APPENDICES

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Appendix 1.1: Benefits of Improved Visibility[103]

Visibility can be defined as the degree to which the atmosphere is transparent to visible light.[104] Visibility impairment is the most noticeable effect of fine particles present in the atmosphere, as particle pollution degrades the visual appearance and perceived color of distant objects and reduces the range at which they can be distinguished from the background.

Visibility impairment due to haze in Class I areas is primarily due to anthropogenic emissions of fine particulate matter ($PM_{2.5}$). $PM_{2.5}$ is composed of ammonium sulfate, ammonium nitrate, organic carbon, elemental carbon, fine soil, and trace metals. Fine particulates can be emitted directly into the atmosphere or can be formed in the atmosphere by the transformation of gaseous emissions such as sulfur dioxide, nitrogen oxides, and volatile organic compounds.

Visibility impairment may be either "reasonably attributable" (defined in 40 CFR 51.301 as attributable by visual observation) to specific sources (i.e. local visibility impairment) or a result of emissions from a large number of sources located over a wide geographic area (regional haze as defined in 40 CFR 51.301). Sources of visible plumes are generally thought to be comparatively negligible contributors to the impairment of visibility in Class I areas. According to EPA (2005), "there have been a limited number of cases in which Federal land managers have certified the existence of visibility impairment in a Class I area as being 'reasonably attributable' to a particular source."[105]

According to EPA:

> "Regional haze impairs visibility in every direction over a large area, in some cases over multi-state regions. It also masks objects on the horizon and reduces the contrast of nearby objects. The formation, extent, and intensity of regional haze are functions of meteorological and chemical processes, which sometimes cause fine particle loadings to remain suspended in the atmosphere for several days and to be transported hundreds of kilometers from their sources (NRC, 1993). It is this second type of visibility degradation, regional haze, which is principally responsible for impairment in national parks and wilderness areas across the country (NRC, 1993).
>
> While visibility impairment in urban areas at times may be dominated by local sources, it often may be significantly affected by long-range transport of haze due to the multi-day residence times of fine particles in the atmosphere. Fine particles transported from urban and industrialized areas, in turn, may, in some cases, be significant contributors to regional-scale impairment in Class I and other rural areas."[106]

The document goes on to state:

> "Regional trends in Class I area visibility are updated and presented in the EPA's National Air Quality and Emissions Trends Report (EPA, 2001). Eastern trends for the 20% haziest days from 1992-1999 showed a 1.5 deciview improvement, or about a 16% improvement. However, visibility in the East remains significantly impaired, with an average visual range of approximately 20 km on the 20% haziest days. In western Class I areas, aggregate trends showed little change during 1990-1999 for the 20% haziest days, and modest improvements

[103] Adapted from the CENRAP SIP Template
[104] National Research Council, Commission on Geosciences, Environment and Resources, 1993.
[105] EPA, OAQPS, 2005. p 6-2.
[106] Ibid. p 6-3.

> on the 20% mid-range and clearest days. Average visual range on the 20% haziest days in western Class I areas is approximately 100 km."[107]

The benefits of improving visibility in the federally protected national parks and wilderness areas by reducing $PM_{2.5}$ pollution are far reaching and include environmental/ecological, health, and economic benefits.

Environmental/Ecological Benefits

The components and precursors of $PM_{2.5}$ are harmful to the environment and ecosystems. For instance, sulfur dioxide is linked to increased transformation of mercury to methyl mercury, the more toxic form of mercury, in lake sediments. In addition to being precursors to sulfate and nitrate fine particles, sulfur dioxide and nitrogen oxides contribute to the formation of acid rain. Acid rain has harmful effects on forests, soils, flora, fauna, waterways, materials, and human health.[108]

According to EPA, acid rain and dry deposition of acidic particles contribute to the corrosion of metals (such as bronze) and the deterioration of paint and stone (such as marble and limestone). These effects seriously reduce the value to society of buildings, bridges, cultural objects (such as statues, monuments, and tombstones), and cars. The afore-mentioned fact is reiterated in the following excerpts from the EPA's review of the Particulate Matter Standard:

> "Physical damage such as corrosion, degradation, and deterioration occurs in metals, paint finishes, and building materials such as stone and concrete, respectively. Metals are affected by natural weathering processes even in the absence of atmospheric pollutants. Atmospheric pollutants, most notably SO_2 and particulate sulfates, can have an additive effect, by promoting and accelerating the corrosion of metals … (CD, pp. 4-192 to 4-193)."[109]

> "In addition, the deposition of ambient PM can reduce the aesthetic appeal of buildings and culturally important articles through soiling. Particles consisting primarily of carbonaceous compounds cause soiling of commonly used building materials and culturally important items such as statues and works of art (CD, p. 4-191). Soiling is the deposition of particles on surfaces by impingement, and the accumulation of particles on the surface of exposed material results in degradation of its appearance" (EPA, 1996b, p. VIII-19)."[110]

Another environmental effect linked to $PM_{2.5}$ precursors, and thus visibility impairment, is the formation of ozone. As stated in the EPA's PM Data Analysis Workbook, "formation of a substantial fraction of secondary $PM_{2.5}$ depends on photochemical gas phase reactions."[111] Ground level ozone has been linked to foliage and ecosystem damages, as well as the more commonly mentioned respiratory problems.

Currently 21 of the 48 contiguous states have areas that have been designated non-attainment for $PM_{2.5}$ and 14 of those states have non-attainment areas for the eight hour ozone standard.[112] Therefore, reduction in visibility impairing pollutants will help these areas to attain the NAAQS for $PM_{2.5}$ and ozone.

Other environmental and ecological benefits are likely to result from the reduction of visibility impairing particulates and their precursors. For example, reduction of sulfur dioxide will reduce the amount of

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[107] Ibid. p 6-4.
[108] EPA. *Effects of Acid Rain*.
[109] EPA, OAQPS, 2005. p 6-51.
[110] Ibid., p 6-50.
[111] EPA, 1996.
[112] EPA, NAAQS Designations web pages

injury or death of tissues in foliage, while reduction of both nitrogen and sulfur compounds will decrease acidification and fertilization of waters and soils and eutrophication of coastal waters and estuaries. Finally, reduction of metals and toxic organics will decrease bioaccumulation in the food chain, which causes neurological and reproductive effects in fish and wildlife.

Health Benefits

Fine particulate matter poses significant health threats because it can easily reach deep into the lungs. Strategies to reduce visibility impairment may result in reduced concentrations of $PM_{2.5}$ elsewhere, leading to health benefits. Studies link particulate matter to a host of health problems, including premature death, aggravated asthma, and other respiratory ailments that require emergency-room care or hospitalization. The elderly are especially at risk for premature death from the effects of particulate matter. Those most at risk for respiratory impacts include the elderly, people with asthma or pre-existing heart or lung disease, and children.

> "There are several reports of associations between short-term fluctuations in ambient PM and day-to-day frequency of respiratory illnesses (6). In most cases, notably in pre-teen children, assessments have found exacerbation of pre-existing illness and related symptoms rather than de novo acute respiratory infections (7). The use of inhalers has also been shown to increase in many young asthmatics in response to air pollution in general and PM in particular."[113]

In EPA's Particulate Matter review, the following effects on the respiratory system from short-term and long-term exposures to particulate matter are discussed:

> "[R]ecent epidemiologic findings are consistent…in showing associations with both respiratory symptom incidence and decreased lung function (CD, p. 9-70). PM_{10} and $PM_{2.5}$ were associated with small decreases in lung function and increases in respiratory symptoms…The findings from studies of physicians' office visits…offer new evidence of acute respiratory effects with exposure to ambient PM that is coherent with evidence of increased respiratory symptoms and admissions/visits to the hospital or emergency room for respiratory disease…In general…studies have indicated that long term exposure to $PM_{2.5}$ is associated with reduced lung function…and increased risk of developing chronic respiratory illness (CD, p. 8-313)."[114]

In the same Review, EPA also found that particulate matter has an impact on cardiovascular health.

> "[N]ew epidemiologic studies provide much more evidence of effects on the cardiovascular system with short-term exposure to PM, particularly PM_{10} and $PM_{2.5}$ (CD, p. 9-67). Epidemiologic studies have reported associations between short-term exposures of ambient PM (often using PM_{10}) and measures of changes in cardiac function such as arrhythmia, alterations in electrocardiogram (ECG) patterns, heart rate or heart rate variability changes, though the CD urges caution in drawing conclusions regarding the effects of PM on heart rhythm (CD, p. 8-166)."[115]

EPA has also stated that exposure to ambient PM affects the autonomic control of the heart; alters cardiac re-polarization; and can affect cardiac arrhythmias and myocardial infractions.[116]

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[113] EPA, ORD, 2004. p 94.
[114] EPA, OAQPS, 2005. pp 3-22 to 3-23.
[115] Ibid, pp 3-23 to 24.
[116] EPA, ORD, 2004.

In 2002, a study by C. Arden Pope, et al, assessed the relationship between long-term exposure to ambient PM pollution and cardiopulmonary mortality.[117] The results seemed to indicate for each 10 μ/m^3 increase of $PM_{2.5}$ there was about a 6% increased risk of cardiopulmonary mortality. This study also assessed the relationship between long-term exposure to fine particulate air pollution and lung cancer, with results indicating that with each 10 μ/m^3 increase in $PM_{2.5}$ ambient air concentration there is an 8% increase in lung cancer mortality.

A press release from the National Institute of Environmental Health Sciences about this study stated:

> "Years of exposure to the high concentrations of tiny particles of soot and dust from cars, power plants and factories in some metropolitan areas of the United States significantly increase residents' risk of dying from lung cancer and heart disease…Arden Pope…the study's co-leader, said that while far less than the risks associated with active cigarette smoking, 'we found that the risk of dying from lung cancer as well as heart disease in the most polluted cities was comparable to the risk associated with nonsmokers being exposed to second-hand smoke over a long period of time.'
>
> The study evaluated the effects of air pollution on human health over a 16-year period. Previous studies have linked soot in the air to many respiratory ailments and even death, but the new findings 'provide the strongest evidence to date that long term exposure to fine particulate air pollution common to many metropolitan areas is an important risk factor for cardiopulmonary mortality,' as well as lung cancer deaths"[118]

Economic Benefits

Poor visibility in national parks and wilderness areas may also result in a decline in visitors, in turn affecting the socio-economic structure of the municipalities located near these areas. Tourism is a major part of the economy of regions around Class I areas, as spending in communities surrounding national park sites was approximately $10.6 billion dollars in 2001.[119] Various studies have shown that poor visibility in National Parks results in lower visitor attendance, which would decrease outside dollars coming in to these areas, and that visitors place a high value on scenic vistas.[120]

Additional economic benefits from improved visibility are linked to improved health outcomes. Incidences of asthma and other cardiopulmonary problems can cause absences from work and school and decreased productivity, as well as high medical expenses. By improving health, decreases in $PM_{2.5}$ will improve these economic indicators.

[117] Pope, et al., 2002.
[118] NIEHS, 2002.
[119] Stynes and Sun, 2003.
[120] U.S. National Park Service, Air Resources Division, *Economic Effects of Air Pollution* and *Clear View: What is it worth?* (web pages)

Appendix 1.2: EPA SIP Submittal Checklist

Y / N or N/A	Regulation Citation	Regulation Summary	Location in SIP
	Administrative Requirements from Appendix V to Part 51		
Y	2.1(a)	Has a letter of submittal from the governor / designee, requesting EPA approval of the SIP been received?	Front matter
Y	2.1(b)	Has the state provided evidence it has adopted the legally enforceable portions of the plan in the state code or body of regulations; or issued the necessary permits, orders, consent agreements in final form?	Appendix 9.6 Appendix 9.7
Y	2.1(c)	Has the state provided evidence it has the necessary legal authority under state law to adopt and implement the plan?	Appendix 2.1
Y	2.1(d)	Has the official state regulation /document been signed/stamped/dated by the appropriate state official indicating that it is fully enforceable by the state?	Appendix 9.6 Appendix 9.7
Y	2.1(e)	Has the state provided evidence it followed all of the procedural requirements of the state's laws and constitution in the adoption/issuance of the plan?	Appendix 2.1
Y	2.1(f)	Has the state provided evidence that public notice was given of the proposed change consistent with procedures approved by EPA, including the date of publication of such notice?	Appendix 2.2
Y	2.1(g)	Has the state provided a certification that public hearings(s) were held in accordance with the information provided in the public notice and the state's laws and constitution, if applicable?	Appendix 2.3
Y	2.1(h)	Has the state provided a compilation of public comments and the state's response thereto?	Appendix 2.4
	Technical Requirements from 40 CFR 51.308		
N	(b)	Was the SIP submitted no later than December 17, 2007?	
Y	(d)	Did the state provide a table identifying each mandatory Class I Federal area located within the state and in each mandatory Class I Federal area located outside the state affected by emissions from within the state?	Table 10.1
Y	(d)(1)	Did the state establish RPGs for each Class I area that provide for an improvement in visibility for the most impaired days over the period of the SIP, and ensure no degradation in visibility for the least impaired days over the same period?	Table 10.6
Y	(d)(1)(i)(A)	In establishing RPGs for each Class I area, did the state consider the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected sources, and include a demonstration showing how these factors were taken into consideration in selecting the goal?	Chapter 10 Appendix 10.5 Appendix 10.6
Y	(d)(1)(i)(B)	Did the state submit the glidepath (i.e., rate of progress needed to attain natural visibility conditions by 2064) for each Class I area?	Table 5.3

Y / N or N/A	Regulation Citation	Regulation Summary	Location in SIP
Y	(d)(1)(i)(B)	In establishing the RPG for each Class I area, did the state calculate the uniform rate of improvement in visibility and the emission reduction measures needed to achieve it for the period covered by the SIP?	Chapter 5 Chapter 8 Modeling TSD
Y	(d)(1)(ii)	If the state establishes a RPG < the glidepath, has it demonstrated, based on the factors in (d)(1)(i)(A), the rate of progress for the SIP to attain natural conditions by 2064 is not reasonable, and its RPG is reasonable?	Chapter 10
Y	(d)(1)(ii)	If the state establishes a RPG < the glidepath, did it provide to the public for review as part of its SIP, an assessment of the number of years it would take to attain natural conditions using its RPG?	Table 10.6
Y	(d)(1)(iv)	In developing its RPG, has the state consulted with those states that may reasonably be anticipated to cause or contribute to visibility impairment in the Class I areas?	Chapter 3 Appendix 3.2
Y	(d)(1)(iv)	If the state cannot agree with another state(s) that a goal provides for reasonable progress, has the state described in its submittal the actions taken to resolve the disagreement?	Chapter 3 Appendix 3.2 Chapter 10
Y	(d)(1)(vi)	Has the state adopted RPGs that represents at least the visibility improvement expected from implementation of other CAA programs during the applicable planning period?	Chapter 10
Y	(d)(2)(i)	Has the state calculated baseline visibility conditions for each Class I area for the most impaired and least impaired days using 2000 to 2004 monitoring data?	Table 5.1
Y	(d)(2)(i)	In calculating the baseline visibility conditions, did the state estimate the average degree of visibility impairment for the most and least impaired days for each calendar year from 2000 to 2004, and then determine the average of these annual values?	Table 5.2
Y	(d)(2)(i)	If the state has Class I areas without onsite monitoring data for 2000 - 2004, did the state use the most representative available monitoring data for 2000 - 2004 to establish baseline values, in consultation with the EPA Regional Office?	Chapter 5
Y	(d)(2)(iii)	Did the state calculate natural visibility conditions for the most impaired and least impaired days by estimating the degree of impairment based on available monitoring information and appropriate data analysis techniques?	Chapter 5 Table 5.1
Y	(d)(2)(iv)A	Did the state calculate the number of deciviews by which baseline conditions exceed natural visibility conditions for the most impaired and least impaired days for the first planning period?	Table 5.3
Y	(d)(3)	Did the state submit a LTS that addresses visibility impairment for each Class I area, inside and outside the state, which may be affected by the state's emissions?	Chapter 10
Y	(d)(3)	Does the LTS include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the RPGs established by states having Class I areas?	Appendix 9.6 Appendix 9.7 Chapter 10 Appendix 10.4

Y / N or N/A	Regulation Citation	Regulation Summary	Location in SIP
Y	(d)(3)(i)	In establishing its LTS, did the state consult with other state(s) to develop coordinated emission management strategies for cases in which it has emissions that are reasonably anticipated to contribute to visibility impairment in any Class I area located in those state(s)?	Chapter 3 Chapter 10
Y	(d)(3)(i)	In establishing its LTS, did the state consult with other state(s) to develop coordinated emission management strategies for cases in which those state(s) have emissions that are reasonably anticipated to contribute to visibility impairment in any Class I area located within the state?	Chapter 3 Chapter 10
Y	(d)(3)(ii)	In establishing its LTS, where multiple state(s) cause or contribute to impairment of the same Class I area, did the state include all measures necessary to obtain its share of the emission reductions needed to meet the RPG for the area?	Chapter 10
Y	(d)(3)(ii)	In addressing (d)(3)(ii), above, if the state participated in a RPO, did it ensure it included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process?	Chapter 3 Chapter 10
Y	(d)(3)(iii)	In establishing its LTS, did the state document the technical basis, including modeling, monitoring and emissions information, on which it is relying to determine its apportionment of emission reduction obligations necessary for achieving reasonable progress in each Class I area it affects?	Chapter 8 Appendix 10.1 Modeling TSD
Y	(d)(3)(iii)	In addressing (d)(3)(iii), above, did the state identify the baseline emissions inventory on which its strategies are based?	Chapter 7 Chapter 8 Modeling TSD
Y	(d)(3)(iv)	Did the state identify all anthropogenic sources of visibility impairment considered by it in developing its LTS, including consideration of major and minor stationary sources, mobile sources, and area sources?	Chapter 7 Chapter 8 Modeling TSD
Y	(d)(3)(v)(A)	In developing its LTS, did the state consider the emission reductions due to ongoing air pollution control programs, including measures to address RAVI?	Chapter 10
Y	(d)(3)(v)(B)	In developing its LTS, did the state consider measures to mitigate the impacts of construction activities?	Chapter 10
Y	(d)(3)(v)(C)	In developing its LTS, did the state consider emissions limitations and schedules for compliance to achieve the reasonable progress goal?	Chapter 10
Y	(d)(3)(v)(D)	In developing its LTS, did the state consider source retirement and replacement schedules?	Chapter 10
Y	(d)(3)(v)(E)	In developing its LTS, did the state consider smoke management techniques for agricultural and forestry management purposes, including plans as currently exist within the state for these purposes?	Chapter 10 Appendix 10.7

Y / N or N/A	Regulation Citation	Regulation Summary	Location in SIP
Y	(d)(3)(v)(F)	In developing its LTS, did the state consider enforceability of emissions limitations and control measures?	Appendix 9.6 Appendix 9.7 Chapter 10 Appendix 10.3 Appendix 10.4
Y	(d)(3)(v)(G)	In developing its LTS, did the state consider the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the LTS?	Chapter 8 Chapter 10 Modeling TSD
Y	(d)(4)	Did the state submit with the SIP a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment representative of all Class I areas within the state?	Chapter 6 Appendix 6.1
N/A	(d)(4)	Did the state coordinate the above monitoring strategy with the RAVI monitoring strategy in § 51.305?	N/A
N	(d)(4)(i)	Did the SIP provide for the establishment of any additional monitoring sites or equipment needed to assess whether RPGs to address regional haze for all Class I areas within the state are being achieved?	Unnecessary
Y	(d)(4)(ii)	Did the SIP establish procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state to regional haze visibility impairment at Class I areas both within and outside the state?	Chapter 6
N/A	(d)(4)(iii)	For a state with no Class I areas, did the SIP establish procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state to regional haze visibility impairment at Class I areas in other states?	N/A
Y	(d)(4)(iv)	Did the SIP provide for the reporting of all visibility monitoring data to EPA at least annually for each Class I area in the state?	Chapter 6
Y	(d)(4)(v)	Did the SIP include a statewide EI of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area?	Chapter 7 Chapter 8 Modeling TSD
Y	(d)(4)(v)	Did the EI include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions?	Chapter 7 Chapter 8 Modeling TSD
Y	(d)(4)(v)	Did the SIP include a commitment to update the EI periodically?	Chapter 7 Chapter 8
Y	(d)(4)(vi)	Did the SIP include other elements necessary to assess and report on visibility (e.g., reporting, recordkeeping, etc.)?	Chapter 10 Chapter 11
Y	(e)	Did the state submit a SIP containing emission limitations representing BART, and schedules for compliance with BART, for each BART eligible source that may reasonably be anticipated to cause or contribute to any impairment of visibility in any Class I area?	Chapter 9 Appendix 9.3 Appendix 9.4 Appendix 9.6 Appendix 9.7
Y	(e)(1)(i)	Did the SIP include a list of all BART-eligible sources within the state with supporting documentation?	Chapter 9 Table 9.1

Y / N or N/A	Regulation Citation	Regulation Summary	Location in SIP
Y	(e)(1)(ii)	Did the SIP include a determination of BART for each BART-eligible source in the state that emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any Class I area?	Chapter 9 Appendix 9.3 Appendix 9.4
Y	(e)(1)(ii)(A)	Did the SIP include a determination of BART based on an analysis of the best system of continuous emission control technology available, and associated emission reductions achievable for each source subject to BART within the state?	Chapter 9
Y	(e)(1)(ii)(A)	In the BART analysis, did the state take into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology?	Chapter 9 Appendix 9.4 Appendix 9.5
Y	(e)(1)(ii)(B)	Did the state determine BART for fossil-fuel fired power plants > 750 megawatts pursuant to the BART guidelines?	Chapter 9 Appendix 9.4
Y	(e)(1)(iii)	If the state has determined that technological or economic limitations on the applicability of measurement methodology to a particular source would make the imposition of an emission standard infeasible, has the state prescribed a design, equipment, work practice, or other operational standard, to require the application of BART, as an alternative to a BART emission standard?	Chapter 9 Appendix 9.3
Y	(e)(1)(iii)	If the state adopted a design, equipment, work practice, or other operational standard alternative to BART, did the state, to the degree possible, set forth the emission reduction to be achieved, and provide for compliance by means which achieve equivalent results?	Chapter 9 Appendix 9.3
Y	(e)(1)(iv)	Has the state required each source subject to BART to install and operate BART as expeditiously as practicable, but no later than 5 years after approval of the SIP?	Chapter 9
Y	(e)(1)(v)	Has the state required each BART source to maintain the required control equipment and establish procedures to ensure such equipment is properly operated and maintained?	Chapter 9
N/A	(e)(4)	If the state is using its participation in CAIR to exempt BART-eligible EGUs from BART, has it included supporting documentation?	N/A
N/A	(e)(4)	If the state is using its participation in CAIR to exempt BART-eligible EGUs from BART, did it include provisions for a geographic enhancement to the program to address RAVI BART under § 51.302(c)?	N/A
N/A	(e)(6)	If a facility is seeking an exemption under §51.303(a)(2)–(h) for any of its BART-eligible emission units, has the appropriate documentation been included in the SIP?	N/A

Y / N or N/A	Regulation Citation	Regulation Summary	Location in SIP
Y	(f)	Has the state included a commitment it will submit its SIP revision, as specified in 51.308(f), *by July 31, 2018,* and every ten years thereafter?	Chapter 11
Y	(g)	Has the state included a commitment it will submit its SIP report, as specified in 51.308(g), *by an exact date named*, that is within 5 years from submittal of the initial SIP?	Chapter 11
Y	(h)	Has the state included a commitment it will, at the time of the submission of the SIP report, also submit a determination of the adequacy of its existing Regional Haze SIP revision, as specified in 51.308(h)?	Chapter 11
Y	(i)(1)(i)-(ii)	Did the state, by November 29, 1999, identify in writing to the FLMs the title of the official to which any FLMs can submit recommendations on the implementation 51.308 including, (i) identification of impairment of visibility in any Class I area(s); and (ii) identification of elements for inclusion in the visibility monitoring strategy required by §51.305 and 51.308?	Chapter 4
Y	(i)(2)	Did the state provide the FLMs an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on the SIP (or its revision)?	Chapter 4
Y	(i)(2)(i)-(ii)	Did the above consultation include the opportunity for the FLMs to discuss their: (i) assessment of impairment of visibility in any Class I area; and, (ii) recommendations on the development of the RPG and on the development and implementation of strategies to address visibility impairment?	Chapter 4
Y	(i)(3)	Did the state include in the SIP a description of how it addressed any comments provided by the FLMs?	Appendix 4.2
Y	(i)(4)	Does the SIP provide procedures for continuing consultation between the state and FLMs on the implementation of 51.308, including development and review of SIP revisions and 5-year progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in Class I areas?	Chapter 4 Chapter 10 Chapter 11

Appendix 2.1: Documentation of legal authority and compliance with State procedure

STATE OF MINNESOTA

OFFICE OF THE ATTORNEY GENERAL

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December 21, 2009

Mr. Bharat Mathur
Acting Regional Administrator (AR-19J)
U.S. Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: State Implementation Plan for Regional Haze; Legal Authority and Compliance with Procedural Requirements

Dear Mr. Mathur:

I am writing to confirm that (1) the Minnesota Pollution Control Agency (MPCA) is acting within its legal authority in submitting the revision to its State Implementation Plan (SIP) for Regional Haze and issuing the rules and orders attached to it; and (2) the MPCA has complied with the procedural rules that apply to such actions.

This letter identifies the sources of the MPCA's authority to implement the proposed revision, and is provided for inclusion in the MPCA's SIP submission to the U.S. Environmental Protection Division (U.S. EPA) to satisfy the requirement of 42 USC § 7410(a)(2)(E).

I. Legal Authority

The MPCA is a statutory agency of the State of Minnesota, Minn. Stat. § 116.02, subd. 1. The Minnesota statute that lays out the powers and duties of the MPCA (Minn. Stat. § 116.07, 2008) states in subd. 2,

> "The agency shall also adopt standards of air quality...Such standards of air quality shall be premised upon scientific knowledge of causes as well as effects based on technically substantiated criteria and commonly accepted practices."

The same statute goes on, in Subdivision 4, to give the agency the authority to

> "[A]dopt, amend, and rescind rules and standards having the force of law relating to any purpose...for the prevention, abatement, or control of air pollution. Any such rule or standard may be of general application throughout the state, or may be limited as to times, places, circumstances, or conditions in order to make due allowance for variations therein. Without limitation, rules or standards may relate to sources or emissions of air contamination or air pollution, to the quality or composition of such emissions, or to the quality of or composition of the ambient air or outdoor atmosphere or to any other matter relevant to the prevention, abatement, or control of air pollution."

This statute also gives the agency the authority to enter into orders, schedules of compliance and stipulation agreements, requiring owners or operators of emission facilities to install and operate monitoring equipment, and to conduct investigations. Minn. Stat. § 116.07, subd. 9 (2008).

Minn. Stat. § 115.071, subd. 1 authorizes the MPCA to enforce Minn. Stat. ch. 116 and all rules, standards, orders, stipulation agreements, schedules of compliance and permits adopted or issued by the MPCA by criminal prosecution, action to recover civil penalties, injunction, action to compel performance, or other appropriate actions.

Among the rules adopted by the MPCA under the above grant of authority is the rule included in the SIP that makes visibility an applicable requirement. Minn. R. 7007.0100, subd. 7, part V lists "any standard or other requirement established under section l69A (Visibility Protection for Federal Class I Areas) or l69B (Visibility) of the act including emission limits established in the determination of best available retrofit technology" as an applicable requirement.

II. Procedural Compliance

The authority to issue orders has been delegated by the Citizens' Board of the MPCA to its Commissioner by delegation dated October 24, 1995. The delegation is subject to several requirements and limitations that either do not apply to the orders issued as part of the Regional Haze SIP revision, or that have been complied with.

The Citizens' Board of the MPCA has also delegated to the Commissioner its authority to make SIP submittals to the U.S. EPA, by delegation dated October 24, 1995. This delegation supplements the Commissioner's direct statutory authority under Minnesota Statute § 116.03, subd. 3 (2008) to act as the state agent to "apply for, receive, and disburse federal funds made available to the state by federal law or rule and regulations promulgated there under for any purpose related to the power and duties of the MPCA or the Commissioner." Nonetheless, the Commissioner and MPCA staff determined that the SIP should be brought before Citizens' Board for its consideration and approval. On December 15, 2009, the Citizens' Board voted to approve submittal of the Regional Haze SIP. The Findings of Fact and Order, signed by the Chair of the Board, is attached.

No additional procedural requirements under state law apply.

Very truly yours,

STEVEN M. GUNN
Deputy Attorney General

(651) 296-8954 (Voice)
(651) 297-4139 (Fax)

AG: #2559389-v1

STATE OF MINNESOTA
MINNESOTA POLLUTION CONTROL AGENCY

IN THE MATTER OF THE PROPOSED REGIONAL HAZE STATE IMPLEMENTATION PLAN FOR THE STATE OF MINNESOTA

FINDINGS OF FACT CONCLUSIONS OF LAW AND ORDER

FINDINGS OF FACT

The above-entitled matter came before the Minnesota Pollution Control Agency (MPCA) Citizens' Board at a regular meeting held in St. Paul, Minnesota on December 15, 2009. Based on the MPCA staff review, comments and information received during the comment period, and other information in the record of the MPCA, the MPCA hereby makes the following Findings of Fact, Conclusions of Law, and Order:

Regulatory Status

1. Section 169A of the Clean Air Act (42 U.S.C. § § 7491) sets forth a national goal of restoring pristine visibility conditions in federal Class I areas. The Clean Air Act requires the U.S. Environmental Protection Agency to promulgate regulations that require each major stationary source which is in existence on August 7, 1977, but which was not in operation for more than fifteen years to procure, install and operate the best available retrofit technology for controlling visibility-impairing emissions. 42 U.S.C. § 7491(b)(2)(A).

2. In 1999, the U.S. Environmental Protection Agency enacted the required federal regulations pursuant to this section of the Clean Air Act. The federal regulations are known as the Regional Haze Rule and are found at 40 CFR 51.300 through 40 CFR 51.309 (Subpart P).

3. The core requirements for State Implementation Plans under the Regional Haze program are laid out in 40 CFR 51.308(d). These requirements are: reasonable progress goals, calculations of baseline and natural visibility conditions, long-term strategy for regional haze, and monitoring strategy.

4. The Best Available Retrofit Technology (BART) requirements for regional haze visibility impairment are contained in 40 CFR 51.308(e). To meet the BART requirements, each State Implementation Plan must include a list of BART-eligible sources within the state and a determination of BART for each subject-to-BART source. BART determinations must be based on the best system of continuous emission control technology available, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impact of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology. BART determinations for fossil-fuel fired power plants with a total generating capacity greater than 750 megawatts must be made pursuant to the guidelines in Appendix Y to Part 51.

Procedural History

5. Pursuant to the Section 110 of the Clean Air Act and 40 CFR 51.300 – 40 CFR 51.309, MPCA staff prepared a proposed State Implementation Plan that conformed to the requirements of federal law.

6. The MPCA notified the public of the public comment period. In addition, the Draft Regional Haze State Implementation Plan was made available for review on the MPCA Web site at http://www.pca.state.mn.us/air/regionalhaze.html.

7. The initial Draft Regional Haze State Implementation Plan was on notice from February 25, 2008 to May 16, 2008. MPCA staff held a public meeting on the Draft Regional Haze SIP on April 8, 2008.

8. The initial Draft Regional Haze State Implementation Plan relied in part on the Clean Air Interstate Rule to which Minnesota was subject. After the notice and comment period on the Draft SIP, the D.C. Circuit Court of Appeals vacated the rule. The MPCA revised the Draft SIP to fill the gap left by the vacated Clean Air Interstate Rule.

9. The public comment period for the Revised Draft Regional Haze SIP began on July 20, 2009 and ended on September 3, 2009. During the comment period on the Revised Draft Regional Haze SIP, the MPCA received three comment letters from government agencies, eight comment letters from affected parties, and two comment letters from citizens.

10. The MPCA prepared responses to all comments received during each comment period. Comment letters received are hereby incorporated by reference as Appendix A to these Findings. The MPCA responses to comments received are hereby incorporated by reference as Appendix B to these Findings and the MPCA adopts the rationale stated in the MPCA staff responses to comments.

CONCLUSIONS OF LAW

11. The MPCA has jurisdiction to submit the Regional Haze State Implementation Plan to the U.S. Environmental Protection Agency for approval and inclusion in Minnesota's State Implementation Plan.

12. Adequate and timely public notice of the proposed Regional Haze State Implementation Plan was given, and public comments on the proposed Plan were addressed in accordance with MPCA requirements.

13. The MPCA concludes that the attached Regional Haze State Implementation Plan contains reasonable progress goals, calculations of baseline and natural visibility conditions, long-term strategy for regional haze, and monitoring strategy, as required under 40 CFR 51.308(d).

14. The MPCA concludes that the reasonable progress goals provide for reasonable progress towards natural visibility conditions and an improvement in visibility for the most impaired days while ensuring no degradation in visibility for the least impaired days.

15. The MPCA concludes that the attached Regional Haze State Implementation Plan contains appropriate BART determinations and emission limitations, as required under 40 CFR 51.308(e), that will achieve emission reductions and reduced visibility impairment from the subject-to-BART units.

16. The MPCA concludes that proper implementation of the control strategies contained in the Regional Haze State Implementation Plan will result in a decrease in emissions that contribute to visibility impairment in the three Class I areas impacted by Minnesota facilities: Boundary Waters Canoe Area Wilderness, Voyageurs National Park, and Isle Royale National Park.

17. Any findings that might properly be termed conclusions and any conclusions that might properly be termed findings are hereby adopted as such.

ORDER

The Minnesota Pollution Control Agency hereby adopts, and authorizes and directs the Commissioner to submit, the attached Regional Haze State Implementation Plan to the U.S. Environmental Protection Agency for approval and inclusion in Minnesota's State Implementation Plan.

IT IS SO ORDERED

Paul Eger

Commissioner Paul Eger
Chair, Citizens' Board
Minnesota Pollution Control Agency

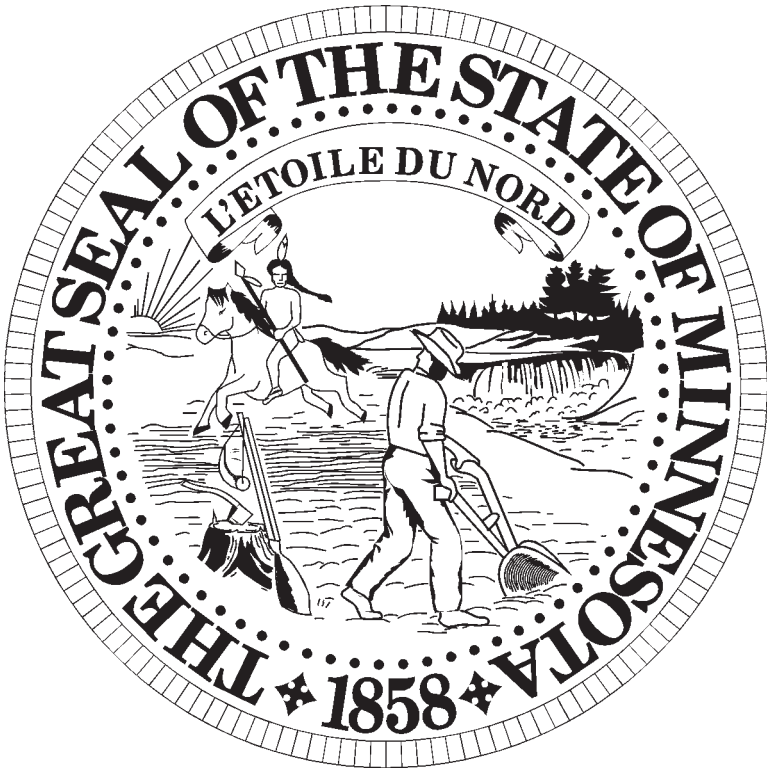
12/16/09

Date

Appendix 2.2: Public Notices

State of Minnesota

State Register



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Published every Monday (Tuesday when Monday is a holiday)

Monday 25 February 2008
Volume 32, Number 35
Pages 1603 - 1658

State Register

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Printing Schedule and Submission Deadlines

Vol. 32 Issue Number	PUBLISH DATE (**BOLDFACE** shows altered publish date)	Deadline for: Emergency Rules, Executive and Commissioner's Orders, Revenue and Official Notices, State Grants, Professional-Technical-Consulting Contracts, Non-State Bids and Public Contracts	Deadline for Proposed, Adopted and Exempt RULES
# 35	Monday 25 February	Noon Tuesday 19 February	Noon Wednesday 13 February
# 36	Monday 3 March	Noon Tuesday 26 February	Noon Wednesday 20 February
# 37	Monday 10 March	Noon Tuesday 4 March	Noon Wednesday 27 February
# 38	Monday 17 March	Noon Tuesday 11 March	Noon Wednesday 5 March

USPS Publication Number: 326-630 (ISSN: 0146-7751)

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compacting State.

Public Comment. Interested persons or groups may submit comments or information on these possible rules in writing until 4:30 p.m. on Friday, April 25, 2008. The Department does not contemplate appointing an advisory committee to comment on the possible rules.

Rules Drafts. The Department does not anticipate that a draft of the possible new rules will be available before the publication of the proposed rules.

Agency Contact Person. Written comments, questions, requests to receive a draft of the rules when it has been prepared, and requests for more information on these possible rules should be directed to: Ms. Carrie Rohling at the Department of Labor and Industry, 443 Lafayette Road North, Third Floor, Saint Paul, Minnesota 55155, or FAX (651) 284-5725.

Alternative Format. Upon request, this Request for Comments can be made available in an alternative format, such as large print, Braille, or cassette tape. To make such a request, please contact the agency contact person at the address or telephone number listed above.

NOTE: Comments received in response to this notice will not necessarily be included in the formal rulemaking record submitted to the administrative law judge if and when a proceeding to adopt rules is started. The agency is required to submit to the judge only those written comments received in response to the rules after they are proposed. If you submitted comments during the development of the rules and you want to ensure that the Administrative Law Judge reviews the comments, you should resubmit the comments after the rules are formally proposed.

Dated: February 11, 2008

Steve Sviggum, Commissioner
Department of Labor and Industry

Minnesota Pollution Control Agency

Environmental Analysis and Outcomes Division

Public Notice on Draft State Implementation Plan Revision

NOTICE IS HEREBY GIVEN that the Commissioner has determined that a State Implementation Plan (SIP) revision must be submitted to meet Minnesota's requirements under the federal Regional Haze Rule (40 CFR 51.300 - 51.309). The draft SIP revision is now available for public comment.

Background. Under the authority of Section 169(a) of the Clean Air Act (the Act), the United States Environmental Protection Agency (EPA) on July 1, 1999 promulgated visibility goals for mandatory Class I Federal areas in the federal Regional Haze Rule. The Regional Haze Rule was further amended in 2005 and 2006. Section 169(a) of the Act and the Regional Haze Rule requires each state to adopt and submit a plan to EPA that addresses the state's contribution to visibility impairment at the mandatory Class I Federal areas.

Purpose of the SIP Revision. The purpose of this SIP revision is to address visibility protection at national parks, wildernesses, and scenic areas, also referred to as mandatory Class I Federal areas. Class I areas within Minnesota are the Boundary Waters Canoe Area Wilderness and Voyageurs National Park. The SIP lays out how Minnesota intends to implement the Regional Haze Rule in order to reduce regional haze in Minnesota's Class I areas as well as those Class I Areas outside of Minnesota where visibility is impacted by emissions from Minnesota.

The SIP revision includes information on the following core requirements of the Regional Haze Rule:

- Reasonable progress goals
- Baseline and natural visibility conditions
- Long-term strategy for regional haze
- Monitoring strategy
- Best Available Retrofit Technology

The SIP revision also fulfills Minnesota's requirements under Section 110(a)(2) of the Act to demonstrate that emissions from Minnesota will not interfere with measures required to meet the implementation plan for any other state related to regional haze and visibility.

The MPCA will hold a public meeting about the proposed SIP revision from 6:00 pm to 8:00 pm on Thursday, April 10, 2008 at the MPCA's Duluth office, 525 Lake Avenue South, Duluth, Minnesota.

In order to facilitate the process of taking public comments during the public meeting, if you would like to speak during the public meeting, please contact the MPCA contact person identified in this notice by April 8, 2008. Those who wish to make comments at the public meeting may also sign up, prior to the start of the public meeting, to speak. If possible, please also provide a written copy of any comments you intend to make at the public meeting.

The MPCA will consider changing the contents of the proposed SIP revision based on comments received during the comment period and at the public meeting. Following the end of the comment period, the Commissioner will decide whether to submit the proposed SIP revision to the EPA unless, as provided by *Minnesota Statutes* § 116.02, the MPCA Citizens' Board makes this decision.

MPCA Contact Person. The MPCA contact person is Catherine Neuschler. Written comments, requests and petitions should be mailed to: Catherine Neuschler, Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division, 520 Lafayette Road North, St. Paul, MN 55155-4194, telephone number: (651) 296-7774 Voice or toll free 1-800-657-3864; facsimile number: (651) 297-8324; and email: *catherine.neuschler@pca.state.mn.us*. TTY users may call the MPCA at TTY (651) 292-5332 or 1-800-657-3864.

Availability of SIP. A copy of the proposed SIP revision is available on the MPCA's Web site at *http://www.pca.state.mn.us/air/regionalhaze.html*. A copy of the proposed SIP is also available upon request by contacting Catherine Neuschler at 651-296-7774, or will be mailed to any interested person upon the MPCA's receipt of a written request. Materials relating to the SIP revision are available for inspection by appointment at the MPCA St. Paul Office, 520 Lafayette Road North, St. Paul, Minnesota 55155, and at the MPCA Duluth Office, 525 Lake Avenue South, Duluth, Minnesota, between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday. To examine these materials in St. Paul, or for more information, please contact Catherine Neuschler. To examine these materials in Duluth please call Patty Parker at (218) 723-4660. All MPCA offices may be reached by calling 1-800-657-3864.

Public Comment Period. Your comments must be in writing and received by Catherine Neuschler by 4:30 p.m. on April 16, 2008. Written comments may be submitted to the MPCA contact person at the address, facsimile number, or E-mail address listed above.

Request to Have MPCA Citizens' Board Make Decision. You have the right to submit a petition to the MPCA Commissioner asking that the MPCA Citizens' Board make the decision on submitting the proposed SIP revision to the EPA. Your petition must be in writing, and must be received by the MPCA contact person by 4:30 p.m. on March 28, 2008. If you submit your request in person or by facsimile, the request must be received by the MPCA by April 1. Whether the petition will be granted or denied is in the sole discretion of the MPCA Commissioner. The MPCA Citizens' Board will only make the decision on the proposed SIP revision if the MPCA Commissioner grants your petition or if an MPCA Citizens' Board member makes a timely request to have the decision made by the MPCA Citizens' Board.

Brad Moore, Commissioner
Minnesota Pollution Control Agency

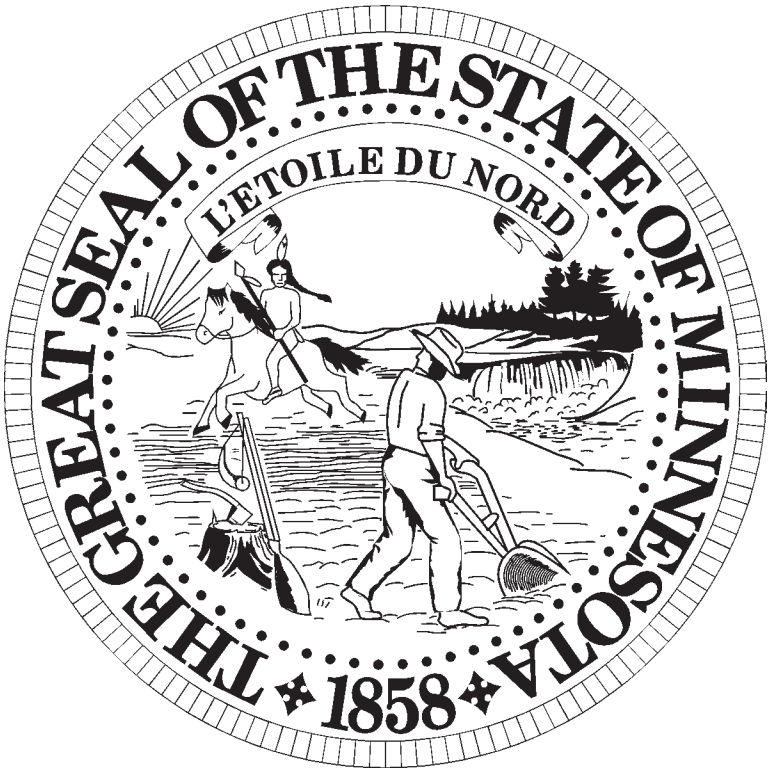
Minnesota Pollution Control Agency

Public Notice for the National Pollutant Discharge Elimination System/State Disposal System General Permit for Stormwater Associated with Construction Activity

NOTICE IS HEREBY GIVEN that the Minnesota Pollution Control Agency (MPCA) intends to reissue National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) General Permit No. MNR100001, under the provisions of *Minnesota Rules* 7001.0210, for persons conducting construction activity and for discharges of stormwater associated with construction activity. Com-

State of Minnesota

State Register



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Monday 7 April 2008
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# 41	Monday 7 April	Noon Tuesday 1 April	Noon Wednesday 26 March
# 42	Monday 14 April	Noon Tuesday 8 April	Noon Wednesday 2 April
# 43	Monday 21 April	Noon Tuesday 15 April	Noon Wednesday 9 April
# 44	Monday 28 April	Noon Tuesday 22 April	Noon Wednesday 16 April

USPS Publication Number: 326-630 (ISSN: 0146-7751)

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facility services for State Fiscal Year 2009 and 2010. The state general fund cost decrease is projected to be $4,546,000 in State Fiscal Year 2009 and ; $1,357,000 in State Fiscal Year 2010.

The net effect of the proposed nursing facility rate change would be an increase in state Medical Assistance expenditures for nursing facility services in State Fiscal Year 2011. The state general fund cost increase is projected to be $1,357,000 for State Fiscal Year 2011.

Information on the proposed inpatient hospital rate changes is available from Paul Olson, Department of Human Services, Health Care Administration, Post Office Box 64984, St. Paul, Minnesota, 55164-0984; **phone** (651) 431-2532 or **email:** *paul.olson@state.mn.us*

Information on the proposed nursing facility and ICF/MR rate changes is available from Kari Irber, Department of Human Services, Continuing Care Administration, Post Office Box 64974, St. Paul, Minnesota, 55164-0974; **phone** (651) 431-3491 or **email:** *kari.irber@state.mn.us.*

The public is invited to attend the legislative hearings where these proposals will be discussed. Information on Senate hearings is available from the Senate Information Office at: (651) 296-0504 (voice) or (651) 296-0250 (**TTY**); for Greater Minnesota call 1-888-234-1112 (voice) or 1-888-234-1216 (**TTY**). Hearing schedules are posted at: *http://www.senate.mn.schedule*

Information on House of Representatives hearings is available from the House of Representatives Public Information Office at: (651) 296-2146 (voice) or (651) 296-9896 (**TTY**); for Greater Minnesota call 1-800-657-3550 or 1-800-627-3529 (**TTY)**. Hearing schedules are posted at: *http://www.house.mn/hinfo/hinfosched.asp*

Notice of final rate changes enacted by the 2008 legislature will be published in the *State Register* prior to the effective date of the changes.

Minnesota Pollution Control Agency

Environmental Analysis and Outcomes Division

Public Notice of Extension of Time to Submit Comments on Draft State Implementation Revision

NOTICE IS HEREBY GIVEN that the Commissioner of the Minnesota Pollution Control Agency (MPCA) is extending the time for submission of comments, requests, and petitions on the Draft State Implementation Plan (SIP) Revision for Regional Haze until May 16, 2008. The purpose of this SIP revision is to address visibility protection at national parks, wildernesses, and scenic areas, also referred to as mandatory Class I Federal areas.

The MPCA will consider changing the contents of the proposed SIP revision based on comments received during the comment period. Following the end of the comment period, the Commissioner will decide whether to submit the proposed SIP revision to the EPA unless, as provided by *Minnesota Statutes* § 116.02, the MPCA Citizens' Board makes this decision.

MPCA Contact Person. The MPCA contact person is Catherine Neuschler. Written comments, requests and petitions should be mailed to: Catherine Neuschler, Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division, 520 Lafayette Road North, St. Paul, MN 55155-4194, **phone:** (651) 296-7774; **toll-free:** 1-800-657-3864; **fax:** (651) 297-8324; and **e-mail:** *catherine.neuschler@pca.state.mn.us*. **TTY** users may call the MPCA at TTY (651) 292-5332 or 1-800-657-3864.

Availability of SIP. A copy of the proposed SIP revision is available on the MPCA's Web site at *http://www.pca.state.mn.us/air/regionalhaze.html*. A copy of the proposed SIP is also available upon request by contacting Catherine Neuschler at (651) 296-7774, or will be mailed to any interested person upon the MPCA's receipt of a written request. Materials relating to the SIP revision are available for inspection by appointment at the MPCA St. Paul Office, 520 Lafayette Road North, St. Paul, Minnesota 55155, and at the MPCA Duluth Office, 525 Lake Avenue South, Duluth, Minnesota, between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday. To examine these materials in St. Paul, or for more information, please contact Catherine Neuschler. To examine these materials in Duluth please call Patty Parker at (218) 723-4660. All MPCA offices may be reached by calling 1-800-657-3864.

Public Comment Period. The original public notice was published on February 25, 2008 in the *State Register* (32 SR 1643). That notice indicated that the public comment period would end on April 16, 2008. This notice is extending the public comment period to May 16, 2008. Comments must be received in writing at the MPCA by 4:30 p.m. on May 16, 2008. Written comments may be submitted to the MPCA contact person at the address, facsimile number, or E-mail address listed above.

Request to Have MPCA Citizens' Board Make Decision. You have the right to submit a petition to the MPCA Commissioner asking that the MPCA Citizens' Board make the decision on submitting the proposed SIP revision to the EPA. Your petition must be in writing. Whether the petition will be granted or denied is in the sole discretion of the MPCA Commissioner. The MPCA Citizens' Board will only make the decision on the proposed SIP revision if the MPCA Commissioner grants your petition or if an MPCA Citizens' Board member makes a timely request to have the decision made by the MPCA Citizens' Board.

Brad Moore, Commissioner
Minnesota Pollution Control Agency

Minnesota Pollution Control Agency

Environmental Analysis and Outcomes Division

Request for Comments on Possible Rule Amendments Governing Prevention of Significant Deterioration of Air Quality to be Codified in *Minnesota Rules* Chapter 7007.3000

Subject of Rule: The Minnesota Pollution Control Agency (MPCA) requests comments on a possible rule revision affecting the MPCA's Prevention of Significant Deterioration of air quality rule, currently codified in *Minnesota Rules*, Section 7007.3000. Please note that as the MPCA develops this rulemaking it may identify portions of other chapters of the air quality rules that need to be amended, for example when one rule cross references another or shares a common definition. Such collateral amendments will be kept within the original scope of the rule.

Background: The federal New Source Review permit program has two parts: 1) Prevention of Significant Deterioration (PSD) applies to major emitting facilities (as that term is defined by § 168 of the Clean Air Act, 42 *U.S.C.* § 7479) in areas that are in attainment with the National Ambient Air Quality Standards (NAAQS) and 2) Non Attainment New Source Review (NANSR) applies to major emitting facilities in areas that are not in attainment with the NAAQS. Currently, all of Minnesota is in attainment with NAAQS. As a result, only the PSD portion of the program applies in Minnesota at this time. Regulations to implement PSD are codified at 40 CFR 51.166 and 40 CFR 52.21.

Currently, the MPCA operates the PSD permit program through direct delegation of authority from the United States Environmental Protection Agency (EPA) to the State of Minnesota. This means that Minnesota operates the federal PSD program as an agent of EPA rather than operating an approved state PSD program. Because Minnesota operates a federally delegated PSD program, it is constrained to administer the federal program verbatim without any changes for state considerations.

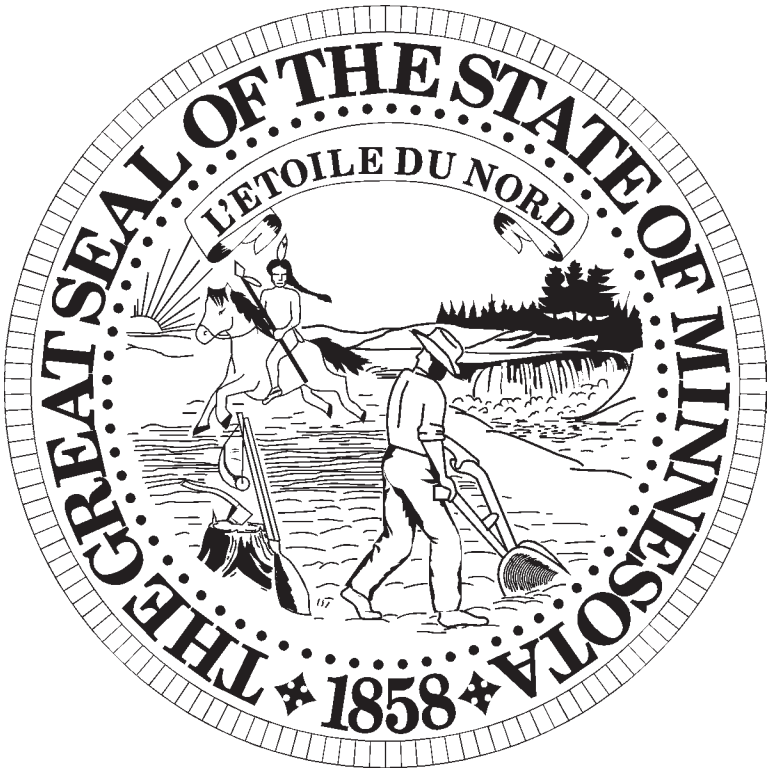
States that operate approved state programs do so by submitting for EPA approval a state implementation plan (SIP) that is at least as effective as the federal PSD program. It should be noted that Minnesota has incorporated the federal PSD rule by reference at *Minnesota Rule* 7007.3000. The incorporation was never submitted to EPA as part of a request for PSD SIP approval, however, and Minnesota continues to operate only as a delegated PSD state.

At this time, the MPCA is considering whether to amend 7007.3000 and whether to submit a State Implementation Plan (SIP) to the EPA in order for Minnesota's PSD permit program to become a "SIP-approved" program rather than a delegated program. Having a SIP-approved PSD program would allow the MPCA the flexibility to determine if future changes to the PSD program should be made in Minnesota. A PSD-approved program would also give Minnesota more time to implement federal PSD amendments in the future and would keep the appeal process for PSD permits within the state.

The MPCA is not currently considering making changes to the substantive provisions of the PSD program; this rulemaking focuses on

State of Minnesota

State Register



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State Register

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# 3	Monday 20 July	Noon Tuesday 14 July	Noon Wednesday 8 July
# 4	Monday 27 July	Noon Tuesday 21 July	Noon Wednesday 15 July
# 5	Monday 3 August	Noon Tuesday 28 July	Noon Wednesday 22 July
# 6	Monday 10 August	Noon Tuesday 4 August	Noon Wednesday 29 July

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Century College, White Bear Lake, MN
Dakota County Technical College, Rosemount, MN
Hennepin Technical College, Brooklyn Park and Eden Prairie, MN
Inver Hills Community College, Inver Grove Heights, MN
Metropolitan State University, St Paul, MN
Minneapolis Community & Technical College, Minneapolis, MN
Minnesota State University Moorhead, Moorhead, MN
Normandale Community College, Bloomington, MN
North Hennepin Community College, Brooklyn Park, MN
Riverland Community College, Austin, Albert Lea, and Owatonna, MN
St Cloud Technical College, St Cloud, MN
St Paul Technical College, St Paul, MN
South Central College, North Mankato, MN

Minneapolis Community and Technical College:

Minnesota West Community and Technical College:

Normandale Community College:
Department of Academic Affairs, Office of Institutional Research:

Winona State University:

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Transportation Department (Mn/DOT)

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An ECP is a health care provider that serves high-risk, special needs, and underserved individuals. In order to be designated as an ECP, a provider must demonstrate that it meets the requirements of *Minnesota Statutes* Section 62Q.19 and *Minnesota Rules* Chapter 4688. The public is allowed 30 days from the date of the publication of this notice to submit written comments on the application. The commissioner will approve or deny the application once the comment period and compliance review is complete.

For more information contact:

Mary Ann Fena
Managed Care Systems Section
Division of Compliance Monitoring
Department of Health
P.O. Box 64882
St. Paul, MN 55164-0882
Phone: (651) 201-5164

Minnesota Pollution Control Agency (MPCA)

Environmental Analysis and Outcomes Division

Public Notice on Revised Draft Regional Haze State Implementation Plan Revision

NOTICE IS HEREBY GIVEN that the Commissioner has determined that a State Implementation Plan (SIP) revision must be submitted to meet Minnesota's requirements under the federal Regional Haze Rule (40 CFR 51.300 - 51.309). A draft SIP was placed on public notice on February 25, 2008; a revised draft Regional Haze SIP is now available for public comment.

Background. Under the authority of Section 169(a) of the Clean Air Act (the Act), the United States Environmental Protection Agency (EPA) on July 1, 1999 promulgated visibility goals for mandatory Class I Federal areas in the federal Regional Haze Rule. The Regional Haze Rule was further amended in 2005 and 2006. Section 169(a) of the Act and the Regional Haze Rule requires each state to adopt and submit a plan to EPA that addresses the state's contribution to visibility impairment at the mandatory Class I Federal areas.

Purpose of the SIP Revision. The purpose of this SIP revision is to address visibility protection at national parks, wildernesses, and scenic areas, also referred to as mandatory Class I Federal areas. Class I areas within Minnesota are the Boundary Waters Canoe Area Wilderness and Voyageurs National Park. The SIP lays out how Minnesota intends to implement the Regional Haze Rule. The SIP revision includes information on the following core requirements of the Regional Haze Rule: reasonable progress goals, baseline and natural visibility conditions, long-term strategy for regional haze, monitoring strategy, and Best Available Retrofit Technology (BART).

A draft SIP was placed on notice in February 2008; in response to comments received and the potential for changes in the application of the federal Clean Air Interstate Rule to Minnesota, the SIP has been revised. The revised SIP is now available for public comment. Comments will be taken only on those portions of the SIP that have changed since the initial draft. Revised portions include:

- Best Available Retrofit Technology for Electric Generating Units
- Administrative Orders by Consent for taconite facilities
- Long Term Strategy

Information on these items is found in Chapters 8, 9, and 10 of the revised SIP. For context, the entire SIP is available for review, but comments will be taken only on Chapter 8, 9, 10 and the associated Appendices, and any changes made in response to comments on the initial draft.

The MPCA will consider changing the contents of the proposed SIP revision based on comments received during the comment period. Following the end of the comment period, the Commissioner will decide whether to submit the proposed SIP revision to the EPA unless, as provided by *Minnesota Statutes* § 116.02, the MPCA Citizens' Board makes this decision.

MPCA Contact Person. The MPCA contact person is Catherine Neuschler. Written comments, requests and petitions should be mailed to: Catherine Neuschler, Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division, 520 Lafayette Road North, St. Paul, MN 55155-4194, telephone number: (651) 757-2607 Voice or toll free 1-800-657-3864; facsimile number: (651)

297-8324; and e-mail: *catherine.neuschler@pca.state.mn.us*. TTY users may call the MPCA at TTY (651) 292-5332 or 1-800-657-3864.

Availability of SIP. A copy of the proposed SIP revision is available on the MPCA's Web site at *http://www.pca.state.mn.us/air/regionalhaze.html*. A copy of the proposed SIP is also available upon request by contacting Catherine Neuschler at (651) 757-2607, or will be mailed to any interested person upon the MPCA's receipt of a written request. Materials relating to the SIP revision are available for inspection by appointment at the MPCA St. Paul Office, 520 Lafayette Road North, St. Paul, Minnesota 55155, between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday. To examine these materials in St. Paul, or for more information, please contact Catherine Neuschler.

Public Comment Period. Your comments must be in writing and received by the MPCA contact person by 4:30 p.m. on August 19, 2009. Written comments may be submitted to the MPCA contact person at the address, facsimile number, or E-mail address listed above.

Request to Have MPCA Citizens' Board Make Decision. You have the right to submit a petition to the MPCA Commissioner asking that the MPCA Citizens' Board make the decision on submitting the proposed SIP revision to the EPA. Your petition must be in writing, and must be received by the MPCA contact person by 4:30 p.m. on August 19, 2009. Whether the petition will be granted or denied is in the sole discretion of the MPCA Commissioner. The MPCA Citizens' Board will only make the decision on the proposed SIP revision if the MPCA Commissioner grants your petition or if an MPCA Citizens' Board member makes a timely request to have the decision made by the MPCA Citizens' Board.

Public Utilities Commission (PUC)

Energy Facilities Planning

Notice of Filing and Public Comment in the Matter of the Application of Buffalo Ridge Power Partners, LLC for a Certificate of Need for the 138-Megawatt Bitter Root Wind Project in Yellow Medicine and Lincoln Counties, Minnesota Public Utilities Commission Docket No: IP-6684/CN-08-785

NOTICE IS HEREBY GIVEN that on April 27, 2009, Buffalo Ridge Power Partners, LLC, (the Applicant) submitted an application for a certificate of need for a 138-Megawatt wind-powered generation facility in Yellow Medicine and Lincoln Counties, near Canby. The proposed wind generation project constitutes a "large energy facility" as defined in *Minnesota Statutes* § 216B.2421, subd. 2 (1) and therefore cannot be constructed or sited in Minnesota unless the commission issues a certificate of need to the Applicant. The review process for certificate of need applications are contained in *Minnesota Rules* Chapter 7849.

On July 7, 2009 the commission ordered an informal review process as authorized by *Minnesota Rules* 7829.1200. This order and other documents associated with certificate of need application can be viewed at: *www.puc.state.mn.us* (click 'Search eDockets' then enter docket number "08 785" for the certificate of need application). Additionally the Applicants intend to file a site permit application for the project and information on this application will be available once the application is filed.

Interested persons are encouraged to provide written comments on whether the proposed project is needed and is in the public interest. **This comment period is open until August 10, 2009 at 4:30 p.m. Individuals may file replies to comments received until September 14, 2009 at 4:30 p.m.** These comments should be addressed to Burl Haar Executive Secretary, Minnesota Public Utilities Commission, 121 7th Place East, Suite 350, St. Paul, MN 55101. Questions about the Bitter Root Wind Project certificate of need application may be directed to Michael Kaluzniak, Minnesota Public Utilities Commission, 121 – 7th Place East, Suite 350, St. Paul, MN 55101, phone: (651) 201-2257, e-mail: *mike.kaluzniak@state.mn.us*.

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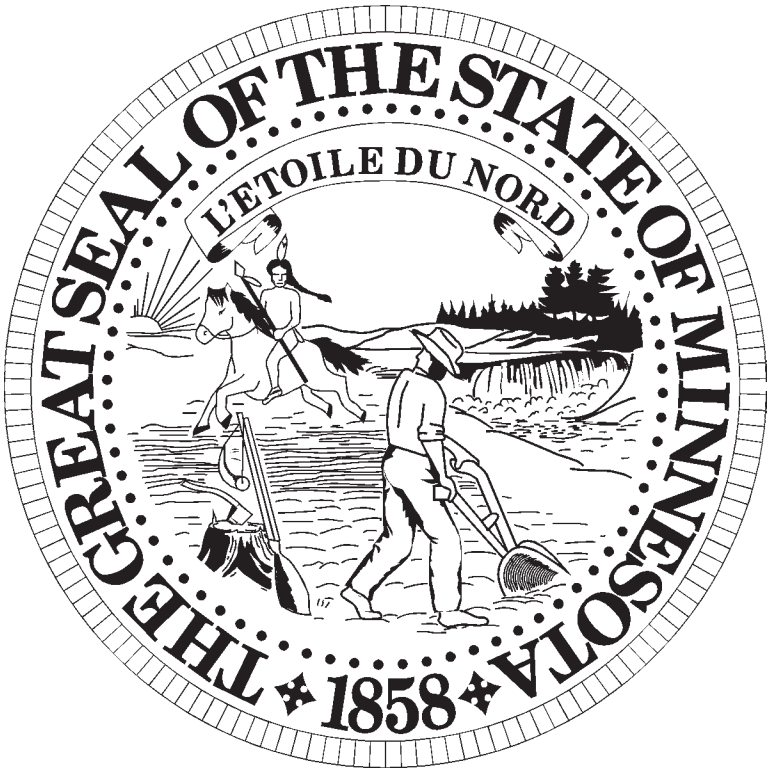

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Monday 10 August 2009
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# 6	Monday 10 August	Noon Tuesday 4 August	Noon Wednesday 29 July
# 7	Monday 17 August	Noon Tuesday 11 August	Noon Wednesday 5 August
# 8	Monday 24 August	Noon Tuesday 18 August	Noon Wednesday 12 August
# 9	Monday 31 August	Noon Tuesday 25 August	Noon Wednesday 19 August

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Minnesota Pollution Control Agency

Environmental Analysis and Outcomes Division

Public Notice of Extension of Time to Submit Comments on Revised Draft State Implementation Revision

NOTICE IS HEREBY GIVEN that the Commissioner of the Minnesota Pollution Control Agency (MPCA) is extending the time for submission of comments, requests, and petitions on the Revised Draft State Implementation Plan (SIP) Revision for Regional Haze until September 3, 2009. The purpose of this SIP revision is to address visibility protection at national parks, wildernesses, and scenic areas, also referred to as mandatory Class I Federal areas.

The MPCA will consider changing the contents of the proposed SIP revision based on comments received during the comment period. Following the end of the comment period, the Commissioner will decide whether to submit the proposed SIP revision to the EPA unless, as provided by *Minnesota Statutes* § 116.02, the MPCA Citizens' Board makes this decision.

MPCA Contact Person. The MPCA contact person is Catherine Neuschler. Written comments, requests and petitions should be mailed to: Catherine Neuschler, Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division, 520 Lafayette Road North, St. Paul, MN 55155-4194; **telephone number:** (651) 757-2607; **Voice or toll free:** 1-800-657-3864; **facsimile number:** (651) 297-8324; and **e-mail:** *catherine.neuschler@state.mn.us*. **TTY** users may call the MPCA at TTY (651) 292-5332 or 1-800-657-3864.

Availability of SIP. A copy of the proposed SIP revision is available on the MPCA's **Web site** at:
http://www.pca.state.mn.us/air/regionalhaze.html.

A copy of the proposed SIP is also available upon request by contacting Catherine Neuschler at (651) 757-2607, or will be mailed to any interested person upon the MPCA's receipt of a written request. Materials relating to the SIP revision are available for inspection by appointment at the MPCA St. Paul Office, 520 Lafayette Road North, St. Paul, Minnesota 55155, between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday. To examine these materials in St. Paul, or for more information, please contact Catherine Neuschler. All MPCA offices may be reached by calling 1-800-657-3864.

Public Comment Period. The original public notice was published on July 20, 2009 in the State Register (34 SR 92). That notice indicated that the public comment period would end on August 19, 2009. This notice is extending the public comment period to September 3, 2009. Comments must be received in writing at the MPCA by 4:30 p.m. on September 3, 2009. Written comments may be submitted to the MPCA contact person at the address, facsimile number, or E-mail address listed above.

Request to Have MPCA Citizens' Board Make Decision. You have the right to submit a petition to the MPCA Commissioner asking that the MPCA Citizens' Board make the decision on submitting the proposed SIP revision to the EPA. Your petition must be in writing. Whether the petition will be granted or denied is in the sole discretion of the MPCA Commissioner. The MPCA Citizens' Board will only make the decision on the proposed SIP revision if the MPCA Commissioner grants your petition or if an MPCA Citizens' Board member makes a timely request to have the decision made by the MPCA Citizens' Board.

Paul Eger, Commissioner
Minnesota Pollution Control Agency

Appendix 2.3: Certification of Public Meeting

The public meeting was held on April 10, 2008. This Appendix includes the sign in sheets showing attendees at the public meeting and the Powerpoint presentation given by MPCA staff at the public meeting.

Minnesota Pollution Control Agency

Regional Haze Public Meeting
April 10, 2008
6 – 8 pm
Duluth Office

Name	Organization	Phone or Email
Tony Shoberg	Barr Engineering Co.	ams@barr.com
KRIS WEGERSON	Friends of BWCA, NMW	jkjl@clearwire.net
MARY HOLLIDAY	REVDRAG	mary.holliday@usfs.com
Michael Cashin	Minn. Power	mcashin@mnpower.com
Dave Skolasinski	Cleveland-Cliffs	dzskolasinski@cleveland-cliffs.com
Dennis Niemi	Minn. Power	dniemi@allete.com
MARY MUNN	Fond du Lac	marymunn@fdlrez.com

Minnesota Pollution Control Agency

Regional Haze Public Meeting
April 10, 2008
6 – 8 pm
~~Duluth Office~~ St. Paul office

Name	Organization	Phone or Email
CRAIG PAGEL	IRON MINING ASSOC.	cpagel@taconite.org
MARY JEAN FENSKE	MPCA	mary jean. fenske@state.mn.us
Catherine Neuschler	MPCA	
BRIAN PASKO	~~MPCA~~ Friends of the Boundary Waters	brian@friends-bwca.org
Dick Cordes	MPCA	richard.cordes@state.mn.us
John Seltz	MPCA	~~JSeltz@~~ johnseltz@state.mn.us

Draft Regional Haze State Implementation Plan

Public Meeting
April 10, 2008
Duluth

Minnesota Pollution Control Agency

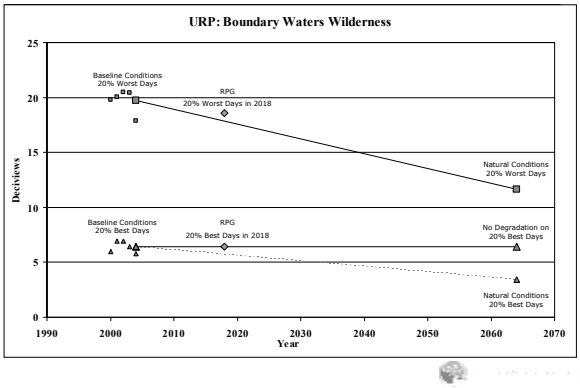
Regional Haze Rule

- States are mandated to improve visibility in national parks, wildernesses (Class I Areas)
  - Implemented through 1999 Regional Haze Rule
    - States must document how they will reach the goal of no man-made visibility impairment by 2064
- Minnesota has two Class I Areas
  - Boundary Waters Canoe Area Wilderness
  - Voyageurs National Park

What is Regional Haze?

- Haze comes from fine particles ($PM_{2.5}$) in the atmosphere
  - Interfere with light reaching the human eye
  - Linked to asthma and adverse health impacts
- Main haze particles are formed through atmospheric reactions involving NO_x and SO_2
  - Focus on reducing these precursor emissions
- Regional problem
  - Requires coordination among states
  - All States required to develop strategies to reduce haze in the Class I areas their emissions impact

Visibility: Uniform Rate of Progress



Visibility Conditions and Goals

	Baseline W20%	Baseline B20%	URP W20%	RPG W20%	Natural W20%	Natural B20%
BWCAW	19.9	6.4	18.0	18.6	11.6	3.4
VNP	19.5	7.1	17.8	18.9	12.1	4.3

- Baseline W20% are the current conditions on the haziest days
  - RPG W20% is the goal MPCA is setting for 2018
  - Natural W20% are the ultimate goal of the rule – we need to improve the haziest days to this level
- Need to ensure visibility on the B20% (cleanest) days do not become more impaired

Projecting Visibility

- Baseline Period
  - Baseline visibility conditions (2000-04)
  - Baseline emissions (2002)
  - Model baseline emissions and compare results to monitored visibility
- Future period
  - Future year emissions (2018)
    - Predicted using economic models and staff knowledge
  - Estimate 2018 visibility through modeling

Control Strategies for Haze

- Minnesota's Draft Haze SIP has three main control strategies
  - "On the books" controls
    - Existing/Planned Federal or State regulations
  - Best Available Retrofit Technology (BART)
    - Only required control strategy
  - Long Term Strategy
    - Northeast Minnesota Plan
    - Future evaluation of additional control strategies

Control Strategies: BART

- Best Available Retrofit Technology requires controls on facilities:
  - In 26 specific source categories
  - Built between 1962 – 1977
  - Emitting > 250 tpy of visibility impairing pollutants (SO_2, NO_x, PM)
- States have discretion in BART application
- Key BART Sources:
  - Electric Generating Units (5)
  - Taconite processing plants (6)

EGU BART: CAIR = BART

- Clean Air Interstate Rule (CAIR)
  - A cap-and-trade program to reduce NO_x and SO_2 emissions from power plants
- CAIR improves visibility more than EGU BART
  - Power plants covered by CAIR do not need to install BART for NO_x and SO_2
  - BART analysis completed for PM
    - Showed little impact
    - Existing PM controls are BART

Taconite BART: Determination

- Focuses on indurating furnaces
  - BART controls are difficult to determine due to lack of new facilities or retrofit projects
    - Few control strategies known to be feasible/cost-effective
- MPCA determined:
  - BART for NO_x is good combustion practices
  - BART for SO_2 is PM scrubbers optimized for SO_2 removal
  - BART for PM is equivalent to taconite MACT
- Determinations need a corresponding emission limit
  - Indurating furnace emissions, especially for NO_x, are variable and difficult to predict

Taconite BART: Emission Measurement

- MPCA requiring CEMS or a comparably accurate method of emission estimation for BART
  - Accurately determine emissions of NO_x and SO_2
  - Give information needed to set a meaningful limit
  - Provide for future required continuous compliance
- Administrative Orders will require CEMS or comparable method
- Goal is to have more accurate emission estimation starting by November 2008

LTS: Northeast Minnesota Plan

- Concern about emissions from this area
  - High emissions in proximity to Class I areas, with disproportionate visibility impact
  - Few reductions planned from non-utilities
  - Several new sources planned
- Ensure area contributes its "fair share" to reductions
- Regional non-binding emission reduction target
  - St. Louis, Lake, Cook, Carlton, Itasca, Koochiching
  - Larger sources > 100 tpy
    - Existing and new sources
  - SO_2 and NO_x
    - 20% decrease by 2012
    - 30% decrease by 2018

LTS: Emissions in NE Minnesota

Region Total NOx + SO_2 (2002)	95,500 tons
Existing Taconite	47%
Existing Power Plants	47%
Other Facilities	6%

LTS: NE Minnesota Plan Implementation

- Annual Emission Tracking
- Research and pilot testing of emission reduction strategies
  - Required from taconite facilities
    - Report on analysis of results and feasibility
  - MPCA will review and evaluate measures based on statutory factors and emission projections
    - Reasonable controls or practices will be implemented at taconite facilities and may be required at other facilities if needed to meet emission budget

Five Year SIP Assessment

- Minnesota's will contain information on:
  - Additional reasonable emission reductions
    - Certain source categories
    - Taconite
    - Facilities in NE Minnesota (if needed)
  - Information from other states on reasonable controls
  - Remaining taconite BART limits
  - Progress in meeting 2012 and 2018 NE Plan emission targets
  - Update of 2018 reasonable progress goal based on new information

Comments Received: FLMs

- BART
  - EGUs should have BART limits in case Minnesota is exempted from CAIR
  - More dates and timelines needed, especially for taconite BART
  - SO_2 determination for taconite facilities can be made now
    - Especially for UTac Line 2
      - Recirculating scrubber likely to be BART
    - SO_2 limits at natural gas fired lines seem too high
  - Taconite NO_x BART should include CEMS or equivalent, installed by 11/08 with reporting by 1/09
    - "Comparable method" should be further explained

Comments Received: FLMs

- NE Minnesota Plan
  - Goal assumes 75% of emissions uncontrollable **by MPCA**
  - More dates and timelines needed
  - Content of pilot test studies at taconite facilities should be more detailed
    - Include tests of improving scrubber SO_2 removal
  - Accuracy of 2002 taconite emissions
    - If shown to be inaccurate, baseline for NE Minnesota Plan should be corrected
    - Should be a factor in determining additional controls needed under the plan

Comments Received: FLMs

- NE Minnesota Plan, cont'd
  - Minor source emissions should be examined
  - State should explain how it will address new permits if targets are not met (2012)/projected to be met (2018)
- Reasonable Progress Goal
  - Should update the information used to set the RPGs during the five year report
- Long Term Strategy
  - Discuss decision not to address agricultural burning
  - Remove detailed description of Smoke Management Plan

Comments Received

- Other comments
  - Cost figures in Table 10.6.1 for SCR on Boise's recovery furnace are too low
  - Should mention and consider the relationship between the Regional Haze SIP and future climate change regulations
  - Identification of various typographical or minor errors

Response to Comments

- Taconite SO_2 BART determinations
  - Limits at natural gas fired lines based on a predictive interval
    - Scrubbers already optimized for SO_2 removal at these lines
      - More information needed at other lines
  - Plan is in place to gather information to set a limit for UTac Line 2
- Updating RPG
  - Chapter 11 indicates Minnesota intends to update the RPG in the five year assessment

Response to Comments

- NE Minnesota Plan
  - If 2018 target is not projected to be met, regulatory options will be pursued to try to make the target
  - Visibility impacts of new permits will be evaluated on a case-by-case basis
- Long Term Strategy
  - Information on SMP is necessary for context, very clear that SMP is not part of SIP

Response to Comments

- SCR cost in Table 10.6.1 is RPO work
  - MPCA will not make final decisions based on the cost figures in this table
  - As this table is the work of CENRAP, the MPCA feels it is inappropriate to alter the table
- Greenhouse gas regulation
  - Situation with climate change legislation is evolving; difficult to determine how programs will overlap
  - Likely that any interactions will be taken into account in future SIPs

Major Changes Made

- Additional Documents
  - Addition of response letter from Missouri
  - Addition of signed AO for Hibbing Taconite
  - Addition of signed AO for Northshore Mining
- New Table 8.9
- EGU BART
  - Clarification that the PM BART determination is existing PM controls
  - Explanation that, if CAIR no longer applies, MPCA will prioritize BART NO_X and SO_2 determinations for facilities not undertaking controls

Major Changes Made

- Taconite BART
  - Clarification that NO_X CEMS apply to all taconite facilities
  - Clarification of which taconite BART limits are being determined when
    - Now: SO_2 limits for lines that burn only natural gas
    - Future: NO_X limits for all facilities and SO_2 limits for lines that burn solid fuels

Major Changes Made

- Taconite BART (cont'd)
  - Description of the comparable to CEMS method
    - 150 emission data points collected under varying furnace conditions
      - Low Variability:
        - Develop emission factor, confirm with annual stack testing and quarterly submission of operating parameters
      - High variability:
        - Develop predictive equation to correlate emissions with process parameters
        - Confirm with annual stack testing and quarterly submittal of predictive parameters

Major Changes Made

- Addition of new table laying out BART and NE Minnesota Plan timelines

Process	Dates
Begin data collection and reporting for taconite facilities with new CEMS/PEMS	November 2008 (no facility later than April 2009)
Begin annual tracking of NE Minnesota Plan emissions	December 2008
MPCA determines remaining BART limits for each taconite facility	By August 31, 2010
Title V permits amended and BART limits included	By June 2012
Taconite facilities conduct pilot testing of potential control strategies and pollution prevention	January 2010 – December 2011
MPCA determines if 2012 target will be met, and projects status of 2018 emission reduction target.	July – December 2011
Taconite facilities report to MPCA on results of pilot testing	By December 31, 2011
MPCA reviews pilot testing reports and determines if any additional controls are reasonable	January – June 2012
MPCA does preliminary analysis of potentially reasonable reductions from non-taconite facilities in NE Minnesota.	January – June 2012
MPCA develops enforceable mechanism to require any additional control found to be feasible, for both taconite and (if necessary) non-taconite facilities	July – December 2012
MPCA submits 5 year assessment which includes BART limits, determination of additional reasonable controls.	December 2012
Facilities install any additional controls found to be reasonable	2013 - 2015

Major Changes Made

- NE Minnesota Plan
  - Clarification that pilot tests of emission reduction projects at taconite facilities should be on-site
  - Commitment to evaluate changes in minor source emissions in 2012 and 2018
    - For facilities with permits that submit an emission inventory
  - Accuracy of 2002 baseline will be taken into account in determining reasonable control strategies from taconite facilities
    - A numerical correction factor is likely to be very difficult, but at least a qualitative analysis should be possible

Major Changes Made

- RPG revised downward 0.1 dv at each Class I Area
  - Based on new modeling that includes the entire NE Minnesota Plan
    - Previously, only a 20% reduction was modeled
  - Impacts when Class I Areas are projected to reach natural conditions

Additional Information

- If you have comments or questions about the Regional Haze SIP
  http://www.pca.state.mn.us/air/regionalhaze.html
- Comment Period Ends May 16, 2008
- Contact:
  Catherine Neuschler
  651-296-7774
  catherine.neuschler@pca.state.mn.us

Appendix 2.4: Public Comments on Draft Haze SIP and MPCA Response

Neuschler, Catherine

From: ijl [ingej@access-one.com]
Sent: Monday, February 25, 2008 11:59 PM
To: Neuschler, Catherine
Subject: Regional Haze Comment

Catherine Neuschler,

Today I was at a Target in St. Louis Park. Outside I saw what I see frequently all over the Twin Cities, a diesel truck idling, fumes spewing out, no one in it. All these air alerts, and no one seems to pay attention to the small things which could be done with no inconvenience. When I complained to the Target managers, they did not seem to understand. More than 35 years ago, I left Los Angeles because of the smog. They have many more cars plus a combination of cold air from the ocean hitting hot air of a desert all trapped against the mountains. They at least had restrictions on burning, bon fires, barbeques, charcoal lighter fluid use, fire places and they had car inspections to make sure pollution equipment was working. They had a number to call with people who actually came out to investigate air complaints. As usual politics often interfered, but those things were in place 35 years ago. Minnesota has fallen behind in setting standards. If people are going to buy polluting cars, they should be taxed according to how much they pollute. People don't need to leave vehicles running. Buses don't need to sit idling as they do next to the Highland Park Library. We can do something about this. One day there will be no place left to move for clean air. If there is technology out there, it should be required of industry as well.

Johanna Lester

Boise White Paper, L.L.C.
400 Second Street
International Falls, MN 56649
218-285-5170

BOISE

March 4, 2008

Catherine Neuschler
Environment Analysis and Outcomes Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Re: Comments on Minnesota's DRAFT Regional Haze SIP – February 2008

Dear Ms. Neuschler:

Boise appreciates the opportunity to provide input and comments related to the draft Regional Haze SIP dated February 2008. Boise has been providing input and comments in conjunction with the MPCA's work on regional haze since 2001. Boise identified three potential BART-eligible units at the International Falls facility and submitted the information to the MPCA in its 2001 Survey. The Boise facility is within 18 kilometers of Voyageurs National Park (VNP) and 80 kilometers of Boundary Waters Canoe Area Wilderness (BWACW). The mill and the MPCA completed a PSD permitting process approximately seven-years ago, during which all three potentially BART-eligible units went through at top-down BACT review. Also, as part of this permitting, visibility and regional haze impacts were evaluated. The modeling indicated no adverse impacts at BWCAW, and only a slight impact (0.5% of daylight hours) associated with visibility at VNP.

Boise has two comments associated with the MPCA Regional Haze SIP, one specific comment and one general comment, as outlined below:

1. **Specific Comment:** *Appendix 3.2: Formal Consultation Letter, NO_X Controls, Q/5D for BWCAW and VNP* and *Appendix 10.6, Table 10.6.1: NO_X Controls, Q/5D for BWCAW and VNP*. Boise has concerns both with the technical feasibility and estimated costs for SCR control of NO_X. If SCR was determined to technically feasible for recovery furnaces, and we strongly believe it is not, the table has erroneous cost information for Boise Cascade Corp. (currently Boise White Paper, L.L.C.) associated with cost of controls. Boise requests that either they remove the reference to Boise entirely in these two tables, or reflect the true cost of SCR controls on the EU320 Recovery Furnace. The true cost of controls were estimated on an annualized bases of over $11,000,000 and on a cost per ton basis at $29,650 per ton of NO_X in a March 1999 PSD Permit Application. Adjusting this for inflation and the current cost of natural gas this would be approximately $38,700 per ton NO_X reduction. See attached *1999 Exhibit B-0 SCR Costs for Recovery Furnace at Boise-Cascade International Falls Mill*. Additionally, the National Council for Air and Stream Improvement (NCASI) issued a technical memo on February 10, 2006 entitled *"Retrofit Control Technology Assessment for NOX, SO2 and PM Emissions from Kraft Pulp and Paper Mill Unit Operations"*. It is believed that this memo was submitted to CENRAP, and has been attached. It stated:

   2.1.6 Selective Catalytic Reduction (SCR)

   The use of SCR on a kraft recovery furnace has never been demonstrated, even on a short-term basis. The impact of high particulate matter concentrations in the economizer region and fine dust particles on catalyst effectiveness is a major impediment to the application of this technology ahead of PM control, as is catalyst poisoning by soluble alkali metals in the gas stream. For SCR installation after an ESP, the gas stream would be too cold for effective reaction with the NO_x. A substantial energy penalty would have to be incurred to reheat the flue gas prior to the SCR section which would be a major drawback.

2.1.7 Summary

In summary, optimization of the staged combustion principle within large, existing kraft recovery furnaces to achieve lower NO_x emissions might be the only technologically feasible option at the present time for NO_x reduction. However, the effect of such air staging on emissions of other pollutants, chiefly SO_2, CO, and TRS, and other furnace operational characteristics needs to be examined with longer-term data on U.S. furnaces. Ultimately, the liquor nitrogen content, which is dependent on the types of wood pulped, is the dominant factor affecting the level of NO_x emissions from black liquor combustion in a recovery furnace. Unfortunately, this factor is beyond the control of pulp mill operators.

The costs estimated in the attached Exhibit B-0, included the cost of control after the ESP, and are a reflection of what NCASI calls a "*substantial energy penalty*". Boise currently has staged combustion on the EU320 Recovery Furnace.

2. **General Comment:** There is no mention in the MN draft Regional Haze SIP about Climate Change legislation and it's potential impacts on regional haze in Minnesota. The NE Minnesota region (the area where the draft MN Regional Haze SIP will have a region-wide target for reductions) has a significant potential for development and utilization of biomass fuels. Biomass fuels make economic sense in ICI's or smaller EGU's and these fuels could be used to reduce the carbon footprint of EGU's and ICI's. If biomass fuels replace coal, the carbon footprint is reduced in addition to reductions in NO_X and SO_2 emissions. While biomass fuel utilization reduces the carbon footprint, it does potentially result in increased NO_x emissions when compared with natural gas fuel, presenting a bit of a paradox for sources trying to work within both programs. The potential benefits of green house gas emission reductions from biomass fuels need to be considered within development of the MN Regional Haze SIP and not penalized.

If you have any questions please give me a call (218) 285-5170.

Sincerely,

David H. Reimer, P.E.
Environmental Manager

DHR/dhr

Attachments: *Exhibit B-0 SCR Costs for Recovery Furnace at Boise-Cascade International Falls Mill dated March 1999*
Retrofit Control Technology Assessment for NOX, SO2 and PM Emissions from Kraft Pulp and Paper Mill Unit Operations by NCASI dated February 2006

Cc: Mike Robertson

United States Department of Agriculture **Forest Service** **Superior National Forest**

8901 Grand Ave. Place
Duluth, MN 55808-1122
Phone: (218) 626-4300
Fax: (218) 626-4398

File Code: 2580-2
Date: March 5, 2008

Mr. David Thornton
Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Mr. Thornton:

On February 7, 2008, the State of Minnesota submitted a draft implementation plan describing your proposal to improve air quality regional haze impacts at mandatory Class I areas across your region. We appreciate the opportunity to work closely with the State through the initial evaluation, development, and subsequent review of this plan. Cooperative efforts such as these ensure that together we will continue to make progress toward the Clean Air Act's goal of natural visibility conditions at our Class I wilderness areas and parks.

This letter acknowledges that the USDA - Forest Service has received and conducted a substantive review of your proposed Regional Haze Rule implementation plan. Please note, however, that only the U.S. Environmental Protection Agency (EPA) can make a final determination about the document's completeness. Therefore, only the EPA has the ability to approve the document. Participation by the Forest Service in the State of Minnesota's administrative process does not waive any legal defenses or sovereignty rights it may have under the laws of the United States, including the Clean Air Act and its implementing regulations.

As outlined in a letter to the State dated September 29, 2006, our review focused on eight basic content areas which reflect priorities for the Federal Land Manager agencies; we have enclosed comments to this letter associated with these priorities. We look forward to your response required by 40 CFR 51.308(i)(3). For further information, please contact Trent Wickman at (218) 626-4372.

Again, we appreciate the opportunity to work closely with the State of Minnesota. The Forest Service compliments you on your hard work and dedication to significant improvement in our nation's air quality values and visibility

Sincerely,

/s/ James W. Sanders
JAMES W. SANDERS
Forest Supervisor

cc: Bruce Polkowsky
Chris Holbeck
Tim Allen
Matt Rau

Technical Comments on Minnesota Regional Haze State Implementation Plan

We would like to begin by commending Minnesota on the quality and depth of their Regional Haze State Implementation Plan (SIP). We believe that it will serve as an excellent roadmap to improve visibility in the Minnesota Class I Areas and hopefully also serve as a model for other states to follow that have yet to submit their plans.

We have some comments on the plan that are included below.

Baseline Visibility Conditions
We support the inclusion of the high-deciview, incomplete, sample days in the baseline because it is a reasonable way to include valuable information that falls outside the standard EPA criteria.

Best Available Control Technology (BART) - Taconite
We conveyed our comments on the BART determinations for the taconite facilities in a letter to Mary Jean Fenske, dated April 10, 2007. We have attached that letter to this one and would like to incorporate those comments by reference.

With respect to the United Taconite facility, we feel the information included in the SIP shows that the installation of a new recirculating scrubber to control sulfur dioxide at this facility is BART. We feel the BART determination for this facility for sulfur dioxide should be made with this SIP and not delayed. We hope that United Taconite's delays in sending requested information does not delay MPCA's BART determination for their facility. We note that United Taconite uses a very high sulfur fuel and its current sulfur dioxide emissions are far above the rest of the industry.

Plant	*2002 ton SO_2/MMLT*
US Steel, Keewatin Taconite	131
Hibbing Taconite	77
US Steel, Minntac	133
United Taconite	749
Mittal Steel	59
Northshore Mining Co.	16

Another possible alternative is to look at the other taconite lines and set a sulfur dioxide standard for United based on the level of performance in the industry.

We believe that an argument can be made that one or more post-combustion control options for nitrogen oxides are BART for the taconite industry. In spite of this, we are willing to delay the determination of proper nitrogen oxides controls to allow the industry to trial nitrogen oxides control options through 2011 under the long term strategy as long as there is a firm deadline in the SIP for the industry to complete the studies. We also believe the content of the control studies should be more clearly specified. For example we'd expect these studies to include on-site, slip-stream and other pilot-scale studies. In

addition, we would prefer that interim deadlines also be included in the SIP to ensure that the studies stay on track.

Besides studying nitrogen oxide controls, as stated in our earlier BART letter, under the long term strategy we feel it is worth having the taconite industry also investigate whether any physical improvements can be made to the existing particulate scrubbers to improve the transfer of sulfur from the gas phase to the liquid phase by modifying or redesigning the internal components of the scrubbers. A number of these options are mentioned in the US EPA BART guidelines. Many relate to improving the water distribution within the scrubber using trays, rings, or improved spray headers/nozzles. This is in line with the general BART determination for sulfur dioxide made on page 62, that the existing particulate scrubbers be "optimized" for sulfur dioxide removal.

We are concerned with the level of the sulfur dioxide limits proposed for the taconite facilities that burn low sulfur fuels. For example, for Hibbing Taconite the proposed limit is about 20 percent above the highest value ever recorded. The difference is similar for the non-coal burning lines at Minntac. This seems to be a large cushion considering that the facilities were not likely focused on optimizing for sulfur dioxide control at the time the tests were done. We would hope the BART limits would encourage the facilities to operate their scrubbers at the best possible performance level – again, in line with the BART determination to optimize these units for sulfur dioxide removal.

Continuous Emissions Monitors (CEMs) at the Taconite Plants
On page 62 of chapter nine a statement is made that CEMs "… would apply to NOx emissions at the facilities burning natural gas and to SO_2 emissions at facilities burning high sulfur fuels." We don't understand why the NOx CEMs are only being required at natural gas fired furnaces. Those furnaces burning fuels other than natural gas will also investigate nitrogen oxide control strategies and therefore will need the CEMs.

We understand from page 62 of the SIP that it is Minnesota's intent to require the installation of continuous emission monitoring systems (CEMs) at the taconite plants by November 30, 2008. We are aware of only two taconite plants to date that have agreed to install them and are concerned that the time frame in the SIP may not be met. We would also like to see a deadline associated with the requirement on page 62 for the taconite plants to "…provide the MPCA with data from these new emission methods." Similarly we believe a deadline should be associated with the MPCA's intent to establish the BART limits and include those in each facility's Title V operating permit to clarify when these tasks will be completed.

We would like to see more specifics as to what specific requirements a "comparable alternative emission measurement method" would have to meet. For example, will you use the criteria in the Federal New Source Performance Standards?

Best Available Control Technology – Electrical Generating Units
Since Minnesota Power has petitioned EPA to remove Minnesota from the Clean Air Interstate Rule (CAIR) we believe that all BART electrical generating units should have

unit-specific BART limits determined with this SIP so that there is no delay in implementing BART should a determination to remove Minnesota from CAIR come at a later date. One facility for which this is a particular concern is Northshore's Power Boiler #2. No BART-like nitrogen oxides or sulfur dioxide unit-specific limits were identified in the SIP. We believe it is reasonable that the permit limits on its neighbor, Taconite Harbor, be considered as one potential source of BART emission limits.

New Sources
We applaud the State for including some of the new Iron Range facilities recently permitted, or in the permitting process, in their 2018 modeling. As you know, a number of additional sources are now in the planning stage. All of these new facilities will put pressure on the Northeastern Minnesota emissions targets and likely require further emission reductions from existing industrial sources in the area.

Reasonable Progress
To help clarify when the following will take place, we would like to see deadlines associated with the following tasks and intermediate deadlines also added, as appropriate:

From Chapter 10, Page 84:

- "MPCA will conduct a BART-like review of the taconite facilities' reports on control strategies and pollution prevention options investigated by the taconite facilities. If it appears that other (non-taconite) facilities will need to implement control strategies in order for the emission reduction target to be met, the MPCA will do a preliminary cost analysis of feasible pollution prevention and control options to evaluate whether any further analysis by those facilities is warranted."

- "If, after all voluntary EGU reductions and reductions at the taconite plants have occurred, additional emission reductions are needed to meet the target, the MPCA would set limits for other sources with reasonable control strategies available. Minnesota would implement this requirement for additional emission reduction measures through a "state retrofit" requirement that would ultimately apply an emission limit to each facility where additional controls have been found to be reasonable. This limit could be set through a state rule or through amendments to each facility's Title V air emission permit, which would be submitted in the Five Year SIP Assessment."

From reviewing Table 11.1 it would appear that the tasks noted above, and those in the table, either are needed to be completed to feed into subsequent tasks for the Five Year report, or themselves are required to be in the Five Year report. To aid in understanding when these tasks will be completed and how they interrelate, please add a column to this table with deadlines and also break down some of the larger tasks into intermediate tasks, also with associated deadlines. We note that the five year report will be expected by December 17, 2012.

We believe the 2018 target for Northeastern Minnesota should continue past 2018 unless it is modified by the next 10 year SIP done in 2018. We believe this point should be clarified in the SIP.

We agree that under the NE Minnesota Plan any additional emission reductions necessary to meet the target would be specified in the Five Year report (which is due on December 17, 2012). We also believe that if at any time between now and 2012 the target appeared to be threatened, it would be prudent for the MPCA to begin the work of assessing control strategies so that a final determination of applicable controls can be included in the Five Year report.

We would like to clarify that our understanding of the paragraph on the bottom of page 84, starting, "If either target…" applies only to the situation where the target in 2018 is projected not to be met. On the contrary, if the 2012 target is not going to be met we'd expect that the Five Year report would include the controls which had already been identified by the MPCA.

We are confused by the following on page 97 – "MPCA will then undertake a BART-like review of these reports and control strategies and evaluate them based on the statutory factors and the status of progress towards the emission target. The five year SIP report will ***likely*** include the results of the analysis, a determination of any control strategies or pollution prevention projects that are reasonable at each of the taconite facilities, and enforceable mechanisms for requiring application of these measures." The inclusion of the word "likely" makes the timing of these tasks unclear. A table with deadlines for the following would be helpful:

- the final report from the taconite plants on additional control technologies investigated for sulfur dioxide and nitrogen oxides
- the MPCA's BART-like review of the report, and
- the installation and operation of control technologies deemed to be reasonable

Since, according to page 84 of the SIP, the investigation of control technologies will happen from 2008 – 2011, we feel the final report should be required to be submitted by the end of 2011 and the MPCA could then have its BART-like review and enforceable mechanisms done in time for the 2012 Five Year report which is due at the end of 2012. It is important that the BART-like review be completed by the Five Year report so that the assessment of the likelihood of attainment of the 2018 targets can be made with full knowledge of the potential for additional controls in the taconite industry (see discussion on page 84). We suggest that those controls identified as reasonable would then be required to be installed and operational within two years or by the end of 2014. We assume this whole process would be open and the MPCA would share relevant documents with the FLMs and the public and also accept and consider their comments.

Smoke Management

We are concerned with the level of detail on the Smoke Management Plan (SMP) in the SIP. The SMP is meant to be a living document that can be easily changed as conditions dictate. We are concerned that the level of detail on the SMP in the SIP creates an

unnecessary administrative hurdle to making future changes to improve the SMP. We have identified, via phone, the language that we feel is unnecessary for the purposes of the SIP on pages 87, 89 and 90.

Interstate Consultation
We hope EPA will facilitate future discussions between Minnesota and its neighboring states. We have submitted comments on Missouri's and Iowa's SIPs that are substantially in line with Minnesota, especially with regard to the issue of the existence of cost effective controls in those states and the "fair share" responsibilities those states have as contributors to visibility impairment in the BWCAW.

United States Department of Agriculture **Forest Service** **Superior National Forest**

8901 Grand Ave. Place
Duluth, MN 55808-1122
Phone: (218) 626-4300
Fax: (218) 626-4398

File Code: 2580
Date: April 10, 2007

Mary Jean Fenske
Staff Engineer
Minnesota Pollution Control Agency
520 Lafayette Road N
St. Paul, MN 55155

Dear Ms. Fenske:

We are providing comment on the Best Available Retrofit Technology (BART) determinations submitted by the taconite plants located in Minnesota. This industry is somewhat unique in that all of the facilities in the United States are in the two states of Michigan and Minnesota. Therefore, these two states carry the entire responsibility of fairly administering the BART regulations to the industry.

As you know, application of BART is one of the components of the Regional Haze Rule. The purpose of the Regional Haze Rule is to require states to assure reasonable progress toward meeting the national goal of preventing any future, and remedying any existing, impairment of visibility in mandatory Class I areas. As the Federal Land Manager for the Boundary Waters Canoe Area Wilderness (BWCAW) Class I area we have an affirmative responsibility to protect the air quality related values of this area. One of the key air quality related values of the BWCAW is visibility.

The determination of BART must consider the "best system of continuous emissions control technology" taking into account "the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility," 40 CFR Section 51.308(e)(1)(ii)(A).

We find the BART determinations submitted by the taconite plants to be deficient in the following ways:

- Available control technologies were not fully evaluated
- Technical difficulties were overstated
- The costs of controls were overstated

More detailed technical comments on these points are enclosed.

Technical analyses by Midwest RPO and MPCA and the BART proposals themselves show that the taconite plants are important contributors to visibility impairment at the BWCAW. It is disappointing that in spite of their importance, the industry has proposed contributing very little toward reducing haze in the BWCAW.

The federal land managers have been meeting with the MPCA to discuss innovative ways to implement the regional haze rule so that new industrial sources in Northeastern Minnesota are addressed. This would happen under the long-term strategy portion of the Regional Haze Rule that lays out actions the state will take to achieve the 2018 visibility goal. Based on the information we present in this letter and enclosure, we believe the MPCA has the information it needs to make determinations under the BART portion of the Regional Haze Rule that require nitrogen oxides (NOx) and sulfur dioxide (SO_2) reductions at the taconite facilities. We are also willing to continue our dialogue with the MPCA, industry, and public to look at how a similar level of reductions can be implemented through the long-term strategy in Minnesota.

We look forward to working with your agency as you develop your own BART determinations for these facilities. If you have questions or comments, please contact Trent Wickman, Engineer (Air Resources), at (218) 626-4372.

Sincerely,

/s/ James W. Sanders
JAMES W. SANDERS
Forest Supervisor

Enclosure

cc: Don Shepherd
Chris Holbeck
David Pohlman
Matt Rau
Asad Khan

Technical Comments

Due to their similarity, for the most part the BART determinations will be addressed as a group. We will focus our review on the indurating furnaces, due to the dominance of their impact over the other BART-eligible units at the taconite facilities.

The recently promulgated Taconite MACT standard represents a BART level of control for particulates from the furnaces; that leaves SO_2 and NOx as the remaining visibility impairing pollutants to be addressed from the furnaces. A summary of the BART proposals from each facility is summarized below.

Facility	**# and Type of Furnace**	**Fuels**	**SO_2 Proposal**	**NOx Proposal**
Keetac	1 grate-kiln	NG, FO, coal, coke	Existing Controls	Existing Controls
Hibbing	3 straight grates	NG, FO	Existing Controls	Energy efficiency projects completed in 2005-06 – effect on emissions unknown
Minntac	5 grate-kilns	NG, FO, biomass, coal (coal only on lines 6 and 7)	Existing Controls	Low NOx burners to preheat section of lines 4, 5, 7 and fuel blending - ~10% reduction
United Taconite	2 grate-kilns	NG, FO, coal, coke (coal and coke only on line 2)	Existing Controls	Heat recoup project on line 1 completed in 2005 - ~ 46% reduction
Mittal	1 straight grate	NG, FO	Existing Controls	Existing Controls
Northshore	2 straight grates	NG, FO	Existing Controls	Existing Controls

Projects that have already been implemented don't count as BART (see MPCA presentation http://www.pca.state.mn.us/publications/presentations/haze-0107-fenske.pdf, slide 6) so the table above becomes:

Facility	# and Type of Furnace	Fuels	SO_2 Proposal	NOx Proposal
Keetac	1 grate-kiln	NG, FO, coal, coke	Existing Controls	Existing Controls
Hibbing	3 straight grates	NG, FO	Existing Controls	Existing Controls
Minntac	5 grate-kilns	NG, FO, biomass, coal (coal only on lines 6 and 7)	Existing Controls	Low NOx burners to preheat section of lines 4, 5, 7 and fuel blending - ~10% reduction
United Taconite	2 grate-kilns	NG, FO, coal, coke (coal and coke only on line 2)	Existing Controls	Existing Controls
Mittal	1 straight grate	NG, FO	Existing Controls	Existing Controls
Northshore	2 straight grates	NG, FO	Existing Controls	Existing Controls

Now that the individual proposals have been summarized, we would like to highlight some concerns we have with the BART determination process taken, which were generally common throughout all the facilities proposals.

Sulfur Dioxide Controls

All facilities use some form of wet scrubber or wet ESP to control particulates. Until recently there has been no motivation for the facilities to optimize these units for SO_2 control. Most of these scrubbers are once-through systems versus the newer recirculating systems such as those at Keetac and Minntac line 3 which treat the scrubber water before reusing it. We believe actions could be taken to optimize the chemistry of the systems and/or optimize the gas to liquid contact to improve the SO_2 removal of these units. For example, just adjusting the pH at Keetac from 6.5 to 8 increased the SO_2 removal from 35% to 64% (H. Jiang, per. com.). The recent report by John Engesser, "Evaluation of Minnesota Taconite Wet Scrubbers…" addresses the chemistry issues in more detail. A few key excerpts from this paper include:

- Over the past 40-50 years of operation of these facilities the dissolved solids in the process and tailing water has increased
- Increased scrubber efficiency can result in increased sulfate concentration in taconite process water

- As the concentration of sulfate increases, the concentration of magnesium and calcium (hardness) also increases which can cause problems to the taconite production process and cause precipitation in pipes.
- A number of other items can contribute to the neutralizing capacity of the flue gas of a facility including, if flux is added to the pellets (i.e. the facility makes fluxed pellets) and if wood is used as a fuel.
- The efficiency of the scrubbing systems is dependant on: the pH and alkalinity of the scrubbing water, the make-up water flowrate, and inlet SO_2 concentration
- The lime recirculating scrubber at Keetac can limit the amount of sulfate and fluoride that enter the tailing water by adjusting the pH of the scrubber water so that they precipitate in the scrubbing water system
- The current removal efficiency of the scrubbers in the report are much higher (26-75%) than that reported by each facility in their BART report (15-30%).
- Keetac – the scrubber report says that the scrubber should be operated at a pH between 7 and 7.5 for optimum scrubbing performance. The BART report from this facility says it will operate at a pH of 6.5.
- United Taconite – the scrubber on line 2 could double its scrubbing efficiency by using either sodium hydroxide or sodium carbonate or adding a new recirculating lime scrubber

The option of modifying the existing scrubbers was dismissed in the BART report from every facility as not being available and therefore not being technically feasible. The reasons stated included corrosion of the process water handling system and the creation of solid wastes. Sulfur scrubbing technology has been in existence since the 1960's. The issues described above are not new, unique or insumountable. In addition these issues are not technical feasibility issues but are economic feasibility issues. The BART proposals did not provide the cost data for this option, so how economically infeasible they may, or may not be, is unknown.

Beyond just adjusting the chemistry of and/or treating the process water, a number of options are available that would help improve the transfer of sulfur from the gas phase to the liquid phase by redesigning the internal components of the scrubber that would be worth investigating depending on the particulars of each scrubber. A number of these options are mentioned in the BART guidelines. Many relate to improving the water distribution within the scrubber using trays, rings, or improved spray headers/nozzles.

Control of SO_2 can also be achieved by either limiting the sulfur content of fuels or fuel switching, for those facilities that use high sulfur fuels. Switching fuels may or may not trade one visibility impairing pollutant (SO_2) for another (NOx), as induration furnaces are thought to emit less NOx when burning solid fuels. It is not clear this is true for all furnace types. Even if it is true, the pollutant trading concern would not be applicable if wood was substituted for coal/coke or if lower sulfur content was specified for the same fuel type. It is also important to note that U.S. EPA's intent is for facilities to consider alternate fuels as an option, not to direct the fuel choice. To consider it as a control option means the economic feasibility should be determined. Fuel sulfur content limits was an option for which EPA determined the costs for oil-fired EGUs in the BART rule

itself. While most of the taconite industry in Minnesota primarily uses natural gas, there are examples of plants (e.g. United Taconite) that use higher sulfur fuels. The economic feasibility of fuel limits was not in any of the BART proposals and should be for those facilities that use higher sulfur fuels.

A couple of key quotes from the EPA BART guidelines are important to keep in mind - "a demonstration of technical infeasibility may involve a showing that there are unresolvable technical difficulties with applying the control to the source (*e.g.*, size of the unit, location of the proposed site, operating problems related to specific circumstances of the source, space constraints, reliability, and adverse side effects on the rest of the facility). *Where the resolution of technical difficulties is merely a matter of increased cost, you should consider the technology to be technically feasible,* FR 7/6/05 pg 39165, emphasis added.

Physical modifications needed to resolve technical obstacles do not, in and of themselves, provide a justification for eliminating the control technique on the basis of technical infeasibility, FR 7/6/05 pg. 39165.

While we believe the best option to control SO_2 is to modify the existing scrubbers, we think it is important that the cost estimates performed for the secondary wet scrubber be accurate. We have concerns with the adjustments made to the EPA costing methodologies, especially the 60% of the total capital investment adjustment due to space considerations, and the site-specific estimate for site work, foundations, and structural steel. In spite of these adjustments that inflate the cost per ton figure, United Taconite shows costs that are within the range of economic feasibility for an additional scrubber on line 2 - $3361/ton. Additionally, looking at the cost and performance of the recent recirculating scrubber installation at Keetac would be additional information to help accurately determine the cost of this type of device.

Nitrogen Oxides Controls
The issue of control of NOx from taconite furnaces has been approached in the past within the context of two Prevention of Significant Deterioration (PSD) permits: Minntac backwards PSD permit and the PSD permit for Minnesota Steel. Minntac is a grate-kiln furnace and Minnesota Steel is a straight grate furnace. This discussion initially focused on the application of selective catalytic reduction (SCR) and more recently has looked at low temperature oxidation (LoTOx).

- In the Minntac case, in a letter dated October 22, 2003, the MPCA determined that SCR was technically feasible but not economically feasible. This configuration assumed reheating of the waste gas. The cost per ton calculated was sensitive to the assumed cost of natural gas and was "at or above the upper range of economic feasibility," and was rejected as best available control technology (BACT).

- In a letter dated August 18, 2006 the MPCA assessed the applicability of LoTOx at 90% control efficiency to Minntac and concluded that LoTOx was technically and economically feasible and therefore BACT.

- In their PSD permit application, Minnesota Steel proposed LoTOx on the waste gas stack at 90% control efficiency for their taconite furnace.

In summary LoTOx has been declared BACT for one type of taconite furnace and will soon be installed on the other. The technical feasibility issues brought up in the BART proposals for each facility have been addressed by the developer of the technology and in the analyses above. Most significantly, the installation in Texas on a number of fluid catalytic cracking units (FCCU) has been successful. These units have a similar airflow and the solid loading in the FCCU off-gas is much higher than the particulate loading in a taconite furnace waste gas stream.

Based on the discussion above it appears that LoTOx is technically and economically feasible for the entire industry. In addition, one form of SCR has been found technically feasible and borderline economically infeasible based in a BACT analysis from four years ago. Another form of SCR, Regenerative Selective Catalytic Reduction looks to have promise, but as a new technology would require trials.

Summary
The net result of the Minnesota taconite BART determinations is that only one facility is proposing doing anything to improve visibility in the BWCAW. This is particularly disheartening in light of the impact these facilities have on visibility. A count of days with a percent change in visibility greater than or equal to 0.5 deciviews at specified receptors within the BWCAW assessed over the 3-year period 2002-2004 due to the emissions from BART sources at the facilities is below (http://www.pca.state.mn.us/publications/aq-sip2-07.pdf - page 5).

Facility	**# of days**
Keetac	228
Hibbing	247
Minntac	530
United Taconite	442
Mittal	228
Northshore	169*

*excludes power house unit #2

This data shows that these facilities caused or contributed to visibility impairment in the BWCAW anywhere from 15 to 48 percent of the period. The only other facilities in Minnesota with a comparable impact are the two largest utilities: Xcel Sherburne County (Sherco), Minnesota Power Boswell; and Minnesota Power Taconite Harbor (which is a smaller power plant, but very close to the BWCAW). When the Midwest RPO looked at the impact to visibility in the BWCAW of the largest industrial sources from across the entire upper Midwest, the taconite plants still claimed 4 spots in the top ten list (which

when added to the three Minnesota power plants mentioned previously, took 7 of the ten spots). The Minnesota Power facilities are pursuing emission reduction projects. Although reasonable progress toward the national visibility goal cannot, and should not, be achieved with reductions from the taconite plants alone, these facilities are clearly an important contributor to impairment and therefore should contribute their fair-share of emission reductions toward improving visibility in the BWCAW.

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

N3615(2301)

APR 0 4 2008

Mr. J. David Thornton
Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Mr. Thornton:

On February 7, 2008, the State of Minnesota submitted a draft state implementation plan (SIP) describing its proposal to improve air quality regional haze impacts at mandatory Class I areas across your region. We appreciate the opportunity to work closely with the State through the initial evaluation, development, and, now, subsequent review of this plan. Cooperative efforts such as these ensure that, together, we will continue to make progress toward the Clean Air Act's goal of natural visibility conditions at all of our most pristine National Parks and Wilderness Areas for future generations.

This letter acknowledges that the U.S. Department of the Interior, received and conducted a substantive review of the February 2008, proposed Regional Haze Rule implementation plan in fulfillment of your requirements under the federal regulations 40 CFR 51.308(i)(2). As outlined in a letter to each state, dated August 1, 2006, our review focused on eight basic content areas. The content areas reflect priorities for the Federal Land Management agencies, and we have enclosed comments associated with these priorities. We are concerned that your draft plan has shortcomings regarding these priority content areas, and our air quality staffs at the National Park Service and U.S. Fish and Wildlife Service are ready to work with you towards resolution of these issues. We request that you consider all of our comments in the enclosure. We have highlighted in **boldface type** those comments we believe the State must address to have a complete and approvable plan.

Please note, however, that only the U.S. Environmental Protection Agency (EPA) can make a final determination regarding the document's completeness and, therefore, ability to receive federal approval from EPA. For further information, please contact Bruce Polkowsky with the National Park Service, Air Resources Division, at 303/987-6944.

We appreciate the opportunity to work closely with the State of Minnesota as it completes its regional haze implementation plan. We share your continued dedication to significant improvement in air quality in national parks and wilderness areas.

Sincerely,

Lyle Laverty

Lyle Laverty
Assistant Secretary for
Fish and Wildlife and Parks

Enclosure

cc:
John Seltz, Supervisor
Air Policy and Mobile Sources Unit, EAOD
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Raoul Lufbery, Acting Superintendent
Voyageurs National Park
3131 Highway 53
International Falls, Minnesota 56649

Tracy Casselman, Refuge Manager
1674 Refuge Entrance Rd.
Seney, MI 49883

Jon Kauffeld, Refuge Chief
1 Federal Drive
Ft. Snelling, MN 55111-4056

Nita Fuller, Regional Chief
1 Federal Drive
Ft. Snelling, MI 49883

Cheryl Newton, Acting Director
Air and Radiation Division
U.S. EPA Region 5
Mail Code: A-18J
77 West Jackson Blvd.
Chicago, IL 60604-3507

Department of the Interior Comments Regarding
Minnesota Draft Regional Haze Rule State Implementation Plan

On February 7, 2008, the State of Minnesota submitted a draft Regional Haze Rule State implementation plan (SIP), pursuant to the requirements codified in federal rule at 40 CFR 51.308(i)(2), to the U.S. Department of the Interior. The air program staffs of the National Park Service (NPS) and the U.S. Fish and Wildlife Service (FWS) have conducted a substantive review of the Minnesota draft plan, and have provided the comments listed below. We applaud the Minnesota Pollution Control Agency (MPCA) for developing a SIP that is responsive to the key policy areas that we identified as important in our August 1, 2006, letter. **As noted below, we have serious concerns in two areas: best available retrofit technology (BART), and the plan for emissions reductions in NE Minnesota.** We look forward to the State's response as per section 40 CFR 51.308(i)(3). For further information regarding these comments, please contact Bruce Polkowsky at (303) 987-6944 or Tim Allen at (303) 914-3802.

Baseline, Natural Condition, and Uniform Rate

We concur with the State's use of adjusted baseline conditions. We agree that days labeled as missing using the standard approach are valid for consideration by the State and better define the impact of sulfate and nitrate on the most impaired days.

Emissions Inventories

We appreciate the inclusion of summary 2002 emissions tables in the SIP on pages 29-30. We request that the 2002 emissions summary information also be placed in the Reasonable Progress section. This better informs the public on the difference between current emissions and future emissions goals of this SIP revision.

Best Available Retrofit Technology (BART)

We concur with MPCA's conclusion that the facilities with emissions units subject to BART are those listed in Table 9.2 on page 58. As noted in that table there are only two source categories with units subject to BART: electric generating units (EGUs) and taconite ore processing facilities.

BART for EGUs

On page 58, the draft SIP notes that MPCA did not complete a BART determination for EGUs subject to BART because those units are subject to the Federal Clean Air Interstate Rules (CAIR). The SIP states that unit specific emissions limits for sulfur dioxide and nitrogen oxides for BART units, as well as for other EGUs will not be fully incorporated into State of Minnesota permits until the five-year assessment required by the Regional Haze rule. This time frame, in conjunction with the unresolved litigation to have Minnesota removed from the CAIR region, could result in substantial delay in meeting BART emissions reduction requirements. **We request the SIP include unit specific**

BART emissions limits for EGUs to avoid delay in implementing BART should Minnesota be removed from the CAIR region. This is particularly important for the Northshore Mining Boiler #2. According to the information contained in the SIP, this facility is not planning to install any emissions controls for sulfur dioxide or nitrogen oxides under CAIR and its current emissions do not represent BART-level limits.

If the listed EGUs become subject to facility-specific BART requirements, additional reductions of particulate emissions would be appropriate since the PM emissions do contribute to their visibility impact and BART limits should be set for all contributing pollutants at levels achievable for a reasonable cost.

BART for Taconite

We believe that there is sufficient information to determine BART emissions limitations for sulfur dioxide emissions, and they should be included in the SIP now. This is particularly important for the United Taconite facility which uses a very high sulfur fuel. That facility could substantially reduce emissions through the use of a re-circulating scrubber at reasonable cost. In addition, we are concerned that the proposed sulfur dioxide emission limits for taconite facilities that burn low sulfur fuels is substantially above measured emissions rates. BART limits should reflect best operational practices.

There is sufficient technical evidence for the State to set BART emissions limits for nitrogen oxides using one or more post-combustion control techniques. Yet, we recognize that there is uncertainty regarding the current yearly nitrogen oxides emissions from taconite facilities, and therefore, there is uncertainty in calculating cost-effectiveness of post-combustion controls. **We concur with a delay in setting BART emissions limits for nitrogen oxides provided that the SIP requires: 1) the sources to install continuous emissions monitors (CEMS), or an equivalent emissions monitoring system, by November 30, 2008, and begin the reporting process no later than January 2009; 2) source emission control trials limited to on-site, slip-stream and other pilot-scale studies; 3) all studies be concluded and reported to MPCA no later than December 2011; and 4) the MPCA to issue permits containing new limits to establish BART for nitrogen oxides at each affected facility no later than December 2012. The SIP should identify appropriate interim deadlines that would assure these actions are completed in a timely fashion.**

Reasonable Progress Goals and Long Term Strategy

On page 82, in the discussion of calculation to determine the emissions reduction goal for sources in NE Minnesota, there is a statement that "75% of all visibility impacts are assumed to be uncontrollable." We would like MPCA to clarify that statement to reflect that those impacts are not controllable by MPCA. MPCA should request in this SIP that these emissions, to the extent controllable by other States or for consideration during international negotiations by EPA, be appropriately controlled to assist MN in making reasonable progress.

The modeling assessment in Chapter 8 of the draft SIP indicates a range of possible outcomes regarding the 20% worst days in 2018. MPCA has selected conservative reasonable progress goals at Voyageurs National Park and Boundary Waters Wilderness that do not achieve the uniform rate of progress, with the understanding that additional improvement is likely pending the outcome of the final BART determinations for taconite facilities and implementation of the NE Minnesota Plan. The SIP should commit the State to updating the information used to set the reasonable progress goals during the 5-year report process and to make decisions on future controls as provided for in the SIP with the knowledge that the uniform rate of progress is not being met in this first implementation period.

NE Minnesota Plan

On page 83, Table 10.4 summarizes the emissions targets for the NE Minnesota region. The more detailed information regarding the specific sources which make up the 2002 inventory is contained in Appendix 10.4. Given the uncertainty regarding the 2002 NOx and SO2 emissions from the taconite facilities, we request that Table 10.4 be expanded to include a column that identifies the total SO2 and NOx emissions from the taconite facilities as a group. This will help frame the discussion how CEM, or equivalent, data on future emissions will be taken into account in final BART determinations and how they figure into controls to be required at the taconite facilities with respect to the regional emissions target. **If initial CEM data indicate a dramatic reduction in emissions from the 2002 inventory and those data are not supported by significant process or line operation changes, then it is likely that the 2002 emissions were less than those listed in the SIP. The "fair share" of the reduction for the NE Minnesota region is 30 percent reduction by 2018 of the actual 2002 emissions. Therefore, some correction factor for CEM versus the 2002 baseline should be accounted for when determining compliance with the 30% reduction goal and to support Prevention of Significant Deterioration air quality related values evaluation by using emissions tracking in the future.**

The draft SIP language indicates that all existing sources identified in calculating the 2002 baseline will be tracked and all future permit applications will be taken into account when calculating the yearly tracking of emissions. We agree that for annual tracking the list of existing sources noted in Appendix 10.4 and new permit applications are sufficient. However, **the SIP should clearly identify those sources. In addition, the SIP should recognize MPCA's responsibility to account for any minor source emissions growth (or decline). The MPCA could address any minor source emissions changes during its 2012 assessment and as part of planning for the next implementation period after 2018.**

We concur with footnote 56 on page 83, indicating it will be difficult to determine the actual baseline emissions given modifications and production fluctuations at taconite plants between the 2002 baseline and current conditions as CEMs are put in place. However, given that the reductions at taconite facilities will represent

BART and will play a key role in whether the NE region is seeing a real 30 percent reduction from actual 2002 emissions, a factor that includes some comparison of the 2002 taconite emissions used in calculating the region's 2002 baseline with the first 12 months of CEM data should be another factor in the selection of cost efficiency requirements for control. This factor should be added to the one listed on Page 84 regarding the selection of cost-effectiveness, or dollar-per-ton-removed thresholds, based on meeting or not meeting the regional emissions reduction target using the original 2002 baseline.

The SIP must have specific dates for completing the BART-like review of the taconite facilities and when the decision on whether non-taconite facilities will need to implement control strategies.

The last three paragraphs of the "Plan for Emissions Reductions in NE Minnesota" section discuss the process by which MPCA will require additional reasonable measures to meet the 2012 and 2018 goals. These paragraphs summarize the framework document contained in Appendix 10.4. **The timelines from the Appendix should be reflected in the SIP language. In addition, the last paragraph concerning not meeting either target should also speak to how the State will address any new permits for facilities to be located in the NE region if targets have not been met (2012) or are likely not to be met (2018).**

The SIP should be clear that the 2018 target remains in place unless altered by a subsequent regional haze SIP revision in 2018 or beyond.

Verification and Contingencies

The issue of adding timelines to the actions indicated in Chapter 10 could be achieved by expanding and adding deadlines to Table 11.1 in the Chapter 11, "Periodic Plan Revisions and Determination of Adequacy".

Coordination and Consultation

We understand MPCA uses a 5 percent contribution threshold for impacts on the worst visibility days for determining which Class I areas it influences for SIP planning purposes. We note that Seney Wilderness, in Michigan, is just below the 5 percent threshold for the worst days but a bit over that threshold when looking at impacts on all days. **We request MPCA to confirm with Michigan that MPCA's SIP meets Michigan's expectations for Minnesota's contribution to assuring reasonable progress at Seney Wilderness.**

Smoke Management

We applaud the SIP's acknowledgement of a smoke management plan that incorporates consideration of visibility effects in its operating procedures. We request the State to

confirm that the plan identifies mandatory Federal Class I areas as sensitive receptors when considering application of smoke reduction techniques.

The State should support its decision to not address smoke management planning regarding agricultural burning activity by a review of available data regarding emissions and visibility impacts rather than relying on EPA's interim air quality policy. The Regional Haze Rule does suggest that agricultural burning activity should be considered as part of the SIP if there is an expectation that such activity significantly contributes to visibility impairment. Since there has been impact from fire during the 20% worst days, it would be important for the State to discuss whether smoke from agricultural sources does or does not contribute to the smoke impacts at Class I areas. If the State considers these fires to be located within an appropriate area of influence for its Class I areas, actions to address these emissions under the SIP should be considered rather than waiting for future interim policies from EPA.

Neuschler, Catherine

From: Glass, Nancy [nancy.c.glass@xcelenergy.com]
Sent: Wednesday, March 19, 2008 3:15 PM
To: Neuschler, Catherine
Cc: Rosvold, Richard A
Subject: Regional Haze Comment

Catherine,

I noticed two mistakes in the draft haze SIP documents on the MPCA web site.

1. Page 80 in Chapter 10, for projects being undertaken to reduce NOx and SO2. The list uses Xcel Energy's unit numbering for the King, Riverside and Sherburne County plants, but incorrect numbers for the High Bridge plant. The High Bridge units that shut down in 2007 are 3, 4, 5 and 6.

2. Memo from Mary Jean Fenske to AQD File No. 202G, dated January 11, 2008. Section 2.3 of the memo says that "Minnesota Power" was not asked by the MPCA to perform a BART analysis for the Allen S. King Plant, instead of saying "Xcel Energy."

Nancy Glass
Senior Environmental Analyst, QEP
Xcel Energy Environmental Services
612.330.5520
Fax 612.330.6357

From: Elanne Palcich [epalcich@cpinternet.com]
Sent: Friday, April 25, 2008 10:51 PM
To: Neuschler, Catherine
Subject: Regional Haze Comments

I have great concerns in regard to haze over the Boundary Waters Canoe Area and Voyageurs National Park. A new sulfide mining industry is exploring the entire Duluth Complex adjacent to, and even underneath, these Class I areas.

Proximity is of prime concern in regard to pollutants.
In addition to threats from an entirely new mining industry, taconite expansion is continuing on the Iron Range, and Minnesota Steel has been permitted but is awaiting more financial support. A coal gasification industry is also vying for a place in the mix.

I would like to know how these projects would be factored into a haze reduction plan. It seems to me that, if a new industry is permitted, than an old industry must make some huge accommodations in reducing its emissions. Otherwise a new industry will have to wait approval until some old industry dies out and leaves a haze opening.

I would like the haze reduction plan to show how a reduction in consumer demand could reduce the amounts of energy and resources that are needed and how recycling of resources could reduce the amount of virgin minerals that need to be mined.

I would also like the haze reduction plan to specifically graph the amount of haze that a new sulfide mining industry would contribute. The Polymet environmental process is far enough along to give baseline haze information that could be extrapolated to plans by Franconia, Duluth Metals, Teck Cominco, and Kennecott. (There may also be others.)

I believe that the coal gasification project also has enough information to predict haze.

Minnesota Steel has already been permitted, so that information should definitely be a part of the haze reduction plan.

Mesabi Nugget is undergoing environmental review, but information could be deduced from former LTV outputs.

Northshore Mining is also in proximity. And Minorca plans expansion in the Biwabik area.

Keewatin taconite expansion must also be factored in, especially with problems that Keetac has had with dust blowing off its tailings basins.

I think that the plan also needs to include peat mining in the area. Dust is a huge factor in peat mining. I believe that Waupaca in Meadowlands is near enough to be factored in.

In regards to this, forested areas can act as a buffer zone for blowing dust. But the U.S. Forest service has plans for huge amounts of clear cutting bordering the BWCA. I believe that logging must be

factored into the haze plan.

Without all this information, I don't see how you can possibly have a haze reduction plan that will actually follow Federal guidelines. There is no way that we can continue to add particulates to the air and reduce haze at the same time.

Thank you.
Elanne Palcich
29 SE 5th St.
Chisholm, MN 55719

From: Gary Clements [gclem@visi.com]
Sent: Monday, May 12, 2008 5:56 PM
To: Neuschler, Catherine
Subject: air pollution control laws & BWCA

Greetings Ms. Neuschler,

My name is Gary Clements, and I live in St. Paul. I have long been a visitor to northern Minnesota, particularly the BWCA area around Ely. I am aware that there is a possible move afoot to weaken some emissions standards or laws that could result in increased haze and air particles in that area.

I would be so dismayed to learn that the taconite industry is not carrying its share of the responsibility for low emissions, and that any weakening of the standards might happen. The BWCA and surrounding Superior National Forest is a gem that cannot be replaced for future generations if we allow the activities of this generation to slowly erode the environment there.

Please take a stand against weakening emissions standards or laws, and demand that ALL industries do their part in protecting our future.

It's not just the loss of economic impact that a damaged northern Minnesota would suffer if thousands like me stopped going. It's just the right thing to do.

Thanks for your consideration,

Gary Clements
1362 Lincoln Ave.
St. Paul, MN 55105

From: d p anderson [dpadaa@frontiernet.net]
Sent: Monday, May 12, 2008 7:37 PM
To: Neuschler, Catherine
Cc: brian@friends-bwca.org
Subject: Regional Haze plan
MPCA,

I am writing to share my support, and strong encouragement, to develop a plan to reduce the regional haze over the BWCA. The taconite industry should do its fair share to control its air pollution. New facilities should be required to keep their emissions as low as possible and existing pollution control laws shouldn't be weakened.

I can tell you from experience that if we don't correct this now, is will not be good. I spend two weeks in Hong Kong last December. Yes, it is a beautiful place; however, the haze was so bad for all but one day that you couldn't see the top of Victoria Peak, just across the harbor.

This is what we need to ensure doesn't happen here. Your actions can make a difference, will they? Let's get this on the right track!

Thanks,

Doug Anderson
19827 Jersey Ave.
Lakeville, MN 55044
952-469-1016

From: Chuck Hoffman [chuckhoffman@mail.com]
Sent: Monday, May 12, 2008 9:46 PM
To: Neuschler, Catherine
Subject: Air Quality in northeastern Minnesota

Dear Ms Neuschler,

I am writing in response to word I have received about plans for reducing haze and pollution in the BWCA and surrounding areas.

As someone who visits the BWCA often, and appreciates its natural beauty, clean air, and healthful environment, I urge you to support maintaining and improving the air quality.

Area industries, such as mining, should do their fair share to keep emissions low.

And air quality standards should be strengthened, not weakened.

Thanks for listening,

Chuck Hoffman
738 Forest Dale Road
New Brighton, MN 55112

From: peterduys@aol.com
Sent: Monday, May 12, 2008 9:53 PM
To: Neuschler, Catherine
Subject: brian@friends-bwca.org
To the MPCA,

Do Not Back Down On The Pollution Control Laws Concerning The Air In The BWCAW!

I am one that depends on an unspoiled area to go to, for personal renewal and restore my faith in the world we live in and the manner in which we take care of it.

I think the Taconite Industry should do its fair share to control its air pollution, new facilities should be required to keep their emissions as low as possible and existing pollution control laws shouldn't be weakened.

Regional haze is creating unhealthy and hard-to-see-through air in northern Minnesota. Pollution from coal plants, taconite facilities and other sources in northern Minnesota and surrounding states has increased the amount of haze in the region. As a result, the air in places like the Boundary Waters Canoe Area Wilderness, Voyageurs National Park and Isle Royale National Park has become less healthy and visibility has been significantly reduced. To protect people who visit places like the Boundary Waters and our national parks, federal law requires Minnesota to develop a "state implementation plan" to reduce haze and eliminate man-made visibility impairments in these areas by 2064.

Lets not rudder away from these laws but embrace them and tighten up on those that feel they have a right to nonchalantly ruin some of the most blessed areas of our world for the sake of profit. When are we going to live in balance with our natural world instead of expecting it to become a bigger dumping ground from our stupidity!

Pete Duys
Northfield, MN

From: Chris Norbury [chitrader@yahoo.com]
Sent: Tuesday, May 13, 2008 9:12 AM
To: Neuschler, Catherine
Cc: brian@friends-bwca.org
Subject: regional haze plan

Dear Ms. Neuschler:

I am concerned about the air quality in northern Minnesota as it affects the Boundary Waters Canoe Area Wilderness and Voyageurs National Park. I understand that the taconite industry is a major contributor to poor air quality in northern Minnesota but is not regulated with regard to pollution control. This is absurd. ANYONE who engages in a business that can possibly harm the environment should be held responsible for doing whatever is necessary to prevent that harm from happening.

I urge you to work for laws and policies that will force ALL polluters to be responsible for cleaning up their messes and help ensure that northern Minnesota remains a clean, healthy area with some of the most pristine wilderness in the nation.

Sincerely,
Chris Norbury

From: Jon Ridge | Executive Director HI-MN [jridge@himinnesota.org]
Sent: Tuesday, May 13, 2008 11:30 AM
To: Neuschler, Catherine
Cc: brian@friends-bwca.org
Subject: BWCA Haze Guidelines
Dear Catherine,

I received a notice from the Friends of the BWCA of your interest in gathering responses in your efforts to control haze and other pollutants in these wilderness areas. Thank you for asking!

I'm a guy in his mid 50's who has been paddling, skiing and winter camping in the BWCA for over 30 years. It is my favorite place on this planet and is right in our backyard if you live in Minnesota. Both the regions of the BWCA and Voyageur's Park have a rich history in their establishment and survival. It is worth our collective effort to protect these resources as best we can.

A visitor to these wilderness areas cannot help but tell the difference between the management of this land and the land where they work and raise a family. As the number of protected wild spaces continues to decline we need to be vigilant in protecting the few that remain.

When paddling the BWCA your senses are overloaded with this wild place. You observe the efforts of a Canadian forest fire in the sky for weeks at a time. You hear a plane from miles away yet never notice them in the city. You appreciate the clean drinking water. You feel safe eating the fish you catch. You know the protections from government leaders of our past have kept this place safe and wild and natural.

But these protections are always at risk. Industrial growth, mining and jobs are important issues in Northern Minnesota. But please lets make sure our air quality and water quality protection remains strong or better yet is made stronger than the past.

The Canadian forest fire is a natural occurrence, haze created from an industrial plant is not. The industrial plant will emit the pollutants daily affecting the air and water quality of the entire region and the visual affect will absolutely impact the visitor to Voyageurs or the BWCA.

I expect the Minnesota PCA to set strong standards for protection, not just for the BWCA but for all of Minnesota. But please lets make sure our unique wilderness remains a wilderness.

Thank you Catherine,

Jon Ridge
jridge@himinnesota.org

Jon Ridge
Executive Director

Hostelling International-USA, Minnesota Council
622 Selby Ave
St. Paul, MN 55104

Phone: 651/251-1495
Fax: 651/251-1496
www.himinnesota.org

From: Erickson, Roy D [RERICKS1@Fairview.org]
Sent: Tuesday, May 13, 2008 4:05 PM
To: Neuschler, Catherine
Cc: brian@friends-bwca.org; eric1187@d.umn.edu; Hanna Erickson
Subject: air pollution

Dear Catherine,

Please do the right thing and require all businesses to contain their air pollution.They should do this regardless of any excuses they may generate.If they can't be competitive because of extra costs then that business is not viable!

A quote from Aldo Leopold: " A thing is right when it tends to preserve the integrity, stability and beauty of the earth's ecosystems. It is wrong when it tends otherwise."

Thanks For Doing The Right Thing,
Roy Erickson

From: Erickson [toddandchristina@hotmail.com]
Sent: Wednesday, May 14, 2008 9:48 PM
To: Neuschler, Catherine
Cc: toddandchristina@hotmail.com
Dear Catherine -

I was so happy to hear that the MN PCA is considering maintaining/improving air quality in the BWCA.

My family are avid campers in the BWCA, and I hope my children will continue to be as they grow up. I support efforts to keep the Boundary Waters as pristine as possible. Efforts to keep emissions low from nearby northern Minnesota taconite industry is a gift to all of us who love northern Minnesota. I appreciate your consideration of these pollution control laws.

Christina Erickson
1764 Simpson Street
Falcon Heights, MN 55113

From: mccor026@umn.edu
Sent: Thursday, May 15, 2008 9:30 AM
To: Neuschler, Catherine
Subject: Air Pollution Regulations

Ms Neuschler
I am a cabin owner on the edgwe of the BWCA and also frequent paddler in Voyageurs and the BWCA. I am writning to urge you to maintain and enforce without exemption the current the current EPA guidelines for air quality .
The BWCA wilderness and the surrounding enviroment need more protection not less. Sincerely Paul mcCormick

1854 Treaty Authority

4428 HAINES ROAD • DULUTH, MN 55811-1524
218.722.8907 • 800.775.8799 • FAX 218.722.7003
www.1854treatyauthority.org

May 13, 2008

Ms. Catherine Neuschler
Air Policy
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

RE: Minnesota's Regional Haze State Implementation Plan

Dear Ms. Neuschler:

The purpose of this letter is to provide comment on the Minnesota Pollution Control Agency's Proposed State Implementation Plan (SIP) for Regional Haze.

The 1854 Treaty Authority is an inter-tribal natural resource management organization governed by the Bois Forte Band and Grand Portage Band of Lake Superior Chippewa, both federally recognized tribes. The organization works to preserve, protect, and enhance the off-reservation treaty rights of these bands in the 1854 Ceded Territory of northeastern Minnesota. Band members continue to exercise rights to hunt, fish, and gather guaranteed under treaty with the United States. Please note that these comments are submitted by 1854 Treaty Authority staff with the understanding that member reservations may submit comments from their own perspective.

Clean Air Interstate Rule (CAIR)/ Best Available Retrofit Technology (BART) for Electrical Generating Units (EGUs)

A Minnesota Power petition to EPA for the removal of Minnesota from CAIR has the potential for a large delay in implementing BART if the petition succeeds. MPCA did not complete a BART determination for BART-specific EGUs because of CAIR. 1854 Treaty Authority believes that all BART EGUs should have specific-unit BART limits determined within this SIP, so that a delay in implementing BART is minimized pending litigation results.

Monitoring Funding

The 1854 Treaty Authority recognizes that while presently there are two IMPROVE monitors within the Class 1 areas of northeast Minnesota, it is concerned about the continued operation of such monitors. According to the draft SIP, "operation is contingent upon continued federal funding" of said monitors and should federal funds fail; MPCA will "attempt to provide support for the operation of at least one of the two IMPROVE sites". Funding for monitoring efforts has become less of a priority due to budget cuts to both federal and state programs and the increase in competition for the remaining existing funds does not guarantee 100% funding for this "critical" component of the "long term success of the Regional Haze Program". 1854 Treaty Authority recommends that the MPCA makes operational support and funding for both monitors a top priority.

Northeast Minnesota Plan

The 1854 Treaty Authority appreciates the inclusion of the three new taconite facilities (Mesabi Nugget, Polymet and Minnesota Steel Industry) for northeast Minnesota in the 2018 emissions modeling.

Per page 83 of the draft SIP, "Minnesota will therefore require these facilities to investigate control technologies and pollution prevention practices for their indurating furnaces through pilot tests or other mechanisms during the 2008-2011 time period, and report to MPCA on the feasibility and cost of effectiveness of said technologies and practices" for the taconite facilities. Also within the Appendix to Chapter 10, Concepts for Implementation it states, "Facilities identified as needing additional analysis will have from 2008-2011 to investigate the feasibility and cost-effectiveness of emission reduction strategies". The 1854 Treaty Authority would request that there be more public review of this process as it progresses and that interim reports be filed and available on a set schedule, so that stakeholders will know exactly what the facilities are doing and that deadlines will be kept.

Within the Appendix to Chapter 10, Concepts for Implementation, it addresses the actions that are needed to meet the 2018 emissions target, if the 2012 emissions target are not met. The 1854 Treaty Authority feels that these actions are for existing facilities and that the SIP does not address new facilities. Also the 1854 Treaty Authority feels that the SIP is vague on how the "memorandum of understanding" would work between the MPCA and the FLMs for major new stationary sources applying for permits. We would like to see more language explaining this MOU in general and how new sources would be permitted if the reduction goals of 2012 and 2018 will not be met.

Continuous Emission Monitoring (CEM) data

The 1854 Treaty Authority supports the Department of the Interior (DOI)'s suggestion (see letter dated April 4, 2008) that a correction factor be applied for CEM data versus 2002 baseline data to account for unreliability in the baseline data. With regard to CEM data, please include dates by which data must be submitted to the MPCA and the MPCA's plan for sharing the results with stakeholders.

Clean Air Mercury Rule (CAMR)

In a number of places, the SIP references the EPA's Clean Air Mercury Rule. Since CAMR was struck down by the United States Court of Appeals – DC Circuit Court on February 8, 2008, the SIP should address this and state what the implications are of this situation. This should still be explained in the SIP or else references to CAMR should be removed.

Thank you for giving us the opportunity for our comments and input on this matter.

Sincerely,

Nicholas Axtell

Environmental Specialist
1854 Treaty Authority
4428 Haines Road
Duluth, Mn 55811

Cc:

J. David Thornton, Minnesota Pollution Control Agency

Darin Steen, Bois Forte Reservation

Tod LeGarde, Grand Portage Reservation

POLYMET
MINING

May 15, 2008

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Ms. Neuschler,

PolyMet Mining, Inc (PolyMet), is submitting these comments in response to the Minnesota Pollution Control Agency (MPCA) proposed State Implementation Plan for the Clean Air Act Regional Haze Rule that will be submitted to the USEPA by the MPCA.

PolyMet is a mining company currently involved in the development of the NorthMet project, located in an established mining district within northeastern Minnesota. The NorthMet project is a development of a copper, nickel, and platinum group metals deposit within the Duluth Complex, an area of known polymetallic nonferrous metal deposits. This established mining district and the current and future emission sources that lie within it are part of the targeted long term strategy for controls required to meet the Reasonable Progress Goals as laid out in Chapters 10 & 11 and Appendix 10.4 –"Concept Plan for Addressing Major Point Sources in Northeastern Minnesota".

As stated in the SIP, Minnesota must demonstrate that its implementation plan includes all measures necessary to obtain its *fair share* of emission reductions needed to meet reasonable progress goals at all Class I areas where visibility is impacted by emissions from Minnesota. The SIP lays out a strategy for emission reductions in the six largest counties, closest to the Class I areas in Northeastern Minnesota. Within Chapter 10 it is stated that the status of the emission targets within this region (identified within Table 10.4) will be used primarily to inform the consideration of cost-effectiveness – if the overall regional emission reduction target is being met, the maximum $/ton cost-effectiveness level considered to be reasonable would likely be lower. Should more reductions be needed to meet the emission target, then a higher $/ton figure may be considered reasonable.

While we concur that existing point sources within this region should do their "fair share" of emissions reductions, we do not feel the SIP completely addresses or evaluates other potential areas of reduction within the *entire* state of Minnesota. It should be noted that in the NE region of MN, the existing non-EGU point sources, and in most cases any future non-EGU point sources of SO_2 and NO_x are and will be large users of electrical energy. As such they are subject to increases in electrical rates from the EGU's that are due to pass-through costs necessary for environmental pollutant control upgrades at the EGU's. Inexorably, they will end up spending more than there fair share in cost of control. On its face, a higher $/ton figure may be considered reasonable in order to achieve a regional target, but may not accurately reflect the other true costs being felt by the source due to other ancillary costs such as electrical rate

increases from mandated pollution reductions. This is especially magnified when the brunt of the costs are borne in a small geographical region, that is heavily dependent upon the mining sector. Once again we would ask that the MPCA ensure the SIP and any future reviews and revisions undertake an assessment of not just the point sources in northeastern MN, but the entire state for any further source reductions. In that manner we can be assured that all of Minnesota is doing its fair share of reductions.

Sincerely,

/s/ Kevin Pylka
Kevin Pylka
Manager Environmental Permitting and Compliance

U. S. Steel Corporation
Minnesota Ore Operations
P.O. Box 417
Mt. Iron, MN 55768

CERTIFIED MAIL 7006 0100 0006 4747 5652

May 15, 2008

Catherine Neuschler
Minnesota Pollution Control Agency
Environmental Analysis and Outcomes Division
520 Lafayette Road North
St. Paul, MN 55155-4194
catherine.neuschler@pca.state.mn.us

Re: Comments on the MPCA Regional Haze State Implementation Plan

Dear Ms. Neuschler,

U. S. Steel Minntac (Minntac) has reviewed the MPCA's draft Regional Haze State Implementation Plan (SIP). Minntac is providing the following comments for consideration.

Page 62 paragraph 2 of the SIP states: "Thus, the MPCA has included draft emission limits in Table 9.5 that represent BART for SO_2 for facilities that burn only natural gas." Draft SO_2 limits have been included in the SIP for Minntac Agglomerator Lines 3-5 all of which are permitted to burn biomass and fuel oil in addition to natural gas.

Page 64, Table 9.5: *SO_2 BART Determinations for Units Where a Full BART Analysis Was Conducted* lists a BART emission limit of 0.421 lbs SO_2 per long ton of fired pellets for Minntac Agglomerator Lines 3-5. Minntac representatives met with the MPCA on Thursday, October 25, 2007 to discuss the SIP draft SO_2 limits. At that time both parties agreed that a pound per hour limit would be more appropriate than a pound of SO_2 per long ton of pellet. Minntac reiterates that a pound per hour limit be used.

If you have any questions or require any additional information please feel free to contact me at (218) 749-7364 or clbartovich@uss.com.

Sincerely,

Chrissy Bartovich
Environmental Control Engineer
U. S. Steel – Minntac

cc: Scott Vagle – USS
Tishie Woodwell – USS
Mark Jeffrey – USS

May 15, 2008

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
Environmental Analysis and Outcomes Division
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: Minnesota Power comments on the "MPCA DRAFT State Implementation Plan (SIP) Revision for Regional Haze"

Dear Ms. Neuschler,

Minnesota Power (MP) appreciates the Minnesota Pollution Control Agency (MPCA) leadership efforts in addressing regional haze, visibility impact concerns in national parks, scenic areas and wilderness areas, also referred to as Mandatory Class I Federal Areas. MP attended the April 10, 2008 Regional Haze teleconference hearing, reviewed the April 8 information packet provided and offers the following comments.

Proximity Impact

First, Minnesota Power wishes to affirm our support for the basic approach the MPCA applied when targeting collective emission reductions from Minnesota sources in close proximity to Class I Wilderness Areas. While visibility modeling has affirmed the relationship between visibility impairing emissions and proximity to Wilderness Areas, MPCA has also recognized that more than half of the visibility impacts on Minnesota Class I areas are from emission sources outside of Minnesota. The MPCA established a workable plan by which Minnesota emissions can be targeted for their "fair share" of reductions needed to meet the Federal, visibility impairment, Reasonable Further Progress goals. MP agrees with the MPCA assessment that Minnesota electric generating units are doing their part to help achieve the MPCA regional haze SIP, northeast Minnesota emission reduction targets.

Minnesota Power Projects/BART Requirements

Minnesota Power notes that sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and particulate emission controls that have been retrofitted and are being retrofitted on Minnesota electric generating units are resulting in significant Minnesota emission reductions. Minnesota Power's Arrowhead Regional Emission Abatement (AREA) controls on the Taconite Harbor Energy Center and Laskin Energy Center have already started to bring benefits through reduced emissions from controls already in service and scheduled to be placed in service over the next year. MP has also announced additional

emission reductions with emission control retrofits at the Boswell Energy Center, Units 1, 2, 3 and 4 that will further reduce SO_2, NO_x and particulate emissions in our area by 2010. It is important to note these MP control retrofit projects will continue, regardless of the status of the Clean Air Interstate Rule in Minnesota, bringing further benefits to Minnesota's regional air quality.

A key part of the regional haze program is to address emissions from units designated by Clean Air Visibility Rule provisions as BART eligible units, that is, units subject to Best Available Retrofit Technology assessment. Minnesota Power's BART eligible units, Boswell Unit 3 and Taconite Harbor Unit 3, are both receiving control retrofits that MPCA review has already designated as BACT or BACT-like. The BACT/BACT-like designation indicates their control retrofit design can meet Best Available Control Technology standards applicable to units of their size, which are considered to be more stringent than Best Available Retrofit Technology. Consequently, MP considers the MPCA's BACT/BACT-like designation as demonstrating the MP BART eligible unit requirements are being satisfied under MPCA's regional haze plan, as supported by MP's emission control retrofits.

All three units at the Taconite Harbor Energy Center are receiving innovative emission control retrofit technology provided by Nalco-Mobotec addressing the challenge of achieving good environmental performance on these smaller sized, electric generating units. MP notes the newly retrofitted NO_x and SO_2 controls performance is undergoing optimization on Taconite Harbor Unit 2. Demonstrated overall performance is confirming the Mobotec technology is the best retrofit technology selection for the Taconite Harbor Energy Center, considering fuel type, boiler size, boiler design, demonstrated emission reduction performance and cost.

Regional Haze SIP and the CAIR Rule

MP notes the reference made by the MPCA to Federal Land Managers (FLMs) comments in the April 8, 2008 hearing packet about the impact of Minnesota's CAIR status on the Minnesota regional haze SIP. MP supports the MPCA position that the measures being implemented in Minnesota are delivering suitable emission control retrofits on BART-eligible electric generating units independent of the Minnesota CAIR status. MP agrees with the MPCA that CAIR cap and trade compliance provisions are not suitable for being overlaid into the Minnesota regional haze SIP, recognizing that specific unit emission rates are not stipulated as part of the CAIR cap and trade program. Regardless of the CAIR outcome, MP continues to install emission control retrofits for regional haze, delivering the associated improvements in Minnesota background air quality that impact regional haze.

Contact Information

Please contact Mike Cashin (218-722-5642 extension 3339) or Brandon Krogh (extension 3954) if you have any questions related to Minnesota Power's comments regarding the

MPCA DRAFT Regional Haze, State Implementation Plan. Thank you again for the opportunity to provide Minnesota Power comments.

Regards,

Michael G. Cashin

Michael G. Cashin, P.E.
Senior Environmental Policy Advisor
Minnesota Power
30 West Superior Street
Duluth, MN 55802

Phone: 218-722-5642 ext. 3339
FAX: 218-723-3923
Cell: 218-343-6472

Cc
Brandon Krogh
Dennis Niemi
Margaret Hodnik
David Thornton (MPCA)

From: Robert Evans [BobEvans@excelsiorenergy.com]
Sent: Friday, May 16, 2008 3:35 PM
To: Catherine.Neuschler@state.mn.us
Subject: Comments on Draft Regional Haze SIP

Importance: High
Dear Ms. Neuschler:

As you know, Excelsior Energy Inc. ("Excelsior") is the proponent of two 600 $MW_{(net)}$ coal-fired IGCC power stations (a.k.a. Mesaba One and Mesaba Two) proposed to be located on Minnesota's Mesabi Iron Range on one of two alternative sites that will likely be designated by the Minnesota Public Utilities Commission later this year in response to the company's application for Site and Route Permits therefrom. As well, Excelsior has submitted applications for the two sources to the Minnesota Pollution Control Agency and the Minnesota Department of Natural Resources to obtain New Source Review Construction Authorization and Water Appropriation Permits, respectively. When they begin operation, Mesaba One and Mesaba Two are expected to emit sulfur dioxide and nitrogen oxides (and other criteria pollutants) at rates rivaling the lowest of any full-scale coal-fired power station in the world.

By design, Mesaba One and Mesaba Two will be capable of using bituminous and subbituminous coals and blends of these two feedstocks with smaller amounts of petroleum coke. Specifically, Mesaba One will be critical in demonstrating the full-scale commercial demonstration of ConocoPhillips' EGas™ technology, the only gasification technology of which we know has been proven capable of using subbituminous coal in an IGCC application. The practical implication of this demonstration is that IGCC will become even more prominent in regulatory decision-making processes for new Midwest baseload coal-fired power stations and major modifications of existing baseload coal-fired stations. Given that the sulfur dioxide and nitrogen oxide emission rates proposed for Mesaba One and Mesaba Two are 0.025 lb and 0.058 lb per million Btu heat input, respectively, are a fraction of the lowest emission rates shown for the Midwest Electric Generating Units in Table 10.3 of the Draft SIP, we believe that substitution of IGCC technology for conventional coal-fired steam electric generating units will become the rule once IGCC is commercially demonstrated. When it does, the state will begin to witness significant reductions in regional haze in its Class I areas.

Therefore, Excelsior recommends that Mesaba one and Mesaba Two be reflected in the inventory of Minnesota Sources in 2018 to reflect growth in electricity demand. In this table, two generic mines were added to reflect growth expected to occur in the mining industry, based on projected emissions from two proposed projects (Minnesota Steel and Polymet). Those two projects alone would require at least 500 MW of baseload electricity. The total growth in baseload need across the region is likely to be much larger.

Applying the same rationale to growth expected to occur in baseload electricity demand, it would be reasonable to include a generic electricity source in the emissions inventory for 2018, based on the emissions of the only new, in-state baseload electric generating sources proposed at this time (i.e., Mesaba One and Mesaba Two). If, alternatively, one assumes that new sources are not constructed, the existing baseload generators in the region (with much higher sulfur dioxide and nitrogen oxide emission rates) are likely to operate at the absolute maximum feasible capacity factor. In that case, the emissions inventory for 2018 should reflect sulfur dioxide and nitrogen oxides emission rates consistent with maximum feasible capacity factors of northeast Minnesota generators, rather than 2002 capacity factors. This, of course, would not be to the advantage of showing that reasonable further progress goals were attainable. Therefore, to the extent that including emissions associated with electricity demand and generation growth affect the 2018 emissions inventory, the reasonable progress goal and 30% emissions reduction target may need to be adjusted. Emissions goals that assume no economic growth have the potential to discourage development which would not be a good approach for achieving regional haze goals.

Thank you for this opportunity to comment on the States Draft Regional Haze SIP. Please call me if you have any questions.

Sincerely,

Robert S. Evans II
V.P., Environmental Affairs
Excelsior Energy Inc.
11100 Wayzata Blvd., Suite 305
Minnetonka, MN 55305
952-847-2355

Cleveland-Cliffs

May 16, 2008

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
Analysis and Outcomes Division
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: Comments on Draft Regional Haze State Implementation Plan

Dear Ms. Neuschler:

Cleveland-Cliffs (Cliffs) is the manager and has ownership interests in the Hibbing Taconite, Northshore, and United Taconite iron ore mines and associated ore processing plants in Northern Minnesota. As a result, Cliffs has a vested interest in provisions in the Regional Haze Best Available Retrofit Technology (BART) State Implementation Plan (SIP) as the SIP pertains to these operations. Cliffs offers the following comments on the SIP.

Unit Of Measure For SO_2 Emission Limit

Cliffs' primary concern with the document lies with SO_2 limits contained in **Table 9.5: SO_2 BART Determinations For Units Where a Full BART Analysis Was Conducted.** Specifically, the SO_2 BART emission limit is in terms of lb SO_2/long ton pellet fired for all furnaces. In some cases, use of the unit could unnecessarily limit production irrespective of SO_2 emissions. Cliffs requests that the MPCA revisit the use of this unit rate with each of the plants especially with regard to the type of fuel used. A site specific reporting unit rate may be appropriate based on numerous site specific conditions. In the case of United Taconite's Furnace Line 2 where solid fuel is used, Cliffs specifically requests that the SO_2 emission limit should be expressed as lb SO_2/MMBtu (to avoid any misunderstanding, MMBtu means million British thermal units).

Northshore SO_2 Emission Data And Limits

Table 9.5 of the Draft SIP includes SO_2 maximum 24-hour Actual Emissions Reported. Northshore's Furnaces 11 and 12 are identical units, but Furnace 11 hood exhaust actual SO_2 emissions are listed as 1231.2 lbs/day and Furnace 12 hood exhaust actual SO_2 emissions are listed as 852 lbs/day. A review of stack test records does not corroborate this difference in emissions between the two furnaces. Cliffs requests that the MPCA review this information with Northshore environmental staff to determine its accuracy. If the data is incorrect, a BART emission limit modification may be required.

Cleveland-Cliffs Inc
Shared Services
227 West 1st Street
Suite 500
Duluth, MN 55802-5054

218.279.6100 PH
218.279.6102 FAX

Northshore is permitted to burn both natural gas and fuel oil in its furnaces although natural gas is by far the predominant fuel burned. It should be noted that the SO_2 emission data presented in Table 9.5 is associated with burning natural gas only. Therefore, specified emission limits should apply only when natural gas is used. This comment pertains to the permitted use of fuel oil at Hibbing Taconite and United Taconite also.

Northshore Emission Control Equipment

Throughout the draft SIP there are numerous references to the emission control equipment used on the furnaces at Northshore Mining. The SIP refers to the control equipment as "wet electrostatic precipitators" or "wet ESPs. This is an error. Northshore uses Wet-Wall ESPs, which are the only units of their kind in use in the United States and possibly the world. A wet ESP operates as a dry EST most of the time, and the plate that collects the particulate matter is periodically flushed with water to remove the particulates. A Wet-Wall ESP is constructed of a series of concentric fiberglass cylinders, and water flows over the cylinders on a continuous basis to remove the particulate matter. In this regard, Cliffs requests that all references to wet ESP in the document be changed to Wet-Wall ESP to accurately identify this epuipment.

Thank you for the opportunity to comment on the Draft SIP. Cliffs looks forward working with the MPCA to resolving the matters addressed in this letter.

Sincerely,

David Z. Skolasinski

David Z. Skolasinski
District Manager-Environmental Affairs

cc: Dana Byrne
David Cartella
Jason Aagenes
Scott Gischia
Andrea Hayden

May 16, 2008

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
Environmental Analysis and Outcomes Division
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Re: Comment on Draft State Implementation Plan Revision for Regional Haze.

ArcelorMittal Minorca Mine, Inc. ("ArcelorMittal") hereby submits its comments to the Minnesota Pollution Control Agency ("MPCA") draft State Implementation Plan ("SIP") revision for regional haze. These comments address four aspects of the draft SIP: 1) the IMPROVE equation, 2) the ArcelorMittal-specific SO_2 emissions limit of 0.123 pounds of SO_2 per long ton of taconite processed, 3) pH monitoring requirements, and 4) NOx BACT equivalency. First, ArcelorMittal supports the use of the IMPROVE modeling equation, but comments that this equation should allow the use of annual average background to replace 20% best day inputs to the model. Second, ArcelorMittal objects to the proposed SIP on the grounds that it should not include a numerical limitation for SO_2 emissions when the primary fuel source is gaseous. Third, ArcelorMittal comments that pH monitoring should not be required if sufficient data is generated to demonstrate stable pH conditions for water leaving the scrubber. Fourth, ArcelorMittal comments that NOx Best Available Control Technology ("BACT") and PSD emission limits should be considered equivalent to Best Available Retrofit Technology ("BART"). Each of these comments will be addressed more fully below. Finally, ArcelorMittal expects that applicable portions of the SIP, including but not limited to the applicable sections of Appendix 9, will be revised to reflect the Administrative Consent Order and permit revisions currently being negotiated by ArcelorMittal and MPCA.

The Regional Haze Rule

On July 6, 2005, the U.S. Environmental Protection Agency ("U.S. EPA") published regulations to address visibility impairment in our nation's largest national parks and wilderness areas ("Class I areas"). This rule is commonly known as the "Regional Haze Rule" (the "Rule"). The Rule requires Minnesota to establish and achieve visibility goals for each of its Class I areas by 2018 by regulating certain emissions believed to contribute to regional haze. MPCA determined that the key haze causing emissions in Minnesota are particulate matter ("PM," measured as PM_{10}), sulfur dioxide ("SO_2"), and nitrogen oxides ("NO_x").

Additionally, the Rule regulates certain stationary sources that could contribute to visibility impairment in Class I areas and requires BART limits for these sources. Pursuant to the Rule, Minnesota must submit a Regional Haze SIP to U.S. EPA identifying sources that cause or contribute to visibility impairment in its Class I areas. The Regional Haze SIP submittal must also include a schedule for implementation of BART and other control measures, including dates by which the MPCA will establish BART limits for specific units at BART-eligible sources

and dates by which facility owners or operators will demonstrate compliance with the limits. MPCA has five years from the time of SIP approval - until at least 2013 - to establish and implement the BART limits.

Accordingly, MPCA must determine what constitutes BART for each BART-eligible unit and must establish emission limits consistent with its determination of BART. BART limits must take into consideration the technology available, the costs of compliance, the energy and the non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology. For taconite pellet furnaces, MPCA determined BART for each of the emissions to be as follows:

NOx – An operating standard of good combustion practices in combination with process changes proposed as BART by the facilities, such as low-NOx burners in pre-heat zones, ported kilns and modified furnace design for improved fuel efficiency.

PM – Equivalent to the taconite Maximum Available Control Technology ("MACT"), which requires control of PM emissions to control hazardous air pollutants. The taconite MACT establishes a PM_{10} limit of 0.01 grains per dry standard cubic foot. For MACT compliance, five facilities, including the ArcelorMittal Minorca Mine operate wet scrubbers.

SO_2 – Existing particulate scrubbers optimized for SO_2 removal, except possibly at the United Taconite Line 2, where BART may require an add-on SO_2 scrubber.

Pursuant to the SIP, MPCA intends to enter into Administrative Consent Orders with each of the taconite facilities determined to be subject-to-BART, including the ArcelorMittal Minorca Mine. MPCA and ArcelorMittal are engaged in ongoing negotiations over the terms and conditions of the consent order, and ArcelorMittal comments that the SIP regulatory requirements should be in accord, and not conflict, with those terms and conditions agreed to by both ArcelorMittal and MPCA for purposes of the ArcelorMittal Administrative Consent Order.

The ArcelorMittal Minorca Mine

ArcelorMittal produces taconite pellets at its facility (the "Minorca Mine") near Virginia, Minnesota. In March 2006, the MPCA determined that ArcelorMittal's Facility includes units that are subject to BART. *See*, RESULTS of Best Available Retrofit Technology (BART) Modeling to Determine Sources Subject-to-BART in the State of Minnesota, March 2006, at http://proteus.pca.state.mn.us/publications/aq-sip2-07.pdf (The Minorca Mine was formerly known as the Ispat Inland Mining Co, and is referred to by that name in the modeling document).

ArcelorMittal has one pellet furnace, identified as Emission Unit EU026 in Air Emissions Permit No. 13700062-002, that MPCA determined is BART-eligible for SO_2 and NO_x and for which a BART analysis was performed. This furnace has 4 stack vents. The stack vents associated with the furnace are identified as SV014, SV015, SV016, and SV017.

I. IMPROVE modeling equation

ArcelorMittal supports using the new IMPROVE modeling equation. As stated in the rule package:

> "Baseline" visibility for determining visibility improvements was determined through the use of average Interagency Monitoring of Protected Visual Environments ("IMPROVE") date for the years 2000 through 2004.

Consistent with the approach taken for refined modeling by other Region Planning Organizations (e.g., VISTAS) as well as the state of Wisconsin, we encourage Minnesota to expressly adopt use of the annual average natural background coupled with the 98th percentile day. The new IMPROVE equation and other refinements in the modeling have eliminated the need for conservative (20% highest day) natural background data in the model.

II. SO_2 limitation inappropriate

MPCA has proposed a BART limit of 0.123 pounds SO_2 per long ton of pellets fired (finished) when the company is burning natural gas. MPCA proposes to incorporate this limit into the Minorca Mine's operating requirements through an air emission permit amendment in 2008. A specific numerical emission limit for SO_2 is inappropriate because SO_2 emissions are primarily a product of the sulfur content of the iron ore feedstock, which varies and cannot be controlled by ArcelorMittal.

The 1997 test results, upon which the 0.123 lb SO_2/ton limit is based, reflect the SO_2 emissions on a single day and therefore cannot take into account the variability in sulfur content of the taconite ore. The amount of sulfur in the raw ore may vary from one day to the next, which can cause great variability in the SO_2 emissions. ArcelorMittal cannot accurately predict sulfur content in the ore being processed, nor can the facility control the amount of sulfur in the ore. Without far more sampling data reflecting the true range of sulfur in the iron ore and the effect of iron ore sulfur content on operations at the facility, therefore, an emissions limit of 0.123 pounds SO_2 per long ton of pellets fired is little more than an arbitrary guess at what actual emissions may be and an equally arbitrary guess at ArcelorMittal's ability to comply. Subjecting ArcelorMittal to enforcement for failure to comply with this standard would be wholly arbitrary and unfair.

Rather than impose an arbitrary emissions level as BART, MPCA should instead require only that BART-appropriate pollution abatement equipment is properly installed and operated. This is particularly appropriate at the Minorca facility because it uses gaseous fuel that contains very little sulfur. Thus, the vast majority of the sulfur being converted to SO_2 comes from the raw ore that cannot be predicted or controlled. Alternatively, MPCA should delay establishing a numerical standard until sufficient data can be gathered to establish a non-arbitrary standard that considers the variability of sulfur in the ore. In the Draft SIP, MPCA states that it will require ArcelorMittal to monitor the concentration of sulfur being introduced into the pelletizing furnace. Implicit in this requirement, which MPCA states "will allow Mittal Steel and the MPCA to gauge the relationship between stack emissions...and the sulfur content of the raw materials," is an acknowledgment that there is not sufficient data at this time to draw any conclusions regarding SO_2 emissions based on the sulfur content of the ore. If this monitoring requirement is imposed on ArcelorMittal, the company should be given several years to gather monitoring data sufficient to set a more realistic numerical SO_2 emissions standard that ensures compliance even when sulfur content in the ore exceeds historic values.[1]

III. pH Monitoring

According to the SIP, MPCA intends to impose certain monitoring requirements on the Minorca Mine through permit conditions as part of the BART permit amendment process. MPCA states they intend to require ArcelorMittal to monitor the pH of the water leaving the scrubber either continuously or on a monitoring schedule to be determined. ArcelorMittal agrees that monitoring pH of water leaving the scrubber can provide information on the effectiveness of scrubber operation, however, continuous pH monitoring of water leaving the scrubber is not necessary.

As MPCA states, ArcelorMittal is already subject to the Taconite MACT, which requires monitoring of the pressure drop across the scrubber and the water flow rate to assure good particulate control. These monitoring requirements are sufficient to ensure the scrubber is operating properly. However, given MPCA's concern that monitoring of pH is required to ensure the scrubber is properly removing SO_2 emissions, ArcelorMittal requests it be given the opportunity to conduct a pH stability demonstration in lieu of ongoing monitoring. If ArcelorMittal can demonstrate stable pH conditions for water leaving the scrubber, the company should not be required to conduct ongoing pH monitoring, which is expensive, operationally burdensome and not required by the MACT standards already in place to ensure proper scrubber operation. If pH stability is demonstrated, requiring ongoing monitoring is an arbitrary requirement that does not generate any additional information with regard to proper scrubber operation.

[1] It should be noted that even if monitoring data is collected for several years and some understanding of the variability of sulfur content of the ore is gained, there still exists the possibility that sulfur content in the ore could vary significantly from one day to the next, creating a possibility for non-compliance out of ArcelorMittal's control.

IV. NOx

For the purposes of compliance with the Rule, NOx BACT and PSD emission limits should be considered equivalent to BART for NOx in Minnesota. Although very similar in process, BART reviews differ in several important respects from the BACT review process. First, because all BART reviews apply to existing sources, the available controls and the impacts of those controls may differ. Second, the Clean Air Act requires slightly different factors be taken into account in determining BART and BACT.

In a BACT analysis, the permitting authority must consider the "energy, environmental and economic impacts and other costs" associated with a control technology in making its determination. In a BART analysis, on the other hand, the state must take into account the "cost of compliance, the remaining useful life of the source, the energy and non-air quality environmental impacts of compliance, any existing pollution control technology in use at the source, and the degree of improvement in visibility from the use of such technology" in making its BART determination. Because of the differences in terminology, the BACT review process tends to encompass a broader range of factors. For example, the term "environmental impacts" in the BACT definition is broader than the term "non-air quality environmental impacts" used in the BART definition. Accordingly, there is no requirement in the BART engineering analysis to evaluate adverse air quality impacts of control alternatives such as the relative impacts on hazardous air pollutants. Finally, for the BART analysis, there is no minimum level of control required, while any BACT emission limitation must be at least as stringent as any New Source Performance Standard that applies to the source.

The BACT rule dates back to 1980 and applies to affected sources for which construction or modification began after 1977. BART, by comparison, applies to all facilities that began operations after 1962 and were in existence in 1977. BART is aimed at filling the regulatory gap left open to "grandfathered" facilities that began operation before the more strict BACT and NSPS controls were implemented, many of which have never since been modified. The BACT rules have, however, captured all those sources that were in existence in 1977 and have been modified since then, such as the Minorca Mine. Facilities such as the Minorca Mine, which have been modified since 1977, and thus subject to BACT, should not also be subject to BART, which is aimed at ensuring retrofitting of those facilities constructed or modified only *pre*-1977. For those facilities falling into the BART-BACT "overlap" (those facilities built after 1962; in existence in 1977; and modified since 1977), BACT should be deemed equivalent to BART.

In the early 1990s, a BACT analysis was conducted at the Minorca Mine, and the indurating furnace at the facility received an emissions limit of 1,088 pounds NOx per hour to represent the emission rate achieved by best available control technology applied to this facility. The BACT determination and related permitting activities are described in the Technical Support Document for Air Emissions Permit No. 13700062-001.

Since BACT controls are generally more restrictive than BART controls, and since the BART rule was intended to regulate those sources that were not subject to BACT and NSPS requirements, MPCA should include a BART-BACT equivalency determination in the SIP. ArcelorMittal proposes the following language:

> "For purposes of the Regional Haze Rule, NOx BACT shall be deemed equivalent to BART, and shall satisfy all BART requirements for any facility that would otherwise be required to comply with BART requirements under the Rule. Any affected facility that performs or has performed a BACT determination and installs or has installed BACT shall not be required to conduct any BART analysis or install new BART controls before construction or modification of any emissions source."

Conclusion

ArcelorMittal supports the efforts of MPCA to comply with the federal Regional Haze Rule through revision of the Minnesota SIP. ArcelorMittal appreciates the opportunity to work with MPCA in drafting the Administrative Consent Order and the opportunity to submit these comments. Finally, ArcelorMittal looks forward to working with MPCA to revise the SIP as necessary to reflect any changes that may be necessary or appropriate to harmonize the SIP and the Administrative Consent Order currently being negotiated. Thank you for your consideration.

Sincerely,

Michael E. Long
Manager Environmental Compliance
ArcelorMittal USA

cc: Jaime Baggenstoss, ArcelorMittal Minorca Facility
Douglas A. McWilliams, Squire, Sanders & Dempsey L.L.P.

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Mr. David Thornton
Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
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VIA ELECTRONIC AND U.S. MAIL

Re:Draft Regional Haze State Implementation Plan Comments

Dear Mr. Thornton:

These comments are submitted on behalf of the Minnesota Center for Environmental Advocacy ("MCEA"). The Friends of the Boundary Waters, the National Parks Conservation Association, and Voyageurs National Park Association join with MCEA in the submission of these comments and incorporate these comments as their own. As indicated, below, each of these organizations has a significant interest in protecting and improving visibility in the Boundary Waters Canoe Area Wilderness ("BWCAW") and Voyageurs National Park ("VNP"). We submit these comments as significant stakeholders in the outcome of the Minnesota Regional Haze State Implementation Plan.

The Minnesota Center for Environmental Advocacy is a Minnesota-based non-profit environmental organization whose mission is to use law, science, and research to preserve and protect Minnesota's natural resources, wildlife, and the health of its people. MCEA has state-wide membership. MCEA's members live, work, and recreate in the BWCAW, VNP and Isle Royale National Park. The Regional Haze State Implementation Plan (Haze SIP) involves environmental impacts in many of the areas of MCEA's work, including air quality, public health, and protection of natural resources.

The Friends of the Boundary Waters Wilderness ("Friends") is the only organization in the country focused squarely on protecting the Boundary Waters Canoe Area Wilderness. The Friends, a non-profit organization, exists

to protect, preserve, and restore the recreational and ecological treasures of the BWCAW, and to defend the BWCAW against pressures created by excessive logging, invasive species, overuse, development, and industrial pollution. The Friends represent nearly 4,500 individuals, family foundations, and organizations, many of whom live adjacent to or regularly visit the BWCAW. Friends' members, along with 258,000 visitors annually, travel to the BWCAW in part to enjoy and seek the health benefits of its clean air. That enjoyment and those health benefits are curtailed on days where high levels of pollutants cause low-visibility and render the air in and around the BWCAW less safe.

Voyageurs National Park Association ("VNPA") is a private, non-profit organization with the mission of protecting and promoting Minnesota's only National Park, Voyageurs National Park ("VNP"). Voyageurs National Park Association meets its mission through a focus on protecting the park by addressing policy issues, providing direct support to Park projects, and advocating to ensure long-term protection of the Park's resources.

The National Parks Conservation Association ("NPCA") is a national non-profit organization working to protect and enhance America's National Parks for present and future generations. NPCA plays a crucial role in ensuring that these magnificent lands and landmarks are protected. The work of NPCA includes advocating for the national parks and the National Park Service, and educating decision makers and the public about the importance of preserving the parks. NPCA represents more than 330,000 members dedicated to park preservation and ensuring that our parks are protected for present and future generations. The NPCA's regional Midwest office works to protect parks in the Midwest, including Voyageurs and Isle Royale National Parks.

I. INTRODUCTION

The Minnesota Pollution Control Agency ("MPCA") submitted a draft State Implementation Plan ("SIP") to the United States Environmental Protection Agency ("EPA") in compliance with the Regional Haze Rule of 1999 ("Regional Haze Rule"), 40 CFR §§51.300-308. Pursuant to the Regional Haze Rule, Minnesota is required to develop a SIP to reduce haze and meet the goal of natural visibility conditions by 2064 in Class I areas both within the state of Minnesota and in Class I areas outside the state of Minnesota which are affected by air pollutants emitted within Minnesota. Minnesota has two Class I areas: the Boundary Waters Canoe Area Wilderness ("BWCAW") and Voyageurs National Park ("VNP"). Within the state of Minnesota, several sources have been identified as making significant contributions to visibility impairments to Class I areas both inside and outside of Minnesota. Additionally, emissions from a number of states and Canada also contribute to visibility impairment in Minnesota's Class I areas.

Throughout the preparation of the Haze SIP, MPCA solicited the input of numerous stakeholders, including Federal Land Managers, local environmental and non-profit organizations, Tribes, industry, and the general public. We appreciate the efforts made by MPCA in involving the public in such a significant undertaking and responding to comments and questions throughout the process. In addition, we greatly appreciate the

extension of time granted for the submission of comments on the draft Haze SIP. While our comments are still somewhat limited in scope, the additional time granted was immensely helpful in allowing us to more completely review the draft Haze SIP and underlying documents than would have been possible with the original deadline of April 16, 2008.

Further, the assistance of MPCA staff in accessing information, making documents available for review, responding to questions, and being available to discuss concerns or clarify questions regarding the draft Haze SIP has also been helpful and is greatly appreciated.

We offer these comments in an effort to ensure that the Haze SIP not only complies with federal guidelines, but, more importantly, achieves meaningful and significant progress towards reducing visibility impairment in BWCAW, VNP, and Isle Royale National Park and protect these areas from harm as a result of human activity. We encourage MPCA to engage with us further throughout the revision of the draft Haze SIP and prior to the submission of the final Haze SIP. Even as we recognize the significant time and resources that were invested in the development of the Haze SIP, we are concerned that the implementation of the Haze SIP will not lead to meaningful improvement in visibility in BWCAW and VNP.[1] Several key factors severely limit the ability of the Haze SIP to improve visibility conditions in BWCAW and VNP, including:

- Problems in the underlying assumptions and technical analysis on which the Haze SIP is based;
- The failure of the Haze SIP to specify emissions reductions, establish reasonable and enforceable timelines for implementation and compliance with pollution control requirements, or otherwise adequately control emissions within Minnesota, particularly with regard to BART eligible sources;
- The refusal of neighboring states to commit to emissions reductions; and
- The failure of the Haze SIP to address future Canadian air emissions which contribute to the region's haze problem.

The following comments are organized as follows:

I. Introduction
II. General Comments
III. Key Areas Of Concern
IV. Visibility Measurements
V. Emissions Inventory
VI. Modeling
VII. Other Comments

[1] See Affidavit, General Comments, #2.

As discussed below, to ensure that Minnesota's Haze SIP leads to improvement in visibility conditions in BWCAW and VNP and adequately complies with the legal requirements of the Regional Haze Rule the issues identified must be resolved. These comments also incorporate the attached Affidavit of Dr. Ranajit Sahu, an expert retained to review and analyze the Draft Haze SIP and supporting documents. Please consider Dr. Sahu's affidavit and attached documents part of these comments and the record herein. Accordingly, we request that the concerns discussed below be addressed prior to the finalization of the Haze SIP.

II. GENERAL COMMENTS

1. Access to Documents and Legal Authority Cited in Draft SIP

While we recognize that the preparation of the Haze SIP required extensive time and effort to develop, the Haze SIP in its current form is extremely difficult to follow and understand. The confusing organization of the Haze SIP and technical language used,[2] combined with the lack of specific or accurate citations to many of the background technical documents and legal authority referenced as the basis for conclusions drawn throughout the Haze SIP, has made meaningful review of the Haze SIP extremely challenging and in some cases impossible. While we appreciate MPCA's efforts to make numerous background technical documents available to the public on the MPCA website and to include a number of these documents in the Appendices to the Haze SIP, the large volume of information provided and the failure to provide complete citation information when specific documents or sources are referenced make accessing this information extremely difficult. Additionally, legal authorities on which the Haze SIP relies are often incompletely or inaccurately cited, making verification of the legal authority for decisions made in the Haze SIP very difficult.[3]

We request that MPCA perform a comprehensive review of the Haze SIP and ensure that all legal authorities are clearly and accurately cited; that background documents are accurately cited, including page numbers, with specific instructions of where to find background documents not easily available to the public; and that references to documents or information contained in Appendices to the Haze SIP also include page numbers and specific references to assist the reader in accessing this information.[4]

2. Climate Change

The Regional Haze Rule requires states to develop a long-term strategy which includes "[T]he anticipated net effect on visibility due to projected changes in point, area, and

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[2] See Affidavit, General Comments, #4-5.
[3] An Example of this concern has been noted in the following comments. However, this examples is not intended to reflect all instances in which additional information or citations should be included.
[4] Consistent page numbering and citation of page numbers when referencing sources in the Appendices would help immeasurably in finding specific references to information in an Appendix.

mobile source emissions over the period addressed by the long-term strategy."[5] Accordingly, the Haze SIP must consider changes in baseline conditions from emissions which are anticipated to occur as a result of climate change during the time period covered by the Haze SIP. While the impact of climate change is anticipated to have a significant impact on conditions which will affect visibility conditions in BWCAW and VNP (e.g. the potential increase in the frequency and intensity of forest fires in northern Minnesota), the Haze SIP fails to acknowledge or analyze the impact climate change will have on visibility conditions in BWCAW and VNP.[6] It is imperative that MPCA include an analysis of the impact climate change will have on visibility conditions between now and 2064 and put this analysis into the Haze SIP. If MPCA does not believe that climate change will have a significant impact on visibility conditions in BWCAW and VNP, this should be discussed in the Haze SIP.

III. KEY AREAS OF CONCERN

1. BART

Effectively reducing emissions from BART-eligible sources is perhaps the single most significant step that MPCA can take to improve visibility conditions in BWCAW and VNP. The development of the Haze SIP and implementation of the Regional Haze Rule provide MPCA with an opportunity to move beyond the state's historical failure to regulate these sources and create a new system through which the significant pollution caused by BART-eligible sources can be significantly reduced. While the Haze SIP includes some efforts to regulate BART-eligible sources, and the taconite industry specifically, more must be done before the Haze SIP adequately complies with federal requirements or effectively reduces the visibility impact of emissions from these sources.

The Regional Haze Rule provides specific information regarding what must be included in a Haze SIP to reduce emissions from BART-eligible sources. Minnesota's Haze SIP fails to comply with federal requirements and EPA guidance for BART-eligible sources.[7] A number of specific deficiencies must be highlighted and addressed prior to the finalization of the Haze SIP, including:

1) Source-specific emissions limits and compliance schedules for each source subject to BART;[8]
2) Deadlines for the installation and operation of BART for each source subject to BART which ensures that BART is installed and operated as expeditiously as practicable, but no later than five years after the approval of the SIP. These deadlines must include information regarding the individual emission unit(s)

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[5] 40 C.F.R. §51.308(d)(3)(v)(G).
[6] See Affidavit, General Comments, #6-7.
[7] 40 C.F.R. §51.308(e).
[8] 40 C.F.R. §51.308(e); Additional Regional Haze Questions, EPA document dated August 24, 2005, (BART #1, 4.)

subject to BART regulation and the time by which the emission unit(s) must begin to comply with the BART limit;[9]

3) The names of source facilities, specific emission units and pollutants being controlled[10] and specific information regarding the controls, control efficiencies, and emissions reductions expected.[11]

The state clearly fails to meet these legal requirements, and recognizes as much, when it states, "[A]t this time, we cannot predict what emission reductions might result from BART in Minnesota."[12]

It must be noted that the difficulty in establishing BART emissions limits for BART-eligible sources in Minnesota is the result of a long history of inadequate emissions regulations of sources in Minnesota, most significantly the failure to effectively regulate the taconite industry in Northeast Minnesota for decades. In addition to being unable to establish BART for taconite, the Haze SIP also fails to identify emissions reductions achieved through BART for Electric Generating Units ("EGUs") in Minnesota. MPCA claims it "did not perform a BART determination for subject-to-BART EGUs to evaluate NOx and SO2 because of the State's inclusion in the CAIR region."[13] However, the potential removal of Minnesota from the CAIR region requires MPCA to establish BART for EGUs and a specific timeline for installation of BART in the event Minnesota is removed from the CAIR region.

The following discussion highlights a number of concerns with BART-eligible sources and BART emission limits which must be addressed prior to the finalization of the Haze SIP.

a. BART-eligible sources contributing less than 0.5 deciviews of visibility impairment

The Regional Haze Rule requires MPCA to identify all BART-eligible sources in the state. The Guidelines for BART Determinations Under the Regional Haze Rule, ("BART Guidelines") provide specific guidance to states in identifying sources subject to BART.[14] Once all BART-eligible sources are identified, the BART Guidelines then require MPCA to determine which BART-eligible sources should be required to install BART.[15] The BART Guidelines give Minnesota two options in determining which BART-eligible sources should be required to install BART. Option 1 requires MPCA to make BART determinations for all BART-eligible sources while Option 2 allows MPCA to consider

[9] 40 CFR §51.308(e)(1)(iv); Additional Regional Haze Questions, EPA document dated August 24, 2005, (BART #4).
[10] 40 CFR §51.308(e)(1)(i-ii).
[11] Additional Regional Haze Questions, EPA document dated August 24, 2006, (BART #4.)
[12] Haze SIP, Ch. 10, p. 81.
[13] Haze SIP, Ch. 9, p. 58
[14] 40 CFR, Part 51, Appendix Y – Section III.
[15] Id.

exempting some sources from BART because they do not cause or contribute to visibility impairment in a Class I area.[16] The Haze SIP indicates that MPCA chose Option 2.[17]

If a state chooses "Option 2", it must then determine which BART-eligible sources cause or contribute to visibility impairment in Class I areas. Before determining which sources cause or contribute to visibility impairment, a threshold for determining which sources cause or contribute to visibility impairment in Class I areas must be established. Once this threshold is established, BART-eligible sources found to cause visibility impairment within the parameters of the threshold are required to install BART, while BART-eligible sources which do not cause visibility impairment within the threshold are exempt from installing BART.

The BART Guidelines specify that a single source that is responsible for a 1.0 deciview change or more should be considered to "cause" visibility impairment, however, a source that causes less than a 1.0 deciview change may still contribute to visibility impairment and thus be subject to BART.[18] The BART Guidelines indicate that when states set a threshold for contribution towards visibility impairment, the state should "consider the number of emissions sources affecting the Class I areas at issue and the magnitude of the individual sources' impacts" noting that "a larger number of sources causing impacts in a Class I area may warrant a lower contribution threshold. States remain free to use a threshold lower than 0.5 deciviews if they conclude that the location of a large number of BART-eligible sources within the State and in proximity to a Class I area justify this approach."[19] However, states are specifically directed not to use a threshold higher than 0.5 deciviews when determining which sources contribute to visibility impairment.[20] Additionally, EPA requires states to provide a basis for the selection of their threshold.[21]

The Haze SIP indicates that MPCA chose 0.5 deciview as the visibility threshold for determining which BART-eligible sources would be required to install BART. The Haze SIP notes that MPCA chose not to set a threshold lower than 0.5 deciviews even though it had the legal authority to do so.[22] MPCA explained its decision not to use a threshold lower than 0.5 deciviews, indicating that even though a number of existing BART-eligible sources were identified "in close proximity to Class I areas, the modeling showed no sources causing impacts at levels just slightly below 0.5 deciview, therefore MPCA

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[16] Id.
[17] Haze SIP, Ch.9, p. 57. The Haze SIP indicates that MPCA chose "option b" from the BART Guidelines. Please note that the BART Guidelines refer to "option 1" and "option 2", not "option a" and "option b". The inaccurate terminology used in the Haze SIP combined with the lack of specific citation to the Guidelines makes it extremely difficult to determine the legal authority for MPCA's decision to choose "option b". The Haze SIP must be corrected to include specific language used in the regulations with precise citations to enable the reader to determine the legal basis on which MPCA made its determination to choose "option b".
[18] 40 CFR Part 51, Appendix Y – Section III.
[19] Id.
[20] Id.
[21] "Additional Regional Haze Questions", EPA document, dated August 24, 2006 (BART #3).
[22] Haze SIP, Ch. 9 p. 57.

did not consider readjusting the contribution threshold."[23] Accordingly, after identifying all BART-eligible sources in Minnesota, MPCA determined that a number of these sources would not be required to install BART based on a finding that they contributed less than 0.5 deciviews of visibility impairment in BWCAW and VNP.[24]

We do not support MPCA's decision to choose "Option 2" and set an arbitrary visibility threshold of 0.5 deciviews for BART-eligible sources. The significant problems associated with the modeling used to determine the impact of specific sources on visibility impairment, the recent indication that even a 0.1 deciview impact could have a significant affect on visibility in BWCAW and VNP,[25] and the presence of a number of existing BART-eligible sources in close proximity to Class I areas indicates that MPCA's decision to choose "Option 2" and set a threshold of 0.5 deciviews is unsupported and is in error.[26] Accordingly, MPCA should revisit its decision to choose "Option 2" and exempt BART-eligible sources found to contribute less than 0.5 deciviews of visibility impairment in BWCAW and VNP in accordance with "Option 2".

b. Taconite Industry

The Haze SIP indicates that the lack of adequate emissions information regarding taconite facilities has resulted in an inability to identify BART for NOx and SO2 for the majority of the taconite facilities.[27] In an effort to better establish emissions baseline data to use as a basis for determining BART for taconite facilities, MPCA is seeking an extension of time to establish BART emissions limits for taconite facilities.

We agree that, while unfortunate, the lack of adequate emissions information from the taconite industry may have made the establishment of BART emissions limits for some taconite facilities infeasible at this time. However, we are concerned that even as the Haze SIP indicates that additional time and information is needed to establish BART emissions limits for taconite facilities, the Haze SIP fails to address why some concrete suggestions made to the state regarding potential BART controls for SO2 and NOx have not been implemented.[28] Accordingly, we do not support an extension of time to establish BART emissions limits for NOx and SO2 for taconite facilities unless MPCA provides conclusive analysis that those suggestions which have been made are infeasible, and impractical, or do not effectively limit emissions from the identified taconite facilities for which those emissions strategies apply. If the specified emissions limits do not apply to a specific taconite facility or emissions source, then we support an appropriate extension of time to obtain additional emissions information from taconite

[23] Id. Id.
[24] Id.
[25] "Changes Made to Regional Haze SIP Since Public Review Draft", p. 3.
[26] Affidavit, Visibility Measurements, #9.
[27] Haze SIP, p.62.
[28] Letter (and attachments) from James W. Sanders, USDA, to Mr. David Thornton, MPCA, dated March 5, 2008; Letter (and attachments) from James W. Sanders, USDA, to Ms. Mary Jean Fenske, MPCA, dated April 10, 2007.

facilities which can be used to establish BART emissions limits provided that the Haze SIP includes clear and enforceable deadlines for establishing BART emissions limits and requiring the installation of the identified BART on specific taconite facilities.

To clarify, we do not support an extension of time to establish BART emissions limits for SO2 for the United Taconite facility because concrete and feasible suggestions have been made to the state regarding BART emissions limits for SO2 emissions for the United Taconite facility.[29] If MPCA is unwilling to require United Taconite to install the specified BART emissions limits for SO2, we request that the Haze SIP specifically discuss this decision and MPCA's justification for this decision. In addition, to the extent that suggestions made by the USDA regarding BART controls for NOx apply to any specific taconite facility or emissions source, the Haze SIP must address these suggestions specifically and indicate to which specific taconite facilities these emissions controls could apply and why MPCA does not consider these BART emissions limits for NOx to constitute BART for the taconite facilities to which this technology applies.[30]

Within the parameters discussed above, we support the extension of time to determine BART for specific pollutants while taconite facilities install "continuous emission control technology" as required by the Regional Haze Rule.[31] However, in allowing for additional time to obtain the requisite information to establish BART, it is imperative that enforceable deadlines and requirements be established and included in the Haze SIP. Specifically, enforceable deadlines must be included in the Haze SIP for the installation of continuous emission control technology; for the collection and reporting of data obtained through this emission control technology to MPCA; for the establishment of BART emissions limits for each pollutant, emissions source, and specific taconite facility; and for the inclusion of these BART emissions limits in each taconite facility's Title V permit. Additionally, the Haze SIP must include requirements indicating which pollutants are to be monitored through the continuous emission control technology.

In the materials submitted as part of the public hearing and conference call held in April and May 2008, MPCA provided a draft chart which included some additional specificity regarding dates and timelines for BART.[32] While this draft table is a good start in providing more specificity and deadlines for the installation of BART for taconite facilities, the table needs to go further and include greater specificity and more explicit deadlines.[33] As discussed during the conference call regarding these materials on May 7, 2008, this table in its current form provides misleading and incomplete information regarding which facilities will be required to meet the indicated deadlines and which pollutants are covered by which deadlines. We request that MPCA add additional information in this table to ensure that specific information and deadlines are included for individual taconite facilities and emissions sources, and specific pollutants.

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[29] Affidavit, BART, #5.
[30] Id.
[31] 40 C.F.R. 51.308(e)(1)(ii)(A).
[32] "Changes Made to Regional Haze SIP Since Public Review Draft", p. 2.
[33] Affidavit, BART, #5.

The Regional Haze Rule requires the Haze SIP to include "[A] requirement that each source subject to BART be required to install and operate BART as expeditiously as practicable, but in no event later than 5 years after approval of the implementation plan revision."[34] Even as MPCA is seeking to delay the determination of BART emissions limits for taconite facilities, the Haze SIP must include deadlines for the installation of BART by taconite facilities early enough to allow MPCA to analyze the emissions reductions achieved through BART and the impact of these reductions on visibility in BWCAW and VNP so that this information can be included as part of the 2012 SIP 5-year assessment.

While MCEA commends the MPCA on its efforts to engage the taconite industry in emissions reductions initiatives, it is imperative that there be transparency in this process with the opportunity for public involvement in agreements which affect the long-term visibility conditions in the BWCAW and VNP. We note specifically that MPCA has entered into a number of Administrative Orders with individual taconite facilities.[35] These Administrative Orders reflect agreement between MPCA and the taconite facilities regarding steps that the facilities will take to install continuous emission control technology in an effort to obtain emissions information needed to establish BART emissions limits. The Haze SIP should include information regarding public participation in this process. Further, recognizing the failure of MPCA to adequately regulate the taconite industry for several decades, it is essential that any agreements entered into between MPCA and taconite facilities be reviewed and approved by EPA with the opportunity for an independent review of emissions data obtained from taconite facilities to ensure that these Administrative Orders and the installed continuous emission control technology lead to significant emissions reductions from taconite facilities.

c. Electric Generating Units (EGU's)

The Regional Haze Rule allows states to meet BART requirements for Electric Generating Units ("EGUs") through participation in the Clean Air Interstate Rule ("CAIR").[36] While the Regional Haze Rule allows states to find that emissions reductions achieved under CAIR equal BART for EGUs, EPA specifically notes that in order for states to meet the uniform rate of progress and ultimate visibility goals for 2064 required under the Regional Haze Rule, additional emissions reductions for EGUs may be required. Guidelines from EPA state that a ". . . determination that the CAIR makes greater reasonable progress than BART for EGUs is not a determination that the CAIR satisfies all reasonable progress requirements in CAIR affected States."[37] EPA goes further, stating that "a State's reasonable progress analyses may indicate that additional

[34] 40 CFR §51.308(e)(i)(iv).
[35] Haze SIP, Appendix 9.6; Administrative Orders provided with materials for public hearings.
[36] 40 C.F.R. 51.308 (e)(4).
[37] "Additional Regional Haze Questions", dated August 24, 2006, Miscellaneous, #4.

control beyond CAIR may be necessary to meet the RPGs set for one or more [of] the Class I areas."[38]

MPCA must require additional controls beyond CAIR for EGUs because implementing CAIR alone will not allow the state to meet the visibility goal of natural visibility conditions by 2064. First, we believe that MPCA's reliance on CAIR to regulate emissions from EGUs is misplaced. By MPCA's own predictions, visibility conditions in BWCAW and VNP are not anticipated to reach natural visibility conditions until well past 2064. Specifically, recent information provided by MPCA shows that VNP will not reach natural visibility conditions until 2177 while BWCAW will not reach natural visibility conditions until 2093.[39] Clearly, the emissions reductions anticipated to be achieved under CAIR will not meet the RPGs required to achieve natural visibility conditions by 2064. Accordingly, additional controls for EGUs beyond CAIR are necessary.

Requiring additional controls for EGUs beyond CAIR is not unprecedented. EGUs in other parts of the United States routinely achieve emissions levels for NOx and SO2 below the levels proposed by the Haze SIP.[40] Accordingly, requiring EGUs to install additional emissions controls beyond that required by CAIR is not only within the realm of possibility, but appears to be regularly achieved for a number of coal-fired units in the United States.[41] The Haze SIP should include a justification for limiting EGU emissions reductions to those established by CAIR and provide an explanation of why the emissions reduction strategies for EGUs in the Haze SIP are higher than emissions levels achieved in other similar EGU facilities in the United States.

2. New Sources

Currently, MPCA is required to assess the emissions impact on air quality from new major sources through federally mandated New Source Review and Prevention of Significant Deterioration ("PSD"), for which Minnesota operates a delegated PSD program.[42] However, if the state is currently not attaining the visibility goal of natural visibility conditions in BWCAW and VNP required through the Regional Haze Rule, any incremental increase in emissions reducing visibility from a new major source is too much. Basically, for haze purposes, MPCA should evaluate potential impacts from new major sources through a non-attainment standard and not an incremental analysis as done through the PSD process. The PSD incremental analysis does not apply when air quality standards and visibility conditions required under the Regional Haze Rule are not being met. The Haze SIP does not explain how its review of major new sources through a PSD analysis meets the requirements of the Regional Haze Rule. This must be addressed in the Haze SIP.

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[38] "Additional Regional Haze Questions", dated August 24, 2006, Miscellaneous, #6.
[39] "Changes Made to Regional Haze SIP Since Public Review Misc. #6 Draft", p. 3.
[40] Affidavit, BART, #4.
[41] Id.

Additionally, as the Haze SIP fails to identify emissions reductions which will be achieved with any specificity, we have serious concerns about approving any new major sources before specific emissions reductions which will be achieved through BART are identified.

The Haze SIP proposes to regulate new major sources in the state differently, depending on where they are located. For those new sources anticipated to be built in the six counties closest to the BWCAW and VNP, MPCA is proposing one approach, while it proposes a separate approach for those new sources outside of NE Minnesota.

During the development of the Haze SIP, the Federal Land Managers ("FLMs") and MPCA developed a proposed plan ("NE Minnesota Plan") to change the way in which FLMs review new major emissions sources in six key counties in Northeastern Minnesota. The six counties were identified due to their close proximity to BWCAW and VNP.[43] The NE Minnesota Plan includes a different approach through which the visibility impacts of new emissions sources in the six counties closest to BWCAW and VNP would be monitored and regulated. Specifically, the NE County Plan proposes that the FLMs and MPCA enter into a Memorandum of Understanding which includes an agreement that the FLMs will forego individual source modeling for new sources in the identified six county area as long as the new sources remain below an established emissions cap. This approach was suggested as a compromise between MPCA and the FLMs in an effort to reduce costs while ensuring that emissions reductions needed to improve visibility in BWCAW and VNP would be achieved.

However, the Haze SIP and NE Minnesota Plan do not explain how removing FLM involvement in individual source modeling for new sources in NE Minnesota will lead to savings when MPCA is still required to meet the federal requirements for New Source Review and the Potential for Significant Deterioration. Additionally, the Haze SIP and NE Minnesota Plan do not explain what is lost (other than the hypothetical expense of individual source modeling) by eliminating FLM involvement in individual source modeling of new sources in NE Minnesota.

The Haze SIP must include further explanation and a more detailed analysis of how the proposed Memorandum of Understanding and elimination of the need to conduct individual source modeling of haze impacts will save money. In addition, the Haze SIP must include a discussion of what is lost through this trade-off. Further, prior to the finalization of a Memorandum of Understanding between the FLMs and MPCA, there must be an opportunity for public comment and participation as this Memorandum of Understanding appears to eliminate federally mandated oversight from the FLMs in the permitting of new major sources in NE Minnesota.

[43] Haze SIP, Appendix 10.4.

IV. VISIBILITY MEASUREMENTS

1. Inconsistency in Measurement of Visibility Changes

The Regional Haze Rule requires states to establish reasonable progress goals (RPGs), expressed in deciviews, that "provide for reasonable progress towards achieving natural visibility conditions".[44] Visibility impairment in Class I areas is thus determined through a measurement of changes in deciviews on the best days and worst days.[45]

While the Haze SIP measures visibility impairment at BWCAW and VNP through the deciview measurement, it fails to explain how MPCA determines when variances in deciview estimates or measurements are statistically significant or otherwise meaningful with inconsistencies apparent in the Haze SIP itself.[46] For example, reductions achieved by including the entirety of the North East Minnesota Plan led to improvements in visibility conditions of 0.1 deciviews for the worst 20% days. In this instance, MPCA indicates that an improvement of 0.1 deciviews in visibility is significant.[47] In other sections of the Haze SIP, larger changes in visibility between 0.2 and 0.8 deciviews are considered insignificant.[48] It appears that MPCA finds that smaller amounts of changes in deciviews are significant when a smaller threshold supports MPCA's position yet finds larger amounts of changes in deciviews to be insignificant when it does not support MPCA's position or desired result.

The different weight given to the measurement of visibility changes in the Haze SIP is confusing and misleading. The Haze SIP should explain why the same deciview change might be considered more or less significant depending on the situation and provide a clear analysis and justification for any visibility changes greater than 0.1 deciviews that are determined not to be significant.

2. IMPROVE Monitors

Visibility measurements at BWCAW and VNP are made through two IMPROVE monitors, one in BWCAW and one in VNP. The IMPROVE monitors are maintained through federal funding. However, fundamental flaws caused by the unreliability of monitoring data from these sites, missing data, and the mechanisms used to make corrections and adjustments to the field data raise serious questions about the reliability of the fundamental assumptions in the Haze SIP based on data from IMPROVE monitors. For example, the Haze SIP fails to adequately address the following issues with the IMPROVE monitors and visibility measurements in BWCAW and VNP:

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[44] 40 CFR § 51.308(d)(1).
[45] Id.
[46] Affidavit, General Comments, #8.
[47] "Changes Made to Regional Haze SIP Since Public Review Draft", p. 3.
[48] Affidavit, General Comments, #8.

a. The ability of only two IMPROVE monitors to reliably and accurately predict the overall visibility conditions and significant impacts to scenic vistas in two extremely large Class I areas, and thus the reliability of the data from these monitors to develop the assumptions that form the basis of the Haze SIP;[49]
b. Uncertainty regarding how representative the data from the 2000-2004 baseline period in relation to individual years or larger patterns in visibility conditions, especially considering that neither the calculations used to determine natural conditions at each Class I area nor underlying calculations for baseline values were included in the Haze SIP.[50]
c. Whether the effort to obtain baseline values by making corrections and adjustments to IMPROVE field data meets the EPA's requirements for filling missing data.[51]

Additionally, in discussions with MPCA and the Federal Land Managers, some uncertainty was voiced regarding the continued funding for both of these IMPROVE monitors due to the close proximity of BWCAW and VNP and perception that two IMPROVE monitors may be unnecessary. In the Haze SIP, MPCA indicates that the continued functioning of both of the IMPROVE monitors is dependent on federal funding.[52] We strongly support the continued funding for both IMPROVE monitors in BWCAW and VNP and encourage MPCA to make continued funding of these monitors a high priority, even in the absence of federal funding. It is essential that both monitors are maintained and function reliably to ensure that the most complete information regarding visibility conditions in the BWCAW and VNP is available and maintained to enable accurate assessment of visibility conditions and progress made towards reaching natural visibility conditions.

V. EMISSIONS INVENTORY

1. Reliability of Emissions Inventories and Projections

The emissions inventories used in the Haze SIP and discussions about these inventories are very difficult to understand.[53] In particular, the significant differences in emissions recorded for the same year and the same pollutant, between the emissions inventories of the various agencies involved, compounds the confusion.[54] The extreme variance between these emissions inventories leads the reader to question what possible significance or reliability these inventories could provide in identifying or regulating emissions that impair visibility in BWCAW and VNP. However, the Haze SIP relies on

[49] Affidavit, Visibility Measurements, #1.
[50] Affidavit, Visibility Measurements, #2-4.
[51] Affidavit, Visibility Measurements, #6-8.
[52] Haze SIP, Ch. 6, p.28.
[53] Affidavit, Emissions Inventory #1-6
[54] Please see tables provided in attached Affidavit, Emissions Inventory, #2 for specific examples of these problems.

these emissions inventories to identify emissions sources and develop strategies and control measures to reduce these emissions.

Further, the failure of the Haze SIP to address the inconsistencies and apparent contradictions in the emissions inventories makes it impossible to determine the significance of emissions reductions proposed in the Haze SIP or the potential impact of these reductions on visibility impairment in Class I areas. The huge disparities found between different emissions inventories in the inventories of individual pollutants raises significant questions regarding the credibility of the inventories used and if these inventories have any legitimate use in predicting future emissions.

Specifically, the Haze SIP should provide context for the use of these emissions inventories, including a background discussion and overview of how emissions inventories are developed and used; a general explanation of why different emissions inventories might include significantly different emissions for the same pollutant; a discussion of the overall reliability of emissions inventories in accurately identifying past and projecting future emissions; a clear explanation of why specific inventories were used in the Haze SIP; and an explanation of how MPCA reconciled differences in emissions reflected in different inventories in reaching conclusions.

2. International Emissions

Recognizing that both the BWCAW and VNP border Canada, Canadian air and emissions inevitably have a significant impact on visibility conditions in Minnesota's Class I areas. The Haze SIP does not include proper documentation of Canadian emissions or an explanation of why proper documentation was not available. While currently Canadian air has a largely positive impact on air quality in BWCAW and VNP, the Haze SIP fails to account for projections of future Canadian emissions in an informed manner. Currently, the Haze SIP simply uses Canadian emissions from 2005 as a basis for projected emissions in 2018. However, the Haze SIP does not support this choice with any analysis of potential growth in emissions sources from Canada over the next decade or how any of this growth will be offset by Canadian regulatory programs. For example, increased emissions from the development of Canadian tar sands in Alberta are not addressed. Further, the Haze SIP fails to acknowledge the impact global climate change will have on Canadian emissions. The failure of the Haze SIP to include an adequate analysis of these considerations leaves the conclusions drawn regarding Canadian emissions meaningless.[55]

3. Ammonia Emissions

Minnesota identifies ammonia as a pollutant which contributes to regional haze and visibility impairment in BWCAW and VNP.[56] While ammonia is a significant

[55] Affidavit, Emissions Inventory, #7.
[56] Haze SIP, Ch.7, p.29

contributor to visibility impairment in the BWCAW and VNP, developing accurate emissions inventories of ammonia from specific sources is extremely difficult due to technical limitations in the ability to track or control ammonia from specific sources.

While the Haze SIP recognizes the problems associated with the ammonia inventory, the state assigns responsibility for improving the modeling of ammonia emissions to federal and regional entities, without identifying ways in which the state can assist in improving our understanding of ammonia emissions.[57] The Haze SIP should explore ways in which the state can assist national and federal entities in understanding ammonia emissions from point and area sources in the state, in identifying ammonia controls for these sources, and in collecting additional ammonia data for the state. The Haze SIP is a long-term plan which should include not only strategies for improving visibility from pollutants which are more fully understood, but should also include strategies for increasing our ability to understand and control pollutants, such as ammonia, which contribute to visibility impairment, but which current control measures and technology lack the capacity to control. If MPCA is not willing or able to conduct this type of assessment of ammonia emissions within the state, the Haze SIP should indicate this and explain why the state will not take these measures.[58]

VI. MODELING

1. Reliability of Models

The Haze SIP indicates that analyses from different models were used to determine the future progress towards improving visibility conditions in BWCAW and VNP contained in the long-term strategy included in the Haze SIP. While it is important to have a system for assessing progress in reaching the goal of natural visibility conditions by 2064, the inconsistencies between models used to determine progress toward visibility goals at BWCAW and VNP raise serious concerns about the reliability of these models as a basis for planning.[59]

The extremely technical language used in the Haze SIP when discussing the air quality models used combined with the failure of the Haze SIP to address the inconsistencies and apparent contradictions in the modeling analyses or explain relevant modeling choices creates significant difficulties for the public to understand the relevance of the projections made through the air quality models. [60]

General background information regarding the use of air quality models similar to that suggested earlier for emissions inventories would provide additional clarity and context for the public to understand how the air quality models are used and the precision, or lack thereof, of predictions made through these air quality models.

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[57] Haze SIP, Ch. 10, p.95.
[58] Affidavit, Emissions Inventory, #8.
[59] Affidavit, Modeling, #1-2.
[60] Affidavit, Modeling, #4.

2. Meteorological Data Used as Basis for Future Predictions

The Haze SIP used a meteorological data set from a single year as a basis for developing future emissions predictions for 2018.[61] Modeling for a long term plan relying on a meteorological data set from a single year is indefensible and renders the long term plan inherently flawed.[62] The long range plan which is developed for the Haze SIP must correct this issue and include an adequate representation of meteorological data sets from multiple years to ensure greater reliability of future projections.

3. Boundary Conditions

The Haze SIP indicates that "boundary conditions" are responsible for a significant contribution to visibility impairment in BWCAW and VNP.[63] It is unclear to what extent visibility impairment attributed to boundary conditions should actually be attributed to specific states. This issue should be addressed in the Haze SIP, as proper allocation of visibility impairment from boundary conditions could lead to a determination that some states which were found not to make significant contributions to visibility impairment in BWCAW and VNP may, in fact, contribute more than 5% to visibility impairment and thus be over the 5% threshold used to determine which states make a significant contribution to visibility impairment in BWCAW and VNP.[64]

VII. Other Comments

1. Collaboration with Other States

The Regional Haze Rule requires states to "consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area. In any situation in which the State cannot agree with another such State or group of States that a goal amounts to reasonable progress, the State must describe in its submittal the actions taken to resolve the disagreement."[65]

The Haze SIP includes numerous references to MPCA's efforts to work with regional planning organizations and other states to achieve consensus regarding baseline conditions, modeling of visibility impairment, and the impact of other states' emissions on visibility conditions in BWCAW and VNP. While we commend MPCA in its efforts to work with the regional planning organizations and consult with states contributing to visibility impairment in Minnesota, these efforts appear to have resulted in no progress in spite of the multiple meetings and extensive collaboration undertaken over a period in excess of two years.

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[61] Affidavit, Modeling, #2.
[62] Affidavit, Modeling, #3.
[63] Haze SIP, Ch.8, pps.47-49.
[64] See Affidavit, Modeling #6.
[65] 40 CFR 51.308(d)(1)(iv).

While some neighboring states refuse to acknowledge the impact their emissions have on BWCAW and VNP, other states contributing to visibility impairment in Minnesota's Class I areas are simply refusing to commit to emissions reductions.[66] Recognizing that a large percentage of visibility impairment originates outside of Minnesota, the failure of MPCA to reach agreement with other states regarding responsibility for visibility impairment in BWCAW and VNP or convince states to reduce their emissions leaves a huge amount of visibility impairment in BWCAW and VNP unaddressed.

EPA indicated that if a contributing state refused to do what was reasonable to meet the RPG for an area, the state with an affected Class I area should notify EPA as early in the process as possible. EPA further notes that even if a State is meeting its uniform rate of progress, states which contribute to visibility impairment in the Class I area of the state are still responsible for developing coordinated emission management strategies.[67] The Haze SIP does not indicate how or if EPA was involved in resolving problems with other states refusing to accept responsibility for causing visibility impairment or failing to commit to emissions reductions needed to improve visibility in BWCAW or VNP. The Haze SIP should indicate how and when EPA was brought into the process, and any results achieved. Further, the Haze SIP needs to more clearly articulate the problems and issues experienced when working with other states which prevented reaching consensus and explore available options available to resolve problems experienced with other states. Simply indicating that 75% of emissions leading to reduced visibility in the BWCAW and VNP are outside of Minnesota, and thus outside the control of MPCA is not acceptable.[68] If MPCA believes that federal intervention is required to resolve ambient air quality issues leading to visibility impairment in BWCAW and VNP, then this should be clearly articulated, with an indication of what measures MPCA will take to ensure that the needed federal involvement is obtained.

Further, to the extent that MPCA believes that the Haze SIPS of other states do not make reasonable progress towards the Haze Goals, put an unfair burden on Minnesota emissions sources, or otherwise fail to protect the visibility in Minnesota's Class I areas, the MPCA should include a direct appeal to the EPA in its Haze SIP to reopen the Haze SIPS of surrounding states to address these concerns.

2. States contributing less than 5% towards visibility impairment in BWCAW and VNP.

Even as the Haze SIP recognizes that 75% of emissions responsible for visibility impairment within Minnesota originate outside of Minnesota, it fails to address 22% of emissions affecting BWCAW and 23% of emissions affecting VNP by not considering

[66] Affidavit, General Comments, #2.
[67] "Additional Regional Haze Questions", EPA document, dated August 24, 2006 (Cooperation with RPOs, 6).
[68] Haze SIP, p. 82.

states which contribute less than 5% to visibility impairment in Minnesota's Class I areas.[69]

Even as MPCA has determined that a significant contribution to visibility impairment from another state equals a contribution over five percent, the federal goal of natural visibility conditions by 2064 will never be met if strategies are not developed to address the cumulative amount of visibility impairment caused by states contributing less than 5% of visibility impairment. The Haze SIP should acknowledge this issue and identify strategies or initiatives which will be explored to address this significant source of visibility impairment in BWCAW and VNP. Using a bright line of a 5% threshold to exclude states from responsibility for their contribution to visibility impairment in BWCAW and VNP fails to ensure that the goals of the Regional Haze Rule are met.[70]

The Haze SIP should identify states contributing less than 5% towards the visibility impairment in Minnesota's Class I areas and incorporate reductions in emissions from these states into Minnesota's long-term strategy. Likewise, Minnesota should not shirk its responsibility to reduce its emissions which contribute to visibility impairment in the Seney Class I area just because MPCA has determined that Minnesota's contributions fall just below the 5% threshold. Minnesota expects other states to do their fair share to reduce emissions that contribute to regional haze in Minnesota's Class I areas. Minnesota must accept and share this same responsibility.

3. New Minor Sources

Visibility reduction as a result of haze is a multi-faceted problem that may require the development of strategies and emissions controls beyond the more traditional focus of federal air quality regulations focused on limiting emissions from new major point sources. While reducing the visibility impact from new major point sources on BWCAW and VNP is essential, the Haze SIP should also indicate how new minor sources will impact visibility in Class I areas and discuss how emissions from new minor sources will be regulated.

4. Mobile Sources

The Haze SIP fails to analyze the impact on visibility of mobile sources from users and visitors of BWCAW and VNP. The large number of visitors to BWCAW and VNP and large amounts of recreation in the area generally, combined with the reliance on motorized vehicles, including off-road vehicles, motorboats and snowmobiles, for transportation and recreation lead to significant mobile source emissions in close proximity to and within BWCAW and VNP. The Haze SIP should analyze the visibility

[69] Affidavit, Other Comments, #1.
[70] Affidavit, Other Comments, #1.

impact from these mobile sources and discuss mitigation measures such as time, location and total number of controls, which can be taken to minimize the impact from these mobile sources. If MPCA believes that these mobile sources are insignificant, the Haze SIP should explain the analysis behind this conclusion.[71]

5. Smoke Management

The role of fire emissions on visibility conditions at BWCAW and VNP should be analyzed more completely in the Haze SIP. Results from a report referenced in the Haze SIP indicate that the total number of acres burned in Minnesota from both wildfire and prescribed fire were usually more than twice that found in the next highest state.[72] The impact of these emissions on visibility is significant and the Haze SIP should discuss why Minnesota has such a large amount of acres burned compared to other states. While Minnesota has a Smoke Management Plan ("SMP") to manage the impact of smoke on the state, it is not clear how the objectives of the SMP affect regional haze goals. Please include additional information regarding how MPCA proposes to regulate visibility reductions in the BWCAW and VNP which result from prescribed fires.

6. Construction Activities

The Regional Haze Rule requires states to address emissions impacts as a result of construction activities.[73] The Haze SIP fails to explicitly address the impact of emissions from construction activities. This information should be included in the Haze SIP.[74]

7. Evaluating Progress against the Glide Path

The Haze SIP should include a comparison of modeled deciview values against actual (converted) measurements at the IMPROVE monitors taken in 2007 as this information should now be available.[75]

Thank you for the opportunity to comment on the draft Regional Haze State Implementation Plan. Please ensure that these comments, including all attachments and cited materials are included in the record for any decision the PCA makes with regard to the Haze SIP.

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[71] Affidavit, Other Comments, #3.
[72] Haze SIP, p. 86
[73] 40 C.F.R. §51.308(d)(3)(v)(B).
[74] Affidavit, Other Comments, #5.
[75] Affidavit, Other Comments, #6.

Please feel free to contact us with any questions or concerns you would like to discuss.

Sincerely,

Mary Winston Marrow
Staff Attorney
Minnesota Center for Environmental Advocacy

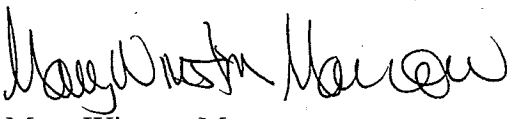
Brian S. Pasko, Policy Director
Friends of the Boundary Waters Wilderness

Cory MacNulty
Executive Director
Voyageurs National Park Association

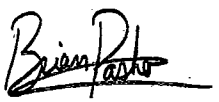
Lynn McClure
National Park Conservation Association

Please feel free to contact us with any questions or concerns you would like to discuss.

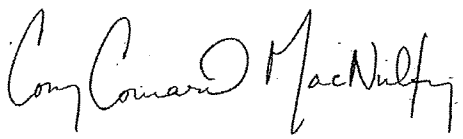
Sincerely,



Mary Winston Marrow
Staff Attorney
Minnesota Center for Environmental Advocacy



Brian S. Pasko, Policy Director
Friends of the Boundary Waters Wilderness



Cory MacNulty
Executive Director
Voyageurs National Park Association

Lynn McClure
National Park Conservation Association

cc: Ms. Cheryl Newton, Acting Director, U.S. EPA Region 5 (via. U.S. Mail only)

MINNESOTA POLLUTION CONTROL AGENCY

In the Matter of the
Minnesota Draft Haze State Implementation Plan

AFFIDAVIT OF DR. RANAJIT SAHU

STATE OF CALIFORNIA)
) ss.
COUNTY OF LOS ANGELES)

RANAJIT SAHU, being first duly sworn, deposes and states:

I. EXPERIENCE AND QUALIFICATIONS

1. I have a Bachelor of Technology degree, with Honors (B.Tech Hons.) from the Indian Institute of Technology (IIT), a Masters of Science (Mechanical Engineering) degree and a Doctorate in Philosophy (Ph.D), the latter two from the California Institute of Technology (Caltech).

2. I have over seventeen years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services as well as design and specification of pollution control equipment. In that time, I have successfully managed and executed numerous projects. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

3. I have provided and continue to provide consulting services to numerous private sector, public sector and public interest group clients. My clients over the past seventeen years include various steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including the Environmental Protection Agency, the United States Department of Justice, California Department of Toxics Substances Control (DTSC), various municipalities, etc. I have performed projects in over 45 states, numerous local jurisdictions and internationally.

4. In addition to consulting, I have taught and continue to teach numerous courses in several Southern California universities including University of California Los Angeles (air pollution), University of California Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past fifteen years.

5. Finally, I have and continue to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well

as before administrative bodies. For details, please see my resume provided in Attachment A. My fee for preparation of this report is $110 per hour.

II. GENERAL COMMENTS

1. I have reviewed the draft Regional Haze State Implementation Plan (RH SIP) prepared by the state of Minnesota (hereafter "state") for the two Class I areas, Voyageurs National Park (VO) and Boundary Waters Canoe Area Wilderness (BW).[1] I have also reviewed numerous supporting documents to the RH SIP and these will be noted in specific comments below. While I made significant efforts to review these complex documents, I note that these documents were developed in numerous forms by large teams of staff working over at least 2 years. As such, even the extended 60-day review period is inadequate to conduct a thorough review. Therefore, all of my comments should be considered preliminary. In addition, this affidavit, by necessity, contains only the major technical comments. It does not attempt to list every single technical comment; nor does it attempt a systematic critique of policy and editorial issues.

2. While I applaud the significant amount of technical and policy work that the state has completed in order to prepare the draft RH SIP, it is my opinion that the goals of attaining natural visibility conditions at VO and BW are unlikely to be met based on the draft RH SIP. I will show that the technical analyses underlying the SIP are generally poorly supported or documented and lack rigor, resulting in conclusions that are not robust. Therefore future predictions resting on these analyses are not likely to be met. And, even if the technical analyses were reliable, the modest goals set forth are unlikely to be met because actions that need to occur to enable the realization of the requisite goals are unlikely to occur. Haze at VO and BW will only reduce if emissions of pollutants that cause haze are reduced. Yet, the RH SIP does not inspire confidence in this regard. Many sources within the state that have been demonstrated to adversely impact haze at these two Class I areas have not committed to emissions reductions. In many cases, such sources are at the beginning stages of data gathering. Other sources in neighboring states (indeed most of the neighboring states themselves[2]) have simply refused to either acknowledge their impacts or have simply refused to commit to emissions reductions.[3] Finally emissions from Canada, bordering both Class I areas,

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[1](Draft SIP, Ch. 1, p. 8) The State of Minnesota has two Federal Class I areas within its borders: the Boundary Waters Canoe Area Wilderness (BWCAW) and Voyageurs National Park (VNP). Draft SIP, Ch. 1, p.8. Although the Draft SIP refers to these two class I areas as BWCAW and VNP, I will use the shorter abbreviations BW and VO, respectively.

[2] Technical Support Document, p. 82. "The PSAT results suggest places to look for emissions reductions appear to be mainly associated with sulfate from EGU and nonEGU point sources in Minnesota, Wisconsin, Iowa, North Dakota and Missouri."

[3] See Letter from Catherine Fitzsimmons, Chief, Air Quality Bureau, State of Iowa Dept. of Natural Resources, to Mr. Brad Moore, MPCA, dated November 1, 2007. See also Draft SIP Ch. 10 in which the state notes that "[P]reliminary indications from the contributing States are that those States are, at this time, unlikely to undertake additional emission reductions for regional haze purposes. Of the contributing States, Missouri has indicated in its SIP that it does not believe that it is a significant contributor to visibility in

have not been properly considered at all. If, after two plus years of intense "cooperative" efforts, the state could not even obtain commitments from other states that are plainly impacting these two Class I areas, it begs the question as to whether this voluntary "cooperative" strategy is worth the time and effort. In addition, I note that EPA requested[4] that if such cooperation was not forthcoming from other states, then this should be brought to EPA's attention "...as early in the process as possible." Please indicate in the record when EPA was brought into the process and what EPA's response has been, if any.

3. I want to acknowledge the cooperation that I received from staff at the state during preparation of these comments. I want to thank staff for being generally responsive to my numerous inquiries and requests for clarifications during this review.

4. I realize that the RH SIP is a complex technical document. Yet, the manner of presentation of the various aspects of the RH SIP and the document organization makes it even more difficult to comprehend and understand. The RH SIP ought to be comprehensible to the public, and not just to the technical and policy personnel who helped develop it. I urge the state to make the document more reader-friendly by considering the following: (a) subjecting the document and its key supporting documents to a full technical editorial review; (b) minimizing the use of jargon by inserting more explanatory boxes defining terms when they first appear; (c) listing, in one location, all of the key assumptions that underlie the RH SIP spanning all technical aspects and policy choices including the emissions inventory, BART for sources, modeling, etc. This will enable the reader to get a better grasp of the degree to which the conclusions of the RH SIP depend on these key assumptions. It will also then plainly focus the analytical effort on making the conclusions more robust by better understanding these key inputs and how they should be accounted for. While it is impossible to eliminate scientific uncertainly in a plan such as the RH SIP which purports to predict the future over the next five decades, it is possible to logically account for or consider such uncertainty in making predictions. Standard tools such as sensitivity analyses or Monte Carlo analyses should be used in order to understand the impacts of variability in key assumptions. The candidate variables for such analyses can be systematically identified provided all of the key variables are listed in one place. A good example of a technical document that concerns itself with making technical forecasts over long time frames and

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either of Minnesota's Class I areas. Iowa has indicated that it does not feel that additional controls are cost effective due to their cost in $/deciview, and that further review of some controls is unwarranted due to the uncertain status of federal regulation.....Although Minnesota has continued to consult with these States, we have been unable to resolve these disagreements."

[4] Additional Regional Haze Questions, EPA document dated August 24, 2006. (Coordination with RPOs, States, and FLMs #6) "If a State with a Class I area determines that a contributing State is not doing what is reasonable to meet the RPG set for the area, and has attempted to resolve this issue, the State with the Class I area should notify EPA and document this issue in its initial RH SIP. For all revisions to the initial RH SIP revision, 40 CFR 51.308(h)(2) requires that the State with the Class I area provide notification to EPA and to the other States which participated in the regional planning process. This subsection further requires the State with the Class I area to collaborate with those States in the regional planning process to develop additional strategies. It is EPA's expectation that issues of communication/collaboration problems such as this be brought to our attention as early in the process as possible."

then conveys this technical information to the public and policy makers is the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report.[5]

5. Due to poor organization (whose structure is driven by a demonstration of compliance with the underlying regulations) and poor presentation (key assumptions are scattered throughout the document and its myriad supporting documents), the RH SIP misleads the reader by suggesting a level of precision in its analytical results and predictions that is simply unwarranted, given the degree to which such results and predictions depend on numerous assumptions that have not been (and, in some cases cannot be) properly supported.

6. The RH SIP is, at its very core, a long range plan.[6] While it is to be reviewed every 10 years or so, even by regulation its ultimate goal is to reach natural visibility conditions at VO and BW by year 2064. In any event, the fact that the RH SIP is a long range plan is indisputable. By definition, long range planning is compromised and long range plans are poorly constructed if they fail to consider material changes and effects that might affect the outcomes of such plans which may occur on concurrent time scales (i.e., the same time scale as the duration of the plans themselves). Without consideration of such secular changes that might occur on the same time scale as the plan, the predictions of the plan are meaningless. The RH SIP is strongly deficient in this regard. It is now a foregone conclusion that the effects of global climate change that are already occurring globally and regionally are likely to be irreversible over the next several decades regardless of mitigation measures that may come into effect in the next two decades. Such climate change induced impacts will be coincident with the time scale of the RH SIP. Such changes are likely to affect key RH SIP assumptions including those relating to emissions inventory (more/fewer fires?; more/fewer wind borne dust; more/fewer biogenic emissions; etc.) and modeling (changes in synoptic wind flow and weather patterns?; changes in rainfall and relative humidity?; etc.). Each of these changes individually and a number of them collectively will affect the prediction of haze at VO and BW. Yet, the RH SIP conspicuously avoids any mention of the impacts of climate change. It is as though it does not exist. If it is the opinion of the state that climate change impacts such as those noted above in the areas of influence (AOI) of VO and BW over the next several decades are insignificant, this should be discussed and supported. If, as is more likely, such impacts are likely to be significant, then its effects on all key RH SIP underlying assumptions should be discussed and analyzed. Without such analysis, the conclusions of the plan are meaningless. The whole exercise is akin to "rearranging the deck chairs on the Titanic."

7. I also urge the state to undertake a systematic brainstorming exercise in order to identify any other impacts (such as climate change) that might be significant and which might occur on the same time scale as the RH SIP. Whether or not any additional causal factors are identified, results of such an exercise should be documented and made

[5] http://www.ipcc.ch/ipccreports/ar4-syr.htm

[6] By its own analysis, the state expects that natural conditions will be reached in VO in year 2177 and in BW in year 2093. See Changes Made To Regional Haze SIP After Public Review Draft, circulated by e-mail, May 6, 2008.

part of the record. This is simply good practice and will make the plan conform to good long-range planning principles.

8. There is no consistency in the plan with which changes in visibility are characterized. For example, recently the state noted that "[T]he RPG for the worst 20% days decreased by 0.1 dv due to new MPCA modeling that includes the entirety of the NE Minnesota Plan. Prior modeling only included a 20% reduction from the area."[7] This leaves the impression, correctly, that the 0.1 dv change is significant. Yet in other portions of the analysis, much larger changes in visibility are treated differently. For example, the RH SIP notes that adjustments to the baseline visibility values to "...include a number of days where data capture at the Class I monitors was incomplete....results in a small, but measurable, effect on the baseline values (i.e., values increase from 0.2 to 0.8 dv,.."[8] Characterizing changes in 0.2 to 0.8 dv as "small" is incorrect. In another instance[9] the RH SIP discusses the impact of days with wildfires in Canada and notes that "[E]limination of these high organic carbon concentration days has a small effect in lowering the baseline visibility levels in the northern Class I areas (i.e., Minnesota Class I areas change by about 0.3 deciviews, and Michigan Class I areas change by less than 0.2 deciviews."

III. VISIBILITY MEASUREMENTS

1. Data for current baseline visibility conditions as full and "natural" conditions are based on data collected at one monitor in each Class I area.[10] However, the appropriateness of the spatial locations of these IMPROVE monitors, with regards to providing a representative metric of visibility at the whole of each Class I area is not discussed in the RH SIP. For example, the BW Class I area is over 1.3 million acres in size with over 1200 miles of canoe routes.[11] Yet, it has only one monitor. While the number and location of the IMPROVE monitors may be based on practical factors such as cost, ability to conduct maintenance in all seasons, etc., nonetheless the SIP should provide a discussion of the meaning of visibility data collected at just one monitor in each Class I area in terms of its ability to represent visibility at numerous (or all scenic vistas) locations at the Class I area. For example, a list of scenic vistas could be provided in the RH SIP at each Class I area. The number of visitors to these vistas could also be noted for the various baseline years at each Class I area. Then, the ability to represent the visibility at each of these scenic vistas by the one IMPROVE monitor should be discussed. In addition, the RH SIP should also discuss if the measured values at the IMPROVE sites are likely to over- or under-estimate the actual visibility and scene

[7] Changes Made To Regional Haze SIP After Public Review Draft, circulated by e-mail, May 6, 2008.
[8] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 6.
[9] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 19.
[10] These monitors are part of the Interagency Monitoring of PROtected Visual Environments (IMPROVE) network. See http://vista.cira.colostate.edu/improve/
[11] http://www.bwcaw.org/

perception at each of the vistas. This would provide a framework within which the later calculation of baseline and natural visibility values could be contextualized. The RH SIP should comment on whether the IMPROVE monitors are, in fact, located at proper location from a visibility measurement standpoint for users of the respective Class I area. As it stands, the entire RH SIP builds from the IMPROVE data with little or no comment on what the IMPROVE data really means for each Class I area.

2. Similarly, there is no discussion of the temporal variability of the data that was collected at the IMPROVE monitors. While the RH regulations prescribe the temporal baseline period (i.e., years 2000-2004), nothing prevents the state from discussing the entirety of the measurement record at each monitor. This will provide a much better context for the data. For example, whether the regulatory baseline time period (which was established for the whole country and all Class I areas) is a truly representative time period for the two Class I areas at issue, would be clear. It would also become clear if there were other factors that may have been affecting data for these Class I areas for this baseline period. For example, even for the 2000-2004 period, the annual data provided are not critically discussed. Portions of a table provided in the RH SIP[12] are reproduced below. Clearly, for the 20% Worst Days as well as for the 20% Best Days, dv data from 2004 are generally lower than the other four years. Yet, the reasons for this are not discussed in the SIP. They should be.

New IMPROVE Equation (Cite: VIEWS, March 2006)									
		20% Worst Days					Baseline	2018	Natural
		2000	2001	2002	2003	2004	Value	URI Value	Conditions
Voyageurs		19.55	18.57	20.14	20.25	18.87	19.48	17.74	12.05
BWCA		20.20	20.04	20.76	20.13	18.18	19.86	17.94	11.61
Isle Royale		20.53	23.07	21.97	22.35	20.02	21.59	19.43	12.36
Seney		22.94	25.91	25.38	24.48	23.15	24.37	21.64	12.65
		20% Best Days					Baseline	2018	Natural
		2000	2001	2002	2003	2004	Value	URI Value	Conditions
Voyageurs		7.01	7.12	7.53	7.68	6.37	7.14		7.14
BWCA		6.00	6.92	7.00	6.45	5.77	6.43		6.43
Isle Royale		6.49	7.16	7.07	6.99	6.12	6.77		6.77
Seney		6.50	6.78	7.82	8.01	6.58	7.14		7.14

Notes: (1) BWCA values for 2002 - 2004 reflect "substituted" data.
(2) New IMPROVE equation values include Kenksi, 2007 adjustment for missing days

3. The 1999 Regional Haze Rule states that in comparing "current conditions" against "natural conditions," natural conditions means "[t]he level of visibility (in deciviews) for the 20 percent most-impaired days, and for the 20 percent

[12] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 8.

least-impaired days, that would exist if there were no manmade impairment."[13] While the RH SIP documents describe the methodology which was used to calculate the natural conditions at each Class I area, I was unable to find the actual calculations themselves. In discussions with staff,[14] I was referred to Mr. Scott Copeland of the Colorado State University, Cooperative Institute for Research in the Atmosphere (CIRA),[15] who had conducted the actual calculations. However, I was unable to establish contact with Mr. Copeland. I am requesting that the actual calculations details be provided as part of the public record.

4. Similarly, the underlying calculations for the baseline values (i.e., for the years 2000 to 2004, inclusive) for visibility at each Class I area are not provided in the public record (or, if present, are not easily discernable). I was again referred to Mr. Copeland of CIRA who had done the actual calculations. Others at LADCO (e.g., Ms. Kenski) may also have participated in these calculations. I am requesting that the actual calculations details be provided as part of the public record.

5. It appears that several corrections/adjustments were made to the IMPROVE field data in order to obtain the baseline values. These are described in the RH SIP[16] and include: (a) calculations made using the original IMPROVE equation and later by the new and refined IMPROVE equation;[17] (b) creation of a "substituted" data set for certain chemical species for BW, using data from VO for years 2002 through 2004; and (c) handling of days with missing data during 2000-2004 (i.e., including them, even though they could have been excluded).[18] I applaud the state and LADCO for the last adjustment.

6. With regards to the first change (i.e., use of new/refined versus original IMPROVE equation), the RH SIP should describe the rationale for this change. While the change may be fully justified, it is clear that all of the data required for the new IMPROVE equation were (and are) not collected at these monitors.[19] Thus, the overall basis for using the new IMPROVE equation is somewhat compromised. The record

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[13] 64 FR 35730.

[14] Personal communication with Ms. Margaret McCourtney, MPCA on May 9, 2008.

[15] http://www.cira.colostate.edu/

[16] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 6.

[17] Draft SIP, Ch. 5, p. 20. "[U]sing the refined equation, the MPCA has determined that natural visibility conditions for BWCAW are best represented by an average of 11.6 deciviews for most impaired days and 3.4 deciviews for the least impaired days. Natural visibility conditions for VNP are best represented by 12.2 deciviews for most impaired days and 4.3 deciviews for the least impaired days."

[18] Draft SIP, Ch. 5, p. 22. "[I]ncluding these days in the baseline calculations has a small but measurable effect on the average deciviews for the 20% worst days. Minnesota has decided to include these days in our baseline calculations, even though the guidance calls for them to be excluded, because they appear to be largely dominated by anthropogenic sulfate and nitrate sources. These are the types of poor visibility days that need to be targeted by regional haze control strategies, so they were retained in order to assure that they receive adequate scrutiny."

[19] See Draft SIP, Ch. 5, p. 20. "[N]ew terms have been added for Sea Salt (important for coastal areas) and for light absorption by NO2, where NO2 observations are available. (These observations are not available for Minnesota, so this component was not used.)"

would be better served with a more detailed explanation on the basis for using the new equation. The RH SIP should also note if the predictions of the new IMPROVE equation would be better if all of the data required was collected. As such, the RH SIP should comment on whether additional data should be collected at the IMPROVE monitors.

7. For the second change (i.e., "patching"[20] of missing BW data from VO), details of the regression analysis referred to in the RH SIP that justified this patching should be provided in the RH SIP. The RH SIP should also note if the methodology and details of this data patching were discussed with EPA and any EPA responses. For example, in an EPA guidance[21] provided in response to various inquiries during preparation of such SIPs, EPA notes its expectations with regards to "...filling missing data..." Speaking of baseline data, EPA notes that "...[A]ll five years should be used if available and suitable per guidance recommendations. If not, then a minimum of three years is recommended. You should not recreate data for years that the monitor was not operational because of the further uncertainty that this data adds. If less than three years of complete data are not available, consultation with EPA is recommended."

8. There are also additional technical issues that should be fully explained in the RH SIP. For example, in discussing the missing data days discussed earlier, the SIP notes that[22] "... Natural background conditions were not recalculated with the inclusion of the previously dropped days, due to the time necessary to do these calculations and the belief that the resulting change would be very small." Setting aside the fact that the RH SIP has been in development for at least the last 2 years and that "...time necessary..." to do the calculations should not have been a factor, the reader is left unclear as to what the impact on this recalculation would have been on natural conditions. Given that the RH SIP has been inconsistent, as noted earlier, in terms of representing what is "small" or not, does this mean that such recalculations, if done, would be in the range of 0.2 to 0.8 dv (previously noted as "small")? If so, these are hardly "small" changes. The RH SIP should clarify.

9. Minnesota has elected to use a value of 0.5 dv as the exemption threshold value in determining whether a BART-eligible source can be anticipated to cause or contribute to visibility impairment.[23] EPA requires that the RH SIP provide a basis for

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[20] See Draft SIP, Ch. 5, p. 21. "[N]ote that the air monitors at BOWA1 had a long term malfunction from 2002 through 2004, which resulted in missing monitoring data for certain chemical species. Data for sulfate and nitrate, the main contributors to visibility impairment, were valid for these days, but data for other species was missing. Data for BWCAW has therefore been "patched" for the invalid chemical species by using data from the VNP IMPROVE monitor (VOYA2) adjusted based on the usual relationship between the concentrations of those chemical species between the two monitors when both captured valid data (determined through a regression analysis)."

[21] Additional Regional Haze Questions, EPA document dated August 24, 2006. (Miscellaneous #11)

[22] See Draft SIP, Ch. 5, p. 22.

[23] See Draft SIP, Ch 9, p. 57. "[A]lthough the MPCA agrees that it could set the "contribution" threshold lower than 0.5 deciviews and is cognizant of a number of existing sources in close proximity to Class I areas, the modeling showed no sources causing impacts at levels just slightly below 0.5 deciview, therefore MPCA did not consider readjusting the contribution threshold."

the selection of this threshold.[24] Minnesota's explanation, namely that the threshold was not readjusted since "...modeling showed no sources causing impacts at levels slightly below 0.5 dv..." should be revisited in light of the significant shortcomings associated with modeling conducted to support the RH SIP. Minnesota should clarify in the record what the modeling showed as impacts even if the levels were not "...slightly below 0.5 dv..." Even if impacts were, say, 0.4 dv or even 0.3 dv, these may be significant enough, given that the same modeling showed only 0.1 dv improvement by considering all supposed reductions in the NE Minnesota Plan, as noted earlier.

IV. EMISSIONS INVENTORY

1. The emissions inventory sections and descriptions in the various documents suffer from use of mind-numbing jargon.[25],[26] While the attempt to be part of numerous regional planning organizations (such as the MRPO/LADCO and CENRAP) on the part of the state is commendable, the various comparisons of the analytical efforts of these organizations and the state show the extent to which there are significant uncertainties in developing even past actual inventories, thereby inspiring no confidence that any projections of future inventories are at all meaningful.

2. It is expected that emissions inventories will have uncertainties. It is naïve to expect otherwise. One standard practice in the presentation of data containing uncertainties is to present the errors associated with the estimates. This is not done in the present instance. Another is to carefully consider the number of significance digits in the presentation of data. Yet, there is no apparent care in this regard either. Collectively, these omissions serve to mislead. First, they create an impression of far greater precision in the reported data. For example, consider the 2002 year emissions inventory for Minnesota itself, since this is the modeled year in the baseline period. This is shown in the following tables, excerpted from the various documents, as noted.

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[24] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #3). "[T]he exemption threshold value selected by the State in determining whether a BART-eligible source can reasonably be anticipated to cause or contribute to visibility impairment must be specified in the SIP documentation, as must the basis for the States' selection of this threshold."

[25] See Technical Support Document p. 17. "[C]ENRAP's latest inventory is baseG, the MRPO's latest 2002 inventory is baseK. Unfortunately, based on each RPO's timing in the creation of these modeling inventories, the latest base year inventory of one RPO is not necessarily included in another RPO's base year1. For example, the MRPO baseK contains CENRAP's baseC. CENRAP's baseG contains the MRPO baseK" See also "[T]he CENRAP baseG contains the most recent WRAP Plan02b inventory."

[26] See Technical Support Document p. 18. "[R]ecently, MRPO changed to a 2005 inventory year (baseM). BaseM incorporates VISTAS baseG except for the five MRPO states, Minnesota nonroad, mobile and point, and Iowa and Missouri agricultural nonroad. VISTAS baseG contains CENRAP baseG, WRAP Plan02b and MANE-VU 3.1 with estimated growth from 2002 to 2005. MRPO also temporalized the EGU emissions from all States using CEM data."

Table 7.1: Minnesota 2002 Baseline Emissions Inventory Summary (tpy)

	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	NH_3
Point Sources	29,465	153,363	130,519	31,473	12,535	1,273
Area Sources	161,358	57,013	17,455	734,109	145,248	172,225
Mobile Sources						
On-Road	90,972	171,627	3,010	3,801	2,752	5,362
Non-Road	84,278	103,084	9,071	9,671	8,851	97
TOTAL	366,073	485,087	160,055	779,054	169,386	178,957

The table above is taken from the Draft SIP, Ch. 7, p. 29.

Table 2.2. Annual 2002 Emissions in Tons for MRPO (baseK) and CENRAP (baseG) by Source and Category for Minnesota and Surrounding States.

	Minnesota (MRPO)[10]								CENRAP[11]						
Minnesota	Specie	Mobile	Non-road	Area (incl NH3)	Bio-genics	Point	Total	Minnesota	Specie	Mobile	Non-road	Area (incl NH3)	Bio-genics	Point	Total
	SO2	28	9,215	22,831	0	130,545	162,619		SO2	2,744	8,690	15,781		134,272	161,487
	NOx	171,967	101,655	58,114	28,736	155,073	515,546		NOx	171,876	100,199	59,497	22,664	156,300	510,536
	NH3	7,199	98	175,486	0	2,307	185,091		NH3	5,314	90	160,380		28,671	194,455
	PM2.5	2,196	5,602	19,528	0	12,536	39,862		PM2.5	2,732	8,548	111,837		27,333	150,450
	Coarse Part.	2,196	6,378	72,157	0	31,050	111,782		Coarse Part.	3,773	9,313	482,445		50,923	546,454
	VOC	97,613	96,807	133,164	698,130	33,726	1,059,439		VOC	100,515	93,206	176,766	1,055,509	49,534	1,475,530

The table above is taken from the Technical Support Document, at p. 21. Collectively, the two tables above show emissions inventory estimates for a single year (2002) for a single state (MN), done by three different entities. Table 7.1 is work by the state, and Table 2.2 contains work by the MRPO and CENRAP. Even the categories and nomenclature do not match. For example, Table 7.1 does not contain emissions of NOx and VOC from biogenic sources. While Table 7.1 divides "mobile" sources into on-road and non-road, it appears that in Table 2.2, what is listed as "mobile" is actually from on-road sources only. It can only be surmised that "Coarse part." in Table 2.2 is the same as PM10 in Table 7.1. However, this may or may not be the case. The reader simply does not know. Table 2.2 shows Area sources also "(incl. NH3)." This is confusing because NH3 is shown separately as a pollutant as well.

Setting aside these descriptive differences, the differences in the estimated emissions (for a year that is now over 6 years ago), is striking. The SO2 emissions from just point sources ranges from 28 tons (MRPO) to 2744 tons (CENRAP) to 3010 tons (MN). The VOC emissions from biogenic sources is shown as 698,130 tons by MRPO and 1,055,509 tons by CENRAP. Coarse particulate emissions are shown as 72,157 tons by the MRPO, as 482,445 tons by CENRAP and by 734,109 tons by MN (assuming that this is PM10).

Coming back to the issue of precision, is it really the intent to report the emissions estimates above down to the last ton? Does MN really believe that the SO2 emissions from the whole state from area sources is exactly 17,455 tons? With what confidence? Since the MRPO estimate for the same pollutant/category is 22,831 tons and that from CENRAP is 15,781 tons, it is ludicrous to imagine that any of these estimates could be correct to even the nearest 1000 tons, much less the last ton. I suggest that the RH SIP reflect significant digits commensurate with the underlying uncertainties as opposed to what is presented in the draft.

3. While it is commendable that the RH SIP points to certain likely errors in the inventory for a few instances,[27] significant glaring differences (which may or may not be errors) are left uncommented and unexplained. With the examples provided above, it is reasonable to ask: (a) why any of these inventories should be relied upon; and (b) if one cannot rely upon a past actual inventory after 2+ years of effort, why should one rely upon future projections (which have the additional uncertainties associated with growth factors, new sources, etc.), upon which this RH SIP is based.

4. Not surprisingly, there are glaring differences in the estimated emissions inventory for another past year (i.e., 2005) for which comparable data are now available. Shown below are two different tables (sources as noted) for this year.

Table 2.3. Annual Minnesota Emissions in MRPO 2005 Base Year Modeling.

MRPO baseM - 2005							
Minnesota	Specie	Mobile	Non-road	Area (incl NH3)	Biogenics	Point	Total
	SO_2	2,448	9,462	15,703		128,646	156,259
	NO_x	146,019	102,052	57,578	34,704	157,983	498,337
	NH_3	6,275	76	188,471		1,507	196,329
	$PM_{2.5}$	1,603	4,902	17,803		2,959	27,267
	PM_{10}	2,634	5,327	67,476		36,028	111,464
	VOC	92,061	115,831	116,742	601,500	36,477	962,611

This table above is taken from the Technical Support Document, p. 24. Shown below is the MN developed inventory, as recently provided.[28]

	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	NH_3
Point Sources	26,184	147,325	129,993	29,664	13,038	2,078
Area Sources	134,292	34,179	17,314	736,056	142,393	171,829
Mobile Sources						
On-Road	92,683	138,341	2,558	3,455	2,408	5,666
Non-Road	95,599	102,424	9,610	8,443	8,004	64
TOTAL	348,758	422,270	159,475	777,618	165,844	179,637

Setting aside the lack of biogenics inventory by MN, there are still large differences. PM2.5 emissions from mobile (or on-road in the later table above) are 1,603 tons (MRPO) and 2,408 tons (MN). PM10 emissions from area sources are 67,476 tons (MRPO) and 736,056 tons (MN). Even for point sources, where the inventories should

[27] See Technical Support Document, p. 18. The most obvious CENRAP emission summary calculation error, shown in Table 2.2, is extremely high nonroad NOx emissions from North Dakota, South Dakota and Wisconsin. CENRAP emissions summaries from this category for each of these States for the base year 2002 are about 460,000 tons/year, 420,000 tons/year and 655,000 tons/year respectively. The CENRAP model inputs do not support these emissions totals, apparent in Section 2.2. Nevertheless, the emissions summary information from CENRAP is included, but should be viewed with caution.

[28] Changes Made To Regional Haze SIP After Public Review Draft, circulated by e-mail, May 6, 2008.

reasonably match, they do not. For instance, the PM2.5 emissions from point sources is 2,959 tons (MRPO) and 13,038 tons (MN). Similarly VOC emissions from point sources are 36,477 tons (MRPO) and 26,284 tons (MN).

5. As noted above, if past actual emissions (going back 6 or 3 years ago) are so imprecise, one has to conclude that they are also inaccurate. And, if recent past actual emissions are inaccurate, and the reasons for such inaccuracy are not explained or discussed, it is wholly premature to confidently leap into distant future year emissions projections, such as for year 2018. Yet, the RH SIP calls for just such an inventory and the state and the RPOs have produced such inventories. But, that is no reason to believe that they are remotely accurate. Three 2018 inventories for MN by the MRPO and CENRAP are shown below.

Table 2.8. Annual Minnesota Emissions in MRPO baseM-r5b 2018 Future Modeling.

MRPO r5b - 2018							
Minnesota	Specie	Mobile	Non-road	Area (incl NH_3)	Biogenics	Point	Total
	SO_2	624	1,872	16,479		75,826	94,802
	NO_x	47,781	64,491	63,638	34,704	102,284	312,899
	NH_3	7,763	87	218,791		800	227,441
	$PM_{2.5}$	1,019	2,473	13,891		16,754	34,137
	PM_{10}	2,167	2,717	43,940		36,905	85,729
	VOC	43,072	77,905	128,212	601,500	37,610	888,299

This is taken from the Technical Support Document, p.35.

Table 2.7. Annual 2018 Emissions in Tons for Minnesota(MRPO) and CENRAP (baseG) by Source Sector and Specie for Minnesota and Surrounding States.

	MRPO[22]								CENRAP[23]							
Minnesota	Specie	Mobile	Non-road	Area (incl NH3)	Bio-genics	Point	Total	Minnesota	Specie	Mobile	Non-road	Area (incl NH3)[24]	Biogenics	Point[25]	Total
	SO2	2	2,169	22,683		83,506	108,361		SO2	694	606	15,735		98,107	115,142
	NOx	31,425	76,874	62,081	28,736	117,492	316,609		NOx	45,729	56,010	62,929	22,664	11,497	176,165
	NH3	10,094	125	238,900		3,425	252,544		NH3	7,406	136	211,371		41,540	260,453
	PM2.5	514	4,408	19,541		25,092	49,555		PM2.5	1,215	4,846	96,522		30,169	132,752
	PM2.5-PM10	514	5,025	72,411		47,908	125,859		PM2.5-PM10	1,214	5,270	439,487		56,455	502,426
	VOC	20,047	86,695	129,398	698,130	42,764	977,034		VOC	42,469	68,027	212,032	1,055,509	67,508	390,036

This is taken from the Technical Support Document, p. 32.

Without going through examples as before, for 2002 and 2005, the differences in the emissions projections are striking. Some of the presented numbers are simply unbelievable. For example, in one case (Table 2.7 above) the MRPO developed SO2 inventory from mobile sources is shown as 2 tons for the whole state. This seems excessively low. If, in fact, the MRPO believes this to be true, the backup documentation and assumptions for this should be provided.

6. Part of the reason emissions projections are less reliable in the future is because they rely on models whose usefulness for such projections has not been fully described in the RH SIP. A good example is the IPM model, used for developing electric power plant steam generating unit (EGUs) emissions. While EPA routinely relies on this privately developed model (by the consulting firm ICF), complete documentation for this model is not publicly available, neither at EPA nor anywhere else. The state uses this model because EPA and other RPOs use it.[29] Yet, its use in the context of state emissions projections for EGUs is dubious, as described in the RH SIP itself. The SIP notes the significant errors associated with an earlier version of this model (2.1.9 VISTAS) and why there was therefore no confidence with this version. Apparently the confidence level increased with a later (version 3.0) version of the model. Even so, the RH SIP notes[30] several corrections that had to be made to the IPM model's predictions. The SIP notes that,[31] "[I]n addition, a few mistakes were noticed in the IPM3.0 predictions; examples of such errors affecting Minnesota facilities include the size of an EGU boiler being understated by 100MW and NOX emission rates being considerably lower than permit limits. Minnesota included these corrections in the "will do" scenario, resulting in a slight increase in predicted NOX emissions. Other States also included higher emissions where they felt IPM had inaccurately predicted the 2018 scenario, such as where facilities were shown with controls although utilities had indicated to the state that they would not be installing controls. Overall, these corrections resulted in higher regional emissions."[32] In fact, several states noted significantly different emissions as compared to IPM3.0 (base), as reported in the RH SIP.[33] For Illinois, the difference between the IPM3.0 (base) and IPM3.0 (will do) cases was: for SO2 277,337 tons vs. 140, 296 tons; for NOx it was 70,378 tons vs. 62,990 tons, respectively. For Indiana the corresponding SO2 estimates were 361,835 tons vs. 628,286 tons; and for NOx they were 90,913 tons vs. 128,625 tons. There are other errors, as noted in the same table. These types and sizes of errors raise serious questions regarding use of the non-documented, black-box, IPM model for future predictions. Thus, all predictions relying on IPM model projections are similarly likely to be unreliable.[34]

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[29] See Technical Supporting Document, p. 27. "[A]ll RPOs agreed to predict future EGU emissions with IPM, which is a model developed by ICF that EPA uses to evaluate future impact of policies on EGUs in combination with projected energy needs. For example, the U.S.EPA used IPM to support the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR). IPM version 2.1.9(VISTAS) was used by both CENRAP 2018G and MRPO r4s1 future year inventories. The IPM model output presumes CAIR and CAMR are implemented. While developing its 2005 baseM future year emissions, the MRPO switched to IPM3.0. IPM 3.0 also presumes CAIR and CAMR are in place, but makes different assumptions (i.e. fuel cost) when estimating future EGU emissions. Minnesota's review of the IPM results concluded that IPM3.0 better reflects Minnesota's estimation of the future EGU scenario. Although the IPM3.0 predictions are improved, they could still use some adjustments."

[30] See Technical Supporting Document, p. 28.

[31] Draft SIP, Ch. 10.

[32] Draft SIP, Ch. 10, p. 80.

[33] See Table 2.6 of the Technical Supporting Document, p. 30.

[34] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 11. "[I]n comparing the LADCO's Round 4 and Round 5 results for the 20% worst days, one noticeable difference is that the Minnesota Class I areas are much closer to the glide path in the newer Round 5 modeling. This difference is due to more SO2 emission reduction in nearby states in the Round 5 modeling (i.e., -8% v. -27% - see Table 4), which reflects EPA's latest (IPM3.0) EGU projections."

7. Both of the Class I areas in question border Canada. Yet, the treatment of Canadian emissions by the state in developing the RH SIP leaves much to be desired. Basically, the state was not able to properly document Canadian emissions – although the reasons for this lack of verification is not properly explained in the SIP. So, it chose to use 2005 year inventories (for the 2002 base year) as well as for the 2018 projected year.[35] I believe that it is misleading to represent that the use of 2005 emissions from Canada for 2018 projections is somehow conservative. While the state alludes to the fact that "...no credit is taken for any possible reduction..." it is more than likely that there will be increases in Canadian emissions in the next decade or more.[36] First, normal growth will likely cause increases unless these are offset with additional regulatory programs – the SIP does not mention any such programs in Canada or the various provinces. Second, certain types of sources such as the accelerated development of Canadian tar sands in Alberta, etc. will likely increase given the current and expected future state of the global energy markets. Third, the impact of global climate change on Canadian emissions is completely disregarded. For these reasons, at least, the treatment of Canadian emissions in the RH SIP is unsatisfactory and the RH SIP's conclusions meaningless.

8. Another pollutant which has significant emissions inventory uncertainty,[37] material to predictions of visibility, is ammonia. To the state's credit, it recognizes so in several places in the SIP. For example, it notes[38] that "[K]ey issues which need to be addressed include technical uncertainties, such as reliability of emission estimates, treatment of ammonia by current photochemical modeling systems, and lack of ambient measurements." The effect of having more ammonia is also noted[39] as such. "The CENRAP case overpredicts nitrate formation at Boundary Waters and Voyageurs compared to observed values collected at monitoring stations. This is likely caused by additional NOx and a significant amount of available ammonia with which to react. Because the CENRAP case has a lot of available ammonia to react with NOx emissions, the model responds well to future projected reductions in NOx emissions, possibly even over-stating them." Yet, inspite of noting these major uncertainties with the ammonia

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[35] See Technical Support Document, p. 35. "[B]ecause of the large uncertainties in the Canadian inventory, Minnesota elected to use the Canadian 2005 inventory for both the base year and the future year. Thus, no credit is taken for any possible reduction (or increase) in emissions from Canada."

[36] It seems likely that MN feels that its approach to Canadian emissions (i.e., holding them constant) is conservative since, by comparison, its RPO, CENRAP, has chosen to reduce emissions from Canada from the base year to the future year. See Technical Support Document, p. 10. Yet, none of the factors mentioned in this document have been considered by CENRAP, makings its estimates mere guesstimates.

[37] Contributing to the uncertainty is the spatial and temporal allocations of emissions. See Technical Support Document, p. 43. "CENRAP has significantly more ammonia in the model system than MRPO for Minnesota, Iowa, North Dakota, South Dakota, Wisconsin and Canada. This occurs in both winter and summer. Some of the additional ammonia in the CENRAP inventory is allocated to northern Minnesota, near the two Minnesota Class I areas, as shown in Figures 3.3 and 3.4. These figures contain total emissions from all source categories. As mentioned in Step 2, more ammonia present results in more ammonium nitrate and ammonium sulfate formation."

[38] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008, p. 22.

[39] Technical Support Document, p. 10.

inventory and its effects on haze,[40] the state does not seem to recommend additional data gathering or monitoring of ammonia and disclaims responsibility for filling these data gaps. While data gaps associated with improving models and model accuracy rightly belong with the RPOs and EPA, those associated with improving the understanding of emissions of ammonia from point and area sources in the state, ammonia controls for such sources, if needed, and the collection of additional ambient data for ammonia within the state and in portions of the Class I areas within the state lie squarely with the state. To abdicate its responsibility in this regard, as the state seems to have done, is unacceptable.

V. BART

1. Per the RH SIP's own analysis, the major BART sources in the state include several EGUs and all of the indurating furnace lines at the taconite mills, many located in the north eastern part of the state (and therefore the subject of the NE Minnesota Plan). EPA has provided guidance relating to what the RH SIP should include, on a source-specific basis relating to BART emission limits and compliance schedules. EPA notes that "[A] State's regional haze (RH) SIP submittal must include source-specific BART emission limits and compliance schedules for each source subject to BART. See 40 CFR 51.308(e). All regulatory requirements must be approved into the SIP.[41],[42] It also notes that "[A]s specified in 40 CFR 51.308(e)(1)(v), States are required to ensure each source subject to BART install and operate BART *as expeditiously as practicable*, but in no event later than 5 years after approval of the implementation plan revision. States should ensure that BART requirements in a SIP are written in a way that clearly specifies the individual emission unit(s) subject to BART regulation and the time by which the emission unit(s) must begin to comply with the BART limit." The governing regulations[43] note that "...[T]he following elements, at a minimum, must be addressed to ensure.... BART controls are adopted into the State's SIP – "[N]ame of source facility and the specific emission units and pollutants being controlled..."[44] and "[S]pecifics of the controls, control efficiency(ies), emissions reductions expected.[45]

2. The above regulatory requirements and EPA guidance notwithstanding, the state plainly fails to meet these requirements. It notes that[46] "[A]t this time, we cannot predict what emission reductions might result from BART in Minnesota." This is

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[40] See Draft SIP, Ch. 10, p. 95. "[I]t is not appropriate to commit to control of ammonia sources at this time. However, there is a clear need to improve 1) our understanding of the role of ammonia in haze formation, 2) our understanding of potential ammonia controls, and 3) the accuracy of particulate nitrate predictions. Minnesota does not consider it our responsibility to conduct such research. Minnesota therefore strongly encourages EPA and the regional planning organizations to continue work in these areas and commits to work with EPA and the RPOs to these ends."

[41] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #1)

[42] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #4)

[43] 40 CFR Part 51, Appendix Y – Section V.

[44] 40 CFR 51.308(e)(1)(i) and (ii)

[45] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #4)

[46] Draft SIP, Ch. 10, p. 81.

particularly true of the taconite indurating furnace lines for which no BART limits are specified. For the EGUs, no NOx or SO2 BART was conducted since the state assumed that inclusion of these sources in EPA's CAIR program, will suffice as BART.[47] The RH SIP goes on to speculate[48] that "[I]t has been shown in the past that installation of continuous monitors allows facilities to more efficiently manage their combustion processes, resulting in less fuel usage and fewer emissions. The MPCA expects this could result in emission reductions of 5 –30%, depending on the facility. The MPCA will have more information about emission reductions from BART by the Five Year SIP Assessment, and will include that information at that time." In the RH SIP, however, it does not require that taconite indurating furnaces therefore install continuous monitors. Later, it notes[49] that "[M]innesota will submit additional enforceable documents in the Five Year SIP Assessment. Once established, BART emission limits will be included in each taconite facility's Title V permit and submitted to EPA. In addition, the MPCA will develop enforceable documents such as permits, Administrative Orders, or a state rule that will require the taconite facilities to conduct the research into additional emission reduction measures (if such is not already being undertaken voluntarily and reported to the MPCA) and implement control strategies found to be reasonable." I am aware that MPCA has developed/is in the process of developing various Administrative Orders with specific taconite facilities which include either continuous emissions monitors or process emissions monitors. However, it is my understanding that the requirements for such monitors are not enforceable under the RH SIP. If so, the RH SIP must include the requirements contained in the Administrative Orders as enforceable in the RH SIP.

3. In the RH SIP, the state notes[50] that it will conduct "...a BART-like review of the taconite facilities' reports on control strategies and pollution prevention options investigated by the taconite facilities." It is not clear what this term means or where the state will derive the regulatory authority to do this "BART-like" review.

4. The RH SIP examined a couple of different emissions reduction strategies for EGUs (noted as EGU1 and EGU2). EGU 1 anticipated a SO2 emissions level of 0.15 lb/MMBtu and NOx emissions level of 0.10 lb/MMBtu. EGU2 anticipated a SO2 emissions level of 0.10 lb/MMBtu and NOx emissions level of 0.07 lb/MMBtu.[51] However, the RH SIP does not provide any rationale as to why these different emissions levels were chosen. The best controlled coal-fired units in the country (and, indeed, even the not-so well controlled units) routinely achieve emissions levels for NOx and SO2 below even the EGU2 levels proposed.[52] Thus, the RH SIP should provide this rationale.

5. The lack of BART for taconite facilities is glaring in spite of the fact that the state acknowledges that these facilities have been in operation for decades, with no

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[47] Draft SIP, Ch 9, p. 58. "[T]he State of Minnesota did not perform a BART determination for subject-to-BART EGUs to evaluate NOX and SO2 because of the State's inclusion in the CAIR region."
[48] Draft SIP, Ch. 10, p. 81.
[49] Draft SIP, Ch. 10, p. 90.
[50] Draft SIP, Ch. 10, p. 84.
[51] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 15.
[52] www.epa.gov/airmarkets

research into emissions reductions. Various commenters have provided the state with concrete suggestions for potential SO2 BART controls[53] and NOx BART controls.[54] Yet, rather than recognize the obvious – namely that there is no incentive for these facilities to come up with meaningful emissions reductions on their own, absent meaningful regulation, the state has again squandered its current opportunity to impose achievable BART limits (in spite of numerous comments from the FLMs, among others) in favor of a loose timetable promising some future controls.[55] This time line, proposed after issuance of the Draft RH SIP in response to FLM comments is shown below.

Process	Dates
Begin data collection and reporting for taconite facilities with new CEMS/PEMS	November 2008 (no facility later than April 2009)
Begin annual tracking of NE Minnesota Plan emissions	December 2008
MPCA determines remaining BART limits for each taconite facility	By August 31, 2010
Title V permits amended and BART limits included	By June 2012
Taconite facilities conduct pilot testing of potential control strategies and pollution prevention	January 2010 – December 2011
MPCA determines if 2012 target will be met, and projects status of 2018 emission reduction target.	July – December 2011
Taconite facilities report to MPCA on results of pilot testing	By December 31, 2011
MPCA reviews pilot testing reports and determines if any additional controls are reasonable	January – June 2012
MPCA does preliminary analysis of potentially reasonable reductions from non-taconite facilities in NE Minnesota.	January – June 2012
MPCA develops enforceable mechanism to require any additional control found to be feasible, for both taconite and (if necessary) non-taconite facilities	July – December 2012
MPCA submits 5 year assessment which includes BART limits, determination of additional reasonable controls.	December 2012
Facilities install any additional controls found to be reasonable	2013 - 2015

[53] Letter (and attachments) from James W. Sanders, USDA, to Mr. David Thornton, MPCA, dated March 5, 2008. This letter notes, for example, "[W]ith respect to the United Taconite facility, we feel the information included in the SIP shows that the installation of a new recirculating scrubber to control sulfur dioxide at this facility is BART. We feel the BART determination for this facility for sulfur dioxide should be made with this SIP and not delayed. We hope that United Taconite's delays in sending requested information does not delay MPCA's BART determination for their facility. We note that United Taconite uses a very high sulfur fuel and its current sulfur dioxide emissions are far above the rest of the industry." The letter also notes that "...we feel it is worth having the taconite industry also investigate whether any physical improvements can be made to the existing particulate scrubbers to improve the transfer of sulfur from the gas phase to the liquid phase by modifying or redesigning the internal components of the scrubbers. A number of these options are mentioned in the US EPA BART guidelines..."

[54] Letter (and attachments) from James W. Sanders, USDA, to Ms. Mary Jean Fenske, MPCA, dated April 10, 2007. "[I]n summary LoTOx has been declared BACT for one type of taconite furnace and will soon be installed on the other. The technical feasibility issues brought up in the BART proposals for each facility have been addressed by the developer of the technology and in the analyses above. Most significantly, the installation in Texas on a number of fluid catalytic cracking units (FCCU) has been successful..."

[55] Changes Made To Regional Haze SIP After Public Review Draft, circulated by e-mail, May 6, 2008.

As this "plan" acknowledges, decades after these taconite plants began operations, the state does not even have meaningful (i.e., continuous and representative) emissions monitoring data to define the proper emissions levels from these facilities.

The "plan" is vague. It is not clear what pollutants will "begin data collection and reporting..." by November 2008. As written, it would imply all pollutants such as NOx, SO2, PM, etc. Yet, clarifications provided by the state[56] indicate that the November 2008 deadline only applies to some pollutants and not all applicable pollutants. The actual details of the PEMs and whether or not they will generate meaningful data comparable to CEMS is still unresolved. The history of lack of controls to date on these plants, coupled with the rather vague timeline proposed does not inspire any confidence that such facilities will "install...additional controls found to be reasonable" by 2015 – a scarce 3 years before the 2018 interim assessment deadline.

VI. MODELING

1. As noted in the RH SIP documents,[57] "[I]n total, Minnesota has five modeling analyses from which to discern progress toward visibility goals at Boundary Waters and Voyageurs. One was conducted by the Central States Regional Planning Association (CENRAP), two were conducted by the Midwest Regional Planning Association (MRPO) and two were conducted by Minnesota using modified MRPO inputs, and are referred to as the Minnesota(MRPO) case." As with the emissions inventory issues discussed earlier, these various modeling analyses used some combination of 2002 and/or 2005 emissions inventories[58] as well as 2002 and 2005 meteorological data. Not surprisingly, the model predictions did not agree; and the RH SIP can only speculate as to what causal factors may be responsible for the apparent disagreement between the various models – e.g., meteorological data, model domain size, etc. For example, the RH SIP notes that "[f]or the 20 percent worst days, the CENRAP BaseG results show a future projected visibility 0.1 dv closer to the glidepath at BWCAW and 0.4 dv closer to the glidepath at VNP than Minnesota(MRPO). The MRPO 2005 results are on the glidepath at BWCAW, and below the glidepath at VNP. These results show 0.8 dv less visibility impact at BWCAW and 1.3 deciviews less visibility impact at VNP than the Minnesota(MRPO) results. Because both the Minnesota(MRPO) and MRPO BaseM 2005 used the same IPM3.0 emissions projection for electric generating units, this cannot account for the difference. The difference likely results from using different meteorology, for 2005, which results in a different set of 20% worst days with less impact from Minnesota, much less impact from the West and Canada and more impact from States to the East and Southeast."[59]

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[56] Conference call with MPCA dated May 7, 2008.
[57] Technical Support Document, p. 9.
[58] Technical Support Document, p. 16. Although Minnesota still uses MRPO inputs in its Minnesota(MRPO) model analyses, they remain the 2002 base year; while incorporating some aspects of the 2005 inventory, as described in section 2.0.
[59] Draft SIP, Ch. 8, p. 45.

2. None of these modeled results can or should be used as the basis for serious planning. In fact, given the large uncertainties in the emissions inventories alone, as well as the reliance on single year meteorological inputs (2002 or 2005), the modeled results simply are not robust enough. Model validation confirmed that the models were "...less reliable for organic carbon – note, the large underestimation in monthly average organic carbon concentrations ... [T]o compensate for model uncertainty and to provide a more robust analysis, additional information should be considered as part of a weight-of-evidence demonstration."[60]

3. It is simplistic to assume that the meteorological data for a long range plan will be similar to that of a given calendar year. Even the EPA's Prevention of Significant Deterioration (PSD) program relies on multiple-year meteorological data in order to make robust model predictions. In the present instance, as noted above, the state speculates that differences in meteorology can "... result in a different set of 20% worst days with less impact from Minnesota ...", etc. The RH SIP does not attempt any kind of sensitivity analysis relating to this choice of meteorological data and how that may affect results. To use a single year meteorological data set for the analysis and to thereby project model results to show natural conditions being attained in year 2177 (for VO) and 2093 (for BW) is simplistic. There is no scientific reason to rely on such "predictions." In fact, the state seems to also think so. Noting the uncertainties relating to ammonia emissions and nitrate formation, among others (such as emissions of NOx from non-EGU point sources in Northeastern MN, it states that[61] "[A]ny actions taken based on these results should be done so with some caution. There are several questions about ammonia emissions and nitrate that remain. First, as mentioned previously, model performance for nitrate is worse than model performance for sulfate, and the model generally underpredicts the formation of nitrate, likely due to an underestimation of wintertime ammonia. Without ammonia monitors located in Northeast Minnesota, it is not possible to measure actual ammonia concentrations. Also, as noted in the BART chapter, emissions estimates for NOX from non-EGU point sources in Northeastern Minnesota may be less accurate than those for other point sources."

4. Some modeling choices are not explained. For example, in order to "...address local source impacts on the ...Class I areas," the state used a Minnesota domain with 12 km spacing.[62] However, why 12 km was chosen versus some other spacing (such as 4 km or 1 km, etc.) is not explained and should be.

5. As with the inventory, the Canadian contributions to haze at the two Class I areas are poorly understood in the various model predictions. The RH SIP notes that[63] "CENRAP's modeling shows a higher Canadian contribution compared to LADCO's and MPCA's modeling. This is due to the larger spatial extent of the CENRAP modeling domain, and differences in the Canadian emissions inventory." If model domain size

[60] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 10.
[61] Draft SIP, Ch. 8, p. 50.
[62] Regional Haze in the Upper Midwest, Summary of Technical Information, Version 2.1, January 31, 2008. See p. 9.
[63] Ibid. See p. 35.

showed a causal relationship to contribution analysis, as this implies, that alone should have been further investigated and a model domain size selected such that it was sufficiently large/encompassing so as to not unduly influence contributions. To continue to run models with insufficient model domain size required to resolve necessary contributions from Canada renders much of the modeling "analysis" suspect. In fact the RH SIP admits that[64] "[I]n conclusion, while the back trajectory analyses suggest the impact from Canadian sources in the northern Class I areas is small, there is sufficient uncertainty with the available modeling analyses that it is not possible to estimate, with any confidence, their impact."

6. Another aspect of the modeling analysis that is noted but not examined is the relatively large contribution of "boundary conditions" in the attribution analysis. For example, for BW, the 2018 case (LADCO Round 5)[65] indicates that boundary conditions (or BC) is the fourth highest contributor to visibility impairment at VO and BW. To what extent this BC contribution should really be attributed to the other known states/RPOs, (such as by plume travel out of the domain from one of the known areas and subsequent re-entry as BC) is not examined. For example, if BC was properly resolved into its constituent origins, could certain states that have attributions less than even the flawed 5% limit (see below), in fact be over the limit? The modeling analysis should discuss this aspect of the attribution analysis.

VII. OTHER COMMENTS

1. Relying on EPA guidance, the state has used the 5% threshold level to determine if haze impacts by a given state on Class I areas located in a different state are significant or not. For example, relying on this, Minnesota claims that it does not materially impact the Seney Class I area; similarly, the state's PSAT analysis shows that a number of MRPO and CENRAP states do not materially impact the BW and VO Class I areas since they do not contribute at or above the 5% level. Setting aside the issue of boundary conditions discussed earlier, the use of the 5% threshold as a bright line, without use of judgment, is wrong. It is particularly so for Class I areas that are: (a) located near the US border with other countries such as the BW and VO Class I areas (since EPA is erroneously allowing states to generally treat international impacts as outside the purview of the RH SIP process) and (b) that are impacted by many states, thereby fragmenting the total contribution into many smaller ones. The fact is, as is shown in the draft RH SIP, excluding states with smaller than 5% contributions effectively sets aside a cumulative contribution that is quite large. The Technical Support Document[66] shows that at BW, the impact of states that have 5% or less contribution is 22%, while at VO the cumulative impact of such states is 23%. Setting aside these states is also arguably unfair to the sources and states that are above 5% since they have to disproportionately reduce emissions to meet the glide path. Thus, the 5% threshold

[64] Ibid. See p. 50.
[65] Ibid. See p. 37 and p. 39.
[66] Technical Support Document, Figures 8.2 and 8.3., p. 80.

should not be used as a bright line to simply exclude states. States can and should use judgment in defining the appropriate threshold, considering the individual Class I area, its location and extent, and the number and magnitude of the contributing states' impacts.

2. The Northeast Minnesota Plan contemplates a Memorandum of Understanding (MOU) between the state and the FLMs with regards to how future, new sources will be handled with regards to haze impacts in the two Class I areas. This MOU should be subject to public review since it is apparently going to contain not just procedural aspects of the review of new source impacts between the state and the FLM but also technical aspects of such review. For example, there are suggestions that as long as new sources remain below an emissions cap, then individual source modeling may not be necessary. Clearly, new sources, if major, cannot forgo federal and state New Source Review analysis (such as PSD) as applicable as a result of this MOU. Since NSR/PSD requires modeling, it is not clear why haze modeling cannot also be performed, or what savings would result from not requiring haze modeling from new sources. The RH SIP and the MOU should articulate any underlying rationale in this regard. From a technical perspective, modeling impacts at a receptor clearly depend on source location in relation to the receptor. Thus, only using an emissions cap to excuse modeling, without knowing source locations, cannot substitute for proper impact analysis.

3. The RH SIP does not contain any analysis of the impact on haze due to users and visitors to the two Class I areas.[67] Both Class I areas are used by significant number of visitors annually.[68] And clearly, use of the Class I areas is accompanied by emissions-creating activities such as mobile source emissions associated with transportation to and from the Class I area, mobile source emissions while at the Class I areas, etc. Since these emissions obviously occur in close proximity to the Class I areas, their impacts are likely to be significant at each Class I area and in particular, scenic vista locations – the very protection of which is the whole reason for the RH SIP. Thus, it is a deficiency of the RH SIP that such activities and impacts are completely disregarded. If the state believes that these activities and impacts are insignificant, then the analytical support for such a conclusion should be provided in the record. If, on the other hand, impacts (now or projected in the future) are likely to be significant, then mitigation measures, appropriate to minimizing such impacts should be discussed.

4. The role of fire emissions on haze at the two Class I areas should be discussed in more detail. Clearly, fire emissions (whether originating in Canada or in the US) have been shown to impact haze on an episodic basis at the Class I areas. Further, as the RH SIP notes, a study by "a MRPO contractor developed an inventory of fire emissions from agricultural, prescribed, and wildfire burning in 2001 – 2003 for the Midwest States; the report shows that Minnesota has the greatest emissions of the eight

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[67] Significant impacts on Class I areas by visitors is not idle speculation. Specific impacts such as those due to transportation have long been recognized. See Memorandum on Transportation Planning to Address Impacts of Transportation on National Parks, Weekly Compilation of Presidential Documents, April 29, 1996 available at http://findarticles.com/p/articles/mi_m2889/is_n17_v32/ai_18565005

[68] For example, over 220,000 recreational visitors came to VO in 2007. See http://www.nature.nps.gov/stats/viewReport.cfm.

States due to burning."[69] This report showed that "[I]n addition, total acres burned by both wildfire and prescribed fire increased in each successive year, and total acres burned in Minnesota were usually more than twice the next highest state." Since the Smoke Management Plan is not proposed to be part of the RH SIP, it is not clear how the objectives of smoke management (i.e., from prescribed fires) will tie in with regional haze goals. If the total acres increased "...in each successive year..." what is the projection for prescribed fire acres in the long term? How will wildfire risks increase with global climate change impacts and how will this affect haze in the two Class I areas? The RH SIP does not provide insight into these and related questions.

5. The RH SIP does not discuss explicitly emissions impacts due to construction activities, as required by the EPA regulations.[70]

6. One useful comparison regarding progress against the glide paths would be to provide comparisons of modeled deciview values against actual measurements (converted) at the IMPROVE monitors taken in 2007, since this data should now be available. The final RH SIP should provide this comparison.

[69] See Draft SIP, Ch. 10, p. 86.
[70] 40 CFR § 51.308(d)(3)(v)(B).

SIGNATURE PAGE

Dated: 5-14-08

Dr. Ranajit Sahu

Subscribed and sworn before me on this 14th day of May, 2008.

My commission expires Feb. 22, 2011.

Notary Public

DONNA GROGAN
Notary Public State of Nevada
No. 07-2004-1
My appt. exp. Feb. 22, 2011

Attachment A

Resume

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES

311 North Story Place
Alhambra, CA 91801
Phone: 626-382-0001
e-mail (preferred): sahuron@earthlink.net

EXPERIENCE SUMMARY

Dr. Sahu has over seventeen years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment; soils and groundwater remediation; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and stormwater discharges, RCRA permitting, etc.), multimedia/multipathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over sixteen years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past seventeen years include various steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Dept. of Justice, California DTSC, various municipalities, etc.). Dr. Sahu has performed projects in over 44 states, numerous local jurisdictions and internationally.

In addition to consulting, Dr. Sahu has taught and continues to teach numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past fifteen years. In this time period he has also taught at Caltech, his alma mater and at USC (air pollution) and Cal State Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

He has excellent written and verbal communication skills in English.

References and specific project experience are available upon request.

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.) public sector (such as the US Department of Justice, EPA, State of California DTSC, etc.) and public interest group clients with project management, air quality consulting, waste remediation and management consulting, as well as regulatory and engineering support consulting services.

1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for** Air Quality/Geosciences/Hazardous Waste Groups, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.

Parsons ES, **Manager for Air Source Testing Services.** Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.

1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.

1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.

1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.

1988-1989 Heat Transfer Research, Inc. **Research Engineer.** Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1984 M. S., Mechanical Engineering, Caltech, Pasadena, CA.

1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

"Thermodynamics and Heat Transfer," Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992-present.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-present.

Air and Waste Management Association, West Coast Section, 1989-present.

PROFESSIONAL CERTIFICATIONS

EIT, California (# XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2009.

PUBLICATIONS (PARTIAL LIST)

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C.Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R.Gavalas, *Combust. Flame*, 77, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in **"Combustion Measurements"** (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

"From Puchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada," with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

"The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants," with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

PRESENTATIONS (PARTIAL LIST)

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

Annex A

Litigation Support

1. Matters for which Dr. Sahu has have provided depositions and affidavits/expert reports include:

(a) Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill

(b) Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.

(c) Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the US Department of Justice in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (S.D. Ohio).

(d) Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the US Department of Justice in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (S.D. Ill.).

(e) Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the US Department of Justice in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (M.D.N.C.).

(f) Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the US Department of Justice in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (S.D. Ohio).

(g) Expert reports and depositions (10/31/2005 and 11/1/2005) on behalf of the US Department of Justice in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc.*, 5:04-cv-00034-KSF (E.D. KY).

(h) Deposition (10/20/2005) on behalf of the US Department of Justice in connection with the Cinergy NSR Case. *United States, et* al. *v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (S.D. Ind.).

(i) Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.

(j) Expert report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.

(k) Expert report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

(l) Expert report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.

(m) Expert report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.

(n) Expert reports and deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (W.D. Pennsylvania).

(o) Expert reports and pre-filed testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.

(p) Expert reports and deposition (October 2007) on behalf of MTD Products Inc., in connection with General Power Products, LLC v MTD Products Inc., 1:06 CVA 0143 (S.D. Ohio, Western Division)

2. Occasions where Dr. Sahu has provided testimony at trial or in similar proceedings include the following:

(q) In February, 2002, provided expert witness testimony on emissions data on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

(r) In February 2003, provided expert witness testimony on regulatory framework and emissions calculation methodology issues on behalf of the US Department of Justice in the Ohio Edison NSR Case in the US District Court for the Southern District of Ohio.

(s) In June 2003, provided expert witness testimony on regulatory framework, emissions calculation methodology, and emissions calculations on behalf of the US Department of Justice in the Illinois Power NSR Case in the US District Court for the Southern District of Illinois.

(t) In August 2006, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Western Greenbrier) on behalf of the Appalachian Center for the Economy and the Environment in West Virginia.

(u) In May 2007, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Thompson River Cogeneration) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) before the Montana Board of Environmental Review.

(v) In October 2007, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Sevier Power Plant) on behalf of the Sierra Club before the Utah Air Quality Board .

May 16, 2008 (Submitted Electronically)

Mr. David Thornton
Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Re: Draft Haze State Implementation Plan Comments

Dear Mr. Thornton:

The following comments regarding the Draft Regional Haze SIP are submitted by Northeastern Minnesotans for Wilderness (NMW). NMW is a regional grassroots, wilderness advocacy group. Our contact is,

NMW
821 E. Pattison ST
Ely, MN 55731
(218) 365-2272
Email concerning Regional Haze may be sent to, "Brad Sagen" hbsagen@cpinternet.com.

NMW's core mission is to preserve and protect wilderness and wild places in the Minnesota Arrowhead Region, especially the BWCAW. Since its founding in 1996 NMW has grown to represent over 400 members and supporters in Northeastern Minnesota. Most NMW members and supporters live in the (Arrowhead) Region of the two Class I Areas listed for protection under the Regional Haze Plan. Because of our regional focus and experience, NMW comments will focus on SIP considerations concerning the 6 county Northeast Minnesota area (the concept plan for Northeastern Minnesota).

NMW has reviewed the materials prepared for submission by MCEA and the expert analysis as contained in the affidavit submitted by Dr. Ranajit Sahu. NMW hereby incorporates, as if set forth herein, the letter of comments from MCEA to MPCA dated May 16 and the affadavit from Dr. Ranajit Sahu attached to that letter.

2064 Goal

The most salient fact in the draft SIP (Changes Made…, p.3) is that the State will not achieve the mandated Natural Conditions target by 2064. The projected compliance by Minnesota is VNP by 2177 and BWCAW by 2093. **In view of other problems with the SIP, this fact alone should disqualify the current plan from receiving Federal approval.**

The SIP expresses no sense of urgency regarding proposed emissions reduction activities. Indeed it effectively postpones implementation of most major activities such as BART requirements until at least 2012.

Realism of the Intermediate Emission Reduction Targets Toward Achieving the Ultimate Target
While the intermediate targets of a 20 percent reduction in emissions 2002-12 and a 30 percent reduction 2002-18 appear formidable, one can question their potential contribution toward achieving the mandated reduction in haze by 2064. The 2002-12 emissions reduction target is 2 percent (1911 tons) a year. The 2012-18 target is an additional 10 percent reduction, yielding a total reduction of 30 percent 2002-18.

The absolute reduction 2012-18, however, is only 1593 tons per year, or 17 per year less than the 2002-12 annual reduction. This is not made clear or discussed in the Draft SIP. The 2012-18 decline in projected annual amounts of reduction appears more realistic because of expected declining marginal rates of return in investment in emissions reduction and in compliance enforcement. (2012-18 reductions actually require a 2 percent annual reduction when measured against the 2012 expected level of emissions as a base.)

Because of reductions anticipated from a variety of sources in the near term, the near term 2012 reduction target should be increased to achieve a more realistic "glide path" over the longer term. **NMW recommends that the 2012 emissions reduction target be set at 25 percent or 2.5 percent per year, and that the 2012-18 target be maintained at a further 10 percent reduction.** This would achieve a 35 percent reduction in emissions 2002-18, a more realistic goal if the 2064 ultimate target is to be achieved.

Problems with Data and Modeling
Dr. Sahu's analysis of data and modeling (Affidavit attached to MCEA letter of May 16) addresses a number of emissions data, projections, and modeling problems on which NMW will offer brief comments in areas of NMW focus and experience.

Emissions Inventory Data. Dr. Sahu identifies a number of gross differences in the several emissions inventories reported in the draft SIP for both 2002 and for 2005 (Sahu Affadavit IV Emissions Inventory .2 and .5). Sahu concludes, and NMW concurs, that little confidence can be place in the Minnesota emissions reported by MPCA.

Special attention is directed to the differences in inventory data concerning point sources from various reports (Sahu Affadavit, IV Emissions Inventory .4) since point sources form the single most important factor in scenarios and SIP projections for emissions reductions. Any confidence in SIP data is undermined by the discrepancies in this most fundamental of data classifications.

Climate Change. The SIP makes no direct mention of climate change as a factor in emissions. Climate change can play an enormous role in meteorological patterns which affect geographic patterns of pollution such as from Canada, and fire and smoke pollution problems (Sahu, II. General Comments .6). The absence of climate change as a factor should either be addressed in the SIP or the exclusion justified.

Canada. Projections for emissions from Canada make the untenable assumption that emissions will remain constant 2005-18 (Sahu, IV Emissions Inventory .8). The projections discount the probability that emissions will increase due to normal growth and in the absence of any

meaningful Canadian legislation concerning emissions reduction. Canadian pollution in the Class I Region is likely to increase because of projects such as the accelerated development of Canadian tar sands in Alberta. As noted earlier, Canadian projections will be substantially affected by meteorological patterns and thus by climate change.

Ammonia. MPCA (Sahu IV. Emissions Inventory .8) does recognize the significance of ammonia as a pollutant and substantial factor in emissions inventories and projections. MPCA, however, does not recommend additional data gathering or monitoring regarding ammonia and rejects responsibility for filling data gaps. This is irresponsible and should be rejected by Federal decision-makers regarding the SIP.

NMW concludes that problems of data, modeling, and projections identified by Dr. Sahu are so substantial that the SIP should not receive Federal approval until substantial improvements are made.

Monitoring Data

The problems of data, modeling, and projections concerning emissions sources and reductions suggest that much greater reliance must be placed on the actual monitoring data. In this regard, certain problems and uncertainties in monitoring must be addressed.

Monitoring Locations. The two current monitoring locations have not been subjected to analysis regarding representation of the two Class I areas, capturing of conditions at scenic vistas, and over and under reporting of haze.

Variability in Monitoring Data. The summary Haze monitoring data for BWCAW and VNP for 2000-04 (Sahu III Visibility Measurements .2) reveal substantial variations with no discernable patterns or likely explanations. (None are provided in the SIP.) Yet the data provide the basis for determination of SIP progress or the lack of it, and for making crucial decisions regarding next steps in pollution control. The data, and the monitoring locations and other considerations, should be subjected to rigorous analysis.

Federal Funding of Monitoring Sites. Continued Federal funding of the two sites is apparently uncertain. The centrality of adequate monitoring to fulfillment of EPA requirements should be made clear. The State should be prepared to assume some responsibility for funding, should Federal support be withdrawn.

BART

This section draws upon but does not offer the details provided by the Dr. Rahu Affadavit attached to the MCEA letter of 5/16. As Dr Rahu states (V. BART):

> EPA notes that "[A] State's regional haze (RH) SIP submittal must include source-specific BART emission limits and compliance schedules for each source subject to BART. See 40 CFR 51.308(e). All regulatory requirements must be approved into the SIP.[1],[2] It also notes that "[A]s specified in 40 CFR 51.308(e)(1)(v), States are required to ensure each source subject to BART install and operate BART *as expeditiously as practicable*, but in no event later than 5 years after approval of the implementation plan revision. States should ensure that BART requirements in a SIP are written in a way that clearly specifies the individual emission unit(s) subject to BART regulation and the time by which the emission unit(s) must begin to comply with the BART limit." The governing regulations[3] note that "…[T]he following elements, at a minimum, must be addressed to ensure…. BART controls are adopted into the State's SIP – "[N]ame of source facility and the specific emission units and pollutants being controlled…"[4] and "[S]pecifics of the controls, control efficiency(ies), emissions reductions expected.[5]

Footnotes renumbered.*

*Renumbered Footnotes to Rahu Affadavit.

[1] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #1)
[2] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #4)
[3] 40 CFR Part 51, Appendix Y – Section V.
[4] 40 CFR 51.308(e)(1)(i) and (ii)
[5] Additional Regional Haze Questions, EPA document dated August 24, 2006. (BART #4)

The SIP clearly fails to meet these requirements. "At this time we cannot predict what emissions reductions might result from BART in Minnesota" (SIP, Chap 10, p. 81). This is particularly true for the taconite indurating furnace lines for which no BART limits have been established. **NMW requests that the SIP specifically address the EPA requirements concerning BART as communicated in the Dr. Ranjit Rahu Affidavit submitted by MCEA, May 16, 2008.**

Bart Timetable. The SIP now offers a very loose timetable postponing even pilot testing of taconite BART to 2010 and required controls to begin installation in 2013 (Changes Made… 04/08 Packet). This schedule only contributes to the projected failure to attain the 2064 target and makes problematic the attainment of the 2018 30% emissions reduction. **NMW recommends that pilot testing of BART control strategies begin as soon as practicable, and certainly concurrent with the tracking of emissions and determination of BART limits proposed for 2008-10. The schedule currently proposed suggests notable foot dragging by MPCA added to the reluctance of taconite mining facilities to propose meaningful control strategies.** Some timetable such as that recommended is the only way the SIP will comply with the 5 year requirement for implementation following approval of the SIP.

BART in EGU. The draft SIP exempts EGU's from BART considerations at this time. This is indefensible, especially in view of the inaccuracies and uncertainties in overall current data and projections. **EGU's should be subject to the same BART guidelines as taconite facilities and neither should be limited to the 5% threshold for consideration.**

Dysfunctions in the Incentives/Sanctions Program for Taconite Emissions

One goal of the NE Minnesota Plan (p.78) is to "spur" development of new control options at taconite facilities. The plan itself (pp.82-84), however, relies on compliance rather than the positive incentives implied by the verb, "spur." Moreover, there appears to be little incentive for individual facilities to even comply. The economic incentive to mining is to prolong the compliance process and to offer only the minimum necessary for compliance. The threat seems to be the imposition of a State Retrofit Requirement (p.84). We contrast this scenario with the evidence submitted that (some) voluntary progress is being achieved with EGU through rate recovery incentives for improved emissions controls.

{As a footnote, we offer the philosophical problem of "The Commons" in which the potential consequences for the (taconite) community as a whole cannot be addressed because the immediate negative individual consequences to members of the community prevent their stepping forward to take positive steps which would improve the general situation.}

NMW recommends that MPCA take two steps to improve the probability of significant emissions reductions by taconite facilities:
1) Make clear (to the general public and to stakeholders) the tools MPCA has at hand to compel compliance at the several stages in implementation of the SIP.
2) Develop positive economic incentives for taconite facilities to develop and implement new emissions controls. (This may require new legislation.)

New Construction Activities

EPA requires emissions impacts analysis for new construction activities (40 CFR § 51.308(d)(3)(v)(B). The draft SIP does not address the issue. There is substantial new construction underway and proposed on the Iron Range for mining and energy especially. According to (the State Agency) Iron Range Resources (Ely Echo, 5/12/08), "About $5 billion in economic development projects are under construction or proposed along a 110-mile corridor stretching from Cohasset to Babbitt and beyond." The projects cited involve an estimated 7,000 construction jobs and are all mining or energy. **The SIP should address the new construction activities issue as required by EPA, with special attention to the NE Minnesota Plan area.**

Mobile Sources and Visitors to Class I Areas

The BWCAW and VNP are destinations for a considerable number of visitors annually (an estimated 250,000 to the BWCAW and 220,000 to VNP). According to USFS, Superior National Forest, adjacent to and surrounding much of these areas, is estimated to draw 4 million visitors annually. Visitors typically arrive by motor vehicle and often drive portions of the perimeters of the two Class I areas. OHV and snowmobile use is heavy in the vicinity of the two areas. Moreover, motorboats and snowmobiles are permitted in VNP and motorboats are allowed in portions of the BW. The older 2 stroke engines still used in many recreational mobile sources are considered to be substantial polluters. In addition, open cooking and camp fires are typically approved in both Class I areas. **In view of the proximity to the scenic vistas deserving of Regional Haze protection, SIP emissions analysis should consider visitor activities and their mobile emissions sources within and in proximity to the BWCAW and VNP.**

Conclusions

The conclusions and recommendations offered by NMW are supported by the analyses reported here and by the more detailed analyses in the letter of comments from MCEA to MPCA dated May 16 and the affadavit from Dr. Ranajit Sahu attached to that letter. As noted, these latter two documents are incorporated as part of NMW public comments concerning the SIP.

The major conclusion regarding the draft SIP is that the SIP in anything like its current form should not receive Federal approval. The deficiencies are simply too great. NMW calls upon MPCA, and if necessary the Federal Government, to undertake the substantial revisions and improvements recommended for the current draft SIP. NMW will provide responsible support for these efforts.

Sincerely,

Brad Sagen, Chair
NMW Board of Directors

From: Dagostino.Kathleen@epamail.epa.gov
Sent: Wednesday, April 23, 2008 12:57 PM
To: Catherine.Neuschler@state.mn.us
Cc: Bortzer.Jay@epamail.epa.gov; Mooney.John@epamail.epa.gov;
Summerhays.John@epamail.epa.gov; Rosenthal.Steven@epamail.epa.gov;
Aburano.Douglas@epamail.epa.gov; Rau.Matthew@epamail.epa.gov
Subject: Comments on Draft Regional Haze SIP

Catherine,

Matt has finished reviewing your draft regional haze submittal and has a few minor comments which I have summarized below. We will be formalizing these comments and submitting them to you before the end of the public comment period.

1) Minnesota needs to submit a complete 2005 emissions inventory. Currently only a 2005 point source inventory has been submitted.

2) Minnesota should include a discussion regarding agricultural burning. If this source was not included because of minimal impacts, this should be articulated and supporting information should be included.

3) MPCA should set deadlines for major steps of the taconite BART process such as installation of CEMs and completion of pilot studies to keep things on track. It appears that MPCA has done this in the most recent draft developed in response to comments.

4) As we are sure you are aware, prior to final submittal, the state must replace "placeholders" with actual documents; e.g., response to public comments.

Let us know if you have any questions.

Thanks,

Kathleen & Matt

From: Rau.Matthew@epamail.epa.gov
Sent: Thursday, May 15, 2008 5:58 PM
To: Neuschler, Catherine
Subject: Draft Regional Haze SIP Comments

Catherine,

Here is what will be sent in a letter to John Seltz:

Comments on February 2008 Draft Minnesota Regional Haze SIP:

The additions and clarifications to the Regional Haze SIP presented in the document "Changes Made to Regional Haze SIP Since Public Review Draft" are helpful. The table proving key dates for the BART process and the Northeast Minnesota Plan are especially helpful.

The schedule in the table suggests it could be mid-2012 before BART limits are incorporated into permits. This is a concern because Minnesota is already past due in submitting enforceable BART limits. I understand that the state is pursuing additional data from its taconite facilities so that appropriate emission limits can be set. Still, EPA is concerned over any delays in setting BART limits. I encourage Minnesota to set appropriate emission limits for its taconite facilities in an enforceable form as quickly as possible.

Considering the Northeast Minnesota Plan, it is not clear what the emission target is beyond 2018. Does the 2018 target remain for the years beyond? Will a new target be set in the 2018 Regional Haze SIP revision? I recommend clarifying what the emission target will be in 2019 and beyond.

Agricultural burning is briefly discussed on page 88 of the draft SIP. There is no mention of the impact of agricultural burning on visibility. The language states that agricultural burning may be addressed in a future SIP revision. It is not clear to the reader if impact of agricultural burning is insignificant, but will be watched in case it becomes an issue or if the state is unsure on the impact now, but it will study it further and take action if warranted. I suggest adding a statement on agricultural burning impact on visibility in Minnesota.

The emissions inventory for 2005 appears incomplete as it only

includes point sources emissions. The 2002 emissions inventory summarizes point source emission and also area source and mobile source emissions. Minnesota has indicated that staff members have completed the 2005 emissions inventory and that it will be included in the final SIP. A complete 2005 emissions inventory can be used with the 2002 baseline emissions inventory and future year emissions inventories to better see trends in emissions than comparing just to the 2002 baseline. EPA supports the inclusion of the complete 2005 emissions inventory in final SIP.

Let me know if you have any questions.

-- Matt

MPCA Response to Comments

Comment Letter 1: Johanna Lester

This comment was mainly concerned with pollution from motor vehicles, particularly smog created around the Twin Cities from idling cars and buses. The commenter stated that "Minnesota has fallen behind in setting standards" and referenced restrictions on burning and vehicle inspection requirements in Los Angeles. This comment also included the statement "If there is technology out there, it should be required of industry as well."

MPCA Response: The comment is focused largely on the problem of urban air pollution. Although this is an important issue, it is not directly related to the Regional Haze program. The commenter did not list any specific concerns with the draft Regional Haze SIP.

Comment Letter 2: Boise White Paper, L.L.C, David Reimer

1) *Cost of Controls* – These comments are on Appendix 3.2 and Appendix 10.6, Table 10.6.1, which contain a table of potentially reasonable NO_X controls within Q/5d[121] of BWCAW and VNP, based on the work of CENRAP. The tables indicate that SCR might be a potential reasonable control option for Boise's recovery furnace. Boise believes that the technological feasibility of applying SCR to recovery furnaces has not been proven, and that, even were the technology feasible, the costs would be considerably higher than reflected in the table. Boise references its 1999 PSD permit application, where the cost per ton of NO_X reduction using SCR was estimated at $29,650/ton. Boise requests that the MPCA either remove the references to Boise from the tables or reflect these higher costs.

MPCA Response: In part due to Boise's concerns, which had previously been made known to MPCA, Appendix 10.6 states that "the MPCA believes that these cost curves are not appropriate for making a final determination of whether controls on a certain source are cost-effective. Therefore, Minnesota is using these tables merely to point to sources or source categories that should be further evaluated in order to determine if controls are cost-effective and could be undertaken in the future for reasonable progress. The listing in this table of a control strategy on a specific source should not be considered a definitive statement of the cost-effectiveness of the listed control or a specific decision or request to place the listed controls on the stated source." In order to make this more clear, in response to this comment the language was modified to state "these cost estimates" rather than referring to cost curves. However, because this table is the work of CENRAP rather than the MPCA, the MPCA feels it is inappropriate to alter the table.

2) *Climate Change* – The commenter is concerned that there is no mention in the draft Regional Haze SIP about climate change legislation and its potential impacts on regional haze and regional haze regulations. The commenter states that Northeast Minnesota has the potential for development and use of biomass fuel sources, which make economic sense and could reduce emissions of CO_2, SO_2, and NO_X. However, there is also a potential for increased NO_X emissions from biomass compared to NO_X emissions from the use of natural gas. The commenter believes that use of biomass fuels for reducing greenhouse gases needs to be considered.

MPCA Response: The MPCA has added some information concerning climate change impacts and possible regulations to the SIP. However, while the MPCA appreciates Boise's concern, at this time the situation with climate change legislation or regulations in Minnesota is still evolving. Therefore, it is difficult to determine how programs to reduce emissions of greenhouse gases and those to improve visibility will overlap. As the Regional Haze program is very long term, it is likely that any interactions will be taken into account in future SIPs.

[121] If a facility is within Q/5d of a Class I area, that means that its annual emissions of the specified pollutant when divided by 5 times the distance in kilometers to the Class I area is greater than 1.

Comment Letter 3: USDA Forest Service, James W. Sanders

1) *Baseline Visibility Conditions* – The Forest Service supports the MPCA's inclusion of the high-deciview, incomplete sample days in the baseline visibility conditions.

MPCA Response: Comment Noted.

2) *BART for Taconite* – In initial BART comments (April 10, 2007), incorporated into their SIP comment letter, the Forest Service commented that the BART analyses submitted by the taconite facilities are incomplete, and raised concerns that the industry is proposing few actions that will contribute to reducing haze. They also commented that more actions could be taken to optimize the existing scrubbers for SO_2 removal, or that different fuel blends could be used to reduce SO_2 emissions, and that the Low Temperature Oxidation (LoTOx) control technology is technologically and economically feasible for the taconite industry. The Forest Service comments particularly that an SO_2 BART determination for United Taconite's Line 2 should be made in this SIP submittal, and that they believe BART to be either installation of a new recirculating scrubber or an SO_2 standard based on the level of SO_2 emissions from the rest of the industry. In addition, they state that they are willing to delay the determination of NO_X BART controls in order to allow for trials of new technology, but that the content of the control studies should be more clearly specified. They also reiterate that more investigation should be done into optimizing scrubbers for SO_2 removal.

MPCA Response: The MPCA appreciates the Forest Service's commitment to working with the MPCA and the facilities to determine the most appropriate NO_X BART determination for the taconite facilities. Some language was added to clarify that pilot testing would be required to be on site and when it would take place.

In regards to the SO_2 BART limits, the MPCA's intention is to set SO_2 limits based on optimal operation of the PM scrubbers for SO_2 removal. Language has been added to the SIP to explain that the MPCA believes the scrubbers at the natural gas fired facilities are already optimized for SO_2 removal, but that more data is needed to determine if this is the case at solid fuel fired lines. Therefore, in the case of most lines that burn solid fuels, SO_2 limits will be set after baseline data is gathered using CEMs or the alternative methods.

For United Taconite Line 2, the MPCA agrees that an SO_2 BART limit can and should be set at this time. In the SIP, the MPCA has set a limit of 1.7 lbs SO_2/MMBtu heat input, which the MPCA believes can be cost-effectively met through fuel blending or addition of a recirculating scrubber. This limit is documented in Appendix 9.3.

During discussion of BART limits with United Taconite, it became clear that the opportunity to pursue a substitute for BART (which was described briefly in the initial draft SIP) needed to be clearly stated to apply to all subject-to-BART sources and that MPCA's criteria for determining an appropriate substitute for BART needed to be elaborated. The MPCA has therefore added the following language to the Regional Haze SIP, and to United Taconite's BART determination memo:

> *"A facility may choose to propose a BART Alternative project. The BART Alternative must result in equivalent or greater emissions reductions and visibility benefits when compared to the MPCA's BART determination.*
>
> *Should a facility choose to propose a BART alternative, the proposal must include:*
> - *A demonstration of equivalent or greater combined annual emission reductions of NO_X and SO_2 (in tpy) than that established in this BART determination;*
> - *Appropriate visibility modeling demonstrating equivalent or greater visibility protection than the MPCA's BART determination; and*
> - *A proposal for enforceable emission limitations, with appropriate and justified averaging periods and methods for evaluating compliance.*

Since the facility would be proposing an alternative to MPCA's BART determination, visibility modeling should follow the MPCA's Guidance for Facilities Conducting a BART Analysis[122] and Best Available Retrofit Technology (BART) Modeling Protocol to Determine Sources Subject-to-BART in the State of Minnesota,[123] using the most recent versions of any model or EPA guidance referenced in those documents. The modeling should compare the baseline, pre-control scenario to post-control scenarios representing the MPCA's BART determination and the BART alternative being proposed by the facility.

Facilities may propose a BART alternative that covers multiple BART units or both BART and non-BART units at the facility in the same source category. A proposal covering BART and non-BART units must demonstrate greater emission reductions and more visibility improvement than MPCA's BART determination.

The MPCA would evaluate the BART alternative proposal, consult with the Federal Land Managers, and determine if it is an acceptable BART alternative. If the project is deemed to result in equivalent or greater pollution control than BART, the MPCA may determine that the proposed project is equivalent to BART. The resulting emission limits would then substitute for the BART emission limits."

3) *CEMs at the Taconite Plants* – Concern was raised by the Forest Service about a statement in the SIP that NO_X CEMs were only being required at the natural gas fired taconite plants. The Forest Service also raised a concern about the timeline for requiring CEMs, as only two plants had agreed to install CEMs. The Forest Service requested more information to describe the requirements that an alternative method to CEMs would have to meet for those facilities that will not be installing CEMs at this time. Also, the commenter stated that a timeline for final BART determinations and inclusion in facility Title V permits should be established.

MPCA Response: The statement that NO_X CEMs or equivalent would only be required at natural gas fired facilities was an error and has been corrected to state "the requirement for more accurate data collection through CEMs or a comparable alternative applies to NO_X emissions at all the facilities."

In regards to the Administrative Orders by Consent for gathering emissions data to support setting BART limits, each taconite facility has signed an Order to install CEMs or undertake an equivalent method of emission measurement. At the time of the initial draft SIP, only US Steel – MinnTac and US Still – KeeTac had agreed to install CEMs. United Taconite has also agreed to install CEMs on both of its indurating furnaces, and the revised SIP includes an Order requiring submission of NO_X emissions information to the MPCA.

Each Order for an equivalent method specifies a period for developing the alternative method and MPCA's approval, along with times for data submission. The Orders require all the facilities to begin to submit data in the first part of 2009; this will allow MPCA to meet its commitment to make BART determinations by September 2010 with a year's worth of operating data. Some data has already been submitted.

The Orders that rely on the alternative method to CEMs installation for gathering emissions data include the basic requirements that need to be met by the facilities in order to employ the alternative method, and require that the alternative method be approved by MPCA. In addition, language was added to the BART chapter to better describe the alternative method. The MPCA also added Table 10.5 to the SIP in order to better delineate the timelines for the completion of taconite BART and the Northeast Minnesota plan. The table notes that MPCA will complete BART determinations by August 2010, and include BART limits in facility Title V permits by September 2011.

4) *BART for EGUs* – The commenter requested that MPCA make unit-specific BART determinations in this SIP so that there is no delay in BART implementation if Minnesota is removed from CAIR.

[122] http://www.pca.state.mn.us/publications/aq-sip2-09.pdf
[123] http://www.pca.state.mn.us/publications/aq-sip2-05.pdf

Specifically, there is concern about Northshore's Power Boiler 2, where no control projects are being undertaken and no BART-like NO_X or SO_2 limits were specified in the SIP.

MPCA Response: At the time of the initial draft Regional Haze SIP being placed on public notice, the MPCA did not feel it necessary to make unit-specific BART determinations for NO_X and SO_2 for EGUs, due to Minnesota's participation in CAIR and the emission reductions expected at subject-to-BART EGUs. Although CAIR was being legally challenged, none of the challengers were asking for the rule's vacatur.

However, after the public comment period for the draft SIP, the DC Circuit Court of Appeals vacated CAIR. It subsequently reversed the vacatur and remanded the rulemaking to EPA, while leaving CAIR in place. One of the issues EPA is directed to study on remand is whether Minnesota's emissions met the threshold for inclusion. Although CAIR remains in effect, EPA has proposed a rule that will stay the effectiveness of CAIR in Minnesota. Therefore, the MPCA has proceeded to make BART determinations for the subject-to-BART EGUs, requiring emission reductions even if CAIR does not remain in effect for Minnesota. Language describing the legal proceedings concerning CAIR was also added to the SIP.

MPCA's EGU BART determinations are documented in Appendix 9.4 of the revised SIP; for ease of review, the table below shows the BART determinations for NO_X and SO_2 for these facilities.

Facility	NO_X BART Limit	SO_2 BART Limit
Minnesota Power – Taconite Harbor Unit 3	0.13 lb/MMBtu	0.42 lb/MMBtu
Minnesota Power – Boswell Unit 3	0.07 lb/MMBtu	0.09 lb/MMBtu
Xcel – Sherburne County Units 1 and 2	0.15 lb/MMBtu	0.12 lb/MMBtu
Rochester Public Utilities – Silver Lake Unit 3	No Limit	2.30 lb/MMBtu
Rochester Public Utilities – Silver Lake Unit 4	0.25 lb/MMBtu	0.60 lb/MMBtu
Northshore Mining – Power Boiler #1*	0.41 lb/MMBtu	0.41 lb/MMBtu
Northshore Mining – Power Boiler #2	0.40 lb/MMBtu	0.48 lb/MMBtu

* Note that Unit 1 is not a BART unit, but was added to the BART determination because it was decided that both power boilers were the logical set to which controls would apply. See the BART memo in Appendix 9.4 for details.

The MPCA also investigated the difference between the EGU emissions estimated by IPM3.0 and used in the SIP modeling and EGU emissions projected without CAIR. For Minnesota, total EGU emissions were very similar. The SIP modeling has 6% (2,900 tons) less NO_X and 9% (4,400 tons) more SO_2 than projected by Midwest RPO from Minnesota EGUs with BART and known controls. Language discussing this similarity was added to Chapter 8 of the revised SIP. Because of similarity in emissions, the MPCA did not alter the modeling used to set the RPG in the SIP.

5) *New Sources* – The commenter expressed support for the State's modeling including new sources that were in the process of being permitted, and notes that more sources in Northeastern Minnesota are currently in the planning stages.

MPCA Response: Comment noted.

6) *Reasonable Progress* – The commenter requested that the MPCA add more specific dates and deadlines for various tasks in the Northeast Minnesota plan, particularly for MPCA's review of taconite plant research into emission reductions. The commenter also requested clarification that the 2018 target for Northeast Minnesota will continue past 2018 unless modified in the next SIP.

MPCA Response: In response to this and other comments, MPCA added Table 10.5, which lists the tasks involved in implementing the remainder of the BART determinations and the Northeast Minnesota Plan, with associated dates. Table 10.5 is reproduced here:

Process	Dates
Begin data collection and reporting for taconite facilities with new CEMs/PEMS, as required by Administrative Orders	November 2008
Begin annual tracking of NE Minnesota Plan emissions	December 2008
MPCA determines remaining BART limits for each taconite facility	By August 31, 2011
MPCA determines if 2012 target will be met, and projects status of 2018 emission reduction target.	January – December 2012
Taconite facilities conduct pilot testing of potential control strategies and pollution prevention	July 2011 – December 2012
Taconite facilities report to MPCA on results of pilot testing	By March 1, 2013
MPCA reviews pilot testing reports and determines if any additional controls are reasonable	March – June 2013
MPCA does preliminary analysis of potentially reasonable reductions from non-taconite facilities in NE Minnesota.	January – June 2013
MPCA develops enforceable mechanism to require any additional control found to be feasible, for both taconite and (if necessary) non-taconite facilities	July 2013 – June 2014
MPCA submits 5 year assessment which includes BART limits, determination of additional reasonable controls.	July 2014
Facilities install any additional controls found to be reasonable	2015 and forward

The SIP was clarified to indicate that emissions in Northeast Minnesota will continue to be held to the level specified by the 2018 target, 30% below 2002 levels.

7) *Smoke Management* – The commenter expressed concern that the level of detail included on the Smoke Management Plan (SMP) creates an unnecessary hurdle to making future changes to the SMP without a SIP revision.

MPCA Response: The SMP is not part of Minnesota's submittal for inclusion in the SIP. The MPCA feels that some level of detail on the SMP is necessary, so that readers who are not familiar with the SMP can get a basic understanding of what it contains and requires. MPCA added language to clarify that the SMP is often revised and updated and that MPCA is not requesting that the language of the SMP be explicitly approved into the SIP.

8) *Interstate Consultation* – The commenter hopes that EPA will facilitate discussions between Minnesota and neighboring states to ensure that contributing states obtain their fair share of emissions reductions.

MPCA Response: MPCA agrees that EPA needs to settle any disputes between Minnesota's SIP and those submitted by contributing states if it appears that contributing states will not achieve their fair share of emission reductions. The MPCA intends to continue participating in the Northern Class I consultation process, discussing regional haze issues with nearby states.

Comment Letter 4: US Department of the Interior, Lyle Laverty

1) *Baseline, Natural Conditions, and Uniform Rate of Progress* – The commenter concurs with the State's decision to use adjusted baseline conditions

MPCA Response: Comment noted.

2) *BART for EGUs* – The commenter requested that the SIP include unit-specific BART emission limits for EGUs, in order to avoid delay in BART implementation if CAIR is vacated or Minnesota is removed from CAIR.

MPCA Response: See response to Forest Service comment #4.

3) *BART for Taconite* – The commenter states that they believe there is sufficient information to determine SO_2 BART emission limits at this time, particularly at United Taconite's Line 2, and that

they should be included in the SIP. They also raise concerns about the proposed SO_2 limits for lines that burn low sulfur fuels, as these are above measured emission rates. In addition, the commenter concurs with the delay in setting NO_X BART limits as long as CEMs or equivalent emission estimation methods are in place by November 2008, with reporting beginning in January 2009; that sources have to do on-site pilot scale studies with results reported to the MPCA by December 2011; and that permits with BART limits are completed by December 2012.

MPCA Response: For United Taconite, see response to Forest Service comment #2.

The SO_2 BART limits for the lines that burn low sulfur fuels are based on a predictive interval (most lines) or other statistical method (Arcelor Mittal) developed from very few data points. Although higher than actual emissions, the MPCA does not believe the facilities will specifically change their operations in order to emit up to the limit. The predominant source of sulfur (and therefore, of SO_2 emissions) from these furnaces is the ore; the primary fuels - natural gas and biomass - are very low in sulfur. The MPCA believes that the geographical source of the ore used by an individual company will not change; companies have very little incentive to use ores outside those that they themselves mine. It is reasonable to assume that the ore's sulfur content will be consistent within a relatively small geographical range; however, the MPCA does not intend to use BART to limit or direct ore choice.

In terms of the timelines for BART, the MPCA agrees with the timelines laid out by the commenter. The Orders contain deadlines that match with those laid out by the commenter, and the MPCA has placed overall timelines into Table 10.5, incorporated into the SIP based on these comments. These require final BART limits to be determined by the MPCA in 2011, earlier than requested by the commenter.

4) *Reasonable Progress Goals and Long Term Strategy* – The commenter asked that MPCA clarify that the emission reduction target for the Northeast Minnesota Plan was developed with the assumption that 75% of all visibility impacts are uncontrollable by the MPCA, not generally uncontrollable. In addition, the commenter requested that the SIP commit the State to updating the information used to set the reasonable progress goals during the five year report process.

MPCA Response: MPCA added the requested clarification on uncontrollable impacts. The MPCA also further clarified that the Five Year SIP assessment submitted by the MPCA will include an update of the reasonable progress goal for 2018, taking into account all additional control strategies being implemented in Minnesota or surrounding states.

5) *Northeast Minnesota Plan*

   a. In reference to emissions from the taconite facilities, the commenter requested that "if initial CEM data indicate a dramatic reduction in emissions from the 2002 inventory and those data are not supported by significant process or line operation changes…some correction factor for CEM versus the 2002 baseline should be accounted for when determining compliance with the 30% reduction goal." The commenter also requested that a factor comparing the 2002 baseline emissions to the CEM data be part of the decision of cost-effective or reasonable additional controls.

MPCA Response: The MPCA feels that developing a numerical "correction factor" would be extremely difficult, and likely unnecessary, as the MPCA believes most of the taconite facilities have done some modifications at their lines since 2002, but prior to the installation of CEMs or development of the alternative method required under the BART Orders. However, the MPCA will examine the CEM and alternative method data, and if there are strong indications that a facility's emissions were dramatically overestimated in 2002, that will be taken into account when deciding what constitutes reasonable additional controls for that facility. The MPCA also understands that the FLMs may wish to take such a correction into account in determining if the 2012 and 2018 targets are projected to be met.

   b. The commenter requested that the SIP clearly identify the existing sources that will be tracked under the NE Minnesota plan, rather than simply having them listed in an appendix.

MPCA Response: The list of existing facilities to be tracked under the plan was added to the main body of the SIP, in addition to Appendix 10.4.

c. The commenter requested that the SIP recognize MPCA's responsibility to account for changes in emissions of minor sources, and that this could be addressed during the 2012 assessment and planning for 2018.

MPCA Response: The MPCA added language to the SIP that commits the MPCA to conducting an evaluation of the changes in emission from minor sources (those in the six county area that hold air permits but are not tracked under the Northeast Minnesota Plan) in 2012 and 2018.

d. The commenter stated that the SIP must have specific dates for the various portions of the Northeast Minnesota plan, particularly the determination of additional reasonable controls for the taconite facilities.

MPCA Response: The MPCA added Table 10.5 to the SIP to lay out the dates and timelines for both BART and the Northeast Minnesota Plan.

e. The SIP should speak to how the State will address any new permits for facilities to be located in the NE region if the 2012 target has not been met or the 2018 target is projected not to be met.

MPCA Response: The MPCA believes that the key goal is the 2018 target. If the area does not meet the 2012 goal, but is projected to meet the 2018 goal, then the plan has succeeded. If we project that the 2018 target will not be met, various regulatory options will be pursued to try to make the target; these will not necessarily apply only to existing sources or only to new sources.

In developing the plan, the MPCA and the FLMs agreed that if the target is not being met, the visibility impacts of any new permit will continue to be evaluated on a case-by-case basis, rather than using solely the more holistic evaluation that is planned as long as the targets are being met. This is planned to be implemented through an MOU between the MPCA and the FLMs, which could contain more detailed language. The language of the SIP indicates that MPCA will consult with the FLMs to determine what additional actions would be appropriate if the 2018 is not projected to be met.

6) *Coordination and Consultation* – The Department of Interior requested that the MPCA confirm with Michigan that Minnesota's SIP meets Michigan's expectations, particularly in regards to Minnesota's contribution to reasonable progress at Seney.

MPCA Response: The MPCA has asked Michigan to confirm that Minnesota's SIP is sufficient to address Minnesota's contribution to visibility at Seney Wilderness.

7) *Smoke Management* – The commenter asked that the MPCA confirm that the Smoke Management Plan identifies Class I areas as sensitive receptors, and to support the decision not to address smoke from agricultural burning activity.

MPCA Response: The Smoke Management Plan does not identify Class I areas specifically as sensitive receptors, but requires them to be given the same consideration as sensitive receptors. Minnesota did not address agricultural burning because it generally occurs in areas of the state distant from the Class I areas, with fuel types that produce very short-term smoke events. More importantly, none of the 20% worst days appear to be influenced by such burning. Information was added to the SIP to further explain why Minnesota chose not to address agricultural burning.

Comment Letter 5: Elanne Palcich

This commenter is primarily concerned about the impact of new industry in Northeast Minnesota – sulfide mining, taconite expansion, and a proposed IGCC power plant – due to proximity to the Class I areas. The commenter asks how these projects are factored into a haze reduction plan, stating that if new industry is permitted, old industry must reduce its emissions. The commenter requests that the haze reduction plan show how a reduction in consumer demand or increased recycling could reduce the amounts of energy and resources that are needed, and include the amount of haze that would be contributed by a new sulfide mining industry, the new coal gasification project, Minnesota Steel Industry,

Mesabi Nugget, and planned expansions at Northshore mining, and Keewatin Taconite. The commenter also raises concerns about peat mining contributing to windblown dust, and plans by the Forest Service to log areas around BWCAW, removing the buffer zone for blowing dust.

MPCA Response: The concern about the impact of new industry in Northeast Minnesota was one of the primary drivers for the inclusion of the Northeast Minnesota Plan into the Regional Haze SIP. That plan sets an emission reduction target for the area that calls for a 30% reduction in pollutants that are precursors to regional haze by 2018; in order to meet this goal there will have to be reductions in emissions from existing facilities if newly permitted facilities are to fit into the overall emission "budget" for the area. Some of this reduction in existing facility emissions is already predicted to occur.

The MPCA set the Reasonable Progress Goal for haze levels in 2018 based on predictions of future emissions. The models used to develop these predictions apply growth and control factors, which should account for any changes in industrial emissions likely to result from changing consumer demand. MPCA's future year emission projections also include several of the new projects mentioned by the commenter, namely Minnesota Steel and Mesabi Nugget. Others were not included due to lack of regulatory certainty, but would be included in future SIP revisions if they are built.

The main components of haze at Minnesota's Class I areas are ammonium sulfate and ammonium nitrate, which are caused from emissions of SO_2 and NO_X. Particles resulting from windblown dust are not a major contributor. Should they become a major contributor in the future, they will be evaluated and addressed in future SIP revisions.

Comment Letters 6 – 14: Gary Clements, Doug Anderson, Chuck Hoffman, Peter Duys, Chris Norbury, Jon Ridge, Roy Erickson, Christina Erickson, Paul McCormick

These commenters made many of the same points in expressing their appreciation for BWCAW and VNP as pristine areas and discussing their concerns over air pollution and visibility. The main points of the comments included 1) support for strengthening, not weakening, air quality rules; 2) concern that the taconite industry is not doing its fair share to control its own emissions and resulting air pollution along with requests that all industry be required to do what is necessary to control air pollution; and 3) concern that new facilities, particularly in the mining industry, be required to keep their emissions as low as possible.

MPCA Response: The MPCA is putting in place the Regional Haze State Implementation Plan in order to ensure that visibility in Minnesota's Class I areas is improved. The SIP strengthens air quality rules. This is particularly true for the Northeast Minnesota Plan where the SIP requires a holistic look at the level of emissions that contribute to regional haze, and a decrease in those emissions from current conditions, not just a case-by-case evaluation that allows new facilities as long as they do not contribute to visibility impairment above a certain threshold. The MPCA also believes that, through BART and the Northeast Minnesota Plan's requirement for research into emission reduction projects at the taconite facilities, the taconite facilities will make emission reductions and contribute to reducing air pollution and regional haze. Finally, all new major facilities across the state will be subject to Best Available Control Technology (BACT), which will minimize their emissions.

Comment Letter 15: Nick Axtell, 1854 Treaty Authority

1) *BART for EGUs* – The commenter requested that the SIP include unit specific BART emission limits for EGUs, in order to avoid delay in BART implementation if CAIR is vacated or Minnesota is removed from CAIR.

MPCA Response: See response to the USDA Forest Service, Comment letter 3, part #4

2) *Monitor Funding* – The commenter requests that the MPCA make it a priority to fund and provide support for both of the IMPROVE monitor sites.

MPCA Response: The MPCA agrees that it is important that both IMPROVE monitors continue to operate, and will continue to work to ensure that federal funding is maintained. The MPCA has committed in the SIP to attempting to provide support for the monitors, should federal funding be eliminated.

However, as the State and Agency's budget process is always unpredictable, the MPCA cannot definitely commit to supporting both monitors without federal funding.

3) *Northeast Minnesota Plan* – The commenter suggests that the facilities in need of further investigation into the feasibility and cost-effectiveness of control technologies make their studies available for public review through scheduled interim reports. The Authority believes that the actions to be taken if the 2012 emission target is not met do not address new facilities. In addition, the commenter would like to see a better explanation on how the memorandum of understanding works.

MPCA Response: The MPCA understands that it is important to many stakeholders to be able to review the results of the investigations and pilot testing of emission control technologies and pollution prevention practices. The MPCA anticipates that much of this information will be shared with stakeholders, as were the BART analyses from many of these facilities. However, certain information may be considered confidential business information and therefore unavailable for public review.

In regards to the 2012 emission target, the commenter is not specific into how the proposed SIP actions do not address new facilities. The MPCA believes the actions to be taken if the 2012 target is not met will address all facilities in existence as of 2012. Any new major facilities that are proposed will have to go through BACT, and the MPCA has also committed to evaluate changes in emissions from minor sources in 2012 and 2018 as part of the Northeast Minnesota plan. In response to another comment, more information on new sources has been added to the SIP. In addition, it should be noted that the MPCA views the 2018 reductions as the ultimate target, with 2012 being merely a check-in point. Therefore, if the 2012 target is not met, but the 2018 target is met, the Plan would be considered a success. The MOU between the FLMs and the MPCA is not yet fully developed, but the MPCA intends to offer some public review of the MOU when it is closer to final form.

4) *Clean Air Mercury Rule* – The commenter suggests that the SIP should explain that CAMR has been struck down and how this affects the SIP or the references to CAMR should be removed.

MPCA Response: The MPCA has taken the commenter's suggestion and both struck some language related to CAMR in the SIP, as it is no longer an "on the books program," and explained that CAMR has been vacated. Ultimately, this should not have a major impact on the Regional Haze program.

Comment Letter 16: Polymet Mining, Kevin Pylka

Polymet Mining believes that the SIP does not adequately address or evaluate the potential for reduction of emissions at sources throughout the state, not just those in the northeastern portion, and asks that the SIP and future reviews take into account the entire state. The commenter also expresses concern that non-EGU point sources of SO_2 and NO_X in the NE region are major users of electricity, and will be subject to costs passed down by EGU point sources in the form of increased electrical rates. Thus, the commenter believes that the costs paid by the non-EGU point sources will be magnified.

MPCA Response: The SIP explains the MPCA's decision to focus on the Northeast region due to the region's disproportionate impact on visibility and lower predicted emission reductions. However, as part of the long term strategy the MPCA is also committing to evaluate certain potentially reasonable controls from source categories such as power plants and industrial, commercial, and institutional boilers. This evaluation will be on a statewide level. The commenter's concern about the non-EGU facilities bearing additional costs due to increases in electrical rates arising from rate recovery for emission reduction projects is noted.

Comment Letter 17: U.S. Steel, Chrissy Bartovich

U.S. Steel noted that the draft SO_2 BART emission limits are presented for lines that burn only natural gas, though U.S. Steel MinnTac lines 3, 4, and 5 have such limits and are also permitted for biomass and fuel oil. Also, MinnTac requests that their BART SO_2 emission limit be in the form of a lb/hour rather than lb/long ton pellets limit. The commenter states that MPCA previously agreed to this change.

MPCA Response: The MPCA is aware of the concern about multiple fuels, and has revised the language in the SIP to clarify that the BART limits are for lines that burn low-sulfur fuels, such as natural gas or

biomass, as their *primary* fuel. Language has also been added to clarify that the SO_2 BART limits established at this time will apply only during the burning of those primary fuels, not during use of back up fuels such as fuel oil.

The MPCA is also willing to change the BART SO_2 limit to a lb/hr value. The U.S. Steel facilities will monitor their SO_2 emissions with Continuous Emission Monitors (CEMs), ensuring that the MPCA will have a more complete and accurate picture of actual emissions, compared to other facilities, and understand how emissions react to changes at the facility.

The emission factor of 0.421 lb SO_2/long ton works out to ~116 lb SO_2/hr (max) for Line 3 and ~180 lb SO_2/hr (max) for Lines 4 & 5. This revised emission limit has been placed in the SIP Table 9.5 and the BART memos in Appendix 9.3.

Comment Letter 18: Minnesota Power, Mike Cashin

Minnesota Power supports emission reduction targets in the northeastern portion of the Minnesota, and states that BART requirements will be met by BACT or BACT-like designs at Minnesota Power's subject units. Minnesota Power states that they will continue to install emission control retrofits regardless of whether CAIR is implemented.

MPCA Response: Comments noted. The MPCA appreciates Minnesota Power's emission reductions.

Comment Letter 19: Excelsior Energy, Bob Evans

Excelsior Energy recommends that their proposed EGUs, Mesaba One and Mesaba Two, be included in Minnesota's 2018 projections of emission sources. Excelsior believes that electricity demand growth should be projected, just as mining growth was projected based upon proposed projects in that industry. If the proposed Mesaba EGUs are not included, Excelsior suggests that the 2018 emissions reflect Minnesota's current EGUs with SO_2 and NO_X emission rates for operations at maximum capacity. Excelsior believes that without projection of growth in electricity demand, economic growth may be discouraged.

MPCA Response: The MPCA attempted to provide the most reasonable 2018 emissions scenarios. IPM3.0, coupled with staff knowledge, was used to project growth in electricity demand, application of control technology, and resulting 2018 emissions. The two mining projects mentioned were included because they met the reasonable level of certainty needed for inclusion into the 2018 emission inventory. Growth at other mining facilities was not projected. At the time of the SIP modeling, MPCA staff did not feel that the Excelsior project met the same criteria for level of regulatory certainty; therefore, it was not included in the emission projections. However, should the project become more certain, the project will be included in the Northeast Minnesota plan projections, and may be included in future modeling scenarios, such as that for the Five Year Assessment.

Comment Letter 20: Cleveland-Cliffs Mining, Dave Skolasinski

1) *Form of SO_2 Emission Limit* – Cleveland-Cliffs requests that a different form be used for the SO_2 BART limits; stating that the lb SO_2/long ton pellet fired form may limit production in some cases. They suggest that the rate be made more appropriate based on the type of fuel being used; one suggestion is a lb/MMBtu limit.

MPCA Response: For the affected lines, nearly all the sulfur being released comes from the ore. The MPCA has set the SO_2 BART limits for the Cleveland-Cliffs facilities based on a predictive interval; the limit is designed not to limit the choice of ore to be used in production. Since the ore is the primary source of sulfur, tying the limit to the heat input would likely be problematic for the Cleveland-Cliffs facilities; the MPCA does not have confidence that a lb/MMBtu limit could be both achievable and meaningful.

2) *Northshore SO_2 Emission Data and Limits* –

   a. Cleveland-Cliffs states that the emissions data reported on Table 9.5 for Northshore's Furnaces 11 and 12 are inconsistent with each other, though the units are identical, and do not reflect stack

test records. They request that the MPCA review the actual emissions with Northshore environmental staff, to ensure a correct BART limit.

MPCA Response: The 1231.2 rate associated with Northshore's EU100 (Furnace 11 Hood Exhaust) in Table 9.5 is in error. It should be 852, the same as shown for EU110 (Furnace 12 Hood Exhaust). The MPCA has made this correction in Table 9.5.

b. Some units are permitted to use fuel oil in their furnaces in addition to natural gas. The emission data in Table 9.5 pertains to burning of natural gas. Cleveland-Cliffs suggests that the specified emission limits only apply to the use of natural gas.

MPCA Response: As noted in the response to Comment Letter 17, the language in the SIP has been revised to clarify that the SO_2 BART limits are for lines that burn low-sulfur fuels as their primary fuel and that the SO_2 BART limits established at this time will apply only during the burning of those primary fuels, not during use of back up fuels.

3) *Northshore Emission Control Equipment* – Cleveland-Cliffs states that Northshore Mining's emission control equipment is incorrectly described. They believe that "Wet-Wall ESP" is the correct term that should be used where the draft refers to wet electrostatic precipitators.

MPCA Response: The MPCA has changed the references to "Wet ESPs" to "Wet-Wall ESPs" throughout the SIP.

Comment Letter 21: Arcelor Mittal Mining, Michael Long

1) *IMPROVE Equation* – ArcelorMittal believes that the IMPROVE modeling equation would be most effective if the 20% best day inputs were replaced by the pairing of annual average background and 98th percentile day. The commenter subsequently clarified that it believes the proposed modification of the IMPROVE equation would result in more realistic background for refined modeling.

MPCA Response: The MPCA has used the IMPROVE equation as specified in EPA guidance. The modification the commenter suggests is not consistent with EPA guidance and would not further the goal of improving visibility. The goal of the rule is to improve visibility to natural conditions, and even the current 20% best days are above natural conditions. A less conservative approach (such as the one suggested) is therefore not warranted. An approach using the 98th percentile visibility day has been used in facility-specific BART analyses, but not in the case of overall visibility.

2) *BART SO_2 Limits* – The commenter believes that that the MPCA should not set an "arbitrary" BART limit for SO_2. The commenter believes the SO_2 BART limit does not take into account the variability of taconite ore's sulfur content; the ore sulfur constitutes the main source of SO_2 emissions for natural gas fired furnaces. The commenter states that the limit developed by MPCA is based on SO_2 emissions on a single day, and that the facility cannot control the sulfur content of the ore. The commenter suggests that the MPCA not set an SO_2 limit at this time, but rather require the proper use of BART-appropriate equipment, or delay setting a numerical limit until more data can be gathered.

MPCA Response: In determining BART SO_2 limits, primarily at lines that burn low sulfur fuels, the MPCA has taken into account the variability of the sulfur content of taconite ore. The limit will not unduly limit ore choice. The MPCA needs to set a BART SO_2 limit, and for furnaces that are already burning low-sulfur fuels, it is reasonable to do so at this time. The MPCA based the limit on the available actual data. If Arcelor Mittal can provide the MPCA with new objective, reliable information that shows the proposed BART limit cannot be met, the MPCA will consider it.

3) *pH Monitoring Requirements* – The commenter requests that if pH values for water exiting the scrubber can be shown to be stable, then ongoing pH monitoring should not be required. The MACT monitoring requirements are sufficient to ensure the scrubber is operating properly.

MPCA Response: pH is a significant factor in scrubbers' efficiency in removing SO_2, therefore ongoing measurement is warranted. The MPCA is willing to consider whether the monitoring activities should be modified, if Arcelor Mittal conducts a pH stability study to the MPCA's approval.

4) *NO_X BACT Equivalency* – The commenter suggests that NO_X BACT and PSD emission limits be deemed equivalent to BART, and that a facility already subject to BACT should not be subject to BART. Arcelor Mittal's Minorca mine conducted a BACT analysis in the early 1990s and received a corresponding emission limit.

MPCA Response: The MPCA does not agree that BACT should, by default, substitute for BART. The determination of BACT controls and emission limits for this facility was done for a modification made in the late 1980s, and did not result in any add-on controls.

In its BART *Guidelines,*[124] EPA recognized that in some cases, existing emission limits established under MACT, NSPS, or NSR/PSD may be the best available at a reasonable cost level and therefore may be BART. However, the rule also states that EPA does "not believe that technology determinations from the 1970s or early 1980s, including new source performance standards (NSPS), should be considered to represent best control for existing sources, as best control levels for recent plant retrofits are more stringent than these older levels." (70 FR 39164) The guidelines are clear that, at some point, previously set emission limits are too old to be considered best technology, as emission control technologies are likely to have advanced in the intervening years. Therefore, the MPCA would not be justified in simply stating that old BACT limits are equivalent to BART.

Since the MPCA has determined that NO_X BART is good combustion practices, the MPCA's goal is to arrive at the best possible BART emission limit based on actual operation conditions at the facility.

5) *Administrative Order* – Arcelor Mittal wants to ensure that any necessary revisions of the SIP reflect the Administrative Consent Order and permit revisions that are currently under negotiation.

MPCA Response: The MPCA and Arcelor Mittal have agreed to an Administrative Order by Consent to explore the development of long-term performance test results as a substitute for CEMs data. It will be an enforceable document of the SIP for this facility and the MPCA has ensured that the two documents are consistent.

Comment Letter 22: Mary Marrow, Minnesota Center for Environmental Advocacy; Brian Pasko, Friends of the Boundary Waters Wilderness; Cory MacNulty, Voyageurs National Park Association; Lynn McClure, National Park Conservation Association. Incorporates Affidavit of Dr. Ranajit Sahu.

(For easier reading, where the letter and attached affidavit provide similar comments, they are treated together. Where only one provides certain comments that is noted.)

II. General Comments

1) *Organization, Access to Documents and Legal Authority* – The commenters feel that the SIP document has confusing organization, and that the manner of presentation and document organization make the SIP difficult to understand. In addition, they state that "Due to poor organization (whose structure is driven by a demonstration of compliance with the underlying regulations) and poor presentation…the SIP misleads the reader by suggesting a level of precision in its analytical results and predictions that is unwarranted."

   It is stated that the MPCA should subject the document to a "full technical editorial review," minimize jargon by inserting more explanatory boxes defining terms when they first appear, and list, in one location, all of the key assumptions that underlie the SIP spanning all technical aspects and policy choices include emission inventory, BART, modeling, etc. Also, the commenters state that tools such as sensitivity or Monte Carlo analyses should be used to understand the impacts of variability in key assumptions.

[124] *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations, Final Rule*. Federal Register 70:128 (6 July 2005), p. 39104.

The commenters also state that the SIP has a lack of specific or accurate citations to many of the background technical documents and legal authority. The commenters request that MPCA ensure that all citations are accurate and specific, with instructions on where to find documents not easily accessible to the public. The commenters also noted that the review time was short to review such a technical document.

MPCA Response: The concerns about organization and access to documentation are noted. The MPCA has made many of the pieces of the SIP available for review throughout the SIP development period. MPCA has also tried to ensure all references are easy to find through including a reference list with weblinks. However, due to the way other organizations have arranged the storage of information on their web sites, it may remain difficult to find certain documents. The MPCA has double checked the reference list to the SIP to ensure that web links are correct.

The MPCA has tried to fully explain all terms when they first appear. However, documenting all of the key assumptions that underlie the various diverse parts of the SIP in one place would be duplicative and unwieldy. Readers who are not interested in the modeling, for example, may not want to wade through a long discussion of the assumptions underlying the modeling prior to reading the rest of the document. The MPCA has, however, added a glossary of terms to the SIP and Technical Support Document.

The SIP presents a large amount of information. Given that the MPCA must demonstrate compliance with the regulations to EPA, the MPCA chose a structure that is designed to most clearly make that demonstration. The MPCA believes the SIP states the uncertainties inherent in the technical analyses, and that these are explained by using the many different analyses discussed, thereby making clear the level of precision in the analyses. The MPCA made the best use of the tools available in order to complete the Regional Haze SIP, which requires states to make specific projections about variable phenomena.

It is unclear in what areas the commenter believes additional sensitivity or, particularly, Monte Carlo analyses would be useful. The MPCA believes that the number of modeling analyses discussed, varying both in emission inventory and meteorological data, serve many of the same functions as a sensitivity analysis and provide useful weight of evidence analysis. Regarding perceived model sensitivity to ammonia emissions and meteorology in the Technical Support Document (TSD), the MPCA has since supported these perceptions through additional modeling. Documentation of the results is in the current TSD. The MPCA also made attempts to better organize and explain the technical analysis, including a new introduction.

2) *Climate Change and Long Term Impacts* – The commenters state that the SIP is a long range plan, though it is to be reviewed every 10 years, and that long range plans are poorly constructed if they fail to consider changes that might affect the outcome of the plan. They believe the haze SIP fails to acknowledge or analyze the impact climate change will have on visibility conditions over the time period of the SIP; by not including any consideration of the effects of climate change they feel the SIP is strongly deficient. The commenters believe MPCA should include such an analysis. Climate change is likely to affect key assumptions such as emission inventory (more/less fires, windborne dust, biogenics) and modeling (changes in wind flow, weather pattern, rainfall and humidity). Since the effects of climate change are likely to be significant, the commenters believe its effects on "all key RH SIP underlying assumptions should be discussed and analyzed." MPCA is also urged by the commenters to undertake a brainstorming exercise to identify other impacts (like climate change) that might be significant and occur on the same time scale as the SIP.

MPCA Response: Under the Regional Haze Rule, the SIP is to be rewritten every 10 years, not just reviewed. Each revision looks at the next ten year period for visibility projections and necessary control strategies to improve visibility. This will allow the state to adjust projections and control strategies in order to take into account other long range phenomena. This SIP is to cover the period until 2018, and in 2018 the MPCA will be submitting another SIP to cover the period until 2028. MPCA acknowledges that climate change is likely to have an impact on some of the same factors that impact visibility impairment, and has added statements concerning the possible impacts of climate change to the SIP. However, it is extremely difficult to predict what that impact will be, particularly in regard to changing wind or rainfall patterns. Joint

research by NESCAUM, Georgia Tech, and MIT indicates that "sensitivities of ozone and $PM_{2.5}$ formation to precursor emissions are found to change only slightly in response to climate change."[125] This research indicates that control strategies which reduce NO_X and SO_2 will remain effective in reducing ozone and $PM_{2.5}$, even in a situation of climate change. In addition, the current status of climate regulation in Minnesota and around the United States is quite uncertain. Given the compounding uncertainties of both visibility and climate modeling, the MPCA believes that an analysis of the impact of climate change on visibility conditions would be unreliable. Like climate change, there are other factors that may interact with the currently known factors to influence visibility impairment. The long-term process with a new SIP every 10 years will allow for future accounting of these impacts as more is known about them.

3) *Technical Analyses* (Affidavit only) – The commenter concludes that the goal of attaining natural visibility conditions is unlikely to be met based on the draft SIP. He states that the technical analyses are poorly supported and lack rigor, therefore the conclusions are not robust and future predictions are not likely to be met. Also, he notes that other states have refused to commit to emission reductions and emissions from Canada are not properly considered; therefore, the record should indicate when EPA was brought into the consultation process and their response.

MPCA Response: The goal of this SIP is to make reasonable progress towards visibility conditions. The MPCA believes that this SIP represents the most accurate technical information available, while acknowledging that many uncertainties exist that, in turn, make the accuracy of the future predictions uncertain. However, despite uncertainty, the MPCA believes that real emission reductions are upcoming that will result in the reduction of visibility impairment in Minnesota's Class I areas. See response below concerning EPA's involvement in arbitrating disputes between states, and for a discussion about Canada emissions.

III. Key Areas of Concern

1) *BART* – The commenters state that the Haze SIP fails to comply with federal requirements and EPA guidance for BART-eligible sources, which says "States should ensure that BART requirements in a SIP are written in a way that clearly specifies the individual emission unit(s) subject to BART regulation and the time by which the emission unit(s) must begin to comply with the BART limit." They are specifically concerned that the SIP does not meet the requirements for source-specific emission limits and compliance schedules for each source subject to BART, deadlines for installation and operation of BART for each source, or specific information regarding the controls, control efficiencies and emission reductions expected. In addition, they believe the MPCA should establish BART limits for EGUs and a specific timeline for installation of BART in the event Minnesota is removed from the CAIR region.

MPCA Response: In the case of BART for the taconite facilities, EPA's BART guidance does not anticipate the difficulty of placing controls on an industry with no new or rebuilt sources that can be looked to as examples of good control technology. Because of the lack of data, if MPCA were forced to require installation of BART controls and set a BART limit immediately, controls would likely be "current controls" and BART would be the facilities' existing limits; in many cases this would result in no emission limits. Through the phased approach, the MPCA has been able to say that BART is good combustion practices (requiring some optimization of the combustion process) and take enough time to gather data in order to set better source-specific emission limits. The MPCA believes this will result in more stringent and better BART limits that can be implemented within five years of SIP approval.

In terms of BART for EGUs, BART determinations have been made and can be found in Appendix 9.4, and in our response to previous comments. These determinations are made by unit.

a. *BART-eligible sources contributing less than 0.5 dv of visibility impairment* – The commenters note that MPCA chose to exempt from BART those BART-eligible sources that contribute less than 0.5 dv to visibility impairment in the Class I areas, but states that the MPCA did not explain

[125] Liao, K., et al. (2007). Sensitivities of Ozone and Fine Particulate Matter Formation to Emissions under the Impact of Potential Future Climate Change. *Environmental Science and Technology*, 41 (24), 8355 – 8361. p 8355

why this threshold was chosen. The commenters do not support MPCA's decision to choose an "arbitrary" visibility threshold to exempt sources from BART, as "even a 0.1 deciview impact could have a significant affect [*sic*] on visibility in BWCAW and VNP." Therefore, MPCA should revisit its decision to exempt these sources.

MPCA Response: The commenter states that the MPCA should revisit the 0.5 deciview threshold for determining which sources are subject-to-BART. This comment was made based on the perception that there are significant shortcomings associated with the RH SIP modeling. These perceived shortcomings of the RH SIP modeling are addressed in Sections V and VI of the response to this comment letter. The State has revisited the 0.5 deciview threshold and has determined that adjusting the 0.5 deciview threshold would not gain any true visibility improvement, confirming our decision to use the threshold.

The basis for which the State selected the 0.5 deciview threshold is provided in the BART documentation.[126] The appropriateness of the threshold was subject to public review and comment in the *Proposed Best Available Retrofit Technology Strategy for Minnesota,* which was on public notice September 6, 2005 through October 21, 2005, and the *Draft Best Available Retrofit Technology (BART) Modeling Protocol to Determine Sources Subject-to-BART in the State of Minnesota*, which was on public notice October 10 through November 4, 2005.

In the comments received on these draft documents, there were proponents for raising and lowering the 0.5 deciview threshold. The MPCA prepared the following response in December 2005:

> *"The MPCA agrees that it has discretion to set the "contribution" threshold lower than 0.5 deciview and is cognizant of a number of existing sources in close proximity to Class I areas. The MPCA will use the proposed contribution threshold of 0.5 deciview for the CALPUFF modeling. However, if the modeling shows a number of sources are causing impacts at levels somewhat below 0.5 deciview, the MPCA may need to consider readjusting the contribution threshold of 0.5 deciview. The MPCA also believes that the U.S. EPA will expect a review of all sources (BART-eligible and non-BART existing sources, mobile and area) for emissions reductions in establishing its 2018 reasonable progress goal with consideration to the four Clean Air Act factors. Thus, the BART implementation process should be viewed in concert with other actions that are required in the development of a regional haze SIP. It is the MPCA's expectation that the totality of these activities will appropriately address sources contributing to visibility impairment"*[127]

The MPCA took into account four factors in revisiting the 0.5 deciview threshold for subject-to-BART:

- How close the BART-eligible source contributions are to the 0.5 threshold;
- Total facility control measures/emission reductions gained by federal regulations and during the establishment of reasonable progress goals in the RH SIP;
- Visibility improvement gains from BART; and
- The tool (CALPUFF) used to determine subject-to-BART status and its applicability to regional haze analyses.

Table A, below, contains the 98th percentile deciview values for all the BART-eligible sources as modeled with CALPUFF. (Table A also contains information on other deciview metrics and what controls on each source were modeled for the Regional Haze SIP.) Sources above 0.5 deciviews were determined to be subject-to-BART, those below the 0.5 deciview threshold were determined not subject-to-BART. The 98th percentile deciview values for those subject-to-BART range from 0.6 – 4.4 deciviews, while the 98th percentile deciview values for those not subject-to-BART range from 0.0 – 0.4 deciviews.

There are 15 facilities with BART-eligible sources that were determined not subject-to-BART based on the 0.5 deciview threshold. Of the 15 facilities, three are subject to the Northeast Minnesota Plan and three are EGUs that were initially subject to CAIR. Minnesota was initially included in CAIR, leading many utilities to install controls in anticipation of CAIR compliance. EPA has recently published a proposed stay of CAIR in Minnesota until there is a repromulgated rule. Should Minnesota not be included in a repromulgated rule, two of the three EGUs that showed modeling results closest to the

[126] Available at http://www.pca.state.mn.us/air/regionalhaze.html
[127] Available at http://www.pca.state.mn.us/publications/aq-sip2-04.pdf

BART threshold—Austin Public Utilities and Otter Tail Power Hoot Lake—will be re-evaluated for reasonable progress controls. Minnesota will re-evaluate at the 5-year SIP assessment. The other of the three EGUs initially subject to CAIR—Xcel Energy, A.S. King—has legally enforceable controls on its BART-eligible unit with Selective Catalytic Reduction controlling 80% NO_X and a scrubber controlling 82% SO_2.

Of the remaining nine facilities not subject to the Northeast Minnesota Plan nor initially subject to CAIR, all have 98th percentile deciview values of 0.2 deciviews or less. Four of these facilities – American Crystal Sugar-East Grand Forks, Flint Hills Resources-Pine Bend, Marathon Ashland Petroleum, and New Ulm Public Utilities – have BART-eligible sources at 0.2 deciviews; four – American Crystal Sugar-Drayton North Dakota, Gopher Resource Corporation, Sappi Cloquet and Southern Minnesota Beet Cooperative – have BART-eligible sources at 0.1 deciviews; and one facility with BART-eligible units has a deciview value of zero.

The commenter implies that the same modeling was conducted for the BART analysis and for the RH SIP. In fact, different modeling requirements are in place for BART than the overall RH SIP. In the BART rule,[128] EPA recommends using the CALPUFF model to evaluate BART. This model is currently is used to demonstrate individual source impacts on visibility at Class I areas as part of the federal New Source Review and Prevention of Significant Deterioration programs.

Although CALPUFF is recommended for use in BART analyses, EPA guidance[129] for regional haze recommends use of a Lagrangian model, such as CALPUFF, only for addressing the primary components of $PM_{2.5}$; not the secondary formed components of $PM_{2.5}$ (i.e. mass associated with sulfate, nitrate and secondary organic carbon). To simulate the effects of strategies to reduce ozone and the secondary components of particulate matter, the guidance states that States should use a photochemical grid model (i.e. CAMx). CAMx is the model Minnesota used for the SIP.

CALPUFF is not recommended for modeling secondary formed components of $PM_{2.5}$ because the model is out of date and uses overly simplistic chemistry. ENVIRON has compared CALPUFF modeling to observations and conducted sensitivity analyses between CALPUFF and photochemical model chemistry and found large over-predictions in sulfate and nitrate formation using the CALPUFF simplified chemistry.[130,131] The MPCA used the CALPUFF model as the tool for determining subject-to-BART status; not as a means to assess true visibility impacts on the Class I areas.

The MPCA believes re-adjusting the 0.5 dv threshold for BART would not result in any additional visibility improvement for the following reasons:

- All BART-eligible sources not subject-to-BART with deciview values 0.3 to less than 0.5 are either currently subject to CAIR[132] or are included in the NE Minnesota Plan; and
- The large over-predictions of sulfate and nitrate associated with the CALPUFF chemistry module indicate that any additional controls on the five BART-eligible units with 98th percentile values of 0.1 to 0.2 deciviews would result in no true visibility improvement.

Thus, the MPCA will not re-adjust the 0.5 deciview threshold for determining subject-to-BART sources. However, language further detailing the MPCA's justification of this decision has been added to the SIP.

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[128] *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations, Final Rule*. Federal Register 70:128 (6 July 2005), p. 39104.

[129] U.S. EPA, Office of Air Quality Planning and Standards. (2007a, April). *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze.* EPA-454/B-07-002. http://www.epa.gov/ttn/scram/guidance/ guide/final-03-pm-rh-guidance.pdf

[130] Morris, Ralph, et al. (ENVIRON), "Evaluation of the CALPUFF Chemistry Algorithms", presented at AWMA 98th Annual Conference and Exhibition", June 2005.

[131] Morris, Ralph, et al. (ENVIRON), "Further Evaluation of the Chemistry Algorithms used in the CALPUFF Modeling System", April 2006.

[132] Many of Minnesota's initially subject-to-CAIR EGUs began undertaking emission reductions projects in preparation for CAIR, and some of these are likely to continue.

Table A. 98th Percentile Deciview Values (& other metrics) for BART-Eligible Sources at the Listed Facilities as Modeled with CALPUFF

Facility Name	CALPUFF Subject-to-BART Data Description	BWCAW			VOYA			Subject-to-BART?	Additional Regional Haze SIP Action
		2002	2003	2004	2002	2003	2004		
American Crystal Sugar – Drayton, North Dakota	Number of Days with Δdv ≥ 0.5	0	0	0	0	0	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.3	0.1	0.1	0.3	0.1	0.1		
	98th Percentile Δdv	0.1	0.0	0.1	0.1	0.0	0.1		
American Crystal Sugar – East Grand Forks	Number of Days with Δdv ≥ 0.5	1	0	0	1	0	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.6	0.2	0.2	0.6	0.1	0.3		
	98th Percentile Δdv	0.2	0.1	0.1	0.2	0.1	0.1		
Arcelor Mittal Mining	Number of Days with Δdv ≥ 0.5	85	77	66	26	20	27	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	32	22	15	6	7	5		
	Largest Δdv	2.8	4.1	2.4	1.5	2.3	1.9		
	98th Percentile Δdv	1.6	1.7	1.4	0.8	1.0	0.9		
Xcel Energy – A. S. King	Number of Days with Δdv ≥ 0.5	4	6	3	1	4	0	No	Legally enforceable controls EU001 (initially subject to CAIR); 80% reduction in NO_X 82% reduction in SO_2
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.7	1.0	0.6	0.7	0.6	0.4		
	98th Percentile Δdv	0.4	0.4	0.4	0.2	0.4	0.3		
Austin Utilities NE Station	Number of Days with Δdv ≥ 0.5	0	3	0	0	1	0	No	Initially subject to CAIR, review in 5-year SIP assessment
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.3	0.7	0.2	0.3	0.6	0.3		
	98th Percentile Δdv	0.2	0.3	0.1	0.1	0.3	0.1		
Boise White Paper	Number of Days with Δdv ≥ 0.5	0	0	0	3	2	1	No	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	0	0	0	1	0	0		
	Largest Δdv	0.5	0.3	0.4	1.5	0.6	0.5		
	98th Percentile Δdv	0.2	0.2	0.2	0.4	0.3	0.3		
United Taconite – Fairlane Plant	Number of Days with Δdv ≥ 0.5	157	148	137	76	67	71	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	103	102	88	45	35	42		
	Largest Δdv	6.1	7.8	5.1	3.8	6.6	4.6		
	98th Percentile Δdv	3.3	3.9	3.6	2.6	3.1	2.5		
Flint Hills Resources – Pine Bend	Number of Days with Δdv ≥ 0.5	0	1	0	0	1	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.3	0.5	0.2	0.2	0.5	0.2		
	98th Percentile Δdv	0.1	0.2	0.2	0.1	0.1	0.1		
Gerdau Ameristeel – St. Paul Mill	Number of Days with Δdv ≥ 0.5	0	0	0	0	0	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.1	0.1	0.1	0.0	0.1	0.1		
	98th Percentile Δdv	0.0	0.0	0.0	0.0	0.0	0.0		
Gopher Resource Corporation	Number of Days with Δdv ≥ 0.5	0	0	0	0	0	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.1	0.2	0.1	0.1	0.1	0.1		
	98th Percentile Δdv	0.0	0.1	0.1	0.0	0.0	0.1		

Facility Name	CALPUFF Subject-to-BART Data Description	BWCAW			VOYA			Subject-to-BART?	Additional Regional Haze SIP Action
		2002	2003	2004	2002	2003	2004		
Hibbing Public Utilities	Number of Days with Δdv ≥ 0.5	2	1	1	0	2	0	No	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	0	1	0	0	0	0		
	Largest Δdv	0.7	1.4	0.7	0.4	0.6	0.5		
	98th Percentile Δdv	0.3	0.3	0.3	0.2	0.3	0.2		
Hibbing Taconite Company	Number of Days with Δdv ≥ 0.5	92	78	77	74	72	59	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	53	34	33	37	30	26		
	Largest Δdv	4.5	6.7	.3	2.9	4.5	3.1		
	98th Percentile Δdv	2.2	1.8	1.9	1.8	2.0	1.9		
U.S. Steel – Keewatin Taconite	Number of Days with Δdv ≥ 0.5	68	57	58	51	46	41	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	24	19	19	19	16	14		
	Largest Δdv	3.2	4.3	3.5	2.0	3.2	1.9		
	98th Percentile Δdv	1.5	1.3	1.4	1.4	1.4	1.3		
Marathon Ashland Petroleum	Number of Days with Δdv ≥ 0.5	0	1	0	0	1	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.3	0.5	0.3	0.2	0.5	0.3		
	98th Percentile Δdv	0.1	0.2	0.2	0.1	0.1	0.2		
U.S. Steel – Minntac	Number of Days with Δdv ≥ 0.5	184	180	166	101	96	92	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	139	131	123	65	52	53		
	Largest Δdv	6.4	7.7	7.3	4.4	6.9	5.8		
	98th Percentile Δdv	4.4	4.4	4.3	3.3	3.8	3.0		
Minnesota Power, Boswell	Number of Days with Δdv ≥ 0.5	77	69	59	69	50	43	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	29	26	18	24	16	17		
	Largest Δdv	4.1	2.5	3.2	3.6	2.5	3.6		
	98th Percentile Δdv	1.6	1.5	1.4	1.5	1.4	1.2		
Minnesota Power, Taconite Harbor	Number of Days with Δdv ≥ 0.5	90	70	65	2	1	0	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	34	26	27	0	0	0		
	Largest Δdv	3.7	3.9	2.0	1.0	0.6	0.5		
	98th Percentile Δdv	2.1	1.7	1.5	0.2	0.2	0.3		
New Ulm Public Utilities	Number of Days with Δdv ≥ 0.5	0	1	1	0	1	1	No	None
	Number of Days with Δdv ≥ 1.00	0	0	1	0	0	0		
	Largest Δdv	0.4	0.7	1.0	0.3	0.5	0.7		
	98th Percentile Δdv	0.1	0.2	0.2	0.1	0.2	0.1		
Northshore Mining Company; Excluding Power House Boiler #2	Number of Days with Δdv ≥ 0.5	60	60	49	8	6	16	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	23	15	21	4	1	1		
	Largest Δdv	2.6	1.9	2.3	2.8	1.1	1.0		
	98th Percentile Δdv	1.6	1.3	1.5	0.5	0.5	0.6		
Northshore Mining Company; Power House Boiler #2	Number of Days with Δdv ≥ 0.5	109	109	98	3	1	1	Yes	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	66	47	47	1	0	0		
	Largest Δdv	3.7	3.8	3.3	1.2	0.7	0.6		
	98th Percentile Δdv	3.0	2.5	2.5	0.2	0.2	0.3		

Facility Name	CALPUFF Subject-to-BART Data Description	BWCAW			VOYA			Subject-to-BART?	Additional Regional Haze SIP Action
		2002	2003	2004	2002	2003	2004		
Otter Tail Power – Hoot Lake	Number of Days with Δdv ≥ 0.5	3	1	5	0	1	5	No	Initially subject to CAIR, review in 5-year SIP assessment
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	1		
	Largest Δdv	0.7	0.8	0.9	0.5	0.5	1.1		
	98th Percentile Δdv	0.4	0.3	0.4	0.2	0.3	0.3		
Rochester Public Utilities – Silver Lake	Number of Days with Δdv ≥ 0.5	1	8	8	1	3	6	Yes	
	Number of Days with Δdv ≥ 1.00	0	2	2	0	1	0		
	Largest Δdv	0.6	1.1	1.1	0.7	1.0	0.9		
	98th Percentile Δdv	0.4	0.6	0.5	0.3	0.4	0.4		
Sappi Cloquet	Number of Days with Δdv ≥ 0.5	0	0	0	0	0	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.1	0.2	0.1	0.1	0.1	0.1		
	98th Percentile Δdv	0.1	0.1	0.1	0.0	0.1	0.1		
Xcel Energy – Sherco	Number of Days with Δdv ≥ 0.5	72	78	80	46	48	46	Yes	
	Number of Days with Δdv ≥ 1.00	38	46	36	20	22	25		
	Largest Δdv	4.0	3.7	4.3	3.9	3.5	3.1		
	98th Percentile Δdv	2.2	2.3	1.8	1.5	2.0	1.9		
Southern Minnesota Beet Cooperative	Number of Days with Δdv ≥ 0.5	0	0	0	0	0	0	No	None
	Number of Days with Δdv ≥ 1.00	0	0	0	0	0	0		
	Largest Δdv	0.3	0.3	0.5	0.3	0.2	0.4		
	98th Percentile Δdv	0.1	0.1	0.1	0.1	0.1	0.1		
Virginia Public Utilities	Number of Days with Δdv ≥ 0.5	3	3	2	0	1	0	No	NE Minnesota Plan
	Number of Days with Δdv ≥ 1.00	0	1	0	0	0	0		
	Largest Δdv	0.7	1.3	0.5	0.3	0.6	0.4		
	98th Percentile Δdv	0.4	0.4	0.3	0.2	0.2	0.2		

b. *Taconite Industry Determinations* – The commenters agree that the lack of adequate emission information from the taconite industry may make establishing BART limits for some of the taconite facilities infeasible at this time. However, they state that the "Haze SIP fails to address why some concrete suggestions made to the state regarding potential BART controls for SO_2 and NO_X have not been implemented." The commenters state through the affidavit that the lack of BART for taconite facilities is glaring, going on to say that the "state has again squandered its current opportunity to impose achievable BART limits…in favor of a loose timetable promising some future controls." Therefore, they do not support an extension of time to establish BART limits unless MPCA provides an analysis that the proposed technologies are infeasible or do not limit emissions, particularly in regards to the USDA comments on BART controls for NO_X. They also do not support any extension of the time to establish an SO_2 BART limit on United Taconite Line 2. If there is an extension, there should be enforceable deadlines, in more specificity than included in the table shared at the public meeting. MPCA must be able to analyze the emission reductions achieved through BART and their impact on visibility as part of the 2012 SIP assessment. Finally, the state notes that it will conduct "a BART-like review" of the taconite facilities' reports on control strategies. The commenters believe it is not clear what this term means or where the state will derive the regulatory authority.

MPCA Response: In their comment letter on the SIP, the USDA Forest Service noted that although they "believe that an argument can be made that one or more post-combustion control options for nitrogen oxides are BART for the taconite industry…[they] are willing to delay the determination of proper nitrogen oxides controls to allow the industry to trial nitrogen oxides control options through 2011 under the long term strategy as long as there is a firm deadline in the SIP for the industry to complete the studies." The MPCA believes that setting a BART limit in the future, once more accurate emission data is gathered, will result in a stronger BART limit than any that could be set at this time. In addition, the Northeast Minnesota Plan and timelines laid out for BART provide the requested firm deadlines. The MPCA intends to discuss the emission reductions achieved through BART in the five year SIP assessment, and language spelling this out has been added to Chapter 11 of the SIP.

Because of the difficulty in determining BART for the taconite facilities, the MPCA considered various approaches to BART. The first was to determine BART technology now, followed by the imposition of limits after data gathering. The other was a delayed BART technology determination after some new and promising technologies are shown to be feasible. However, the MPCA believes that BART is to be based on what is feasible now, and should not be delayed. Therefore, the MPCA determined that the better approach is to require the taconite facilities to research control strategies and then, essentially undertake a BART II or "state retrofit" requirement in the future. Facilities will have to undertake an analysis of available emission reduction opportunities, similar to that submitted to the MPCA under BART. The MPCA will then review the feasibility and cost-effectiveness of installing controls or employing pollution prevention. The MPCA has broad regulatory authority, but would likely implement a state rule or Administrative Orders to specifically require this "BART II" process.

c. *Taconite Administrative Orders* – Although the SIP states that MPCA will have more information about emissions from the taconite industry, the SIP does not require that taconite indurating furnaces therefore install continuous monitors. In the affidavit the commenter states, "I am aware that MPCA has developed/is in the process of developing various Administrative Orders with specific taconite facilities which include either continuous emissions monitors or process emissions monitors. However, it is my understanding that the requirements for such monitors are not enforceable under the RH SIP. If so, the RH SIP must include the requirements contained in the Administrative Orders as enforceable in the RH SIP." The commenter also states that plan is vague and the actual details of the alternative method (predictive equation) are still missing. Also, the commenters feel there needs to be transparency in the process and public involvement in the Administrative Orders and review of data received.

MPCA Response: The MPCA has provided an opportunity for public input on the Administrative Orders. Two Orders were included in the draft SIP, and additional Orders were provided during the public meeting and on the MPCA's website. All Orders have now been signed, meeting the requirements laid out in the SIP and following a substantially similar framework to those placed on notice. The public may provide additional comment on the Orders (or any other portion of the SIP) when EPA proposes approval or disapproval of the SIP. In terms of reviewing data provided through the installation of CEMs/PEMs, the MPCA intends to share this data with the public, through the emission inventory and other methods. However, it is possible that some information may be considered confidential business information, particularly information related to process parameters, and therefore would not be able to be shared publicly. This will be evaluated on a facility by facility basis. For information on the situation with United Taconite Line 2, please see the response to the Forest Service, Comment Letter 3, part 2.

It is not clear what the commenter means by stating that the requirements for emission monitors are not enforceable under the Regional Haze SIP and that the SIP "must include the requirements contained in the Administrative Orders as enforceable in the RH SIP." The MPCA will be submitting to EPA Administrative Orders for the taconite facilities, and requesting that those Orders be included in the SIP. That inclusion will make the Orders enforceable at both the state and federal levels. MPCA has taken this approach, using both Orders and permits, in its criteria pollutant SIPs and it has been effective.

Since the draft SIP, MPCA has included in the body of the SIP document more information on what is required for the PEMs method of emissions monitoring. Details on specific facility requirements can be found in the Administrative Order issued to each facility, which are included in Appendix 9.7 of the final SIP.

d. *EGUs* – The commenters state that "MPCA must require additional controls beyond CAIR for EGUs because implementing CAIR alone will not allow the state to meet the visibility goal of natural visibility conditions by 2064." They note that the SIP examined some emission reduction strategies for EGUs (the EGU1 and EGU2 scenarios). However, they feel the SIP does not provide any rationale as to why these were chosen. EGUs in other states routinely achieve lower emission levels than those in the Haze SIP and therefore the SIP should include a justification of those levels.

MPCA Response: Although the ultimate goal of the rule is to have no man-made visibility impairment by 2064, this SIP covers only the period through 2018. As explained in the response to Comment Letter 23, #1, the 2018 goals set in this SIP meet the requirements for reasonable progress. Nothing in this SIP prevents the MPCA from requiring additional emission reductions from sources in order to make continued progress towards the 2064.

That being said, many of Minnesota's EGUs are undertaking voluntary control projects that result in emissions at or below the level set by CAIR (bearing in mind that CAIR sets a lb/MMBtu level for allowance distribution but does not mandate that facilities emit at or below that level). In addition, subject-to-BART EGUs are now being required to install BART due to Minnesota's likely exclusion from CAIR.

The EGU1 and EGU2 scenarios were developed by a LADCO working group as part of their evaluation of candidate control measures. A reference for the appropriate white paper has been added to the SIP.[133] Although individual EGUs may be controlled to levels lower than those proposed, the levels set in these two scenarios were meant to be a regionwide average, not applicable to every individual EGU source.

2) *New Sources* – The commenters state that, "for haze purposes, MPCA should evaluate potential impacts from new major sources through a non-attainment standard and not an incremental analysis as done through the PSD process. The PSD incremental analysis does not apply when air quality standards and visibility conditions required under the Regional Haze Rule are not being met. The Haze SIP does not explain how its review of major new sources through a PSD analysis meets the requirements of the Regional Haze Rule." The commenters have concerns about approving any new

[133] Lake Michigan Air Directors Consortium (LADCO). (2005, December 9). *Interim White Paper - Midwest RPO Candidate Control Measures Source Category: Electric Generating Units.* http://64.27.125.175/reports/rpo/Regional%20Air%20Quality/White%20Papers%20March%202006/EGU_Ver4.pdf

major sources before the emission reductions to be achieved through BART are known. They also state that the Northeast Minnesota Plan does not explain what is saved or lost by removing FLM involvement in individual source modeling for new sources in that region. They request that any MOU have an opportunity for public comment and participation as such an MOU "appears to eliminate federally mandated oversight from the FLMs in the permitting of new major sources in NE Minnesota."

MPCA Response: Again, it is important to note that the Regional Haze Rule does not hold states to meeting any specific visibility goal, just to implementation of the identified control strategies. Therefore, the Regional Haze SIP is very different from SIPs for attainment of criteria pollutant standards, and the MPCA believes that a non-attainment standard type analysis would be inappropriate under the visibility program because there is no bright line ambient standard to delineate attainment versus non-attainment.

The Regional Haze Rule does not treat Class I areas with low visibility as nonattainment areas; it does not require any specific treatment of new sources, outside of that established through the PSD process. For new major sources or major modifications, the PSD program requires the installation of Best Available Control Technology (BACT) and modeling of the project's impacts on local air quality. New sources or major modifications outside the Northeast Minnesota Plan also need to screen their emissions. If they are judged to have a potential adverse impact on visibility, those projects will need to perform more sophisticated modeling of their proposed impacts on Class I areas, including their effects on visibility.

Sources covered by the Northeast Minnesota Plan that propose PSD modifications for haze pollutants will have to install BACT and ensure that their emissions fit into the budget for the Plan. The PSD regulations also require the consideration of other impacts to the environment. The proximity of new and modified facilities to Minnesota's Class I areas, even those covered by the Plan, necessitates consideration of visibility in this step. (Historically, the MPCA has incorporated similar environmental factors into the BACT determination by adjusting the cost-effectiveness threshold.) This can lead to the application of more effective control strategies and thus lower emission rates. In addition, the MPCA could cite the visibility section of the PSD rule in order to ask for controls. Either option would likely generally result in installation of more stringent controls. Through the PSD process, which includes review by and input from the Federal Land Managers, the MPCA will be able to minimize the impact of new sources on visibility.

The Northeast Minnesota plan attempts to move from the incremental approach of the traditional PSD visibility program towards a more holistic approach. If emissions are declining under the Northeast Minnesota Plan, visibility impairment from those sources should be decreasing; this is a better approach than determining if simply the addition of pollutants will not have too great an impact on the Class I area. The FLMs would continue to review BACT determinations, and would also review the status of emissions under the Northeast Minnesota Plan; the plan changes, rather than eliminates, FLM oversight for new sources in this area. In addition, it adds a category of sources (those between 100 and 250 tpy) that would get FLM scrutiny that may not do so now if a PSD permit is not issued. The goal of an MOU is to set out the specifics for how FLM review will be conducted in the future. If an MOU between the MPCA and FLMs is developed, it will be posted on the MPCA's Regional Haze website to be reviewed by interested parties, and comments will be taken as they were during the development of the Northeast Minnesota Plan.

MPCA has clarified and provided additional explanation of the treatment of new sources in the SIP.

<u>IV. Visibility Measurements</u>

1) *Inconsistency in Measurement of Visibility Changes* – The SIP does not explain how MPCA determines when variances in deciview estimates or measurements are statistically significant or meaningful. The inclusion of the change in RPG of 0.1 dv due to complete modeling of the Northeast Minnesota plan indicates that an improvement of 0.1 dv is significant, while in other sections, larger changes in visibility between 0.2 and 0.8 dv are considered insignificant. The SIP should explain and justify why changes > 0.1 dv are not considered significant. The commenter believes the SIP has no consistency in determining which changes in visibility are considered significant. The presentation of the revised RPG at the public meeting left the impression that a 0.1 dv change is significant, yet in

other areas much larger changes (0.2 to 0.8 dv) are called small. The commenter believes that "Characterizing changes in 0.2 to 0.8 dv as 'small' is incorrect."

MPCA Response: The affidavit quotes the MRPO document "Regional Haze in the Upper Midwest, Summary of Technical Information", Version 2.1, January 31, 2008, which is provided as an Appendix to the Minnesota Regional Haze SIP. In that document, visibility levels of less than 1 deciview are described as "small". When describing the change as "small" the MRPO was using the term in the context of perceptible changes in haziness – in the deciview scale. By definition, 1 deciview is the amount of change in visibility that the human eye can discern, and in this context, "a 1 to 2 deciview difference corresponds to a small, visibly perceptible change in scene appearance" by the human observer.[134] Therefore, any visibility change below 1 deciview could rationally be called "small" or insignificant, as it is imperceptible.

It should be noted that the SIP does not state that a change of 0.1 dv is significant. The MPCA shared with stakeholders at the public meeting the results of a modeling analysis that resulted in the 2018 RPGs decreasing 0.1 dv in order to explain why the RPGs in the final document would be slightly different from those presented in the draft document. It was not presented as a significant change.

The use of the term "small" in the previous context is not meant to minimize the progress the Minnesota Regional Haze SIP illustrates at tenth-of-a-deciview levels toward achieving observable visibility changes. Any change toward improved visibility, whether that change is perceptible by the human observer, is a step in the right direction toward reaching the visibility goals.

2) *IMPROVE Monitors* – The SIP does not address the ability of only two monitors to accurately measure visibility conditions in the entirety of the Class I areas or the appropriateness of the location of the IMPROVE monitors. The commenters feel that the "SIP should provide a discussion of the meaning of visibility data collected at just one monitor in each Class I area in terms of its ability to represent visibility at numerous (or all scenic vistas) locations at the Class I area. For example, a list of scenic vistas could be provided in the RH SIP as each Class I area. The number of visitors to these vistas could also be noted for the various baseline years at each Class I area."

   The commenters also state that the SIP does not address any temporal variability or uncertainty as to how representative the 2000 – 2004 baseline period is compared to individual years or other periods. Although the regulations only require data from 2000 – 2004, the commenters believe the state should discuss more years of data, providing greater context. Even for 2000 – 2004, the commenter feels the annual data provided are not critically discussed. The SIP should also discuss if the monitors are likely to over or under-estimate actual visibility. Finally, the MPCA should support continued funding of monitors.

MPCA Response: The MPCA understands the concern about the ability of the IMPROVE monitors to address visibility in the entirety of each Class I area. However, the choice of monitor sites is made by federal entities, not the State. In addition, the use of a single monitor to reflect visibility conditions in the Class I areas was addressed by the EPA in development of the Final Regional Haze Regulations. In response to comments on the Regional Haze Rule regarding the use of the one deciview change as the threshold for perception in all cases for all scenes, the EPA made the following statement, which also appears to appropriately address the comment:

> *"EPA wishes to emphasize that the overall goal of the regional haze program is not to track changes in visibility for only certain vistas at a specific Class I area. Rather, the program is designed to track changes in regional visibility for the range of possible views of sky and terrain found in any Class I area, and to assure progress toward a national goal…The monitoring network is not designed to track changes in visibility for specific views in each Class I area. Rather, the network is designed to characterize visibility conditions that, for each site, are representative of a fairly broad geographic region. The EPA believes this approach is consistent with the nature of regional haze, which is defined as a uniform haze caused by numerous sources covering a broad area".*

[134] Pitchford, M.L. and Malm, W. C. (1994). Development and Application of a Standard Visual Index. *Atmospheric Environment*, 28, pp. 1049-1054.

While preparing the Regional Haze SIP, the MPCA followed EPA rules and guidance, which went through extensive public notice and comment. The final rules and guidance do not require the type of analysis suggested by the commenter. Furthermore, upon consultation with the U.S. Forest Service, which oversees BWCAW, staff is unaware of any list of scenic vistas within the BWCAW. Although the Forest Service does tally the number of visitors at entry points to the BWCAW, and dates in and out of those points, they do not know what locations (or scenic vistas) people visit once they enter the BWCAW.

The MPCA believes it is reasonable to focus attention in the SIP to the most recent years (i.e. 2000-2004) of monitoring data collected at the Class I areas. This data provides representation of the air quality at the time period from which we intend to improve visibility conditions. As the commenter states, "the RH regulations prescribe the temporal baseline period (i.e. 2000-2004)". The lower visibility values in 2004 are due to an unusual meteorological year, when the Midwest was cooler and wetter than some other years. That year had corresponding record low ozone and particulate concentrations throughout the Midwest, as shown in a report prepared by Donna Kenski of LADCO.[135] To allow for variations in meteorology like those described above – without putting undue weight on an anomalous meteorological year, the EPA chose to include a 5-year baseline period to "establish a more robust baseline value" than using a 3-year period.

3) *IMPROVE Data Analysis* (Largely from Affidavit)

   a. The commenters feel the SIP does not address whether the efforts to adjust/correct IMPROVE data meets EPA's data filling requirements, and request that the details of the regression analysis used to "patch" the BWCAW monitor data for the years of malfunction should be included in the SIP and that the SIP should also note if the methodology and details were discussed with EPA and any EPA responses.

MPCA Response: The Regional Haze rule prescribes the baseline as the years 2000 through 2004. An equipment malfunction in 2002, 2003 and 2004 at the BWCAW IMPROVE monitor site caused the loss of the following data :

- "Module A" – $PM_{2.5}$ particle mass
- "Module C" – Elemental and organic carbon mass, and
- "Module D" – PM_{10} particle mass

This data loss invalidated three out of every seven samples from these modules. "Module B" has a denuder that collects nitrate, chloride, sulfate and nitrite. According to CIRA, the "Module B" data from BWCAW during this period are valid. In order to utilize the valid data from BWCAW, Scott Copeland of CIRA substituted the missing components with a linear regression analysis from corresponding valid data collected at Voyageurs. His replacement of the missing BWCAW IMPROVE was presented to the national EPA/RPO Monitoring and Data Analysis discussion group. This group held monthly conference calls to report research related to visibility and to address problems and issues with monitoring and data analysis; EPA representatives participated in the calls. MPCA staff attended all the calls that addressed data substitutions and EPA did not express any opposition to the respective methods. The EPA position was that approval of substituted datasets would be the responsibility of the Region reviewing affected SIP submittals. It was, however, understood that participants in the discussion group would decide the validity of substitution methods, and that the process of presenting to this national workgroup constituted the approval process. This precept applied to all the data restorations done at Class I areas (e.g. Mingo NWR, Breton Island, nine in the WRAP states). Data substitution reports are available on the VIEWS website.[136]

Additional documentation of the data substitution method is in the document *IMPROVE Data Substitution Methods for Regional Haze Planning* recently presented at the Air and Waste Management Association specialty conference "Aerosol and Atmospheric Optics: Visual Air Quality and Radiation" in Moab, Utah, April 28, 2008 through May 2, 2008.

[135] Kenski, D. (2006, March 20). *Draft: PM2.5 Trends in the Midwest*. Provided via email to Margaret McCourtney, May 29, 2008.
[136] http://vista.cira.colostate.edu/views/Web/Documents/SubstituteData.aspx

b. The commenter also states that the SIP should describe the rationale for the change to the new IMPROVE equation, particularly because it is "clear that all the data required for the new IMPROVE equation were (and are) not collected at these monitors. Thus, the overall basis for using the new IMPROVE equation is somewhat compromised." The SIP should also note if the predictions would be better if all the data was collected and comment on whether additional data should be collected at the IMPROVE monitors.

MPCA Response: As stated in the SIP, the new IMPROVE equation better fits the observed light extinction values. The MPCA chose to use the new equation because it is more representative and to promote consistency as the new equation is being used by most other states. In referring to missing data, the commenter references a statement in the draft SIP, Chapter 5, page 20, which states: "[New] terms have been added for Sea Salt (important for coastal areas) and for light absorption by NO_2, where NO_2 observations are available. (These observations are not available for Minnesota, so this component was not used)." The IMPROVE steering committee, in its December 2005 approval of the revised IMPROVE algorithm, had no intention of excluding sites that did not collect this component from using the equation. Instead, it included the additional component for sites that do collect it. The "old" IMPROVE algorithm also does not contain NO_2. According to Scott Copeland of CIRA, "NO_2 is not a normal part of the IMPROVE program. [He] would expect slight changes to both natural and baseline conditions, perhaps adding very roughly 1-3 Mm^{-1} to the 20% worst baseline and 0.5-1.5 Mm^{-1} to the 20% worst natural. This would have a small effect on glide path calculations." Further information on the revised algorithm can be found on the IMPROVE website.[137]

c. The commenter also requests that the actual calculations for the 20% best and worst natural condition and baseline condition days should be included. Finally, although the commenters applaud the MPCA and LADCO for including the poor visibility days with missing data in the baseline period, the commenters feel that the fact that natural conditions were not recalculated with the inclusion these days is a problem, as it is unclear what the impact of this recalculation would be on natural conditions.

MPCA Response: As stated in the Technical Support Document, page 69,

> *"The **baseline visibility conditions** were calculated using the regulatory version of the observed data obtained from VIEWS, and includes the substituted values for Boundary Water...The 20 percent worst days in Boundary Waters and Voyageurs used here differ from those currently available on VIEWS. The MRPO identified some days at Upper Midwest Class I area data excluded from the 20 percent worst days on VIEWS because of incomplete capture of insignificant components of visibility in those Class I areas. For example, coarse mass and soil/crustal material are missing, while the remaining components—notably sulfate and nitrate—are present at levels that would cause those days to be on the list of 20 percent worst. The details of the MRPO inclusion of missing days is described in "Impact of Missing Data on Worst Days at Midwest Northern Class I Areas", March 12, 2007 (revised June, 19, 2007). Over the five-year period used to calculate the baseline visibility conditions, this affects six days at Boundary Waters and three days at Voyageurs. The baseline increases by 0.3 dv at Boundary Waters and 0.2 dv at Voyageurs. The MRPO treatment does not affect the 20 percent best days."*

As requested, the actual calculations are provided below, and for the public record:

[137] http://vista.cira.colostate.edu/IMPROVE/Publications/GrayLit/gray_literature.htm

A. Using monitored data, rank baseline visibility for each day with PM_{10}, $PM_{2.5}$ and speciated $PM_{2.5}$ measurements within a Class I area.

1. Obtained $PM_{2.5}$ speciated monitored data from VIEWs with inclusion of missing data from MRPO;
2. Estimate extinction coefficient for each day using the new IMPROVE equation[138] adopted by the IMPROVE Steering Committee in December 2005:[139]

b_{ext} = 2.2 * f_S(RH) * [small sulfate] + 4.8 * f_L(RH) * [large sulfate]

+ 2.4 * f_S(RH) * [small nitrate] + 5.1 * f_L(RH) * [large nitrate]

+ 2.8 * [small organic mass] + 6.1 * [large organic mass]

+ 10 * [elemental carbon]

+ 1 * [fine soil]

+ 1.7 * f_{SS}(RH) * [sea salt]

+ 0.6 * [coarse mass]

+ Rayleigh scattering (site specific—BOWA1= 11, VOYA2 = 12)

+ 0.33 * [NO_2 (ppb)]

where: b_{ext} is calculated total light extinction in inverse megameters

f_S(RH) is the relative humidity adjustment factor for small particles;

f_L(RH) is the relative humidity adjustment factor for large particles;

f_{SS}(RH) is the relative humidity adjustment factor for sea salt; and

The apportionment of the total concentration of sulfate compounds into the concentrations of the small and large size fractions is accomplished using the following equations:

[large sulfate] = ([total sulfate]/20μg/m³) * [total sulfate], for [total sulfate] < 20 μg/m³;

[large sulfate] = [total sulfate], for [total sulfate] ≥ 20 μg/m³; and

[small sulfate] = [total sulfate] – [large sulfate]

The same equations above for large sulfate, are also used to apportion total nitrate and total organic mass concentrations into the large and small size fractions.

NO_2 is not currently measured at the IMPROVE monitors, so this factor is not included. It also is not part of the "old" IMPROVE equation.

[138] IMPROVE Steering Committee, "Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data", July 2005.
[139] VIEWs web site. http://vista.cira.colostate.edu/views/Web/RHR/RHR_Planning.aspx

Monthly f_S(RH) and f_L(RH) values are presented in Table 1.[140],[141]

ClassI	*f*(RH)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BOWA1	f_S(RH)	3.24	2.84	2.99	2.64	2.93	3.21	3.44	3.67	3.80	3.07	3.50	3.49
	f_L(RH)	2.50	2.26	2.32	2.09	2.22	2.42	2.57	2.69	2.76	2.37	2.65	2.65
	f_{SS}(RH)	3.74	3.37	3.34	2.92	3.03	3.43	3.68	3.85	3.95	3.44	3.89	3.92
VOYA2	f_S(RH)	3.16	2.77	2.82	2.59	2.65	3.28	3.25	3.48	3.66	3.02	3.37	3.32
	f_L(RH)	2.46	2.22	2.22	2.07	2.09	2.46	2.46	2.59	2.70	2.35	2.58	2.55
	f_{SS}(RH)	3.69	3.31	3.20	2.90	2.89	3.46	3.55	3.71	3.87	3.42	3.83	3.80

3. Convert b_{ext} to decivews (dv) using the following equation:

   Haze Index (dv) = 10 *ln*(b_{ext} /10)

   Where: b_{ext} and light scattering due to Rayleigh scattering (i.e. the "10" in the denominator) are both expressed in inverse megameters (Mm^{-1}). In order to be consistent across all Class I areas, the U.S. EPA prescribed that the Rayleigh Scattering in the denominator of the conversion of the extinction value to deciviews should always be 10 instead of using site-specific Rayleigh Scattering values.[142]

4. Order the deciview values for all days at each Class I area for each of the 5-years of the baseline period from worst (highest deciview value) to best (lowest deciview value).

<u>B. Calculate the average baseline deciview for the 20 percent worst (highest deciview values) and for the best (lowest deciview value).</u>

1. Calculate the arithmetic mean deciview value for the 20 percent worst and best visibility values for each year;
2. Average the resulting 5-year mean deciview values reflecting worst visibility for each of the years; and
3. Average the 5-year mean deciview values reflecting best visibility for each of the years.

The calculations of natural conditions are done by the VIEWS staff at CIRA for all states. Scott Copeland recently presented a paper, "Calculation Method for Natural Conditions with the New IMPROVE algorithm," to the Air and Waste Management Association specialty conference "Aerosol and Atmospheric Optics: Visual Air Quality and Radiation" in Moab, Utah, April 28, 2008 through May 2, 2008.

After learning about MRPO's discovery of the poor visibility, missing data days (often referred to as the Kenski days because of Donna Kenski's discovery and subsequent analysis of the data) and the decision to include them in the 20% worst days, VIEWS staff discovered that these types of missing data days existed at many Class I areas, and hoped to do some recalculation of visibility conditions with the additional data. The MPCA requested VIEWS staff to calculate natural conditions with the new data for BWCAW and VNP, as had been done by VIEWS when the new IMPROVE algorithm was adopted. However, these calculations were not done due to the relatively late discovery of these data in the Regional Haze process (early 2007) and the workload and staff shortage at VIEWS. The MPCA believes

[140] VIEWs web site. http://vista.cira.colostate.edu/views

[141] Hand, J.L, and Malm, W.C. (March 2006) *Review of the IMPROVE Equation for Estimating Ambient Light Extinction Coefficients*. http://vista.cira.colostate.edu/improve/publications/GrayLit/016_IMPROVEeqReview/IMPROVEeqReview.htm

[142] U.S. EPA, Office of Air Quality Planning and Standards. (2007, April). G*uidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze*. EPA-454/B-07-002. http://www.epa.gov/ttn/scram/guidance/ guide/final-03-pm-rh-guidance.pdf

that VIEWS still intends to complete this calculation, and post it on the VIEWS website – the national visibility data repository.

The change will be very small due to the fact that natural conditions in deciviews are small and the changes due to the addition of these days had a relatively small effect on the 20% best and worst days in the baseline years. A proportionate change to natural visibility would be less than this. According to Scott Copeland of CIRA, "Including the Kenski days has a demonstrable effect on the baseline values, but the natural conditions 2 values are normalized to the Trijonis annual mean estimate. So, for example, adding a few extra high sulfate days increases the annual sulfate mean, which increases the sulfate scaling factor which reduces all the values in the distribution, somewhat offsetting the larger values. In the specific case of BOWA1 and VOYA2, only 6 and 3 sample dates respectively are added to the distribution of roughly 120 observations that are in the 5 years' worth of 20% worst days, so there is just no way to move the mean very much."

V. Emission Inventory

1) *Jargon* – The commenters state that the emission inventories used and discussions of these are difficult to understand due to use of jargon.

MPCA Response: The commenter specifically refers to portions of the TSD as examples of jargon. The TSD is meant primarily to fulfill the needs of a technical audience, by providing all the details of the data analysis and modeling that supports the SIP. The intended audience includes those at EPA responsible for reviewing the SIP and technical staff at Regional Planning Organizations, States, and consultants that are very familiar with the technical process. The example the commenter provided of jargon in the documentation contains a lot of meaning for individuals and groups that have been deeply involved in the technical portions of the Regional Haze SIP process.

Chapter 8 of the SIP is intended for a more general audience, in order to explain the technical basis of the SIP. In response to this comment, the MPCA will review Chapter 8 of the SIP in order to ensure that its presentation of technical information is as clear as possible and understandable to a general audience.

For instance, the example given in the affidavit relates to the various versions of the modeling inventories created by the regional planning organizations for the Haze SIP; similar language is included in the TSD and Chapter 8 of the SIP describing these modeling inventories. The MPCA will modify the Regional Haze SIP Chapter 8 to include the underlined statement in order to help describe these version numbers.

> *"Both CENRAP and the MRPO incorporated the inventories developed by the States within their respective RPOs and shared modeling inventories with one another and other RPOs. Due to the iterative nature of the work, a variety of emission inventories have been developed and used by organizations conducting haze modeling. Therefore, each RPO might have a different version of their member States' inventories. Each subsequent version of a modeling emissions inventory might include the addition of emission sources that were missed, corrections to location coordinates and stack parameters of industrial point sources, and revisions to the inventory methodology.*
>
> *Both CENRAP and MRPO have identified the various versions of their modeling inventories using a lettering system. Each base year inventory starts with the word "base" followed by the version (i.e. "A" through "Z"). CENRAP's final 2002 inventory is BaseG, the MRPO's latest 2002 inventory is BaseK. Unfortunately, based on each RPO's timing in the creation of these modeling inventories, the latest base year inventory of one RPO is not necessarily included in another RPO's base year. For example, the MRPO BaseK contains CENRAP's BaseC, while CENRAP's BaseG contains the MRPO BaseK."*

The MPCA will make similar changes to the SIP to ensure that any jargon is appropriately explained. The MPCA will also review the draft TSD and remove jargon as much as possible and provide additional explanation where jargon may be necessary. The MPCA will add a glossary that addresses potentially unfamiliar terms in the Technical Support Document and the SIP.

2) *Reliability of Emissions Inventories* – The commenters feel that the SIP does not address the inconsistencies, contradictions, and "huge disparities" between the various emission inventories,

which raises questions about the credibility of the inventories. The commenter states that glaring differences between inventories are left unexplained, and therefore it is reasonable to ask why any of these inventories should be relied upon. This includes differences between the 2002 and 2005 inventories developed by Minnesota and MRPO. The commenters believe the haze SIP should provide context for these inventories, with a background discussion and overview of how they are developed and used and an explanation of why there are differences and how MPCA reconciled them. The commenters also believe that errors associated with the inventory estimates and the number of significant digits used in reporting the inventory data should be considered. These two omissions lead to an impression of greater precision in the reported data than is possible. The commenters also state that the different emission inventory tables in the Draft SIP and TSD report emissions somewhat differently in terms of defining source categories and emission types, and these should be made consistent.

MPCA Response: The commenter claims great uncertainty in the base year "past actual" inventory, and references Tables in Chapter 7 of the Regional Haze SIP and in the Technical Support Document, section 2.0, Emissions Inventory Development (the emissions summary data in this table is also in Chapter 8 of the Regional Haze SIP). The table containing Minnesota's 2002 emissions in Chapter 7 was developed by the emissions inventory staff of the MPCA for submission to the National Emissions Inventory. The tables in Chapter 8 are summaries of the modeled inventory. The modeling inventory starts with the inventory provided by the State and makes enhancements as necessary, due to findings during the modeling process. Recall the iterative nature of deriving the modeled emissions described in the draft TSD in "II. Process for Developing Technical Support for Regional Haze", Pages 12 through 15. Thus, some differences will be seen between the inventory prepared by a State for the NEI; and those modified for purposes of modeling.

As noted in Chapter 8, page 34 of the SIP, and Section 2.1, page 17 of the draft TSD:

> *"For some sectors, methods initially available to States for inventory development were inadequate for air quality modeling. For these sectors, both CENRAP and MRPO have independently, and in some cases cooperatively, hired contractors to develop emissions data to support improvement of State-developed inventories where the older methodology, insufficient for modeling purposes, was used. For example, it is important to have accurate ammonia emissions because ammonia combines with sulfuric and nitric acid to form aerosol sulfate and nitrate, significant components of $PM_{2.5}$ and of visibility impairment. Also, States do not create inventories for biogenic sources, so these inventories had to be created."*

Eliminating biogenic emissions (which States do not calculate for the NEI) from the emission totals in the summary tables in the Regional Haze SIP chapter 7, the most significant difference between the total State-generated emissions and modeled emissions are primary particulates. As noted in Section 2.0, Table 2.1, page 20 of the draft TSD:

> *"Wind-blown and agricultural tilling dust emissions were eliminated from the modeling inventory due to concerns over the transportable fraction of fugitive dust. Road dust is included".*

There also is no expectation that the emissions totals in Table A and Table B would match because they were created with different calculation methodology. The State calculations in Chapter 7 were developed as county annualized emissions summed for the State, whereas the State annual emissions totals in Chapter 8 and in Section 2.0 of the TSD are back-calculated from the CAMx model-ready input files. CAMx model-ready emissions are by grid cell (or elevated point), in moles per hour for gases and grams per hour for aerosols. Emissions that are back-calculated to grid cells on the borders between two States are assigned as appropriately as possible geographically. This does not replicate how the emissions were initially assigned to grid cells in the emissions modeling process; but is the best method available to the State for describing the modeled emissions in tons per year by geographic region.

The MPCA agrees that these emissions summaries should not be summarized to the ton. The MPCA will modify emission inventory tables in the Regional Haze SIP chapters 7 and 8, and the TSD section 2.0, so all values are presented to 3 significant digits.

The resulting State derived NEI emissions and the back-calculated modeled emissions (to three-significant digits) for Minnesota are provided in Tables A and B, below. Considering the calculation methodology differences in deriving the summary tables, and other reasons described above, the emissions are quite similar.

Table A: 2002 Modeled Emissions for Minnesota.

SrcGroup		SO_2	NO_X	NH_3	PM_{25}	PM_{10}	VOC
Point		131,000	155,000	2,310	12,500	31,100	33,700
Area		22,800	58,100	175,000	19,500	72,200	133,000
Mobile	**On-road**	29	172,000	7,200	2,200	2,200	97,600
	Non-road	9,210	102,000	98	5,600	6,380	96,800
Biogenics		0	28,700	0	0	0	698,000
Minnesota TOTAL:		163,000	516,000	185,000	39,900	112,000	1,060,000
(no biogenics) TOTAL:		163,000	487,000	185,000	39,900	112,000	361,000

Table B: 2002 State Derived Emissions for NEI.

SrcGroup		SO_2	NO_X	NH_3	PM_{25}	PM_{10}	VOC
Point		131,000	153,000	1,270	12,500	31,500	29,500
Area		17,500	57,000	172,000	145,000	734,000	161,000
Mobile	**On-road**	3,000	172,000	5,360	2,750	3,800	91,000
	Non-road	9,100	103,000	97	8,850	9,670	84,300
Biogenics		n/a	n/a	n/a	n/a	n/a	n/a
TOTAL:		161,000	485,000	179,000	169,000	779,000	366,000

The commenter specifically mentions mobile source SO_2 emissions as a concern. In the modeled inventory, on-road mobile source SO_2 for Minnesota is summarized as ~28 tons per year. The MPCA agrees that this estimate is low; however, the MPCA believes this does not make the modeled inventory unusable for purposes of the SIP. Even with on-road mobile source emissions at ~3,000 tons SO_2 per year, point source contributions of SO_2 (~130,000 tons per year) far out-weigh on-road mobile source SO_2 emissions. The main impact on visibility from on-road mobile sources comes from NO_x emissions (~170,000 tons per year).

The commenter made the same remarks for summary tables developed for the 2005 inventories. The MPCA response to this comment is the same, with an additional factor: While the State-derived annual emissions summary table in Chapter 7 of the SIP depicts the final 2005 NEI, the MRPO modeled 2005 inventory does not. These inventories take a few years to develop and the Chapter 7 table was added to the Regional Haze SIP late in SIP development process. The MRPO modeled 2005 inventory was developed much earlier with the data available at the time.

Minnesota did not use the MRPO modeled 2005 inventory to develop progress goals for the Regional Haze SIP; so whether or not the State-derived emissions summary tables and the modeled 2005 inventory match is irrelevant. The 2005 modeled inventory was provided in the TSD as part of the weight-of-evidence to help explain why the progress goals differ between the 2002 and 2005 modeling analyses. The MRPO 2005 inventory will be moved to an Appendix of the TSD to lessen any confusion caused by its inclusion.

In addition to comparing the emissions summaries between the 2002 Minnesota NEI and the 2002 modeled inventory estimates, the commenter also made comparisons between the MRPO modeled inventory (which the MPCA relies upon in the SIP, and is summarized above) and the CENRAP derived emission summaries by State. The MPCA made an attempt in the draft TSD to warn the reader, on page 18, paragraph 6, which states,

> *"The CENRAP model inputs do not support these emissions totals, apparent in Section 2.2. Nevertheless, the emissions summary information from CENRAP is included, but should be viewed with some caution."*

Due to the apparent confusion caused by the inclusion of this somewhat erroneous data, the MPCA will remove the CENRAP-derived summary emissions data from the Tables in section 2.0 of the TSD. The MPCA will also remove the CENRAP 2018 summary emissions from the TSD.

The MPCA has confidence in the MRPO developed modeled 2002 inventory for Regional Haze SIP purposes. The continued emissions inventory development work has resulted in the best modeling emissions inventories possible to date. An attempt to better explain, and put into context, the differences in the modeling inventories and how they are used to define uncertainties in the model results will be added to the TSD.

3) *Reliability of Emission Projections* (Affidavit) - The commenters reiterate that if past actual emission inventories are so inaccurate, "it is wholly premature to confidently lead into distant future year emissions projections, such as for year 2018," as there is no reason to believe that 2018 inventories are accurate. The commenters also state that the emission projections rely on models whose usefulness for projecting future emissions has not been fully described. The example used is that of the IPM model, routinely used by EPA but with no documentation provided. The commenter believes that because the state had to make corrections to the IPM data, all predictions relying on IPM model projections are likely to be unreliable. The comparisons of the different work of the different organizations show the significant uncertainties in developing even past actual inventories, and inspire no confidence that any projections of future inventories are meaningful.

MPCA Response: Although the MPCA has often lamented the fact that IPM is such a "black box" to those outside of EPA, all RPOs agreed to predict future EGU emissions with IPM for consistency with EPA projections used to support the CAIR rule. The Regional Haze Rule requires states to project emissions to the future; including emissions of electric generating units (EGUs). Like the emissions development for all categories, many iterations and improvements were made through a concerted effort among the States through the RPO process. The future projections used in the SIP are the best to date. We can only use the tools that are available to us, and review the projections to verify that yield reasonable results. MPCA staff reviewed the future year projections for EGUs used in the Regional Haze SIP and confirmed that they are consistent with expectations based all the available information on hand to date.

The commenter also raises questions about different future scenarios of utility emissions presented. The commenter implies that the fact many states "noted significant different emissions as compared to IPM3.0 (base), as reported in the RH SIP" means that the IPM model results in large errors in predicting 2018 emissions, drawing this conclusion from comparing IPM3.0 (base), which is the primary IPM3.0 future year emission projection, and IPM3.0 (will do), which is a future prediction modified with information from several states, presented in table 8.3. However, as stated in Chapter 8 of the draft SIP, although the IPM3.0 (will do) scenario does include the correction of some mistakes, many of the changes made were due to "committed control projects that occurred after the deadline for submission of such projects to EPA for inclusion in IPM3.0." Therefore, these emissions are meant to be different from those in IPM3.0, because they represent a different future scenario. The SIP was further clarified by adding the following language to Chapter 10: "the projects in the IPM "will do" scenario were not known in time to be submitted to EPA in order to be included in the base IPM3.0 projection."

4) *International Emissions* – The comment letter states, "The Haze SIP does not include proper documentation of Canadian emissions or an explanation of why proper documentation was not

available" and "fails to account for projections of future Canadian emissions in an informed manner." The commenters also state that there is no analysis of potential growth in emissions sources from Canada or how growth will be offset by Canadian regulatory programs. The commenters feel it is likely that there will be increases in Canadian emissions over the next decade, due to tar sands development, and these, as well as the impact of climate change on Canadian emissions, are not explained.

MPCA Response: There are difficulties in accessing the Canadian inventory, which the MPCA believes it is appropriate for the EPA to resolve in a government-to-government relationship. Therefore, the MPCA believes that the action taken in the SIP (holding emissions from Canada constant) is the most appropriate action, as it focuses attention on the changes in emissions in Minnesota and other States that are required to submit Haze SIPs. The explanation provided in the draft TSD, section 2.3, page 35, provides sufficient reason for using the Canadian 2005 inventory for both the 2002 base-year modeling and the 2018 future-year modeling. The draft TSD states, "…no credit is taken for any possible reduction (or increase) in emissions from Canada." The MPCA emphasized reductions in emissions because the use of the available 2000 base-year, and 2018 future-year Canadian emissions would have resulted in modeled visibility impacts closer to the URP at BWCAW and VNP than when the emissions are held constant. Thus, we would have taken credit for emissions reductions in Canada. Because the underlying data and calculations used to create the Canada emissions are unavailable, along with problems with the dataset, the MPCA is uncomfortable taking credit for those modeled visibility improvements. The choice was made to keep the emissions constant.

5) *Ammonia Emissions* – The commenters note that ammonia emissions have significant uncertainty, but that the state does not seem to recommend additional data gathering or monitoring of ammonia. The commenters feel the state should not assign responsibility for improving ammonia modeling without identifying how the state can help to improve understanding. Instead, the Haze SIP should include "strategies for increasing our ability to understand and control pollutants" for pollutants such as ammonia. The state is responsible for improving understanding of emissions of ammonia from point and area sources and, if needed, collection of additional ambient ammonia measurements.

MPCA Response: Both CENRAP and MRPO are currently planning to conduct studies of ammonia in the near future. The MPCA certainly intends to assist in these studies, as we believe that a better understanding of ammonia is necessary on a regional level.

VI. Modeling

1) *Reliability of Models* – The commenters state that SIP language is very technical, and general background information on the use of air quality models would provide additional clarity/context. As noted in the SIP, Minnesota has five modeling analyses to draw from. The commenters state that the five scenarios do not agree, and the SIP can only speculate as to the causal factors. The commenters feel that inconsistencies between the models used to determine progress towards visibility goals raises concerns about the reliability of the models as a basis for planning, and that "none of these modeled results can or should be used as the basis for serious planning", as they are not robust enough. The commenter specifically refers to a statement in the draft SIP that models are "less reliable for organic carbon – note the large underestimation in monthly average organic carbon concentrations." Therefore, the commenters request that more information be added to a weight of evidence analysis.

MPCA Response: One reason the commenter states the modeled results should not be used for planning is because of the model performance of organic carbon. The MPCA disagrees. Model performance of organic carbon in the rural BWCAW and VNP fit within performance goals on non-wildfire days (Organic carbon often arises from wildfires) and is better than that seen in overall performance conducted by the MRPO which encompasses a much larger scope and includes urban areas. The weight-of-evidence that poor performance at BWCAW and VNP is on days influenced by wildfires is documented in the draft TSD, Section 6, page 59, which states:

> *"Organic carbon performance is good [at BWCAW and VOYA] with several days not meeting [the performance] criteria. They are May 26, June 1, July 19 and October 2.…In a*

paper titled 'Establishing Reasonable Progress Goals for the Northern Class I Areas: Treatment of Organic Carbon", April 2, 2007, the MRPO addresses impact from wildfire activity. MRPO identifies the days with bad organic carbon model performance as days in which the Minnesota Class I areas were impacted by Canadian wildfires".

It makes sense that modeled organic carbon performance on those days would be poor because wildfires were not included in the modeling inventory. Because wildfires cannot be predicted in the future, for the modeled inventory wildfires can either be included – and held constant – from the base-year to the future-year (as CENRAP had done) or excluded from the both the base-year and future-year, and handle the model performance in a qualitative manner as MRPO (and Minnesota) has done, and is described above.

In order to clarify why inclusion of wildfires in the modeling inventory is not necessary to establish reasonable progress goals at BWCAW and VOYA, a description of how modeling results are used in the reasonable progress test is useful. First, the absolute modeled concentration results are not directly used. Rather, the EPA guidance describes a method (also described in the draft TSD in Section 7.0, pages 69-70) of using the modeled results to establish a unitless "relative response factor" which is then applied to the observed data. The relative response factors are the ratio of the future absolute model concentration for each individual component of $PM_{2.5}$ (i.e. averaged over the 20% worst days), to the base case absolute model concentration for each individual component of $PM_{2.5}$. Because wildfires are not predictable nor controllable in the sense of enforceable control strategies, no changes in organic carbon due to wildfires appears in the relative response factor. This means that organic carbon levels due to wildfires are included in the baseline and in the reasonable progress goal, both of which are established using monitored data, but no changes in organic carbon due to wildfire occurrence is assumed in the goal. The MPCA will clarify in the TSD that the five modeling analyses do agree as long as we take the opportunity to understand and consider the uncertainties of each. This is what the MPCA attempt to do in the TSD.

2) *Meteorological Data* – The commenters note that the SIP uses met data from one year as a basis for developing 2018 emission predictions; they state that it is overly simplistic to assume that the met data for a long term plan will be the same as any one calendar year. Therefore, they believe modeling for a long term plan using met data from one year is "indefensible" and renders the long term plan inherently flawed. The SIP should include multiple years of met data to ensure greater reliability of future predictions. Even PSD permitting requires multiple years of data. The SIP does not show any sensitivity analysis about the met data and how that affects results.

MPCA Response: The MPCA agrees that it would be preferable to utilize multiple years of meteorology covering the baseline period (2000-2004), however, the amount of resources would be immense, in terms of the physical (hard drive space, computer processing speed), time and money. The level of effort and resources that were put toward this multi-year/multi-organization project are not trivial. The requirements for the simpler individual source modeling conducted for PSD cannot compare to that required for the large, resource-intensive regional models used for attainment of the ozone and $PM_{2.5}$ standards and for establishing visibility goals. In order to conduct one year of modeling, it was necessary to pool resources and conduct the work through the RPOs.

Cognizant of the intense resources required to conduct these analyses, EPA guidance for regional haze does not tread in the area of modeling multiple meteorological years, but discusses modeling analysis encompassing multiple days, and suggests a possible need to model an entire year. For modeling $PM_{2.5}$, EPA guidance discusses modeling a full year as "a logical goal." For regional haze, the multiple days are those which reflect the variety of meteorological conditions representing visibility impairment on the 20% best and 20% worst days in the Class I areas being modeled. Minnesota knows of no state that surpassed EPA guidelines by modeling multiple years of meteorology in establishing their regional progress goals.

Because of the resource limitations, the EPA guidelines attempt to take into account the year-to-year variability of the meteorology in the baseline (years 2000 – 2004). The middle year (2002) has more weight due to the fact the emissions and the meteorology are used to develop the relative response factors (RRF) applied to the baseline. Also, the "relative" application of the model results is intended to

"help reduce the impact of possible over-or under-estimations by the dispersion model due to emissions, meteorology, or general selection of other model input parameters."

The commenter quotes the Regional Haze SIP as saying Minnesota "speculates" that differences in meteorology can "…result in a different set of 20% worst days with less impact from Minnesota." The commenter refers to a hypotheses made by the MPCA as to why the MRPO 2005 modeling showed reasonable progress goals closer to the URP than the Minnesota 2002 goals. The MPCA would like to clarify that the different set of 20% worst days are determined by the observed data; not by the modeling.

That being said, the MPCA obtained the 2005 meteorology developed by the MRPO. The MPCA tested the hypothesis in the Regional Haze SIP and draft TSD by modeling 2002 anthropogenic emissions with 2005 biogenics – which are highly dependant on meteorology – and 2005 meteorology. Because biogenic emissions remain the same from the base-year to the future-year, use of 2005 biogenics does not influence the resulting RRFs.

The use of 2005 meteorology results in a reasonable progress goals 0.4 deciviews closer to the URP at BWCAW, and 0.8 deciviews closer to the URP at VNP. Because of time and resources, Minnesota was able to test this hypothesis only after the public notice of the draft TSD; and only because the MRPO switched from a 2002 base year to a 2005 base year. The result demonstrates that the RRF, and hence, reasonable progress goals, are sensitive to meteorology and where the emission reductions occur.

The RRFs, developed from the modeling, really reflect a percent reduction in each individual component of $PM_{2.5}$. If significant percent reductions in $PM_{2.5}$ precursors occur to the – for example, Southeast – of BWCAW and VNP, and during that meteorological year winds predominated from the Southeast during the 20 percent worst days, the RRF would reflect the percent reductions from the geographic area to the Southeast. If those same emissions reductions occur in the Southeast but meteorological conditions bring influence from a different geographic area on the 20 percent worst days, like the Northwest, the emissions reductions from the southeast will not carry as much weight in the RRF.

There is no way to anticipate how other meteorological years would impact the results without conducting the modeling, which as described above is too resource intensive for most organizations to conduct, at least in the near term, and certainly it is beyond Minnesota's resources.

3) *Boundary Conditions* – The SIP indicates that "boundary conditions" are responsible for a significant amount of visibility impairment; the commenters state that it is unclear if some of these boundary conditions should be attributed to specific states. They believe that the extent to which BCs could be attributed to specific states should be analyzed, as it may mean that some states contribute more than 5% to visibility impairment.

MPCA Response: Boundary conditions are those source contributions outside of the modeling domain. In the case of the Haze SIP (and ozone and $PM_{2.5}$ attainment modeling) they are the conditions derived from monthly averaged species output from the global scale chemical transport model (GEOS-CHEM) for the year 2002. Essentially, the GEOS-CHEM model is run at a much coarser resolution to allow for modeling global emissions. The GEOS-CHEM model output is processed to remove discrepancies between the grid scales, etc., and the GEOS-CHEM and CAMx model are linked at the CAMx domain boundary.

Boundary conditions can transfer into and out of the domain from the North, South, East and West. In the case of ozone, boundary conditions can also enter in from the top of the domain due to stratospheric infusion. Source apportionment techniques can only account for the total contribution of boundary conditions to the overall visibility conditions, which accounts for the conservation of mass in the modeling apportionment.

Expanding the domain likely would not have an effect on the extent to which boundary conditions contribute to the visibility impact at BWCAW and VNP. The CENRAP domain covers at least the entire U.S. and has a similar contribution to extinction attributed to boundary conditions. The domain used in the modeling to support the Regional Haze SIP extends far enough out from BWCAW and VNP to fully account for the contributions from the most significant geographic regions (i.e. States). None of the state contributions in the significant-contribution analysis are lost in the boundary conditions.

4) *Grid Size* (Affidavit only) – The commenter states that some modeling choices are not explained, such as the choice to use a 12km grid over Minnesota rather than a 4 km or 1 km grid.

MPCA Response: The spatial resolution to use for emissions and meteorology when conducting a regional scale modeling analysis are dictated by spatial variability in emissions, spatial precision of the available emissions data, and whether smaller scale meteorology may have a significant affect on the results. Another constraint to consider is time and resources.

In the BWCAW and VNP, and generally in the Midwest, there is no complex terrain (i.e. geographic features such as mountains) and so the meteorology for regional scale modeling need not have great spatial resolution. The BWCAW and VNP also are in a rural area. In an urban setting, one would use no lesser grid resolution than 12-km.

EPA guidance, page 158, states: "Because of the remoteness of Class I areas, grid cell sizes up to 36 km on a side should suffice for regional haze-related modeling. States may wish to perform diagnostic tests using plume-in-grid analyses, as well as finer horizontal resolution to determine if results may differ using more finely resolved emissions and meteorology."

Both CENRAP and MRPO, and other States affiliated with them, modeled at 36km grid spacing. With the resources made available through MRPO, Minnesota went beyond the RPO 36km regional haze modeling conducted for the Midwest with a 12km flexi-nest over Minnesota and conducted a plume-in-grid analysis for individual sources located in the Northeastern part of Minnesota, nearest the Class I area.

The 12km "flexi-nest" incorporated 12km landuse, but did not contain emissions or meteorology resolved to 12km. As noted in item #3 above, the cost, time and data management difficulties greatly increase with more finely resolved grids. The 2002 12km meteorological data and emissions were not readily available, nor did Minnesota have time to process the data and have readily available space to store the data.

Effectively, the 12km flexi-nest provides more resolved placement of point sources. As noted in the TSD, the MPCA conducted plume-in-grid modeling for the point sources nearest the BWCAW and VOYA. The plume-in-grid tool allowed the State to gain better understanding of the influence of individual facilities on Class I area visibility by looking at the early treatment of dispersion and chemistry of point source plumes.

5) *Inclusion of Canada* (Affidavit only) – The commenter states that the Canadian contributions to haze are poorly understood in the model predictions. Some of this seems to be due to the domain size; if domain size is a factor, that should be investigated and a domain used that is "sufficiently large/ encompassing so as to not unduly influence contributions." The commenter believes that continuing to run models with insufficient domain size to resolve Canadian contributions renders much of the modeling suspect.

MPCA Response: Efforts are underway to explore expanding the domain west and north to include more of the Canadian contribution in concert with efforts to work with the Canada government regarding their inventory. It is the understanding of the MPCA that Canada has increased their efforts to improve the characterization of the tar sands sources for the same reasons the commenter mentions. The MPCA has no intention of including an expanded domain that includes the Alberta inventory as it currently exists. Because Canada emissions were kept constant in the modeling and thus, were not in the relative response factors used to determine reasonable progress goals, expanding the domain at this time would be meaningless. The collaborative effort between the two countries will take considerable time and will require significant contribution by the U.S. federal and the Canadian governments. However, this ongoing effort does not preclude U.S. sources from taking reasonable measures to improve visibility in the meantime.

VII. Other Comments

1) *Collaboration with Other States* – The commenters state that MPCA's efforts to work with the RPOs and States that contribute to visibility impairment in Minnesota "appear to have resulted in no progress in spite of the multiple meetings and extensive collaboration undertaken." The feel that since the MPCA did not reach agreement with other states on those states' responsibility for visibility

impairment or emission reductions, much of the visibility impairment remains unaddressed. The SIP does not indicate how/if EPA was involved in resolving problems with other states, and should make a direct appeal to EPA to resolve the inter state issues. In addition, the commenters feel the SIP should more clearly articulate the problems and issues experienced in working with other states, not simply indicate that 75% of visibility impairing emissions are outside MPCA's control.

MPCA Response: The MPCA has been, and continues to be, involved in consultation with many surrounding states. EPA regional staff (particularly Region 5 staff) have also been involved in these calls, and therefore have been party to many of the states' discussions about contribution. It is the MPCA's understanding that disagreements between states about contribution or appropriate controls will be resolved by consultation in and among EPA regional offices during SIP review. As requested by the commenter, the MPCA has added a more direct appeal to EPA to resolve these issues.

At this time, it is difficult to know how much visibility impairment at Minnesota's Class I areas resulting from other states will be addressed as only two contributing states have submitted their Haze SIPs. It should be noted that MPCA's reference to the fact that 75% of visibility impairing emissions are outside of MPCA's control refers only to the development of the target for the Northeast Minnesota Plan; though it generally holds true, this did not affect how the MPCA approached consultation with other States. The MPCA hopes to be able to include emission reductions from surrounding states' haze and $PM_{2.5}$ SIPs in the five year SIP assessment.

2) *States contributing less than 5%* - The commenters state that the 5% threshold for designating states as causing or contributing to visibility impairment leaves out 22% of emissions affecting BWCAW and 23% of VNP. They believe the federal goal will not be met if strategies are not developed to address the cumulative amount of visibility impairment caused by state contributing less than 5% of visibility impairment, and state that "excluding states with smaller than 5% contributions effectively sets aside a cumulative contribution that is quite large…Setting aside these states is also arguably unfair to the sources and states that are above 5% since they have to disproportionately reduce emissions to meet the glide path." The commenters feel that the Haze SIP should identify states that contribute < 5% and incorporate reductions in emissions from these states into Minnesota's long term strategy. Likewise, MPCA should address its impact on Seney.

MPCA Response: The decision to use a 5% threshold to designate specific contributing states was a policy decision made for this SIP. Such a threshold might be changed in future SIPs. Places in the SIP (Appendix 10.1, Table 10.1.1) show the contributions to visibility impairment by all states; the MPCA believes that using the 5% threshold gets the most important contributors to visibility impairment in Minnesota's Class I areas. States with contributions below 5% generally had contributions much below that threshold.

However, emissions data and projections for all states in the modeling domain were included in Minnesota's modeling of 2018 and determination of RPGs. Although states with less than a 5% contribution to light extinction are not asked to make emission reductions particularly to reduce their impact on Minnesota's Class I areas, these states should also making reductions to reduce their impacts the Class I areas, and any $PM_{2.5}$ nonattainment areas, to which they are significant contributors, which would also reduce their contribution to haze in Minnesota. It should also be noted that the Regional Haze program is a long term one; should certain states not reduce their emissions, they will contribute a higher portion of visibility impairment in the future and can be addressed at that time. The RPGs set by the MPCA are set taking into account projected emission changes in all states in the domain, and will not require disproportionate reductions from those states as compared to other states

Michigan has not asked Minnesota to specifically address its impact on Seney, and the MPCA believes that emission reductions undertaken to improve visibility at BWCAW, VNP, and Isle Royale National Park will also benefit Seney Wilderness.

3) *New Minor Sources* – The commenters state that the SIP should indicate how new minor sources will impact visibility and discuss how emissions from new minor sources will be regulated.

MPCA Response: The addition of new minor sources is included in projections for emission growth for 2018, and therefore taken into account in the visibility modeling of the future. Emissions from minor sources generally will continue to be regulated through the MPCA's operating permitting program. The MPCA has added a component to the Northeast Minnesota Plan that includes an evaluation of overall minor source emissions in the six-county area at the plan check-in points of 2012 and 2018. The Northeast Minnesota Plan also explicitly includes sources with emissions between 100 and 250 tpy.

4) *Northeast Minnesota Plan* (Affidavit) – The commenter notes that the Northeast Minnesota plan contemplates an MOU between the MPCA and FLMs. The commenter believes this MOU should be subject to public review. The commenter also states, in regards to the Northeast Minnesota Plan, that since new major sources have to undergo PSD analysis, it is not clear why haze modeling cannot also be performed. The commenter believes that using an emissions cap to excuse modeling, without taking into account source locations, is flawed.

MPCA Response: Location was one of the key concerns in determining which counties to include in the Northeast Minnesota Plan. For the purposes of the Plan, it was determined that it was reasonable to treat all emissions from the chosen six counties equally, regardless of their location, in terms of their effect on visibility impairment. The one exception is emission sources that are located extremely close to the Class I areas. Modeling to determine visibility impact is resource-intensive, both for the source and the agency reviewing the modeling (which is often the relevant FLM.) In addition, facilities are generally approved as long as they do not contribute more than a certain amount to visibility impairment. Although this may help to minimize individual facility emissions, it does nothing to look at the sum total of many facilities' emissions. The Northeast Minnesota Plan is designed to result in a reduction of emissions from the totality of nearby facilities, which can only decrease the contribution to visibility impairment from those facilities. It therefore takes a more holistic look at emissions contributing to visibility impairment than the standard PSD modeling.

5) *Mobile Sources* – The commenters state that the SIP fails to analyze the visibility impacts of mobile sources (off-road vehicles, motorboats, snowmobiles) from users and visitors of the Class I areas.

MPCA Response: Although the modeling analysis contains emissions associated with marine, recreational vehicle (as well as other non-road vehicles) and on-road vehicles to and/or into the Class I areas (as appropriate), no specific regional haze impact analysis was conducted specifically for visitors of BWCAW and VNP. Motor vehicle impacts were evaluated holistically rather than specifically directed toward visitors of the Class I area. The website cited by the commenter relates to transportation planning at all federal National Parks regarding aesthetic concerns – both noise and sight – due to low altitude airplane flights and full parking lots. These aesthetic issues are beyond the scope of the SIP.

6) *Fire Emissions and Smoke Management* – The commenters believe the SIP should discuss why Minnesota has such a high level of prescribed burning compared to other states, and that the role of fire emissions should be discussed in more detail, particularly because of the high level of prescribed burning. They state that the SIP should include more information on how MPCA proposes to regulate visibility impairment which results from prescribed fires. They feel it is not clear how the objectives of the Smoke Management Plan affect or tie in with the regional haze goals.

MPCA Response: The role of fire emissions was discussed in detail. As noted in the SIP, Minnesota's native ecosystems are dependent on and adapted to fire disturbance; for example, Minnesota has more coniferous forest land than nearby states (Michigan and Wisconsin) and these tree species are more fire dependent. In addition, Minnesota has greater land area than nearby states and likely also has more undeveloped vegetative habitats where there is lower concern about wildland/ urban interface problems with burning. Due largely to these factors, Minnesota's land management agencies conduct a more active prescribed burning program than the other nearby states. Although Minnesota does have high levels of prescribed burning, prescribed burning does not have an impact on the haziest days at the Class I areas. The commenter says that it is not clear how the objectives of the Smoke Management Plan (SMP) affect the regional haze goals, but in fact, reducing haze is a key objective for having a SMP, and the SMP is the basic instrument to address visibility effects from prescribed fires. The SMP provisions address visibility through use of ventilation index and sensitive receptor areas. The revised 2008 SMP also

references the AQI and, in practice, if the AQI is elevated for either ozone or fine particles, it is recommended that burns not be conducted in the area. The MPCA, as required in the SMP, conducts an annual review of the effects of prescribed burning on Minnesota's air quality, providing actual measurement and attribution of ozone and fine particle levels to prescribed fires. This evaluation serves to make the SMP more robust in its goals of reducing visibility effects.

7) *Construction Activities* – The commenters feel that the SIP fails to explicitly address the impact of emissions from construction activities.

MPCA Response: The SIP deals with nonroad emissions, and, as stated, rules are already in place to prevent particulate emissions from construction and minimize the impact of federal construction through conformity rules. EPA Region V reviewed Minnesota's draft SIP and did not identify this as an area of deficiency.

8) *Evaluating progress against the Glide Path* – The commenters believe the SIP should include a comparison of modeled deciview values against actual measurements at the IMPROVE monitors taken in 2007.

MPCA Response: The MPCA did not model a projection for 2007, so there cannot be a direct comparison between modeled and actual visibility conditions in 2007. The MPCA has added to the SIP, in Chapter 5, the following table updating monitored visibility conditions (with no data adjustments) for 2005 through 2007.

Site	Days	2005	2006	2007	Baseline (Average 2000 - 2004)	2000 - 2007 Average	Most Recent Five Year Average (2003 - 2007)	Natural Conditions
BWCAW	20% Worst	21.3	19.6	19.8	19.9	20.0	19.8	11.6
	20% Best	6.3	5.8.	5.8	6.4	6.3	6.1	3.4
VNP	20% Worst	19.9	20.5	19.2	19.5	19.6	19.8	12.1
	20% Best	6.8	6.5	6.7	7.1	6.9	6.8	4.3
Isle Royale	20% Worst	23.8	21.9	21.7	21.6	21.9	21.9	12.5
	20% Best	7.1	6.4	6.4	6.8	6.7	6.6	3.7

The MPCA will continue to use the IMPROVE data in order to evaluate our progress towards meeting the RPGs.

Comment Letter 23: Northeastern Minnesotans for Wilderness, Brad Sagen

This comment letter incorporates by reference Comment Letter 22, summarized and responded to above. Responses focuses solely on the additional comments made in this letter.

1) *2064 Goal* – The commenter states that the "State will not achieve the mandated Natural Conditions target by 2064…In view of other problems with the SIP, this fact alone should disqualify the current plan from receiving Federal approval. The SIP expresses no sense of urgency regarding proposed emissions reduction activities. Indeed it effectively postpones implementation of most major activities such as BART requirements until at least 2012."

MPCA Response: The MPCA recognizes that, at this time, we are not projecting meeting natural conditions by 2064. However, the SIP meets the requirements of 40 CFR 51.308(d)(1), which states:

> *"The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least impaired days over the same period."*

In addition, 40 CFR 51.308(d)(1)(ii) states

> *"For the period of the implementation plan, if the State establishes a reasonable progress goal that provides for a slower rate of improvement in visibility than the rate that would be needed to attain natural conditions by 2064, the State must demonstrate…that the rate of*

progress for the implementation plan to attain natural conditions by 2064 is not reasonable; and that the progress goal adopted by the State is reasonable. The State must provide to the public for review…an assessment of the number of years it would take to attain natural conditions if visibility improvement continues at the rate of progress selected by the State as reasonable."

The MPCA believes that it has demonstrated that the rate of progress set in the SIP is reasonable, and that additional progress is not yet known to be reasonable. The MPCA has provided dates by which the Class I areas will reach natural conditions if progress continues at this rate. Therefore, the MPCA has fulfilled these requirements of the Regional Haze Rule. In addition, although not all BART limits are not being set in this SIP, BART limits are to be incorporated into permits by September 1, 2011, meeting the deadline of implementation within five years of SIP submittal. The MPCA believes the delay in determining BART limits will ultimately result in better BART limits.

2) *Realism of the Intermediate Emission Reduction Targets Toward Achieving the Ultimate Target* – The commenter here questions the potential contribution of the 20% and 30% reduction goals towards meeting the 2064 goals. The commenter states that the 2012, 20%, reduction goal is 1911 tons per year, and that the absolute reduction, 2012 – 2018, is only 1593 tons per year, or 17% less than the 2002 – 2012 annual reduction. The commenter requests that the emission reduction targets be increased, to a 25% reduction by 2012 and a 35% reduction by 2018.

MPCA Response: The MPCA views the 2018, 30%, reduction target as the ultimate goal, with the 20% target being set as a "check-in" to ensure that all the emission reductions needed to get to a 30% reduction are not made at the last minute. The goal of the emission reduction target is to reduce overall emissions in tons per year. As shown in Table 10.4 of the SIP, a reduction in emissions from 2002 – 2012 is 19,112 tons per year, while the additional reductions to 2018 is an additional 9,556 tons per year. It appears that the commenter has divided this number by the number of years (9556 / 6 = 1593 as stated in the commenter's letter) to estimate the incremental or marginal number of tons that must be reduced each year. However, the MPCA does not feel that this is the best way to evaluate emission changes. The nature of control projects is such that decreases in emissions are likely to come in larger steps, not incremental, annual reductions. Although there are many ways to think about setting the emission reduction target, the MPCA believes that the 30% reduction goal for 2018 is both substantial enough to result in visibility improvement, and yet reasonably achievable.

3) *Monitoring* – The commenter suggests that greater reliance be placed on actual monitoring data, but raises concerns that the location of the monitors have not been analyzed to determine if they are representative of the entirety of the Class I areas, and that there is unexplained variation in the monitoring data. The commenter asks that the State be prepared to assume some responsibility for funding the monitors if federal funding is withdrawn.

MPCA Response: Monitoring data is important, but it would be difficult to place more reliance on the monitors due to some of the concerns expressed by the commenter, namely the fact that the monitors are located in one spot within each large Class I area. Therefore, they cannot represent the entirety of the Class I area, which is why modeling is used with multiple receptors to estimate conditions across each Class area. On funding, see tesponse to comment letter 15, item 2.

4) *BART* –The commenter "recommends that pilot testing of BART control strategies begin as soon as practicable, and certainly concurrent with the tracking of emissions and determination of BART limits".

MPCA Response: The MPCA would like to make clear that the pilot testing is for additional controls to be implemented under the long term strategy. BART has been determined to be existing controls or good combustion techniques, not add-on controls. Therefore, in order to set BART limits based on the current state of technology in the industry, the MPCA needs to have data reflecting emissions under current operating conditions, prior to any pilot testing of add-on controls. However, the MPCA understands that some testing into energy efficiency improvements and other good combustion practices is currently ongoing.

5) *Dysfunctions in the Incentives/Sanctions Program for Taconite Emissions* – The commenter states that there is little incentive for individual facilities to comply with the plan to develop new control options or pollution prevention technologies at the taconite facilities. They recommend that MPCA "make clear…the tools MPCA has at hand to compel compliance at the several stages in implementation of the SIP [and] develop positive economic incentives for taconite facilities to develop and implement new emissions controls."

MPCA Response: As stated in the SIP, the MPCA has yet to determine exactly what tool will be used to require investigation into emission controls at the taconite facilities. The main tools would be either a state rule (such as the BART rule), Administrative Orders (such as those issued to require CEMs/PEMS), or requirements in facility operating permits. Since the draft SIP, one facility (US Steel – MinnTac) is being required to investigate emission controls through requirements in a permit. In terms of economic incentives, the MPCA is exploring what kinds of incentives might be within its authority. As the commenter notes, longer term incentives would likely require new legislation. Given the current budget situation, any incentive that results in increased state spending seems unlikely. The MPCA hopes that the installation of CEMs and the pilot testing of control strategies will result in the discovery of process changes or add-on controls that both reduce emissions and save money, thereby creating the correct incentives.

Comment Letter 24: EPA Region V

1) *BART*

   a. MPCA should set deadlines for major steps of the taconite BART process such as installation of CEMs and completion of pilot studies to keep things on track. The timeline for BART and the Northeast Minnesota Plan presented at the public meeting addresses this concern.

MPCA Response: Comment noted. The timeline table mentioned will be included in the SIP as Table 10.5.

   b. The date of setting enforceable BART limits is listed in the table provided at the public meeting as mid-2012, which is a concern. The MPCA should set appropriate BART emission limits for the taconite facilities in an enforceable form as soon as possible.

MPCA Response: Based on timelines for data collection, the MPCA previously believed it would be possible to set enforceable BART limits in Title V permits for the taconite facilities by September 1, 2011. However, the economic situation leading to the idling of nearly all the taconite facilities affects the MPCA's ability to receive and analyze the year of data we believe is necessary to set BART emission limits, particularly for NO_X. However, the MPCA does believe that BART determinations will be able to be made by the end of August 2011, with BART limits being placed in permits so that BART compliance occurs within five years of EPA's approval of the SIP.

2) *Northeast Minnesota Plan* – It is not clear what will happen to the emission target is beyond 2018. This should be clarified in the SIP

MPCA Response: MPCA has added the following explanation to the SIP to clarify the status of the Northeast Minnesota Plan target after 2018: "Emissions from the six-county region covered by the Northeast Minnesota plan will continue to be held to a level 30% below 2002 levels beyond 2018. In future SIP revisions, the MPCA will consult with the FLMs and evaluate the necessity of maintaining emissions from Northeast Minnesota at this level and the possibility of continuing reductions from the area in order to reach the long term visibility goals."

3) *Agricultural burning* – Although agricultural burning is briefly discussed, there is no mention of the impact of this burning on visibility.

MPCA Response: The MPCA has added further information to the SIP describing the type of agricultural burning that is prevalent in Minnesota, and that the MPCA believes that this does not have a significant impact on visibility because the generally light fuel type does not produce major smoke events. In

addition, an analysis of the days impacted by smoke does not show any impacts from agricultural burning, and such burning takes place in portions of the state quite distant from the Class I areas.

4) *Emissions Inventory* – The 2005 emission inventory is incomplete, as only point sources are shown. The complete 2005 emission inventory should be included as it helps to illustrate trends in emissions both now and in the future.

MPCA Response: The 2005 emission inventory was not complete when the initial Draft SIP was put on public notice. It is now complete and a summary has been added to the SIP.

Appendix 2.5: Interim Comments on Revised Regional Haze SIP and MPCA Response

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April 17, 2009

VIA U.S. MAIL

Mr. David Thornton
Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, 55155

Re: Revisions to Haze State Implementation Plan
Regional Haze Rule, 40 CFR §§51.300-308

Dear Mr. Thornton:

These comments are submitted on behalf of the Minnesota Center for Environmental Advocacy ("MCEA") in response to the Minnesota Pollution Control Agency's ("MPCA") proposed revisions to Minnesota's Regional Haze State Implementation Plan. The Friends of the Boundary Waters Wilderness ("Friends"), the National Parks Conservation Association ("NPCA"), and the Voyageurs National Park Association ("VNPA") join with MCEA in the submission of these comments and incorporate these comments as their own. As indicated in the attached organizational information, each of these organizations has a significant interest in protecting and improving visibility in the Class I areas in Minnesota and in Michigan, including the Boundary Waters Canoe Area Wilderness ("BWCAW"), Voyageurs National Park ("VNP") and Isle Royale National Park. We submit these comments as significant stakeholders in the outcome of the Minnesota Regional Haze State Implementation Plan.

MCEA, Friends, NPCA, and VNPA submitted comments, dated May 16, 2008, in response to the Minnesota Draft Haze State Implementation Plan, dated February 8, 2008 ("draft Haze SIP"). Since the submission of these comments, several developments have occurred prompting MPCA to make significant changes to the draft Haze SIP, which we discussed with MPCA at a meeting on March 17, 2009. We are submitting these comments in response to these developments and proposed changes to the draft Haze SIP, including concerns regarding:

- Proposed emission reductions for BART-eligible EGUs;
- Need to provide public notice and comment in response to proposed changes to draft Haze SIP as result of removal of Minnesota from CAIR;
- Emissions monitoring requirements for taconite facilities; and
- Northeast Minnesota Plan.

1. Proposed Emission Reductions For BART-Eligible EGUs

The Regional Haze Rule, 40 CFR §§51.300-.308, requires Minnesota to develop a haze SIP to reduce haze and meet the goal of natural visibility conditions by 2064 in Class I areas both within the state of Minnesota and in Class I areas outside the state of Minnesota which are affected by air pollutants emitted within Minnesota. The Regional Haze Rule requires state implementation plans to include;

> "emission limitations representing BART and schedules for compliance with BART for each BART-eligible source that may reasonably be anticipated to cause or contribute to any impairment of visibility in any mandatory Class I Federal area, unless the State demonstrates that an emissions trading program or other alternative will achieve greater reasonable progress toward natural visibility conditions." 40 CFR §51.308(e).

The emissions reductions for BART-eligible electric generating units ("EGUs") proposed by the MPCA for inclusion in Minnesota's Haze SIP do not comply with the requirements of the Regional Haze Rule. MPCA has not demonstrated that it conducted the required BART analysis for BART-eligible EGUs pursuant to Appendix Y to Part 51 – Guidelines for BART Determinations Under the Regional Haze Rule, 70 Fed. Reg. at 39,156, ("Appendix Y") or that it is participating in an emissions trading program or other alternative which achieves greater reasonable progress toward natural visibility conditions than that achieved through BART emissions reductions as required by 40 CFR §51.308(e).

BART emissions limits for BART-eligible EGUs must include a determination of BART for PM, NO_X and SO_2. MPCA completed a BART analysis for PM but did not complete BART analyses for NO_X and SO_2 due to anticipated emissions reductions for NO_X and SO_2 achieved through the Clean Air Interstate Rule ("CAIR") for BART-eligible EGUs. The Regional Haze Rule specifically allows states to meet emission reduction requirements for BART-eligible EGUs through participation in "one or more of the EPA-administered CAIR trading programs for SO_2 and NO_X". 40 CFR § 51.308(e)(4).

At the time the draft Haze SIP was issued for public comment, Minnesota was included in the CAIR region. However, subsequent to the initial comment period for the draft Haze SIP, federal litigation challenging the Clean Air Interstate Rule resulted in the EPA indicating its intent to "stay the effectiveness of the rule with respect to sources located in the State of Minnesota."[1] As a result of these federal developments and in response to public comments, MPCA indicated its intent to make BART determinations for BART-eligible EGUs in Minnesota and use these BART determinations as the basis for required emissions reductions of BART-eligible EGUs.[2]

While MPCA indicated that it would conduct BART determinations for BART-eligible EGUs, it appears that MPCA has neither conducted case-by-case BART determinations for BART-eligible EGUs nor demonstrated that an emissions trading program or other alternative measure will

[1] Letter, dated October 31, 2008, from US EPA to Mr. Michael W. Steinberg.
[2] Summary of SIP Changes in Response to Comments, dated March 12, 2009.

achieve greater reasonable progress toward natural visibility conditions as required by the Regional Haze Rule. During our meeting with MPCA on March 17, 2009, MPCA staff indicated that BART-eligible EGUs would not be required to install additional emissions controls because the emissions reductions achieved through recently installed or in progress controls would not significantly alter the anticipated emissions reductions which would have been achieved if Minnesota was still included in the CAIR region.

Now that Minnesota is no longer included in the CAIR region, MPCA's decision to forego a full BART analysis and base the required emissions reductions for BART-eligible EGUs on anticipated emissions reductions which would have been achieved if Minnesota was still part of the CAIR region is not authorized by the Regional Haze Rule.

The Regional Haze Rule specifically requires the determination of BART to be made on a case-by-case basis through:

> ". . . . an analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each BART-eligible source that is subject to BART within the State. In this analysis, the State must take into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology." 40 CFR §51.308(e)(1)(ii)(A).

The Regional Haze Rule allows states to meet emission reduction requirements for BART-eligible EGUs through participation in an EPA-administered CAIR trading program for NO_X and SO_2. However, the Regional Haze Rule does not authorize states which are not participating in an EPA-administered CAIR trading program to use emissions reductions which might have been achieved if the state were part of CAIR as a replacement for determining emissions control requirements for BART-eligible units or other alternative measures. Now that Minnesota is not part of the CAIR region, MPCA may no longer base emissions reductions for BART-eligible EGUs on emission reductions which would have been achieved through its inclusion in the CAIR region or CAIR trading programs for NO_X and SO_2.

By relying on anticipated emissions reductions achieved through CAIR, MPCA has also failed to show that its proposed emissions limits for BART-eligible EGUs meet the requirements of an alternative as authorized by the Regional Haze Rule. The Regional Haze Rule allows states to opt to implement or require participation in "other alternative measure[s] rather than to require sources subject to BART to install, operate and maintain BART". However, if a state opts to use an alternative measure, this alternative measure of emissions control "must achieve greater reasonable progress than would be achieved through the installation and operation of BART." 40 CFR §51.308(e)(2). The Regional Haze Rule clearly outlines specific and detailed information which the state must include in its Haze SIP to demonstrate that the alternative measure will achieve greater reasonable progress than would have resulted from the installation and operation of BART at those sources subject to BART and covered by the alternative program. *See* 40 CFR §51.308(e)(2)(i)(A-E). The emissions limits for BART-eligible EGUs

proposed by MPCA do not comply with the requirements of the Regional Haze Rule for the use of an "alternative measure" as a substitute for requiring BART-eligible EGUs in Minnesota to install, operate and maintain BART.

The changes MPCA is proposing to make to Minnesota's Haze SIP for BART-eligible EGUs fail to comply with federal requirements and EPA guidance for BART-eligible sources pursuant to 40 CFR §51.308(e). Accordingly, we do not support MPCA's proposed emissions limitations for BART-eligible EGUs in Minnesota. We request that MPCA either conduct full BART analyses for BART-eligible EGUs or provide adequate information consistent with the requirements of the Regional Haze Rule, 40 CFR §51.308(e)(2)(i)(A-E), to show that the proposed emissions limits for these sources achieve greater reasonable progress than would have resulted from the installation and operation of BART.

2. Need to provide public notice and comment in response to proposed changes to draft Haze SIP as result of removal of Minnesota from CAIR.

Even as MPCA fails to comply with the Regional Haze Rule's requirements for determining emissions reductions for BART-eligible EGUs, MPCA has no apparent plans to provide an opportunity for public notice and comment regarding the proposed emissions limitations for BART-eligible EGUs and changes to the draft Haze SIP as a result of Minnesota's removal from the CAIR region.

Appendix Y specifically requires states to provide an opportunity for public comments on BART determinations for BART-eligible sources, stating that:

> "The CAA further requires States to make BART emission limitations part of their SIPs. As with any SIP revision, States must provide an opportunity for public comment on the BART determinations, and EPA's action on any SIP revision will be subject to judicial review." Appendix Y to Part 51 – Guidelines for BART Determinations Under the Regional Haze Rule, 70 Fed. Reg. at 39,157.

The removal of Minnesota from the CAIR region and impact of this removal on the determination of emissions limitations for BART-eligible EGUs has resulted in significant changes to the draft Haze SIP which was made available for public comment in February 2008. MPCA is legally obligated to provide an opportunity for public notice and comment in response to changes made to the Haze SIP as a result of Minnesota's removal from the CAIR region. If MPCA fails to provide an opportunity for public comment on its proposed changes to the haze SIP and emissions limitations for BART-eligible EGUs, MPCA will be violating its obligations under federal regulations. Accordingly, we request that an opportunity for public comment be made in response to the significant changes to the draft Haze SIP precipitated by Minnesota's removal from the CAIR region.

We recognize that providing an opportunity for public comment regarding the emissions limits for BART-eligible EGUs will postpone the submission of the Haze SIP to the Environmental Protection Agency ("EPA"). While MPCA may be reluctant to further delay the submission of

the Haze SIP to the EPA, MPCA must take the time it needs to ensure that the Haze SIP complies with the legal requirements of the Regional Haze Rule in regards to emissions limitations for BART-eligible EGUs and provide an opportunity for public review of these emissions limitations. Anything less would leave Minnesota's draft Haze SIP susceptible to challenge due to its failure to comply with the requirements of the Regional Haze Rule.

Even though the EPA recently issued a Finding of Failure to Submit State Implementation Plans equired by the 1999 Regional Haze Rule, 74 Fed. Reg. at 2392, indicating that Minnesota had failed, along with 36 other states, to timely submit its regional Haze SIP to the EPA, the removal of Minnesota from the CAIR region necessitates that MPCA take additional time to amend the Haze SIP in response to this change. The Clean Air Act requires that the EPA promulgate a Federal Implementation Plan ("FIP") within two years of the effective date of a finding that a state has failed to submit a SIP. The EPA's finding that Minnesota failed to submit a SIP was effective January 15, 2009. Accordingly, EPA is not expected to issue an FIP for Minnesota until January 2011, leaving MPCA with adequate time to comply with the requirements of the Regional Haze Rule in determining appropriate emissions limitations for BART-eligible EGUs.

3. Emissions Monitoring Requirements For Taconite Facilities

At our March 17, 2009 meeting with MPCA, we were informed that MPCA finalized Administrative Orders with all of the taconite facilities in Minnesota, allowing half of the taconite facilities to install an unproven emission estimation method, or Predictive Emission Monitoring Systems ("PEMs") instead of Continuous Emissions Monitors (CEMs). MPCA's approval of PEMs for half of the taconite facilities rather than requiring all taconite facilities to utilize CEMs violates the requirements of the Regional Haze Rule. The Regional Haze Rule specifically requires determinations of BART to be "based on an analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each BART-eligible source that is subject to BART within the State." 40 CFR §51.308(e)(1)(ii)(A).

Throughout the development of the Haze SIP, MPCA emphasized the importance of reducing uncertainty surrounding actual emissions from taconite facilities to determine whether individual facilities in the region are providing an appropriate share of progress toward the 2018 visibility goal. As a result of the lack of adequate emissions information from taconite facilities, MPCA proposed to postpone the determination of BART for taconite facilities to allow for a period of time during which taconite facilities would be required to obtain more accurate emissions information which could then be used as a basis for determining BART. In our comments, dated May 16, 2008, we supported an extension of time to allow for more accurate and complete information to be obtained regarding the actual emissions from each taconite facility.

During the development of the draft Haze SIP, we were told that alternatives matching the accuracy and reliability of CEMs did not exist for taconite facilities, and that taconite facilities would ultimately be required to install CEMs as mandated by the Regional Haze Rule. By allowing half of the taconite facilities to estimate their emissions through PEMs, MPCA is violating the plain language of the Regional Haze Rule which requires that BART be based on an

analysis of "the best system of continuous emission control technology available". In addition, by approving PEMs for half of the taconite facilities, MPCA is abandoning its commitment to reduce uncertainty surrounding actual emissions from the taconite industry in northern Minnesota and is losing a critical opportunity to establish reliable baseline data regarding emissions of taconite facilities and the effectiveness of future emission control strategies in this "under-controlled" sector.

MPCA's decision to enter into agreements with taconite facilities allowing the use of PEMs without the opportunity for public review and comment is of particular concern. In our comments, dated May 16, 2008, we specifically indicated that agreements between MPCA and the taconite facilities should be open to public review. MPCA's failure to provide an opportunity for public involvement, coupled with MPCA's decision to allow half of the taconite facilities to install PEMs rather than CEMs as required under the Regional Haze Rule, raises serious concerns regarding the impartiality of MPCA's decisions and MPCA's willingness to forgo its responsibility to enforce environmental regulations in regards to the taconite industry.

While we continue to support MPCA's efforts to assess cumulative visibility impacts from existing and proposed major point sources in Northeastern Minnesota, the establishment of reliable baseline data for actual emissions from the taconite industry is a cornerstone of Minnesota's Regional Haze SIP and the Northeast Minnesota Plan. Minnesota's taconite facilities must be required to install CEMs to ensure that BART determinations for these facilities are based on the best system of continuous emission control technology available and that real progress is made to significantly reduce emissions from these facilities which endanger both the Boundary Waters Canoe Area Wilderness and Voyageurs National Park.

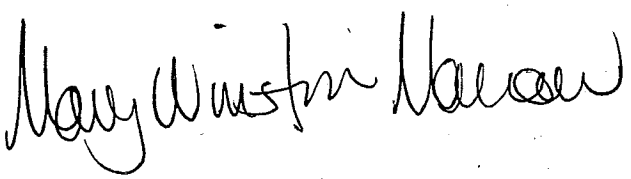
4. Northeast Minnesota Plan

During our March 17, 2009 meeting with MPCA, we were informed that the MPCA and Federal Land Managers ("FLMs") had not yet entered into a Memorandum of Understanding that would require the FLMs to change their review of new major emissions sources proposed in the six counties included in the Northeast Minnesota Plan. As we indicated in our comments, dated May 15, 2008, any Memorandum of Understanding between the MPCA and FLMs must be open to full public comment and participation.

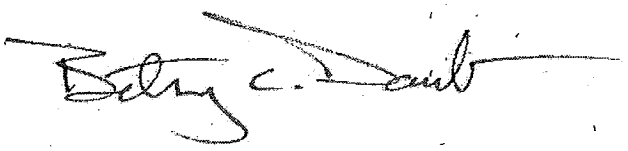
Thank you for your consideration of our concerns. We look forward to further discussions with you regarding these matters.

Please feel free to contact us with any questions or concerns you would like to discuss.

Sincerely,



Mary Winston Marrow
Staff Attorney
Minnesota Center for Environmental Advocacy



Betsy Daub, Policy Director
Friends of the Boundary Waters Wilderness

Cory McNaulty
Executive Director
Voyageurs National Park Association

Lynn McClure
National Park Conservation Association

Cc: John Seltz, Air Policy, MPCA (via electronic mail)
Catherine Neuschler, Air Policy, MPCA (via electronic mail)
Cheryl Newton, US EPA (via electronic and U.S. mail)
James W. Sanders, Forest Service
Don Shepherd, National Park Service (via electronic and U.S. mail)
Chris Holbeck, National Park Service (via electronic mail)
Trent Wickman, Forest Service

Minnesota Center for Environmental Advocacy

The Minnesota Center for Environmental Advocacy is a Minnesota-based non-profit environmental organization whose mission is to use law, science, and research to preserve and protect Minnesota's natural resources, wildlife, and the health of its people. MCEA has state-wide membership. MCEA's members live, work, and recreate in the BWCAW, VNP and Isle Royale National Park. The Regional Haze State Implementation Plan (Haze SIP) involves environmental impacts in many of the areas of MCEA's work, including air quality, public health, and protection of natural resources.

TO PROTECT FRIENDS of the BOUNDARY WATERS WILDERNESS PRESERVE

The Friends of the Boundary Waters Wilderness ("Friends") is the only organization in the country focused squarely on protecting the Boundary Waters Canoe Area Wilderness. The Friends, a non-profit organization, exists to protect, preserve, and restore the recreational and ecological treasures of the BWCAW, and to defend the BWCAW against pressures created by excessive logging, invasive species, overuse, development, and industrial pollution. The Friends represent nearly 4,500 individuals, family foundations, and organizations, many of whom live adjacent to or regularly visit the BWCAW. Friends' members, along with 258,000 visitors annually, travel to the BWCAW in part to enjoy and seek the health benefits of its clean air. That enjoyment and those health benefits are curtailed on days where high levels of pollutants cause low-visibility and render the air in and around the BWCAW less safe.

VOYAGEURS NATIONAL PARK ASSOCIATION

Voyageurs National Park Association ("VNPA") is a private, non-profit organization with the mission of protecting and promoting Minnesota's only National Park, Voyageurs National Park ("VNP"). The Voyageurs National Park Association meets its mission through a focus on protecting the park by addressing policy issues, providing direct support to Park projects, and advocating to ensure long-term protection of the Park's resources.

National Parks Conservation Association®
Protecting Our National Parks for Future Generations®

The National Parks Conservation Association ("NPCA") is a national non-profit organization working to protect and enhance America's National Parks for present and future generations. NPCA plays a crucial role in ensuring that these magnificent lands and landmarks are protected. The work of NPCA includes advocating for the national parks and the National Park Service, and educating decision makers and the public about the importance of preserving the parks. NPCA represents more than 330,000 members dedicated to park preservation and ensuring that our parks are protected for present and future generations. The NPCA's Midwest office works to protect national parks in the region, including Voyageurs and Isle Royale.

United States Department of Agriculture **Forest Service** **Eastern Region** **626 E. Wisconsin Suite 800 Milwaukee, WI 53202**

File Code: 2580
Date: April 28, 2009

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Ms. Neuschler:

Thank you for sending us the Best Available Retrofit Technology (BART) determinations your office made for the electric generating units (EGUs) subject to BART in Minnesota. We are aware these BART determinations are a key part of the regional haze plan being prepared. This plan will demonstrate how Minnesota will make reasonable progress toward meeting the national goal of preventing any future, and remedying any existing, impairment of visibility in mandatory Class I federal areas. The regulations describing what these plans should contain are found at 40 CFR 51.300 through 309. As the Federal Land Manager (FLM) for the Boundary Waters Canoe Area Wilderness, we are very interested in these BART determinations and the Minnesota Regional Haze Plan as a whole.

The regional haze regulations at 40 CFR 51.308(i) require consultation between the FLMs and the State. Specifically, the FLM is to receive 60 days to review and comment on any plan or plan revision. The State must also include a description of how it addressed the FLM comments if they are received in the specified timeframe. We view Minnesota's change in approach to BART analysis as a substantial change to the previously noticed version of the plan that was presented to the public. We are, therefore, asking for a public review of these changes. Given this need for public review, we are asking for 60 days to comment before the public meeting per 40 CFR 51.308(i). We are also asking that your responses to our comments be communicated to the public.

The State of Minnesota, Minnesota Pollution Control Agency (MPCA), put a draft version of the regional haze state implementation plan (SIP) on public notice through May 16, 2008. In that draft, the State showed on page 58 in relation to the 8 EGUs at 6 sources subject to BART:

> **EGU BART Determinations**
>
> The EPA has found that, as a whole, the Clean Air Interstate Rule (CAIR) cap-and-trade program improves visibility more than implementing BART in states affected by CAIR. A state that opts to participate in the CAIR program under part 96 AAA-EEE need not require affected BART-eligible EGUs to install, operate, and maintain BART. BART-eligible EGUs in both CAIR states and non-CAIR states must submit a BART determination if the state finds they are subject to BART. If a state accepts EPA's overall finding that CAIR "substitutes" for BART, then the BART determination need only be done for PM emissions, as NOx and SO_2 emissions are addressed by CAIR. The State of Minnesota did not perform a BART determination for subject-to-BART EGUs to evaluate NOx and SO_2 because of the State's inclusion in the CAIR region.

Even though BART subject EGUs were required by Minnesota to submit BART determinations, they were not the basis of any BART limits in the SIP since CAIR was going to substitute for BART at that time. As such, we did not review them.

Since the time of the draft regional haze SIP, the CAIR rule was vacated and then reinstated. The MPCA indicated that the Environmental Protection Agency (EPA) has proposed that Minnesota not be included in the new version of CAIR. As a result of all of these issues, Minnesota asked the BART subject EGUs to update their original BART analyses. Three EGUs did in November 2008.

On February 2, 2009, Minnesota sent the FLMs BART determinations for five EGUs. On March 3, 2009, we received determinations for another EGU and a correction for two of the previous EGU determinations. On March 12, 2009, we received determinations for the last two EGUs.

We also recently received (on April 9, 2009) the BART determination for a non-EGU, United Taconite, line number 2.

While we believe MPCA should provide the FLM 60 days to review the BART determinations, we are reviewing them as expeditiously as possible. Our technical comments on the BART determinations received to date are enclosed. We have also included comments related to the emission monitoring systems you proposed for the taconite industry. Thank you for continuing to work with us to improve visibility in the Nation's Class I areas.

If you have any questions or comments, please direct them to Trent Wickman at (218) 626-4372 or twickman@fs.fed.us.

Sincerely,

/s/ Logan Lee (for)
KENT P. CONNAUGHTON
Regional Forester

Enclosure

cc: Chris Holbeck, Bruce Polkowsky, Tim Allen, John Summerhays, Jim Sanders, Ann Acheson, Paul Stockinger, Trent Wickman

Best Available Retrofit Technology (BART) determinations for Electric Generating Units (EGUs) subject to BART in Minnesota.

Technical Comments
U.S. Forest Service
April 15, 2009

General Comments
We have two general concerns. One is to be sure that all BART limits are made enforceable and are installed and operated within five years from the approval of the SIP. Our second concern is how will the change in approach to BART for EGUs affect the reasonable progress goals set in the draft SIP? Please discuss this issue in your response to our comments.

Minnesota Power – Boswell Unit 3 and Xcel Energy – A.S. King
We have no comments on these sources.

Rochester Public Utilities (RPU)
This source has two EGUs subject to BART, Boiler 3 (24 MW) and Boiler 4 (60 MW). The BART determination for Boiler 4 discusses terms of a 2006 settlement agreement which resulted from the appeal of a previous permit amendment, Air Emissions Permit No. 10900011-003 issued in 2004. Under the settlement terms, RPU is required to install and operate, "a NOx (nitrogen oxides) emission reduction system that is designed to achieve at least a 0.15 lbs/MMBtu emission rate for NOx" on Boiler 4. This will be achieved through installation of the control technology known as 'Mobotec.' Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX selective non-catalytic reduction (SNCR) with furnace urea injection for NOx control. The MPCA has determined that installation of the Mobotec system represents BART for NOx on Unit 4. Initial operation of Mobotec has shown an emission rate of 0.25 lbs/ MMBtu is achievable on a 30-day rolling average basis.

It is unclear why the MPCA set the limit at 0.25 lbs/MMBtu when the settlement agreement required 0.15 lbs/MMBtu. The same Mobotec system on Unit 3 at Taconite Harbor is being proposed to be permitted at 0.13 lbs/MMBtu. If the Mobotec system is BART, the limits should be set at the best performing level of the technology. Please explain this discrepancy.

Minnesota Power - Taconite Harbor
The BART EGU at this source is Unit 3 (75 MW). We are concerned the BART analysis for this source did not follow the five-step process recommended in the EPA and MPCA BART Guidelines, specifically:

Step 1 – Identify All Available Retrofit Control Technologies
Step 2 – Eliminate Technically Infeasible Options
Step 3 – Evaluate Control Effectiveness of Remaining Control Technologies
Step 4 – Evaluate Impacts and Document the Results
Step 5 – Propose BART

In particular, there was no explanation for the rejection of low-NOx burner (LNB) technology. It was discussed as being technically feasible in the submittal by Minnesota Power, but the November 19, 2008, submittal states on page 4, "However, Minnesota Power asked that this technology not be included in this evaluation due to the performance of Mobotec's ROFA technology at THEC Units 1 and 2." This is not allowed under the five-step BART process. All technically feasible options should move to the next step in the process. Combinations of technically feasible technologies should also be considered. Low-NOx burners can be used in combination with the control options proposed and those combinations should be included in the next step of the BART process.

Per Table 1 of the November 19, 2008, submittal, the baseline sulfur dioxide (SO_2) is 0.70 lbs/MMBtu. The cover letter of the same submittal says, "Current capture efficiency on Units 1 & 2 is about 40% although given Nalco-Mobotec's continuing efforts, we expect capture efficiency to improve to at least 50%. With a baghouse however, we estimate the system will readily achieve a capture efficiency of 55+%." The 55% control from the baseline equates to an emission rate of 0.32 lbs/MMBtu. The MPCA's January 16, 2009, memo says BART for SO_2 will include a new sorbent injection/fabric filter system yet the BART limit will be 0.42 lb/MMBtu which is based on the 40% control number from the other Units at the source which are controlled by sorbent injection/ESPs. Since a new fabric filter is being installed, we feel the BART limit should reflect the performance of that piece of control equipment and not the emission rate from the other units during their shakedown period, with a poorer performing piece of control equipment.

Xcel Energy - Sherburne County (Sherco)
The BART subject Units at this source are Unit 1 (690 MW) and Unit 2 (683 MW). In general, we believe the MPCA is dismissing better performing control options that are cost effective. For example, for Unit 1 BART for NOx is set at 0.15 lbs/MMBtu. Better performing control options are available that showed cost effectiveness for NOx as low as $1700/ton and $2500/ton. We feel these levels are clearly cost effective especially when you consider that control costs for other EPA regulations (e.g., CAIR and presumptive BART) were in the $2000/ton range.

We feel the use of incremental costs to remove the following control options for NOx is inappropriate: for Unit 1, CC/LNB/SOFA+SNCR (at $980/ton); and for Unit 2, the same control option (at $2100/ton). Please consider these options in the final BART determination.

Although the proposed control levels may meet presumptive BART, we would like to remind the MPCA that presumptive BART does not set the floor, (see Federal Register July 6, 2005, page 39171) "you should be sure to consider the level of control that is currently best achievable at the time that you are conducting your BART analysis."

We would like to point out the modeling done for the BART determinations shows that after the BART controls proposed by the MPCA are implemented, just the NOx from just

the BART Units at the source contribute to visibility impairment for 20% of the year in the BWCAW. The same is true for just the SO_2 emissions from just the BART Units at the source. These Units are clearly some of the highest impacting BART sources in Minnesota, and the highest impacting EGU next to Northshore Mining's power boiler which is located almost adjacent to the BWCAW. We feel this level of impact requires deeper emission reductions and higher expenditures to allow the State to make reasonable progress while also allowing future economic expansion.

Northshore Mining - Power Boiler 2

The BART subject EGU at this source is Boiler 2 (75 MW). Our main comment with the analysis for this EGU is that cost effective controls were rejected.

We believe all NOx control options in Tables 5-12 of the facility's original BART submittal, other than SCR, are cost effective. When viewing the cost effectiveness numbers, it should be remembered that the MPCA stated numbers were inflated (see page 5 of March 3, 2009 memo). Therefore, we believe the best performing option should be selected - Low-NOx Burner with Overfired Air and SNCR.

We do not understand the following statement from page 4 of the of the MPCA memo, "There appears to be increases in $PM_{2.5}$ when measuring condensable particulate matter from systems using selective noncatalytic reduction (SNCR). The MPCA therefore believes that until technical issues are resolved, it is not appropriate to use control technologies incorporating the use of SNCR to address haze impacts. Therefore, two alternatives relying on SNCR were eliminated from consideration."

This statement comes after the MPCA specifically asked the company to include an SNCR system in their analysis (ROFA/Rotamix). We are unaware of the technical issues mentioned. It does not appear to be either a technical feasibility or economic feasibility issue; therefore, it is not relevant to the five-step BART process. We are unaware of this becoming a deciding issue in any other BART analysis. In fact, this same version of SNCR is being proposed (and run) at Taconite Harbor and RPU. If $PM_{2.5}$ emissions were to slightly increase after installing SNCR, the overall change in visibility impairing pollutants could be modeled to determine the overall affect on visibility. We suggest that SNCR be included in the BART analysis.

The MPCA selected LNB/OFA as BART for NOx even though a better performing option, reburn/LNB/OFA, is listed as an option for only $812/ton (per MPCA memo) which is also cost effective. No explanation was included as to why the better performing, cost effective option was not chosen. In addition, the selected technology was to achieve a 40% reduction from current average baseline emissions of 0.6 lbs/ MMBtu per a 30-day rolling average. The 40% control of 0.6 lbs/MMBtu is 0.36 lbs/ MMBtu, not the limit of 0.52 lbs/MMBtu proposed by Northshore Mining which is based on the worst case 24-hour emission rate. When the final BART limit is chosen, in addition to percent control, please clarify what the lbs/MMBtu limit will be.

For SO_2 MPCA selects Dry Sorbent Injection/Baghouse ($7305/ton) as BART, over two other control options that perform better and are more cost effective, Wet ESP ($3761/ton) and absorber ($5555/ton), (see Table on page 5 of MPCA memo) without explanation. We were told via email on March 4, 2009, this decision was made to prevent a water discharge to Lake Superior. As an alternative to dismissing the control options, the cost of water treatment could be accounted for and added to the costs of control for these options.

We are concerned with the BART alternative language. Please clarify that any alternative developed must have the emission reductions come from the source itself. Also, please clarify that these reductions cannot come from the taconite furnaces since they are already specifically required to undergo testing and the application of controls under the reasonable progress portion of the SIP.

We would like to offer comment on a number of statements made in the facility's original BART submittal.

> On page 11, "Barr compared emissions data provided by NMC to the baseline modeling conducted by MPCA. This revealed MPCA had modeled all PM_{10} emissions as $PM_{2.5}$ which would significantly over predict PM impacts. Therefore, the baseline modeling included within this report used a size breakdown for particulate matter based upon stack test results."
>
> > While on the one hand the approach described above may over predict impacts, on the other hand the particulate matter was not speciated. A scattering efficiency of 1 was assumed for all $PM_{2.5}$. Certain species of PM (such as organic carbon) have a much higher scattering efficiency. Therefore, not speciating the particulate matter under predicts impacts.
>
> On page 13, "However, the results also indicate that the highest modeled impact may not exceed human perceptibility which is on the order of one to two dV."
>
> > We do not agree. The EPA BART guidelines go into great detail on why 0.5 dV was selected as the threshold for contributing to visibility impairment (especially see FR July 6, 2005, footnote 28 on page 39119). The subject to BART modeling showed that this source is one of the highest impacting BART sources in Minnesota, and the highest EGU. This source showed 316 days over 3 years over 0.5 dV meaning it currently contributes to visibility impairment in the BWCAW for 30% of the year. This is important to keep in mind when costs of controls are considered.

Lastly, we do not believe that the BART guidelines allow the rejection of control options because they do not produce improvement that is perceptible.

Emissions Monitoring Systems for the Taconite Industry

The regional haze SIP discussed the need for continuous emission monitoring systems on the taconite industry for nitrogen oxides for a number of reasons including: 1) to set the BART limits; 2) to "allow facilities to more efficiently manage their combustion processes, resulting in less fuel usage and fewer emissions. The MPCA expects this could result in emission reductions of 5-30%, depending on the facility;" and 3) to track reasonable progress under the Northeast Minnesota Plan.

These systems were required through administrative orders which allowed the facilities to propose an "alternate method" to the most accurate option, continuous emission monitors (CEMs). Some facilities have chosen the alternate method. We are concerned the alternate systems will not provide the data to achieve the three aims laid out above. We are especially concerned the facilities will not be able to identify operating scenarios that lower emissions. If the relationships between a very small number of operating parameters, developed over a limited testing period, are used to predict emissions over all operating periods, unique combinations of operating parameters that will lower emissions will not be identified.

When we were made aware of the alternate method option, we asked that any alternative system approved by MPCA provide data equivalent in quality to a CEM. We also asked any alternative method meet EPA performance specifications for predictive emission systems. MPCA staff indicated that at the time such specifications did not exist. We would like to point out that such guidance does now exist (see FR, Vol. 74, No. 56, pages 12575-12591). We would appreciate MPCA evaluating the alternate systems being proposed against the applicable EPA performance specifications.

National Park Service Comments (Electronic Version)

June 26, 2009

N3615 (2350)

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Ms. Neuschler:

Following are our general comments on the Minnesota Pollution Control Agency's (MPCA's) current Best Available Retrofit Technology (BART) proposals for the Electric Generating Units (EGUs) located in Minnesota that are subject to BART. While we recognize that many of the MN EGUs (especially MN Power) are making large investments toward reducing their emissions, we believe that significant additional reductions can be achieved and are warranted under the BART program. We have enclosed detailed comments that further support our position on the specific BART proposals.

Purpose of the BART Program

The core purpose of the BART program is to improve visibility in our Class I areas. BART is not necessarily the most cost-effective solution but instead, BART represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors. We believe that it is essential to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. Voyageurs National Park (NP) in Minnesota and Isle Royale NP in Michigan are two Class I areas administered by the National Park Service that are currently impacted by MN EGUs.

Level Playing Field

It is important that regulatory agencies provide a level playing field and that they treat similar emission sources in a similar manner, unless exceptions are properly documented and justified. It is also generally accepted, given economies of scale, that the large EGUs should be more-stringently-controlled than the smaller EGUs. (We suggest that the MN EGUs can be divided into two categories—above 370 MW capacity and below 80 MW capacity.) Instead, within the large EGU category, there appears to be a trend of declining stringency as the size of the EGU increases, and some of the smaller EGUs would actually be required to meet tighter limits than some of the larger EGUs. This is especially apparent when one compares the higher limits proposed for Units #1 and #2 at

Xcel's 1,400 MW Sherco facility to the lower limits proposed by Minnesota Power for its 375 MW Boswell #3 (see table below). While we are pleased that the citizens of the Twin-Cities metropolitan area would receive some relief from Xcel's emissions, Xcel and the other EGUs still must address their impacts in Voyageurs and Isle Royale NPs. In the smaller EGU category, where the EGUs are virtually identical in size, we see that Minnesota Power has proposed the lowest Nitrogen Oxide (NO_X) limits for its Taconite Harbor #3.

Proposed NO_x Limits

Operating Company	Plant	Unit	Boiler Type	Fuel	Rating	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	tangential	sub-bituminous	690	LNB+SOFA	0.15
Xcel Energy	Sherburne County Generating Station	Unit #2	tangential	sub-bituminous	683	Combustion Optimization	0.15
Xcel Energy	Allen S. King Generating Plant	Unit #1	cyclone	sub-bituminous	550	SCR	0.10
Minnesota Power	Boswell Energy Center	Unit #3	tangential	sub-bituminous	375	LNB+OFA+SCR	0.07
Northshore Mining	Silver Bay Power Plant	Unit #2	wall-fired	sub-bituminous	75	LNB+OFA	0.372
Minnesota Power	Taconite Harbor	Unit #3	tangential	bit/sub-bituminous	75	ROFA/Rotamix	0.13
Rochester Public Utilities	Silver Lake Plant	Unit #4	wall-fired	bituminous	60	ROFA/Rotamix	0.25

Proposed SO_2 Limits

Operating Company	Plant	Unit	Fuel	Rating (MW)	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	sub-bituminous	690	FGD upgrade	0.12
Xcel Energy	Sherburne County Generating Station	Unit #2	sub-bituminous	683	FGD upgrade	0.12
Xcel Energy	Allen S. King Generating Plant	Unit #1	sub-bituminous	550	FGD upgrade	0.12
Minnesota Power	Boswell Energy Center	Unit #3	sub-bituminous	375	wet FGD	0.09
Northshore Mining	Silver Bay Power Plant	Unit #2	sub-bituminous	75	LSD+FF	0.06*
Minnesota Power	Taconite Harbor	Unit #3	bit/sub-bituminous	75	FSI and new FF	0.32
Rochester Public Utilities	Silver Lake Plant	Unit #4	bituminous	60	dry FGD	0.60

*MPCA has proposed an alternate limit for SO_2 at Northshore.

Proposed Total PM_{10} Limits

Operating Company	Plant	Unit	Fuel	Rating (MW)	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	sub-bituminous	690	existing wet ESP	0.090
Xcel Energy	Sherburne County Generating Station	Unit #2	sub-bituminous	683	existing wet ESP	0.090
Xcel Energy	Allen S. King Generating Plant	Unit #1	sub-bituminous	550	FF	0.030
Minnesota Power	Boswell Energy Center	Unit #3	sub-bituminous	375	FF	0.035
Northshore Mining	Silver Bay Power Plant	Unit #2	sub-bituminous	75	existing FF	0.094*
Minnesota Power	Taconite Harbor	Unit #3	bit/sub-bituminous	75	FSI and new FF	0.012
Rochester Public Utilities	Silver Lake Plant	Unit #4	bituminous	60	dry FGD w FF	0.400

*0.046 gr/dscf

Five-step BART Process

It appears that MPCA has attempted to "re-brand" control programs already adopted by the EGUs to meet other requirements, as satisfying BART, without conducting the required five-step BART analyses. While we understand that MPCA has been forced to quickly react to recent EPA decisions affecting the status of the MN EGUs, MPCA has effectively pre-empted the required five-step BART analysis by saying that BART is equivalent to BACT, or to whatever the EGU has already committed to installing. This approach is only allowed if MPCA demonstrates that the source has in place, or is committing to, federally-enforceable limits that represent the **most stringent level of control**.[1] None of the sources exempted by MPCA from the five-step BART process meet that criterion. Without a five-factor analysis from the company or MPCA, it is difficult for us to fully evaluate whatever reasoning went into the MPCA proposal. We recommend that MPCA either adopt limits that really are the most-stringent, or move quickly to complete the five-step BART process.

In general, Steps #1 (Identify all available retrofit options) and #2 (Eliminate technically infeasible options) of the BART process were adequately addressed, so we shall begin at:

Step 3 - Evaluate Control Effectiveness

[1] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long as these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section."

MPCA and the BART sources have consistently underestimated the abilities of established pollution control technologies (e.g., wet scrubbers and Selective Catalytic Reduction) to reduce emissions. MPCA should also evaluate potential upgrades to the existing control equipment.

MPCA's estimates of control effectiveness appear inconsistent. For example, MPCA has determined that a spray dryer/fabric filter system can meet 0.06 lb SO_2/mmBtu at Northshore Mining's Unit 2, but the same system would only be required to meet a limit ten-times higher at Rochester Public Utilities' Silver Lake Unit #4. And, even for the inherently more-efficient wet scrubbing systems at the larger EGU, the SO_2 limits would be 50% to 100% higher than SO_2 BART at Northshore. MPCA should explain these inconsistencies.

Step 4 - Evaluate Impacts and Document Results

MPCA has accepted at face value cost estimates presented by the EGUs. In the case of the Northshore Unit 2, those overestimates were so egregious that MPCA conducted its own analysis, and we commend MPCA for that. However, Xcel submitted estimates that consistently exceeded national norms without the supporting documentation or analyses required by the EPA BART Guidelines.

While it is appropriate to consider incremental costs in addition to average costs, we have a concern with the over-emphasis placed by MPCA upon this factor and with the way in which the incremental cost analysis was conducted.[2] Because, in most cases, the cost of pollution control rises exponentially with control efficiency, the slope of the cost-versus-efficiency curve will also increase. For this reason, rigid use of incremental cost effectiveness will always result in the choice of the cheapest option if carried to this extent. (For example, if this approach were used to evaluate particulate controls, it is likely that all controls more expensive than a multiple cyclone would be rejected.) According to the NSR Workshop manual, "As a precaution, the difference in incremental costs among dominant alternatives cannot be used by itself to argue one dominant alternative is preferred to another." Instead, it should be used to compare closely performing options.

Step 5 - Evaluate Visibility Impacts

Only for Sherco and Northshore were the visibility impacts of the BART options evaluated. This fifth-step of the BART process is essential for assessing the ability of a potential control strategy to address the fundamental purpose of the BART program. And, this fifth-step can provide information critical to determining the true cost-effectiveness of a visibility-improvement strategy. This analysis can also provide useful information on the relative importance of, for example, reducing NO_X versus SO_2 emissions from a given source. Based upon the limited data provided, it appears that, on a per-ton basis, reducing

[2]EPA BART Guideline: "You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option."… "You should exercise caution not to misuse these [average and incremental cost effectiveness] techniques… [but consider them in situations where an option shows]…slightly greater emission reductions…"

NO_X provides greater visibility benefits than reducing SO_2 in the cool, moist climate of northern MN.

We believe that it is appropriate to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. It simply does not make sense to use the same metric to evaluate the effects of reducing emissions from a BART source that impacts only one Class I area as for a BART source that impacts multiple Class I areas. And, it does not make sense to evaluate impacts at one Class I area, while ignoring others that are similarly significantly impaired. If we look at only the most-impacted Class I area, we ignore that the other Class I areas are all suffering from impairment to visibility "caused"[3] by the BART source. It follows that, if emission from the BART source are reduced, the benefits will be spread well beyond only the most impacted Class I area, and this must be accounted for.

The BART Guidelines represent an attempt to create a workable approach to estimating visibility impairment. As such, they require several assumptions, simplifications, and shortcuts about when visibility is impaired in a Class I area, and how much impairment is occurring. The Guidelines do not attempt to address the geographic extent of the impairment, but assume that all Class I areas are created equal, and that there is no difference between widespread impacts in a large Class I area and isolated impacts in a small Class I area. To address the problem of geographic extent, we have been looking at the cumulative impacts of a source on all Class I areas affected, as well as the cumulative benefits from reducing emissions. While there are certainly more sophisticated approaches to this problem, we believe that this is the most practical, especially when considering the modeling techniques and information available.

Compared to the typical control cost analysis in which estimates fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per deciview (dV) to improve visibility may appear extraordinarily expensive. However, our compilation[4] of BART analyses across the U.S. reveals that the **average cost per dV proposed by either a state or a BART source is $10 - $17 million**,[5] with a maximum of almost $50 million per dV proposed by Colorado at the Martin Drake power plant in Colorado Springs.

Reasonable Progress

Even if an EGU is exempt from BART, it may still be subject to review under the Reasonable Progress requirements of the Regional Haze Rule. MPCA may wish to consider additional emission reductions under that aspect of the Regional Haze program.

[3] EPA defines a source with an impact greater than one deciview as "causing" impairment.

[4] http://www.wrapair.org/forums/ssjf/bart.html

[5] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

In conclusion, we appreciate MPCA's efforts to date regarding the BART process, but we believe that significant additional reductions can be achieved and are warranted. We look forward to working with the MPCA as this process advances. We believe that good communication and sharing of information will help expedite this process, and suggest that you contact Don Shepherd (don_shepherd@nps.gov, 303-969-2075) if you have any questions or comments about this document.

Sincerely,

John Bunyak
Chief, Policy, Planning and Permit Review Branch

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Xcel Energy – Allen S. King Generating Plant Unit #1
MPCA 4/28/09 report

The Allen S. King (King) plant is a coal-fired electric utility operated by Xcel Energy (Xcel) and located in Oak Park Heights, Minnesota. According to EPA's Clean Air Markets Database, in 2007, King ranked #360 in the U.S. in sulfur dioxide (SO_2) emissions at 2,569 tons and #249 for nitrogen oxides (NO_x) emissions at 3,903 tons.

The facility's main power boiler (Unit #1) is a coal-fired cyclone boiler with a generating capacity of 550 megawatts (MW) of electricity. Modeling analyses conducted by MPCA indicate that Boiler #1 causes or contributes to visibility impairment at Boundary Waters Canoe Area.

Pollution control equipment on the main boiler as of the date of issuance (March 28, 2005) of Air Emission Permit No. 16300005-005 consisted of an electrostatic precipitator to control Particulate Matter (PM) emissions. Permit action 005 authorized modification of the King Plant. The Rehabilitation Project is complete and includes the installation of new pollution control equipment, modification of the plant heat rejection system, and rehabilitation and life extension of the main (EU 001, coal-fired) boiler. The rehabilitation allows the plant to operate at a capacity approaching its original design rating. The boiler rehabilitation consisted of:

- Replacement of the furnace floor and support system.
- Installation of new cyclone burners and re-entrant throats.
- Replacement of furnace sidewalls and furnace floor tubes.
- Installation of induced draft fans to accommodate additional draft requirements of new control equipment.

The new (additional) control equipment consists of:

- Selective Catalytic Reduction (SCR) reactor for control of nitrogen oxides (NO_X) emissions.
- Spray dryer absorber lime-based semi-dry Flue Gas Desulfurization (FGD) system for control of sulfur dioxide (SO_2) emissions.
- Pulse-Jet-cleaned Fabric Filter (PJFF) for additional control of PM.

The rehabilitation of Boiler #1 was completed in 2007.

MPCA BART Analysis

Xcel Energy was not asked by the MPCA to perform a BART analysis because Xcel Energy was in the process of installing BACT-like controls for NO_X, SO_2, and PM on Unit 1 with construction ending in 2007. A BART analysis was not requested by the MPCA because all of the following criteria were met:

- The MPCA had sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART;
- Public Utility Commission (PUC) approvals for the reductions were in place; and
- The MPCA determined that planned emission reductions represented or exceeded BART levels of control.

The MPCA issued permit no. 16300005-005 on March 28, 2005, that allowed Unit #1 to be retrofitted with:

- Selective Catalytic Reduction (SCR) reactor for control of NO_X emissions.
- Spray dryer absorber lime-based semi-dry Flue Gas Desulfurization (FGD) system for control of SO_2 emissions.
- Pulse-Jet cleaned Fabric Filter (PJFF) for additional control of PM.

MPCA contends that the proposed emissions limits and the control equipment that Xcel Energy has recently installed are consistent with Federal New Source Review Best Available Control Technologies. EPA's BART Guidelines assert that if a State finds a BART source that already has controls in place which are the most stringent available, then it is not necessary to complete each of the steps in the BART analysis (FR 39165). The following limits were incorporated into the requirements for Unit 1 through Air Emission Permit No. 16300005-005 issued on March 28, 2005.

NO_X Limit (lb/MmBtu)	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
< 0.10 (30 day rolling average)	< 0.12 (30 day rolling average)	< 0.030

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

CALPUFF modeling was run for this source at the controlled emission rates and the modeled results were less than the subject-to-BART thresholds. The controlled emission rates are incorporated into the 2018 regional scale modeling performed.

MPCA Determination of the BART Limit

The following limits represent the MPCA's determination of BART for Unit 1.

NO_X Limit (lb/MmBtu)	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
< 0.10 (30 day rolling average)	< 0.12 (30 day rolling average)	< 0.030

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS Review

Although presumptive BART probably does not apply, and King #1 has avoided BART by reducing impacts to below 0.5 dv, it is still subject to review under the Reasonable Progress requirements of the Regional Haze Rule. The SCR installed there should be able to achieve lower emission rates. For example, based upon 2002 - 2004 CAM data, uncontrolled NO_X emissions from this cyclone furnace were 0.70 lb/mmBtu; 90% reduction by SCR would lead to 0.07 lb/mmBtu.

The dry scrubber there should also be able to achieve lower emission rates. For example, based upon 2002 - 2004 CAM data, King #1 had uncontrolled SO_2 emissions of 1.47 lb/mmBtu. By comparison, Sierra Pacific Power proposed that its Ely PC boiler meet a 30-day rolling average SO_2 limit of 0.060 lb/mmBtu using a dry scrubber while burning coal with uncontrolled emissions of 1.7 lb/mmBtu. Furthermore, MPCA has proposed that BART for SO_2 at Northshore #2 is 0.06 lb/mmBtu (30-day rolling average).

Sierra Pacific Power also proposed that its Ely PC boiler meet a total PM_{10} limit of 0.020 lb/mmBtu.

Minnesota Power Boswell Unit 3
MPCA 5/22/09 report

The Boswell Energy Center (BEC) operated by Minnesota Power (MN Power) consists of four Electric Generating Units (EGUs) with a combined net generating capacity of approximately 1,025 megawatts (MW). BEC is located adjacent to the Mississippi River in Cohasset, Minnesota. According to EPA's Clean Air Markets Database, in 2007, BEC ranked #130 in the U.S. in sulfur dioxide (SO_2) emissions at 21,580 tons and #61 for nitrogen oxides (NO_x) emissions at 14,761 tons.

Since Boswell Unit 3 (375 MW) was commissioned in 1973 and MPCA modeling has demonstrated that its emissions cause or contribute to visibility impairment in Boundary Waters Canoe Area, Isle Royale National Park, Seney National Wildlife Refuge, and Voyageurs National Park, Boswell Unit 3 is subject to BART.

MN Power BART Analysis
Unit 3 is tangentially-fired with sub-bituminous coal. Particulate matter (PM) emissions are currently controlled by a wet scrubber which incidentally removes approximately 30% of the boiler flue gas SO_2. In addition, as operating conditions allow, MN Power lowers NO_x emissions by simulating over-fire air combustion by operating the top burner level as a combustion air port only.

As part of the Boswell 3 Plan, MN Power proposes to install a powdered activated carbon injection system to capture flue gas mercury and a continuous emission monitoring system for mercury; Low-NO_X Burners (LNB), Over-Fire Air (OFA) and Selective Catalytic Reduction (SCR) to reduce NO_X, as well as a Combustion Optimization System to optimize the balance between NO_x reductions and carbon monoxide control; a flue gas desulfurization (FGD) scrubber to further reduce SO_2, and a fabric filter to control PM and help optimize mercury removal performance. In addition, MN Power is upgrading the existing turbine/generator to restore the electrical net output lost from operating the new emission control equipment.

With a combination of LNB/OFA[1] and SCR, MN Power expects a NO_x reduction of approximately 80% at Unit 3 compared to current baseline levels. That is, a reduction in the NO_x emission rate from 0.37 lbs/mmBtu to 0.07 lbs/mmBtu with a corresponding annual reduction of 3,904 tons (from 4,808 tons to 904 tons). Finally, mercury oxidation across the SCR may also contribute a co-benefit mercury removal.

MN Power expects Unit 3 annual SO_2 emissions to decrease from 12,096 tons to 1,162 tons - a 10,934 ton reduction. This 90+% reduction improves upon the current 30% co-benefit SO_2 removal by the existing wet particulate scrubber, which will be replaced by the new FGD scrubber. The new emission rate is expected to be approximately 0.09

[1] Another benefit of reducing the initial formation of NOx in the boiler is reduction in the amount of ammonia required to further reduce NOx emissions.

lbs/mmBtu compared to the current emission rate of approximately 0.95 lbs/mmBtu (which reflects the current SO_2 removal from the existing wet particulate scrubber).[2]

With a new fabric filter, Minnesota Power expects annual PM emissions to drop by about 2,525 tons. The existing wet particulate scrubber has a PM emission rate of 0.21 lbs/mmBtu based on the most recent Title V stack test (June 12, 2002), whereas the fabric filter is expected to have a 0.014 lbs/mmBtu emission rate. In addition, as discussed above, the fabric filter provides essential co-benefits by removing mercury that adheres to particles captured by the fabric filter.

MPCA BART Analysis

Minnesota Power was not asked by the MPCA to perform a BART analysis for Boswell Unit 3, because Minnesota Power is installing BACT-like controls for NO_x, SO_2, and PM on Unit 3 on which construction began in 2007. A BART analysis was not requested by the MPCA because all of the following criteria were met:

- The MPCA had sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART;
- Public Utility Commission (PUC) approvals for the reductions were in place; and
- The MPCA determined that planned emission reductions represented BART levels of control.

The MPCA issued permit no. 06100004-003 on March 28, 2007, that allows Power boiler No. 3 to be retrofitted with Low NO_x burners, over fire air and selective catalytic reduction for nitrogen oxides control. It will be retrofitted with a baghouse filter for particulate and mercury control, and finally, with a wet scrubber for SO_2 control.

The proposed emissions limits and control equipment that Minnesota Power is proposing to install are consistent with Federal New Source Review Best Available Control Technologies. EPA's BART Guidelines assert that, if a State finds a BART source that already has controls in place which are the most stringent available, then it is not necessary to complete each of the steps in the BART analysis. The following limits were incorporated into the requirements for Unit 3 through Air Emission Permit No. 06100004-003 issued on March 28, 2007.

NOx Limit (lb/mmBtu)	SO2 Limit (lb/mmBtu)	PM10 Limit* (lb/mmBtu)
< 0.07 (30 day rolling average)	< 0.09 (30 day rolling average)	< 0.035

*PM10 limit includes filterable plus organic and inorganic condensibles.

The public notice of the permit provided for opportunity for comment on this approach.

CALPUFF modeling was not rerun for this source; however, the controlled emission rates are incorporated into the 2018 regional scale modeling performed.

[2] The current uncontrolled SO_2 emission rate is approximately 1.35 lb/mmBtu based on current coal.

MPCA Determination of the BART Limit
The following limits represent the MPCA's determination of BART for Boiler 3.

NO_x Limit (lb/mmBtu)	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
< 0.07 (30 day rolling average)	< 0.09 (30 day rolling average)	< 0.035

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS BART Analysis
While we commend MN Power for its comprehensive proposal, MPCA has effectively pre-empted the required five-step BART analysis by saying that BART is equivalent to BACT. This approach is only allowed if MPCA demonstrates that the source has in place, or is committing to, federally-enforceable limits that represent the **most stringent level of control**.[3] As discussed below, BEC does not meet these criteria for exemption from the five-step BART process. Without a five-factor analysis from the company or MPCA, it is impossible for us to evaluate whatever reasoning went into the MPCA proposal.

We believe that the proposed pollution controls can achieve even greater emission reductions if fully utilized. For example, a modern wet scrubber, such as that proposed by MN Power, can achieve 0.06 lb SO_2/mmBtu,[4] and the proposed combination of combustion controls and SCR can achieve a NO_x limit of 0.05 lb/mmBtu, both on a 24-hour basis.[5] Furthermore, in its 11/19/08 BART submittal for its Taconite Harbor facility, MN Power states, "The use of an SCR is expected to achieve a NO_x emission rate of 0.05 lb/mmBtu based on recent emission guarantees offered by SCR system suppliers." MPCA/MN Power should show why lower emission limits cannot be achieved at Boswell Unit 3.

[3] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long [as] these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section."
[4] For example, MPCA has proposed that BART for SO_2 is 0.06 lb/mmBtu (30-day rolling average) at Northshore #2.
[5] Permit issued 7/31/08 by EPA to Sithe Global Power for the Desert Rock power plant.

Minnesota Power Taconite Harbor Unit 3
MPCA 4/29/09 report

Minnesota Power (MN Power) operates a coal-fired steam-electric generating station known as the Taconite Harbor Energy Center (THEC) near Schroeder, Cook County, Minnesota. The three tangentially-fired coal boilers (75 megawatts—MW—net each) at the facility were originally designed to operate on bituminous coal, but began burning sub-bituminous coal in the early 1990s. They are permitted to burn either coal type. According to EPA's Clean Air Markets Database, in 2007, THEC ranked #290 in the U.S. in sulfur dioxide (SO_2) emissions at 5,062 tons and #291 for nitrogen oxides (NO_x) emissions at 3,004 tons.

Modeling analyses conducted by MPCA indicate that Unit #3 causes or contributes to visibility impairment at Boundary Waters Canoe Area (BWCA) and Isle Royale National Park. Only Unit 3 at the facility is subject to BART.

MPCA BART Analysis

MN Power was asked by the MPCA to perform a BART analysis for THEC Unit 3. MN Power has undertaken an emissions reduction project for the three generating units, referred to as the Arrowhead Regional Emissions Abatement (AREA) Project.[1] MN Power elected to begin the project with the retrofitting of Unit 2, which is not a BART-eligible unit due to its construction date (1957). The MPCA issued permit no. 03100001-006 on January 8, 2007, that allows boiler No. 2 to be retrofitted with additional air pollution controls as a demonstration project. The emissions reduction project involves the installation of Nalco-Mobotec's ROFA/Rotomix control system for reduction of NO_X and SO_2. Additionally, Mobotec's "Minplus" injection system was installed to control mercury (Hg) emissions. The project also involved modifying the electrostatic precipitators from "hot-side" to "cold-side".

MN Power proposed to install Mobotec multi-pollutant control technology[2] on each of the three 75 MW boilers to reduce SO_2 (by 65% to 0.24 lb/mmBtu), NO_X (by 64% to 0.14 lb/mmBtu), and Hg (by 90% to 0.0000049 lb/mmBtu).

[1] On 10/14/05 MN Power submitted its Arrowhead Regional Emissions Abatement (AREA) proposal and accompanying rate rider, pursuant to Minn. Stat. § 216B.1692, to reduce SO_2 and NO_x emissions from its Syl Laskin and Taconite Harbor generating stations. The AREA plan submitted by MN Power proposed to use Furnace Sorbent Injection (FSI) to reduce SO_2 by 64% from 0.67 lb/mmBtu to 0.24 lb/mmBtu. The AREA SO_2 and NO_x reductions would result in a reduction in days with significant visibility impairment at BWCA from 163 days/3 years to 54 days/3 years; the maximum impact would drop from 3.274 dv to 1.642 dv. At VOYA, the maximum impact would drop from 0.366 dv to 0.157 dv.

[2] Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX selective non-catalytic reduction (SNCR) with furnace urea injection for NO_X control. In addition, the system includes a Furnace Sorbent Injection ('FSI') system for injection of a calcium alkaline reagent (limestone) for SO2 control, and a system to inject a clay-based sorbent (MinPlus) to adsorb and chemically bind vaporized elemental mercury.

Operation of the Rotamix system throughout 2008 demonstrated that the ROFA/Rotamix system controlled emissions below the "presumptive BART" level [for NO_x] for very large power boilers of 0.15 lb/mmBtu. Operation of the system however did not achieve SO_2 removals as planned. Therefore, the MPCA requested MN Power prepare a BART analysis for Unit 3. The analysis for NO_X, SO_2 and PM was submitted November 2008, recommending the installation of a fabric filter to achieve up to 50% removal of SO_2 with the use of Rotamix.

BART guidelines request an identification of control technologies and their annualized cost per ton of pollutant removed. The analysis shows the cost of reductions as follows:

Control Technology	Post-BART emissions (lb/mmBtu)	Total Levelized Cost ($/yr)	Tons removed	Cost Effectiveness ($/ton)
NOx				
SCR	0.05	$5,085,000	1,100	$4,600
ROFA/Rotamix	0.13	$2,876,000	840	$3,400
ROFA	0.15	$1,616,000	750	$2,200
SO2				
Semi-dry SD and new FF	0.08	$9,689,000	1,940	$5,000
FSI and ESP Conversion	0.42	$1,109,000	880	$4,000
FSI and new FF	0.42	$1,868,000	880	$5,300

CALPUFF modeling was not rerun for this source. However, the controlled emission rates are incorporated into the 2018 regional scale modeling performed.

The MPCA concurred with Minnesota Power's assessment of controls and their costs. MPCA proposes that Nalco-Mobotec is BART for NO_X, and that furnace sorbent injection with a PM_{10} control limit of 0.012 lb/mmBtu, achievable with the installation of a new fabric filter, is BART for SO_2 and PM_{10}.

The following limits represent the MPCA's determination of BART for Unit 3.

NOx Limit	SO2 Limit	PM10 Limit*
0.13 lb/mmBtu	0.32 lb/mmBtu	< 0.012 lb/mmBtu
30-day rolling average	30-day rolling average	

*PM10 limit includes filterable plus organic and inorganic condensibles.

NPS Comments on the MPCA BART Analysis

NO_x: MPCA proposes that Nalco-Mobotec is BART for NO_X at 0.13 lb/mmBtu. While we agree with and commend MN Power and MPCA for this proposal, we request that a revised, full five-step analysis be conducted, as required by the BART Guidelines.

SO_2: MPCA proposes that furnace sorbent injection with a limit of 0.32 lb/mmBtu is BART for SO_2.

Step 1 – Identify All Available Retrofit Control Technologies
MN Power identified a reasonable range of control options.

Step 2 – Eliminate Technically Infeasible Options
No additional technologies were eliminated.

Step 3 - Evaluate Control Effectiveness
As modified per Table 1 of the November 19, 2008, submittal, MN Power's estimates of control effectiveness appear reasonable. However, we believe that a spray dryer/fabric filter combination achieving 90% control should be able to reduce SO_2 emissions to 0.07 lb/mmBtu from the current 0.70 lb/mmBtu, instead of the 0.08 lb/mmBtu cited by MN Power.

Step 4 – Evaluate Impacts and Document the Results
According to MN Power, "A budgetary cost estimate was obtained for a wet limestone FGD system. The budgetary cost estimate included the equipment associated with the absorber, reagent (limestone) preparation, and waste handling. However, there are other balance-of-plant costs that are not captured in this high-level analysis. With the use of a wet limestone FGD system, a new stack will be needed to handle the saturated flue gas. This is a significant cost that is not included in this analysis. There is also additional piping, limestone handling equipment, and building costs that are not included. Because a wet limestone FGD system will achieve about the same SO_2 removal as a semi-dry FGD system but will cost significantly more, this technology is not evaluated further." This is not allowed by the BART Guidelines. Once a technology is determined to be technically feasible, the remaining steps of the analysis must be completed for it, especially because the wet FGD technology would result in 25% lower emissions (by MN Power's estimates).

Once again, neither MN Power nor MPCA provided enough information to evaluate their estimates for the semi-dry spray dryer/fabric filter combination. So, we note that there are precedents[3] (e.g., Northshore #3) which show that BART can be spray dryers on small coal-fired boilers like THEC with limits at 0.06 lb/mmBtu.

Step 5 - Evaluate Visibility Impacts
Both MN Power and MPCA omitted this critical step.

PM_{10}: MPCA proposes that a PM_{10} control limit of 0.012 lb/mmBtu, achievable with the installation of a new fabric filter, is BART and we concur.

Conclusions & Recommendations

- Technically feasible options such as wet FGD cannot be eliminated from the full five-factor analysis.
- Cost estimates should follow EPA guidance and sufficient documentation should be provided.

[3] The Colorado Department of Public Health and Environment concluded that BART for the 85 MW Martin Drake Unit #6 burning coal with uncontrolled emissions of 0.80 lb/mmBtu (vs. 0.70 lb/mmBtu at Taconite Harbor) is the semi-dry spray-dryer/fabric filter option that MN Power/MPCA rejected.

- MPCA appears to have overestimated the cost of SCR.
- MPCA should re-consider addition of a semi-dry spray-dryer because it would provide greater emission reductions than estimated by MN Power and costs were not documented adequately. It appears inconsistent that a spray dryer/fabric filter is BART at Northshore and RPU, but not at THEC. Because THEC has proposed to add a fabric filter as part of its BART proposal, MPCA appears to be "wasting" an opportunity to add the spray dryer and take advantage of the combined SO_2 removal capabilities.
- MPCA must properly evaluate impacts and document the results of the technically-feasible control strategies. We are especially concerned that the MN Power/MPCA BART analysis did not address improvements in visibility that would result from the technically-feasible control options.

Northshore Mining (NSM) Silver Bay Power Plant
MPCA 5/26/09 report

The Silver Bay facility[1] is located on the north shore of Lake Superior. Of interest in the BART determination is the Silver Bay Power plant which has two boilers identified as Unit 1 and Unit 2. Both units are permitted to fire natural gas and coal, and both use a fabric filter to control particulate matter (PM).

Unit 2 at the facility is subject to BART as start-up was in 1963.[2] Unit 2 has a dry bottom, front-wall-fired configuration with a maximum heat-input rating of 765 mmBtu/hr and an output of 75 megawatts (MW). Nitrogen Oxides (NO_X) emissions are controlled through good combustion practices. There are no post-combustion sulfur dioxide (SO_2) controls. Modeling analyses conducted by MPCA indicate that Unit 2 causes or contributes to visibility impairment at Boundary Waters Canoe Area (BWCA), Isle Royale National Park, and Voyageurs National Park.

MPCA BART Analysis
Northshore Mining (NSM) was asked by the MPCA to perform a BART analysis for Unit 2. A BART analysis dated September 28, 2006, was submitted to the MPCA by Northshore Mining. In September 2008, Cliffs Natural Resources was requested to review its 2006 submittal and update it as necessary, including adding the NO_X/SO_2 control technology Rotating Over-Fire Air (ROFA) +Rotamix+Furnace Sorbent Injection (FSI) by Nalco/Mobotec to the feasible control technologies it evaluated. Cliffs' material was provided to the MPCA in November 2008.

Nitrogen Oxides Control
Selective Catalytic Reduction (SCR) was rejected by NSM due to cost. MPCA will not require further assessment of SCR at this time, believing that if future NO_X reductions are needed, the technology has not been eliminated as a technically feasible alternative.

Sulfur Dioxide Control
The MPCA does not believe that the two alternatives that rely on water to remove SO_2 from the flue gases can be determined to be BART technologies. Wet electrostatic precipitators (wet ESPs) and absorbers have substantial negative non-air quality environmental impacts as they would require expanded wastewater discharges into Lake Superior, an outstanding resource value water with special protections. Securing permits for such a discharge would be exceedingly difficult and prolonged, calling into question whether such wet control devices could become operational during the BART timeline. Because dry controls without water treatment requirements are available to achieve equal

[1] Cliffs Natural Resources, Ltd. is the parent company of both Northshore Mining Company and Silver Bay Power Company. Northshore Mining Company operates a taconite processing plant at the Silver Bay facility; Silver Bay Power Company operates a power plant at the facility, which provides electricity both for the taconite processing operations and the grid. (Northshore Mine's taconite processing facility is subject to a separate BART determination.) Cliffs Natural Resources, Northshore Mines, and Silver Bay Power are co-permittees for Title V permit no. 07500003-004 for the Silver Bay facility.
[2] Boiler No. 1 is not subject to BART because start-up of that unit was in 1959.

or better results, without the same environmental drawbacks, the MPCA has eliminated wet controls from further evaluation.

Cost estimates provided by NSM for dry sulfur dioxide control were significantly higher than those provided to the MPCA by other electric generators with similar sized boilers. Therefore, the MPCA conducted its own assessment of likely capital and operating costs related to SO_2 scrubbing. In addition to interviewing NSM and its engineering consultant, MPCA surveyed three vendors that provide scrubbers and fabric filters to the power industry. Each vendor reported likely equipment costs significantly below equipment costs included in Cliffs' analysis. Each vendor volunteered equipment cost estimates from similar-sized projects recently purchased or installed. EPA's Control Cost Manual was relied on to generate the full project cost estimate. All costs are budgetary estimates, with an expected precision of +/- 30%.

Multi-pollutant Controls

Two options have been developed that can be described as multi-pollutant controls, that is, a single technology will address control of both NO_X and SO_2. MPCA states that cost-effectiveness of using these technologies cannot be assessed for each pollutant alone as done previously, but appear to be best evaluated by considering the total amount of NO_X and SO_2 reduced.

MPCA requested NSM to evaluate the installation of ROFA with Rotamix and FSI for controlling NO_X and SO_2 because the technology has been installed at three coal-fired units in Minnesota with successful results.

ROFA is generally equivalent to overfire air in which a portion of the combustion air is withheld from the primary combustion zone and transferred to a higher elevation in the furnace. The component called "Rotamix" is a selective noncatalytic reduction technique where urea is injected into the boiler. SO_2 removal is accomplished by FSI—injection of hydrated lime. The bound SO_2 reaction products, unreacted lime and flyash, are then captured downstream by the particulate control device.

The second multi-pollutant option is NSM's proposal to combust 20% biomass in both units. The biomass proposal consists of co-firing biomass at both Units 1 and 2 at a rate of 20% or greater of total heat input. Co-firing involves displacing some coal with biomass. Because of the near-absence of sulfur in biomass, SO_2 emissions are reduced proportionately with the increased use of biomass on a heat input basis. Concurrent with the use of biomass to replace coal is the need to replace burners with Low-NO_X Burners (LNB) and Over-Fire Air (OFA). LNB are needed to feed enough fuel into the boiler, while additional combustion air from the OFA will extinguish any flaming biomass ash particles that might carry out of the boiler itself, thus maintaining the integrity of the fabric filters used for particulate matter control.

MPCA has determined that the existing control technology, a fabric filter (FF) baghouse, represents BART. However, the MPCA does not believe that the proposed total PM limit of 0.6 lb/mmBtu (the total PM emissions limit in the current operating permit) reflects

BART. The current operating permit, however, also imposes a PM_{10} emissions limit of 0.046 gr/dscf. MPCA believes that this is a more appropriate emissions limit reflecting BART for this unit because it regulates a larger portion of PM emissions currently exiting the unit and is more in keeping with the operations of a fabric filter.

CALPUFF modeling was not rerun for this source; however, emission rates for this unit projected by EPA's Integrated Planning Model are incorporated into the 2018 regional scale modeling performed.

MPCA Determination of the BART Limit

In other utility BART determinations, MPCA evaluated the reduction requirements for NO_X and SO_2 individually without regard to total cost of the project, primarily because the options did not rely on multi-pollutant control strategies. In this instance, the MPCA requested the facility owner evaluate a multi-pollutant control strategy while NSM itself requested that one be evaluated as a potential BART alternative.

If the MPCA were to rely on pollutant-by-pollutant reduction options, BART appears to be the use of Low NO_X burners and overfire air on Unit 2 to achieve an emissions rate of 0.31 lb/mmBtu,[3] and spray drying/fabric filters to achieve an SO_2 emissions rate of 0.06 lb/mmBtu. The total annualized cost of these controls, based on the MPCA's recalculation of spray drying, is shown in MPCA's Table 6 below. The cost-effectiveness of this combined pollutant reduction is $2,634. This cost is nearly indistinguishable from the biomass co-firing alternative preferred by NSM and modified by the MPCA (inclusion of low NO_X burners and OFA on Unit 1).[4]

Table 6. Multi-pollutant control options at Silver Bay Power

Control Technology	NOx Emissions Rate Lb/mmBtu	SO2 Emissions Rate Lb/mmBtu	Total Tons Reduced	Total Annualized Costs	$/ton total Pollutant Reduced
LNB/OFA and SD/FF					
Unit2	0.37 (40% reduction)	0.06 (90% reduction)	2,376 748 tpy NOx 1,628 tpy SO2	$6,258,000	$2,634
Co-firing Biomass in Units 1 and 2					
Unit1 Unit2	0.28 0.37	0.41 0.48	1742 1,159 tpy NOx 583 tpy SO2	$4,809,000	$2,761

[3] We believe that MPCA meant 0.37 lb/mmBtu.

[4] MPCA modified the cost of spray drying based on interviews with air pollution control equipment vendors, and has described the estimates as "budgetary" as +/- 30%. This cost is being compared the cost of the biomass co-firing project where significantly more information was used to develop the scope and cost of the project. Hence, the MPCA concludes that the incremental difference is insignificant.

The limits in MPCA's Table 7 represent its determination of BART:

Table 7. BART Limits for Silver Bay Power

	NOx Limit	SO2 Limit	PM10 Limit*
Unit1			
	0.28 lb/mmBtu	0.41 lb/mmBtu	<0.046 gr/dscf
	30-day rolling average	30-day rolling average	(limit in existing permit)
Unit2			
	0.37 lb/mmBtu	0.48 lb/mmBtu	<0.046 gr/dscf
	30-day rolling average	30-day rolling average	(limit in existing permit)

*PM10 limit includes filterable plus organic and inorganic condensibles.

NPS BART Review

While we agree that a multi-pollutant approach that combines reductions at the BART-eligible Unit #2 with reductions at the BART-exempt Unit #1 is reasonable,[5] MPCA has not executed this approach correctly. In order to use this plant-wide cap approach, MPCA must show that the improvement to visibility is greater than with a conventional BART application to Unit #2. MPCA could do this by showing that each BART pollutant is reduced more than it would have been had the conventional approach been used, or by modeling both the conventional BART emissions and comparing them to its proposed BART emissions—MPCA did neither.

First, the conventional BART review of Unit #2.

NO_X: **MPCA has proposed limits that are almost three times higher than it proposed for MN Power's Taconite Harbor plant and almost half-again the limits it proposed at Rochester Public Utility's Silver Lake plant, both of which are similarly-sized facilities and burn coal.** While Taconite Harbor and Silver Lake would be installing Mobotec's multi-pollutant control technology, Silver Bay would be allowed to install only the much-less-efficient (and cheaper) LNB/OFA to achieve 40% control.

Step 1 - Identify all Available Retrofit Control Technologies

With the addition of the analyses of the Mobotec system and the biomass option, MPCA evaluated a comprehensive suite of control strategies.

Step 2 - Eliminate Technically Infeasible Options

Despite having already determined that NSM's control costs for SO_2 were inflated, MPCA accepted NSM's SCR costs without question and rejected SCR on the basis that it

[5] According to EPA's BART Guidelines: There may be situations where a specific set of units within a fence-line constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)…You should consider allowing sources to "average" emissions across any set of BART-eligible emission units within a fence-line, so long as the emission reductions from each pollutant being controlled for BART would be equal to those reductions that would be obtained by simply controlling each of the BART-eligible units that constitute BART-eligible source.

was too expensive.[6] However, NSM created an invalid scenario by first rejecting SCR in the typical "high dust" location. NSM states, "Because of experience and the potential for comparable catalyst surface plugging, a high-dust SCR is determined to be technically infeasible on Unit 2 and will not be considered further." We ask NSM to explain the "experience" to which its consultant is referring, as almost all modern SCRs retrofitted to coal-fired boilers are installed in the high-dust location. By creating this invalid "obstacle," NSM shifted the SCR discussion to a low-dust location, which necessitates extensive energy and associated costs for reheating the SCR to the optimum operating temperatures. NSM used this reason to reject SCR on the basis of cost per ton and (incorrectly) halt its analysis.[7] MPCA must re-evaluate "high dust" SCR.

Step 3 - Evaluate Control Effectiveness
NSM underestimated SCR control effectiveness at 80% versus the generally-accepted 90% capability of this option.

NSM underestimated the effectiveness of ROFA+Rotamix at 40%. By comparison, MN Power estimated that this technology would reduce NO_x by 68% at its Taconite Harbor facility. MPCA has incorrectly accepted this 40% control estimate in making its BART determination for Unit #2. According to Mobotec, "While NO_X reduction with typical LNB and OFA systems can sometimes exceed 35%, ROFA NO_X reduction routinely exceeds 50% and, depending on furnace geometry, ROFA NO_X reduction can exceed 60%.[8] The Mobotec system has been reported to achieve NO_X reductions as high as 83% on a coal-fired boiler similar in size to Northshore #2.[9]

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[6] NSM used the wrong section of the EPA Control Cost Manual to estimate SCR costs. Instead of using the approach described in Section 4.2, Chapter 2, "Selective Catalytic Reduction," it appears that NSM tried to apply methods from Section 5.2, Chapter 1, "Wet Scrubbers for Acid Gas."

[7] Once a technology is determined to be technically feasible, the remaining steps in the BART analysis must be conducted.

[8] "The Viability and Economics of Adding a ROFA®/Rotamix® MobotecSystem to a Selective Catalytic Reduction (SCR) Installation" Edwin E. Haddad, P.E, Jay S. Crilley, P.E., and Brian S. Higgins, Ph.D., Mobotec USA Inc. NETL/DOE 2003 Conference on SCR and SNCR for NO_X Reduction Pittsburgh, PA October 29-30, 2003

[9] ROFA: At full load, ROFA alone reduced NOx from 0.58 lb/mmBtu to 0.22 lb/mmBtu. This amounts to a 62% reduction in NOx. There is a small power draw associated with the ROFA fan, but there is also a drop in stack temperature (discussed later). These two effects counter each other and we can assume that the efficiency does not change appreciably. Therefore, there are no significant O&M costs associated with the ROFA NOx reduction.
Rotamix: At full load, Rotamix (urea) further reduced NOx from 0.22 lb/mmBtu to 0.10 lb/mmBtu. This is a further 55% reduction in NOx over-and-above the ROFA reduction. Since urea is injected, there are additional chemical costs. Further, there is an ambient fan installed at Vermilion for the Rotamix system. This fan draws less than 20 kW during full-load operation.
MobotecSystem: The costs per ton of NOx removed can be calculated for the ROFA & Rotamix installation. At full load, the MobotecSystem (ROFA and Rotamix) reduced NOx from 0.58 to 0.10 lb/mmBtu. This is an 83% reduction in NOx.
"SCR Levels of NOx Reduction with ROFA and Rotamix (SNCR) at Dynegy's Vermilion Power Station," Kristopher A. Coombs, Sr., Dynegy Midwest Generation; Jay S. Crilley, Mark Shilling, and Brian Higgins, Mobotec USA; Presented at: 2004 Stack Emissions Symposium Clearwater Beach, FL July 28-30, 2004

MPCA contends that, because LNB+OFA can achieve 40% reductions (748 tpy) at a lower cost, it is BART instead of ROFA+Rotamix at 40%. However, if ROFA+Rotamix can achieve the same 68% removal estimated at Taconite Harbor, it would remove 1,272 tpy. **MPCA must re-evaluate application of ROFA+Rotamix at its true capability.**

Step 4 - Evaluate Impacts and Document Results
Despite having already determined that NSM's control costs for SO_2 were "highly inflated," MPCA accepted NSM's costs of ROFA+Rotamix without question. **NSM has overestimated the costs of ROFA+Rotamix.** For example, NSM estimated an Installed Capital Cost of $25,310,000 and an Annual Cost of $8,070,000 for its 75 MW boiler. By comparison, MN Power estimated an Installed Capital Cost of $8,113,000 and an Annual Cost of $2,876,000 at its same-size Taconite Harbor facility. NSM has not documented or justified the costs presented in its cost analyses, and has included costs for SO_2 control in its NO_x control cost analyses. **MPCA must re-evaluate application of ROFA+Rotamix at its true cost.**

Step 5 - Evaluate Visibility Impacts
In its BART submittal, NSM observes that, "Based on the conditions at this location, NO_X emissions are more culpable for impacting visibility than SO_2 emissions by **nearly** a factor of 2." Our review of the NSM modeling results indicates that NO_X emissions are more culpable for impacting visibility than SO_2 emissions by **more than** a factor of 2. Either way, this finding indicates that the value of reducing NO_X is substantially greater than for SO_2 and this should be considered in the BART determination.

Although NSM presented visibility impact results for each of its control strategies at BWCA, it should have provided similar results for the other two Class I areas where the Silver Bay plant causes or contributes to visibility impairment (I.e., Voyageurs and Isle Royale National Parks). NSM estimated that its proposed BART strategy, LNB+OFA would yield a reduction of 446.8 tpy at an annual cost of $640,000 and would improve visibility at BWCA by 0.51 dv, resulting in a cost-effectiveness at BWCA of $1,250,000/dV.

MPCA did not include any consideration of visibility impacts in its review report.

Assuming that visibility improvement is directly proportional to the reduction in annual emissions, we estimate that the approximately three-fold reduction that could be achieved by application of ROFA+Rotamix would improve visibility at BWCA by about 1.5 dV. If we also assume that the annual cost for this reduction, based upon the Taconite Harbor BART proposal, is similar ($3 million), the cost-effectiveness becomes $2 million/dV.

SO_2: We commend MPCA for determining that a more stringent level of SO_2 control than that proposed by NSM is BART, and that MPCA considers an SO_2 emissions rate of 0.06 lb/mmBtu to be BART for this unit. MPCA proposes that this emissions rate can be achieved with the use of spray drying/fabric filters.

Step 1 - Identify all Available Retrofit Control Technologies
NSM identified a reasonable range of control options.

Step 2 - Eliminate Technically Infeasible Options
While we believe that switching to lower-sulfur coal is a legitimate option, because NSM's coal appears to already fall into that category, further sulfur reductions are not likely to be feasible.

MPCA also eliminated all wet-scrubbing options because of potential wastewater discharges. Instead, MPCA should have addressed this issue in the context of the costs associated with mitigating those discharges.

Step 3 - Evaluate Control Effectiveness
NSM has grossly underestimated the capability of wet scrubbing to reduce SO_2 beyond the 80% it estimated. It is generally-accepted that wet scrubbing can achieve at least 90% control, and typically 95% or better.

Step 4 - Evaluate Impacts and Document Results
Because MPCA found that NSM had likely overestimated its control costs, it made an excellent effort to re-evaluate the spray drying/fabric filter strategy that NSM rejected on the bases of those overestimated costs. (However, we do question the need for a complete replacement of the existing fabric filter.) MPCA estimated that the spray dryer/fabric filter combination would achieve 90% control and remove 1,469 tons of SO_2 per year at an annual cost of $5,777,000 with a cost-effectiveness of $3,574/ton.[10]

Step 5 - Evaluate Visibility Impacts
Although NSM presented visibility impact results for each of its control strategies at BWCA, it should have provided similar results for the other two other Class I area where the Silver Bay plant causes or contributes to visibility impairment. NSM estimated that a spray dryer/FF would yield a reduction of 1,544.9 tpy at an annual cost of $13,140,000 and would improve visibility at BWCA by 0.397 dV, resulting in a cost-effectiveness of $32,100,000/dV.

MPCA did not include any consideration of visibility impacts in its review report.

Assuming that visibility improvement is directly proportional to the reduction in annual emissions, we estimate that the 1,628 tpy reduction that could be achieved by application of the spray dryer/FF combination would improve visibility at BWCA by about 0.42 dV. If we also assume that the annual cost for this reduction is similar to the $5.8 million annual cost estimated by MPCA, the cost-effectiveness at BWCA becomes $14 million/dV, which is reasonable because it is lower than the $17 million/dV average cost per dV proposed by either a state or a BART SO_2 sources[11] is $10 - $17 million.[12]

[10] Our inspection of MPCA's "Appendix A: Assessing Cost Estimates at Northshore Mines Silver Bay Power Plant" leads us to believe that the MPCA conclusions were based upon data estimating that the spray dryer/fabric filter combination would achieve 90% control and remove 1,545 tons of SO_2 per year at an annual cost of $5,776,563 with a cost-effectiveness of $3,739/ton.
[11] http://www.wrapair.org/forums/ssjf/bart.html

We agree with MPCA that the installation of a spray dryer upstream of an upgraded fabric filter to achieve an emission limit 0.06 lb/mmBtu is BART for this source.

PM: The MPCA has determined that the existing control technology, fabric filter baghouses, represents BART. While we agree, MPCA has presented no justification for a PM_{10} limit that is almost eight times higher (when converted to lb/mmBtu) than that proposed for MN Power's Taconite Harbor Unit #3 (0.094 lb/mmBtu versus 0.012 lb/mmBtu).

Alternative BART for NO_x and SO2

As noted above, MPCA must show that its BART-Alternative would achieve greater reductions of both NO_x and SO_2 than conventional BART, or that it would produce greater visibility benefits. We believe that the emission reduction targets should be at least 1,272 tpy NO_x and 1,628 tpy for SO_2. Instead, MPCA is proposing reductions of 1,159 tpy for NO_x and 583 tpy for SO_2. Even if one accepts the MPCA proposal that conventional BART is 748 tpy NO_x and 1,628 tpy for SO_2, its proposal falls short of the SO_2 target (as do the combined reductions).

We also have a concern about how such an alternative BART proposal would be implemented. Unless the alternative is implemented on a daily basis, some days would continue to experience the current high emissions. Because the visibility analysis compares the past maximum emissions day to the future maximum emissions day, there would be no change and no improvement.

Conclusions & Recommendations

- MPCA improperly rejected SCR in a high-dust location as being technically infeasible.
- MPCA's rejection of ROFA+Rotamix is unjustified and inconsistent with its proposed uses at Taconite Harbor and Silver Lake.
- MPCA eliminated all wet-scrubbing options because of potential wastewater discharges. Instead, MPCA should address this issue in the context of the costs associated with mitigating those discharges.
- NSM has grossly underestimated the capability of wet scrubbing to reduce SO_2 beyond the 80% it estimated.
- MPCA found that NSM had likely overestimated its SO_2 control costs and properly re-evaluated those strategies. Installation of a spray dryer upstream of an upgraded fabric filter to achieve an emission limit 0.06 lb/mmBtu is BART for this source.
- MPCA has presented no justification for a PM_{10} limit that is almost eight times higher than that proposed for MN Power's Taconite Harbor Unit #3.
- MPCA's proposed BART alternative does not satisfy EPA criteria and is not acceptable.

[12] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

Rochester Public Utilities – Silver Lake Plant; Units 3 and 4
MPCA 4/29/09 report

Rochester Public Utilities (RPU) operates a bituminous coal and natural gas-fired steam-electric generating station known as the Silver Lake Plant (SLP) in Rochester, Minnesota. The facility has a total nominal generating capacity of 100 megawatts (MW) gross, and the largest unit (Unit 4) has a capacity of around 60 MW. According to EPA's Clean Air Markets Database, in 2007, SLP ranked #380 in the U.S. in sulfur dioxide (SO_2) emissions at 1,837 tons and #476 for nitrogen oxides (NO_X) emissions at 482 tons.

Unit 3 has a capacity of 24 MW. Units 3 and 4 were constructed in 1962 and 1969, respectively. Modeling analyses conducted by MPCA have determined that SLP causes or contributes to visibility impairment in the Boundary Waters Canoe Area.

MPCA BART Analysis
RPU was not requested to submit a BART analysis for SLP Unit 4 since they have proceeded with an air pollution control retrofit project for the targeted visibility pollutants (particulate matter—PM, SO_2, and NO_X). A BART analysis was not requested by the MPCA because all of the following criteria were met:

- The MPCA had sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART;
- Public Utility Commission (PUC) approvals for the reductions were in place; and
- The MPCA determined that planned emission reductions represented BART.

The MPCA issued permit no. 10900011-004 on September 7, 2007, that allows Unit 4 to be retrofitted with additional controls. This pollution control project on Unit 4 is not required by rule or statute, but satisfies the terms of a 2006 settlement agreement. MPCA is a party to the settlement agreement. The planned project at SLP will install additional pollution control equipment for SO_2, PM, and NO_X on Unit 4.

Under the settlement terms, RPU is required to install and operate "a NO_X emission reduction system that is designed to achieve at least a 0.15 lbs/mmBtu emission rate for NO_X." This will be achieved through installation of the control technology known as 'Mobotec.' Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX Selective Non-Catalytic Reduction (SNCR) with furnace urea injection for NO_X control. The MPCA has determined that installation of the Mobotec system represents BART for NO_X on Unit 4. Initial operation of Mobotec has shown an emission rate of 0.25 lbs/mmBtu is achievable on a 30-day rolling average basis.

SO_2 controls consist of installing a spray-dryer absorber designed to achieve a 70 - 85% removal rate. The MPCA has determined that installation of this system represents BART for SO_2 on Unit 4. To control PM, the existing ESP will be replaced by a fabric filter that includes a bag leak indicator. The MPCA has determined that installation of this system represents BART for PM_{10} on Unit 4.

The MPCA has determined that BART for Unit 3 is no additional control because Units 3 and 4 combined were found to be only "marginally" subject-to-BART and, as described,

significant control upgrades are planned for Unit 4, the larger BART unit. Unit 4 impacted visibility more than Unit 3 as Unit 4's 2002 SO_2 emissions were about four times those of Unit 3. Given the small impact on visibility by Unit 3, the MPCA has determined that the existing control equipment represents BART for this unit. This includes multi-cyclones in series with electrostatic precipitators for PM_{10} control. There are permit limitations for SO_2 and PM_{10}; the unit is not subject to any NO_X emission limit or control requirement.

CALPUFF modeling was not rerun for this source; however, the controlled emission rates are approximated in the 2018 regional scale modeling performed.

	NOx Limit	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
Unit 3	No limit	< 2.30	<0.4
		(operating alone; 1-hr, 3-hr,	
		24-hr block average)	
Unit 4	< 0.25	< 0.60	<0.4
	(30 day average)	(1-hr, 3-hr, 24-hr block average)	

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS BART Analysis

MPCA did not perform the required five-step BART. This approach is only allowed if MPCA demonstrates that the source has in place, or is committing to, federally-enforceable limits that represent the **most stringent level of control**.[1] SLP does not meet these criteria. Without a five-factor analysis from the company or MPCA, it is impossible for us to evaluate whatever reasoning went into the MPCA proposal.

NO_X: While we agree with the control strategy proposed by RPU/MPCA, we believe that they should more-fully utilize its capabilities. For example, MN Power and MPCA have proposed that Taconite Harbor Unit #3 meet 0.13 lb/mmBtu using the same control technology on a similar-sized coal-fired boiler. MPCA must explain why the RPU boiler should be allowed almost twice the NO_X emission rate as Taconite Harbor.

SO_2: MPCA appears to be confusing generic control technology requirements with BART. The visibility regulations define BART as follows:

> Best Available Retrofit Technology (BART) means an **emission limitation** based on the degree of reduction achievable through the application of the best system of continuous

[1] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long {as} these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section."

> emission reduction for each pollutant which is emitted by... [a BART -eligible source]. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

While the SO_2 control technology proposed by MPCA may be capable of achieving BART, without an appropriate **emission limit**, the BART requirement is not satisfied. We recognize that MPCA is proposing that the 0.60 lb/mmBtu BART limit be enforced over short-term periods (to address a local NAAQS problem), but the proposed limit does nothing to prevent SLP from operating at this high emission rate continuously. Clearly, the proposed control technology is capable of achieving much lower emissions over the longer (24-hour block, 30-day rolling, annual) averaging periods used in BART analyses.

In its BART analysis, MPCA states, "SO_2 controls consist of installing a spray-dryer absorber designed to achieve a 70 - 85% removal rate." Not only is this assertion not reflected in the proposed BART limit, a spray-dryer/fabric filter combination as proposed for SLP can achieve at least 90% SO_2 reduction.[2] MPCA must evaluate the actual potential of this technology, propose appropriate emission limits, and explain how it arrived at its proposed limits.

PM: According to MPCA, "To control PM, the existing ESP will be replaced by a fabric filter that includes a bag leak indicator. The MPCA has determined that installation of this system represents BART for PM_{10} on Unit 4."

Once again, we agree that the technology has the potential to represent BART, but that the proposed emission limit, 0.4 lb/mmBtu, does not. For example, MN Power and MPCA have proposed that Taconite Harbor Unit #3 meet 0.012 lb/mmBtu using the same control technology on a similar-sized coal-fired boiler. MPCA must explain why the RPU boiler should be allowed 33 times the PM_{10} emission rate as Taconite Harbor.

Conclusions & Recommendations

- MPCA must conduct a five-step BART analysis and justify its proposed limits.
- The control technologies proposed have the potential to represent BART, but the proposed limits do not reflect the levels of control achievsble with these technologies.
- MPCA has not justified a NO_X limit that is almost twice the NO_X emission limit proposed for Taconite Harbor which would use the same technology.
- The proposed SO_2 and PM_{10} limits do not reflect the capability of the proposed spray-dryer absorber/fabric filter combination. (MPCA has proposed a PM_{10} limit that is 33 times the PM_{10} emission rate it proposed for Taconite Harbor.) MPCA must evaluate the actual potential of the proposed SO_2 and PM_{10} control technologies, propose appropriate emission limits, and explain how it arrived at those limits.

[2] For example, in Table 5-2 of the Northshore Mining Silver Bay power plant BART analysis, it is estimated that the spray-dryer/fabric filter combination can achieve 90% control.

Xcel Energy's Sherburne County Generating Plant (Sherco)
MPCA 5/19/09 report

Xcel Energy's (Xcel) Sherburne County generating plant (Sherco) consists of three units with a total plant electrical output rating of 2,255 megawatts (MW). According to EPA's Clean Air Markets Database, in 2007, Sherco ranked #104 in the US in sulfur dioxide (SO_2) emissions at 25,493 tons and #14 for nitrogen oxides (NO_x) emissions at 25,683 tons. Unit 1 (690 MW net, installed in 1976) and Unit 2 (683 MW net, installed in 1977) are tangentially-fired. Units 1 and 2, the only BART-eligible units, each have a maximum rated heat input capacity of 7,111 mmBtu/hr. Sub-bituminous coal is the primary fuel for all three power boilers.

The air pollution control equipment for Units 1 and 2 consists primarily of spray towers (wet scrubbing) and wet electrostatic precipitators (WESPs) to control particulate (PM) and SO_2 emissions. In 2007 Xcel installed Low-NO_X Burners (LNB), separated/close coupled Over-Fire Air (OFA) systems, and a combustion optimization system to reduce NO_X emissions from Unit 1. For Unit 2 NO_X, Xcel installed a computer-based combustion optimization system for the OFA system in 2006. These changes to Units 1 and 2 should allow Xcel to achieve a NO_X emission rate of 0.15 lb/mmBtu.

Information provided by Xcel estimates that Sherco Units #1 & #2 currently cause 2.68 deci-Views (dV) of visibility impairment at the Boundary Waters Canoe Area (BWCA), 2.34 dV of visibility impairment at Voyageurs National Park (NP), and 1.79 dV of visibility impairment at Isle Royale National Park NP.

Xcel BART Proposal

SO_2: Based on…incremental costs, the **most cost-effective option** for optimal SO_2 control is retrofitting the existing scrubbers with sparger tubes and lime injection…Xcel Energy firmly believes the most cost-beneficial visibility improvements will be brought about by retrofitting the existing wet scrubbers with sparger tubes and lime injection.

NO_X: Based on…incremental cost, the **most cost-effective option** for NO_X control for Unit 1 is the installation of a combustion optimization system, and LNB and SOFA. **Based on …incremental cost**, the most cost-effective option for NO_X control for Unit 2 is installation of a combustion optimization system… Xcel Energy firmly believes the most cost-beneficial visibility improvements will be brought about by installing new LNB, a separated/close coupled OFA system, and a combustion optimization system for Unit 1, and a combustion optimization system for Unit 2.

MPCA BART Analysis

Xcel was requested by the MPCA to perform a BART analysis for Sherco because the MPCA did not have sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART (March 2006). A BART analysis dated October 27, 2006, for Sherco Units 1 and 2 was submitted to the MPCA by Xcel.1

The MPCA has determined that the NO_X emissions limitation of 0.15 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limits are achieved

with LNB and OFA at Sherco 1 and additional computerized combustion controls on Unit 2. The technology achieves the "presumptive BART" emissions rate, and does not prohibit or prevent the future installation of any known additional NO_X control technology.

As shown in [MPCA's] Table 2, at this time SCRs are an order of magnitude more expensive than other NO_x controls. Xcel determined that implementing SCRs on these units would be $40 million (annualized) above the cost of proposed BART, and result in only 3,500 additional tons of NO_x removal. Getting only 1.5 times the pollutant reductions at greater than ten times the cost is not cost-effective for BART.

The MPCA has determined that the SO_2 emissions limitation of 0.12 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limit is achieved with the installation of sparger tubes in the existing scrubbers and the injection of lime to lower pH of the scrubbing system. The technology achieves the "presumptive BART" emissions rate, and does not prohibit or prevent the future installation of any known additional SO_2 control technology.

The MPCA has determined that the existing particulate control represents BART and the existing permit limit for PM_{10} is an appropriate BART limit.

CALPUFF modeling was not rerun for this source. The 2018 regional-scale modeling does reflect the 2006 and 2007 combustion control upgrades to Units 1 and 2. The MPCA will include revised emission rates that reflect approved control upgrades for the 2012 State Implementation Plan report regional-scale modeling.

MPCA Determination of the BART Limit

The following limits represent the MPCA's determination of BART for Units 1 and 2.

NO_X Limit	**SO_2 Limit**	**PM_{10} Limit***
0.15 lb/mmBtu	0.12 lb/mmBtu	0.09 lb/mmBtu
on a 30-day rolling average	on a 30-day rolling average	

*PM10 limit includes filterable plus organic and inorganic condensibles.

NPS BART Analysis

While the presumptive BART limits apply to Units #1 & #2, Xcel and MPCA must still conduct a complete, five-step analysis to determine if the presumptive limits are appropriate for this particular case. Although MPCA did not do so, Xcel did provide sufficient data for NPS to conduct an independent analysis.

The key to MPCA's BART proposal appears to reside in this statement: "…SCRs are an order of magnitude more expensive than other NO_x controls. **Xcel determined** that implementing SCRs on these units would be **$40 million** (annualized) above the cost of proposed BART, and result in only **3,500 additional tons** of NO_x removal. Getting only **1.5 times the pollutant reductions** at greater than **ten times the cost** is **not cost-**

effective for BART." (emphasis added) We shall address each point of that statement in our discussion below.

NO_X: Xcel/MPCA have proposed that the NO_X emissions limitation of 0.15 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limits are achieved with LNB and OFA at Sherco 1 and additional computerized combustion controls on Unit 2. According to Xcel, the emission reductions would result in 0.57 dV of visibility improvement at BWCA at a cost-effectiveness ratio of $5 million/dV, and 1.44 dV of improvement across all three Class I areas.

Step 1 - Identify all Available Retrofit Control Technologies
Xcel identified a reasonable range of control options.

Step 2 - Eliminate Technically Infeasible Options
Xcel rejected several options to reduce NO_X for the following reasons:

- Mobotec's Rotamix® system, LoTOx® and the ECOTUBE® approaches were rejected because neither has been demonstrated on units this large. However, Xcel provided no reason why none of these technologies could be transferred[1] from similar, but smaller applications, such as at MN Power's Taconite Harbor facility.
- NO_xStar® and gas re-burn were rejected due to there being no natural gas line to the plant.

Step 3 - Evaluate Control Effectiveness
Xcel and MPCA have underestimated the effectiveness of SCR by assuming that SCR can only achieve 0.08 lb/mmBtu on an annual basis. (Xcel estimates that this approach would result in 0.88 dV of visibility improvement at BWCA and 2.14 dV of improvement across all three Class I areas.) Not only is this assumption unsupported, it is also inconsistent with the BART limit of 0.07 lb/mmBtu proposed by MPCA for the Minnesota Power Clay Boswell Unit #3 (which has higher uncontrolled NO_X emissions). And, **MN Power has stated in its Taconite Harbor BART analysis that SCR is capable of achieving 0.05 lb/mmBtu.**

MPCA has stated that SCR would "…result in only **3,500** additional tons of NO_x removal." Even if we relied upon Xcel's estimates, the difference between the MPCA/Xcel proposal for BART and their estimates for NO_X removed by SCR totals **3,800** tons per year. If we recognize that SCR can reduce NO_X to 0.05 lb/mmBtu (or less) on an annual basis and apply MPCA's mathematical approach, true utilization of SCR would remove an additional 1,644 tpy for a total of **5,444** tpy more reduction from SCR than from the MPCA/Xcel BART proposal. So, instead of obtaining only the "**1.5 times the pollutant reductions"** of the MPCA/Xcel BART proposal as stated by MPCA, **full utilization of SCR would provide more than 1.8 times the proposed reductions.**

Step 4 - Evaluate Impacts and Document Results
MPCA states that SCR is "**not cost-effective** for BART." The core purpose of the BART program is to improve visibility in our Class I areas. **BART is not necessarily the most**

[1] see the BART Guidelines on technical feasibility

cost-effective solution but instead, BART represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors. We believe that it is essential to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected.

MPCA states that, "Xcel determined that implementing SCRs on these units would be **$40 million** (annualized) above the cost of proposed BART." Even taken at face-value, that statement is false. Using the costs presented by MPCA/Xcel, the total annualized cost for combustion controls plus SCR at both Sherco #1 + #2 is $33 million, and the difference between total annualized costs for the MPCA/Xcel BART proposal and SCR is $30 million.

Additionally**, Xcel and MPCA have overestimated the cost of SCR.** EPA guidance states, "The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual). In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible."

Instead, Xcel (and, by default, MPCA) relied upon the CueCost program to generate cost estimates. Xcel included some very questionable and unsupported assumptions in its input to the CueCost model, which resulted in some extraordinarily high cost estimates. For example, Xcel chose the highest available retrofit factor with no justification or explanation. Instead of relying upon the 7% interest rate recommended by the Cost Manual, Xcel used higher values, and Xcel ignored the availability of the Chemical Engineering Cost Index (recommended by EPA) and substituted its own (unsupported) value. The result of these and other questionable assumptions and estimates[2] is that, on a cost/ton basis, the Operation and Maintenance (O&M) costs for SCR at Sherco are two – four times greater than the O&M costs estimated by MN Power for SCR at its much smaller Boswell Unit #3.

Our contention that the Cost Manual should be the primary source for developing cost analyses that are transparent and consistent across the nation and provide a common means for assessing costs is further supported by this November 7, 2007, statement from EPA Region 8 to the North Dakota Department of Health:

> The SO_2 and PM cost analyses were completed using the CUECost model. According to the BART Guidelines, in order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual. Therefore, these analyses should be revised to adhere to the Cost Manual methodology.

We believe that this guidance from EPA directs Xcel and MPCA to revise their cost analyses to reflect a more-consistent use of the Cost Manual, or, at least, support and document their estimates.

[2] For example, Xcel estimated a catalyst cost of $356 per cubic foot compared to MN Power's estimate of $189 cubic foot.

NPS followed the EPA guidance and generated estimates of SCR costs based upon application of the OAQPS Control Cost Manual. We were able to estimate capital costs of about $66 and $49 million ($95/kW and $71/kW) for units #1 and #2, respectively. (Compared to the Xcel estimates of $105 and $90 million), annual costs of about $7.6 and $6.5 million (compared to the Xcel estimates of $18 and $15 million), and cost-effectiveness of $1,300/ton and $1,400/ton of NO_X removed (compared to the MPCA estimates of $2,500 and $4,500 per ton).[3] **Instead of the $33 million in annual costs presented by Xcel, and the $43 million implied by MPCA, application of the BART Guidelines leads to a much lower total annualized cost of $14 million.**

With respect to MPCA's statement that application of SCR would result in "greater than **ten times the cost"** of its BART proposal, one can simply compare the $2.7 million annual cost of the MPCA proposal to the $15 million annual cost of SCR estimated according to the BART Guidelines.

It is clear that **MPCA has based its cost analysis entirely upon the incremental cost** of SCR versus its BART proposal. While it is appropriate to consider incremental costs in addition to average costs, we have a concern with the over-emphasis placed by MPCA upon this factor and with the way in which the incremental cost analysis was conducted. [4] Because, in most cases, the cost of pollution control rises exponentially with control efficiency, the slope of the curve will also increase. For this reason, rigid use of incremental cost effectiveness will always result in the choice of the cheapest option if carried to this extent. (For example, if this approach were used to evaluate particulate controls, it is likely that all controls more expensive than a multiple cyclone would be rejected.) According to the NSR Workshop manual, "As a precaution, the difference in incremental costs among dominant alternatives cannot be used by itself to argue one dominant alternative is preferred to another." Instead, it should be used to compare closely performing options.

We believe that our cost estimates, based upon application of the EPA BART Guidelines, are more "transparent" and more realistic than those presented by Xcel/MPCA and warrant further consideration of SCR by MPCA.

Step 5 - Evaluate Visibility Impacts

Our review of the Xcel modeling results indicates that NO_X emissions are more culpable for impacting visibility than SO_2 emissions; this finding indicates that the value of reducing NO_X is greater than for SO_2 and this should be considered in the BART determination.

As noted above, Xcel did provide information on the benefits of reducing NO_X (and SO_2) at the BWCA. For example, Xcel estimated that addition of SCR to Sherco #1 & #2

[3] MN Power estimated $3,200/ton to add SCR at its Boswell Unit #3.

[4] EPA BART Guideline: "You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option."… "You should exercise caution not to misuse these [average and incremental cost effectiveness] techniques… [but consider them in situations where an option shows]…slightly greater emission reductions…"

would reduce NO_X emission by 10,400 tpy and would result in 0.88 dV of visibility improvement at BWCA and 2.14 dV of improvement across all three Class I areas.[5] Xcel then compared the additional improvement that would result from SCR to the additional cost and estimated this "incremental" cost to be $95 million per dV. It appears that Xcel (inappropriately) relied heavily on this incremental cost analysis to eliminate SCR as a BART option.

In the case of NO_X control, it is especially important to evaluate the total option, not just the most expensive part. All new pulverized coal (PC)-fired EGUs of which we are aware use combustion controls (as proposed by Xcel) in combination with SCR. Although this increases the capital cost of the NO_X control system, by lowering the amount of NO_X that the SCR must treat, annual operating costs can be reduced substantially. Thus, NO_X controls for a modern PC boiler will consist of a relatively inexpensive combustion control system followed by a relatively expensive SCR. As states evaluate the cost-effectiveness of those NO_X control systems as part of their routine Best Available Control Technology analyses, we are not aware of any state that has ever suggested that the combustion controls and SCR should be evaluated separately. At Sherco, the "average cost effectiveness" analysis (as recommended by EPA) would yield $30 - $54 million/dV at BWCA using the Xcel cost estimates, and about $16 million/dV at BWCA using the NPS estimates derived from the EPA Cost Manual.

Compared to the typical control cost analysis in which estimates typically fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per dV to improve visibility may appear extraordinarily expensive. However, our compilation[6] of BART analyses across the U.S. reveals that the **average cost per dV proposed by either a state or a BART source is $10 - $17 million**,[7] with a maximum of almost $50 million per dV proposed by Colorado at the Martin Drake power plant in Colorado Springs.

Because Sherco causes visibility impairment in at least three Class I areas, it is appropriate to consider the improvements in all of those areas to properly asses the benefits of reducing emissions at Sherco. **With application of SCR at Sherco, the "average cost effectiveness" would yield $12 - $22 million/dV summed across the three Class I areas using the Xcel cost estimates, and about $7 million/dV using the NPS estimates derived from the EPA Cost Manual.** These values fall well within the range of "reasonableness" established by other states and BART sources.

SO_2: Xcel/MPCA have proposed that the SO_2 emissions limitation of 0.12 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limit is achieved with the installation of sparger tubes in the existing scrubbers and the injection

[5] Visibility at BWCA improves by 0.00009 dV per ton of NOx removed, and by 0.00022 dV summed across all three Class I areas.
[6] http://www.wrapair.org/forums/ssjf/bart.html
[7] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

of lime to lower pH of the scrubbing system. According to Xcel, the emission reductions would result in 0.55 dV of visibility improvement at BWCA at a cost-effectiveness ratio of $4 million/dV, and 1.59 dV of improvement across all three Class I areas.[8]

While we agree that it generally makes sense to upgrade existing scrubbers, we believe that the upgraded Sherco scrubbers may be capable of achieving greater emission reductions than proposed by Xcel/MPCA. Based upon the coal quality data provided by Xcel, we estimate that current uncontrolled SO_2 emissions are 0.98 lb/mmBtu of this sub-bituminous coal. Therefore, the proposed 0.12 lb/mmBtu BART limits would represent an overall control efficiency of about 88%. By comparison, data in our BART compilation indicates that North Dakota has proposed BART limits for several EGUs that represent higher control efficiencies (Coal Creek @ 94%, Stanton @ 90%, M.R. Young @ 95%). For example, if Sherco were to upgrade its scrubbers to achieve 91% control, it could meet the same 0.09 lb/mmBtu limit proposed for Boswell #3. Xcel should show how it determined that the proposed scrubber upgrades could achieve only 88% control and why they cannot do as well as MN Power.

PM_{10}: The MPCA has determined that the existing particulate control represents BART and the existing permit limit (0.09 lb/mmBtu) for PM_{10} is an appropriate BART limit. Considering that this limit is more than six times higher than the limit proposed for MN Power's Boswell #3, Xcel and MPCA should have evaluated the existing wet electrostatic precipitators for potential upgrades.

Conclusions & Recommendations

- The BART limits proposed by Xcel/MPCA will allow Sherco to continue to cause visibility impairment at BWCA, Voyageurs NP, and Isle Royale NP.
- While reducing both NO_X and SO_2 emissions from Sherco are important, on a per-ton basis, reducing NO_X provides greater visibility benefits than reducing SO_2.
- It is important that regulatory agencies provide a level playing field and that they treat similar emission sources in a similar manner, unless exceptions are properly documented and justified. MPCA has provided no rationale for allowing Xcel to avoid SCR installation at Sherco while requiring MN Power to install SCR at its Bosewll Unit #3.
- Xcel and MPCA have underestimated the ability of SCR to reduce NO_X emissions and overestimated its costs. We believe that a proper five-factor analysis would conclude that SCR at 0.05 lb/mmBtu is BART for Sherco #1 & #2.
- Xcel/MPCA have provided no justification for the proposed SO_2 BART limit. We believe that the proposed scrubber upgrade may be able to achieve a lower SO_2 limit. For example, MPCA has proposed SO_2 limits of 0.09 lb/mmBtu at Boswell #3 and 0.06 lb/mmBtu at Northshore #2.
- Xcel/MPCA should evaluate potential upgrades to the existing wet ESPs.

[8] Visibility at BWCA improves by 0.00007 dV per ton of NOx removed, and by 0.00019 dV summed across all three Class I areas.

The overarching principle driving the MPCA proposal is summed up in this statement:

> In addition to addressing BART at Sherco, Xcel has completed major projects within its generating system in Minnesota that have reduced air pollution substantially. Xcel has completed the retrofit of SCR and spray dryer/fabric filter at the Allen S King station in Oak Park Heights, and repowered the High Bridge and Riverside stations by retiring the coal fired units and constructing natural gasfired combined combustion turbines. This entire project, titled "Metropolitan Emissions Reduction Project" (MERP) and completed in 2010 with the demolition of Riverside coal units, results in the reduction of about 22,000 tons of NOx and 38,000 tons of SO_2.

While we are pleased that the citizens of the Twin-Cities metropolitan area are receiving some relief from Xcel's emissions, Xcel still must address its impacts in Voyageurs and Isle Royale National Parks.

USDA United States Department of Agriculture | Forest Service | Eastern Region | 626 E. Wisconsin Suite 800 Milwaukee, WI 53202

File Code: 2580-2
Date: July 10, 2009

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Ms. Neuschler:

Thank you for the additional material supporting the draft Best Available Retrofit Technology (BART) determinations for Northshore Mining's Silver Bay Power Plant (Northshore) and United Taconite (United). Based on our review we believe these determinations do not follow the Environmental Protection Agency's (EPA) five-step process. Therefore we are providing our comments so that these determinations can be revised before they are submitted to EPA for approval.

These BART determinations are a key part of the Regional Haze plan being prepared by the Minnesota Pollution Control Agency (MPCA). This plan will demonstrate how Minnesota will make reasonable progress toward meeting the national goal of preventing any future, and remedy any existing, impairment of visibility in mandatory Class I federal areas. As the Federal Land Manager for the Boundary Waters Canoe Area Wilderness (BWCAW), the Forest Service has an affirmative responsibility to protect the air quality-related values of this area. One of the key air quality-related values of the BWCAW is visibility. As such, the Forest Service is very interested in these BART determinations and the Minnesota Regional Haze Plan as a whole.

We appreciate your consideration of our April 28, 2009, comments on the draft BART determination for Minnesota's electrical generating units and your willingness to re-notice the draft Regional Haze State Implementation Plan. A revised electrical generating unit BART determination memo was shared with us after our April comment letter which includes significant new material for Northshore. In addition, we have not yet commented on the additional material sent in April for the BART determination at the United Taconite facility.

As you know, the BART determination must consider the best system of continuous emissions control technology taking into account the following *factors*: "the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility," 40 CFR Section 51.308(e)(1)(ii)(A).

The BART guidelines issued by the Environmental Protection Agency (EPA) (70 Federal Register 39163) outline the five steps necessary in completing a BART determination which are:

1) Identify all available retrofit control technologies.
2) Eliminate technically infeasible options.
3) Evaluate control effectiveness of remaining control technologies.
4) Evaluate impacts and document the results.
5) Evaluate the visibility impacts.

We have the following specific concerns with the determinations for Northshore and United. We believe the BART determination for Northshore does not follow the five steps in EPA's guidelines for determining BART. A number of reasons are used by the MPCA to justify the control option selected as BART for United. Some of these reasons are not Clean Air Act factors. Also, the need to treat scrubber water is used to disqualify better performing and affordable control options. In our review of your analysis, we found it is accounted for in the costs of these options and has been successfully implemented at another taconite plant. For both Northshore and United, we use components of your analyses to demonstrate that better performing air pollution control options are feasible. A greater reduction in air emissions will help the BWCAW achieve the national goal of a steady improvement in visibility. Our recommendations and technical comments regarding the proposed determinations are enclosed.

We appreciate the opportunity to continue working closely with your agency as you develop final BART determinations for these facilities. If you have questions or comments, please contact Trent Wickman at (218) 626-4372 or twickman@fs.fed.us.

Sincerely,

/s/ Logan Lee (for)
KENT P. CONNAUGHTON
Regional Forester

Enclosure

cc: Don Shepherd
Chris Holbeck
Bruce Polkowsky
Tim Allen
John Summerhays
Asad Kahn
Jim Sanders
Ann Acheson
Paul Stockinger
Trent Wickman

Technical Comments on the BART Determination for Northshore Mining's Silver Bay Power Plant (Northshore)

We received an updated version of MPCA's BART analyses for Minnesota's electrical generating units on May 26, 2009. This document was a series of memos for each BART subject unit and contained significant new information for Northshore. At this facility the BART-subject unit is Unit 2, a 75-megawatt (MW) boiler. A non-BART–eligible unit (Unit 1) of 35 MW also exists at the site and is discussed in the memo. Our comments on the determination for Northshore are below.

We are concerned that the five BART analysis steps were not followed for Northshore. On page 5 of the MPCA BART memo for this facility the MPCA departs from the 5-step process under the title "multi-pollutant controls." The memo states that this section is for a "…single technology that will address control of both NOx (nitrogen oxides) and SO_2 (sulfur dioxide). The cost-effectiveness of using these technologies cannot be assessed for each pollutant alone…" Our understanding is that this type of a parallel BART analysis process is not included in EPA's BART guidelines. In addition, the Mobotec technology that is cited as an example of a multi-pollutant technology that cannot be assessed on a pollutant-specific basis was split into its constituent parts and included in a pollutant-by-pollutant analysis for the Minnesota Power - Taconite Harbor BART analysis that is included in the same document as Northshore. This shows that the cost-effectiveness of these technologies can be assessed on a pollutant-specific basis and a parallel "multi-pollutant" analysis process is not needed.

Further, we find the analysis itself flawed because it includes Unit 1 along with Unit 2 as a BART-subject unit, but does not conduct a separate BART analysis for that unit. The results presented in Table 5 are, therefore, not a valid comparison because they consider potential controls on two units versus controls on one. If Unit 1 is going to be considered a part of the overall BART–subject source then it should have a control technology analysis done for it for NOx and SO_2 and the results should be added to the results for Unit 2 that are shown in the first line of Table 5. At a minimum Appendix B suggests that low-NOx burners with overfire air are feasible at Unit 1 with a reduction in NOx emissions of 40 percent. An analysis of possible SO_2 controls was not included in the memo for Unit 1.

Page 8 of the memo says that BART appears to be 0.31 lb/MMBtu (pounds per million Btu - this appears to be a typo, Table 6 says 0.37 lb/MMBtu) at $642 per ton for NOx for Unit 2 through the use of low-NOx burners (LNB) and overfire air (OFA). Based on our experience with other states and the presumptive BART determination for electrical generating units made by EPA in the BART guidelines that used a cost threshold for NOx of about $1500/ton, we believe the costs of $1540 per ton shown in Table 3 for LNB/OFA/selective non-catalytic reduction (SNCR) are also reasonable and this option should be considered BART for this unit. Additional support for this point is in the BART memo for United Taconite. On page 7 of the United memo a table is included with sulfur dioxide removal options ranging from $6504/ton to $599/ton. The text below this table states, "It appears that all alternatives are cost effective." In addition, the memo for Minnesota Power – Boswell, Unit 3 selects LNB/OFA/selective catalytic reduction at $3200/ton as BART.

If the costs for LNB/OFA/SNCR for NOx are combined with the spray dryer (SD)/fabric filter (FF) selected by MPCA for SO_2, the new overall costs per ton are $2771 for both pollutants and the total tons removed are (1028 + 1628) 2656 tons.

The memo then goes on to select the co-firing of biomass as BART because the cost per ton is "indistinguishable" from the other option (LNB/OFA for NOx and SD/FF for SO_2). That statement does not describe what criteria was used to make the BART selection since the cost per ton does not differentiate between the options, but is the only factor mentioned. This is despite the fact that the biomass option removes 285 fewer tons of NOx and SO_2. We suggested a control option above (LNB/OFA/SNCR for NOx and SD/FF for SO_2) that also has a cost per ton that is indistinguishable from the other options and the tons removed are 50 percent more than the chosen one. In addition, as discussed above, we believe the memo shows that at minimum a 40 percent reduction in NOx from Unit 1 is feasible (equivalent to 546 tons per Table 2, Appendix B February 20, 2008 memo) plus possible additional SO_2 controls.

We support the discussion of a BART alternative as outlined in the previous MPCA BART memo for Northshore dated March 3, 2009, as long as the alternative demonstration is equal to or greater than the combined annual emission reductions of NOx and SO_2 (in tpy) established in the BART determination (i.e., 2656 + 546 = 3202 tons). A SO_2 control analysis was not conducted for Unit 1 so the total tons reduced could be higher should feasible SO_2 controls be identified.

The second paragraph on page 7 recognizes that Unit 1 could also be regulated under the reasonable progress section of the SIP, but suggests that the reasonable progress requirements would be delayed, or take longer than BART. We do not understand this statement. The SIP includes both reasonable progress and BART requirements. If feasible controls are identified for a unit (such as Unit 1 at Northshore) then our understanding is they should be required as a part of this SIP submittal along with BART.

Technical Comments on the BART Determination for United Taconite

We submitted our original comments on the BART proposals for the Taconite plants in an April 10, 2007, letter to Mary Jean Fenske and again in a March 5, 2008, letter to David Thornton. These comments supplement those made previously and specifically respond to the March 26, 2009, MPCA BART memo for United.

The BART determination for this facility is very important to us. Sulfur is the pollutant with the largest contribution to visibility impairment in Minnesota's Class I areas. United uses high sulfur fuel, but with no sulfur specific controls. Thus, as shown in our March 5 letter, United Taconite stands out amongst the other taconite plants in terms of sulfur emissions per ton of production.

On page 7 of the memo a table of SO_2 control options are included. The text under the table says, "It appears that all alternatives are cost effective." The memo then goes on to select fuel blending at 1.70 lb SO_2/MMbtu for three reasons: 1) it does not require additional construction, 2) is quicker, and 3) avoids further degradation of water quality. We would like to address each of these issues.

The BART guidelines require the BART selections be based on the Clean Air Act factors listed in our cover letter. Reasons 1) and 2) do not appear to us to be included in the factors. In addition, it is not clear to us that the selected control option would be implemented quicker than any other selected as BART unless specific limits requiring an expedited implementation schedule was included in an enforceable document.

It appears that Reason 3) is also not valid. Page 6 of the memo says water treatment costs were included as part of the overall scrubber costs. Therefore, we question how water quality would be degraded. Implementation of sulfate treatment has already been successfully implemented at United's neighboring taconite facility, Minntac[1]. In fact, they predict that installation of their water treatment system will lead to an improvement in the quality of their tailings basin discharge.

Since the only remaining factor is cost and all options have been determined to be cost effective, we recommend the fuel blending plus polishing scrubber should be BART and the SO_2 limit should be 0.68 lb/MMBtu. We agree with the description on Page 8 that any BART alternative should achieve an equivalent or greater annual emission reduction. We believe the targeted reduction level should correlate with the fuel blending plus polishing scrubber option; i.e., 3237 tons of SO_2.

[1] Tom Moe and Troy Eddy, U.S. Steel Membrane treatment of a taconite process water for sulfate removal and commercial implementation potential, MINING INTO THE FUTURE - 82nd Annual Meeting SME Minnesota Section, 70th Annual University of Minnesota Mining Symposium, April 14-15, 2009

MPCA Response to Interim Comments

The Federal Land Managers (Appendix 2.4, Comment Letters 3 and 4) and a coalition of environmental groups (Appendix 2.4, Comment Letter 22) provided some of the most extensive and detailed comments on the MPCA's Draft Regional Haze SIP. One of the main concerns of these groups was the need for the MPCA to make Best Available Retrofit Technology (BART) determinations for electric generating units (EGUs).

As noted in the response to the comments in Appendix 2.4, the MPCA agreed to make these determinations. The MPCA shared information on our response to the initial comments with the coalition of environmental groups, along with preliminary plans for BART determinations at each subject EGU. In addition, the MPCA shared draft EGU BART determination memos with the Federal Land Managers (FLMs), to fulfill consultation requirements under 40 CFR 51.308(i).

After being provided with this additional information concerning the MPCA's plan for completing BART determinations, these groups provided additional comments. The MPCA is making those comments available here, along with the MPCA's response. In particular, the MPCA is sharing the FLM comments, so that the public may be aware of these comments prior to commenting on the Revised Draft Regional Haze SIP.

Generally, the MPCA notes that several commenters urged the MPCA to use U.S. EPA's *Guidelines for BART Determinations Under the Regional Haze Rule* (40 CFR pt. 51, Appendix Y). The MPCA understand the *Guidelines* to be mandatory only in determining BART for fossil-fuel fired power plants with a total generating capacity greater than 750 megawatts. In all other cases, the MPCA understands the *Guidelines* to be discretionary. Accordingly, the MPCA has not applied five-step process laid out in the *Guidelines* in all respects to power plants with a total generating capacity less than 750 megawatts, but has considered the recommendations made by the *Guidelines*.

Comment Letter 1: Mary Marrow, Minnesota Center for Environmental Advocacy; Betsy Daub, Friends of the Boundary Waters Wilderness; Cory MacNulty, Voyageurs National Park Association; Lynn McClure, National Park Conservation Association.

1) *BART* – The commenters stated that the MPCA did not demonstrate that the BART determinations for EGUs comply with the requirements for the Regional Haze Rule to conduct case-by-case BART determinations.

MPCA Response: The MPCA believes that our EGU BART determinations are appropriate and comply with the requirements of the Regional Haze Rule; it should be noted that detailed BART determinations were not provided to the commenters prior to their submission of comments. Based on the comments, and those expressed by the FLMs, the MPCA provided a more complete description of its BART determinations to further explain the MPCA's analysis. The MPCA is placing the BART determinations on notice in a revised Haze SIP so that they can be further reviewed.

2) *Need to Provide Public Notice* – The commenters stated that the changes to the SIP were substantial enough that the MPCA needed to provide additional public notice of a revised Haze SIP.

MPCA Response: The MPCA concurs and has placed the revised haze SIP on public notice.

3) *Emissions Monitoring for Taconite Facilities* – The commenters express concern about the accuracy of Predictive Emissions Monitoring Systems (PEMS) as an alternative method to CEMs for measuring emissions at the taconite companies, and the lack of public notice of Administrative Orders by Consent used to allow the alternative method.

MPCA Response: As noted previously, additional information concerning the alternative method has been added to the revised Haze SIP. In addition, the MPCA is placing the revised SIP, including Administrative Orders for both CEMs and Alternative Methods, on public notice.

4) *Northeast Minnesota Plan* – The Commenters request that if the MPCA and the FLMs enter into a Memorandum of Understanding that changes FLM review of new major emissions sources in the six county Northeast area, such a Memorandum must be open to public comment.

MPCA Response: The MPCA concurs, and will ensure any such MOU is made available for public information and comment.

Comment Letter 2: USDA Forest Service, Kent Connaughton, Regional Forester

1) *Public Notice* – The Forest Service views the change in Minnesota's BART approach for EGUs as a substantial one, and requests public review of the changes, along with a 60-day review of the BART determination prior to any public meeting. In addition, the Forest Service asks that MPCA's response to their comments be made available to the public.

MPCA Response: As noted above, the MPCA has placed the revised Regional Haze SIP on public notice. The MPCA does not plan to hold an additional public meeting concerning the SIP. As the FLMs received EGU BART determinations, along with a BART determination for United Taconite Line 2, from February 2- April 9, 2009, the FLMs shall have had at least 60 days to review the BART determinations prior to the end of the public notice. Comments on the BART determinations by both the Forest and Park Service, and the MPCA's response provided in this document, are being included in the revised version of the SIP that is being placed on public notice. The revised SIP will also include BART determinations that have been amended in response to these comments.

2) *General Comments* – The Forest Service articulates two general concerns: first, that BART limits are made enforceable and installed and operated within five years of SIP approval; second, is a question on how the change in the approach to BART for EGUs impacts the RPGs set in the SIP.

MPCA Response: On the first concern, many of the EGUs already have operating controls and limits in place that have been deemed to be BART. As noted in the BART memos, the MPCA is committing to adding BART citations to the permits (likely in the form "Title I Condition: SIP for Regional Haze, BART") within the specified five year time frame. On the second concern, the MPCA anticipated that the impact on the RPGs of moving from Clean Air Interstate Rule (CAIR) = BART to individual BART determinations would be of interest. The MPCA has added the following language to the Revised SIP, in Chapter 8, along with a Table (Table 8.4) that compares CAIR and non-CAIR projected emission from Minnesota EGUs.

"Minnesota has determined that the known controls in 2018 with CAIR in place – as modeled in the IPM 3.0 "will do" scenario and used to establish the RPG – and without CAIR in place – as shown in the MRPO Case B 2018 – are nearly identical for Minnesota. The resulting emissions projections are also very similar. Dissimilarities in emissions projections are attributed to differences in emission projection methods. The control assumptions in the IPM 3.0 "will do" scenario (with CAIR in place) and the controls without CAIR are shown in Table 8.4.

Because of the similarities in EGU emissions projected in Minnesota, both with and without CAIR, the MPCA has continued to use the modeling including the IPM 3.0 "will do" projections for EGUs."

3) *BART for Rochester Public Utilities* – The commenter is concerned about the 0.25 lbs/MMBtu emission limit set to correspond with operation of the Mobotec system for NOx control at RPU Boiler 4. The Forest Service states that the settlement agreement with Rochester Public Utilities (RPU) required RPU "to install and operate 'a NOx (nitrogen oxides) emission reduction system that is designed to achieve at least a 0.15 lbs/MMBtu emission rate for NOx' on Boiler 4", and that the limit 366 should be set at the best performing level of the technology. The commenter asks the MPCA to explain the discrepancy between 0.15 lbs/MMBtu and the 0.25 lbs/MMBtu BART limit.

MPCA Response: The settlement agreement, to which the MPCA is a party, requires RPU to install and commence operation of a NO_X emission reduction system designed to achieve a 0.15 lbs/MMBtu NO_X emission rate by July 1, 2009. The settlement agreement recognizes that the system must be operated consistent with "technological limitations, manufacturer's specifications, and good engineering and maintenance practices." The settlement agreement also requires RPU to "take all necessary steps to ensure that the FGD and NO_X emissions reduction systems are incorporated into the Title V Operating Permit for the Silver Lake Plant". The MPCA issued a permit on September 7, 2007, that allows installation of the NO_X emission reduction system.

RPU chose to install Rotating Opposed Fired Air (ROFA)/ Rotamix for NO_X control. The results of the application of the ROFA/Rotamix system to a boiler and fuel are site-specific, but RPU reported to the MPCA that they had received a vendor guarantee for emissions of 0.15 lbs/MMBtu. Operation of the NO_X emission reduction system began in early 2009, prior to the required deadline. Initial emission rates from 2009, from EPA's Clean Air Markets Division, show that the unit is operating at a 0.292 lbs/MMBtu emission rate. The MPCA expects the NO_X emissions rate to drop further, after the end of an initial "shake down" or tuning period. The settlement agreement requires RPU to provide the Minnesota Center for Environmental Advocacy, another party to the settlement, with annual reports of emissions beginning in calendar year 2010. This documents the expectation that some time would be needed to optimize the emission reduction system to achieve the expected emission rates; the facility has confirmed that additional operating experience is necessary to determine the optimal operating conditions.

Given that further optimization will be necessary to achieve the proposed BART limit, the NO_X limit of 0.25 lbs/MMBtu is appropriate at this time. The limit set by the MPCA is lower than that in RPU's current permit and ensures reductions of NO_X that, when combined with the operation of the associated SO_2 controls, will ensure that the facility drops below the 0.5 dv threshold for contributing to visibility impairment.

4) *BART for Taconite Harbor* – The Forest Service is concerned that the BART analysis for Taconite Harbor did not follow the five-step process recommended in the BART *Guidelines*. In addition, there is no explanation for why Low-NO_X burners are not evaluated for NO_X control, though they had previously been identified by Minnesota Power as feasible controls. Finally, the Forest Service raises concerns about the choice of a BART limit for SO2 based on a capture efficiency of 40%, when Minnesota Power's cover letter indicates that a capture efficiency of 55% is estimated to be readily achievable.

MPCA Response: The MPCA notes that the BART *Guidelines* are required for sources at power plants larger than 750 MW. Taconite Harbor does not fall into this category. The MPCA believes that the BART analysis did appropriately examine the factors that are required to be considered in making BART determinations. However, the MPCA has provided additional clarification in the SIP and all the BART memos concerning how these factors were considered. Low-NO_X burners were not evaluated in the final BART submittal due to their similarity to the ROFA system and lesser control efficiency. Although it is important to evaluate a range of controls, the MPCA did not feel it was necessary to evaluate a lesser control when there was reason to believe that a technology with better control efficiency existed that could be deemed BART. In terms of the SO_2 BART limit, the MPCA has re-evaluated the capture efficiency and agrees with the commenter that assuming the higher efficiency is more appropriate for the BART memo. The BART memo and limit were revised to reflect a 55% capture efficiency.

5) *BART for Sherburne County* – The commenter believes that the MPCA has dismissed higher performing and cost-effective NO_X emission controls, and that the use of incremental costs to remove certain NO_X emissions controls was inappropriate. In addition, the commenter states that the presumptive BART is not a floor, and that controls should be considered that go beyond that level. 367 The commenter also states that Sherburne County is one of the largest contributors to visibility impairment; that modeling shows that just the NO_X and just the SO_2 contribute to visibility impairment for 20% of the year at BWCAW.

MPCA Response: Although controls at $2000/ton may be seen as generally reasonable, costs at this level are an order of magnitude higher than the most cost-effective NO_X controls. The MPCA believes that it is appropriate to consider incremental costs as part of the cost-effectiveness evaluation. Although the

BART *Guidelines* are discretionary in this case, they state that incremental cost-effectiveness should be considered in conjunction with average cost-effectiveness when considering whether to eliminate a control option under BART. Achieving only 1.5 times the emissions control at three to ten times the annual cost is not a reasonable requirement for BART. In addition, the BART controls do not prevent the installation of future SO_2 or NO_X controls in order to obtain reasonable progress towards visibility improvement. Finally, there is no way of knowing if the 20% days that Sherburne County impacts are the same 20% worst days that must be improved. Modeling shows a perceptible (>0.5 dv) improvement in visibility from installation of just the NO_X controls and just the SO_2 controls, and also a reduction in days where Sherburne County contributes over 0.5 dv to visibility impairment.

6) *BART for Northshore Power Boiler* – The commenter believes that all NO_X control options listed are cost effective, with the exception of SCR, and that the best performing option (LNB + OFA + SNCR) should be selected. The commenter notes that the MPCA believes cost numbers were inflated. The commenter also raises concern about the exclusion of SNCR, noting that MPCA asked the company to evaluate an SNCR system and that the technical issues do not appear to be relevant to the five-step BART process. The commenter also notes that reburn/LNB/OFA is a cost-effective and better performing option, but no explanation was given as to why that technology was not chosen. The commenter also states that 40% control of NO_X from average baseline emissions results in an emission limit of 0.36 lbs/MMBtu, not the 0.52 lbs/MMBtu proposed by the facility. For SO_2 controls, the commenter states that the MPCA chose dry sorbent injection although several wet-scrubbed options were more cost-effective and provided greater control, and that the MPCA articulated that this was due to concerns about water discharge to Lake Superior. The commenter requests that the MPCA add the cost of water treatment to the costs of control for these options, rather than dismissing them. The commenter then offers comments on the facility's BART submittal, and states that control options should not be rejected because visibility improvement is not perceptible.

MPCA Response: The comments are based on a preliminary BART determination that specified LNB + OFA and dry sorbent injection as BART. After the MPCA's initial draft of the BART determination was complete, the MPCA undertook a reanalysis of SO_2 control costs, while the company requested that a fuel-blending option including both units be examined in the BART analysis. The BART analysis and the final determination is therefore different than the draft.

The MPCA agrees with the commenter that the appropriate BART emission limit for NO_X is 40% control from the average baseline, and has set a numerical BART emission limit, rather than specifying a 40% reduction in order to make this clear. However, in discussions with the facility, changes were made to the baseline emissions, which result in an emission rate of 0.40 lbs/MMBtu.

The preliminary BART determination showed wet scrubbing to be more cost effective than both spray drying and dry sorbent injection. As noted in the MPCA's final analysis of BART memo included in the SIP, the MPCA subsequently undertook a separate analysis of "dry" SO_2 control costs (Table 4, BART Determination for Northshore Mining Silver Bay Power Plant). This resulted in much lower cost estimates for spray drying and dry sorbent injection, making these costs roughly equivalent to those for wet scrubbing. The MPCA therefore concludes that wet scrubbing is less cost-effective than these other 368 options, because of the costs to treat wastewater for discharge, which were not included in the analysis submitted by the facility. The MPCA did not undertake an exhaustive review of the cost of wet scrubbing and related wastewater treatment because, as our final determination notes, there is a scrubbing option that removes more SO_2 and appears less costly.

The MPCA agrees with the commenter that imperceptible visibility improvement is not a justification for rejecting otherwise feasible and cost-effective controls.

7) *Taconite Emissions Monitoring Systems* – The Forest Service is concerned that the alternative method to CEMs that will be used by several of the taconite facilities will not provide accurate enough data to achieve the aims of the Regional Haze SIP and will not allow facilities to identify operating scenarios that could result in lower emissions. The Forest Service requests that EPA performance specifications for predictive emission systems be used by the MPCA to evaluate the alternate systems.

MPCA Response: The EPA's performance specification was finalized on March 25, 2009. The latest deadlines for any of the facilities to submit an alternative method proposal was March 1, 2009. The MPCA committed to approve or disapprove that alternate method within 30 days of submittal. Therefore, it was not feasible for the MPCA to evaluate the alternate method against EPA's promulgated performance specification. However, the MPCA acknowledges that the federal performance specification may be an appropriate compliance tool to ensure high quality data in the future.

Comment Letter 3: Department of Interior, National Park Service, John Bunyak General Comments

1) *Purpose of the BART Program* – The National Park Service (NPS) comments that "BART is not necessarily the most cost-effective solution" and in addition that "the cumulative effects of improving visibility across all of the Class I areas affected" should be considered.

MPCA Response: The MPCA does not believe that its BART determinations for EGUs represent simply the most cost-effective level of controls, but that the determinations have properly considered all the statutorily required factors. As noted in the response to the Forest Service comment above, the substitution of facility-specific BART requirements for the MPCA's previous determination of CAIR=BART does not result in substantial changes in projected 2018 emissions from EGUs. Therefore, the cumulative effects of improving visibility are considered in the overall visibility modeling conducted by the MPCA, included in the SIP, and used to set the reasonable progress goals. Emission reductions from Minnesota's EGU sectors were also included in the regional scale modeling conducted by the Midwest Regional Planning Organization (MRPO) for the states affecting the Northern Class I areas. As noted in the SIP, the MPCA expects that BART will result in similar emission reductions as would have come from the CAIR scenario that was modeled in the SIP. The modeling performed for the Regional Haze SIP as a whole, which included the emission changes at most of the subject-to-BART EGUs, developed RPGs that show visibility improvement at the Class I areas.

2) *Level Playing Field* – The NPS states that it is important that regulatory agencies treat similar emission sources in a similar manner, and exceptions to this general requirement should be properly documented and justified. NPS also raises concerns about what is viewed as a "trend of declining stringency as the size of the EGU increases" in the MPCA's BART determinations.

MPCA Response: The MPCA agrees that consistent treatment of sources should be considered, and the comparisons to similar emission sources provided by the NPS are instructive. However, BART is a case-by-case analysis of control technology and corresponding emission limit, taking into account sitespecific factors. Therefore, different facilities may end up with different controls or emission limits due to site-specific factors. The MPCA believes that Minnesota's BART determinations are consistent with 369 BART determinations made by other states. Minnesota's BART determinations have set emission limits and control efficiencies that are within reasonable ranges for the associated technology. The MPCA's determinations account for varying conditions at each Minnesota facility, which yields results that are not suited to side-by-side comparisons.

3) *Five-step BART Process* – The NPS believes that the MPCA has simply tried to designate other control programs already adopted by the EGUs as appropriate for BART without performing the required five-step BART analyses. In particular, the NPS raises concerns that MPCA deemed Best Available Control Technology (BACT) or BACT-like controls as BART without completing the fivestep BART analysis. The NPS states that this is only appropriate if a source has limits that represent "the most stringent level of control."

MPCA Response: The five-step process laid out in the *Guidelines*, is discretionary for power plants with less than 750 megawatts total generating capacity. The MPCA applied the factors laid out in the BART rule and the Clean Air Act, which the NPS refers to as a "five-factor analysis." In making BART determinations, section 169A(g) of the Clean Air Act requires states to consider the available retrofit technologies, the cost of compliance, the energy and non-air quality environmental impacts of compliance, any existing pollution control technology at the sources, the remaining useful life of the sources, and the degree of visibility improvement which may reasonably be anticipated from the use of BART. The MPCA believes that the BART determinations appropriately take into account these factors.

The MPCA does not believe that consideration of these factors must necessarily be quantitative. Because consideration of these factors is statutorily required, the MPCA concluded that it was appropriate to take into account controls adopted by the EGUs for other programs as existing pollution control technology.

The BART rule finalized by the EPA states that "the BART provision in the regional haze rule contains no explicit treatment of modification or how modified emissions units, previously subject to the requirement to install best available control technology (BACT)…are treated under the rule…We note, however, that if…a modification was a major modification that resulted in the installation of controls, the State will take this into account during the review process and may find that the level of controls already in place are consistent with BART" (70 FR 39160). The MPCA has appropriately considered such modifications and existing controls in completing our BART determinations.

4) *Evaluate Control Effectiveness* – The NPS states that "MPCA and the BART sources have consistently underestimated the abilities of established pollution control technologies…to reduce emissions" and that MPCA's estimates of control effectiveness appear to be inconsistent, particularly between small and large EGUs.

MPCA Response: While this and the next two criteria are part of the *Guidelines* and not mandatory considerations, BART is a facility-specific control technology and corresponding emission limit. Because of inherently different circumstances at each unit (different coal, different combustion technology, etc.) control effectiveness may be different. The MPCA has chosen, in general, to accept each facility's determination of how effective a given control technology will be at that facility.

5) *Evaluate Impacts and Document Results* – NPS raises concerns about MPCA's general acceptance of cost-estimates provided by facilities; of particular mention are the estimates submitted by Xcel for the Sherco plant. In addition, NPS believes that MPCA and Xcel relied too much on incremental costs to reject technologies that the NPS believes should be considered as BART.

MPCA Response: The MPCA has reviewed cost estimates contained within the BART analyses, and seeks explanations or revisions as it believes necessary, as noted by NPS in its comment. Questions related to Sherco's cost estimates are shown in the response to the site-specific BART determinations below. The MPCA agrees with the NPS concerns about the use of the incremental cost-effectiveness metric, as over-reliance could lead to selecting the cheapest option. The MPCA does believe there is a place for the use of incremental cost-effectiveness, and believes that it has applied it appropriately when weighing when to move to higher-performing alternatives. In the case of Sherco, the incremental cost-effectiveness did not result in the selection of the cheapest control. Xcel described in its BART analysis an incremental cost curve with a period of small increases followed by the exponential cost increases. The BART technology chosen is generally the last technology on the more moderate portion of the curve.

6) *Evaluate Visibility Impacts* – The NPS states that only Sherco and Northshore were subject to an evaluation of the visibility impacts of the BART options. The NPS states that this step is essential, and can provide useful information on the relative importance of reducing emissions of SO_2 versus emissions of NOx; the NPS believes that reducing NOx provides greater visibility benefits. The NPS also states that visibility improvement must be considered in a given Class I area, as well as cumulatively across all Class I areas impacts by the source. The NPS points out that the average cost of BART controls, in dollars per deciview of visibility improvement, averages $10-17 million and goes as high as $50 million.

MPCA Response: Xcel evaluated visibility impacts within its analysis of BART alternatives. Because Boswell Unit 3 emission reductions were included in the overall SIP modeling (see Tables 8.1 and 8.4 of the SIP), the visibility impact of the reductions at Boswell were considered.

For EGUs less than 750 MW, the resulting visibility improvement is to be considered, but the MPCA believes that it does not have to be quantitatively demonstrated. Instead, the MPCA considered the initial demonstration of facility impact prior to installation of BART controls. In general, the MPCA has seen BART analyses that rely on evaluations of visibility improvement in order to attempt to exempt sources from BART, either due to "small" visibility improvement, or controls being too expensive in the dollar/deciview ($/dv) framework. The MPCA therefore chose not to rely on any $/dv calculations in the

SIP. The MPCA's position is that cost-effective controls should be installed, even if they result in limited improvement in visibility, and technically infeasible or not cost-effective controls are not required under BART, even if they result in significant visibility improvement. Because all BART sources contribute to visibility impairment, any reduction in emissions should result in improvements in visibility. Also, the majority of the controls designated as BART were included in the MPCA's regional scale haze modeling, as described in Chapters 8 and 9 of the SIP, and were used in determining the reasonable progress goals. The RPGs show improvement from current conditions at both of Minnesota's Class I areas.

7) *Reasonable Progress* – The NPS notes that reasonable progress requirements of the Regional Haze rule still apply, and the MPCA may wish to consider additional emission reductions under those requirements.

MPCA Response: The MPCA does intend to further evaluate sources for reasonable progress, particularly in the Five Year SIP Assessment and the next Regional Haze SIP. Facility-Based Comments

8) *Particulate Matter* – In many cases, the NPS raises concerns about the specific emission limit set for particulate matter controls.

MPCA Response: As noted in Table 9.3 of the SIP, the subject-to-BART EGUs generally show extremely low contributions to visibility impairment, less than 0.1 dV. Northshore Silver Bay shows a contribution of 0.16 dV, less than half of the 0.5 dV contribution threshold. Because of the small visibility impact that would result from controls, the MPCA deemed existing controls and emission limits to be BART.

9) Northshore Mining Silver Bay – The main concerns raised by the NPS are:
   a. MPCA has not correctly executed the plant-wide cap approach; instead MPCA must show that the improvement in visibility is greater than with a conventional BART application to Unit 2 alone;
   b. Proposed NO_X limits are much higher than those proposed for Taconite Harbor and Silver Lake, as Silver Bay is only be asked to install LNB/OFA;
   c. MPCA should not have accepted the costs for SCR, SCR should not have been rejected for application in a "high dust" scenario, and SCR control effectiveness should have been evaluated at 90% control rather than 80% control;
   d. The effectiveness of ROFA+Rotamix was underestimated and the costs inflated, the control should be re-evaluated with a control efficiency closer to the 68% being achieved at Taconite Harbor, and at the true costs;
   e. The value of reducing NO_X from this facility is much higher than the value of reducing SO_2, and that should be considered; MPCA did not include any consideration of visibility impacts in its review report.
   f. MPCA should not have eliminated wet scrubbing options for SO_2 control, but instead should have included the costs of mitigating the discharges;
   g. The BART alternative does not reduce enough emissions and must be implemented on a daily basis.

MPCA Response:

a. The MPCA believes that the NPS has somewhat misunderstood the MPCA's BART determination for Silver Bay. As part of the consideration of available retrofit emission control techniques, it is noted that "There may be situations where a specific set of units within a fenceline constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)" In identifying various control techniques, it became clear to the MPCA that for the biomass control, Units 1 and 2 were the logical set to which control would apply, as much of the handling and related equipment would be sized to handle both units.

However, the NPS links this concept with that of "allowing sources to 'average' emissions across any set of BART-eligible emission units within a fenceline." The MPCA believes that this linkage is incorrect. The guidance concerning averaging among BART-eligible units would not apply to the MPCA's BART determination, as Unit 1 and Unit 2 are not both BART-eligible and separate limits were established for each unit. In addition, this concept applies to establishing emission limits and compliance dates, not designating emission control techniques. Should Silver Bay choose to undertake an alternative project, as allowed in the MPCA's BART determination, that project would likely allow for averaging among the EGU emission units that have complete BART determinations. However, as set forth, that alternative would require demonstrations of equivalent or higher reductions and visibility improvement.

b. The NOx emissions limit is appropriate to the technology applied. The emissions limit is applied assuming the application of LNB/OFA would achieve a NO_X reduction of 40%, a reasonable assumption for this control technology.

c. The MPCA believes it reasonably evaluated the use of SCRs at this facility. The MPCA's determination is not unlike determinations made by other states that SCRs are not cost-effective for units of this size.

d. Like the NPS, he MPCA was somewhat concerned about NSM's representation of the ROFA/Rotamix option. Two factors related to this option led the MPCA to not evaluate the option further (1) NSM reported that its existing boiler design limits the control efficiency of ROFA and (2) the higher capital cost of ROFA compared to LNB/OFA is due to the additional equipment and electrical needs of the technology.

The MPCA discussed the assumptions used in the development of the ROFA/Rotamix control option with NSM. When asked why the lower NO_X control efficiency, NSM orally reported that Boiler 2 is a front-fired boiler that does not generate the same combustion/heat pattern that wall or tangential-fired units create, somewhat limiting the advantages that ROFA can provide at tangential fired units like Taconite Harbor. It is not reasonable to assume that a similar removal efficiency would be achieved.

Second, the use of ROFA requires a large fan to deliver sufficient air to accomplish mixing of combustion air. At site visits, Taconite Harbor operators have pointed out to MPCA staff that installing ROFA requires large fans, blowers, and substantially upgraded electrical systems. These types of upgrades are a considerable portion of the project costs. Site visits at Silver Bay Power indicate that upgrades to the electrical system would be critical. The MPCA believes the ROFA cost estimate provided is likely a conservative estimate of project costs, but unlikely to be completely out of line with actual costs and therefore sufficient to establish that ROFA is not a cost-effective technology at this source. Given these factors, the MPCA believes that, the ROFA/Rotamix control option has been reasonably evaluated.

e. The MPCA has considered visibility impacts throughout its review of the NSM BART analysis, and has stressed the need for reductions of NO_X and SO_2. As described in our Northeast Minnesota plan, we seek reductions in both pollutants, and have not weighed one over another. The MPCA is currently conducting modeling that may more accurately demonstrate the relative value of these pollutants in improving visibility, and this could be considered in future Regional Haze SIP revisions.

f. The timing of implementation is a critical factor in meeting the regional haze goals, which naturally leads to considering the ease of implementing a project. The MPCA believes it has appropriately evaluated wet scrubbing technologies, especially when other methods provide a higher level of control.

g. The BART determination made by the MPCA applies the emission limit as a 30-day rolling average, consistent with the typical application of emission limits to steam generating boilers. The NPS has specifically requested such an average at other facilities. While we are not strictly adhering to the *Guidelines* to conduct our analysis, the *Guidelines* are being used to inform our deliberations, in this instance in setting an averaging period for emission limits. The MPCA imposes shorter emission limits if an ambient air standard might be threatened, but that is not the case here. A 30-day rolling average will ensure consistent implementation of the biomass co-firing option.

10) Rochester Public Utilities, Silver Lake – The main concerns articulated by the NPS are:

a. The NO_X control strategy is capable of performing at a lower emission rate, such as the Taconite Harbor rate of 0.13 lbs/MMBtu; and

b. The SO_2 control technology needs an appropriate emission limitation, as it is capable of achieving lower emission rates over the longer period (30-day rolling average) than the shortterm limits (0.6 lbs/MMBtu) designated by the MPCA

MPCA Response:

a. Please see the response to the Forest Service, Commenter Letter 2, #3.

b. The SO_2 BART determination is suitable for the specific conditions at this facility, which uses bituminous coal rather than the sub-bituminous coal primarily used in the Minnesota Power system. Although RPU currently purchases a bituminous coal that is relatively low in sulfur, this coal is becoming more difficult and more expensive to procure.

In addition, the combined impacts from both of the facility's BART-eligible units barely crossed the subject-to-BART threshold of 0.5 dv. As noted in the March 2006 *RESULTS of Best Available Retrofit Technology (BART) Modeling to Determine Sources Subject-to-BART in the State of Minnesota,* RPU shows modeling "results indicating it is not subject-to-BART over the entire three-year period, but is subject-to-BART when comparing against the threshold for each year individually...EPA has directed states to consider information generated on impacts using both the 3-year and individual-year methods when making their final subject-to-BART identification decisions. When evaluating each of the three modeling years, RPU has eight days in both 2003 and 2004 that are greater than 0.5 deciviews, which could qualify the facility for subject-to-BART status." This modeling was based on the facility's prior emission limits for Units 3 and 4, which were up to 3.2 lbs/MMBtu SO_2 on both units. The 2.3 lbs/MMBtu limit on Unit 3 and 0.6 lbs/MMBtu limit on Unit 4 would likely have been sufficient to make the facility not subject-to-BART, had the controls been chosen at the time the MPCA did the BART modeling. The 0.6 lbs/MMBtu SO_2 limit on Unit 4 is appropriate and sufficient to ensure that the control is operated and reduces the facility's visibility impact.

11) Taconite Harbor Unit 3 – The main concerns articulated by the NPS are:

a. MPCA did not perform the five-step BART;
b. SO_2 emissions with a spray dryer/fabric filter and 90% control could be reduced to 0.07 lbs/MMBtu rather than 0.08 lbs/MMBtu
c. The MPCA and Minnesota Power did not appropriately develop the costs of wet FGD, which would result in 25% lower SO_2 emissions.

MPCA Response:

a. Taconite Harbor is a small EGU and application of the five-step BART process in the *Guidelines* is not required.

b. The 0.08 lbs/MMBtu is a reasonable SO_2 permit emission limit to assume for the application of a spray dryer/fabric filter. This assumption does not materially change the BART determination.

c. The consideration of costs in the manner described by Minnesota Power for rejecting wet FGD is appropriate for this facility. The BART analysis notes that some significant balance-of-plant costs were not included: a new stack to handle saturated flue gas, piping, limestone handling and associated building costs.

Indeed, the MPCA considered eliminating this option as technically infeasible due to the difficulties developing appropriate wastewater treatment for wet scrubber residue within the BART implementation timeframe. The facility sits on the shores of Lake Superior, an outstanding resource value water body, which constrains wastewater disposal options to offsite treatment and discharge. Any change to the current NPDES permit for Taconite Harbor that results in an increased mass loading of one or more pollutants is subject to nondegradation review in accordance with Minn. R. 7050.0180. The permit allows for non-contact cooling water discharge at this time, but not for wastewater or other process sources.

12) Boswell Unit 3 – The main concerns of the NPS are:

a. The MPCA pre-empted the required BART analysis by saying that BART is equivalent to BACT, an approach that is only allowed if the limits represent the most stringent level of control;

b. The proposed controls can achieve greater emission reductions. EPA has issued a PSD permit in 2008 that has a limit of 0.05 lbs/MMBtu for NO_X on a 24-hour basis and 0.06 lbs/MMBtu for SO_2 on a 24-hour basis.

MPCA Response:

a. The BART *Guidelines* allow for the consideration of equipment already in place at the facility. The MPCA has appropriately noted that existing equipment will achieve emission limits that in 2007, when Minnesota Power proposed its voluntary reduction project at Boswell 3, the MPCA determined that the project's proposed permit limits for NO_X, SO_2 and PM were equivalent to BACT,[143] with emission limits below the BACT median range shown in the BACT Clearinghouse.

b. The MPCA believes that EPA has *not* issued a PSD permit limit for NO_X of 0.05 lb/MMBtu on a 24-hour basis; the permit issued for the Desert Rock facility contains a 0.06 lb/MMBtu limit on a 24-hour basis, and a 0.05 lb/MMBtu limit on a 365-day rolling average. This permit contains conditional future NO_X emission limits that incorporate a 30-day rolling average. None of these emission limits conform to the form of emission limits described in the *Guidelines*, or generally used for BART, and therefore are not necessarily useful as comparative emission standards for a retrofit project.

In addition, the MPCA notes that there is an accepted difference between achieved and permitted emission levels. The MPCA has no desire to cause compliance issues for facilities by tightening permitted facility emission rates to such an extreme that any variability in operations can cause exceedances. The emission rates in the BART determination are reasonable rates for the chosen technologies and represent appropriate permit limits.

13) Allen S. King Unit 1 – The NPS notes that King should be reviewed for reasonable progress controls, and raises the following issues:

a. The SCR installed should be able to achieve lower NO_X emission rates, closer to 0.07 lbs/MMBtu rather than 0.10 lbs/MMBtu.
b. The dry scrubber should be able to achieve lower SO_2 emission rates, as an example, Sierra Pacific Power has a limit of 0.060 lbs/MMBtu

MPCA Response:

In reviewing these comments, the MPCA has discovered inconsistencies in the treatment of Allen S. King throughout the SIP. Although the MPCA included a BART determination in the Revised Draft Haze SIP, the NPS notes that controls installed at King prior to the BART process made it fall below the threshold of visibility impact for inclusion. The MPCA reviewed the SIP and information presented to stakeholders, and determined that the King facility is NOT subject to BART due to enforceable and operating controls. Therefore, references to BART controls at King, including the BART memo, were removed. This does not impact the emission rates that will be achieved at the King facility. The remainder of this response addresses the NPS concerns that lower emission rates could be set for reasonable progress.

a. It cannot reasonably be concluded that the SCR now installed and operating at Allen S. King should be able to achieve an emissions rate or control efficiency for which the SCR was not designed. The SCR was installed in 2007 after the MPCA determined that its permitted emissions rate reflects emission rates determined through BACT. The SCR has been online for about a year. Xcel has reported to EPA's Clean Air Markets database an average NO_X rate of 0.10 lb/MMBtu. At this NO_X emissions rate, King Unit 1 is (1) in compliance with the facility's permit, (2) meeting the presumptive BART rate for cyclone boilers, and (3) demonstrating modeled visibility impacts less than 0.5 dv. No further change to the permitted NO_X emission rate is necessary at this time.

b. Similarly, it does not seem reasonable to assume that a spray dryer/fabric filter system designed to achieve an SO_2 emissions rate of 0.12 lb/MMBtu and installed in 2008 can be operated to achieve an SO_2 emissions rate of 0.06 lb/MMBtu. The SD/FF system was installed in 2007 after the MPCA determined that the SO_2 emissions rate reflects emission rates determined through BACT. The SD/FF system is achieving an emissions rate of 0.09 lb/MMBtu as reported in U.S. EPA's Clean Air Markets emissions

[143] http://www.pca.state.mn.us/publications/aq5-06.pdf

database. Because at this rate King Unit 1 is (1) in compliance with its permit, (2) achieving SO2 emission rates below the presumptive SO_2 rate for BART and (3) demonstrating modeled visibility impacts less than 0.5 dv, no further changes to the permitted SO_2 emission rate is necessary at this time. The MPCA will continue to look at all EGUs for reasonable progress controls in future SIP revisions.

14) Sherburne County (Sherco) Units 1 and 2 – The main concerns of the NPS are:

a. The MPCA did not complete a five-step analysis.

b. Xcel stated that Rotamix, LoTOx, and ECOTUBE were not feasible because they have not been demonstrated on large units, but did not provide information as to why these could not be transferred from smaller applications.

c. The control effectiveness of SCR was understated – Xcel has chosen 0.08 lbs/MMBtu, when Taconite Harbor showed 0.07 lbs/MMBtu and SCR could achieve 0.05 lbs/MMBtu. Total NOx reductions would then be higher.

d. Xcel and MPCA have over-estimated the cost of SCR. Xcel used the CueCost model with unsupported assumptions in the inputs. The OAQPS Control Cost Manual should be used instead, or support and document the estimates in the BART analysis.

e. MPCA has placed too much emphasis on the incremental cost analysis in selecting BART for Sherco Units 1 and 2.

f. Evaluation of the impact on visibility of installing combustion controls and SCR should be done cumulatively, not separately, resulting in average cost effectiveness of $7 million/dV using NPS figures, not $12 – 22 million/dV using Xcel's numbers.

g. Upgrading the scrubbers should achieve greater emission reductions; the BART determination shows a control efficiency of 88%, while limits on several EGUs in North Dakota range from 90 – 95%. Xcel should upgrade the scrubbers to 91% control and an emission limit 0f 0.09 lbs/MMBtu.

MPCA Response:

a. The MPCA believes that the appropriate five-step analysis was completed by Xcel and the MPCA in accordance with the *Guidelines*, and is properly documented in Xcel's BART analysis submitted to the MPCA and MPCA's BART determination.

b. The MPCA properly rejected Rotamix, LoTOx and ECOTUBE as available technologies. The *Guidelines* state "The control alternatives can include not only existing controls for the source category in question but also take into account technology transfer of controls that have been applied to similar source categories and gas streams. Technologies which have not yet been applied to (or permitted for) full scale operations need not be considered as available; we do not expect the source owner to purchase or construct a process or control device that has not already been demonstrated in practice." Technology transfer may be taken into account, but is not required. The above sentences show that facilities do not need to consider technologies that have not been demonstrated on similar facilities.

c. Xcel completed its analysis of NO_x controls in October 2006. At that time, the median BACT emission rates for new sub-bituminous coal fired units was 0.08 lb/MMBtu, with a range of 0.07 to 0.1 lb/MMBtu.[144] The MPCA has found a single BACT determination of 0.05 lb/MMBtu on a 30-day rolling average when reviewing the BACT clearinghouse; most 30-day rolling averages for NO_x BACT determinations are set at 0.07 lb/MMBtu. Where a permit limit of 0.05 lb/MMBtu was set, it was as an *annual* average. The *Guidelines* requires an EGU's permit specify an averaging time of a 30-day rolling average for limits set as BART. The 0.08 lb/MMBtu is a reasonable permit limit for this technology at that time averaging time, reflecting the capability of the technology.

[144] The MPCA was preparing its analysis of Minnesota Power's Boswell 3 air pollution control retrofit project, and reviewed the status of BACT determinations for subbituminous coal units. The MPCA reported the range and the median value of NOx determinations. See http://www.pca.state.mn.us/publications/aq5-06.pdf

d. The MPCA believes that Xcel's cost estimates are appropriate for all control technologies. We note that when asked to update their BART analysis, Xcel replied by stating that while the costs of control devices has increased overall, the costs of controls relative to one another has not changed.[145] The MPCA relies on its permittees to understand their facilities, as well as the engineering, financing, construction and air pollution control equipment markets well enough to properly estimate project costs.

As already pointed out by NPS, when cost estimates look unreasonable, the MPCA has undertaken significant efforts to identify more appropriate data. Xcel was asked by the MPCA to update its BART analysis to account for such issues as increased project costs since 2006 when the BART analysis was completed. Because Xcel is currently very active in the air pollution control market, having recently completed significant air pollution control retrofit projects similar in size and scope, and capital cost, to those at Sherco Units 1 and 2, the MPCA believes that the cost estimates are sufficiently accurate for use in a BART determination. The OAQPS Control Cost manual is very useful for providing initial design information for some types of controls (not all) and providing a structure for "study level" cost estimates without having site-specific information. However, the Manual states: "Moreover, the user has to be able to exercise 'engineering judgement' on those occasions when the procedures may need to be modified or disregarded."[146] The MPCA notes that Xcel's use of CueCost has been made transparent, and that Xcel has documented what factors were used in generating their costs.

e. The MPCA believes that is has appropriately weighed the incremental costs in selecting BART for this facility, as described earlier. The outcome of the MPCA's deliberation is not unlike those made for similar-sized units in other states.

f. As previously stated, the MPCA has not relied on dollars/deciview as a parameter upon which to determine BART. We have seen this parameter used to reject reasonable and cost-effective controls, and so have relied on other factors in our determination.

g. Xcel has factored in site-specific issues in upgrading the scrubbers. Because BART is a site-specific determination, the MPCA is relying on Xcel's engineering analysis, and has determined that the proposal to achieve an SO2 permit limit of 0.12 lb/MMBtu is reasonable.

Comment Letter 4: USDA Forest Service, Kent Connaughton, Regional Forester (Letter 2)

Northshore Mining Power Boiler

1) *Five-Step Process* – The Forest Service raises concerns that the BART determination for this unit did not follow the required five-step process. A main concern is the evaluation of Mobotec and biomass co-firing as multi-pollutant controls; the Forest Service States that this "parallel" process is not allowed under the BART Guidelines. The Forest Service also states that the Mobotec technology was split into its component parts and analyzed as such for the Taconite Harbor facility.

MPCA Response: The BART process gives States discretion in the analysis of feasible and costeffective controls and subsequent determination of BART. The MPCA concluded that it is more appropriate to consider Mobotec controls and biomass firing in the multi-pollutant analysis. Mainly, this was because both control technologies could have had the NO_X controls (ROFA or LNB) applied without the corresponding SO_2 controls, but that the controls being investigated primarily for SO_2 reductions (Rotamix and use of biomass) could not be applied successfully without the corresponding NO_X controls.

2) *Inclusion of Unit 1* – The Forest Service states that they "find the analysis itself flawed because it includes Unit 1 along with Unit 2 as a BART-subject unit, but does not conduct a separate BART analysis for that unit" and therefore the results do not present a valid comparison.

[145] Rosvold, Richard, Xcel Energy. Letter to Todd Biewen, MPCA. November 13. 2008. http://www.pca.state.mn.us/publications/bart-rev1108-sherco.pdf

[146] U.S. EPA. EPA Air Pollution Control Cost Manual, Background. pg. 1-7. EPA/452/B-02-001 http://www.epa.gov/ttn/catc/dir1/cs1ch1.pdf

MPCA Response: As noted in the response to a similar comment by NPS, the BART *Guidelines* state "There may be situations where a specific set of units within a fenceline constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible." Because of the nature of the biomass co-firing BART control technology, namely that handling and related equipment for getting biomass into the boilers would be sized to handle both units, the MPCA determined that for this specific control technique both units became the logical set of units to which control would apply. The MPCA does not believe that simply because such a determination was made for the evaluation of this specific control technique does not mean that both units should be subject to BART in all circumstances.

3) *Cost-Effectiveness Threshold and BART Selection* – The MPCA determined that BART for NO_X was installation of LNB+OFA at a cost of $642/ton. The Forest Service states that based on their experience with other EGUs and presumptive BART levels, the cost threshold for NO_X should be higher ($1500/ton) and therefore a BART determination of LNB+OFA+SNCR is reasonable and should be BART. The Forest Service notes that the MPCA's BART memo for United Taconite a table of SO2 removal options ranging from $599/ton to $6504/ton states that all options are costeffective; in addition, Boswell Unit 3 selects SCR as BART at a cost of $3200/ton.

   The Forest Service states that "If the costs for LNB/OFA/SNCR for NO_X are combined with the spray dryer (SD)/fabric filter (FF) selected by MPCA for SO_2, the new overall costs per ton are $2771 for both pollutants and the total tons removed are (1028 + 1628) 2656 tons." The Forest Service suggests that this option be chosen as BART because its cost is also indistinguishable from the BART option chosen by the MPCA and the MPCA does not note any factors other than indistinguishable cost for choosing the biomass co-firing option, which results in less pollutant removal.

MPCA Response: The MPCA continues to note that BART is a case-by-case determination. The situation for Northshore's power boilers, which primarily generate power for the adjacent taconite operations (although some is sold to the grid) is different from that of EGUs that sell power only to the grid. The MPCA believes that it is appropriate to consider this difference when evaluating costeffectiveness. The MPCA also notes that SO_2 controls are generally more expensive than NO_X controls, and therefore a different cost-effectiveness threshold for the two pollutants is appropriate. Finally, in regards to Boswell 3, those controls were deemed to be BART because they are "BACT-like"; BACT is generally accepted as having a higher cost threshold than BART.

The MPCA does not believe that a multi-pollutant evaluation approach as shown by the Forest Service is appropriate for those controls; in the case chosen by the Forest Service, installation of the SO_2 controls does not require installation of all the listed NO_X controls. The MPCA chose the biomass co-firing option because we believe it is appropriate, cost-effective, and does not prevent the future installation of additional controls. These units are currently uncontrolled, and the state of future regulations is quite uncertain. As a BART technology exists that does not preclude installation of future controls, the MPCA believes it is an appropriate choice.

4) *SO_2 Emission Reductions from Unit 1* - The Forest Service believes that the addition of emission reductions from Unit 1 is feasible. Although the Forest Service supports the discussion of a BART alternative, the Forest Service includes a higher emission reduction baseline and states that the total tons could be even higher if SO2 controls were identified on Unit 1.

MPCA Response: The MPCA notes that the BART determination of biomass co-firing does include NO_X and SO_2 reductions from the use of biomass in Unit 1. However, the MPCA believes that the appropriate equivalent tons of reduction is the 1981 tons set forth in the MPCA's BART determination. The MPCA also reiterates that controls on Unit 1 are only "logical" and therefore considered part of BART in the case of the biomass co-firing control technique.

5) *Reasonable Progress* – The Forest Service notes that the MPCA's BART determination memo states that Unit 1 could be regulated under reasonable progress, but suggests that this would take longer than BART. If feasible controls are identified for a unit, they should be required as part of the SIP submittal.

MPCA Response: At this time, the MPCA believes that the biomass co-fire BART determination made is the best way to start the process of controlling Unit 1 due to BART's set compliance deadline and the advantage of controlling both units through one project. The emission reductions identified in Minnesota's SIP are sufficient to attain the reasonable progress goals set forth. Also, as noted in the SIP, the MPCA continues to research control strategies for strengthening the SIP, and is likely to revise the RPGs during the Five Year SIP assessment to reflect additional controls and emission reductions. These additional emission reductions may include the replacement for the Clean Air Interstate Rule, acid gas controls on EGUs, or other additional control strategies found to be reasonable.

United Taconite

6) The Forest Service states that the MPCA's SO_2 BART determination for United Taconite of 1.7 lbs/MMBtu, based on fuel blending, was selected inappropriately. The Forest Service notes that the memo states that fuel blending was selected because "1) it does not require additional construction, 2) is quicker, and 3) avoids further degradation of water quality." The Forest Service believes that the first two reasons are not included as factors for consideration by the Clean Air Act. The Forest Service also states that reason 3 does not appear to be valid because water treatment costs are included as part of overall scrubber costs, sulfate treatment has been implemented at Minntac and is predicted to improve the quality of the tailing basin discharge, and therefore it is not clear that water quality would be degraded with a scrubber option. As the MPCA determined that all options are costeffective, the Forest Service believes that fuel blending plus a polishing scrubber represents BART, with an emission limit of 0.68 lbs/MMBtu.

MPCA Response: The regulations at 40 CFR 51.308(e)(1)(ii)(A), mentioned by the commenter, specify certain mandatory criteria. The criteria are not identified as the exclusive criteria, however. The MPCA believes it is proper for the MPCA to take other, relevant considerations into account. For example, other portions of the visibility regulations ask the state to consider "the time necessary for compliance." The MPCA believes that it is appropriate to consider a time factor in this case as well. The commenter also notes that it is not clear that the fuel blending alternative would be implemented sooner without an enforceable document with an expedited implementation schedule; the MPCA could certainly consider such an enforceable document when putting the BART limit in the permit.

The consideration of the water quality drawbacks of scrubbing is part of the evaluation of "energy and nonair quality environmental impacts." A BART determination that does not exacerbate existing water quality issues is appropriate; when a BART determination is available that does not require extensive mitigation of nonair quality impacts such a determination should be strongly considered. Although the Forest Service states that sulfate treatment at Minntac "is predicted" to improve the quality of the discharge, the MPCA notes that this improvement has not yet been demonstrated. In addition, considerable energy usage is necessary for water treatment. Therefore, the MPCA believes its BART limit of 1.7 lbs SO_2/MMBtu heat input is reasonable and appropriate, and has been demonstrated as such using the five factors.

Appendix 2.6: Public Comments on Revised Regional Haze SIP and MPCA Response

This appendix contains the public comments received during the notice period of the Revised Regional Haze SIP. In addition, during the MPCA Citizens' Board consideration of the Revised Regional Haze SIP, several hundred emails were sent to the Commissioner and the Board concerning the Regional Haze SIP. Those comments are provided only electronically, in a separate file. They generally echoed comments that had already been received and responded to.

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September 3, 2009

Via Email: Catherine.Neuschler@state.mn.us

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Re: Comments on Regional Haze State Implementation Plan

ArcelorMittal Minorca Mine, Inc. ("ArcelorMittal") hereby submits its comments to the Minnesota Pollution Control Agency's ("MPCA") Regional Haze State Implementation Plan ("Regional Haze SIP"), which was made available for public notice on July 20, 2009. Since MPCA has indicated it is accepting public comment on this proposed rule through September 3, 2009, these comments are timely.

1. **MPCA Should Consider Additional Information Before Establishing a BART SO_2 Limit for the Minorca Mine.**

In response to a prior draft of the Regional Haze SIP,[1] ArcelorMittal explained that it was inappropriate to establish a specific numerical emission limit for SO_2 because SO_2 emissions at the Minorca Mine are primarily a function of the sulfur content of its taconite ore feedstock, which varies significantly. MPCA's proposed BART limit of 0.123 pounds SO_2 per long ton of pellets fired when natural gas is combusted is based on limited data that do not reflect the variability of the source or its feedstock ore. MPCA proposes to render this SO_2 limit enforceable by incorporating this limit into the Minorca Mine's Title V operating permit after EPA approval of the Regional Haze SIP when that permit is otherwise reopened or amended. ArcelorMittal objects to the proposed BART limit for SO_2 because it is not consistently achievable by the indurating furnace at the Minorca Mine.

In response to ArcelorMittal's earlier comments, MPCA indicated that it would reconsider this proposed limitation if "ArcelorMittal can provide the MPCA with new objective, reliable information that shows the proposed BART limit cannot be met...." We are providing this information in Attachment A, which contains SO_2 testing data collected in 15 minute intervals between March 12, 2008 and March 22, 2008. Based on this data, average SO_2 emissions per long ton of pellets during this period was 0.113 lbs SO_2 per long ton of pellets fired with a standard deviation of 0.34 lbs. Based on this data, ArcelorMittal would only be able to comply with MPCA's currently proposed 0.123 lbs limit approximately 60% of the time. This is unacceptable.

[1] ArcelorMittal incorporates the comments it filed in response to MPCA's prior draft of the Regional Haze SIP by reference as if those comments were fully rewritten here.

In contrast, our preliminary statistical analysis using a three sigma approach with this data suggests the BART SO_2 limit should be at least 0.216 lbs/long ton of pellets fired. Adoption of a three sigma approach is necessary to enable consistent compliance despite the demonstrated variability of the source. Also, any BART SO_2 limit ultimately established should be expressed in terms of a daily average. That is appropriate because the Regional Haze program assesses visibility impacts on a daily basis via analysis of the worst and best visibility days.

While this additional data establishes that the proposed 0.123 lbs SO_2 standard is infeasible and inappropriate, it is still insufficient to set a firm emissions limit at this juncture. Since that testing occurred over just 11 days, it necessarily provides only a snapshot of the SO_2 emissions at the Minorca Mine during a period when it was processing a certain batch of ore. That is too finite a period to fully capture the natural variability that exists in the taconite ore coming from the Minorca Mine. Only the integrated analysis of additional data collected over time (as different ores are mined and processed) can adequately capture the variability of this particular operation. Establishing a SO_2 standard without more comprehensive data on sulfur content of the ore would risk subjecting ArcelorMittal to enforcement for failure to comply due to natural conditions that are not well understood and fall wholly beyond its control.

Rather than attempting to impose an unsubstantiated SO_2 emissions level as BART, MPCA should focus its efforts on the proper operation of the scrubber emission control system, which the Agency has already deemed BART-appropriate. That practical approach is well suited for use at the Minorca facility because it primarily combusts gaseous fuel that contains very little sulfur with No. 2 fuel oil as a back-up. Relying on parametric monitoring to ensure that control efficiencies are maintained, ArcelorMittal can accurately calculate SO_2 emissions to help MPCA assess progress towards its visibility goals. If several years of experience with that approach indicate that a numeric limit is truly necessary, MPCA will remain able to promulgate such a limit in a less arbitrary manner based on the subsequent collection of additional data.

2. <u>MPCA Should Not Incorporate by Reference the Administrative Orders Into the Regional Haze SIP.</u>

On January 22, 2009, ArcelorMittal and the MPCA entered into an Administrative Order By Consent ("AOC") which required ArcelorMittal to conduct testing and analysis to assess the variability of NOx emissions at the Minorca Mine. On February 21, 2009, ArcelorMittal submitted its analysis based on testing that had occurred during March 2008. That submission contained a proposal to use an Alternative Method for calculating NOx emissions from its facility. Pursuant to paragraph 11 of the AOC, that submission obligated the MPCA to "either approve or disapprove the use of an Alternative Method within 30 days...." Despite that deadline, MPCA has yet to respond with its approval or disapproval.

The Regional Haze SIP should contain MPCA's approval of ArcelorMittal's Alternative Method. Instead, the document refers to the AOC as requiring "submittal of an alternative emission measurement method...by March 1, 2009." This has already occurred and many of the AOC obligations will be rendered moot once MPCA approves the Alternative Method proposed. Thus, it is inappropriate to refer to the AOC or request that EPA somehow incorporate that document as part of the SIP. MPCA should act on ArcelorMittal's request by approving the proposed Alternative Method and then directly reference that Alternative Method in the proposed SIP, thus increasing the transparency of the rule and avoiding potential confusion and ambiguity.

It is also inappropriate for MPCA to request that EPA "approve" the AOC "into the SIP." Although the intent of this request remains unclear, it could be interpreted as a request to establish that the AOC somehow has distinct, additional legal force as part of Minnesota's State Implementation Plan. The AOC is fully enforceable without that additional step, and incorporation into the SIP would add no apparent value. In contrast, incorporating a static document which merely describes how the parties plan to reach agreement on the appropriate BART monitoring means that the SIP is outdated immediately. Further, incorporation would risk making any perceived violation of the AOC (by either party) also constitute a violation of SIP. There is no need to formalize that transitory document in such an ambiguous, potentially harmful manner.

3. NOx Data Provided to MPCA Support Using BACT as NOx BART

ArcelorMittal supports MPCA's determination that BART for NOx for its taconite pellet furnaces is good combustion practices in its current configuration without add-on control equipment or additional process changes. As such, MPCA's proposed BART for NOx is the emission level achieved consistently under the current operating configuration implementing good combustion practices.

In accordance with the Administrative Order by Consent, ArcelorMittal submitted its low Relative Variability Index (RVI) demonstration using over 150 hours of test data collected during an extended Method 7E NOx test March 11-22, 2008. The Schedule of Compliance description of ArcelorMittal's Administrative Order requirement in Table 9.7 of the Draft BART SIP needs to be updated with the following:

> Pursuant to its Administrative Order by Consent, ArcelorMittal submitted a data-supported analysis of the relative variability of its NOx emissions in February 2009 demonstrating low variability. NOx emissions for the indurating furnaces will be determined using an emission factor derived from this test data, and verified through stack testing every two years.

Consistent with EPA's Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations, Final Rule, 70 Fed. Reg. 128 (July 6, 2005) ("EPA BART Guidelines") at 39104, ArcelorMittal's unique site-specific NOx BACT emission limitation (1088 lbs/hr from all four stacks combined) must be considered BART. While EPA and MPCA acknowledge that some older BACT determinations may no longer reflect the best technology, that is not the case for the ArcelorMittal furnace. MPCA has proposed the current operating configuration with good combustion practices as BART for the ArcelorMittal furnace. The NOx BACT limit has required that ArcelorMittal implement good combustion practices to ensure compliance. The NOx data submitted to MPCA in February 2009 pursuant to the Administrative Order verify that NOx emissions when using good combustion practices in the current operating configuration are consistent with the NOx BACT emission limit. All hourly data from the four stacks combined are within 15% of the NOx BACT limit. ArcelorMittal is the only taconite facility with a NOx BACT limit in Minnesota and it has demonstrated through extended emission testing that the BART SIP should reflect the NOx BACT emission limit as BART for the ArcelorMittal furnace.

Conclusion

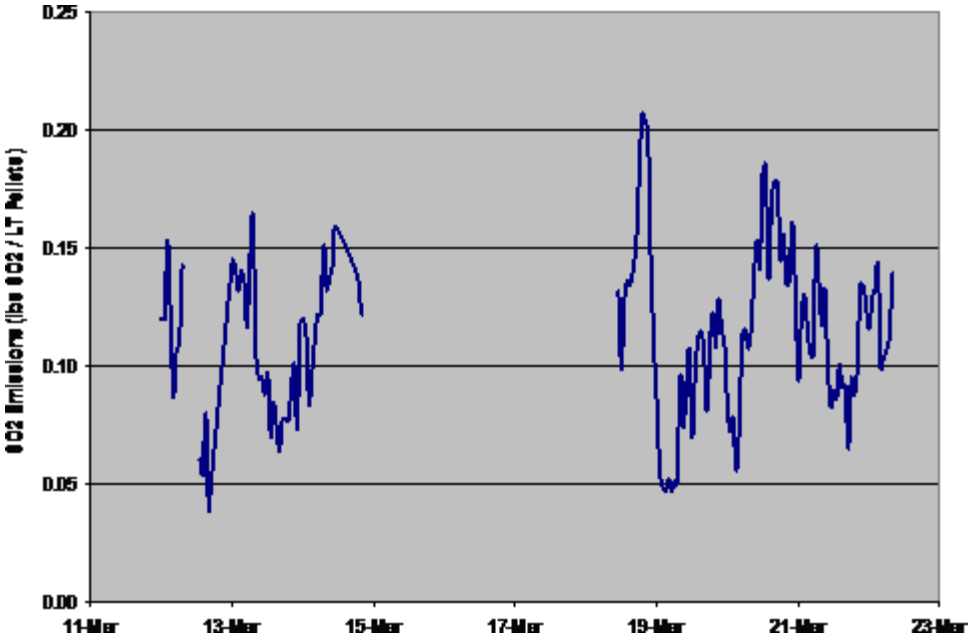
ArcelorMittal supports the efforts of MPCA to comply with the federal Regional Haze Rule through revision of the Minnesota SIP. We respectfully request that MPCA withdraw the 0.123 lb SO_2/long ton pellets fired proposed BART limit in light of the attached data. We encourage MPCA to consider BART controls that focus on proper scrubber operation instead of numeric limits to better accommodate the variability of the sulfur content of ores. To the extent that numeric limits are proposed, we insist that they be based on adequate data, a three sigma statistical analysis to incorporate variability, and a 24-hour averaging period to better correspond with the daily methods used to assess visibility impacts. Finally, we respectfully request that MPCA's BART SIP recognize the Alternative Method that ArcelorMittal proposed in February 2009 using a low RVI emission factor to predict NOx emissions instead of incorporating the Administrative Order by Consent into the SIP.

ArcelorMittal appreciates the opportunity to work with MPCA and the opportunity to submit these comments. Please feel free to contact me with any questions regarding the comments above at your convenience at (330) 659-9163.

Sincerely,

Michael E. Long
Manager Environmental Compliance
ArcelorMittal USA

cc: Jaime Baggenstoss, ArcelorMittal Minorca Facility
Douglas A. McWilliams, Squire, Sanders & Dempsey L.L.P.


0.25
0.20
0.15
0.10
0.05
0.00
11-Mar
13-Mar
15-Mar
17-Mar
19-Mar
21-Mar
23-Mar

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
Measured Mean	5.6	6.8	4.5	6.7	3.6	5.7	2.7	3.5	
Mean incl Repl Values	5.6	6.8	4.6	7.0	3.4	5.3	2.7	3.5	**22.6**
3/11/08 23:45	5.8	7.1	5.0	7.2	***3.1***	***4.8***	2.2	2.7	22
3/12/08 0:00	6.4	7.8	5.4	7.8	***3.5***	***5.4***	2.5	3.1	24
3/12/08 0:15	5.0	6.2	4.3	6.2	***3.0***	***4.7***	2.4	3.0	20
3/12/08 0:30	5.3	6.5	4.5	6.5	***3.1***	***4.8***	2.3	3.0	21
3/12/08 0:45	7.0	8.9	6.2	8.9	***3.8***	***6.1***	2.7	3.5	27
3/12/08 1:00	6.7	8.3	5.8	8.4	***3.8***	***5.9***	2.8	3.5	26
3/12/08 1:15	7.4	9.1	6.6	9.4	***4.2***	***6.5***	3.1	3.9	29
3/12/08 1:30	7.1	8.9	6.1	8.9	***4.2***	***6.5***	3.2	4.1	28
3/12/08 1:45	7.6	9.4	6.6	9.5	***4.7***	***7.2***	3.8	4.7	31
3/12/08 2:00	7.4	9.2	6.4	9.3	***4.4***	***6.9***	3.5	4.4	30
3/12/08 2:15	6.9	8.4	6.0	8.5	***4.0***	***6.2***	3.1	3.8	27
3/12/08 2:30	6.2	7.7	5.2	7.5	***3.7***	***5.7***	2.8	3.5	24
3/12/08 2:45	5.6	6.9	4.7	6.8	***3.4***	***5.2***	2.6	3.3	22
3/12/08 3:00	4.9	6.2	4.2	6.0	***3.1***	***4.8***	2.5	3.2	20
3/12/08 3:15	3.9	4.8	3.4	4.9	***2.6***	***4.1***	2.3	2.9	17
3/12/08 3:30	3.8	4.7	3.3	4.7	***2.6***	***4.0***	2.3	2.9	16
3/12/08 3:45	4.4	5.6	3.9	5.6	***2.8***	***4.5***	2.4	3.0	19
3/12/08 4:00	4.7	5.8	4.0	5.8	***2.9***	***4.5***	2.3	2.9	19
3/12/08 4:15	4.0	5.0	3.5	5.2	***2.6***	***4.1***	2.2	2.8	17
3/12/08 4:30	4.3	5.6	3.9	5.7	***2.8***	***4.4***	2.3	3.0	19
3/12/08 4:45	6.2	7.8	5.4	8.0	***3.6***	***5.7***	2.7	3.5	25
3/12/08 5:00	6.4	7.9	5.5	8.1	***3.6***	***5.6***	2.6	3.3	25
3/12/08 5:15	5.4	6.7	4.7	6.7	***3.2***	***4.9***	2.4	3.0	21
3/12/08 5:30	4.9	6.1	4.4	6.6	***2.9***	***4.6***	2.3	2.9	20
3/12/08 5:45	5.4	6.8	4.7	6.8	***3.2***	***5.0***	2.4	3.1	22
3/12/08 6:00	6.0	7.5	5.2	7.7	***3.4***	***5.4***	2.5	3.2	24
3/12/08 6:15	6.9	8.6	6.1	9.3	***3.9***	***6.0***	2.8	3.5	28
3/12/08 6:30	6.7	8.4	5.8	9.0	***3.8***	***5.9***	2.8	3.5	27
3/12/08 6:45	6.9	8.6	6.0	9.0	***3.8***	***6.0***	2.7	3.5	27
3/12/08 7:00	7.2	9.0	6.4	9.3	***4.1***	***6.5***	3.1	4.0	29
3/12/08 7:15	7.6	9.6	6.8	9.8	***4.4***	***7.0***	3.4	4.3	31
3/12/08 7:30	7.6	9.5	6.9	10.3	***4.5***	***7.0***	3.5	4.4	31
3/12/08 7:45	8.0	9.8	7.0	10.3	***4.5***	***6.9***	3.2	4.1	31
3/12/08 8:00	6.6	8.1	5.9	8.4	***3.6***	***5.5***	2.5	3.1	25
3/12/08 8:15	5.1	6.2	4.5	6.6	***3.0***	***4.6***	2.3	2.8	20
3/12/08 8:30	5.9	7.4	5.3	7.7	***3.3***	***5.2***	2.4	3.0	23
3/12/08 8:45	6.7	8.4	5.8	8.4	***3.6***	***5.7***	2.5	3.2	26
3/12/08 9:00	6.2	7.8	5.3	7.5	***3.3***	***5.3***	2.3	3.0	24
3/12/08 9:15	6.0	7.4	5.2	7.4	***3.2***	***5.1***	2.3	2.9	23
3/12/08 9:30	5.9	7.3	5.1	7.6	***3.2***	***5.0***	2.3	2.8	23
3/12/08 9:45	4.5	5.5	3.9	5.8	***2.7***	***4.2***	2.1	2.6	18
3/12/08 10:00	3.4	4.2	3.1	4.6	***2.3***	***3.5***	2.0	2.5	15
3/12/08 10:15	3.4	4.2	3.1	4.6	***2.3***	***3.5***	2.0	2.5	15
3/12/08 10:30	3.0	3.9	2.8	4.1	***2.1***	***3.4***	1.9	2.4	14
3/12/08 10:45	4.6	5.8	4.0	5.9	***2.7***	***4.3***	2.1	2.7	19
3/12/08 11:00	4.9	6.1	4.2	6.1	***2.9***	***4.5***	2.2	2.7	19
3/12/08 11:15	3.7	4.7	3.4	4.8	***2.5***	***3.8***	2.1	2.6	16
3/12/08 11:30	3.1	3.9	2.9	4.2	***2.2***	***3.4***	2.0	2.5	14
3/12/08 11:45	3.3	4.2	3.2	4.7	***2.3***	***3.6***	2.0	2.6	15
3/12/08 12:00	4.7	5.9	3.8	5.5	***2.8***	***4.4***	2.2	2.7	19
3/12/08 12:15	4.6	5.8	3.3	4.9	***2.8***	***4.3***	2.2	2.7	18
3/12/08 12:30	3.3	4.2	4.2	6.0	***2.2***	***3.5***	1.9	2.4	16
3/12/08 12:45	3.6	4.5	2.8	4.2	***2.3***	***3.7***	2.0	2.5	15
3/12/08 13:00	3.8	4.8	3.0	4.6	***3.9***	***6.1***	4.4	5.6	21
3/12/08 13:15	4.8	5.9	3.6	5.2	***2.7***	***4.3***	2.1	2.6	18
3/12/08 13:30	3.8	4.8	3.0	4.5	***2.4***	***3.7***	1.9	2.4	16
3/12/08 13:45	3.8	4.7	2.9	4.2	***2.3***	***3.6***	1.8	2.3	15
3/12/08 14:00	4.6	5.7	3.5	5.1	***2.6***	***4.1***	2.0	2.5	17
3/12/08 14:15	5.1	6.3	3.9	5.7	***2.8***	***4.4***	2.0	2.6	19
3/12/08 14:30	5.0	6.2	4.0	5.9	***2.7***	***4.3***	2.0	2.4	19
3/12/08 14:45	3.5	4.3	2.8	4.0	***2.0***	***3.1***	1.5	1.9	13
3/12/08 15:00	3.2	3.9	2.6	3.7	***1.8***	***2.8***	1.4	1.7	12
3/12/08 15:15	2.9	3.6	2.6	3.8	***1.8***	***2.8***	1.5	1.9	12
3/12/08 15:30	3.4	4.2	2.9	4.1	***2.1***	***3.2***	1.7	2.1	14
3/12/08 15:45	2.7	3.3	2.5	3.6	***1.9***	***2.9***	1.7	2.1	12
3/12/08 16:00	2.6	3.2	2.5	3.7	***1.8***	***2.8***	1.7	2.1	12
3/12/08 16:15	2.9	3.6	2.6	3.7	***1.9***	***3.0***	1.7	2.1	13
3/12/08 16:30	3.5	4.3	3.1	4.6	***2.1***	***3.3***	1.7	2.1	14
3/12/08 16:45	3.9	4.9	3.3	4.8	***2.3***	***3.6***	1.8	2.2	16

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/12/08 17:00	4.5	5.7	3.7	5.4	***2.6***	***4.0***	1.9	2.4	17
3/12/08 17:15	4.8	6.1	3.9	5.8	***2.7***	***4.3***	2.0	2.5	19
3/12/08 23:45	7.4	8.8	6.2	9.3	***4.3***	***6.6***	3.3	4.2	29
3/13/08 0:00	6.6	7.9	5.3	8.0	***3.7***	***5.7***	2.8	3.5	25
3/13/08 0:15	8.2	9.8	6.4	9.6	***4.6***	***7.0***	3.4	4.3	31
3/13/08 0:30	7.4	8.8	6.0	9.1	***4.2***	***6.4***	3.1	3.9	28
3/13/08 0:45	7.8	9.2	6.2	9.0	***4.3***	***6.5***	3.1	3.9	29
3/13/08 1:00	6.3	7.5	5.0	7.1	***3.6***	***5.5***	2.7	3.4	23
3/13/08 1:15	6.1	7.3	4.8	6.7	***3.5***	***5.3***	2.6	3.3	23
3/13/08 1:30	7.1	8.4	5.6	7.8	***4.0***	***6.1***	2.9	3.7	26
3/13/08 1:45	6.9	8.2	5.4	7.5	***3.9***	***5.9***	2.8	3.6	25
3/13/08 2:00	6.3	7.6	4.9	6.9	***3.5***	***5.4***	2.6	3.3	23
3/13/08 2:15	6.5	7.8	5.1	7.3	***3.6***	***5.6***	2.7	3.4	24
3/13/08 2:30	7.2	8.7	5.8	8.3	***4.1***	***6.4***	3.1	3.9	27
3/13/08 2:45	7.3	8.8	5.9	8.3	***4.3***	***6.6***	3.3	4.2	28
3/13/08 3:00	7.7	9.1	6.2	8.8	***4.6***	***7.0***	3.5	4.5	29
3/13/08 3:15	7.8	9.2	6.3	8.8	***4.6***	***7.0***	3.5	4.5	29
3/13/08 3:30	7.5	8.9	6.1	8.5	***4.5***	***6.9***	3.5	4.5	29
3/13/08 3:45	7.9	9.4	6.4	9.0	***4.6***	***7.0***	3.5	4.5	30
3/13/08 4:00	6.5	7.7	5.2	7.2	***3.8***	***5.7***	2.8	3.6	24
3/13/08 4:15	6.4	7.4	4.9	6.7	***3.4***	***5.0***	2.3	2.8	22
3/13/08 4:30	6.7	7.9	5.1	7.0	***3.4***	***5.1***	2.2	2.7	23
3/13/08 4:45	6.4	7.6	5.1	7.1	***3.3***	***4.9***	2.1	2.6	22
3/13/08 5:00	6.3	7.4	5.1	6.9	***3.3***	***5.0***	2.2	2.8	22
3/13/08 5:15	6.6	7.9	5.6	7.7	***3.6***	***5.4***	2.5	3.1	24
3/13/08 5:30	6.7	8.0	5.8	8.1	***3.9***	***5.9***	3.0	3.7	26
3/13/08 5:45	7.4	8.8	6.7	9.3	***4.8***	***7.3***	4.1	5.1	30
3/13/08 6:00	7.3	8.7	6.8	9.3	***5.1***	***7.7***	4.6	5.7	31
3/13/08 6:15	7.1	8.4	6.6	9.2	***5.2***	***7.7***	4.7	5.9	31
3/13/08 6:30	6.9	8.0	6.3	8.6	***4.7***	***7.0***	4.2	5.2	29
3/13/08 6:45	6.8	8.0	6.2	8.4	***4.2***	***6.3***	3.4	4.3	27
3/13/08 7:00	6.9	8.0	6.2	8.5	***4.0***	***5.9***	3.0	3.6	26
3/13/08 7:15	6.4	7.4	5.7	7.8	***3.5***	***5.3***	2.5	3.1	24
3/13/08 7:30	5.5	6.4	4.3	6.0	***2.9***	***4.3***	2.0	2.4	19
3/13/08 7:45	4.1	4.9	3.4	4.8	***2.2***	***3.3***	1.6	1.9	15
3/13/08 8:00	4.6	5.4	3.7	5.6	***2.2***	***3.3***	1.2	1.5	16
3/13/08 8:15	5.2	6.2	3.9	6.1	***3.1***	***4.9***	0.0	0.0	17
3/13/08 8:30	5.7	6.8	4.4	6.9	***3.4***	***5.3***	0.0	0.0	19
3/13/08 8:45	5.9	7.0	4.4	6.6	***3.6***	***5.5***	0.0	0.0	19
3/13/08 9:00	5.9	7.1	4.6	6.8	***3.6***	***5.6***	0.0	0.0	19
3/13/08 9:15	6.6	7.8	5.0	7.1	***4.0***	***6.1***	0.0	0.0	21
3/13/08 9:30	5.9	7.1	4.7	6.9	***3.6***	***5.5***	0.0	0.0	20
3/13/08 9:45	5.8	6.8	4.5	6.4	***3.5***	***5.3***	0.0	0.0	19
3/13/08 10:00	5.6	6.6	4.3	6.1	***3.4***	***5.2***	0.0	0.0	18
3/13/08 10:15	6.0	7.0	4.7	6.4	***3.6***	***5.5***	0.0	0.0	19
3/13/08 10:30	5.8	6.9	4.7	6.7	***3.5***	***5.4***	0.0	0.0	19
3/13/08 10:45	6.1	7.1	5.4	7.4	***3.7***	***5.6***	0.0	0.0	20
3/13/08 11:00	4.5	5.4	4.4	6.1	***2.7***	***4.2***	0.0	0.0	16
3/13/08 11:15	4.3	5.1	3.3	4.6	***2.6***	***4.0***	0.0	0.0	14
3/13/08 11:30	5.0	6.0	4.1	5.6	***4.7***	***7.2***	5.1	6.4	25
3/13/08 11:45	5.2	6.2	4.2	5.9	***4.0***	***6.0***	3.8	4.8	23
3/13/08 12:00	4.5	5.3	3.9	5.7	***3.4***	***5.2***	3.3	4.1	20
3/13/08 12:15	3.9	4.5	3.3	4.7	***3.1***	***4.6***	3.0	3.8	18
3/13/08 12:30	2.7	3.1	2.4	3.5	***2.6***	***3.8***	2.8	3.5	14
3/13/08 12:45	1.7	2.0	1.7	2.6	***2.2***	***3.2***	2.6	3.2	11
3/13/08 13:00	2.3	2.8	2.2	3.4	***2.4***	***3.6***	2.6	3.3	13
3/13/08 13:15	4.4	5.2	3.4	5.1	***3.1***	***4.7***	2.8	3.5	19
3/13/08 13:30	4.5	5.3	3.4	5.1	***3.1***	***4.6***	2.7	3.4	18
3/13/08 13:45	3.2	3.9	2.7	4.0	***2.6***	***3.8***	2.5	3.1	15
3/13/08 14:00	4.0	4.7	3.1	4.4	***2.8***	***4.2***	2.5	3.1	17
3/13/08 14:15	4.1	4.9	3.3	4.5	***2.9***	***4.4***	2.6	3.3	17
3/13/08 14:30	4.0	4.8	3.1	4.6	***2.8***	***4.2***	2.6	3.1	17
3/13/08 14:45	2.7	3.2	2.3	3.4	***2.3***	***3.4***	2.3	2.9	13
3/13/08 15:00	2.6	3.2	2.2	3.1	***2.3***	***3.4***	2.3	2.8	12
3/13/08 15:15	2.6	3.1	2.2	3.1	***2.3***	***3.4***	2.3	2.9	12
3/13/08 15:30	2.6	3.1	2.2	3.1	***2.2***	***3.3***	2.2	2.8	12
3/13/08 15:45	3.5	4.1	2.8	4.1	***2.5***	***3.7***	2.3	2.8	15
3/13/08 16:00	3.2	3.9	2.6	3.5	***2.4***	***3.6***	2.3	2.8	14
3/13/08 16:15	3.5	4.2	2.8	4.1	***2.5***	***3.7***	2.3	2.8	15
3/13/08 16:30	3.4	4.1	2.8	4.1	***2.5***	***3.7***	2.2	2.7	15
3/13/08 16:45	4.5	5.4	3.5	5.4	***2.9***	***4.3***	2.4	2.9	18

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/13/08 17:00	4.3	5.2	3.3	5.0	***2.8***	***4.2***	2.3	2.9	17
3/13/08 17:15	4.1	4.9	3.2	4.7	***2.7***	***4.1***	2.3	2.9	17
3/13/08 17:30	3.8	4.5	3.0	4.6	***2.6***	***3.9***	2.3	2.8	16
3/13/08 17:45	3.8	4.5	3.1	4.6	***2.6***	***3.8***	2.2	2.8	16
3/13/08 18:00	3.6	4.3	3.1	4.7	***2.5***	***3.7***	2.2	2.7	15
3/13/08 18:15	3.7	4.4	3.2	5.3	***2.5***	***3.7***	2.2	2.7	16
3/13/08 18:30	3.4	4.1	3.1	4.9	***2.4***	***3.6***	2.1	2.7	15
3/13/08 18:45	3.7	4.4	3.3	5.2	***1.9***	***3.0***	1.3	1.6	14
3/13/08 19:00	3.8	4.5	3.3	5.1	***2.6***	***3.9***	2.2	2.8	16
3/13/08 19:15	4.3	5.1	3.6	5.5	***2.7***	***4.1***	2.3	2.8	17
3/13/08 19:30	3.4	4.1	3.0	4.5	***2.4***	***3.7***	2.2	2.8	15
3/13/08 19:45	4.4	5.3	3.9	5.7	***2.8***	***4.3***	2.3	3.0	18
3/13/08 20:00	5.6	6.7	4.7	7.3	***3.3***	***5.0***	2.5	3.2	22
3/13/08 20:15	6.2	7.3	5.3	8.2	***3.5***	***5.2***	2.6	3.2	24
3/13/08 20:30	4.9	5.8	4.2	6.5	***3.0***	***4.5***	2.4	3.0	20
3/13/08 20:45	4.5	5.4	3.8	6.1	***2.8***	***4.2***	2.3	2.8	19
3/13/08 21:00	3.8	4.6	3.3	4.9	***2.5***	***3.9***	2.2	2.8	16
3/13/08 21:15	4.1	4.9	3.4	5.2	***2.6***	***4.0***	2.2	2.7	17
3/13/08 21:30	3.5	4.2	3.2	5.0	***2.4***	***3.6***	2.1	2.6	15
3/13/08 21:45	3.4	4.1	3.0	4.6	***2.4***	***3.6***	2.1	2.7	15
3/13/08 22:00	3.1	3.7	2.8	4.3	***2.2***	***3.4***	2.0	2.6	14
3/13/08 22:15	4.1	5.1	3.7	5.9	***2.6***	***4.1***	2.2	2.8	18
3/13/08 22:30	6.0	7.3	5.1	8.1	***3.5***	***5.4***	2.6	3.3	24
3/13/08 22:45	6.5	8.1	5.7	9.2	***3.8***	***5.9***	2.8	3.6	27
3/13/08 23:00	6.0	7.2	5.1	8.3	***3.6***	***5.4***	2.7	3.4	24
3/13/08 23:15	5.5	6.6	4.7	7.5	***3.2***	***4.9***	2.4	3.1	22
3/13/08 23:30	5.0	6.1	4.4	7.2	***3.0***	***4.6***	2.3	2.9	21
3/13/08 23:45	5.5	6.8	5.0	8.4	***3.3***	***5.1***	2.5	3.2	24
3/14/08 0:00	7.0	8.5	6.3	10.4	***4.3***	***6.6***	3.4	4.3	30
3/14/08 0:15	6.8	8.2	6.1	10.0	***4.1***	***6.3***	3.2	4.1	29
3/14/08 0:30	6.5	7.7	5.9	8.9	***3.7***	***5.6***	2.7	3.4	26
3/14/08 0:45	5.0	6.0	4.4	6.7	***3.0***	***4.6***	2.4	2.9	20
3/14/08 1:00	4.0	4.8	3.7	5.4	***2.5***	***3.9***	2.1	2.7	17
3/14/08 1:15	4.1	5.0	3.7	5.2	***2.6***	***4.1***	2.2	2.8	17
3/14/08 1:30	4.4	5.4	4.1	6.6	***2.8***	***4.3***	2.3	2.9	19
3/14/08 1:45	4.4	5.2	4.0	5.9	***2.7***	***4.1***	2.2	2.8	18
3/14/08 2:00	3.0	3.7	3.0	4.2	***2.2***	***3.4***	2.0	2.5	14
3/14/08 2:15	4.3	5.3	3.9	5.4	***2.7***	***4.2***	2.2	2.8	18
3/14/08 2:30	4.5	5.5	4.0	5.5	***2.8***	***4.3***	2.3	2.9	18
3/14/08 2:45	5.3	6.5	4.7	7.2	***3.2***	***4.9***	2.4	3.1	22
3/14/08 3:00	5.2	6.3	4.7	6.9	***3.1***	***4.9***	2.5	3.2	21
3/14/08 3:15	5.4	6.6	4.9	7.4	***3.3***	***5.1***	2.6	3.3	22
3/14/08 3:30	5.4	6.5	4.9	7.5	***3.3***	***5.1***	2.6	3.4	22
3/14/08 3:45	5.6	6.8	5.0	7.6	***3.3***	***5.1***	2.6	3.3	23
3/14/08 4:00	5.6	6.8	5.1	7.6	***3.3***	***5.1***	2.6	3.3	23
3/14/08 4:15	6.2	7.5	5.6	8.8	***3.7***	***5.6***	2.8	3.6	25
3/14/08 4:30	5.5	6.6	5.0	7.7	***3.4***	***5.2***	2.7	3.4	23
3/14/08 4:45	6.0	7.3	5.4	8.8	***3.6***	***5.5***	2.8	3.5	25
3/14/08 5:00	5.3	6.4	4.8	7.8	***3.2***	***5.0***	2.6	3.3	22
3/14/08 5:15	5.1	6.2	4.7	7.4	***3.1***	***4.8***	2.5	3.2	22
3/14/08 5:30	6.1	7.4	5.4	8.5	***3.6***	***5.5***	2.7	3.5	25
3/14/08 5:45	6.1	7.4	5.5	8.8	***3.7***	***5.7***	2.9	3.7	26
3/14/08 6:00	6.1	7.4	5.5	9.2	***3.7***	***5.8***	2.9	3.8	26
3/14/08 6:15	6.4	7.9	5.8	9.7	***4.1***	***6.3***	3.4	4.3	28
3/14/08 6:30	6.8	8.3	6.0	9.5	***4.4***	***6.9***	3.8	4.8	30
3/14/08 6:45	7.3	8.8	6.4	10.3	***4.7***	***7.3***	4.0	5.1	31
3/14/08 7:00	6.8	8.2	5.9	8.9	***4.3***	***6.6***	3.5	4.4	28
3/14/08 7:15	5.6	6.8	5.5	8.1	***3.6***	***5.5***	3.0	3.9	24
3/14/08 7:30	6.0	7.3	5.3	7.8	***3.7***	***5.7***	2.9	3.8	25
3/14/08 7:45	5.8	7.2	5.2	7.8	***3.6***	***5.7***	3.0	3.8	24
3/14/08 8:00	6.3	7.7	5.6	8.5	***4.9***	***7.5***	4.7	6.0	30
3/14/08 8:15	6.3	7.8	5.5	8.4	***3.7***	***5.8***	2.8	3.6	26
3/14/08 8:30	6.1	7.5	5.3	8.6	***3.6***	***5.6***	2.8	3.6	25
3/14/08 8:45	6.5	8.0	5.6	9.3	***3.9***	***6.1***	3.0	3.9	27
3/14/08 9:00	6.6	8.0	5.6	9.2	***4.1***	***6.4***	3.3	4.3	28
3/14/08 9:15	6.7	8.2	5.8	9.7	***3.1***	***5.0***	1.8	2.3	25
3/14/08 9:30	7.3	9.0	6.2	10.3	***4.2***	***6.6***	3.2	4.1	30
3/14/08 9:45	7.0	8.7	6.0	8.4	***3.8***	***6.0***	2.7	3.5	27
3/14/08 10:00	7.2	8.9	6.4	8.9	***4.1***	***6.5***	3.0	4.0	28
3/14/08 10:15	6.8	8.5	6.5	9.1	***4.4***	***6.9***	3.6	4.8	29
3/14/08 10:30	6.8	8.4	6.3	9.1	***4.5***	***7.0***	3.8	5.0	29
3/14/08 10:45	6.3	7.7	5.8	8.2	***3.9***	***6.2***	3.2	4.2	26

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/14/08 11:00	6.4	8.0	5.8	8.2	***4.0***	***6.3***	3.2	4.2	27
3/14/08 11:15	6.5	8.1	5.8	8.5	***3.9***	***6.2***	3.1	4.1	27
3/14/08 11:30	6.3	7.8	5.5	8.0	***3.8***	***6.1***	3.1	4.0	26
3/14/08 11:45	6.8	8.5	6.1	8.9	***4.3***	***6.8***	3.5	4.6	29
3/14/08 18:00	6.9	8.4	5.2	7.3	***3.7***	***5.7***	2.6	3.2	25
3/14/08 18:15	8.2	9.9	6.2	8.5	***4.4***	***6.7***	3.0	3.8	29
3/14/08 18:30	7.1	8.3	5.4	7.3	***3.8***	***5.7***	2.6	3.3	25
3/14/08 18:45	6.1	7.5	4.7	6.5	***3.3***	***5.1***	2.3	2.9	22
3/14/08 19:00	6.6	7.9	5.1	7.4	***3.6***	***5.5***	2.5	3.2	24
3/14/08 19:15	6.5	7.9	5.0	7.2	***3.6***	***5.6***	2.6	3.3	24
3/14/08 19:30	6.5	7.9	4.9	6.9	***3.5***	***5.5***	2.5	3.2	24
3/14/08 19:45	6.4	7.8	4.9	6.9	***3.5***	***5.5***	2.5	3.2	23
3/14/08 20:00	6.2	7.7	4.8	7.2	***3.5***	***5.5***	2.6	3.3	24
3/17/08 14:00	4.7	5.7	3.8	5.8	***3.4***	***5.2***	3.1	4.0	21
3/17/08 14:15	4.9	5.8	3.9	5.9	***3.3***	***5.1***	2.9	3.7	20
3/17/08 14:30	5.3	6.2	4.1	6.2	***3.3***	***5.0***	2.7	3.4	21
3/17/08 14:45	5.2	6.0	4.0	6.0	***3.1***	***4.8***	2.5	3.2	20
3/17/08 15:00	4.8	5.7	3.8	5.6	***3.0***	***4.6***	2.4	3.1	19
3/17/08 15:15	4.9	5.7	3.7	5.5	***2.9***	***4.4***	2.3	2.8	18
3/17/08 15:30	4.8	5.6	3.7	5.5	***2.8***	***4.2***	2.2	2.7	18
3/17/08 15:45	4.8	5.5	3.7	5.6	***2.7***	***4.1***	2.0	2.6	18
3/17/08 16:00	5.2	6.2	4.1	6.1	***2.9***	***4.4***	2.1	2.6	19
3/17/08 16:15	4.7	5.5	3.6	5.4	***2.6***	***3.9***	1.8	2.3	17
3/17/08 16:30	3.8	4.4	3.0	4.4	***2.2***	***3.3***	1.7	2.1	14
3/17/08 16:45	3.4	4.1	2.8	4.1	***2.1***	***3.2***	1.7	2.1	14
3/17/08 17:00	4.0	4.7	3.1	4.6	***2.3***	***3.6***	1.8	2.3	15
3/17/08 17:15	4.2	5.0	3.4	5.1	***2.5***	***3.8***	1.9	2.4	16
3/17/08 17:30	5.2	6.1	4.0	6.1	***2.9***	***4.4***	2.1	2.6	19
3/17/08 17:45	5.1	6.0	4.1	6.2	***2.9***	***4.4***	2.1	2.7	19
3/17/08 18:00	5.5	6.5	4.4	6.6	***3.0***	***4.6***	2.1	2.7	20
3/17/08 18:15	5.6	6.6	4.5	6.7	***3.1***	***4.6***	2.2	2.7	21
3/17/08 18:30	4.7	5.5	3.7	5.7	***2.7***	***4.0***	2.0	2.5	18
3/17/08 18:45	4.8	5.7	3.9	5.8	***2.7***	***4.2***	2.0	2.5	18
3/17/08 19:00	4.4	5.3	3.8	5.7	***2.7***	***4.1***	2.1	2.7	18
3/17/08 19:15	5.4	6.4	4.4	6.7	***3.0***	***4.7***	2.3	2.9	21
3/17/08 19:30	5.6	6.6	4.6	7.0	***3.1***	***4.8***	2.3	2.9	21
3/17/08 19:45	5.9	6.9	4.8	7.2	***3.2***	***4.8***	2.2	2.8	22
3/17/08 20:00	5.0	5.9	4.1	6.1	***2.8***	***4.2***	2.0	2.5	19
3/17/08 20:15	3.5	4.2	3.0	4.6	***2.2***	***3.3***	1.8	2.3	14
3/17/08 20:30	4.4	5.3	3.7	5.5	***2.6***	***3.9***	1.9	2.4	17
3/17/08 20:45	5.5	6.5	4.3	6.6	***2.6***	***3.9***	1.4	1.8	19
3/18/08 10:00	4.0	4.7	4.9	7.4	***3.2***	***4.8***	3.2	4.0	21
3/18/08 10:15	7.1	8.2	5.5	8.1	***4.4***	***6.6***	3.6	4.5	27
3/18/08 10:30	7.0	8.1	5.3	8.0	***4.3***	***6.5***	3.5	4.4	27
3/18/08 10:45	6.7	7.8	5.0	7.5	***4.2***	***6.3***	3.4	4.3	26
3/18/08 11:00	6.7	7.8	5.1	7.7	***4.1***	***6.3***	3.3	4.3	26
3/18/08 11:15	6.8	7.9	5.2	7.8	***4.3***	***6.5***	3.5	4.6	27
3/18/08 11:30	6.9	7.9	5.2	7.8	***4.2***	***6.3***	3.3	4.3	26
3/18/08 11:45	6.2	7.2	4.7	7.0	***3.8***	***5.8***	3.1	4.0	24
3/18/08 12:00	6.7	7.7	5.1	7.6	***4.2***	***6.3***	3.4	4.4	26
3/18/08 12:15	6.7	7.8	5.2	7.8	***4.2***	***6.4***	3.4	4.4	26
3/18/08 12:30	6.3	7.3	4.9	7.3	***4.2***	***6.4***	3.6	4.7	26
3/18/08 12:45	6.1	7.1	4.6	6.9	***3.9***	***6.0***	3.3	4.2	24
3/18/08 13:00	5.9	6.8	4.5	6.6	***3.7***	***5.6***	3.0	3.9	23
3/18/08 13:15	6.4	7.4	5.1	7.6	***4.0***	***6.1***	3.3	4.2	25
3/18/08 13:30	6.3	7.3	5.3	7.9	***3.9***	***6.0***	3.2	4.1	25
3/18/08 13:45	6.6	7.7	5.7	8.5	***4.4***	***6.6***	3.7	4.8	28
3/18/08 14:00	6.7	7.8	5.8	8.7	***4.5***	***6.9***	4.0	5.1	28
3/18/08 14:15	6.5	7.6	5.6	8.3	***4.4***	***6.7***	3.9	5.0	28
3/18/08 14:30	6.3	7.3	5.4	8.0	***4.3***	***6.5***	3.7	4.8	27
3/18/08 14:45	6.2	7.1	5.2	7.8	***4.1***	***6.2***	3.5	4.5	26
3/18/08 15:00	6.1	7.1	5.2	7.7	***4.0***	***6.1***	3.4	4.4	25
3/18/08 15:15	6.3	7.3	5.3	7.9	***4.1***	***6.3***	3.5	4.5	26
3/18/08 15:30	6.8	7.9	5.8	8.6	***4.5***	***6.9***	3.9	5.0	28
3/18/08 15:45	6.7	7.9	5.8	8.6	***4.6***	***7.0***	4.0	5.2	29
3/18/08 16:00	7.0	8.1	5.9	8.7	***4.6***	***6.9***	3.9	5.0	29
3/18/08 16:15	7.0	8.1	5.9	8.9	***4.5***	***6.8***	3.7	4.8	29
3/18/08 16:30	7.5	8.6	6.4	9.5	***5.0***	***7.6***	4.4	5.6	31
3/18/08 16:45	6.9	8.0	5.8	8.7	***4.4***	***6.7***	3.7	4.8	28

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/18/08 17:00	7.1	8.2	6.0	9.1	***4.7***	***7.1***	4.0	5.2	30
3/18/08 17:15	7.8	9.0	6.6	9.9	***5.2***	***7.9***	4.5	5.8	33
3/18/08 17:30	7.9	9.2	6.8	10.2	***5.4***	***8.1***	4.7	6.0	34
3/18/08 17:45	8.3	9.7	7.2	10.6	***6.0***	***9.1***	5.5	7.1	37
3/18/08 18:00	8.0	9.3	3.0	4.4	***6.3***	***9.6***	6.1	7.9	31
3/18/08 18:15	8.0	9.2	7.0	10.4	***5.0***	***7.6***	4.1	5.3	33
3/18/08 18:30	7.8	9.1	6.9	10.3	***6.0***	***9.1***	5.7	7.3	36
3/18/08 18:45	8.4	9.6	7.2	10.7	***6.3***	***9.6***	6.0	7.7	38
3/18/08 19:00	8.2	9.3	7.1	10.4	***6.2***	***9.3***	5.8	7.5	37
3/18/08 19:15	7.8	9.0	6.7	10.0	***5.8***	***8.7***	5.3	6.8	35
3/18/08 19:30	8.2	9.5	7.1	10.6	***6.3***	***9.6***	6.0	7.8	37
3/18/08 19:45	7.7	8.9	6.6	9.8	***5.7***	***8.7***	5.3	6.9	34
3/18/08 20:00	8.0	9.3	6.9	10.4	***6.1***	***9.3***	5.8	7.5	36
3/18/08 20:15	7.7	8.9	6.8	10.2	***6.4***	***9.7***	6.4	8.2	37
3/18/08 20:30	7.4	8.5	6.5	9.7	***5.8***	***8.8***	5.6	7.2	34
3/18/08 20:45	7.8	9.0	6.7	10.0	***5.9***	***9.0***	5.5	7.2	35
3/18/08 21:00	7.1	8.2	6.1	9.0	***5.1***	***7.7***	4.6	5.9	31
3/18/08 21:15	6.9	7.9	5.9	8.7	***4.8***	***7.3***	4.3	5.5	29
3/18/08 21:30	7.2	8.1	6.0	8.9	***4.6***	***6.8***	3.8	4.8	29
3/18/08 21:45	6.2	7.1	5.1	7.5	***3.6***	***5.4***	2.7	3.4	23
3/18/08 22:00	6.1	6.9	4.9	7.2	***3.4***	***5.1***	2.5	3.2	22
3/18/08 22:15	5.8	6.5	4.6	6.7	***3.3***	***4.9***	2.4	3.1	21
3/18/08 22:30	5.6	6.4	4.5	6.6	***3.3***	***4.9***	2.5	3.1	21
3/18/08 22:45	5.6	6.4	4.5	6.6	***3.3***	***5.0***	2.6	3.3	21
3/18/08 23:00	5.3	6.1	4.3	6.4	***3.1***	***4.6***	2.3	2.9	20
3/18/08 23:15	5.0	5.7	4.1	6.0	***2.9***	***4.3***	2.2	2.8	19
3/18/08 23:30	5.0	5.8	4.3	6.4	***3.1***	***4.7***	2.5	3.2	20
3/18/08 23:45	4.9	5.7	4.4	6.5	***3.4***	***5.2***	3.0	3.9	21
3/19/08 0:00	5.7	6.5	4.6	6.9	***3.6***	***5.5***	3.0	3.9	23
3/19/08 0:15	5.2	6.0	4.1	6.1	***3.2***	***4.8***	2.5	3.2	20
3/19/08 0:30	4.3	4.9	3.4	5.1	***2.4***	***3.6***	1.7	2.2	16
3/19/08 0:45	3.4	4.0	2.5	3.7	***1.8***	***2.7***	1.2	1.5	12
3/19/08 1:00	3.2	3.7	2.4	3.6	***1.7***	***2.6***	1.1	1.5	11
3/19/08 1:15	3.7	4.2	2.8	4.1	***1.9***	***2.9***	1.3	1.6	13
3/19/08 1:30	2.8	3.3	2.1	3.1	***1.5***	***2.3***	1.0	1.3	10
3/19/08 1:45	3.0	3.5	2.4	3.6	***1.6***	***2.5***	1.1	1.5	11
3/19/08 2:00	3.5	4.1	2.1	3.2	***1.8***	***2.7***	1.1	1.4	11
3/19/08 2:15	3.3	3.8	1.7	2.6	***1.6***	***2.5***	1.0	1.3	10
3/19/08 2:30	3.1	3.6	1.7	2.6	***1.5***	***2.3***	0.9	1.2	10
3/19/08 2:45	2.6	3.1	1.4	2.2	***1.4***	***2.1***	0.9	1.2	9
3/19/08 3:00	3.3	3.9	1.8	2.7	***1.6***	***2.5***	1.0	1.3	10
3/19/08 3:15	2.8	3.4	1.5	2.4	***1.4***	***2.2***	0.9	1.1	9
3/19/08 3:30	3.8	4.5	2.0	3.0	***1.9***	***2.9***	1.2	1.6	12
3/19/08 3:45	2.9	3.4	1.5	2.3	***1.5***	***2.2***	0.9	1.2	9
3/19/08 4:00	3.4	3.9	1.7	2.6	***1.7***	***2.6***	1.0	1.4	10
3/19/08 4:15	3.6	4.2	1.7	2.6	***1.9***	***2.8***	1.2	1.5	11
3/19/08 4:30	2.8	3.2	1.2	1.9	***1.4***	***2.2***	0.9	1.2	8
3/19/08 4:45	2.5	2.9	1.0	1.5	***1.2***	***1.9***	0.8	1.0	7
3/19/08 5:00	2.8	3.2	1.1	1.6	***1.4***	***2.2***	0.9	1.2	8
3/19/08 5:15	3.6	4.2	1.1	1.8	***1.8***	***2.8***	1.2	1.5	10
3/19/08 5:30	3.5	4.0	1.1	1.6	***1.8***	***2.7***	1.2	1.5	10
3/19/08 5:45	3.4	4.0	1.1	1.8	***1.7***	***2.5***	1.0	1.3	10
3/19/08 6:00	3.4	3.9	1.0	1.5	***1.6***	***2.5***	1.0	1.2	9
3/19/08 6:15	3.3	3.7	0.9	1.4	***1.5***	***2.3***	0.8	1.1	8
3/19/08 6:30	2.7	3.1	0.7	1.0	***1.3***	***1.9***	0.7	0.9	7
3/19/08 6:45	3.4	3.9	1.6	2.6	***1.5***	***2.3***	0.8	1.0	10
3/19/08 7:00	4.1	4.8	2.8	4.4	***2.0***	***3.0***	1.2	1.5	14
3/19/08 7:15	5.7	6.7	3.0	4.8	***2.7***	***4.2***	1.6	2.1	18
3/19/08 7:30	5.4	6.3	4.1	6.3	***2.8***	***4.3***	1.9	2.4	19
3/19/08 7:45	4.5	5.3	3.3	5.1	***2.5***	***3.9***	1.8	2.4	17
3/19/08 8:00	4.8	5.6	3.6	5.6	***4.0***	***6.2***	4.0	5.3	23
3/19/08 8:15	5.1	6.0	3.7	5.8	***2.9***	***4.4***	2.1	2.7	19
3/19/08 8:30	5.3	6.2	3.9	6.0	***2.9***	***4.5***	2.1	2.7	19
3/19/08 8:45	5.6	6.5	4.2	6.5	***3.1***	***4.8***	2.3	3.0	21
3/19/08 9:00	5.1	6.0	3.9	6.1	***2.9***	***4.5***	2.2	2.9	20
3/19/08 9:15	5.2	6.1	3.8	6.1	***2.6***	***4.0***	1.6	2.1	18
3/19/08 9:30	4.4	5.1	3.3	5.2	***2.6***	***4.0***	2.0	2.6	17
3/19/08 9:45	4.7	5.5	3.5	5.6	***2.7***	***4.2***	2.1	2.7	18
3/19/08 10:00	5.0	5.9	3.7	6.1	***2.9***	***4.5***	2.2	2.9	19
3/19/08 10:15	5.7	6.8	4.2	6.7	***3.3***	***5.1***	2.5	3.3	22
3/19/08 10:30	5.7	6.9	4.4	7.1	***3.4***	***5.2***	2.6	3.4	23
3/19/08 10:45	5.5	6.5	4.5	7.4	***3.3***	***5.1***	2.6	3.4	22

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/19/08 11:00	5.1	6.0	4.1	6.2	***3.1***	***4.9***	2.5	3.3	20
3/19/08 11:15	5.0	5.9	4.1	6.2	***3.1***	***4.7***	2.5	3.2	20
3/19/08 11:30	4.9	5.7	3.8	6.1	***2.9***	***4.5***	2.3	3.0	19
3/19/08 11:45	4.7	5.7	3.8	6.1	***2.9***	***4.5***	2.3	3.0	19
3/19/08 12:00	5.3	6.2	4.2	6.7	***3.1***	***4.8***	2.4	3.2	21
3/19/08 12:15	5.3	6.2	4.3	6.2	***3.1***	***4.8***	2.4	3.1	20
3/19/08 12:30	5.2	6.2	4.2	6.9	***3.1***	***4.7***	2.4	3.1	21
3/19/08 12:45	4.9	5.8	3.9	6.2	***2.9***	***4.5***	2.3	3.0	19
3/19/08 13:00	5.0	6.0	4.1	6.5	***3.0***	***4.7***	2.4	3.1	20
3/19/08 13:15	5.3	6.3	4.3	6.6	***3.2***	***4.9***	2.5	3.3	21
3/19/08 13:30	5.4	6.4	4.4	6.9	***3.3***	***5.2***	2.7	3.5	22
3/19/08 13:45	5.9	7.0	4.8	7.4	***3.6***	***5.6***	2.9	3.8	24
3/19/08 14:00	5.5	6.5	4.5	7.0	***3.3***	***5.1***	2.6	3.4	22
3/19/08 14:15	5.4	6.5	4.5	7.2	***3.3***	***5.1***	2.6	3.4	22
3/19/08 14:30	5.8	6.9	4.7	7.2	***3.5***	***5.4***	2.7	3.6	23
3/19/08 14:45	6.2	7.3	4.9	7.9	***3.7***	***5.7***	2.9	3.8	25
3/19/08 15:00	5.9	6.9	4.7	7.6	***3.5***	***5.4***	2.8	3.6	23
3/19/08 15:15	5.8	6.8	4.5	7.4	***3.4***	***5.2***	2.6	3.4	23
3/19/08 15:30	5.1	6.1	4.0	6.6	***3.0***	***4.7***	2.3	3.0	20
3/19/08 15:45	5.5	6.6	4.3	6.7	***3.2***	***5.0***	2.4	3.1	21
3/19/08 16:00	5.4	6.5	4.2	6.7	***3.3***	***5.0***	2.5	3.3	22
3/19/08 16:15	5.8	7.3	4.5	6.7	***3.4***	***5.4***	2.6	3.3	23
3/19/08 16:30	5.5	6.9	4.4	6.8	***3.4***	***5.3***	2.7	3.5	22
3/19/08 16:45	6.1	7.6	4.7	7.1	***3.5***	***5.5***	2.7	3.4	24
3/19/08 17:00	5.8	7.2	4.5	6.7	***3.5***	***5.4***	2.7	3.4	23
3/19/08 17:15	6.4	7.9	5.0	7.3	***3.8***	***5.9***	3.0	3.8	25
3/19/08 17:30	5.8	7.2	4.5	6.7	***3.5***	***5.4***	2.7	3.4	23
3/19/08 17:45	5.2	6.5	4.2	6.2	***3.1***	***4.8***	2.4	3.1	21
3/19/08 18:00	5.5	6.8	4.2	6.3	***3.2***	***5.0***	2.4	3.1	21
3/19/08 18:15	5.8	7.2	4.5	6.6	***3.5***	***5.4***	2.7	3.5	23
3/19/08 18:30	5.7	7.1	4.6	6.7	***3.6***	***5.6***	2.9	3.8	23
3/19/08 18:45	6.7	8.4	5.6	8.8	***4.4***	***7.0***	3.7	4.9	29
3/19/08 19:00	7.5	9.3	6.1	9.9	***5.1***	***8.0***	4.5	5.8	33
3/19/08 19:15	7.1	8.8	5.8	9.0	***4.7***	***7.4***	4.0	5.2	30
3/19/08 19:30	6.3	7.8	5.1	7.7	***4.2***	***6.6***	3.6	4.7	27
3/19/08 19:45	6.0	7.5	4.9	7.4	***4.0***	***6.4***	3.5	4.5	26
3/19/08 20:00	6.1	7.6	4.9	7.4	***3.9***	***6.1***	3.2	4.2	25
3/19/08 20:15	6.0	7.5	4.8	7.5	***3.7***	***5.9***	3.0	3.9	25
3/19/08 20:30	6.1	7.6	4.9	7.7	***3.8***	***5.9***	3.0	3.9	25
3/19/08 20:45	5.9	7.5	4.9	7.4	***3.9***	***6.2***	3.3	4.3	25
3/19/08 21:00	5.9	7.4	4.8	7.2	***3.9***	***6.2***	3.3	4.4	25
3/19/08 21:15	5.8	7.2	4.7	7.0	***3.8***	***6.0***	3.2	4.2	24
3/19/08 21:30	5.2	6.5	4.2	6.4	***3.3***	***5.3***	2.8	3.6	22
3/19/08 21:45	4.8	6.0	3.8	6.2	***3.0***	***4.8***	2.5	3.3	20
3/19/08 22:00	4.8	6.1	3.8	6.4	***3.0***	***4.8***	2.5	3.3	21
3/19/08 22:15	4.9	6.1	3.8	6.6	***3.1***	***4.9***	2.5	3.3	21
3/19/08 22:30	4.4	5.7	3.6	6.0	***3.0***	***4.8***	2.6	3.4	20
3/19/08 22:45	5.3	6.7	4.2	6.5	***3.4***	***5.5***	2.9	3.8	22
3/19/08 23:00	5.0	6.3	3.9	6.3	***3.1***	***5.0***	2.6	3.4	21
3/19/08 23:15	5.1	6.5	4.1	6.6	***3.3***	***5.3***	2.7	3.6	22
3/19/08 23:30	5.0	6.3	3.9	6.3	***3.2***	***5.1***	2.6	3.4	21
3/19/08 23:45	4.5	5.6	3.6	5.7	***2.3***	***3.6***	1.4	1.9	17
3/20/08 0:00	4.8	6.1	3.9	6.3	***3.0***	***4.8***	2.5	3.3	20
3/20/08 0:15	4.9	6.2	4.0	6.6	***3.0***	***4.8***	2.4	3.2	21
3/20/08 0:30	4.4	5.5	3.5	6.0	***2.8***	***4.4***	2.3	3.0	19
3/20/08 0:45	4.2	5.2	3.3	5.6	***2.6***	***4.2***	2.2	2.8	18
3/20/08 1:00	3.9	4.9	3.0	5.0	***2.5***	***4.0***	2.1	2.8	17
3/20/08 1:15	3.9	4.8	2.9	5.0	***2.5***	***4.0***	2.1	2.8	17
3/20/08 1:30	4.9	6.1	3.7	6.5	***2.9***	***4.7***	2.3	3.1	20
3/20/08 1:45	4.1	5.2	3.1	5.3	***2.6***	***4.1***	2.1	2.7	17
3/20/08 2:00	3.9	4.8	3.0	5.0	***2.1***	***3.4***	1.5	2.0	15
3/20/08 2:15	4.2	5.2	3.6	5.3	***2.4***	***3.8***	1.8	2.3	17
3/20/08 2:30	4.3	5.6	3.1	4.5	***2.2***	***3.6***	1.4	1.8	16
3/20/08 2:45	3.6	4.8	2.5	3.9	***1.9***	***3.2***	1.3	1.7	14
3/20/08 3:00	4.1	5.4	2.9	4.6	***2.4***	***3.8***	1.8	2.3	16
3/20/08 3:15	4.5	5.8	3.2	4.7	***2.7***	***4.3***	2.1	2.7	18
3/20/08 3:30	4.7	5.9	3.5	5.1	***2.8***	***4.4***	2.2	2.8	18
3/20/08 3:45	5.1	6.5	3.8	5.6	***3.0***	***4.8***	2.3	3.0	20
3/20/08 4:00	5.2	7.0	4.0	6.0	***3.2***	***5.3***	2.5	3.4	22
3/20/08 4:15	5.6	7.5	4.3	6.9	***3.4***	***5.7***	2.7	3.7	24
3/20/08 4:30	6.1	7.7	5.1	7.8	***4.0***	***6.4***	3.4	4.5	26
3/20/08 4:45	6.3	7.9	5.2	8.1	***4.4***	***7.1***	4.0	5.3	28

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/20/08 5:00	5.7	7.6	4.8	7.7	***3.9***	***6.5***	3.4	4.6	26
3/20/08 5:15	5.9	8.3	4.9	8.3	***3.9***	***6.7***	3.4	4.5	28
3/20/08 5:30	6.4	8.4	5.2	8.8	***4.1***	***6.6***	3.4	4.5	28
3/20/08 5:45	5.4	6.8	4.3	7.1	***3.2***	***5.2***	2.5	3.4	23
3/20/08 6:00	5.4	7.1	4.2	7.2	***3.3***	***5.4***	2.6	3.5	23
3/20/08 6:15	5.9	7.6	4.6	7.8	***3.5***	***5.8***	2.8	3.7	25
3/20/08 6:30	5.3	7.0	4.3	7.1	***3.2***	***5.3***	2.5	3.4	23
3/20/08 6:45	5.0	6.4	3.9	6.4	***2.9***	***4.8***	2.3	3.0	21
3/20/08 7:00	4.9	6.2	3.8	6.1	***2.9***	***4.7***	2.2	2.9	20
3/20/08 7:15	4.6	6.0	3.6	5.8	***2.8***	***4.5***	2.2	2.9	19
3/20/08 7:30	5.3	7.0	5.0	7.9	***3.2***	***5.3***	2.5	3.4	24
3/20/08 7:45	5.6	7.3	4.4	7.0	***3.4***	***5.6***	2.6	3.6	23
3/20/08 8:00	5.4	7.2	4.4	7.0	***4.3***	***7.1***	4.2	5.7	27
3/20/08 8:15	6.0	8.1	4.8	7.8	***3.7***	***6.2***	3.0	4.1	26
3/20/08 8:30	5.9	7.9	5.1	8.5	***3.6***	***6.0***	2.8	3.8	26
3/20/08 8:45	6.6	8.8	5.6	9.1	***3.8***	***6.4***	2.9	3.9	28
3/20/08 9:00	6.8	8.8	5.6	8.9	***4.0***	***6.7***	3.1	4.3	29
3/20/08 9:15	7.4	9.2	5.8	8.9	***4.4***	***7.2***	3.5	4.8	30
3/20/08 9:30	7.1	8.7	5.6	8.3	***4.2***	***6.8***	3.3	4.5	28
3/20/08 9:45	7.3	8.8	5.7	8.5	***4.4***	***6.9***	3.5	4.7	29
3/20/08 10:00	7.7	9.3	6.1	9.1	***4.8***	***7.5***	3.8	5.2	31
3/20/08 10:15	8.3	9.9	6.6	9.7	***5.0***	***7.8***	3.9	5.3	33
3/20/08 10:30	7.0	8.4	5.5	8.3	***4.2***	***6.5***	3.2	4.3	28
3/20/08 10:45	6.4	7.6	5.0	7.4	***3.7***	***5.8***	2.8	3.8	25
3/20/08 11:00	7.2	8.6	5.8	8.4	***4.2***	***6.5***	3.1	4.1	28
3/20/08 11:15	8.1	9.6	6.4	9.6	***4.9***	***7.6***	3.8	5.1	32
3/20/08 11:30	8.9	10.8	7.3	10.8	***6.0***	***9.5***	5.2	7.0	38
3/20/08 11:45	8.3	10.1	6.9	10.4	***5.5***	***8.8***	4.8	6.4	36
3/20/08 12:00	8.4	10.3	6.9	10.3	***5.5***	***8.7***	4.6	6.2	35
3/20/08 12:15	8.8	11.4	7.4	11.8	***5.8***	***9.4***	4.9	6.5	39
3/20/08 12:30	8.6	11.7	7.2	12.3	***5.6***	***9.4***	4.8	6.3	40
3/20/08 12:45	8.7	11.1	***7.6***	***12.0***	***5.7***	***9.1***	4.8	6.4	39
3/20/08 13:00	8.5	10.8	***7.1***	***11.1***	4.8	7.6	4.3	5.7	35
3/20/08 13:15	8.7	11.4	***7.4***	***11.8***	5.1	8.0	4.5	6.0	37
3/20/08 13:30	8.3	11.2	***7.4***	***12.0***	5.1	8.1	4.7	6.3	38
3/20/08 13:45	8.7	11.5	***7.3***	***11.7***	6.0	9.4	4.4	5.9	39
3/20/08 14:00	2.8	3.7	***5.8***	***9.1***	1.9	2.9	5.5	7.3	23
3/20/08 14:15	8.1	10.4	***7.8***	***12.3***	5.2	8.0	5.4	7.1	38
3/20/08 14:30	8.6	10.3	***7.9***	***12.1***	5.4	8.3	5.2	6.8	38
3/20/08 14:45	8.0	9.1	***6.9***	***10.1***	4.7	7.1	4.3	5.6	32
3/20/08 15:00	7.8	9.3	***6.6***	***9.8***	4.5	6.7	4.0	5.2	31
3/20/08 15:15	8.2	9.4	***7.3***	***10.8***	4.9	7.5	4.6	6.1	34
3/20/08 15:30	9.4	10.7	***8.8***	***13.1***	6.0	9.0	5.9	7.7	41
3/20/08 15:45	8.4	10.0	***7.8***	***11.9***	5.3	8.2	5.2	6.9	37
3/20/08 16:00	8.4	9.6	***8.1***	***12.2***	5.5	8.3	5.5	7.3	37
3/20/08 16:15	8.4	9.5	***7.7***	***11.3***	5.2	7.8	5.0	6.5	35
3/20/08 16:30	8.6	9.6	***8.0***	***11.7***	5.4	8.2	5.2	6.9	36
3/20/08 16:45	8.2	9.0	***7.9***	***11.6***	5.4	8.1	5.4	7.0	36
3/20/08 17:00	7.3	8.1	***7.0***	***10.2***	4.7	7.1	4.7	6.1	31
3/20/08 17:15	7.2	7.7	***6.6***	***9.5***	4.5	6.5	4.4	5.6	29
3/20/08 17:30	6.8	7.4	***6.0***	***8.6***	1.4	2.0	3.8	4.8	23
3/20/08 17:45	6.6	7.1	***6.2***	***9.0***	4.2	6.3	4.2	5.4	28
3/20/08 18:00	6.4	7.1	***5.9***	***8.6***	4.0	6.1	3.8	5.0	27
3/20/08 18:15	6.4	7.2	***5.8***	***8.6***	3.9	6.0	3.8	5.0	27
3/20/08 18:30	6.7	7.8	***6.3***	***9.5***	2.6	3.9	4.2	5.5	27
3/20/08 18:45	6.2	8.0	***6.0***	***9.4***	3.9	6.1	4.1	5.4	29
3/20/08 19:00	6.9	8.9	***6.3***	***9.9***	4.2	6.5	4.1	5.4	31
3/20/08 19:15	6.5	8.1	***5.6***	***8.7***	3.8	5.9	3.5	4.6	27
3/20/08 19:30	5.9	7.3	***4.8***	***7.5***	1.9	2.9	2.9	3.8	21
3/20/08 19:45	6.0	7.6	***4.8***	***7.6***	3.7	5.8	2.8	3.8	25
3/20/08 20:00	6.0	7.5	***4.9***	***7.6***	3.9	6.0	2.9	3.8	25
3/20/08 20:15	5.9	6.9	***5.0***	***7.5***	3.9	6.1	3.0	4.0	25
3/20/08 20:30	5.9	6.9	***4.9***	***7.4***	3.9	6.0	2.9	3.9	24
3/20/08 20:45	6.0	7.4	***5.1***	***8.0***	4.1	6.4	3.2	4.2	26
3/20/08 21:00	6.7	8.7	***5.7***	***8.9***	4.5	7.0	3.5	4.6	29
3/20/08 21:15	6.1	7.3	***5.2***	***7.9***	4.4	6.9	3.2	4.2	26
3/20/08 21:30	7.0	8.7	***5.8***	***9.0***	4.6	7.1	3.5	4.6	30
3/20/08 21:45	7.2	9.3	***5.9***	***9.4***	4.9	7.8	3.5	4.7	31
3/20/08 22:00	6.8	9.0	***5.8***	***9.3***	4.6	7.3	3.5	4.7	30
3/20/08 22:15	6.6	8.7	***5.7***	***9.1***	4.5	7.1	3.6	4.8	30
3/20/08 22:30	6.6	8.3	***5.8***	***9.0***	4.5	7.1	3.7	4.9	29
3/20/08 22:45	5.4	6.8	***4.2***	***6.6***	3.4	5.3	2.4	3.2	22

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/20/08 23:00	5.4	6.7	***4.0***	***6.1***	3.1	4.9	2.1	2.8	20
3/20/08 23:15	4.5	6.0	***3.4***	***5.5***	2.7	4.1	1.8	2.4	18
3/20/08 23:30	4.2	5.0	***3.2***	***4.8***	2.4	3.8	1.7	2.3	16
3/20/08 23:45	4.8	6.0	***3.6***	***5.6***	2.8	4.4	2.0	2.6	19
3/21/08 0:00	5.9	7.4	***4.4***	***6.8***	3.5	5.5	2.3	3.1	23
3/21/08 0:15	5.1	6.7	***3.9***	***6.3***	3.1	4.9	2.2	2.9	21
3/21/08 0:30	5.7	7.1	***4.4***	***6.9***	3.6	5.7	2.5	3.3	23
3/21/08 0:45	5.8	6.9	***4.4***	***6.7***	3.6	5.7	2.4	3.2	23
3/21/08 1:00	6.3	7.3	***4.8***	***7.2***	3.9	6.2	2.6	3.5	24
3/21/08 1:15	5.8	6.8	***4.5***	***6.8***	3.7	5.9	2.5	3.4	23
3/21/08 1:30	6.2	7.7	***4.9***	***7.7***	4.0	6.3	2.8	3.8	25
3/21/08 1:45	6.4	7.9	***5.1***	***7.9***	4.1	6.5	2.9	3.9	26
3/21/08 2:00	6.1	7.9	***4.8***	***7.7***	3.9	6.3	2.7	3.7	25
3/21/08 2:15	6.2	8.0	***4.8***	***7.6***	3.9	6.3	2.7	3.6	26
3/21/08 2:30	5.7	6.6	***4.4***	***6.6***	3.6	5.8	2.4	3.3	22
3/21/08 2:45	6.3	7.2	***4.8***	***7.2***	3.9	6.2	2.6	3.5	24
3/21/08 3:00	6.1	6.8	***4.9***	***7.3***	3.9	6.3	2.8	3.9	24
3/21/08 3:15	6.5	7.3	***5.2***	***7.8***	4.2	6.7	3.0	4.1	26
3/21/08 3:30	6.3	7.2	***4.9***	***7.4***	3.9	6.4	2.8	3.8	25
3/21/08 3:45	6.3	8.2	***4.7***	***7.6***	3.8	6.0	2.6	3.5	25
3/21/08 4:00	6.1	8.0	***4.7***	***7.6***	3.8	6.1	2.6	3.5	25
3/21/08 4:15	6.0	7.5	***4.6***	***7.2***	3.7	6.0	2.6	3.5	24
3/21/08 4:30	5.6	6.6	***4.3***	***6.4***	3.5	5.5	2.3	3.1	22
3/21/08 4:45	5.3	6.1	***3.9***	***5.8***	3.1	4.9	2.1	2.8	20
3/21/08 5:00	5.4	6.2	***4.1***	***6.1***	3.3	5.3	2.2	3.0	21
3/21/08 5:15	6.3	7.2	***5.2***	***7.8***	4.4	7.0	3.1	4.2	26
3/21/08 5:30	7.2	8.3	***6.1***	***9.2***	5.0	8.0	3.8	5.1	31
3/21/08 5:45	7.2	8.3	***6.2***	***9.4***	5.0	8.0	3.9	5.2	31
3/21/08 6:00	6.6	7.7	***5.5***	***8.4***	4.5	7.3	3.3	4.5	28
3/21/08 6:15	6.5	7.7	***5.5***	***8.4***	4.5	7.2	3.4	4.6	28
3/21/08 6:30	6.4	8.0	***5.1***	***8.0***	4.2	6.8	3.0	4.0	27
3/21/08 6:45	6.1	7.7	***4.6***	***7.3***	3.8	6.1	2.6	3.4	25
3/21/08 7:00	5.8	7.5	***4.4***	***7.0***	3.6	5.8	2.4	3.2	24
3/21/08 7:15	6.2	7.8	***4.9***	***7.7***	4.1	6.6	2.8	3.8	26
3/21/08 7:30	6.3	7.5	***4.9***	***7.5***	4.0	6.4	2.7	3.7	25
3/21/08 7:45	5.8	6.5	***4.2***	***6.2***	3.4	5.4	2.2	3.0	21
3/21/08 8:00	4.9	5.6	***3.7***	***5.5***	3.0	4.7	2.0	2.6	18
3/21/08 8:15	5.9	6.7	***4.6***	***6.8***	3.8	6.1	2.6	3.4	23
3/21/08 8:30	6.5	7.7	***5.1***	***7.8***	4.2	6.7	2.9	3.9	26
3/21/08 8:45	6.2	7.7	***4.9***	***7.6***	5.9	9.3	2.8	3.7	28
3/21/08 9:00	6.1	7.5	***5.9***	***9.1***	3.7	5.8	4.0	5.4	28
3/21/08 9:15	6.0	7.1	***4.3***	***6.5***	3.5	5.5	2.2	2.9	22
3/21/08 9:30	5.3	6.5	***3.9***	***6.0***	3.2	5.0	2.1	2.7	20
3/21/08 9:45	5.6	6.7	***4.0***	***6.1***	3.2	5.1	2.0	2.7	20
3/21/08 10:00	4.7	5.6	***2.9***	***4.4***	2.7	4.3	1.1	1.5	16
3/21/08 10:15	5.4	6.2	***3.7***	***5.4***	2.8	4.3	1.7	2.3	18
3/21/08 10:30	4.9	5.6	***3.4***	***5.1***	2.6	4.0	1.7	2.2	17
3/21/08 10:45	4.4	5.2	***3.2***	***4.9***	2.4	3.6	1.7	2.2	16
3/21/08 11:00	4.3	5.1	***3.2***	***4.8***	2.3	3.6	1.7	2.3	16
3/21/08 11:15	4.4	5.0	***3.3***	***4.9***	2.3	3.6	1.8	2.4	16
3/21/08 11:30	4.9	5.5	***3.6***	***5.2***	2.5	3.8	1.9	2.5	17
3/21/08 11:45	5.8	6.6	***4.1***	***6.1***	3.0	4.5	2.1	2.8	20
3/21/08 12:00	5.5	6.6	***3.9***	***5.9***	2.8	4.3	2.0	2.6	19
3/21/08 12:15	5.0	5.6	***3.6***	***5.3***	2.6	4.0	1.9	2.5	17
3/21/08 12:30	4.8	5.3	***3.6***	***5.2***	2.5	3.8	1.9	2.5	17
3/21/08 12:45	4.6	5.4	***3.4***	***5.1***	2.4	3.6	1.8	2.4	16
3/21/08 13:00	5.0	5.5	***3.6***	***5.1***	2.5	3.8	1.8	2.4	17
3/21/08 13:15	4.7	5.3	***3.4***	***5.1***	2.4	3.7	1.8	2.4	17
3/21/08 13:30	5.5	6.9	***4.0***	***6.2***	2.9	4.4	2.1	2.8	20
3/21/08 13:45	6.0	7.6	***4.4***	***6.9***	3.2	4.9	2.3	3.1	22
3/21/08 14:00	5.5	6.8	***4.2***	***6.4***	3.1	4.7	2.3	3.0	21
3/21/08 14:15	5.3	6.0	***4.1***	***6.0***	3.0	4.6	2.3	3.0	19
3/21/08 14:30	5.5	6.2	***4.1***	***5.9***	3.0	4.4	2.2	2.8	19
3/21/08 14:45	5.2	5.8	***3.8***	***5.6***	2.8	4.1	2.1	2.7	18
3/21/08 15:00	4.7	5.4	***3.5***	***5.2***	2.5	3.8	1.9	2.4	17
3/21/08 15:15	5.1	5.8	***3.8***	***5.6***	2.8	4.2	2.1	2.7	18
3/21/08 15:30	5.0	5.6	***4.0***	***5.7***	2.9	4.3	2.3	2.9	19
3/21/08 15:45	5.0	6.1	***3.8***	***5.8***	2.7	4.1	2.1	2.7	19
3/21/08 16:00	5.7	6.7	***4.2***	***6.2***	2.9	4.4	2.2	2.8	20
3/21/08 16:15	5.2	6.1	***3.9***	***5.8***	2.8	4.2	2.1	2.7	19
3/21/08 16:30	4.4	4.8	***3.3***	***4.8***	2.3	3.4	1.8	2.3	15
3/21/08 16:45	3.7	4.2	***2.9***	***4.3***	2.0	3.1	1.7	2.2	14

Furnace Line Waste Gas SO_2 Testing

TIME STAMP	STACK A Results		STACK B Results *replacement values in italics*		STACK C Results *replacement values in italics*		STACK D Results		TOTAL
	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2 Average	SO2	SO2
15 min interval	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	ppm Dry	Emission	Emission
	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Avg	Rate (lb/hr)	Rate (lb/hr)
3/21/08 17:00	4.0	4.8	***3.1***	***4.7***	2.2	3.3	1.8	2.3	15
3/21/08 17:15	4.5	5.6	***3.4***	***5.2***	2.5	3.7	1.9	2.4	17
3/21/08 17:30	5.1	6.2	***3.7***	***5.7***	2.8	4.2	2.0	2.6	19
3/21/08 17:45	5.2	6.3	***3.9***	***6.0***	2.9	4.5	2.1	2.8	20
3/21/08 18:00	4.9	6.3	***3.7***	***5.8***	2.8	4.3	2.0	2.7	19
3/21/08 18:15	5.2	6.5	***3.9***	***6.0***	3.0	4.7	2.1	2.8	20
3/21/08 18:30	5.7	7.1	***4.7***	***7.2***	3.7	5.8	2.8	3.6	24
3/21/08 18:45	6.0	7.6	***4.9***	***7.6***	3.7	5.8	2.9	3.8	25
3/21/08 19:00	6.3	8.0	***5.0***	***8.0***	3.9	6.0	3.0	3.9	26
3/21/08 19:15	6.3	8.2	***5.1***	***8.1***	3.9	6.0	3.0	3.9	26
3/21/08 19:30	6.2	7.7	***4.9***	***7.6***	3.7	5.8	2.8	3.7	25
3/21/08 19:45	6.0	7.3	***4.6***	***7.1***	3.5	5.4	2.5	3.3	23
3/21/08 20:00	5.5	6.8	***4.2***	***6.6***	3.2	5.0	2.4	3.1	22
3/21/08 20:15	6.4	8.1	***5.3***	***8.3***	4.1	6.4	3.2	4.2	27
3/21/08 20:30	6.9	8.7	***5.7***	***9.0***	4.4	6.9	3.5	4.6	29
3/21/08 20:45	6.7	8.2	***5.6***	***8.6***	4.1	6.5	3.4	4.5	28
3/21/08 21:00	6.8	8.5	***5.8***	***9.0***	4.2	6.6	3.5	4.7	29
3/21/08 21:15	6.3	8.0	***5.2***	***8.2***	3.8	6.0	3.2	4.2	26
3/21/08 21:30	6.1	7.7	***5.1***	***7.9***	3.7	5.8	3.1	4.0	25
3/21/08 21:45	6.3	7.9	***5.3***	***8.2***	3.8	6.1	3.2	4.2	26
3/21/08 22:00	6.1	7.8	***5.2***	***8.1***	3.7	5.9	3.2	4.2	26
3/21/08 22:15	6.2	7.9	***5.3***	***8.4***	3.8	6.0	3.3	4.4	27
3/21/08 22:30	6.1	7.5	***5.0***	***7.8***	3.5	5.6	3.0	4.0	25
3/21/08 22:45	6.0	7.8	***4.9***	***7.7***	3.5	5.5	2.9	3.8	25
3/21/08 23:00	6.3	7.6	***5.1***	***7.9***	3.7	5.9	3.1	4.1	25
3/21/08 23:15	6.2	7.6	***4.8***	***7.3***	3.4	5.4	2.6	3.5	24
3/21/08 23:30	5.8	7.1	***4.4***	***6.8***	3.2	5.1	2.4	3.2	22
3/21/08 23:45	5.8	7.0	***4.4***	***6.8***	3.2	5.0	2.4	3.2	22
3/22/08 0:00	5.9	6.7	***4.7***	***7.0***	3.4	5.4	2.7	3.6	23
3/22/08 0:15	6.4	7.5	***5.2***	***8.0***	3.8	6.1	3.1	4.2	26
3/22/08 0:30	6.6	7.9	***5.5***	***8.3***	4.0	6.4	3.3	4.4	27
3/22/08 0:45	6.0	6.7	***5.1***	***7.6***	3.7	6.0	3.1	4.2	25
3/22/08 1:00	6.1	6.8	***5.2***	***7.8***	3.8	6.1	3.3	4.4	25
3/22/08 1:15	6.1	7.0	***5.5***	***8.3***	4.0	6.4	3.6	4.8	27
3/22/08 1:30	6.1	6.9	***4.9***	***7.3***	3.9	6.4	2.8	3.8	24
3/22/08 1:45	6.1	7.0	***5.3***	***8.0***	3.7	5.9	3.4	4.5	25
3/22/08 2:00	6.3	7.2	***5.5***	***8.3***	3.8	6.1	3.4	4.6	26
3/22/08 2:15	6.0	7.0	***5.3***	***8.2***	3.7	6.0	3.4	4.6	26
3/22/08 2:30	6.4	7.4	***5.8***	***8.8***	4.0	6.4	3.7	5.0	28
3/22/08 2:45	6.4	7.4	***5.8***	***8.9***	4.0	6.4	3.9	5.2	28
3/22/08 3:00	6.3	7.6	***5.4***	***8.3***	3.8	6.0	3.4	4.4	26
3/22/08 3:15	5.6	6.5	***4.4***	***6.6***	3.1	5.0	2.5	3.4	21
3/22/08 3:30	4.9	5.7	***4.0***	***5.9***	2.8	4.4	2.3	3.1	19
3/22/08 3:45	5.0	5.9	***4.1***	***6.2***	2.9	4.6	2.4	3.2	20
3/22/08 4:00	4.9	5.6	***4.1***	***6.1***	2.9	4.7	2.5	3.3	20
3/22/08 4:15	6.0	6.8	***4.8***	***7.2***	3.4	5.4	2.8	3.8	23
3/22/08 4:30	5.2	6.1	***4.3***	***6.5***	3.0	4.9	2.5	3.4	21
3/22/08 4:45	4.9	6.1	***3.9***	***6.0***	2.7	4.3	2.2	3.0	19
3/22/08 5:00	4.6	5.9	***3.7***	***6.0***	2.6	4.3	2.2	3.0	19
3/22/08 5:15	5.5	6.8	***4.4***	***7.0***	3.2	5.1	2.6	3.5	22
3/22/08 5:30	5.7	7.0	***4.5***	***7.1***	3.2	5.2	2.6	3.5	23
3/22/08 5:45	5.4	6.8	***4.2***	***6.5***	3.0	4.8	2.3	3.1	21
3/22/08 6:00	4.8	6.2	***3.7***	***5.9***	2.6	4.2	2.1	2.8	19
3/22/08 6:15	5.0	6.1	***3.9***	***6.1***	2.8	4.6	2.3	3.0	20
3/22/08 6:30	5.5	7.1	***4.4***	***6.9***	3.1	5.1	2.5	3.4	22
3/22/08 6:45	5.5	7.0	***4.6***	***7.3***	3.3	5.4	2.8	3.8	23
3/22/08 7:00	6.2	8.0	***5.3***	***8.5***	3.8	6.1	3.3	4.4	27
3/22/08 7:15	6.0	7.8	***5.2***	***8.3***	3.7	6.0	3.3	4.4	26
3/22/08 7:30	5.2	6.3	***4.9***	***7.6***	3.7	5.9	3.3	4.4	24
3/22/08 7:45	5.7	7.3	***5.1***	***8.1***	3.6	5.9	3.3	4.4	26
3/22/08 8:00	6.2	8.0	***7.0***	***11.2***	5.2	8.4	5.3	7.2	35

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September 3, 2009

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
Analysis and Outcomes Division
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: Comments on Draft Regional Haze State Implementation Plan

Dear Ms. Neuschler:

Cliffs Natural Resources (Cliffs) is the manager and has ownership interests in the Hibbing Taconite, Northshore, and United Taconite iron ore mines and associated ore processing plants in Northern Minnesota. As a result, Cliffs has a vested interest in provisions in the Regional Haze Best Available Retrofit Technology (BART) State Implementation Plan (SIP) dated July 2009 as the SIP pertains to these operations. In consultation with, and on behalf of Northshore, Hibbing Taconite, and United Taconite, Cliffs offers the following comments on the draft BART SIP as a summary and a supplement to the various and extensive comments Cliffs and its affiliates (Northshore, Silver Bay Power, Hibbing Taconite, and United Taconite) have already provided in writing through numerous letter exchanges with MPCA related the BART Regional Haze issue. Those previous letter exchanges are all incorporated by reference and several of those key documents are attached hereto.

Site-Specific Comments

Silver Bay Power (SBP)

Cliffs believes the only proper BART determination for SBP consists of Low NOx Burners/Over-Fire Air (LNB/OFA) for Unit 2, and anything else should not be included in the SIP. Notwithstanding this, SBP will commit to meet or exceed MPCA's multipollutant BART determination, provided that SBP's proposed flexible alternative to MPCA's proposed BART that meets and exceeds this determination will be deemed acceptable

Silver Bay Power (SBP), a subsidiary of Northshore Mining Company, operates a cogeneration coal fired power plant on Northshore's taconite ore processing plant site and provides electrical

power and process steam primarily for use at the ore processing plant. A small amount of electricity is also sold to the grid. Electrical power is generated from two power boilers designated as Unit 1 and Unit 2. Unit 2 is a BART eligible emission source, but Unit 1 is not.

Table 9.4 on page 71 of the SIP addresses NOx and SO_2 BART Determinations for electric generating units including those for SBP as follows:

- For Unit 1 the table specifies installation of LNB and OFA for NOx control and Biomass Co-Firing for SO_2 control. The corresponding NOx and SO_2 BART limits are 0.41 lb/MMBtu and 0.41 lb/MMBtu, respectively.

- For Unit 2 the table specifies installation of LNB and OFA for NOx control and Biomass Co-Firing for SO_2 control. The corresponding NOx and SO_2 BART limits are 0.40 lb/MMBtu and 0.48 lb/MMBtu, respectively.

Notwithstanding the comments below, SBP will commit to meet or exceed MPCA's multipollutant BART determination, provided that SBP's proposed flexible alternative to MPCA's proposed BART that meets and exceeds this determination will be deemed acceptable. Although Cliffs believes the only proper BART determination for SBP consists of LNB/OFA for Unit 2, Cliffs believes that it can contribute to Minnesota's Regional Haze reduction goals by committing to a flexible and intelligent pollution reduction goal that is equal or better than MPCA's proposed multi-pollutant limits. Traditional, single-pollutant technologies for SO2 prove prohibitively expensive for SBP because of its small scale, existing use of very low sulfur fuel, and costly retrofit considerations and are not cost justifiable under BART. Further, from a practical standpoint, such extensive investment in coal pollution control technology essentially locks in 100% coal usage for the life of the facility. As Cliffs has discussed with MPCA, Cliffs recognizes that BART is only one piece of the larger environmental picture for this small non-utility, cogeneration power plant. Well-conceived, long-term, and sustainable environmental solutions must also be developed for the upcoming Boiler MACT revision, CAIR (or it's successor), the next phase of Regional Haze, and imminent greenhouse gas legislation.

With this in mind, Cliffs has proposed several flexible, voluntary and early reduction proposals outside of the BART context that are consistent with, and meet or exceed MPCA's multi-pollutant determination. Cliffs reiterates its intent, per SBP's latest proposal, to initiate early reduction at SBP and begin more detailed analysis on the technical and economic feasibility of various options to reach these reduction goals in the context of future environmental legislation and regulation. *That said, Cliffs is compelled to briefly clarify (in conjunction with the attached letters and all prior BART communications between MPCA and Cliffs, Northshore and/or Silver Bay Power) that the only proper BART determination for SBP consists of LNB/OFA for Unit 2:*

- *Biomass co-firing on Unit 2 for SO_2 control constitutes fuel switching, which is an inappropriate control mechanism for BART. The Clean Air Act, the legislative history of the Clean Air Act, EPA's regulations, and EPA guidelines regarding BART all support that BART does not mandate a fuel switch (see paragraph A under Site Specific Comments for United Taconite).*

- *Unit 1 is not a BART eligible emission source, and the BART SIP is confined to addressing emission controls and emission limits for BART eligible sources only.*

Hibbing Taconite (HTC)

Table 9.7 on page 79 of the SIP includes a schedule of compliance and stipulates that an alternative emission measurement method (comparable to CEMs) is to be submitted by June 30, 2008 for Furnace Line 1, March 31 for Furnace Line 2, and June 30, 2008 for Furnace Line 3. Due to the premature failure of newly purchased and installed stack gas flow monitors, an extension of the compliance schedule was requested and granted by the MPCA. The compliance schedule should be modified to reflect the new schedule, which is March 31, 2010 for Furnace Line 2, and within 60 days of restart of Furnace Lines 1 and 3. Due to current idle status of the entire Hibbing Taconite facility and uncertain restart date as a result of the current economic recession, a further extension of the compliance schedule for Furnace Line 2 is anticipated.

Northshore Mining

Table 9.2, Column 4 incorrectly refers to Boiler No. 2 as EU004. The correct emission unit number is EU002, and Cliffs requests that this correction be made.

United Taconite

Cliffs believes the only proper BART determination for United Taconite consists of good combustion practices for NOx and objects to MPCA's SO2 BART determination and any other evaluation of ported kilns. Notwithstanding this, United Taconite will commit to meet or exceed MPCA's SO2 BART determination, provided that the proposed flexible BART alternative that meets or exceed this determination and is incorporated into United Taconite's pending permit application of July, 2008 will be permitted and deemed an acceptable BART alternative.

United Taconite has proposed what it believes to be a superior and more environmentally sustainable solution for the facility than the polishing scrubber or simple fuel blending as proposed in MPCA's Draft Regional Haze SIP. In July of 2008, United Taconite submitted a permit application for its "Green Production Project" that proposed significant capital expenditures to convert the facility for utilization of cleaner, lower sulfur solid fuels. Specifically, the project will allow for reduced emissions of SO_2, NO_X, particulate matter, mercury, and greenhouse gases. Petroleum coke will be substantially reduced in favor of cleaner fuels such as lower sulfur coal and/or biomass. Compliance with new limits will be demonstrated with continuous emissions monitors. Overall, the project will benefit the environment by guaranteeing emission reduction levels of SO2, NOx, and Particulate Matter that meet or exceed MPCA's proposed BART reductions. Further, this project is the critical first step to position United Taconite for substantial biomass utilization that could further provide *substantially greater emission reductions in the future* and reflects Cliffs' and United Taconite's commitment to actively seek out and invest to reduce its environmental footprint.

Cliffs reiterates its commitment, per its Green Production Project permit application, to initiate its conversion to cleaner fuels (that meets or exceeds MPCA's proposed BART reductions) for early emission reductions at United Taconite and begin more detailed analysis on the technical and economic feasibility of biomass use at various levels contingent upon the granting of the permit for the Green Production Project. That said, Cliffs is compelled to briefly clarify its positions *(in conjunction with the attached letters and all prior BART communications between MPCA and Cliffs and United Taconite)* consistent with its past extensive communication with MPCA including comments regarding fuel switching/blending, that MPCA's proposed SO2 limit cannot be legally mandated by BART and there is no SO2 reduction technology that is technically and economically feasible in the BART context for United Taconite:

A. ***Minnesota's Proposed SIP Incorrectly Suggests that a Fuel Switch May Constitute BART and Should Not Be Included in the SIP***

Table 9.6 on page 77 of the SIP addresses SO_2 BART emission limits and includes a limit of 1.7 lbs/MMBtu for Furnace Line 2, which is to be achieved through fuel blending. Similarly, page 73 of the SIP includes the following statement, "MPCA has determined that the SO_2 BART limit for this line is 1.7 lbs/MMBtu, and believes that this limit can be met either through fuel blending, installation of an additional polishing scrubber, or a combination of both."

It is Cliffs' position that fuel blending constitutes fuel switching and would require a modification of the fuel handling system at United Taconite. As previously addressed in these comments for SBP and prior letters from Cliffs and/or United, fuel switching is an inappropriate control mechanism for BART. The proposed SIP suggesting that a fuel switch may constitute BART is an incorrect interpretation and inconsistent with the language of the Clean Air Act, the legislative history of the Clean Air Act, EPA's regulations, and EPA guidelines regarding BART. BART as defined under the Clean Air Act does not require a facility to switch fuels. BART requirements focus on retrofitting existing operations with control *technologies*. Nowhere did Congress define BART to include consideration of "clean fuels" or "fuel switches." By contrast, in defining the Best Available Control Technology ("BACT") under section 169 of the Clean Air Act, Congress expressly provided that BACT consider, among other things, "fuel cleaning" and "clean fuels." Clean Air Act § 169(3), 42 U.S.C. § 7479(3). Failure to include "clean fuels" in the Clean Air Act's definition of "BART," as exists in the Clean Air Act BACT definition, demonstrates that Congress did not mean for the former to include "clean fuels." "[W]here Congress includes particular language in one section of a statute but omits it in another section of the same Act, it is generally presumed that Congress acts intentionally and purposely in the disparate inclusion or exclusion." *KP Permanent Make-Up, Inc. v. Lasting Impression I, Inc.*, 543 U.S. 111, 117-118 (2004) (citations omitted) (refusing to read need to negate element of plaintiff's statutory burden of proof into defendant's statutory affirmative defense, when the two statutes used different phrasing). *See also Lutheran Social Services of Minnesota v. U.S.*, 758 F.2d 1283, 1289 (8th Cir. 1985) (citations omitted) (noting qualification that applies to tax exempt status of religious orders purposely omitted from statute governing exemption status of integrated auxiliaries). In addition, nowhere in the legislative history of the Regional Haze provisions of the Clean Air Act generally, or the BART definition specifically, is there any

support for the contention that Congress intended or even contemplated that BART mandate fuel switches at existing facilities.

EPA's regulations also do not support that BART mandates a fuel switch. EPA's regulations, consistent with the phrase "retrofit technology," refer to add-on "technologies" and nowhere define BART to expressly include or require "clean fuels" or "fuel switches." *See* 40 C.F.R § 51.308. EPA guidelines regarding BART also reflect the focus on add-on control technologies, such as scrubbers and other similar *equipment* designed to control emissions. Importantly, EPA guidelines expressly provide that a BART retrofit control analysis should *not* include fuel switches. *See* 70 Fed. Reg. 39104, 31964 (July 6, 2005) (discussing "potentially applicable retrofit control alternatives" such as "low-NOx burners" and stating "it is not our intent to direct States to switch fuel forms *e.g.* from coal to gas"). EPA's use of the abbreviation *e.g.*, which comes from the Latin expression *exempli gratia* meaning "for the sake of example," makes clear EPA's intent that fuel switches generally are not considered BART. In addition, EPA's express inclusion of this language in the final rule regarding the BART guidelines, and elimination of potentially contrary language that was suggested in the proposed rule, make clear EPA's decision and intent that BART does not mandate fuel switches. *Compare* proposed rule, 69 Fed. Reg. 25184, 25219 (May 5, 2004) *with* final rule, 70 Fed. Reg. 31964 (July 6, 2005) (Final rule, in discussing identification of available retrofit controls, eliminates phrase "use of materials" that result in lower emissions and adds express language that BART does not require fuel switches.). EPA has thus unequivocally stated that BART does not require fuel switches.

Accordingly, the Clean Air Act, the legislative history of the Clean Air Act, EPA's regulations, and EPA guidelines regarding BART all support that BART does not mandate a fuel switch as suggested by MPCA staff. Mandating such a fuel switch would not only exceed MPCA's statutory and regulatory authority, it would also cause substantial new operating costs, limit fuel flexibility, have minimal impact on regional haze, and result in an increase of mercury emissions.

B. *Installation of an Additional SO_2 Polishing Scrubber is Not Cost Effective and Could Have Other Associated Adverse Environmental Impacts and Should Be Removed From Consideration in the SIP*

Installation of an additional SO_2 polishing scrubber is not cost effective and could have other associated adverse environmental impacts. This was clearly documented in the BART Analysis that United Taconite prepared and submitted to the MPCA. Further documentation of the economic infeasibility of this technology was provided to the MPCA in a letter dated February 7, 2008. In this letter, United Taconite documented concerns regarding water impacts associated with increased sulfate loading and the need and cost of water treatment associated with an SO_2 scrubber, as well as the cost of lost production on Line 2 that would result during installation of the scrubber. Cliffs maintains its position that these costs in addition to the very high capital and operating costs of a new scrubber are economically infeasible for use at this ore processing plant.

C. *Further Evaluation of Ported Kilns Should Be Removed From the SIP*

Another issue of significant concern is the requirement in Table 9.7 on page 80 of the SIP for United Taconite to evaluate modification of the standard grate-kiln indurating furnace to a grate-ported kiln indurating furnace. Modification of grate-kiln furnace to a grate-ported kiln furnace has only been attempted at one other taconite facility and it was done primarily for pellet production and quality reasons, not as an emission control technology. Converting to a ported kiln is a significant modification. In United Taconite's case additional kiln supports and footing would be needed to handle the additional tons of steel and welds that are added to the kiln along with replacing or modifying the furnace's air handling system. In addition, United Taconite submitted to MPCA an evaluation of the ported kiln in the September 2006 United Taconite BART Analysis report. Following is an excerpt from the report:

> "The purpose of air injections is to provide additional oxygen for pellet oxidation. The oxidation reaction produces enough heat to offset the heat loss associated with air injection. Air injection reduces the overall energy use of the kiln and produces a higher quality taconite pellet. Air injection also reduces the carry-over of the oxidation reaction into the pellet coolers.
>
> Ported kilns are potentially applicable to grate kilns. In the past, the technology was believed to reduce NOx formation. However, the technology vendor will not guarantee that ported kilns will reduce NOx emissions because controlling the oxygen in the firing zone is not possible due to the flow of air from the cooler. Any reduction in NOx would be minor and incidental to the process improvement and specific to the individual furnace. Therefore, although this may be an available and applicable technology, it does not reduce NOx emissions and will not be further evaluated in this report."

Ported kilns were properly evaluated in the 2006 BART Analysis Report and were removed from further consideration because ported kilns do not reduce NOx emissions. Cliffs requests that MPCA delete the reference in the SIP to ported kilns for United Taconite.

D. *Factual Errors That Require Correction*

In addition to the comments provided above, Cliffs requests that the MPCA make the following factual corrections in the SIP regarding United Taconite.

- Table 9.5 on page 72 incorrectly identifies Furnace Line 1 as a straight-grate furnace. Furnace Line 1 is a grate-kiln furnace, and Cliffs requests that this correction be made.

- In Table 9.6 for Furnace Line 2 requires certification of the SO_2 CEMS by June 1, 2009. Due to operational problems encountered with the CEMS, United Taconite requested and the MPCA granted an extension of the deadline to October 1, 2009. Cliffs requests that the revised due date be updated in the SIP.

- In Table 9.7 for Furnace Line 2 requires certification of the NOx CEMS by June 1, 2009. Due to operational problems encountered with the CEMS, United Taconite requested and the

MPCA granted an extension of the deadline to October 1, 2009. Cliffs requests that the revised due date be updated in the SIP.

General Comments

Cliffs offers the following comments on various aspects and segments of the SIP:

1. MPCA's proposed SIP notes that EPA's Regional Haze Rule is intended to achieve visibility goals by 2064 and that MPCA's SIP is intended to show that the state is making "reasonable progress" toward those goals. MPCA's proposed SIP, however, suggests millions of dollars of control, research, and monitoring requirements for the taconite production industry, while failing to recognize that based on reported economic ore reserves, most if not all of the ore bodies will be exhausted and correspondingly, most of the taconite production facilities that currently operate in Minnesota will likely not contribute in any way to regional haze by 2064. The Clean Air Act and EPA's Regional Haze Rule require that Minnesota consider the remaining useful life of facilities in establishing reasonable progress goals, and Minnesota's failure to do so is contrary to applicable law.

   As MPCA is aware, Congress established a "national goal" of eliminating "impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution." 42 U.S.C. § 7491. Congress did not set any specific time by which the goal must be met—requiring instead "reasonable progress" toward meeting the national goal. EPA's Regional Haze Rule has based its "reasonable progress" provisions on a sixty-year time period that would see natural background conditions restored by 2064. 40 C.F.R. § 51.308(d)(1)(i)(B). EPA suggested a framework for states in setting reasonable progress goals for regional haze, by which a state determines the "uniform rate of visibility improvement" that would need to be maintained to reach natural conditions by 2064. 40 C.F.R. § 51.308(d)(1)(i)(B). Under such an approach, a state could establish a long term strategy to arrive at a reasonable progress "glidepath," with visibility impairment diminishing at a uniform rate until background levels are achieved in 2064. 40 C.F.R. § 51.308(d)(3). EPA was clear, however, that "[t]he glidepath is not a presumptive target, and States may establish a [reasonable progress goal] that provides for greater, lesser, or equivalent visibility improvement as that described by the graph." *Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program* (EPA Office of Air Quality Planning and Standards) 1-3. Indeed, in the 1999 regional haze final rule, EPA specifically removed sections of the proposed rule that set forth presumptive rates of progress for each ten to fifteen year period. *See* 62 Fed. Reg. 41138, 41146 (July 31, 2997) (proposed rule), 64 Fed. Reg. 35714, 35731 (final rule) (July 1, 1999). In doing so, EPA was "mindful of the balance that must be maintained between the need for strategies that will achieve *meaningful improvements in air quality* and the need to provide *appropriate flexibility* for States in designing strategies that are responsive to both air quality and *economic concerns*." 64 Fed. Reg. 35731 (emphases added).

   Minnesota's SIP should not impose additional requirements on taconite production facilities beyond Best Available Retrofit Technology ("BART") requirements for subject units because these operations, as their reported economic ore reserves are exhausted, will

demonstrate "meaningful improvements in air quality" and better than "equivalent visibility improvement" to the glidepath approach by the 2064 target. Those taconite production operations that will not be in operation will not contribute to *any* visibility impairment. Importantly, consideration of the impending retirement or remaining useful life of sources affecting regional haze in establishing a reasonable progress strategy is *mandated* by the Clean Air Act and EPA's regulations. *See* 42 U.S.C. § 7491(g) (requiring the consideration of sources' "remaining useful life" in determining "reasonable progress"); 40 C.F.R. § 51.308(d)(1)(i)(A) (requiring states to consider the remaining useful life of affected sources in setting reasonable progress goals); 40 C.F.R. § 51.308(d)(3)(v)(D) (requiring states to consider "source retirement and replacement schedules" in developing a long term strategy). As EPA explained in its final Regional Haze Rule, part of the reason the agency selected a sixty-year period was that "in the longer term, it can be expected that continued progress in visibility will be possible as industrial facilities built in the latter half of the 20th century reach the end of their useful lives and are retired." 64 Fed. Reg. 35732.

Consistent with Congress' mandate and EPA's regulations, MPCA should be "responsible to both air quality and economic concerns" and recognize that the reported economic ore reserves of Minnesota's taconite mines well be exhausted by 2064. For this reason, the MPCA should not cause these mining operations to incur unnecessary costs as part of Minnesota's regional haze SIP when they have no possibility of contributing to regional haze within the schedule established by EPA.

2. Cliffs requests that the MPCA document in the SIP that all BART emission limits are the result of a 30-day rolling average where a CEMS or PEMS is applied as they pertain to the Cliffs owned or managed ore processing facilities.

3. Cliffs supports the MPCA's position in the SIP that Parametric Emission Monitoring Systems (PEMS) are viable alternatives to CEMS. To strengthen this position, Cliffs requests that the MPCA add a discussion on the viability of PEMS and the fact the EPA recognizes PEMS data as being comparable to that of CEMS. The discussion should also clarify that the Regional Haze Rule specifically requires determinations of BART to be "based on an analysis of the best systems of continuous emission control technology available and associated emissions reductions available...." In this regard, CEMS and PEMS are monitoring technologies and not emission control technologies.

   As evidenced in the Voluntary Administrative Orders entered into between the MPCA and taconite facilities as part of BART, it should also be recognized that there are situations where facilities can demonstrate stability of emissions rates such that neither CEMS nor PEMS are justifiable. Both of these monitoring systems are complex and expensive and do not provide useful information for facilities whose emissions are of low variability.

   Further to this discussion and as previously discussed with MPCA staff, Northshore Mining and United Taconite have experienced considerable difficulty with installing, calibrating, and operating the CEMS units on their furnace waste gas stacks. Neither facility has been able to operate the CEMS for more that a few days before the CEMS malfunction. This is due to the high moisture content, high salt content, and elevated temperature of the waste gas that

inhibit the sensors from accurately gathering data. In working with the CEMS manufacturer multiple attempts have been made to test various filter components, deflector shield configurations, and maintenance/cleaning regimes, but none of these efforts has succeeded in achieving acceptable uptime on the monitor. At this point in time, CEMS operation at Northshore and United Taconite is proceeding on a trial basis, and it is uncertain whether or not the CEMS operating problems can be overcome and they can be demonstrated to be a technically feasible emission measurement option for the taconite furnace emissions.

4. Table 9.5 includes the type of pellets produced by each mine. Cliffs objects to the use of the term "acid" pellets in the table and in accompanying footnotes b and d. The use of the term "acid" could be misinterpreted to be a product that results in "acid rock drainage". Acid drainage has not and does not result for precipitation water draining from the stockpiled pellets. This fact is well documented from years of water quality monitoring at taconite plants. The appropriate term for this type of pellet is "standard" pellet. For this reason, Cliffs requests that all references to "acid" pellets be deleted from the SIP and replaced with the term "standard" pellets.

5. Page 93, paragraph 1 notes that use of continuous emissions monitoring (CEMS) is expected to result in NOx emissions reductions of 5-30% based on better control of production processes in response to the monitoring data. Cliffs does not believe it's appropriate to refer to CEMs as "control technology"—rather it is simply a measurement device. Cliffs requests that the MPCA provide a justification of this expectation and examples of emission reductions that have been achieved through use of CEMS.

   Cliffs wishes to point out that taconite furnaces by design must be operated in an air-rich oxidizing atmosphere to produce high quality pellets that meet customer specifications. Unlike boilers that are operated to produce heat or steam, the atmosphere in taconite furnaces cannot simply be altered to achieve a reduction in NOx emissions, which in turn would result in production of an inferior product. To do so would jeopardize the ongoing economic viability of the mining and ore processing operations.

6. Page 95, paragraph following Table 10.4 and page 96, paragraph 3 state that the taconite industry may be uncontrolled or under-controlled for NOx and SO_2 emissions. In response, the MPCA will require the facilities to investigate control technologies and pollution prevention practices for their indurating furnaces through pilot tests, undertaking research or other emission control technology development and report to the MPCA on technical and economic feasibility of the technologies and practices.

   To the extent such research develops new technologies for emission controls, MPCA plans to require use of such new controls by the taconite industry. These requirements are not authorized by applicable law. Nowhere in the Regional Haze provisions of the Clean Air Act, or EPA's Regional Haze Rule, does Congress or EPA provide that "reasonable progress" goals would be satisfied by mandating research and pilot trials of new technologies. Such an approach is nowhere mentioned or considered in the Clean Air Act, EPA's Regional Haze regulations, or EPA's seventy-page final Regional Haze rule. 64 Fed. Reg. 35714-35744 (July 1, 1999). If, as in this case, MPCA determines that imposition of an

emissions standard upon a source is infeasible, the regulations allow a state to instead prescribe "a design, equipment, work practice, or other operational standard, or combination thereof." 40 C.F.R. § 51.308(e)(iii). The regulations *do not* authorize a state to require research and pilot trials in an attempt to develop an effective control technology. In fact, EPA specifically rejected such a requirement when discussing "available" technologies in its 2005 BART guidelines. The agency determined that a technology is not available for BART purposes until *after* the research and testing stage, and stated: "[w]e do not expect a source owner to conduct extended trials to learn how to apply a technology on a totally new and dissimilar source type." 70 Fed. Reg. 39104, 39165 (July 6, 2005). MPCA's proposed research and pilot studies requirements exceed statutory and regulatory authority, impose unnecessary costs on the taconite industry, and should be removed from the SIP.

Further to this discussion, Table 10.5 on pages 97 and 98 includes a BART and Northeast Minnesota Plan timeline that would require taconite facilities to conduct emission control pilot testing during the period July 2011 – December 2012, a period of 18 months, and report the results to the MPCA by March 1, 2013. Notwithstanding the regulatory analysis presented in the previous paragraph, even if the taconite facilities were to undertake technology development, this is an unrealistic timeframe for the stipulated tasks. Becoming knowledgeable about such technologies, proceeding through the budget process, equipment procurement, and actual pilot testing would require a period of years to accomplish, much less 18 months. This is simply an unrealistic expectation.

It is Cliffs' position that it is in the business of taconite ore mining and processing and not emission control technology development. It neither has the expertise nor the resources to pursue the technology development and to do so would reduce its competitiveness in the market place. Unlike utilities, which can pass on the cost of technology development to rate payers, the taconite plants cannot pass such costs on to customers and must also remain competitive in the market place. However, if technologies are identified and developed for potential use on taconite furnaces, the taconite plants would then be able to determine the technical and economic feasibility of installing the technology.

7. The BART provisions of the Regional Haze Rule stipulate that BART control technologies must be demonstrated to be technically and economically feasible to be applicable to an emission source. However, the SIP contains no cost thresholds for economic feasibility of emission control technologies. In this regard, Cliffs requests that the MPCA include in the SIP its cost effectiveness thresholds for NOx and SO_2 controls for the taconite industry. The cost thresholds must be relevant to private industry and independent of thresholds for public utilities because the taconite industry cannot pass the costs on to its customers as the public utilities can. Further, the economic feasibility thresholds should be identified in terms of cost per deciview of visibility improvement, and they should be comparable to thresholds used by other states.

8. Tables 9.6 and 9.7 on pages 76-81 include a baseline capacity number 93% for all pellet furnaces at all mines. A discussion of this figure is not readily apparent in the SIP. Cliffs requests that an explanation and justification for this number be added in the SIP and that a

footnote to the tables be added referencing the page on which the explanatory discussion appears.

Cliffs appreciates the opportunity to comment on the July 2009 Draft BART SIP. In the event you have any questions regarding these comments, please contact David Skolasinski at 218-279-6128.

Sincerely,

David Skolasinski

David Skolasinski
District Manager-Environmental & Regulatory Planning & Analysis

cc: Dana Byrne
David Cartella
Edward LaTendresse
Michael Mlinar
Jack Tuomi
Jason Aagenes
Scott Gischia
Andy McDowell
Jim Mennell

CLIFFS NATURAL RESOURCES
Northshore Mining Company
P 218 225-4126 F 218 225-8037

September 3, 2009

Mr. David Thornton
Assistant Commissioner
Minnesota Pollution Control Agency
525 Lafayette Road North
St. Paul, MN 55155-4194

Re: Technical Corrections to July 2, 2009 MPCA BART Determination Letter for Silver Bay Power

Dear Mr. Thornton,

Northshore Mining has had an opportunity to review MPCA's BART determination letter for Silver Bay Power (SBP) and is compelled to point out several technical inaccuracies that underlie the basis for MPCA's single-pollutant determination and how those inaccuracies affect an ultimate multipollutant BART determination for SBP. This letter is provided both to identify these inaccuracies, yet still support MPCA's multipollutant determination, albeit on a somewhat different basis than MPCA outlined.

1. Cost of Control Estimates

Over the past several months, SBP has spent considerable time and effort to verify or dispute MPCA's work to assess and re-assess multiple control technologies for SBP when MPCA was unsatisfied with the engineering information put forward by SBP at MPCA's request. Despite repeated discussions on several of these issues, MPCA continues to base cost estimates on several inaccurate assumptions and misunderstandings about the Silver Bay Power facility. SBP feels MPCA's lack of practical experience with actual operation and maintenance of a power plant, control equipment design engineering, or equipment installation of this scale at a major facility, coupled with oversimplified discussions with vendors and inappropriate comparisons with other facilities has resulted in markedly inaccurate estimates of installed equipment costs. These issues are outlined below.

1.1 Site Specific Cost Factors

1.1.1 Appendix A to the determination indicates that part of MPCA's assessment relies on obtaining 'estimates' from equipment vendors. MPCA states that "little was understood about site specific conditions" and thus the estimates were characterized as +/- 30% as a likely true estimate.

Silver Bay Power has repeatedly brought up with MPCA several unique site specific factors that must be considered as part of any engineering cost review for this facility. Those factors include:

- limited plot space
- complex ductwork geometry
- limited station electrical power supply
- challenging terrain and
- proximity to Lake Superior.

Each of these factors results in significant installation challenges and related increased total project costs for any emissions reduction solution.

Engineering reviews of technology such as the Mobotec ROFA systems showed true installed costs at over 250% of vendor estimates for the Silver Bay Power site. Even the Rochester Public Utilities project, which MPCA inappropriately attempts to use as a benchmark for SBP had actual installation costs escalate by 175% between project scoping and installation.

The EPA Air Pollution Cost Control Manual notes that a general rule of thumb for applying retrofit factors is that as installation size increases and accuracy of cost estimates decreases, so should the retrofit factor be increased to account for growing uncertainty. The Manual also goes on to identify several factors that should be considered when assigning a retrofit factor which include: site preparation, lost production (generation), auxiliary equipment requirements, and handling and erection and engineering for 'tight fit' situations, all of which apply in the case of Silver Bay Power.

Site specific factors have a significant impact on actual installed cost of equipment at a facility and MPCA's BART determination letter fails to accurately capture the impact of those costs for SBP in its single-pollutant SO2 control equipment assessments.

1.1.2 MPCA cites an industry journal article that is used to attempt to illustrate Northshore's cost of control to be higher than 'industry standard' costs for sulfur control. In fact, a review of this reference reveals that the author qualifies the industry data as widely variable, primarily due to site specific factors.

> *"Average total installed costs reported by the survey respondents were expected to have wide variation, principally because of the peculiarities that exist at each project site, the retrofit project complexity, and the timing differences between projects. Therefore, defining an average project cost is difficult without some understanding of the project-specific details of each of the 78 units surveyed."* (Sharp, George. "Update: What's that Scrubber Going to Cost?" Power. March 1, 2009.)

The author indicates that use of an 'average' project cost is not reflective of the unique features at any site and thus it is inappropriate to use the average costs of control for the traditional energy sector as a benchmark by which to gauge costs for a specific project.

1.1.3 MPCA suggested higher than probable control efficiencies for dry sorbent injection than could be achieved at SBP. Dry sorbent injection relies on residence time in the ductwork between the end of the boiler and the fabric filter for sulfur removal to occur. The ductwork arrangement at SBP allows for very little residence time and best engineering judgment suggests that removal efficiencies would likely be well below traditional energy sector standards for this removal technology.

1.2. Comparison to Traditional Electric Generating Units

1.2.1 MPCA attempts to compare the cost of control at SBP, a non-utility, with traditional utility boilers without considering the completely different organizational and financial structure of the two groups. Equipment that is deemed affordable under the utility system, is qualified as "affordable" when substantial portions of those costs will be passed directly on to the rate-paying base.

SBP has no ability to pass costs on to others and must wholly bear those expenses while maintaining a financial case for continuing to operate as a viable business. For this reason, it is inappropriate to draw direct comparisons with costs of control for the Electricity Generating Unit sector for economic feasibility assessments.

1.2.2 MPCA failed to recognize the already low sulfur emissions from SBP when compared to emissions from similar size utility generating units. Because SO2 emissions are already low for the SBP units, the cost of control will always be higher at SBP than for generation units of similar size with higher baseline SO2 emissions.

1.3. Cost Estimation Model

1.3.1 MPCA changed approaches from the industry and agency accepted EPA cost estimation methods to a different method, which is generally accepted to underestimate the cost of emissions control. In fact, BART specifically references the use of the EPA Emission Control Cost Manual for estimating equipment costs for BART. A more valid cost estimate is made using the accepted estimation methods.

Notably, this set of assumptions and mischaracterizations used by the MPCA present a situation for which the MPCA bears no risk in making control cost estimates for SBP, and for which SBP bears all the risk when installation costs are greater than MPCA anticipates or when control equipment performance is lower than MPCA anticipates

2. Corrections to Cost of Control Summaries

Taking into consideration all the issues noted above, a cost of control table has been updated to illustrate the actual, site specific anticipated cost of control for the key technologies which have been focused upon by MPCA.

Control Options for Silver Bay Power Boiler 2

Control Technology	NOx Emissions Rate (lb/mmBtu)	SO2 Emissions Rate (lb/mmBtu)	Tons Reduced (tpy)	Emissions Reduced (%)	Total Annualized Cost	$/ton pollutant Reduced
Low NOx Burners / Overfire Air (NOx Control)	0.40	na	808 (NOx)	40%	$472,000	$596
Dry Sorbent Injection/Baghouse (SO2 Control)	na	0.36	724 (SO2)	40%	$8,680,000	$11,990
Spray Dryer/Baghouse (SO2 Control)	na	0.06	1628 (SO2)	90%	$13,750,000	$8,446
Co-firing Biomass on Unit 1 and Unit 2 (Multipollutant Control)	Unit 1: 0.41 Unit 2: 0.40	Unit 1: 0.41 Unit 2: 0.48	1981 tpy NOx: 1398 tpy SO2: 583 tpy	NOx: 40% SO2: 20%	$4,809,000	$2,427

Northshore concurs that Low-NOx Burners and Overfire Air (LNB/OFA) constitute BART for Unit 2. However, the updated cost information demonstrates that single-pollutant SO2 control remains economically unfeasible for SBP.

MPCA's determination letter for SBP masks the true cost of SO2 control when those costs are pooled together with the cost of LNB/OFA for Unit 2. EPA's BART guidance does not allow a BART analysis to 'average' out higher and lower cost single-pollutant control technologies.

The biomass combustion solution, which incorporates both NOx reductions through integrated LNB/OFA and SO2 reductions, presents a true multipollutant control option, which in this situation demonstrates a significant cost advantage over the single-pollutant sulfur control options.

3. Visibility Impacts and Ultimate Form of Emissions Limits

Modeling completed by SBP according to the accepted BART modeling protocols indicates that nitrogen oxide emissions reductions from SBP make substantially greater visibility improvements than do sulfur dioxide emissions reductions. In fact, scenarios modeled by SBP show that a reduction of ~1700 tpy of NOx alone exhibits 25% greater visibility improvement than for a reduction of a 2200 ton mix of 30% NOx and 70% SO2.

SBP's various BART solutions proposals to the agency, dating as far back as early 2008, request the flexibility of a combined emissions reduction limit. MPCA's acceptance of this form of limit will only open the possibility of visibility improvement above that which has already been characterized for the facility considering that higher percentages of NOx reductions than those presently outlined in the determination will only enhance visibility improvement.

4. Summary

In summary, SBP reiterates its position that while it believes the only proper BART determination for SBP consists of LNB/OFA for Unit 2, SBP will endeavor to meet or exceed MPCA's multipollutant BART determination, provided that flexible BART alternatives that meet or exceed this determination will be deemed acceptable.

As we have discussed at length, BART is only one piece of the larger environmental picture for this small non-utility, cogeneration power plant. Intelligent environmental solutions must also be developed for the upcoming Boiler MACT revision, CAIR (or its successor), the next phase of Regional Haze, and imminent greenhouse gas legislation. MPCA's allowance for flexibility in addressing BART may, in fact, *enable greater emissions reductions and greater visibility improvement* than can be achieved through the approach MPCA's present memorandum would establish.

Finally, SBP not only wishes to address the multiple technical inaccuracies with the single-pollutant sulfur determination (as outlined above) to the extent they leave significant misinformation in the public record regarding this issue, but also reiterates that no reductions have yet been achieved at Silver Bay Power, despite Northshore having proposed a project (that was likely equal or better than MPCA's recent determination) and committed capital funding to fast-track a reduction project that would have by now been installed and operating at the plant. MPCA's inaction means that early emissions reductions, which would be in place today, will not be realized for some time now due to the global economic conditions.

Sincerely,

Michael P. Mlinar
Vice President / General Manager
Northshore Mining Company

Cc: Catherine Neuschler, Minnesota Pollution Control Agency
David Cartella, Cliffs Natural Resources
Scott Gischia, Northshore Mining Company

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

September 3, 2009

N3615 (2350)

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Dear Ms. Neuschler:

Following are our general comments on the Minnesota Pollution Control Agency's (MPCA's) current Best Available Retrofit Technology (BART) proposals for the Electric Generating Units (EGUs) located in Minnesota that are subject to BART. These comments update and supplement the comments that we provided on June 26, 2009. While we recognize that many of the MN EGUs (especially MN Power) are making large investments toward reducing their emissions, we believe that significant additional reductions can be achieved and are warranted under the BART program. We have enclosed detailed comments that further support our position on the specific BART proposals.

Purpose of the BART Program

The core purpose of the BART program is to improve visibility in our Class I areas. BART is not necessarily the most cost-effective solution but instead, BART represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors. We believe that it is essential to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. Voyageurs National Park (NP) in Minnesota and Isle Royale NP in Michigan are two Class I areas administered by the National Park Service that are currently impacted by MN EGUs.

Level Playing Field

It is important that regulatory agencies provide a level playing field and that they treat similar emission sources in a similar manner, unless exceptions are properly documented and justified. It is also generally accepted, given economies of scale, that the large EGUs should be more-stringently-controlled than the smaller EGUs. (We suggest that the MN EGUs can be divided into two categories—above 370 MW capacity and below 80 MW capacity.) Instead, within the large EGU category, there appears to be a trend of declining stringency as the size of the EGU increases, and some of the smaller EGUs would actually be required to meet tighter limits than some of the larger EGUs. This is

especially apparent when one compares the higher limits proposed for Units #1 and #2 at Xcel's 1,400 MW Sherco facility to the lower limits proposed by Minnesota Power for its 375 MW Boswell #3 (see table below). While we are pleased that the citizens of the Twin-Cities metropolitan area would receive some relief from Xcel's emissions, Xcel and the other EGUs still must address their impacts in Voyageurs and Isle Royale NPs. In the smaller EGU category, where the EGUs are virtually identical in size, we see that Minnesota Power has proposed the lowest Nitrogen Oxide (NO_X) limits for its Taconite Harbor #3.

Proposed NO_x Limits

Operating Company	Plant	Unit	Boiler Type	Fuel	Rating	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	tangential	sub-bituminous	690	LNB+SOFA	0.15
Xcel Energy	Sherburne County Generating Station	Unit #2	tangential	sub-bituminous	683	Combustion Optimization	0.15
Xcel Energy	Allen S. King Generating Plant	Unit #1	cyclone	sub-bituminous	550	SCR	0.10
Minnesota Power	Boswell Energy Center	Unit #3	tangential	sub-bituminous	375	LNB+OFA+SCR	0.07
Northshore Mining	Silver Bay Power Plant	Unit #2	wall-fired	sub-bituminous	75	LNB+OFA	0.41
Minnesota Power	Taconite Harbor	Unit #3	tangential	bit/sub-bituminous	75	ROFA/Rotamix	0.13
Rochester Public Utilities	Silver Lake Plant	Unit #4	wall-fired	bituminous	60	ROFA/Rotamix	0.25

Proposed SO_2 Limits

Operating Company	Plant	Unit	Fuel	Rating (MW)	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	sub-bituminous	690	FGD upgrade	0.12
Xcel Energy	Sherburne County Generating Station	Unit #2	sub-bituminous	683	FGD upgrade	0.12
Xcel Energy	Allen S. King Generating Plant	Unit #1	sub-bituminous	550	FGD upgrade	0.12
Minnesota Power	Boswell Energy Center	Unit #3	sub-bituminous	375	wet FGD	0.09
Northshore Mining	Silver Bay Power Plant	Unit #2	sub-bituminous	75	LSD+FF	0.06*
Minnesota Power	Taconite Harbor	Unit #3	bit/sub-bituminous	75	FSI and new FF	0.32
Rochester Public Utilities	Silver Lake Plant	Unit #4	bituminous	60	dry FGD	0.60

*MPCA has proposed an alternate limit for SO_2 at 0.48 lb/mmBtu at Northshore.

Proposed Total PM_{10} Limits

Operating Company	Plant	Unit	Fuel	Rating (MW)	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	sub-bituminous	690	existing wet ESP	0.090
Xcel Energy	Sherburne County Generating Station	Unit #2	sub-bituminous	683	existing wet ESP	0.090
Xcel Energy	Allen S. King Generating Plant	Unit #1	sub-bituminous	550	FF	0.030
Minnesota Power	Boswell Energy Center	Unit #3	sub-bituminous	375	FF	0.035
Northshore Mining	Silver Bay Power Plant	Unit #2	sub-bituminous	75	existing FF	0.094*
Minnesota Power	Taconite Harbor	Unit #3	bit/sub-bituminous	75	FSI and new FF	0.012
Rochester Public Utilities	Silver Lake Plant	Unit #4	bituminous	60	dry FGD w FF	0.400

*0.046 gr/dscf

Five-step BART Process

It appears that MPCA has attempted to "re-brand" control programs already adopted by the EGUs to meet other requirements and take advantage of state rate recovery allowances, as satisfying BART, without conducting the required five-step BART analyses for Boswell #3.[1] Even when the five-step analysis is not a requirement, MPCA must still show (as it tried to do in its analysis for Northshore Mining) that it achieved an equivalent result.[2] While we understand that MPCA has been forced to quickly react to recent EPA decisions affecting the status of the MN EGUs, MPCA has effectively pre-empted the five-step BART analysis (or its equivalent) by saying that BART is equivalent to BACT, or to whatever the EGU has already committed to installing.[3] This approach is only allowed if MPCA demonstrates that the source has in place, or is committing to, federally-enforceable limits that represent the **most stringent level of control**.[4] None of the sources exempted by MPCA from the five-step BART process (or

[1] The five-step process is required for EGUs at facilities with a total capacity of 750 MW or more (e.g., Boswell, Sherburne County).

[2] Even though the five-step process is not required for the taconite plants reviewed by MPCA, that process was used by MPCA in its BART determinations for the taconite industry.

[3] MPCA repeatedly contends that, because a source has "existing" controls, they must be considered in its BART analysis. While this would be true for controls that truly were existing as of the 2005 publication of the BART Guidelines, to cite controls installed after the BART guidelines became known as reasons for requiring less than BART is not appropriate.

[4] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long as these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART

its equivalent) meet that criterion. Without a five-factor analysis (or its equivalent) from the company or MPCA, it is difficult for us to fully evaluate whatever reasoning went into the MPCA proposal. Although we agree with MPCA that "different facilities may end up with different controls or emission limits due to site-specific factors," MPCA should explain how those site-specific factors influenced its decisions. Therefore, we recommend that MPCA either adopt limits that really are the most-stringent, or move quickly to complete the five-step, or equivalent, BART process.

In general, Steps #1 (Identify all available retrofit options) and #2 (Eliminate technically infeasible options) of the BART process were adequately addressed, so we shall begin at:

Step 3 - Evaluate Control Effectiveness
On page 370 of its responses to comments, MPCA states that, "The MPCA has chosen in general, to accept each facility's determination of how effective a given control technology will be at that facility." As a result, MPCA and the BART sources have consistently underestimated the abilities of established pollution control technologies (e.g., wet scrubbers and Selective Catalytic Reduction) to reduce emissions. MPCA should also evaluate potential upgrades to the existing control equipment.

MPCA's estimates of control effectiveness appear inconsistent. For example, MPCA has determined that a spray dryer/fabric filter system can meet 0.06 lb SO_2/mmBtu at Northshore Mining's Unit 2, but the same system would only be required to meet a limit ten-times higher at Rochester Public Utilities' Silver Lake Unit #4. And, even for the inherently more-efficient wet scrubbing systems at the larger EGU, the SO_2 limits would be 50% to 100% higher than SO_2 BART at Northshore. MPCA should explain these inconsistencies.

Step 4 - Evaluate Impacts and Document Results
MPCA has accepted at face value cost estimates presented by the EGUs.[5] In the case of the Northshore Unit 2, those overestimates were so egregious that MPCA conducted its own analysis, and we commend MPCA for that. However, Xcel submitted estimates that consistently exceeded national norms without the supporting documentation or analyses required by the EPA BART Guidelines.

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determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section."

[5] On page 376 of its responses to comments, MPCA states that, "The MPCA relies on its permittees to understand their facilities, as well as the engineering, financing, construction and air pollution control equipment markets well enough to properly estimate project costs."

While it is appropriate to consider incremental costs in addition to average costs, we have a concern with the over-emphasis placed by MPCA upon this factor and with the way in which the incremental cost analysis was conducted.[6] Because, in most cases, the cost of pollution control rises exponentially with control efficiency, the slope of the cost-versus-efficiency curve will also increase. For this reason, rigid use of incremental cost effectiveness will always result in the choice of the cheapest option if carried to this extent. (For example, if this approach were used to evaluate particulate controls, it is likely that all controls more expensive than a multiple cyclone would be rejected.) According to the NSR Workshop manual, "As a precaution, the difference in incremental costs among dominant alternatives cannot be used by itself to argue one dominant alternative is preferred to another." Instead, it should be used to compare closely performing options.

Step 5 - Evaluate Visibility Impacts

MPCA repeatedly states that, "Because [a given unit's] emission reductions were included in the overall SIP modeling (see Tables 8.1 and 8.4 of the SIP), the visibility impact of the reductions at [the given unit] were considered." Only for Sherco and Northshore were the visibility impacts of any of the BART options specifically evaluated.[7] This fifth-step of the BART process is essential for assessing the ability of a potential control strategy to address the fundamental purpose of the BART program. And, this fifth-step can provide information critical to determining the true cost-effectiveness of a visibility-improvement strategy. This analysis can also provide useful information on the relative importance of, for example, reducing NO_X versus SO_2 emissions from a given source. Based upon the limited data provided, it appears that, on a per-ton basis, reducing NO_X provides greater visibility benefits than reducing SO_2 in the cool, moist climate of northern MN.

We believe that it is appropriate to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. It simply does not make sense to use the same metric to evaluate the effects of reducing emissions from a BART source that impacts only one Class I area as for a BART source that impacts multiple Class I areas. And, it does not make sense to evaluate impacts at one Class I area, while ignoring others that are similarly significantly impaired. If we look at only the most-impacted Class I area, we ignore that the other Class I areas are all suffering from impairment to visibility "caused"[8] by the BART source. It follows that, if emission from the BART source are reduced, the benefits will be spread well beyond only the most impacted Class I area, and this must be accounted for.

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[6] EPA BART Guideline: "You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option."... "You should exercise caution not to misuse these [average and incremental cost effectiveness] techniques... [but consider them in situations where an option shows]...slightly greater emission reductions..."

[7] Even though Northshore did provide some visibility modeling results, no analysis was provided for the critical comparison of the alternative BART options, as explained in our comments specific to that facility.

[8] EPA defines a source with an impact greater than one deciview as "causing" impairment.

The BART Guidelines represent an attempt to create a workable approach to estimating visibility impairment. As such, they require several assumptions, simplifications, and shortcuts about when visibility is impaired in a Class I area, and how much impairment is occurring. The Guidelines do not attempt to address the geographic extent of the impairment, but assume that all Class I areas are created equal, and that there is no difference between widespread impacts in a large Class I area and isolated impacts in a small Class I area. To address the problem of geographic extent, we have been looking at the cumulative impacts of a source on all Class I areas affected, as well as the cumulative benefits from reducing emissions. While there are certainly more sophisticated approaches to this problem, we believe that this is the most practical, especially when considering the modeling techniques and information available.

Compared to the typical control cost analysis in which estimates fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per deciview (dV) to improve visibility may appear extraordinarily expensive. However, our compilation[9] of BART analyses across the U.S. reveals that the **average cost per dV proposed by either a state or a BART source is $9 - $19 million**,[10] with a maximum of almost $50 million per dV proposed by Colorado at the Martin Drake power plant in Colorado Springs.

BART Determinations

We are confused by these apparently contradictory statements on page 371 of MPCA's responses to comments:

- The MPCA's position is that cost-effective controls should be installed, even if they result in limited improvement in visibility, and technically infeasible or not cost-effective controls are not required under BART, even if they result in significant visibility improvement.
- Because of the small visibility impact that would result from controls, the MPCA deemed existing controls and emission limits to be BART.

We believe that it is the intent of the Regional Haze program to make visibility improvement a prominent factor in the BART determination process. Therefore, even if only a small visibility improvement would result from revisiting existing controls, MPCA should require any cost effective and technically feasible alternatives.

Reasonable Progress

Even if an EGU is exempt from BART, it may still be subject to review under the Reasonable Progress requirements of the Regional Haze Rule. MPCA may wish to consider additional emission reductions under that aspect of the Regional Haze program.

[9] http://www.wrapair.org/forums/ssjf/bart.html

[10] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

In conclusion, we appreciate MPCA's efforts to date regarding the BART process, but we believe that significant additional reductions can be achieved and are warranted. We look forward to working with the MPCA as this process advances. We believe that good communication and sharing of information will help expedite this process, and suggest that you contact Don Shepherd (don_shepherd@nps.gov, 303-969-2075) if you have any questions or comments about this document.

Sincerely,

John Bunyak
Chief, Policy, Planning and Permit Review Branch

Enclosures

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Xcel Energy – Allen S. King Generating Plant Unit #1
MPCA 4/28/09 report and subsequent Responses to Comments

The Allen S. King (King) plant is a coal-fired electric utility operated by Xcel Energy (Xcel) and located in Oak Park Heights, Minnesota. According to EPA's Clean Air Markets Database, in 2007, King ranked #360 in the U.S. in sulfur dioxide (SO_2) emissions at 2,569 tons and #249 for nitrogen oxides (NO_x) emissions at 3,903 tons.

The facility's main power boiler (Unit #1) is a coal-fired cyclone boiler with a generating capacity of 550 megawatts (MW) of electricity. Modeling analyses conducted by MPCA indicate that Boiler #1 causes or contributes to visibility impairment at Boundary Waters Canoe Area.

Pollution control equipment on the main boiler as of the date of issuance (March 28, 2005) of Air Emission Permit No. 16300005-005 consisted of an electrostatic precipitator to control Particulate Matter (PM) emissions. Permit action 005 authorized modification of the King Plant. The Rehabilitation Project is complete and includes the installation of new pollution control equipment, modification of the plant heat rejection system, and rehabilitation and life extension of the main (EU 001, coal-fired) boiler. The rehabilitation allows the plant to operate at a capacity approaching its original design rating. The boiler rehabilitation consisted of:

- Replacement of the furnace floor and support system.
- Installation of new cyclone burners and re-entrant throats.
- Replacement of furnace sidewalls and furnace floor tubes.
- Installation of induced draft fans to accommodate additional draft requirements of new control equipment.

The new (additional) control equipment consists of:

- Selective Catalytic Reduction (SCR) reactor for control of nitrogen oxides (NO_X) emissions.
- Spray dryer absorber lime-based semi-dry Flue Gas Desulfurization (FGD) system for control of sulfur dioxide (SO_2) emissions.
- Pulse-Jet-cleaned Fabric Filter (PJFF) for additional control of PM.

The rehabilitation of Boiler #1 was completed in 2007.

MPCA BART Analysis

Xcel Energy was not asked by the MPCA to perform a BART analysis because Xcel Energy was in the process of installing BACT-like controls for NO_X, SO_2, and PM on Unit 1 with construction ending in 2007. A BART analysis was not requested by the MPCA because all of the following criteria were met:

- The MPCA had sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART;
- Public Utility Commission (PUC) approvals for the reductions were in place; and
- The MPCA determined that planned emission reductions represented or exceeded BART levels of control.

The MPCA issued permit no. 16300005-005 on March 28, 2005, that allowed Unit #1 to be retrofitted with:

- Selective Catalytic Reduction (SCR) reactor for control of NO_X emissions.
- Spray dryer absorber lime-based semi-dry Flue Gas Desulfurization (FGD) system for control of SO_2 emissions.
- Pulse-Jet cleaned Fabric Filter (PJFF) for additional control of PM.

MPCA contends that the proposed emissions limits and the control equipment that Xcel Energy has recently installed are consistent with Federal New Source Review Best Available Control Technologies. EPA's BART Guidelines assert that if a State finds a BART source that already has controls in place which are the most stringent available, then it is not necessary to complete each of the steps in the BART analysis (FR 39165). The following limits were incorporated into the requirements for Unit 1 through Air Emission Permit No. 16300005-005 issued on March 28, 2005.

NO_X Limit (lb/MmBtu)	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
< 0.10 (30 day rolling average)	< 0.12 (30 day rolling average)	< 0.030

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

CALPUFF modeling was run for this source at the controlled emission rates and the modeled results were less than the subject-to-BART thresholds. The controlled emission rates are incorporated into the 2018 regional scale modeling performed.

MPCA Determination of the BART Limit

The following limits represent the MPCA's determination of BART for Unit 1.

NO_X Limit (lb/MmBtu)	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
< 0.10 (30 day rolling average)	< 0.12 (30 day rolling average)	< 0.030

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS Review

Although presumptive BART probably does not apply, and King #1 has avoided BART by reducing impacts to below 0.5 dv, it is still subject to review under the Reasonable Progress requirements of the Regional Haze Rule. The SCR installed there should be able to achieve lower emission rates. For example, based upon 2002 - 2004 CAM data, uncontrolled NO_X emissions from this cyclone furnace were 0.70 lb/mmBtu; 90% reduction by SCR would lead to 0.07 lb/mmBtu. This is further supported by the Memorandum of Understanding between the Illinois EPA and Dominion Energy that requires that the Kincaid Station cyclone boilers #1 and #2 meet 0.07 lb/mmBtu on an annual basis. CAM data show that these boilers have consistently operated at or below this limit beginning in 2005. Because utilities typically operate pollution control equipment such that it just complies with required limits rather than to its fullest capability, MPCA should obtain information on the design of the King SCR system and evaluate it to determine if lower NO_x emissions are feasible with the existing equipment.

The dry scrubber there should also be able to achieve lower emission rates. For example, based upon 2002 - 2004 CAM data, King #1 had uncontrolled SO_2 emissions of 1.47

lb/mmBtu. By comparison, Sierra Pacific Power proposed that its Ely PC boiler meet a 30-day rolling average SO_2 limit of 0.060 lb/mmBtu using a dry scrubber while burning coal with uncontrolled emissions of 1.7 lb/mmBtu. Furthermore, MPCA has proposed that BART for SO_2 at Northshore #2 is 0.06 lb/mmBtu (30-day rolling average).

Sierra Pacific Power also proposed that its Ely PC boiler meet a total PM_{10} limit of 0.020 lb/mmBtu.

Minnesota Power Boswell Unit 3
MPCA 5/22/09 report and subsequent Responses to Comments

The Boswell Energy Center (BEC) operated by Minnesota Power (MN Power) consists of four Electric Generating Units (EGUs) with a combined net generating capacity of approximately 1,025 megawatts (MW). BEC is located adjacent to the Mississippi River in Cohasset, Minnesota. According to EPA's Clean Air Markets Database, in 2007, BEC ranked #130 in the U.S. in sulfur dioxide (SO_2) emissions at 21,580 tons and #61 for nitrogen oxides (NO_x) emissions at 14,761 tons.

Since Boswell Unit 3 (375 MW) was commissioned in 1973 and MPCA modeling has demonstrated that its emissions cause or contribute to visibility impairment in Boundary Waters Canoe Area, Isle Royale National Park, Seney National Wildlife Refuge, and Voyageurs National Park, Boswell Unit 3 is subject to BART.

MN Power BART Analysis
Unit 3 is tangentially-fired with sub-bituminous coal. Particulate matter (PM) emissions are currently controlled by a wet scrubber which incidentally removes approximately 30% of the boiler flue gas SO_2. In addition, as operating conditions allow, MN Power lowers NO_x emissions by simulating over-fire air combustion by operating the top burner level as a combustion air port only.

As part of the Boswell 3 Plan, MN Power proposes to install a powdered activated carbon injection system to capture flue gas mercury and a continuous emission monitoring system for mercury; Low-NO_X Burners (LNB), Over-Fire Air (OFA) and Selective Catalytic Reduction (SCR) to reduce NO_X, as well as a Combustion Optimization System to optimize the balance between NO_x reductions and carbon monoxide control; a flue gas desulfurization (FGD) scrubber to further reduce SO_2, and a fabric filter to control PM and help optimize mercury removal performance. In addition, MN Power is upgrading the existing turbine/generator to restore the electrical net output lost from operating the new emission control equipment.

With a combination of LNB/OFA[1] and SCR, MN Power expects a NO_x reduction of approximately 80% at Unit 3 compared to current baseline levels. That is, a reduction in the NO_x emission rate from 0.37 lbs/mmBtu to 0.07 lbs/mmBtu with a corresponding annual reduction of 3,904 tons (from 4,808 tons to 904 tons). Finally, mercury oxidation across the SCR may also contribute a co-benefit mercury removal.

MN Power expects Unit 3 annual SO_2 emissions to decrease from 12,096 tons to 1,162 tons - a 10,934 ton reduction. This 90+% reduction improves upon the current 30% co-benefit SO_2 removal by the existing wet particulate scrubber, which will be replaced by the new FGD scrubber. The new emission rate is expected to be approximately 0.09

[1] Another benefit of reducing the initial formation of NOx in the boiler is reduction in the amount of ammonia required to further reduce NOx emissions.

lbs/mmBtu compared to the current emission rate of approximately 0.95 lbs/mmBtu (which reflects the current SO_2 removal from the existing wet particulate scrubber).[2]

With a new fabric filter, Minnesota Power expects annual PM emissions to drop by about 2,525 tons. The existing wet particulate scrubber has a PM emission rate of 0.21 lbs/mmBtu based on the most recent Title V stack test (June 12, 2002), whereas the fabric filter is expected to have a 0.014 lbs/mmBtu emission rate. In addition, as discussed above, the fabric filter provides essential co-benefits by removing mercury that adheres to particles captured by the fabric filter.

MPCA BART Analysis

Minnesota Power was not asked by the MPCA to perform a BART analysis for Boswell Unit 3, because Minnesota Power is installing BACT-like controls for NO_x, SO_2, and PM on Unit 3 on which construction began in 2007. A BART analysis was not requested by the MPCA because all of the following criteria were met:

- The MPCA had sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART;
- Public Utility Commission (PUC) approvals for the reductions were in place; and
- The MPCA determined that planned emission reductions represented BART levels of control.

The MPCA issued permit no. 06100004-003 on March 28, 2007, that allows Power boiler No. 3 to be retrofitted with Low NO_x burners, over fire air and selective catalytic reduction for nitrogen oxides control. It will be retrofitted with a baghouse filter for particulate and mercury control, and finally, with a wet scrubber for SO_2 control.

The proposed emissions limits and control equipment that Minnesota Power is proposing to install are consistent with Federal New Source Review Best Available Control Technologies. EPA's BART Guidelines assert that, if a State finds a BART source that already has controls in place which are the most stringent available, then it is not necessary to complete each of the steps in the BART analysis. The following limits were incorporated into the requirements for Unit 3 through Air Emission Permit No. 06100004-003 issued on March 28, 2007.

NOx Limit (lb/mmBtu)	SO2 Limit (lb/mmBtu)	PM10 Limit* (lb/mmBtu)
< 0.07 (30 day rolling average)	< 0.09 (30 day rolling average)	< 0.035

*PM10 limit includes filterable plus organic and inorganic condensibles.

The public notice of the permit provided for opportunity for comment on this approach.

CALPUFF modeling was not rerun for this source; however, the controlled emission rates are incorporated into the 2018 regional scale modeling performed.

[2] The current uncontrolled SO_2 emission rate is approximately 1.35 lb/mmBtu based on current coal.

MPCA Determination of the BART Limit
The following limits represent the MPCA's determination of BART for Boiler 3.

NO_x Limit (lb/mmBtu)	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
< 0.07 (30 day rolling average)	< 0.09 (30 day rolling average)	< 0.035

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS BART Analysis
While we commend MN Power for its comprehensive proposal, MPCA has effectively pre-empted the required five-step BART analysis by saying that BART is equivalent to BACT. This approach is only allowed if MPCA demonstrates that the source has in place, or is committing to, federally-enforceable limits that represent the **most stringent level of control**.[3] As discussed below, BEC does not meet these criteria for exemption from the five-step BART process. Without a five-factor analysis from the company or MPCA, it is impossible for us to evaluate whatever reasoning went into the MPCA proposal.

We believe that the proposed pollution controls can achieve even greater emission reductions if fully utilized. For example, a modern wet scrubber, such as that proposed by MN Power, can achieve 0.06 lb SO_2/mmBtu,[4] and the proposed combination of combustion controls and SCR can achieve a NO_x limit of 0.05 lb/mmBtu, on a 30-day rolling average basis, and 0.0385 lb/mmBtu on an annual average basis.[5] Furthermore, in its 11/19/08 BART submittal for its Taconite Harbor facility, MN Power states, "The use of an SCR is expected to achieve a NO_x emission rate of 0.05 lb/mmBtu based on recent emission guarantees offered by SCR system suppliers." MPCA/MN Power should show why lower emission limits cannot be achieved at Boswell Unit 3.

[3] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long [as] these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section."
[4] For example, MPCA has proposed that BART for SO_2 is 0.06 lb/mmBtu (30-day rolling average) at Northshore #2.
[5] Permit issued 7/31/08 by EPA to Sithe Global Power for the Desert Rock power plant. On page 375 of its responses to comments, "the MPCA notes that there is an accepted difference between achieved and permitted emission levels." On the contrary, it is generally accepted that, unless MPCA can show otherwise, it should be presumed to be achievable. A rigid adherence to the MPCA approach would mean that control technology would forever be locked into the accomplishments of the past.

Minnesota Power Taconite Harbor Unit 3
MPCA 4/29/09 report and subsequent Responses to Comments

Minnesota Power (MN Power) operates a coal-fired steam-electric generating station known as the Taconite Harbor Energy Center (THEC) near Schroeder, Cook County, Minnesota. The three tangentially-fired coal boilers (75 megawatts—MW—net each) at the facility were originally designed to operate on bituminous coal, but began burning sub-bituminous coal in the early 1990s. They are permitted to burn either coal type. According to EPA's Clean Air Markets Database, in 2007, THEC ranked #290 in the U.S. in sulfur dioxide (SO_2) emissions at 5,062 tons and #291 for nitrogen oxides (NO_x) emissions at 3,004 tons.

Modeling analyses conducted by MPCA indicate that Unit #3 causes or contributes to visibility impairment at Boundary Waters Canoe Area (BWCA) and Isle Royale National Park. Only Unit 3 at the facility is subject to BART.

MPCA BART Analysis

MN Power was asked by the MPCA to perform a BART analysis for THEC Unit 3. MN Power has undertaken an emissions reduction project for the three generating units, referred to as the Arrowhead Regional Emissions Abatement (AREA) Project.[1] MN Power elected to begin the project with the retrofitting of Unit 2, which is not a BART-eligible unit due to its construction date (1957). The MPCA issued permit no. 03100001-006 on January 8, 2007, that allows boiler No. 2 to be retrofitted with additional air pollution controls as a demonstration project. The emissions reduction project involves the installation of Nalco-Mobotec's ROFA/Rotomix control system for reduction of NO_X and SO_2. Additionally, Mobotec's "Minplus" injection system was installed to control mercury (Hg) emissions. The project also involved modifying the electrostatic precipitators from "hot-side" to "cold-side".

MN Power proposed to install Mobotec multi-pollutant control technology[2] on each of the three 75 MW boilers to reduce SO_2 (by 65% to 0.24 lb/mmBtu), NO_X (by 64% to 0.14 lb/mmBtu), and Hg (by 90% to 0.0000049 lb/mmBtu).

[1] On 10/14/05 MN Power submitted its Arrowhead Regional Emissions Abatement (AREA) proposal and accompanying rate rider, pursuant to Minn. Stat. § 216B.1692, to reduce SO_2 and NO_x emissions from its Syl Laskin and Taconite Harbor generating stations. The AREA plan submitted by MN Power proposed to use Furnace Sorbent Injection (FSI) to reduce SO_2 by 64% from 0.67 lb/mmBtu to 0.24 lb/mmBtu. The AREA SO_2 and NO_x reductions would result in a reduction in days with significant visibility impairment at BWCA from 163 days/3 years to 54 days/3 years; the maximum impact would drop from 3.274 dv to 1.642 dv. At VOYA, the maximum impact would drop from 0.366 dv to 0.157 dv.

[2] Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX selective non-catalytic reduction (SNCR) with furnace urea injection for NO_X control. In addition, the system includes a Furnace Sorbent Injection ('FSI') system for injection of a calcium alkaline reagent (limestone) for SO2 control, and a system to inject a clay-based sorbent (MinPlus) to adsorb and chemically bind vaporized elemental mercury.

Operation of the Rotamix system throughout 2008 demonstrated that the ROFA/Rotamix system controlled emissions below the "presumptive BART" level [for NO_x] for very large power boilers of 0.15 lb/mmBtu. Operation of the system however did not achieve SO_2 removals as planned. Therefore, the MPCA requested MN Power prepare a BART analysis for Unit 3. The analysis for NO_X, SO_2 and PM was submitted November 2008, recommending the installation of a fabric filter to achieve up to 50% removal of SO_2 with the use of Rotamix.

BART guidelines request an identification of control technologies and their annualized cost per ton of pollutant removed. The analysis shows the cost of reductions as follows:

Control Technology	Post-BART emissions (lb/mmBtu)	Total Levelized Cost ($/yr)	Tons removed	Cost Effectiveness ($/ton)
NOx				
SCR	0.05	$5,085,000	1,100	$4,600
ROFA/Rotamix	0.13	$2,876,000	840	$3,400
ROFA	0.15	$1,616,000	750	$2,200
SO2				
Semi-dry SD and new FF	0.08	$9,689,000	1,940	$5,000
FSI and ESP Conversion	0.42	$1,109,000	880	$4,000
FSI and new FF	0.42	$1,868,000	880	$5,300

CALPUFF modeling was not rerun for this source. However, the controlled emission rates are incorporated into the 2018 regional scale modeling performed.

The MPCA concurred with Minnesota Power's assessment of controls and their costs. MPCA proposes that Nalco-Mobotec is BART for NO_X, and that furnace sorbent injection with a PM_{10} control limit of 0.012 lb/mmBtu, achievable with the installation of a new fabric filter, is BART for SO_2 and PM_{10}.

The following limits represent the MPCA's determination of BART for Unit 3.

NOx Limit	SO2 Limit	PM10 Limit*
0.13 lb/mmBtu	0.32 lb/mmBtu	< 0.012 lb/mmBtu
30-day rolling average	30-day rolling average	

*PM10 limit includes filterable plus organic and inorganic condensibles.

NPS Comments on the MPCA BART Analysis

NO_x: MPCA proposes that Nalco-Mobotec is BART for NO_X at 0.13 lb/mmBtu. We agree with and commend MN Power and MPCA for this proposal,.

SO_2: MPCA proposes that furnace sorbent injection with a limit of 0.32 lb/mmBtu is BART for SO_2.

Step 1 – Identify All Available Retrofit Control Technologies
MN Power identified a reasonable range of control options.

Step 2 – Eliminate Technically Infeasible Options
No additional technologies were eliminated.

Step 3 - Evaluate Control Effectiveness
As modified per Table 1 of the November 19, 2008, submittal, MN Power's estimates of control effectiveness appear reasonable. However, we believe that a spray dryer/fabric filter combination achieving 90% control should be able to reduce SO_2 emissions to 0.07 lb/mmBtu from the current 0.70 lb/mmBtu, instead of the 0.08 lb/mmBtu cited by MN Power. According to page 374 of MPCA's responses to comments, "The 0.08 lbs/mmBtu is a reasonable SO2 permit emission limit to assume for the application of a spray dryer/fabric filter. This assumption does not materially change the BART determination." We request that MPCA show the calculations upon which its determinations are based.

Step 4 – Evaluate Impacts and Document the Results
According to MN Power, "A budgetary cost estimate was obtained for a wet limestone FGD system. The budgetary cost estimate included the equipment associated with the absorber, reagent (limestone) preparation, and waste handling. However, there are other balance-of-plant costs that are not captured in this high-level analysis. With the use of a wet limestone FGD system, a new stack will be needed to handle the saturated flue gas. This is a significant cost that is not included in this analysis. There is also additional piping, limestone handling equipment, and building costs that are not included. Because a wet limestone FGD system will achieve about the same SO_2 removal as a semi-dry FGD system but will cost significantly more, this technology is not evaluated further." This is not allowed by the BART Guidelines. Once a technology is determined to be technically feasible, the remaining steps of the analysis must be completed for it, especially because the wet FGD technology would result in 25% lower emissions (by MN Power's estimates).

Once again, neither MN Power nor MPCA provided enough information to evaluate their estimates for the semi-dry spray dryer/fabric filter combination. So, we note that there are precedents[3] (e.g., Northshore #3) which show that BART can be spray dryers on small coal-fired boilers like THEC with limits at 0.06 lb/mmBtu. However, taken at face-value, a requirement for the semi-dry spray dryer/fabric filter combination would achieve greater SO_2 reductions at a lower cost per ton of pollutant removed than the strategy proposed by MN Power/MPCA. The advantage of the semi-dry spray dryer/fabric filter combination may become even greater if the lower SO_2 rates achievable by this option are properly evaluated.

Step 5 - Evaluate Visibility Impacts
Both MN Power and MPCA omitted this critical step.

[3] The Colorado Department of Public Health and Environment concluded that BART for the 85 MW Martin Drake Unit #6 burning coal with uncontrolled emissions of 0.80 lb/mmBtu (vs. 0.70 lb/mmBtu at Taconite Harbor) is the semi-dry spray-dryer/fabric filter option that MN Power/MPCA rejected.

PM_{10}: MPCA proposes that a PM_{10} control limit of 0.012 lb/mmBtu, achievable with the installation of a new fabric filter, is BART and we concur.

Conclusions & Recommendations

- Technically feasible options such as wet FGD cannot be eliminated from the full five-factor analysis.
- Cost estimates should follow EPA guidance and sufficient documentation should be provided.
- MPCA appears to have overestimated the cost of SCR.
- MPCA should re-consider addition of a semi-dry spray-dryer because it would provide greater emission reductions than estimated by MN Power and costs were not documented adequately. It appears inconsistent that a spray dryer/fabric filter is BART at Northshore and RPU, but not at THEC. Because THEC has proposed to add a fabric filter as part of its BART proposal, MPCA appears to be "wasting" an opportunity to add the spray dryer and take advantage of the combined SO_2 removal capabilities.
- MPCA must properly evaluate impacts and document the results of the technically-feasible control strategies. We are especially concerned that the MN Power/MPCA BART analysis did not address improvements in visibility that would result from the technically-feasible control options.

Northshore Mining (NSM) Silver Bay Power Plant
NPS comments on the MPCA 7/02/09 BART Determination report

The Silver Bay facility[1] is located on the north shore of Lake Superior. Of interest in the BART determination is the Silver Bay Power plant which has two boilers identified as Unit 1 and Unit 2. Both units are permitted to fire natural gas and coal, and both use a fabric filter to control particulate matter (PM).

Unit 2 at the facility is subject to BART as start-up was in 1963.[2] Unit 2 has a dry bottom, front-wall-fired configuration with a maximum heat-input rating of 765 mmBtu/hr and an output of 75 megawatts (MW). Nitrogen Oxides (NO_X) emissions are controlled through good combustion practices. There are no post-combustion sulfur dioxide (SO_2) controls. Modeling analyses conducted by MPCA indicate that Unit 2 causes or contributes to visibility impairment at Boundary Waters Canoe Area (BWCA), Isle Royale National Park, and Voyageurs National Park.

MPCA p659: **2. Regulatory and/or Statutory Basis**
2.1 Overview of Visibility, Regional Haze, and Best Available Retrofit Technology Program
The analysis must take into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility that may reasonably be anticipated to result from use of the technology.
NPS: MPCA appears to have applied EPA's five-step BART analysis approach.

MPCA p 660: **2.2 Affected Units**
Boiler 2 at the facility is subject to BART as start-up for this unit was in 1963. Boiler 1 is not subject to BART because start-up of that unit was in 1959, prior to the BART-eligibility date.

MPCA's BART Analysis
MPCA p 661: Because this facility has a total generating capacity less than 750 MW (total generating capacity is about 110 MW), the determination of BART does not require strict compliance with the BART guidelines found in 40 CFR Part 51 Appendix Y. The MPCA has, however, used the guidelines in an advisory fashion and has given consideration to the factors required by the Clean Air Act in making its determination of BART:
(a) The cost of compliance;
(b) The energy and non-air quality environmental impacts of compliance;

[1] Cliffs Natural Resources, Ltd. is the parent company of both Northshore Mining Company and Silver Bay Power Company. Northshore Mining Company operates a taconite processing plant at the Silver Bay facility; Silver Bay Power Company operates a power plant at the facility, which provides electricity both for the taconite processing operations and the grid. (Northshore Mine's taconite processing facility is subject to a separate BART determination.) Cliffs Natural Resources, Northshore Mines, and Silver Bay Power are co-permittees for Title V permit no. 07500003-004 for the Silver Bay facility.
[2] Boiler No. 1 is not subject to BART because start-up of that unit was in 1959.

(c) Any existing air pollution control technology already in place;
(d) The remaining useful life of the source, and
(e) The degree of visibility improvement which may reasonably be anticipated from the use of BART.

NPS: We agree with MPCA and commend them for using an approach recommended by the guidelines.

MPCA BART Analysis
MPCA p660: Northshore Mining (NSM) was asked by the MPCA to perform a BART analysis for Unit 2. A BART analysis dated September 28, 2006, was submitted to the MPCA by Northshore Mining. In September 2008, Cliffs Natural Resources was requested to review its 2006 submittal and update it as necessary, including adding the NO_X/SO_2 control technology Rotating Over-Fire Air (ROFA) +Rotamix+Furnace Sorbent Injection (FSI) by Nalco/Mobotec to the feasible control technologies it evaluated. Cliffs' material was provided to the MPCA in November 2008.

Nitrogen Oxides Control

Following is our application of the five-step approach recommended by EPA's BART Guidelines:

Step 1 - Identify all Available Retrofit Control Technologies
NPS: With the addition of the analyses of the Mobotec system and the biomass option, MPCA evaluated a comprehensive suite of control strategies.

Step 2 - Eliminate Technically Infeasible Options
MPCA p661: Selective Catalytic Reduction (SCR) was rejected by NSM due to cost. MPCA will not require further assessment of SCR at this time, believing that if future NO_X reductions are needed, the technology has not been eliminated as a technically feasible alternative.
NPS: Despite having determined that NSM's control costs for SO_2 were inflated (see below), MPCA accepted NSM's SCR costs without question and rejected SCR on the basis that it was too expensive.[3] However, NSM created an invalid scenario by first rejecting SCR in the typical "high dust" location. NSM states, "Because of experience and the potential for comparable catalyst surface plugging, a high-dust SCR is determined to be technically infeasible on Unit 2 and will not be considered further." We ask NSM to explain the "experience" to which its consultant is referring, as almost all modern SCRs retrofitted to coal-fired boilers are installed in the high-dust location. By creating this invalid "obstacle," NSM shifted the SCR discussion to a low-dust location, which necessitates extensive energy and associated costs for reheating the SCR to the

[3] NSM used the wrong section of the EPA Control Cost Manual to estimate SCR costs. Instead of using the approach described in Section 4.2, Chapter 2, "Selective Catalytic Reduction," it appears that NSM tried to apply methods from Section 5.2, Chapter 1, "Wet Scrubbers for Acid Gas."

optimum operating temperatures. NSM used this reason to reject SCR on the basis of cost per ton and (incorrectly) halt its analysis.[4] MPCA must re-evaluate "high dust" SCR.

Step 3 - Evaluate Control Effectiveness

NPS: NSM underestimated SCR control effectiveness at 80% versus the generally-accepted 90% capability of this option.

NSM underestimated the effectiveness of ROFA+Rotamix at 40%. By comparison, MN Power estimated that this technology would reduce NO_x by 68% at its Taconite Harbor facility. MPCA has incorrectly accepted this 40% control estimate in making its BART determination for Unit #2. According to Mobotec, "While NO_X reduction with typical LNB and OFA systems can sometimes exceed 35%, ROFA NO_X reduction routinely exceeds 50% and, depending on furnace geometry, ROFA NO_X reduction can exceed 60%.[5] The Mobotec system has been reported to achieve NO_X reductions as high as 83% on a coal-fired boiler similar in size to Northshore #2.[6]

MPCA contends that, because LNB+OFA can achieve 40% reductions at a lower cost, it is BART instead of ROFA+Rotamix at 40%. While we commend MPCA for setting a numerical NO_X limit, when MPCA goes on to say that, "However, in discussions with the facility, changes were made to the baseline emissions, which result in an emission rate of 0.40 lbs/mmBtu," we are left to wonder what happened to change the baseline emission rate?

Furthermore, if ROFA+Rotamix can achieve the same 68% removal estimated at Taconite Harbor, it would remove 1,272 tpy. **MPCA must re-evaluate application of ROFA+Rotamix at its true capability.**

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[4] Once a technology is determined to be technically feasible, the remaining steps in the BART analysis must be conducted.

[5] "The Viability and Economics of Adding a ROFA®/Rotamix® MobotecSystem to a Selective Catalytic Reduction (SCR) Installation" Edwin E. Haddad, P.E, Jay S. Crilley, P.E., and Brian S. Higgins, Ph.D., Mobotec USA Inc. NETL/DOE 2003 Conference on SCR and SNCR for NO_X Reduction Pittsburgh, PA October 29-30, 2003

[6] ROFA: At full load, ROFA alone reduced NOx from 0.58 lb/mmBtu to 0.22 lb/mmBtu. This amounts to a 62% reduction in NOx. There is a small power draw associated with the ROFA fan, but there is also a drop in stack temperature (discussed later). These two effects counter each other and we can assume that the efficiency does not change appreciably. Therefore, there are no significant O&M costs associated with the ROFA NOx reduction.

Rotamix: At full load, Rotamix (urea) further reduced NOx from 0.22 lb/mmBtu to 0.10 lb/mmBtu. This is a further 55% reduction in NOx over-and-above the ROFA reduction. Since urea is injected, there are additional chemical costs. Further, there is an ambient fan installed at Vermilion for the Rotamix system. This fan draws less than 20 kW during full-load operation.

MobotecSystem: The costs per ton of NOx removed can be calculated for the ROFA & Rotamix installation. At full load, the MobotecSystem (ROFA and Rotamix) reduced NOx from 0.58 to 0.10 lb/mmBtu. This is an 83% reduction in NOx.

"SCR Levels of NOx Reduction with ROFA and Rotamix (SNCR) at Dynegy's Vermilion Power Station," Kristopher A. Coombs, Sr., Dynegy Midwest Generation; Jay S. Crilley, Mark Shilling, and Brian Higgins, Mobotec USA; Presented at: 2004 Stack Emissions Symposium Clearwater Beach, FL July 28-30, 2004

Step 4 - Evaluate Impacts and Document Results

NPS: Despite having already determined that NSM's control costs for SO_2 were "highly inflated," MPCA accepted NSM's costs of ROFA+Rotamix without question. **NSM has overestimated the costs of ROFA+Rotamix.** For example, NSM estimated an Installed Capital Cost of $25,310,000 and an Annual Cost of $8,070,000 for its 75 MW boiler. By comparison, MN Power estimated an Installed Capital Cost of $8,113,000 and an Annual Cost of $2,876,000 at its same-size Taconite Harbor facility. NSM has not documented or justified the costs presented in its cost analyses, and has included costs for SO_2 control in its NO_x control cost analyses. **MPCA must re-evaluate application of ROFA+Rotamix at its true cost.**

Step 5 - Evaluate Visibility Impacts

MPCA p 665: CALPUFF modeling was not rerun for this source; however, emission rates for this unit projected by EPA's Integrated Planning Model are incorporated into the 2018 regional scale modeling performed.

NPS: In its BART submittal, NSM observes that, "Based on the conditions at this location, NO_X emissions are more culpable for impacting visibility than SO_2 emissions by **nearly** a factor of 2." Our review of the NSM modeling results indicates that NO_X emissions are more culpable for impacting visibility than SO_2 emissions by **more than** a factor of 2. Either way, this finding indicates that the value of reducing NO_X is substantially greater than for SO_2 and this should be considered in the BART determination.

Although NSM presented visibility impact results for each of its control strategies at BWCA, it should have provided similar results for the other two Class I areas where the Silver Bay plant causes or contributes to visibility impairment (I.e., Voyageurs and Isle Royale National Parks). NSM estimated that its proposed BART strategy, LNB+OFA would yield a reduction of 446.8 tpy at an annual cost of $640,000 and would improve visibility at BWCA by 0.51 dv, resulting in a cost-effectiveness at BWCA of $1,250,000/dV.

MPCA did not include any consideration of visibility impacts in its review report.

Assuming that visibility improvement is directly proportional to the reduction in annual emissions, we estimate that the approximately three-fold reduction that could be achieved by application of ROFA+Rotamix would improve visibility at BWCA by about 1.5 dV. If we also assume that the annual cost for this reduction, based upon the Taconite Harbor BART proposal, is similar ($3 million), the cost-effectiveness becomes $2 million/dV.

Determine BART

MPCA p 665: BART appears to be the use of Low-NO_X burners and overfire air on Boiler 2 to achieve an emissions rate of 0.40 lb/mmBtu.
NPS: **MPCA has proposed limits that are almost three times higher than it proposed for MN Power's Taconite Harbor plant and almost half-again the limits it proposed at Rochester Public Utility's Silver Lake plant, both of which are similarly-sized facilities and burn coal.** While Taconite Harbor and Silver Lake would be installing Mobotec's multi-pollutant control technology, Silver Bay would be allowed to install only the much-less-efficient (and cheaper) LNB/OFA to achieve 40% control.

Sulfur Dioxide Control

Following is our application of the five-step approach recommended by EPA's BART Guidelines:

Step 1 - Identify all Available Retrofit Control Technologies

NPS: NSM identified a reasonable range of control options.

Step 2 - Eliminate Technically Infeasible Options

MPCA p 662: The MPCA does not believe that the two alternatives that rely on water to remove SO_2 from the flue gases can be determined to be BART technologies. Wet electrostatic precipitators (wet ESPs) and absorbers have substantial negative non-air quality environmental impacts as they would require expanded wastewater discharges into Lake Superior, an outstanding resource value water with special protections. Securing permits for such a discharge would be exceedingly difficult and prolonged, calling into question whether such wet control devices could become operational during the BART timeline. Because dry controls without water treatment requirements are available to achieve equal or better results, without the same environmental drawbacks, the MPCA has eliminated wet controls from further evaluation.

NPS: MPCA eliminated all wet-scrubbing options because of potential wastewater discharges. Instead, MPCA should have addressed this issue in the context of the costs associated with mitigating those discharges.

Step 3 - Evaluate Control Effectiveness

NPS: NSM has grossly underestimated the capability of wet scrubbing to reduce SO_2 beyond the 80% it estimated. It is generally-accepted that wet scrubbing can achieve at least 90% control, and typically 95% or better.

Step 4 - Evaluate Impacts and Document Results

MPCA p 662: Cost estimates provided by NSM for dry sulfur dioxide control were significantly higher than those provided to the MPCA by other electric generators with similar sized boilers. Therefore, the MPCA conducted its own assessment of likely capital and operating costs related to SO_2 scrubbing. In addition to interviewing NSM and its engineering consultant, MPCA surveyed three vendors that provide scrubbers and fabric filters to the power industry. Each vendor reported likely equipment costs significantly below equipment costs included in Cliffs' analysis. Each vendor volunteered equipment cost estimates from similar-sized projects recently purchased or installed. EPA's Control Cost Manual was relied on to generate the full project cost estimate. All costs are budgetary estimates, with an expected precision of +/- 30%.
NPS: We commend MPCA for conducting an independent review of Northshore's cost estimates. Because MPCA found that NSM had likely overestimated its control costs, it made an excellent effort to re-evaluate the spray drying/fabric filter strategy that NSM rejected on the bases of those overestimated costs. (However, we do question the need for a complete replacement of the existing fabric filter.) MPCA estimated that the spray dryer/fabric filter combination would achieve 90% control and remove 1,469 tons of SO_2 per year at an annual cost of $5,777,000 with a cost-effectiveness of $3,574/ton.[7]
MPCA p 663: EPA's Cost Control Manual was relied on to generate the full project cost estimate.
NPS: We agree with MPCA that this is the appropriate approach.

Step 5 - Evaluate Visibility Impacts

MPCA p 665: CALPUFF modeling was not rerun for this source; however, emission rates for this unit projected by EPA's Integrated Planning Model are incorporated into the 2018 regional scale modeling performed.

NPS: Although NSM presented visibility impact results for each of its control strategies at BWCA, it should have provided similar results for the other two other Class I area where the Silver Bay plant causes or contributes to visibility impairment. NSM estimated that a spray dryer/FF would yield a reduction of 1,544.9 tpy at an annual cost of $13,140,000 and would improve visibility at BWCA by 0.397 dV, resulting in a cost-effectiveness of $32,100,000/dV.

MPCA did not include any consideration of visibility impacts in its review report.

Assuming that visibility improvement is directly proportional to the reduction in annual emissions, we estimate that the 1,628 tpy reduction that could be achieved by application of the spray dryer/FF combination would improve visibility at BWCA by about 0.42 dV. If we also assume that the annual cost for this reduction is similar to the $5.8 million

[7] Our inspection of MPCA's "Appendix A: Assessing Cost Estimates at Northshore Mines Silver Bay Power Plant" leads us to believe that the MPCA conclusions were based upon data estimating that the spray dryer/fabric filter combination would achieve 90% control and remove 1,545 tons of SO_2 per year at an annual cost of $5,776,563 with a cost-effectiveness of $3,739/ton.

annual cost estimated by MPCA, the cost-effectiveness at BWCA becomes $14 million/dV, which is reasonable because it is lower than the $17 million/dV average cost per dV proposed by either a state or a BART SO_2 sources[8] is $10 - $17 million.[9]
We agree with MPCA that the installation of a spray dryer upstream of an upgraded fabric filter to achieve an emission limit 0.06 lb/mmBtu is BART for this source.

Determine BART

SO_2: We commend MPCA for determining that a more stringent level of SO_2 control than that proposed by NSM is BART, and that MPCA considers an SO_2 emissions rate of 0.06 lb/mmBtu to be BART for this unit. MPCA proposes that this emissions rate can be achieved with the use of spray drying/fabric filters.

Multi-pollutant Controls

MPCA p663: Two options have been developed that can be described as multi-pollutant controls, that is, a single technology will address control of both NO_X and SO_2. MPCA states that cost-effectiveness of using these technologies cannot be assessed for each pollutant alone as done previously, but appear to be best evaluated by considering the total amount of NO_X and SO_2 reduced.

MPCA requested NSM to evaluate the installation of ROFA with Rotamix and FSI for controlling NO_X and SO_2 because the technology has been installed at three coal-fired units in Minnesota with successful results.

ROFA is generally equivalent to overfire air in which a portion of the combustion air is withheld from the primary combustion zone and transferred to a higher elevation in the furnace. The component called "Rotamix" is a selective noncatalytic reduction technique where urea is injected into the boiler. SO_2 removal is accomplished by FSI—injection of hydrated lime. The bound SO_2 reaction products, unreacted lime and flyash, are then captured downstream by the particulate control device.

The second multi-pollutant option is NSM's proposal to combust 20% biomass in both units. The biomass proposal consists of co-firing biomass at both Units 1 and 2 at a rate of 20% or greater of total heat input. Co-firing involves displacing some coal with biomass. Because of the near-absence of sulfur in biomass, SO_2 emissions are reduced proportionately with the increased use of biomass on a heat input basis. Concurrent with the use of biomass to replace coal is the need to replace burners with Low-NO_X Burners (LNB) and Over-Fire Air (OFA). LNB are needed to feed enough fuel into the boiler, while additional combustion air from the OFA will extinguish any flaming biomass ash particles that might carry out of the boiler itself, thus maintaining the integrity of the fabric filters used for particulate matter control.

[8] http://www.wrapair.org/forums/ssjf/bart.html
[9] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

NPS: While we agree that a multi-pollutant approach that combines reductions at the BART-eligible Unit #2 with reductions at the BART-exempt Unit #1 is reasonable,[10] MPCA has not executed this approach correctly. In order to use this plant-wide cap approach, MPCA must show that the improvement to visibility is greater than with a conventional BART application to Unit #2. MPCA could do this by showing that each BART pollutant is reduced more than it would have been had the conventional approach been used, or by modeling both the conventional BART emissions and comparing them to its proposed BART emissions—MPCA did neither.

MPCA p 664: The MPCA evaluated a biomass co-firing project that involves both units as BART for a number of reasons. First, it is appropriate to evaluate work practices that result in lower "production-specific emissions" within a BART analysis, and states are encouraged in EPA's BART guidance to consider "inherently lower-emitting processes/practices".6 Secondly, BART guidance notes that there are situations "...where a set of units within a fenceline constitutes the logical set to which controls would apply and that set of units may or may not all be BART eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)"

NPS: We agree with MPCA that this is the appropriate approach.

Particulate Matter 10 microns and smaller

MPCA p 665: MPCA has determined that the existing control technology, a fabric filter (FF) baghouse, represents BART. However, the MPCA does not believe that the proposed total PM limit of 0.6 lb/mmBtu (the total PM emissions limit in the current operating permit) reflects BART. The current operating permit, however, also imposes a PM_{10} emissions limit of 0.046 gr/dscf. MPCA believes that this is a more appropriate emissions limit reflecting BART for this unit because it regulates a larger portion of PM emissions currently exiting the unit and is more in keeping with the operations of a fabric filter.

NPS: MPCA has determined that the existing control technology, fabric filter baghouses, represents BART. While we agree, MPCA has presented no justification for a PM_{10} limit that is almost eight times higher (when converted to lb/mmBtu) than that proposed for MN Power's Taconite Harbor Unit #3 (0.094 lb/mmBtu versus 0.012 lb/mmBtu).

[10] According to EPA's BART Guidelines: There may be situations where a specific set of units within a fence-line constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)…You should consider allowing sources to "average" emissions across any set of BART-eligible emission units within a fence-line, so long as the emission reductions from each pollutant being controlled for BART would be equal to those reductions that would be obtained by simply controlling each of the BART-eligible units that constitute BART-eligible source.

MPCA Determination of the BART Limit

MPCA pp 665-66: In other utility BART determinations, MPCA evaluated the reduction requirements for NO_X and SO_2 individually without regard to total cost of the project, primarily because the options did not rely on multi-pollutant control strategies. In this instance, the MPCA requested the facility owner evaluate a multi-pollutant control strategy while NSM itself requested that one be evaluated as a potential BART alternative.

If the MPCA were to rely on pollutant by pollutant reduction options, BART appears to be the use of Low-NO_X burners and overfire air on Boiler 2 to achieve an emissions rate of 0.40 lb/mmBtu, and spray drying/fabric filters to achieve an SO_2 emissions rate of 0.06 lb/mmBtu. The total annualized cost of these controls, based on the MPCA's recalculation of spray drying, is shown in Table 6 below. The cost-effectiveness of this combined pollutant reduction is $2,634. This cost is nearly indistinguishable from the biomass co-firing alternative preferred by NSM and modified by the MPCA (inclusion of Low-NO_X burners and OFA on Boiler 1).

Table 6. Multi-pollutant control options at Silver Bay Power

Control Technology	NOx Emissions Rate Lb/mmBtu	SO2 Emissions Rate Lb/mmBtu	Total Tons Reduced	Total Annualized Costs	$/ton total Pollutant Reduced
LNB/OFA and SD/FF					
Unit2	0.40 (40% reduction)	0.06 (90% reduction)	2,437 808 tpy NOx 1,628 tpy SO2	$6,258,000	$2,568
Co-firing Biomass in Units 1 and 2					
Unit1 Unit2	0.41 0.40	0.41 0.48	1981 1,159 tpy NOx 583 tpy SO2	$4,809,000	$2,761

The limits in MPCA's Table 7 represent its determination of BART:

Table 7. BART Limits for Silver Bay Power

	NOx Limit	SO2 Limit	PM10 Limit*
Unit1			
	0.41 lb/mmBtu	0.41 lb/mmBtu	<0.046 gr/dscf
	30-day rolling average	30-day rolling average	(limit in existing permit)
Unit2			
	0.40 lb/mmBtu	0.48 lb/mmBtu	<0.046 gr/dscf
	30-day rolling average	30-day rolling average	(limit in existing permit)

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS: Not only is BART not necessarily the most cost-effective option, it is also not necessarily the least-expensive option. In this case, the LNB/OFA and SD/FF option provides the greatest total reduction of NO_x + SO_2 at a cost that is lower per ton of

pollutant removed than the option allowed by MPCA. However, because NSM's modeling analyses indicate that NO_x reductions may provide more visibility reduction on a ton-for-ton basis, MPCA may be able to show that co-firing biomass will result in more visibility improvement than the LNB/OFA and SD/FF option, or that NSM can not afford the higher annual costs of the LNB/OFA and SD/FF option.

MPCA p 666: Compliance with the NO_X and SO_2 limits will be through the use of CEMs. Compliance with the PM_{10} value will be through periodic performance testing.
NPS: We agree that CEMs are the most appropriate method to determine compliance.

BART Alternative

MPCA pp 666-67: As indicated in the Regional Haze SIP, the MPCA's determination of a specific BART limit does not preclude facilities from proposing alternatives to BART as they work towards BART compliance. This section further elaborates what the MPCA would consider as acceptable BART alternatives, subject to EPA approval of Minnesota's Regional Haze SIP and BART determinations.

NSM may choose to propose a BART Alternative project that is equivalent or better than BART. The BART Alternative must result in equivalent or greater emissions reductions and visibility benefits from the facility when compared to the MPCA's BART determination.
Should NSM choose to propose a BART alternative, the proposal must include:

- A demonstration of equivalent or greater combined annual emission reductions of NO_x and SO_2 (in tpy) than that established in this BART determination;
- Appropriate visibility modeling demonstrating equivalent or greater visibility protection than the MPCA's BART determination; and
- A proposal for enforceable emission limitations, with appropriate and justified averaging periods and methods for evaluating compliance.

Since the facility would be proposing an alternative to MPCA's BART determination, visibility modeling should follow the MPCA's *Guidance for Facilities Conducting a BART Analysis*[10] and *Best Available Retrofit Technology (BART) Modeling Protocol to Determine Sources Subject-to-BART in the State of Minnesota*,[11] using the most recent versions of any model or EPA guidance referenced in those documents. The modeling should compare the baseline, pre-control scenario to post-control scenarios representing the MPCA's BART determination and the BART alternative being proposed by the facility.

NSM may propose a BART alternative that covers multiple BART units or both BART and non-BART units at the facility in the same source category. A proposal covering BART and non-BART units must demonstrate greater emission reductions and more visibility improvement than MPCA's BART determination. The MPCA would evaluate this proposal in consultation with the Federal Land Managers and determine if it is an acceptable BART alternative. If the MPCA accepts the proposal as such, the resulting emission limits would be placed in the facility's permit and noted as BART emission

limits. Ultimately, EPA approval of an enforceable document (such as a Title V permit) containing BART emission limits will be necessary.

NPS: The MPCA proposal appears to contradict this statement from page 373 of its Responses to Comments: "As described in our Northeast Minnesota plan, we seek reductions in both pollutants, and have not weighed one over another."

Nevertheless, MPCA must show that its BART-Alternative would achieve greater reductions of both NO_x and SO_2 than conventional BART, or that it would produce greater visibility benefits. We believe that the emission reduction targets should be at least 1,272 tpy NO_x and 1,628 tpy for SO_2. Instead, MPCA is proposing reductions of 1,159 tpy for NO_x and 583 tpy for SO_2. Even if one accepts the MPCA proposal that conventional BART is 808 tpy NO_x and 1,628 tpy for SO_2, its proposal falls short of the SO_2 target (as do the combined reductions).

We also have a concern about how such an alternative BART proposal would be implemented in this special situation. Unless the alternative is implemented on a daily basis, some days would continue to experience the current high emissions. Because the visibility analysis compares the past maximum emissions day to the future maximum emissions day, there would be no change and no improvement.

NPS Conclusions & Recommendations

- We commend MPCA for its application of the BART factors to this small EGU.
- MPCA improperly rejected SCR in a high-dust location as being technically infeasible.
- MPCA's rejection of ROFA+Rotamix is unjustified and inconsistent with its proposed uses at Taconite Harbor and Silver Lake.
- MPCA eliminated all wet-scrubbing options because of potential wastewater discharges. Instead, MPCA should address this issue in the context of the costs associated with mitigating those discharges.
- NSM has grossly underestimated the capability of wet scrubbing to reduce SO_2 beyond the 80% it estimated.
- We commend MPCA for determining that NSM had likely overestimated its SO_2 control costs and for its independent and thorough re-evaluation of those strategies.
- We commend MPCA for determining that installation of a spray dryer upstream of an upgraded fabric filter to achieve an emission limit 0.06 lb/mmBtu is BART for Boiler #2.
- MPCA has presented no justification for a PM_{10} limit that is almost eight times higher than that proposed for MN Power's Taconite Harbor Unit #3.
- MPCA did not evaluate the visibility improvements that would result from its proposed BART and did not demonstrate that its proposed BART alternative is better than BART. For this reason, MPCA's proposed BART alternative does not satisfy EPA criteria and is not acceptable.

Rochester Public Utilities – Silver Lake Plant; Units 3 and 4
MPCA 4/29/09 report and subsequent Responses to Comments

Rochester Public Utilities (RPU) operates a bituminous coal and natural gas-fired steam-electric generating station known as the Silver Lake Plant (SLP) in Rochester, Minnesota. The facility has a total nominal generating capacity of 100 megawatts (MW) gross, and the largest unit (Unit 4) has a capacity of around 60 MW. According to EPA's Clean Air Markets Database, in 2007, SLP ranked #380 in the U.S. in sulfur dioxide (SO_2) emissions at 1,837 tons and #476 for nitrogen oxides (NO_X) emissions at 482 tons.

Unit 3 has a capacity of 24 MW. Units 3 and 4 were constructed in 1962 and 1969, respectively. Modeling analyses conducted by MPCA have determined that SLP causes or contributes to visibility impairment in the Boundary Waters Canoe Area.

MPCA BART Analysis

RPU was not requested to submit a BART analysis for SLP Unit 4 since they have proceeded with an air pollution control retrofit project for the targeted visibility pollutants (particulate matter—PM, SO_2, and NO_X). A BART analysis was not requested by the MPCA because all of the following criteria were met:

- The MPCA had sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART;
- Public Utility Commission (PUC) approvals for the reductions were in place; and
- The MPCA determined that planned emission reductions represented BART.

The MPCA issued permit no. 10900011-004 on September 7, 2007, that allows Unit 4 to be retrofitted with additional controls. This pollution control project on Unit 4 is not required by rule or statute, but satisfies the terms of a 2006 settlement agreement. MPCA is a party to the settlement agreement. The planned project at SLP will install additional pollution control equipment for SO_2, PM, and NO_X on Unit 4.

Under the settlement terms, RPU is required to install and operate "a NO_X emission reduction system that is designed to achieve at least a 0.15 lbs/mmBtu emission rate for NO_X." This will be achieved through installation of the control technology known as 'Mobotec.' Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX Selective Non-Catalytic Reduction (SNCR) with furnace urea injection for NO_X control. The MPCA has determined that installation of the Mobotec system represents BART for NO_X on Unit 4. Initial operation of Mobotec has shown an emission rate of 0.25 lbs/mmBtu is achievable on a 30-day rolling average basis.

Given that further optimization will be necessary to achieve the proposed BART limit, the NO_X limit of 0.25 lbs/mm Btu is appropriate at this time. **The limit set by the MPCA is lower than that in RPU's current permit and ensures reductions of NO_X that, when combined with the operation of the associated SO_2 controls, will ensure that the facility drops below the 0.5 dv threshold for contributing to visibility impairment.**

SO_2 controls consist of installing a spray-dryer absorber designed to achieve a 70 - 85% removal rate. The MPCA has determined that installation of this system represents BART for SO_2 on Unit 4. To control PM, the existing ESP will be replaced by a fabric filter that includes a bag leak indicator. The MPCA has determined that installation of this system represents BART for PM_{10} on Unit 4.

The MPCA has determined that BART for Unit 3 is no additional control because Units 3 and 4 combined were found to be only "marginally" subject-to-BART and, as described, significant control upgrades are planned for Unit 4, the larger BART unit. Unit 4 impacted visibility more than Unit 3 as Unit 4's 2002 SO_2 emissions were about four times those of Unit 3. Given the small impact on visibility by Unit 3, the MPCA has determined that the existing control equipment represents BART for this unit. This includes multi-cyclones in series with electrostatic precipitators for PM_{10} control. There are permit limitations for SO_2 and PM_{10}; the unit is not subject to any NO_X emission limit or control requirement.

CALPUFF modeling was not rerun for this source; however, the controlled emission rates are approximated in the 2018 regional scale modeling performed.

	NOx Limit	SO_2 Limit (lb/mmBtu)	PM_{10} Limit* (lb/mmBtu)
Unit 3	No limit	< 2.30	<0.4
		(operating alone; 1-hr, 3-hr,	
		24-hr block average)	
Unit 4	< 0.25	< 0.60	<0.4
	(30 day average)	(1-hr, 3-hr, 24-hr block average)	

*PM_{10} limit includes filterable plus organic and inorganic condensibles.

NPS BART Analysis

NO_X: While we agree with the control strategy proposed by RPU/MPCA, we are puzzled by MPCA's statement that, "The 2.3 lbs/mmBtu limit on Unit 3 and 0.6 lbs/mmBtu limit on Unit 4 would likely have been sufficient to make the facility not subject-to-BART, had the controls been chosen at the time the MPCA did the BART modeling. The 0.6 lbs/mmBtu SO2 limit on Unit 4 is appropriate and sufficient to ensure that the control is operated and reduces the facility's visibility impact." Instead, we believe that the BART limits should more-fully reflect the capabilities of the technology. For example, MN Power and MPCA have proposed that Taconite Harbor Unit #3 meet 0.13 lb/mmBtu using the same control technology on a similar-sized coal-fired boiler. Because MPCA has stated elsewhere that its BART determinations are not dependent upon the degree of visibility improvement, we request that MPCA set its BART limits to maximize the capabilities of the chosen control technology. Furthermore, even if RPU were to have avoided BART, it would still have been subject to review under the Reasonable Progress requirements of the Regional Haze Rule.

SO_2: MPCA appears to be confusing generic control technology requirements with BART. The visibility regulations define BART as follows:

> Best Available Retrofit Technology (BART) means an **emission limitation** based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by... [a BART -eligible source]. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

While the SO_2 control technology proposed by MPCA may be capable of achieving BART, without an appropriate **emission limit**, the BART requirement is not satisfied. We recognize that MPCA is proposing that the 0.60 lb/mmBtu BART limit be enforced over short-term periods (to address a local NAAQS problem), but the proposed limit does nothing to prevent SLP from operating at this high emission rate continuously. Clearly, the proposed control technology is capable of achieving much lower emissions over the longer (24-hour block, 30-day rolling, annual) averaging periods used in BART analyses.

In its BART analysis, MPCA states, "SO_2 controls consist of installing a spray-dryer absorber designed to achieve a 70 - 85% removal rate." Not only is this assertion not reflected in the proposed BART limit, a spray-dryer/fabric filter combination as proposed for SLP can achieve at least 90% SO_2 reduction.[1] MPCA must evaluate the actual potential of this technology, propose appropriate emission limits, and explain how it arrived at its proposed limits.

PM: According to MPCA, "To control PM, the existing ESP will be replaced by a fabric filter that includes a bag leak indicator. The MPCA has determined that installation of this system represents BART for PM_{10} on Unit 4."

Once again, we agree that the technology has the potential to represent BART, but that the proposed emission limit, 0.4 lb/mmBtu, does not. For example, MN Power and MPCA have proposed that Taconite Harbor Unit #3 meet 0.012 lb/mmBtu using the same control technology on a similar-sized coal-fired boiler. MPCA must explain why the RPU boiler should be allowed 33 times the PM_{10} emission rate as Taconite Harbor.

Conclusions & Recommendations

- MPCA must conduct a five-step BART analysis (or equivalent) and justify its proposed limits.
- The control technologies proposed have the potential to represent BART, but the proposed limits do not reflect the levels of control achievable with these technologies.
- MPCA has not justified a NO_X limit that is almost twice the NO_X emission limit proposed for Taconite Harbor which would use the same technology.

[1] For example, in Table 5-2 of the Northshore Mining Silver Bay power plant BART analysis, it is estimated that the spray-dryer/fabric filter combination can achieve 90% control.

- The proposed SO_2 and PM_{10} limits do not reflect the capability of the proposed spray-dryer absorber/fabric filter combination. (MPCA has proposed a PM_{10} limit that is 33 times the PM_{10} emission rate it proposed for Taconite Harbor.) MPCA must evaluate the actual potential of the proposed SO_2 and PM_{10} control technologies, propose appropriate emission limits, and explain how it arrived at those limits.

Xcel Energy's Sherburne County Generating Plant (Sherco)
MPCA 5/19/09 report and subsequent Responses to Comments

Xcel Energy's (Xcel) Sherburne County generating plant (Sherco) consists of three units with a total plant electrical output rating of 2,255 megawatts (MW). According to EPA's Clean Air Markets Database, in 2007, Sherco ranked #104 in the US in sulfur dioxide (SO_2) emissions at 25,493 tons and #14 for nitrogen oxides (NO_x) emissions at 25,683 tons. Unit 1 (690 MW net, installed in 1976) and Unit 2 (683 MW net, installed in 1977) are tangentially-fired. Units 1 and 2, the only BART-eligible units, each have a maximum rated heat input capacity of 7,111 mmBtu/hr. Sub-bituminous coal is the primary fuel for all three power boilers.

The air pollution control equipment for Units 1 and 2 consists primarily of spray towers (wet scrubbing) and wet electrostatic precipitators (WESPs) to control particulate (PM) and SO_2 emissions. In 2007 Xcel installed Low-NO_X Burners (LNB), separated/close coupled Over-Fire Air (OFA) systems, and a combustion optimization system to reduce NO_X emissions from Unit 1. For Unit 2 NO_X, Xcel installed a computer-based combustion optimization system for the OFA system in 2006. These changes to Units 1 and 2 should allow Xcel to achieve a NO_X emission rate of 0.15 lb/mmBtu.

Information provided by Xcel estimates that Sherco Units #1 & #2 currently cause 2.68 deci-Views (dV) of visibility impairment at the Boundary Waters Canoe Area (BWCA), 2.34 dV of visibility impairment at Voyageurs National Park (NP), and 1.79 dV of visibility impairment at Isle Royale National Park NP.

Xcel BART Proposal
SO_2: Based on…incremental costs, the **most cost-effective option** for optimal SO_2 control is retrofitting the existing scrubbers with sparger tubes and lime injection…Xcel Energy firmly believes the most cost-beneficial visibility improvements will be brought about by retrofitting the existing wet scrubbers with sparger tubes and lime injection.

NO_X: Based on…incremental cost, the **most cost-effective option** for NO_X control for Unit 1 is the installation of a combustion optimization system, and LNB and SOFA. **Based on …incremental cost**, the most cost-effective option for NO_X control for Unit 2 is installation of a combustion optimization system… Xcel Energy firmly believes the most cost-beneficial visibility improvements will be brought about by installing new LNB, a separated/close coupled OFA system, and a combustion optimization system for Unit 1, and a combustion optimization system for Unit 2.

MPCA BART Analysis
Xcel was requested by the MPCA to perform a BART analysis for Sherco because the MPCA did not have sufficient information about planned emission reductions at the time facilities were notified that they were subject to BART (March 2006). A BART analysis dated October 27, 2006, for Sherco Units 1 and 2 was submitted to the MPCA by Xcel.1

The MPCA has determined that the NO_X emissions limitation of 0.15 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limits are achieved

with LNB and OFA at Sherco 1 and additional computerized combustion controls on Unit 2. The technology achieves the "presumptive BART" emissions rate, and does not prohibit or prevent the future installation of any known additional NO_X control technology.

As shown in [MPCA's] Table 2, at this time SCRs are an order of magnitude more expensive than other NO_x controls. Xcel determined that implementing SCRs on these units would be $40 million (annualized) above the cost of proposed BART, and result in only 3,500 additional tons of NO_x removal. Getting only 1.5 times the pollutant reductions at greater than ten times the cost is not cost-effective for BART.

In the case of Sherco, the incremental cost-effectiveness did not result in the selection of the cheapest control. Xcel described in its BART analysis an incremental cost curve with a period of small increases followed by the exponential cost increases. The BART technology chosen is generally the last technology on the more moderate portion of the curve.

The MPCA has determined that the SO_2 emissions limitation of 0.12 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limit is achieved with the installation of sparger tubes in the existing scrubbers and the injection of lime to lower pH of the scrubbing system. The technology achieves the "presumptive BART" emissions rate, and does not prohibit or prevent the future installation of any known additional SO_2 control technology.

The MPCA has determined that the existing particulate control represents BART and the existing permit limit for PM_{10} is an appropriate BART limit.

CALPUFF modeling was not rerun for this source. The 2018 regional-scale modeling does reflect the 2006 and 2007 combustion control upgrades to Units 1 and 2. The MPCA will include revised emission rates that reflect approved control upgrades for the 2012 State Implementation Plan report regional-scale modeling.

MPCA Determination of the BART Limit

The following limits represent the MPCA's determination of BART for Units 1 and 2.

NO_X Limit	**SO_2 Limit**	**PM_{10} Limit***
0.15 lb/mmBtu	0.12 lb/mmBtu	0.09 lb/mmBtu
on a 30-day rolling average	on a 30-day rolling average	

*PM10 limit includes filterable plus organic and inorganic condensibles.

NPS BART Analysis

Contrary to MPCA's assertion,[1] the BART Guidelines are **not** discretionary in this case. While the guidelines and the presumptive BART limits apply to Units #1 & #2, Xcel and

[1] MPCA response to comments, p 368.

MPCA must still conduct a complete, five-step analysis to determine if the presumptive limits are appropriate for this particular case. Although MPCA did not do so, Xcel did provide sufficient data for NPS to conduct an independent analysis.

The key to MPCA's BART proposal appears to reside in this statement: "…SCRs are an order of magnitude more expensive than other NO_x controls. **Xcel determined** that implementing SCRs on these units would be **$40 million** (annualized) above the cost of proposed BART, and result in only **3,500 additional tons** of NO_x removal. Getting only **1.5 times the pollutant reductions** at greater than **ten times the cost** is **not cost-effective** for BART." (emphasis added) We shall address each point of that statement in our discussion below.

NO_X: Xcel/MPCA have proposed that the NO_X emissions limitation of 0.15 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limits are achieved with LNB and OFA at Sherco 1 and additional computerized combustion controls on Unit 2. According to Xcel, the emission reductions would result in 0.57 dV of visibility improvement at BWCA at a cost-effectiveness ratio of $5 million/dV, and 1.44 dV of improvement across all three Class I areas.

Step 1 - Identify all Available Retrofit Control Technologies
Xcel identified a reasonable range of control options.

Step 2 - Eliminate Technically Infeasible Options
Xcel rejected several options to reduce NO_X for the following reasons:

- Mobotec's Rotamix® system, LoTOx® and the ECOTUBE® approaches were rejected because neither has been demonstrated on units this large. However, Xcel provided no reason why none of these technologies could be transferred[2] from similar, but smaller applications, such as at MN Power's Taconite Harbor facility.
- NO_xStar® and gas re-burn were rejected due to there being no natural gas line to the plant.

Step 3 - Evaluate Control Effectiveness
Xcel and MPCA have underestimated the effectiveness of SCR by assuming that SCR can only achieve 0.08 lb/mmBtu on an annual basis. (Xcel estimates that this approach would result in 0.88 dV of visibility improvement at BWCA and 2.14 dV of improvement across all three Class I areas.) Not only is this assumption unsupported, it is also inconsistent with the BART limit of 0.07 lb/mmBtu proposed by MPCA for the Minnesota Power Clay Boswell Unit #3 (which has higher uncontrolled NO_X emissions). And, **MN Power has stated in its Taconite Harbor BART analysis that SCR is capable of achieving 0.05 lb/mmBtu.**

We are providing information from EPA's CAM database (in Appendix A) that demonstrates that 21 tangentially-fired boilers similar to the Sherco units can achieve 0.05 lb/mmBtu or lower when equipped with SCR.

[2] see the BART Guidelines on technical feasibility

MPCA has stated that SCR would "…result in only **3,500** additional tons of NO_x removal." Even if we relied upon Xcel's estimates, the difference between the MPCA/Xcel proposal for BART and their estimates for NO_X removed by SCR totals **3,800** tons per year. If we recognize that SCR can reduce NO_X to 0.05 lb/mmBtu (or less) on an annual basis and apply MPCA's mathematical approach, true utilization of SCR would remove an additional 1,644 tpy for a total of **5,444** tpy more reduction from SCR than from the MPCA/Xcel BART proposal. So, instead of obtaining only the "**1.5 times the pollutant reductions"** of the MPCA/Xcel BART proposal as stated by MPCA, **full utilization of SCR would provide more than 1.8 times the proposed reductions.**

Step 4 - Evaluate Impacts and Document Results
MPCA states that SCR is "**not cost-effective** for BART." The core purpose of the BART program is to improve visibility in our Class I areas. **BART is not necessarily the most cost-effective solution** but instead, BART represents a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors. We believe that it is essential to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected.

MPCA states that, "Xcel determined that implementing SCRs on these units would be **$40 million** (annualized) above the cost of proposed BART." Even taken at face-value, that statement is false. Using the costs presented by MPCA/Xcel, the total annualized cost for combustion controls plus SCR at both Sherco #1 + #2 is $33 million, and the difference between total annualized costs for the MPCA/Xcel BART proposal and SCR is $30 million.

Additionally**, Xcel and MPCA have overestimated the cost of SCR.** EPA guidance states, "The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual). In order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual, where possible."

Instead, Xcel (and, by default, MPCA) relied upon the CueCost program to generate cost estimates. Xcel included some very questionable and unsupported assumptions in its input to the CueCost model, which resulted in some extraordinarily high cost estimates. For example, Xcel chose the highest available retrofit factor with no justification or explanation. Instead of relying upon the 7% interest rate recommended by the Cost Manual, Xcel used higher values, and Xcel ignored the availability of the Chemical Engineering Cost Index (recommended by EPA) and substituted its own (unsupported) value. The result of these and other questionable assumptions and estimates[3] is that, on a cost/ton basis, the Operation and Maintenance (O&M) costs for SCR at Sherco are two – four times greater than the O&M costs estimated by MN Power for SCR at its much smaller Boswell Unit #3.

[3] For example, Xcel estimated a catalyst cost of $356 per cubic foot compared to MN Power's estimate of $189 cubic foot.

Our contention that the Cost Manual should be the primary source for developing cost analyses that are transparent and consistent across the nation and provide a common means for assessing costs is further supported by this November 7, 2007, statement from EPA Region 8 to the North Dakota Department of Health:

> The SO_2 and PM cost analyses were completed using the CUECost model. According to the BART Guidelines, in order to maintain and improve consistency, cost estimates should be based on the OAQPS Control Cost Manual. Therefore, these analyses should be revised to adhere to the Cost Manual methodology.

We believe that this guidance from EPA directs Xcel and MPCA to revise their cost analyses to reflect a more-consistent use of the Cost Manual, or, at least, support and document their estimates.

NPS followed the EPA guidance and generated estimates of SCR costs based upon application of the OAQPS Control Cost Manual. We were able to estimate capital costs of about $66 and $49 million ($95/kW and $71/kW) for units #1 and #2, respectively. (Compared to the Xcel estimates of $105 and $90 million), annual costs of about $7.6 and $6.5 million (compared to the Xcel estimates of $18 and $15 million), and cost-effectiveness of $1,300/ton and $1,400/ton of NO_X removed (compared to the MPCA estimates of $2,500 and $4,500 per ton).[4] **Instead of the $33 million in annual costs presented by Xcel, and the $43 million implied by MPCA, application of the BART Guidelines leads to a much lower total annualized cost of $15 million.**

With respect to MPCA's statement that application of SCR would result in "greater than **ten times the cost"** of its BART proposal, one can simply compare the $2.7 million annual cost of the MPCA proposal to the $15 million annual cost of SCR estimated according to the BART Guidelines.

It is clear that **MPCA has based its cost analysis entirely upon the incremental cost** of SCR versus its BART proposal. While it is appropriate to consider incremental costs in addition to average costs, we have a concern with the over-emphasis placed by MPCA upon this factor and with the way in which the incremental cost analysis was conducted.[5] Because, in most cases, the cost of pollution control rises exponentially with control efficiency, the slope of the curve will also increase. For this reason, rigid use of incremental cost effectiveness will always result in the choice of the cheapest option if carried to this extent. (For example, if this approach were used to evaluate particulate controls, it is likely that all controls more expensive than a multiple cyclone would be rejected.) According to the NSR Workshop manual, "As a precaution, the difference in incremental costs among dominant alternatives cannot be used by itself to argue one dominant alternative is preferred to another." Instead, it should be used to compare closely performing options.

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[4] MN Power estimated $3,200/ton to add SCR at its Boswell Unit #3.

[5] EPA BART Guideline: "You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option."… "You should exercise caution not to misuse these [average and incremental cost effectiveness] techniques… [but consider them in situations where an option shows]…slightly greater emission reductions…"

We believe that our cost estimates, based upon application of the EPA BART Guidelines, are more "transparent" and more realistic than those presented by Xcel/MPCA and warrant further consideration of SCR by MPCA.

As noted above, MPCA justifies its decision by stating, "…the incremental cost-effectiveness did not result in the selection of the cheapest control. Xcel described in its BART analysis an incremental cost curve with a period of small increases followed by the exponential cost increases. The BART technology chosen is generally the last technology on the more moderate portion of the curve." If that is the case, then MPCA must compare the incremental cost of adding SCR at Sherco to the incremental cost of adding SCR at Boswell #3 and show that it is greater at Sherco.

On page 377 of its responses to comments, MPCA states that, "The MPCA believes that is has appropriately weighed the incremental costs in selecting BART for this facility, as described earlier. The outcome of the MPCA's deliberation is not unlike those made for similar-sized units in other states." That depends upon which states one looks to. For example, Wyoming has proposed SCR as BART on the 330 MW tangentially-fired Naughton Unit #3, and for Reasonable Progress on the 530 MW Bridger Units #3 & #4. And, Oregon has proposed SCR on the 617 MW Boardman plant as part of its Reasonable Progress strategy. And, of course, Boswell Unit #3 will meet 0.07 lb/mmBtu with SCR.

Step 5 - Evaluate Visibility Impacts

Our review of the Xcel modeling results indicates that NO_X emissions are more culpable for impacting visibility than SO_2 emissions; this finding indicates that the value of reducing NO_X is greater than for SO_2 and this should be considered in the BART determination.

As noted above, Xcel did provide information on the benefits of reducing NO_X (and SO_2) at the BWCA. For example, Xcel estimated that addition of SCR to Sherco #1 & #2 would reduce NO_X emission by 10,400 tpy and would result in 0.88 dV of visibility improvement at BWCA and 2.14 dV of improvement across all three Class I areas.[6] Xcel then compared the additional improvement that would result from SCR to the additional cost and estimated this "incremental" cost to be $95 million per dV. It appears that Xcel (inappropriately) relied heavily on this incremental cost analysis to eliminate SCR as a BART option.

In the case of NO_X control, it is especially important to evaluate the total option, not just the most expensive part. All new pulverized coal (PC)-fired EGUs of which we are aware use combustion controls (as proposed by Xcel) in combination with SCR. Although this increases the capital cost of the NO_X control system, by lowering the amount of NO_X that the SCR must treat, annual operating costs can be reduced substantially. Thus, NO_X controls for a modern PC boiler will consist of a relatively inexpensive combustion control system followed by a relatively expensive SCR. As states evaluate the cost-

[6] Visibility at BWCA improves by 0.00009 dV per ton of NOx removed, and by 0.00022 dV summed across all three Class I areas.

effectiveness of those NO_X control systems as part of their routine Best Available Control Technology analyses, we are not aware of any state that has ever suggested that the combustion controls and SCR should be evaluated separately. At Sherco, the "average cost effectiveness" analysis (as recommended by EPA) would yield $30 - $54 million/dV at BWCA using the Xcel cost estimates, and about $16 million/dV at BWCA using the NPS estimates derived from the EPA Cost Manual.

Compared to the typical control cost analysis in which estimates typically fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per dV to improve visibility may appear extraordinarily expensive. However, our compilation[7] of BART analyses across the U.S. reveals that the **average cost per dV proposed by either a state or a BART source is $9 - $19 million**,[8] with a maximum of almost $50 million per dV proposed by Colorado at the Martin Drake power plant in Colorado Springs.

Because Sherco causes visibility impairment in at least three Class I areas, it is appropriate to consider the improvements in all of those areas to properly asses the benefits of reducing emissions at Sherco. **With application of SCR at Sherco, the "average cost effectiveness" would yield $12 - $22 million/dV summed across the three Class I areas using the Xcel cost estimates, and about $7 million/dV using the NPS estimates derived from the EPA Cost Manual.** These values fall well within the range of "reasonableness" established by other states and BART sources.

SO_2: Xcel/MPCA have proposed that the SO_2 emissions limitation of 0.12 lb/mmBtu on a 30-day rolling average is BART for Sherco Units 1 and 2. The emission limit is achieved with the installation of sparger tubes in the existing scrubbers and the injection of lime to lower pH of the scrubbing system. According to Xcel, the emission reductions would result in 0.55 dV of visibility improvement at BWCA at a cost-effectiveness ratio of $4 million/dV, and 1.59 dV of improvement across all three Class I areas.[9]

While we agree that it generally makes sense to upgrade existing scrubbers, we believe that the upgraded Sherco scrubbers may be capable of achieving greater emission reductions than proposed by Xcel/MPCA. Based upon the coal quality data provided by Xcel, we estimate that current uncontrolled SO_2 emissions are 0.98 lb/mmBtu of this sub-bituminous coal. Therefore, the proposed 0.12 lb/mmBtu BART limits would represent an overall control efficiency of about 88%. By comparison, data in our BART compilation indicates that North Dakota has proposed BART limits for several EGUs that represent higher control efficiencies (Coal Creek @ 94%, Stanton @ 90%, M.R. Young @ 95%). For example, if Sherco were to upgrade its scrubbers to achieve 91% control, it could meet the same 0.09 lb/mmBtu limit proposed for Boswell #3. Xcel should show

[7] http://www.wrapair.org/forums/ssjf/bart.html

[8] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

[9] Visibility at BWCA improves by 0.00007 dV per ton of NOx removed, and by 0.00019 dV summed across all three Class I areas.

how it determined that the proposed scrubber upgrades could achieve only 88% control and why they cannot do as well as MN Power.

PM_{10}: The MPCA has determined that the existing particulate control represents BART and the existing permit limit (0.09 lb/mmBtu) for PM_{10} is an appropriate BART limit. Considering that this limit is more than six times higher than the limit proposed for MN Power's Boswell #3, Xcel and MPCA should have evaluated the existing wet electrostatic precipitators for potential upgrades.

Conclusions & Recommendations

- The BART limits proposed by Xcel/MPCA will allow Sherco to continue to cause visibility impairment at BWCA, Voyageurs NP, and Isle Royale NP.
- While reducing both NO_X and SO_2 emissions from Sherco are important, on a per-ton basis, reducing NO_X provides greater visibility benefits than reducing SO_2.
- It is important that regulatory agencies provide a level playing field and that they treat similar emission sources in a similar manner, unless exceptions are properly documented and justified. MPCA has provided no rationale for allowing Xcel to avoid SCR installation at Sherco while requiring MN Power to install SCR at its Bosewll Unit #3.
- Xcel and MPCA have underestimated the ability of SCR to reduce NO_X emissions and overestimated its costs. We believe that a proper five-factor analysis would conclude that SCR at 0.05 lb/mmBtu is BART for Sherco #1 & #2.
- Xcel/MPCA have provided no justification for the proposed SO_2 BART limit. We believe that the proposed scrubber upgrade may be able to achieve a lower SO_2 limit. For example, MPCA has proposed SO_2 limits of 0.09 lb/mmBtu at Boswell #3 and 0.06 lb/mmBtu at Northshore #2.
- Xcel/MPCA should evaluate potential upgrades to the existing wet ESPs.

The overarching principle driving the MPCA proposal is summed up in this statement:

> In addition to addressing BART at Sherco, Xcel has completed major projects within its generating system in Minnesota that have reduced air pollution substantially. Xcel has completed the retrofit of SCR and spray dryer/fabric filter at the Allen S King station in Oak Park Heights, and repowered the High Bridge and Riverside stations by retiring the coal fired units and constructing natural gasfired combined combustion turbines. This entire project, titled "Metropolitan Emissions Reduction Project" (MERP) and completed in 2010 with the demolition of Riverside coal units, results in the reduction of about 22,000 tons of NOx and 38,000 tons of SO_2.

While we are pleased that the citizens of the Twin-Cities metropolitan area are receiving some relief from Xcel's emissions, Xcel still must address its impacts in Voyageurs and Isle Royale National Parks.

Appendix A: SCR on Eastern Tangentially-Fired EGUs

If we **look at real-world hourly CAM emission data** for eastern EGUs retrofitted with SCR and operated during the summer ozone season--

["Appendix A. 2006 Tangentially-fired boiler Low NOx charts.xls"]

we see a consistent pattern of reductions from 0.3 - 0.6 lb/mmBtu down to 0.05 lb/mmBtu when the SCR is operating on these tangentially-fired EGUs. Here is a closer look at the period when the SCR was actually operating:

["Appendix A. Summary of 2006 Ozone Season data for Tangentially-fired EGUs.xls"]

The summary table indicates that there is little variation in average emissions depending upon averaging time. For example, **the average ozone-season average NO_x emission rate was 0.05 lb/mmBtu**, the average 30-day average was 0.052 lb/mmBtu, and the average 24-hour average was 0.051 lb/mmBtu. **Because most cost-effectiveness calculations should be based upon annual averages, it seems appropriate to assume an annual average emission rate of 0.05 lb/mmBtu for that task.**

The median values showed a little more variation than the average values, and lower than the average values, indicating that the distribution is skewed slightly by some of the higher emission rates.

Because the BART Guidelines recommend a maximum 30-day rolling average, we also have data for this parameter and it indicates much more variation, as one might expect for this extreme value.

I suggest that **the bottom section of the table is most important in that it attempts to relate the ozone-season average emission used in the cost calculations the 30-day average emission typically used in establishing permit limits.** At first glance, this data appears to support a 30-day limit of 0.08 lb/mmBtu, but take a look at this:

[“Appendix A. Widows Creek 8, 2006 ozone season.xls”]

If one had only the lb/mmBtu data, it would seem that there is a lot of variation in the 30-day average emission rates at Widow's Creek #8, and the maximum 30-day average is 2.6 times the average ozone-season average However, if one inspects the chart for the mass emission rates, it appears that these variations and differences are not so large. In fact, the tabulated values for the ratio of maximum 30-day average NOx mass (203 lb/hr) is only 1.2 times the ozone-season average (169 lb/hr) at Widow's Creek #8. I suspect that, because these EGUs are only required to meet mass emission limits--lb/hr instead of lb/mmBtu, that is how the SCRs are tuned. So, as load drops, there is no reason to maintain the SCR efficiency (and the lb/mmBtu rises), as long as the lb/hr limit is met. If that is the case, then it is probably more useful to look a the ratios of the mass emission

rates to determine the true ratio of maximum 30-day average to annual average emissions if the SCR were always operated to maximize its effectiveness; the tabulated results indicate that this ratio is 1.1:1 for these EGUs.

So what? Well, if we can assume that **a modern SCR retrofit can achieve 0.05 lb/mmBtu on an annual average**, and that an SCR that is operated to achieve its maximum effectiveness would typically result in **maximum 30-day average emissions no more than 1.1 times the annual average**, then we could assume that a **30-day rolling average limit of 0.06 lb/mmBtu would provide more than an adequate margin of safety for the EGU to operate.**

Appendix A.

STATE	FACILITY NAME	ORISPL CODE	UNIT ID	OP YEAR	ASSOC STACKS	PRG CODE INFO	SUM OP TIME	NUM MONTHS REPORTED	NOX RATE	NOX MASS	HEAT INPUT	OP STATUS INFO	UNIT TYPE INFO	PRIMARY FUEL INFO	NOX_CONTROL_INFO
VA	Chesterfield Power Station	3797	5	2008		NBP, ARP, CAIRNOX, CAIROS	3,602	5	0.03	165	10,814,785	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Separated OFA Selective Catalytic Reduction
TX	W A Parish	3470	WAP7	2008		ARP, CAIRNOX	3,635	5	0.04	393	19,046,097	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
PA	Keystone	3136	2	2008		ARP, NBP, CAIRNOX, CAIROS	3,660	5	0.04	605	28,579,775	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Selective Catalytic Reduction
VA	Chesapeake Energy Center	3803	4	2008		NBP, ARP, CAIRNOX, CAIROS	3,077	5	0.04	98	5,666,839	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
MD	Mirant Morgantown	1573	1	2008		ARP, NBP, CAIRNOX, CAIROS	3,280	5	0.04	313	14,535,587	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Ammonia Injection Selective Catalytic Reduction
TX	W A Parish	3470	WAP8	2008		ARP, CAIRNOX	3,602	5	0.04	466	21,252,090	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
VA	Chesterfield Power Station	3797	6	2008		NBP, ARP, CAIRNOX, CAIROS	3,482	5	0.04	382	18,722,140	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Selective Catalytic Reduction
MA	Brayton Point	1619	1	2008		ARP, NBP, CAIROS	3,458	5	0.05	135	7,164,182	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Selective Catalytic Reduction
TN	Kingston	3407	6	2008	CSKI69	NBP, ARP, CAIRNOX, CAIROS	3,493	5	0.05	140	5,749,073	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Separated OFA Selective Catalytic Reduction
TN	Kingston	3407	7	2008	CSKI69	NBP, ARP, CAIRNOX, CAIROS	3,672	5	0.05	146	5,960,537	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Separated OFA Selective Catalytic Reduction
TN	Kingston	3407	8	2008	CSKI69	NBP, ARP, CAIRNOX, CAIROS	3,503	5	0.05	141	5,812,739	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Separated OFA Selective Catalytic Reduction
TN	Kingston	3407	9	2008	CSKI69	NBP, ARP, CAIRNOX, CAIROS	3,556	5	0.05	146	5,950,992	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
GA	Wansley (6052)	6052	2	2008		ARP, CAIRNOX	3,644	5	0.05	646	25,328,619	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Selective Catalytic Reduction
TN	Kingston	3407	1	2008	CSKI15	NBP, ARP, CAIRNOX, CAIROS	3,489	5	0.05	104	4,006,506	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
TN	Kingston	3407	2	2008	CSKI15	NBP, ARP, CAIRNOX, CAIROS	3,672	5	0.05	110	4,259,740	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
TN	Kingston	3407	3	2008	CSKI15	NBP, ARP, CAIRNOX, CAIROS	3,382	5	0.05	101	3,935,776	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
TN	Kingston	3407	4	2008	CSKI15	NBP, ARP, CAIRNOX, CAIROS	3,668	5	0.05	108	4,188,284	Operating	Tangentially-fired	Coal	Selective Catalytic Reduction
TN	Kingston	3407	5	2008	CSKI15	NBP, ARP, CAIRNOX, CAIROS	3,570	5	0.05	157	6,078,797	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Separated OFA Selective Catalytic Reduction
MD	Mirant Morgantown	1573	2	2008		ARP, NBP, CAIRNOX, CAIROS	2,958	5	0.05	313	13,385,092	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Ammonia Injection (Began Jun 01, 2008) Selective Catalytic Reduction (Began Jun 01, 2008)
GA	Wansley (6052)	6052	1	2008	MS1BYP, MS1FGD	ARP, CAIRNOX	3,656	5	0.05	745	27,908,071	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled/Separated OFA Selective Catalytic Reduction
KY	Trimble County	6071	1	2008		NBP, ARP, CAIRNOX, CAIROS	3,526	5	0.05	435	16,746,076	Operating	Tangentially-fired	Coal	Low NOx Burner Technology w/ Closed-coupled OFA Selective Catalytic Reduction

United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

September 3, 2009

N3615 (2350)

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Dear Ms. Neuschler:

Following are our general comments on the Minnesota Pollution Control Agency's (MPCA's) current Best Available Retrofit Technology (BART) proposals for the taconite plants located in Minnesota that are subject to BART. Due to their similarity, for the most part, the taconite BART determinations will be addressed as a group. (Certain issues related to United and Keetac will be addressed in separate enclosures.) We will focus our review on the indurating furnaces, due to the dominance of their impact over the other BART-eligible units at the taconite facilities.

The recently promulgated Taconite Maximum Achievable Control Technology (MACT) standard represents a BART level of control for particulates from the furnaces; that leaves sulfur dioxide (SO_2) and nitrogen oxide (NO_X) as the remaining visibility-impairing pollutants to be addressed from the furnaces.

Five-step BART Process

We commend MPCA for requiring that the taconite plants follow EPA's recommended five-step BART process. However, we have concerns about how those five steps were implemented.

Steps #1 (Identify all available retrofit options) and #2 (Eliminate technically infeasible options)

A couple of key quotes from the EPA BART guidelines are important to keep in mind: "a demonstration of technical infeasibility may involve a showing that there are unresolvable technical difficulties with applying the control to the source (*e.g.*, size of the unit, location of the proposed site, operating problems related to specific circumstances of the source, space constraints, reliability, and adverse side effects on the rest of the facility). *Where the resolution of technical difficulties is merely a matter of increased cost, you should consider the technology to be technically feasible."* FR 7/6/05 pg 39165, emphasis added.

"Physical modifications needed to resolve technical obstacles do not, in and of themselves, provide a justification for eliminating the control technique on the basis of technical infeasibility." FR 7/6/05 pg. 39165.

Common Control Options Rejected as Technically Infeasible

Rejected Sulfur Dioxide Controls

The option of modifying the existing scrubbers was dismissed in the BART report from every facility as not being available and therefore not being technically feasible. The reasons stated included corrosion of the process water handling system and the creation of solid wastes. Sulfur scrubbing technology has been in existence since the 1960's. The issues described above are not new, unique, or insurmountable. In addition, these issues are not technical-feasibility issues but are economic-feasibility issues. The BART proposals did not provide the cost data for this option, so how economically infeasible they may, or may not be, is unknown.

The dry scrubbing options (Dry Sorbent Injection and Spray Dry Absorption) were deemed technically infeasible because the high moisture content of the gas stream would cause blinding of the baghouse typically used downstream of the lime injection. However, these facilities should investigate the application of a wet electrostatic precipitator (ESP) downstream of the lime injection point, instead of a baghouse. Or, these facilities could investigate injection of lime upstream of the wet ESP that they have deemed technically feasible.

Coal Processing was eliminated because these facilities do not consider it to be commercially available.

Alternate Fuels were rejected on the premise that EPA did not intend to promote fuel-switching. However, this does not preclude evaluation of lower sulfur fuels. In its BART preamble, EPA states, "Our economic analysis suggests that switching to low sulfur fuel oil is a cost effective method in reducing SO_2 emissions from oil fired units."[1] EPA's BART Guidelines recommend that, "...for oil-fired units, regardless of size, you should evaluate limiting the sulfur content of the fuel oil burned to 1 percent or less by weight."[2] We believe that evaluation of lower sulfur oil, coal, and petroleum coke is also appropriate for those taconite facilities that already burn any of those fuels.

Rejected Nitrogen Oxides Controls

All facilities rejected Low Temperature Oxidation (LoTOx) on the basis that it is not technically feasible because it has not been used on an indurating furnace.

The issue of control of NO_x from taconite furnaces has been approached in the past within the context of two Prevention of Significant Deterioration (PSD) permits: Minntac

[1] P 159 of the BART Preamble
[2] P 363 of the BART Guidelines

backwards PSD permit and the PSD permit for Minnesota Steel. Minntac is a grate-kiln furnace and Minnesota Steel is a straight grate furnace. This discussion initially focused on the application of selective catalytic reduction (SCR) and more recently has looked at LoTOx.

- In the Minntac case, in a letter dated October 22, 2003, the MPCA determined that SCR was technically feasible but not economically feasible. This configuration assumed reheating of the waste gas. The cost per ton calculated was sensitive to the assumed cost of natural gas and was "at or above the upper range of economic feasibility," and was rejected as best available control technology (BACT).
- In a letter dated August 18, 2006, the MPCA assessed the applicability of LoTOx at 90% control efficiency to Minntac and concluded that LoTOx was technically and economically feasible, and therefore BACT. Minntac is now required to test LoTOx.
- In their PSD permit, Minnesota Steel and MPCA proposed LoTOx on the waste gas stack at 90% control efficiency for their taconite furnace.

In summary, MPCA has declared that LoTOx is BACT for one type of taconite furnace (straight grate) and will soon require testing on the other (grate kiln). The technical feasibility issues brought up in the BART proposals for each facility have been addressed by the developer of the technology and in the analyses above. This supports MPCA's conclusion that LoTOx is a viable candidate for BACT, and that LoTOx can be applied to both types of indurating furnaces. In order to avoid further analysis of LoTOx, the other taconite plants must show why their indurating furnaces are so different from those at Minntac and MN Steel as to preclude its application. Otherwise, they must evaluate LoTOx by applying the remaining BART factors.

All facilities eliminated Regenerative Selective Catalytic reduction (RSCR) on the basis that it was technically infeasible, citing several reasons:

- Taconite dust is different from boiler ash. (True, but SCRs have been successfully located in "high-dust" areas downstream of coal-fired boilers and upstream of particulate control equipment.)
- Taconite dust is erosive. (True, but so is flyash.)
- RSCR has not been applied downstream of a wet scrubber. (Why is this a problem for RSCR but not for SCR?)
- SCR catalyst may oxidize mercury. (That is a positive benefit of SCR.)

We would like to see a response to these comments by a reputable vendor of RSCR. Furthermore, it is generally assumed that converting mercury to its oxidized state is a desirable co-benefit of SCR, which presents the opportunity to more easily capture it with a wet scrubber. Considering that all taconite facilities determined that conventional SCR is technically feasible, even though it has never been applied to a taconite furnace either, it appears that the taconite industry approach is biasing the analysis away from a potentially viable alternative (RSCR) and toward an alternative (SCR) that can be easily rejected later. (See the "Straw Man" discussion below.)

Common Control Options Accepted as Technically Feasible

All but Northshore depend upon Venturi-rod wet scrubbers for particulate removal and assume that these scrubbers also remove 15% - 30% of the uncontrolled SO_2. (Northshore uses a wet ESP which it assumes removes 90% of the uncontrolled SO_2.)

Step 3 - Evaluate Control Effectiveness

SO_2: Addition of a Wet-Wall Electrostatic Precipitator (WESP) was assumed to remove 80% of the remaining SO_2 in the gas stream, regardless of the degree of SO_2 removal already achieved. The facilities assume that an additional Wet Scrubber would remove 60% of the remaining SO_2 regardless of the degree of SO_2 removal already achieved. These facilities contend that the low scrubber efficiency estimate is due to the more dilute concentration of SO_2 in the exhaust gas stream due to much greater excess air in the indurating furnaces than in a boiler. However, we do not understand why a wet scrubber specifically designed for SO_2 removal would be less effective than a WESP which is more typically used to remove PM. We suggest that the wet scrubber would be able to achieve at least the same 80% additional SO_2 control as the WESP.[3] The facilities should provide documentation to show why they cannot achieve a similar level of control with a wet scrubber. We also do not understand why the efficiency of the add-on controls would be independent of the degree of removal of the existing controls.

NOx: Even though it has never been applied to a taconite furnace, all facilities assumed that addition of conventional SCR would reduce NO_x emissions by 80%, regardless of the type of indurating process to which it would be applied. We understand that SCR can reduce 90% of the NO_x in a given gas stream, but that it is most effective when applied to gas streams with relatively high NO_x concentrations, such as the grate/kiln exhausts and the waste gas exhausts from the straight-grate kilns. We believe that a valid evaluation of SCR would consider these factors.

Step 4 - Evaluate Impacts and Document Results

<u>BART Cost Ceilings for SO_2 and NO_x Control</u>

All facilities presented a BART cost range for SO_2 and NO_x of $1,000 - $1,300 per ton as a firm guideline that became the basis for deeming technically feasible control options as having unacceptable costs. All facilities postulated these ranges from information found in the Clean Air Interstate Rule (CAIR) and a few court cases.

All facilities appear to be confusing the costs incurred in BART versus costs incurred in trading programs such as CAIR. Any cost ranges derived from CAIR proceedings might be considered as relevant, but certainly not definitive. Any use of the value of a CAIR emission trading allowance to establish a BART cost range is erroneous, because the basis for the CAIR rule is reduction of SO_2 and NO_x emissions more cheaply than similar

[3] In its March 2007 permit application, Minnesota Steel estimated that a wet scrubber could remove 90% of the SO_2 from both the hood exhaust and the waste gas exhausts on its straight-grate indurating furnace.

reductions achieved on a technology basis. Again, court verdicts regarding a specific set of circumstances should not be relied upon to set a particular cost range, because many differences in relevant facts may exist between the BART source and the litigant.

We reject the adoption by a BART-eligible source of a specific BART cost range above which technically feasible control options are arbitrarily deemed to be unacceptable. All of the above-named references to cost are relevant considerations, but the particular circumstance of the source (financially and with respect to the magnitude of necessary visibility improvements to be achieved now and in the future) bears heavily on acceptable cost ranges.

"Universal" Retrofit Cost

The taconite consultant should describe its "experience with similar projects" that allowed it to estimate a 60% retrofit factor for all of the retrofit technologies evaluated at every facility. We doubt that each situation presents the same degree of difficulty and warrants the same assumption.

BART "Straw Man"

Each BART analysis appears to bias the analysis toward the option that is most expensive (e.g., WESP, conventional SCR), and away from the option that is most cost-effective (lower sulfur fuels, caustic reagent, dedicated wet scrubbers, LoTOx, RSCR). For example, RSCR, with its 90% - 95% thermal efficiency was rejected as technically infeasible, while conventional SCR with its 60% - 70% thermal efficiency was accepted, even though neither has ever been applied to a taconite furnace. This essentially diverts attention from the option that might actually be chosen by an unbiased analysis.

Step 5 - Evaluate Visibility Impacts

Multiple Class I Areas

One of the factors comprising the BART evaluation is the resulting "degree of improvement in visibility..." In their analyses, the taconite facilities presented only the visibility improvements that were predicted to occur at the nearest Class I area. Because it is likely that reduced emissions from any of these facilities will result in improved visibility at more than one of the four Class I areas[4] for which they are significant contributors to impairment,[5] any analysis of visibility improvement should consider these multiple benefits. And, the facilities should model the impacts of their final BART proposals to increase emissions upon visibility at the four Class I areas.

[4] Boundary Waters Canoe Area (BWCA), Isle Royale National Park (NP), Seney National Wildlife Refuge (Seney), and Voyageurs NP

[5] The six taconite facilities cause or significantly contribute to impaired visibility in a total of 17 cases across the four Class I areas.

We believe that it is appropriate to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected. It simply does not make sense to use the same metric to evaluate the effects of reducing emissions from a BART source that impacts only one Class I area as for a BART source that impacts multiple Class I areas. And, it does not make sense to evaluate impacts at one Class I area, while ignoring others that are similarly significantly impaired. If we look at only the most-impacted Class I area, we ignore that the other Class I areas are all suffering from impairment to visibility "caused"[6] by the BART source. It follows that, if emission from the BART source are reduced, the benefits will be spread well beyond only the most impacted Class I area, and this must be accounted for.

The BART Guidelines represent an attempt to create a workable approach to estimating visibility impairment. As such, they require several assumptions, simplifications, and shortcuts about when visibility is impaired in a Class I area, and how much impairment is occurring. The Guidelines do not attempt to address the geographic extent of the impairment, but assume that all Class I areas are created equal, and that there is no difference between widespread impacts in a large Class I area and isolated impacts in a small Class I area. To address the problem of geographic extent, we have been looking at the cumulative impacts of a source on all Class I areas affected, as well as the cumulative benefits from reducing emissions. While there are certainly more sophisticated approaches to this problem, we believe that this is the most practical, especially when considering the modeling techniques and information available.

Compared to the typical control cost analysis in which estimates fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per deciview (dV) to improve visibility may appear extraordinarily expensive. However, our compilation[7] of BART analyses across the U.S. reveals that the **average cost per dV proposed by either a state or a BART source for an Electric Generating Unit (EGU) is $9 - $19 million**,[8] with a maximum of almost $50 million per dV proposed by Colorado at the Martin Drake power plant in Colorado Springs.

BART Determinations

Although the taconite industry, which is already responsible for very large impacts on visibility in the northern Class I areas, is actually proposing to increase emissions and impacts, MPCA has proposed limits which would keep those increases to a minimum, and, in some cases (as discussed in separate enclosures) reduce emissions. Nevertheless, we believe that the taconite facilities should bear a similar share of the burden as the EGUs which are proposing to reduce emissions significantly.

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[6] EPA defines a source with an impact greater than one deciview as "causing" impairment.

[7] http://www.wrapair.org/forums/ssjf/bart.html

[8] For example, PacifiCorp has stated in its BART analysis for its Bridger Unit #2 that "The incremental cost effectiveness for Scenario 1 compared with the baseline for the Bridger WA, for example, is reasonable at $580,000 per day and $18.5 million per deciview."

We commend MPCA for asserting that (p613) "United Taconite may choose to propose a BART Alternative project that is equivalent or better than BART. The BART Alternative must result in equivalent or greater emissions reductions and visibility benefits from the facility when compared to the MPCA's BART determination." We ask that MPCA apply this same "greater emissions reductions and visibility benefits" standard to all of its BART alternatives.

Reasonable Progress

Even if a source is exempt from BART, it may still be subject to review under the Reasonable Progress requirements of the Regional Haze Rule. MPCA may wish to consider additional emission reductions under that aspect of the Regional Haze program. One component of MPCA's Reasonable Progress strategy is the Northeastern Minnesota Plan, discussed below.

While MPCA is correct in saying (p64) that "all the estimated future visibility conditions are moving in the desired downward direction toward natural conditions," they fall significantly short of the Uniform Rate of Progress (URP) needed to achieve that goal by the national target date of 2064. Instead, MPCA's proposed Reasonable Progress Goal (RPG) represents 35% of the URP at Voyageurs NP (and 67% at BWCA. Because it is generally understood that maintaining the URP will become more difficult as the "low hanging fruit" is controlled, it will likely become even more difficult in the future to attain the URP unless MPCA increases the stringency and expands the scope of its emission reduction efforts. For example, as discussed below, MPCA could reduce its BART-exemption threshold to a value lower than the maximum 0.5 dv allowed by the BART Guidelines.

We ask that MPCA reconcile the following statements:

- p369: "The MPCA agrees with the commenter that imperceptible visibility improvement is not a justification for rejecting otherwise feasible and cost-effective controls.
- p371: "The MPCA's position is that cost-effective controls should be installed, even if they result in limited improvement in visibility..."
- p67: "Although the MPCA could set the contribution threshold lower than 0.5 deciviews and is cognizant of a number of existing sources in close proximity to Class I areas, the modeling showed no sources causing impacts at levels just slightly below 0.5 deciviews. The 98th percentile deciview values for those subject-to-BART range from 0.6 – 4.4 deciviews, while the 98th percentile deciview values for those not subject-to-BART range from 0.0 – 0.4 deciviews."

MPCA goes on to say that:

A total of 15 facilities with BART-eligible sources were determined not subject-to-BART based on the 0.5 deciview threshold. Of those 15 facilities, three are subject to the Northeast Minnesota Plan [Boise White Paper, Hibbing Public Utilities, Virginia Public Utilities] and three are EGUs [Austin Public Utilities, Xcel—A.S. King, Otter Tail Power-Hoot Lake] that were initially subject to CAIR. Minnesota was initially included in CAIR, leading many utilities to install controls in anticipation of CAIR compliance.

EPA has recently published a proposed stay of CAIR in Minnesota until there is a re-promulgated CAIR rule. Should Minnesota not be included in a re-promulgated rule, two of the three EGUs that showed modeling results closest to the BART threshold (Austin Public Utilities and Otter Tail Power Hoot Lake) will be re-evaluated for reasonable progress controls at the time of the Five Year SIP Assessment.

Based on these facts, the application of BART would likely have little impact on the emission reductions expected from these facilities. Of the remaining nine facilities not subject to the Northeast Minnesota Plan or initially subject to CAIR, all have 98th percentile deciview values of 0.2 deciviews or less. Therefore, MPCA did not readjust the contribution threshold chosen for exempting sources from BART.

NPS believes that, in view of MPCA's failure to meet URP and its own commitment to require installation of cost-effective controls, "even if they result in limited improvement in visibility," MPCA should expand its BART or Reasonable Progress (RP) analyses to at least include sources (Boise White Paper, Hibbing Public Utilities, Virginia Public Utilities) with impacts between 0.2 and 0.5 dv. Inclusion in the Northeast Minnesota Plan does not guarantee that these sources will reduce emissions. Analysis of potential emission reduction strategies under the BART or RP provisions of the Regional Haze Rule could yield additional and needed emission reductions.

The Northeastern MN Plan

While we agree with the concept inherent in the Northeastern MN Plan, we have serious concerns about the validity of the 2002 emission estimates upon which the Plan is based. Although we have sufficient confidence in the emission data collected from the Electric Generating Units, that is far from the case with the taconite emission estimates. For example, in its taconite BART analyses, MPCA repeatedly states that, "Due to the lack of sufficient emissions data representing the range of operating conditions that influence emissions, the MPCA is unable at this time to set an emission limit that corresponds to BART for [the source's] indurating furnace." If the emissions data are not good enough for MPCA, then we question its use as a basis for determining the success of the NE MN Plan over the next nine years.

Our concerns are further illustrated by a closer inspection MPCA's "Northeast Minnesota Plan Emission Tracking Spreadsheet." For all practical purposes, if the 2002 NO_x emission estimates for Minntac are correct, then the NE MN Plan target is met with no additional reductions from the taconite industry. If the Minntac 2002 NO_x emissions are not correct, then the 2018 target is not met. We request an explanation from MPCA for the reduction in Minntac's NO_x emissions from 2002 to 2012 and to 2018.

One of the key elements of the NE MN Plan is that emissions must be accurately estimated and tracked. We understood that MPCA would require installation of Continuous Emission Monitors on all taconite lines to facilitate that process. We are very concerned that MPCA has not done so, and has allowed the taconite plants an option which we do not believe will provide equivalent results.

Continuous Emission Monitors (CEMs)

We understand that CEMs or an equivalent alternative were to have been installed or implemented at each of the taconite plants in 2008. However, that process has been delayed due to economic conditions and that "the MPCA is placing the revised SIP, including Administrative Orders for both CEMs and Alternative Methods, on public notice." (p366) However, at the same time, MPCA has rejected the concerns of the U. S. Forest Service that the alternative method to CEMs that will be used by several of the taconite facilities will not provide accurate enough data to achieve the aims of the Regional Haze SIP and will not allow facilities to identify operating scenarios that could result in lower emissions. The Forest Service requested that EPA performance specifications for predictive emission systems be used by the MPCA to evaluate the alternate systems. In rejecting that request, the MPCA responded that:

> The EPA's performance specification was finalized on March 25, 2009. The latest deadlines for any of the facilities to submit an alternative method proposal was March 1, 2009. **The MPCA committed to approve or disapprove that alternate method within 30 days of submittal.** Therefore, it was not feasible for the MPCA to evaluate the alternate method against EPA's promulgated performance specification. However, the MPCA acknowledges that the federal performance specification may be an appropriate compliance tool to ensure high quality data in the future.

If the MPCA has already made an irrevocable commitment "to approve or disapprove that alternate method" by the end of March, what is the point of now announcing that it is taking comments on those Administrative Orders? Furthermore, what decisions did MPCA make, and upon what bases?

Nevertheless, we shall take this opportunity—our first—to provide our comments on the issue of CEMs and their alternatives. First, it is clear that MPCA recognizes the value of good emissions data as a component of its BART strategies:

> The MPCA has determined that continuous emission monitors or a comparable alternative emission measurement method combined with hourly process data can provide data that would be necessary in setting BART NO_x limits based on BART as good combustion practices, past installation of Low NO_x Burners in the preheat zone and the upcoming implementation of furnace energy efficiency projects in early 2008.
>
> From its experience with electric utilities, refineries, and other facilities, the MPCA notes that strategies to use CEMs to reduce NO_X have been successful. The MPCA believes that monitoring NO_X emissions with CEMs or other parametric monitoring at pelletizing furnaces will identify operating conditions under which NO_X emissions can be reduced. The MPCA also notes that NO_X reductions have occurred at another taconite facility after installing CEMs. While those reductions cannot be directly tied to operational changes identified with the aid of CEMs, this observation strongly suggests that using CEMs at pelletizing furnaces will help reduce NO_X through the feedback to the operator and plant management that a CEMs or predictive emission monitoring system provides. Operators can fine tune the operation since it responds to a number of variables under their control and the results of these adjustments can be seen with a CEMs. Plant management can analyze temporal differences in individual furnace operations and differences in emissions among similar furnaces to gain understanding of the factors that influence NO_X formation and apply that knowledge to lower emissions.

MPCA has approved installation and operation of CEMs for some taconite plants:

- p279: The U.S. Steel facilities will monitor their SO_2 emissions with Continuous Emission Monitors (CEMs), ensuring that the MPCA will have a more complete and accurate picture of actual emissions, compared to other facilities, and understand how emissions react to changes at the facility.
- Keetac (p6): An SO_2 Continuous Emission Monitoring Systems (CEMS) will be required to gather data to establish the appropriate BART limit. The CEMS will also be used to determine continuous compliance with that limit. Through Administrative Orders by Consent, the MPCA has required other taconite facilities that use solid fuels with a higher sulfur content (coal) to install SO_2 Continuous Emission Monitoring Systems and to monitor parameters that are linked to scrubber performance.
- p7: Keetac proposes existing combustion controls and fuel blending as BART, with the installation of continuous emission monitoring systems (CEMS) to monitor NO_X emissions. The NO_X limit for the furnace will be based on at least twelve months of monitoring data. The MPCA agrees with Keetac's proposal to install CEMS to monitor NO_X emissions and to set a limit based on those measurements after acquiring twelve months of emission data.
- Minntac p551: The MPCA has determined that continuous emission monitors combined with hourly process data can provide data that would be necessary in setting BART NO_X limits based on BART as good combustion practices, fuel blending and the operation of low-NO_X burners for Lines 4, 5, 6, and 7 and combustion controls and fuel blending for Line 3.
- p559: Minntac has agreed to install SO_2 Continuous Emission Monitoring Systems (CEMS) on the waste gas stacks for Lines 3, 4, and 5; in addition, SO_2 CEMS and the collection of scrubber operating data are being required through an Administrative Order by Consent to provide more accurate emission data and scrubber operating parameter data for determination of a BART limit for only Lines 6 and 7 where a high sulfur fuel (coal) is burned.
- p532: If HTC decides to monitor SO_2 emissions with CEMs, the MPCA may adjust the SO_2 emission limit based on scrubber performance parameters (e.g., pH) and on the data collected from CEMs.

MPCA has also required CEMs at small EGUs: (p666) Northshore Compliance with the NO_X and SO_2 limits will be through the use of CEMs.

We therefore endorse the use of CEMs in the contexts described above, and encourage their use wherever good emissions data are essential and where CEMs are applicable.

We have some major concerns about the potential for the comparable alternatives to be equivalent to CEMs:

- MPCA has not presented any evidence or examples that such an approach will work as well as the established CEM method. MPCA has consistently demanded that potential control technologies be demonstrated and proven before considering them as BART. MPCA should apply the same rigorous standard to the methods used to set and to verify compliance.

- MPCA should provide assurance that it is capable of obtaining the data necessary to adequately assess and evaluate the proposed alternatives. We are especially concerned by the apparent inability of MPCA to obtain data it had twice requested from United Taconite, which twice "declined" to comply with MPCA's requests, with no adverse consequences, as described below (by MPCA):

  > p608: The MPCA requested that United Taconite amend the BART analysis to include an additional control technology – a new recirculating particulate matter wet scrubber to replace existing equipment on Line 2 to achieve an overall SO2 control efficiency of at least 60%. When **United Taconite declined to provide such information**, the MPCA contracted with STS Consultants to prepare the cost estimate. The final cost estimate was completed by the MPCA, and is dated July 30, 2007. The final cost estimate is attached.
  > The MPCA also requested an analysis of alternative fuel blends (coal and petroleum coke) for Line 2 as an SO2 control alternative. **United Taconite declined to provide such analysis.** As a result, the MPCA prepared separately its analysis of fuel blends.

We strongly believe that CEMs should be the preferred and presumptive method to determine emissions, and that any alternative approach should be used only if CEMs cannot be relied upon due to site-specific circumstances or that the alternative meets or exceeds the EPA performance specifications for predictive emission systems. We also request assurance from MPCA that it has the authority to obtain any information it needs from a source to ensure that any proposed alternative monitoring strategy can be successfully and transparently implemented.

In conclusion, we appreciate MPCA's efforts to date regarding the BART process, but we believe that significant additional reductions can be achieved and are warranted. We look forward to working with the MPCA as this process advances. We believe that good communication and sharing of information will help expedite this process, and suggest that you contact Don Shepherd (don_shepherd@nps.gov, 303-969-2075) if you have any questions or comments about this document.

Sincerely,

John Bunyak
Chief, Policy, Planning and Permit Review Branch

Enclosures

cc:
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BART Determinations for United Taconite
National Park Service (September 3, 2009)

On page 379 of the Response to Comments, the U. S. Forest Service (USFS) states that the MPCA's SO_2 BART determination for United Taconite of 1.7 lbs/mmBtu, based on fuel blending, was selected inappropriately. The USFS notes that the memo states that fuel blending was selected because "1) it does not require additional construction, 2) is quicker, and 3) avoids further degradation of water quality." The USFS believes that the first two reasons are not included as factors for consideration by the Clean Air Act. The USFS also states that reason 3 does not appear to be valid because water treatment costs are included as part of overall scrubber costs, sulfate treatment has been implemented at Minntac and is predicted to improve the quality of the tailing basin discharge, and therefore it is not clear that water quality would be degraded with a scrubber option. As the MPCA determined that all options are cost-effective, the USFS believes that fuel blending plus a polishing scrubber represents BART, with an emission limit of 0.68 lbs/mmBtu.

MPCA Response: The regulations at 40 CFR 51.308(e)(1)(ii)(A), mentioned by the commenter, specify certain mandatory criteria. The criteria are not identified as the exclusive criteria, however.

The consideration of the water quality drawbacks of scrubbing is part of the evaluation of "energy and nonair quality environmental impacts." A BART determination that does not exacerbate existing water quality issues is appropriate; when a BART determination is available that does not require extensive mitigation of nonair quality impacts such a determination should be strongly considered. Although the USFS states that sulfate treatment at Minntac "is predicted" to improve the quality of the discharge, the MPCA notes that this improvement has not yet been demonstrated. In addition, considerable energy usage is necessary for water treatment. Therefore, the MPCA believes its BART limit of 1.7 lbs SO_2/mmBtu heat input is reasonable and appropriate, and has been demonstrated as such using the five factors.

NPS: MPCA cannot "derive" additional reasons to exclude a control technology. Furthermore, only those "energy and nonair quality environmental impacts" that cannot be evaluated as part of the technical economic feasibility analyses should be considered under that category. MPCA should provide reasons why it does not believe that sulfate treatment at Minntac would improve the quality of the discharge.

p612: The BART limit for Line 2 is 1.7 lb SO_2/MMBtu heat input. This SO_2 limit can be met through modifying fuel blends; however, it could also be accomplished through use of additional air pollution control equipment. This limit is a 30-day rolling average, using SO_2 flue gas monitors. The emissions limit can be met through fuel changes, additional air pollution control equipment, or a combination of both.

NPS: MPCA should explain how it derived this limit.

BART Determinations for Keewatin Taconite
National Park Service (September 3, 2009)

MPCA p3: The permit for the US Steel – Keetac facility allows the combustion of natural gas, distillate fuel oils, coal, and petroleum coke in the pelletizing furnace. Coal and natural gas are the primary fuels; **coal is a significant source of sulfur**. Another source of sulfur emissions from this furnace is the iron ore used to form the green balls, although this represents a smaller contribution than the sulfur in the solid fuels burned. Sulfur dioxide emissions are currently controlled by wet scrubbers.

MPCA p5: The MPCA reviewed the BART analysis provided by Keetac and agrees with Keetac's assessment of technical infeasibility for Dry Sorbent Injection, Spray Dryer Absorption, **Alternate Fuels**, and Coal Processing.

NPS: MPCA should explain why it considers it technically infeasible for Keetac to burn a lower-sulfur coal.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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SEP 0 3 2009

REPLY TO THE ATTENTION OF:

AR-18J

John Seltz
Minnesota Pollution Control Agency
Environmental Assessment and Outcomes Division
520 Lafayette Road North
St. Paul, Minnesota 55155

Dear Mr. Seltz:

I am writing to provide the U.S. Environmental Protection Agency's comment on the Minnesota Pollution Control Agency's proposed Best Available Retrofit Technology (BART) determinations for electric generating units. These BART determinations are in Appendix 9.4 of your July 2009 Regional Haze State Implementation Plan (SIP). As you know, EPA has already provided comments on other portions of Minnesota's Regional Haze Plan.

EPA reviewed Minnesota's proposed BART determinations for electric generating units using the Regional Haze Rule (64 FR 35714) and the BART Determination Guidelines (70 FR 39104). Based on our review, EPA has identified a number of issues that Minnesota will need to address in order to receive approval of its final Regional Haze SIP.

First, Minnesota should demonstrate that its BART analyses for its electric generating units addressed the five factors that must be considered. An analysis containing information on all factors of the BART review process is necessary for EPA to adequately review the BART portion of the regional haze submission. The BART factors are the costs of compliance, energy and non-air quality environmental impacts, existing pollution controls, remaining useful life of the facility, and visibility impacts. Documentation of the facts used in selecting BART controls and emission limits will demonstrate that you properly considered the factors. In order to assist in this effort, my staff has provided some sample BART analyses to the Minnesota PCA in an August 13, 2009, e-mail message. Please expand the BART analyses for the EGU sources, so that the analyses address all factors.

EPA generally supports the BART comments the Federal Land Managers made regarding the proposed BART determinations for your electric generating units. We understand that you have been drafting responses to these comments that will be included

in the final submission. Please let us know if we can be of assistance as you address the Federal Land Manager or any other comments on the proposed BART determinations.

We also have comments specific to the BART determination analyses of two facilities, North Shore Mining's Silver Bay facility and Rochester Public Utility's Silver Lake facility. Our remaining concerns with these two facilities follow.

North Shore Mining Silver Bay

North Shore Mining Silver Bay facility has two units. Unit 2 is BART eligible. The BART analysis by North Shore suggested BART limits as NOx: 0.40 pounds per million British Thermal Units (lb/MMBTU), SO2: 0.06 lb/MMBTU, and PM: 0.094 lb/MMBTU.

The facility proposed multi-pollutant controls as an alternative to BART. This includes using biomass (wood) in place of about 20% of the coal in firing both boilers. The result is additional nitrogen oxides reduction of 351 tons per year (1159 tons compared to 808 tons) but 1045 tons per year less sulfur dioxide reduction (583 tons compared to 1628 tons). Minnesota proposed the alternate control limits because the costs in dollars per ton is similar and North Shore prefers the alternate limits. The alternate limits are NOx: Boiler 1- 0.41 lb/MMBTU, Boiler 2- 0.40 lb/MMBTU, and SO_2: Boiler 1- 0.41 lb/MMBTU, Boiler 2- 0.48 lb/MMBTU.

Minnesota's plan as written, does not currently demonstrate that the alternate control limits will provide better progress toward the visibility goals, that is greater visibility improvement over the same time period, than operating Unit 2 at BART limits. In particular, the proposed emissions limit has fewer sulfur dioxide reductions than the BART limits would obtain. The Minnesota analysis does not address the visibility improvement expected from either set of emission limits.

In your response to comments from the U.S. Forest Service, Minnesota states that the Silver Bay facility's boilers "primarily generate power for the adjacent taconite operations." The response goes on to say that this type of operation is different from electrical generation units that sell power to the electrical grid. EPA is unclear why this fact would make a difference in the BART analysis. The case by case analysis is utilized to account for differences in the boiler design, boiler size, fuel type, and other factors. The ultimate use of the electricity should not be a factor in the analysis. If the state has additional information that clarifies this argument, EPA will be happy to consider it.

Rochester Public Utility- Silver Lake

Two of the four units at Rochester Public Utility's Silver Lake facility are subject to BART. Unit 3 has a 24 megawatt (MW) capacity and unit 4 has a 60 MW capacity. Minnesota is has identified controls being installed on Unit 4 to meet a consent decree and current controls for the smaller Unit 3 as BART controls. The state feels that Unit 3

is such a small contributor to haze that it is not worth pursuing emissions reductions using BART.

Minnesota's plan does not show that the proposed reductions from Unit 4 are at least equivalent to the visibility improvement from implementing BART level controls on both Unit 3 and Unit 4. Minnesota should perform a BART analysis on Unit 3 to see if controls are feasible. It is a small unit, but some emissions reduction may still be feasible. If no emissions control is feasible on Unit 3, Minnesota should note this in the plan.

Minnesota must consider the BART limits for both Unit 3 and Unit 4. If the State can demonstrate that the proposed controls on just Unit 4 will cause greater visibility improvement than adding BART controls to both units, then the proposed limits could be used in place of BART limits on Unit 3 and Unit 4.

The NOx limit on Unit 4 that was proposed as BART, 0.25 lb/MMBTU, is higher than the consent decree limit of 0.15 lb/MMBTU. Minnesota explained in its comment responses that the source has not yet been able to reach the consent decree limits and, therefore, set BART limits where the controls are currently performing. Minnesota notes that the NOx emission rates are expected to drop further. The state should consider if the NOx limit on Unit 4 can be set to decrease over time. It appears Unit 4 will eventually be able to achieve the 0.15 lb/MMBTU limit and the state plan should reflect this if possible.

Minnesota should also expand on the lower SO_2 emission limits on Units 1, 2, and 3 mentioned in the analysis. Specifically, how do the lower limits on these units plus the limit from the control being installed on Unit 4 compare to the reductions from adding SO_2 BART limits on Unit 3 and Unit 4?

Thank you for the opportunity to comment on your proposed BART determinations for electric generating units. We look forward to work with you as the regional haze plan is completed. If you have any questions, please contact Matt Rau, of my staff, at 312-886-6524.

Sincerely,

John Mooney
Chief
Criteria Pollutant Section

EXCELSIOR ENERGY

September 3, 2009

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
Environmental Analysis and Outcomes Division
520 Lafayette Road North
Saint Paul, Minnesota 55155-4194

Re: July 2009 Draft State Implementation Plan ("SIP") Revision for Regional Haze
Excelsior Energy Inc. Comments

Dear Ms. Neuschler:

On May 16, 2008, Excelsior Energy Inc. ("Excelsior") submitted comments on the Minnesota Pollution Control Agency's ("MPCA" or the "Agency") draft Regional Haze SIP. We have reviewed our original comments in light of the SIP Revision dated July 2009 (hereafter, the "SIP Revision") and have decided to re-emphasize the role that new IGCC baseload generating plant(s) could play in i) helping meet the State's reasonable progress goals ("RPGs") for 2018 and ii) achieving the emission reduction targets set in the Concept Plan for Addressing Major Point Sources in Northeastern Minnesota (hereafter, the "Northeast Minnesota Plan"). The former goal is best accomplished by leveraging decision-making processes outside the universe of the Agency's direct control. The latter goal is best accomplished by imposing strategic pollution controls on a much smaller universe of sources within its direct control. Remarkably, constructing and operating the Mesaba Energy Project (the "Project") firmly upholds both goals.

LEVERAGING DECISION-MAKING OUTSIDE MINNESOTA

On pages 304-5 in the July 2009 SIP Revision Appendices, the Agency responds to a commenter's criticism [for failing to take a stronger stance regarding other states' contribution to visibility degradation in the BWCA and VNP] by stating that "disagreements between states about contribution or appropriate controls will be resolved by consultation in and among EPA regional offices during SIP review." These disagreements can be bypassed by the Project's ability to wield significant leverage on its neighboring states' pollution control decision-making through demonstration of its lower-emitting technology, and subsequent technology-forcing mechanisms of federal/state air permitting regulations.

Currently, Excelsior knows of no other domestic, fuel-flexible IGCC project in advanced stages of development using coal as its principal feedstock and no other such project using subbituminous coal as its primary fuel source. The importance of the Project in this regard should be evident given the primary reliance on western subbituminous coal of electric generators in each state the Agency has identified as a significant contributor to visibility

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degradation in Minnesota's Class I areas (i.e., Illinois, Iowa, Minnesota, Missouri, North Dakota, and Wisconsin). The six figures in Exhibit I show information taken from a 2007 report prepared by the U.S. Energy Information Agency ("EIA") that identifies the domestic distribution of U.S. coals by state of origin and destination. With the exception of North Dakota (a state endowed with substantive reserves of lignite), each of the 'visibility-impact-inducing' states uses western subbituminous coal for electric generation to the practical exclusion of bituminous coals from eastern states. The implications of having successfully permitted, constructed, and comissioned the Project will put tremendous pressure on the owner of every western subbituminous coal-fueled power plant to consider IGCC as a replacement for older generating plants they may seek to reconstruct, significantly uprate, or otherwise change to a degree constituting a major modification. As every permit governing a major new source or major modification is considered, the technology-forcing mechanisms in federal air permitting regulations (i.e., BACT, BART, etc.) would push those projects toward IGCC-equivalent emission controls on the order of the Project, which as seen in the following section, constitute substantive reductions relative to levels that can be economically achieved by other sources. This represents leverage above and beyond what the Agency could seek to obtain through dispute resolution processes involving the EPA Regions and other state agencies.

STRATEGIC POLLUTION CONTROL DECISION-MAKING FOR SOURCES SUBJECT TO THE NORTHEAST MINNESOTA PLAN

The point behind Excelsior's May 16, 2008 comments was that an upsurge in economic growth – occurring in the next several years in the six county geographic area covered by the Northeast Minnesota Plan (Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis) – would likely cause emissions in the area's power sector to rise in the absence of new baseload power plants able to meet the load associated with such growth. Such an outcome could compromise achieving the Plan's 2018 sulfur dioxide and nitrogen oxides emission reduction target, i.e., a 30% reduction from the combined emissions of these pollutants from the 2002 baseline year.

For example, one of the largest future electrical demands in the six county area will be associated with the Essar Steel Minnesota ("ESM") steel manufacturing process. The electric arc furnaces that are the source of such demand produce the intense heat needed to process direct reduced iron into steel by inducing large electric currents to flow between electrodes lowered into large, refractory-lined "ovens". The instantaneous demand for electricity for this operation is projected to be on the order of hundreds of megawatts with an annual capacity factor near 70%. The successful supplier of electricity to an operation with such demands will look for the cheapest source of power so that the steel products manufactured by the operation remain competitive in the market place.

The most reliable, predictably-priced baseload source of electricity produced from fossil fuel comes from coal-fueled power plants. Absent new, highly efficient baseload coal-fueled plants to meet future electricity demands, the source of reliable, predictably priced power will most likely come from increasing the capacity factor at older, coal-fueled power plants that have low operating costs and high emission rates relative to a new baseload unit. As Excelsior has noted in every regulatory venue where the Project has come under scrutiny, the Project's environmental profile – including its combined emissions of sulfur dioxide and nitrogen oxides – is unparalleled relative to conventional coal-fueled EGUs and other IGCC projects where fuel-flexibility and the use of subbituminous coal is dictated.

Exhibit II has been attached to compare the emission rates of major, BART-eligible EGUs within the geographic domain of the Northeast Minnesota Plan to those of the Project (the

Project's prescribed emission rates for SO_2 and NO_X are 0.025 lb/MMBtu and 0.058 lb/MMBtu, respectively). The table in Exhibit II also shows emission rates for BART-eligible sources outside the Northeastern Minnesota Plan's domain. Per unit of energy input, the Project's combined SO_2 and NO_X emission rates are shown to be one-half those of the most stringent BART limit for a facility subject to the Northeast Minnesota Plan and on the order of one-tenth those for the least controlled unit subject thereto.

Combined, the table in Exhibit II, the Project's emission rates noted above, and the MPCA's recognition that it did not model the Project in its 2018 projection (see page 279 of the SIP Revision), suggests that displacing energy produced at any of the major existing coal-fueled power plants in the Northeast Minnesota Plan (that would end up providing power to new developments slated to occur within the area in the near future) with power produced by the Project will improve the probability that the 2018 30% reduction target will be achieved. Therefore, the Project is fully compatible with the Northeastern Minnesota Plan's reduction goals.

Along these lines, the reduction goals of the Northeastern Minnesota Plan need versatility to account for growth in industrially-based economic activity in the region, which aside from the permitting authority over new and existing air emission facilities, is outside the Agency's control. As currently designed, the Plan's goals may be met if no new controls are added, but the region's economy continues to languish. The 2018 goal may be missed if sufficient controls were installed at regional facilities to meet goals at the current industrial output, but subsequent economic growth and associated electricity demand forced increased capacity factor operations at existing, less efficient, expensive-to-control coal-fueled power plants. Therefore, the Plan would benefit visibility most if it possessed versatility to adjust for economic growth and accounted not only for new electric generating units' emissions but also those unit's potential to avoid dramatically larger increases in emissions at existing generating units.

Conclusions

The MPCA should actively support development of the Project given the consistency of constructing and operating an inherently low-emitting, highly efficient, reliable, predictably priced IGCC power station with the Agency's RPGs and its goals for achieving the emission reduction targets set forth in the Northeast Minnesota Plan. A reasoned first step in this direction would be to recognize in the SIP Revision the potential for such benefits to accrue. Please call me at 952-847-2355 if you have any questions regarding this potential or need further information from Excelsior to support the case for such a claim.

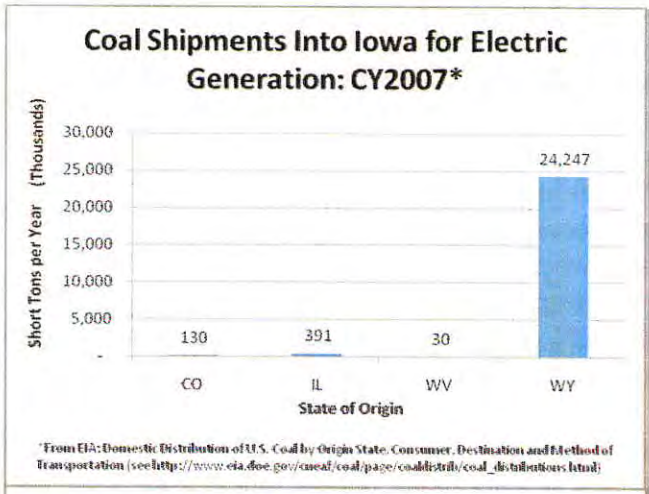
Thank you for this second opportunity to comment on the State's Regional Haze Implementation Plan.

Sincerely,

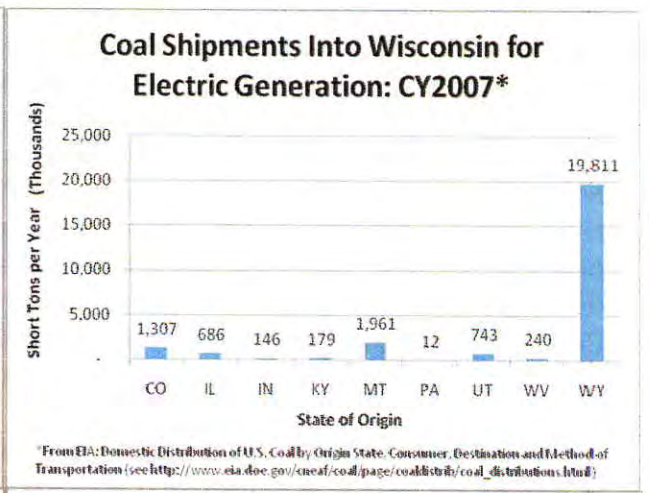
Robert S. Evans II
V.P., Environmental Services

Exhibit I

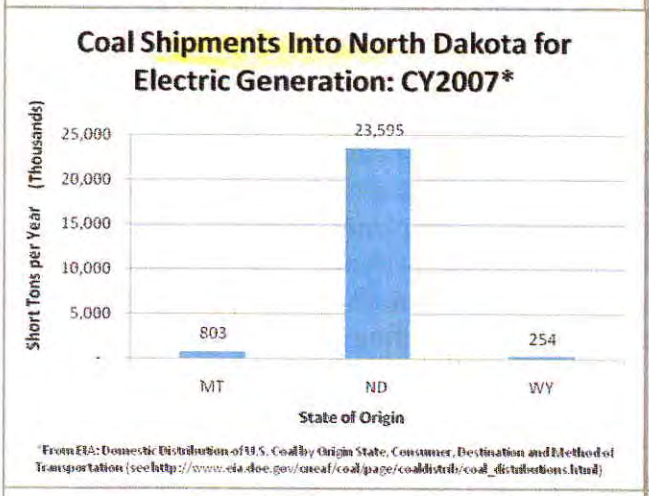
Domestic Distribution of U.S. Coal by Origin State to Destination State Electric Generators



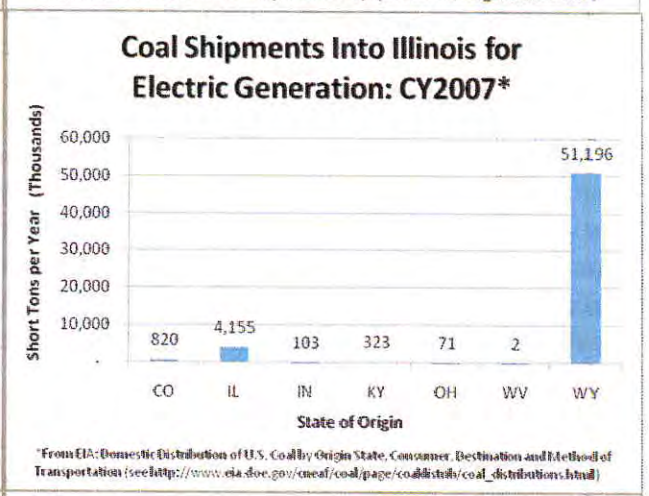
*From EIA: Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation (see http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/coal_distributions.html)



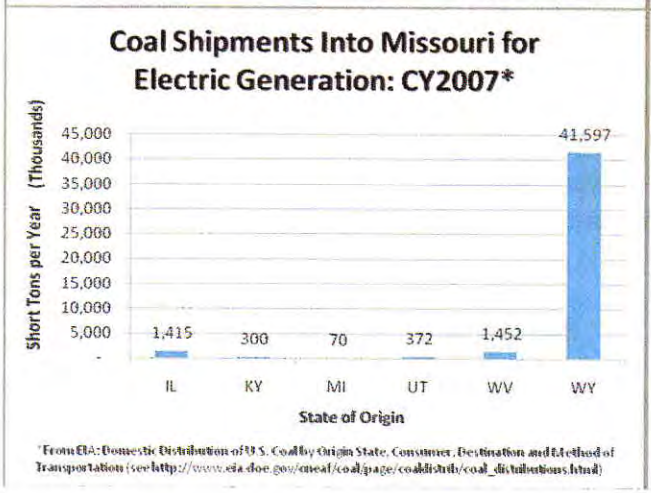
*From EIA: Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation (see http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/coal_distributions.html)



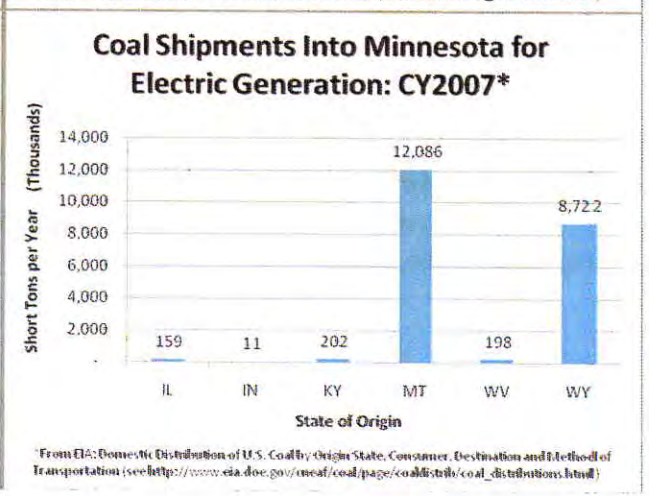
*From EIA: Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation (see http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/coal_distributions.html)



*From EIA: Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation (see http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/coal_distributions.html)



*From EIA: Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation (see http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/coal_distributions.html)



*From EIA: Domestic Distribution of U.S. Coal by Origin State, Consumer, Destination and Method of Transportation (see http://www.eia.doe.gov/cneaf/coal/page/coaldistrib/coal_distributions.html)

Exhibit II

MPCA BART Determination for Major EGUs in Minnesota

NO_X and SO_2 BART Determinations for EGUs*

Facility Name	Emission Unit	NOx Bart Technology	NOx BART Limit (lbs/MMBtu)	SO2 BART Technology	SO2 BART Limit (lbs/MMBtu)
MN Power, Taconite Harbor	Boiler no. 3 (EU003)	ROFA/Rotamix (Mobotec)	0.13	FSI and ESP conversion (hot side to cold side)	0.42
MN Power, Boswell	Boiler no. 3 (EU003)	LNB + OFA, SCR	0.07	Wet scrubber	0.09
Rochester Public Utilities, Silver Lake	Unit #3 boiler (EU003)	No additional	No Limit	No additional	2.30
	Unit #4 boiler (EU004)	ROFA/Rotamix	0.25	Spray dryer absorber	0.60
Xcel Energy, Sherco	Boiler 1 (EU001)	LNB +SOFA+ Combustion Optimization	0.15	Retrofit FGD with sparger tubes	0.12
	Boiler 2 (EU002)	Combustion Optimization			
Xcel Energy, Allen S King	Boiler 1 (EU001)	SCR	0.10	Spray dryer absorber lime-based (FGD)	0.12
Northshore Mining, Silver Bay	Boiler 1 (EU001)	LNB + OFA	0.41	Biomass co-fire	0.41
	Boiler 2 (EU002)	LNB + OFA	0.40	Biomass co-fire	0.48

*From Table 9.4 of SIP Revision

Neuschler, Catherine

From: Herb Davis
Sent: Friday, August 28, 2009 6:17 AM
To: Catherine.Neuschler@state.mn.us
Subject: BWCA/Haze

I am retired and visited the BWCA for five nights in May of this year and am always amazed that this area is set aside and beautiful. If I could arrange my death it would be after a long portage on the way out.

I want you to know that the BWCA has been a major part of making my choice to retire in MN and I am glad to be here to take advantage of it. I want you to do everything to protect the environment of the BWCA. I realize we are loosing the war on emissions and want you to make protecting this treasure part of the last stand!

I hope there are actions that you can take that will keep the BWCA haze free. Please and Thanks.

Sincerely;

Herbert Davis
12474 County 100
Sauk Centre,MN 56378-4760

Minnesota Center for
Environmental Advocacy

The legal and scientific voice protecting and defending Minnesota's environment

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September 3, 2009

VIA ELECTRONIC AND U.S. MAIL

Commissioner Paul Eger
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, 55155

Re: Minnesota Revised Draft Haze State Implementation Plan
Regional Haze Rule, 40 CFR §§51.300-308

Dear Commissioner Eger:

These comments are submitted on behalf of the Minnesota Center for Environmental Advocacy ("MCEA") in response to the Minnesota Pollution Control Agency's ("MPCA") Revised Draft Haze State Implementation Plan. The Friends of the Boundary Waters Wilderness ("Friends"), the National Parks Conservation Association ("NPCA"), and the Voyageurs National Park Association ("VNPA") join with MCEA in the submission of these comments and incorporate these comments as their own.[1]

MCEA, VNPA, NPCA, and Friends appreciate the MPCA's decision to provide public notice and an opportunity for public comment in response to the July 2009 Minnesota Revised Draft Haze State Implementation Plan ("Revised Haze SIP"). In addition, we would like to recognize the extent to which the MPCA has included the public in the process of the development and revision of the Regional Haze State Implementation Plan and provided multiple opportunities for public input and involvement. We appreciate the efforts made by MPCA to involve the public in such a significant undertaking and respond to comments and questions throughout the process. In addition, we greatly appreciate the extension of time granted for the submission of comments on the Revised Haze SIP. While our

[1] As indicated in the attached organizational information, each of these organizations has a significant interest in protecting and improving visibility in the Class I areas in Minnesota and in Michigan, including the Boundary Waters Canoe Area Wilderness ("BWCAW"), Voyageurs National Park ("VNP") and Isle Royale National Park. We submit these comments as significant stakeholders in the outcome of the Minnesota Regional Haze State Implementation Plan.

comments are still somewhat limited in scope, the additional time granted allowed us to more completely review the Best Available Retrofit Technology ("BART") determinations made by the MPCA for Minnesota's BART-eligible electric generating units ("EGUs").

Further, the assistance of MPCA staff in accessing information, making documents available for review, responding to questions, and being available to discuss concerns or clarify questions regarding both the initial draft Haze SIP and the Revised Haze SIP has been helpful and is greatly appreciated. We understand that the MPCA intends to bring the Revised Haze SIP before the MPCA Citizen's Board as an informational item during its regularly scheduled meeting in September 2009 and as a decision item during its regularly scheduled meeting in October 2009. We appreciate the MPCA's inclusion of the Citizen's Board in this matter as the outcome of the Regional Haze SIP process affects the interests of all Minnesotans in ensuring that our most valuable natural resources are restored and protected.

We offer these comments in an effort to ensure that Minnesota's Regional Haze SIP not only complies with federal guidelines but, more importantly, achieves meaningful and significant progress towards reducing visibility impairment in the Boundary Waters Canoe Area Wilderness and Voyageurs and Isle Royale National Parks by protecting these areas from harm as a result of human activity.[2] However, even as we recognize the significant time and resources invested in the development of the Haze SIP, we are concerned that the implementation of the Haze SIP fails to comply with the Clean Air Act and Regional Haze Rule and will not lead to meaningful improvement in visibility in Boundary Waters Canoe Area Wilderness, and Voyageurs and Isle Royale National Parks.

In addition to the issues we identified in our earlier comments, we highlight some additional areas which significantly limit the ability of the Haze SIP to improve visibility conditions in the Boundary Waters Canoe Area Wilderness, and Voyageurs and Isle Royale National Parks, including:

- EGU BART-determinations;
- Control and Monitoring of Taconite Facilities;
- Northeast Minnesota Plan; and
- Canadian Emissions.

[2] MCEA, NPCA, VNPA, and Friends previously submitted comments on Minnesota's Draft Haze State Implementation Plan in May 2008, April 2009, and July 2009. Please note that we have not included many of the concerns raised in our earlier comments here as we limited our current comments to new issues which developed since the initial Haze SIP comment period in 2008.

I. EGU BART-DETERMINATIONS[3]

A. General Comments.

Due to the highly technical nature of MPCA's EGU BART-determinations, MCEA, NPCA, VNPA, and Friends retained Dr. Ranajit Sahu, a nationally recognized air quality expert, to review the MPCA's EGU Bart-determinations.[4] Throughout his review, Dr. Sahu identifies significant inaccuracies and technical shortcomings in the MPCA's EGU BART-determinations. Most of Dr. Sahu's comments and concerns mirror those raised by the Federal Land Managers of the National Park Service and United States Forest Service which remain unresolved, notwithstanding the MPCA's response to interim comments.[5] We note the outstanding issues with MPCA's EGU BART-determinations as a way of highlighting the extensive concerns with the MPCA's BART-determinations which have been raised both by national experts in the highly technical field of air quality control and by institutions and individuals with whom the MPCA is legally obligated to consult in regard to matters related to Minnesota's Class I areas.[6] We are extremely concerned with the MPCA's failure to resolve issues raised by the Federal Land Managers ("FLMs") regarding the EGU BART-determinations. Dr. Sahu's analysis not only confirms the serious concerns raised by the FLMs, but also provides additional weight and technical review which serves to further delineate the significant legal and technical deficiencies with the MPCA's EGU BART-determinations.

While we recognize the unique challenges faced by MPCA in making the EGU BART-determinations due to the legal uncertainty regarding the applicability of the Clean Air Interstate Rule ("CAIR") to Minnesota and removal of Minnesota from CAIR, the fundamental flaws in the MPCA's BART-determinations must be corrected. The extent of disagreement between the technical assessments made by MPCA and those made by the National Park Service, United States Forest Service, and Dr. Sahu reflects more than a mere difference of opinion or legal interpretation on what types of emission controls should be required of Minnesota's BART-eligible EGUs. The extensive technical issues raised by the National Park Service, Forest Service and Dr. Sahu have not yet been adequately addressed by MPCA.

The attached review by Dr. Sahu also confirms that the MPCA's proposed emissions limits for BART-eligible EGUs fail to comply with the legal requirements of the Clean Air Act and the Regional Haze Rule. While the MPCA responded extensively to the interim comments of the National Park Service and Forest Service regarding the EGU BART-determinations,[7] Dr. Sahu's analysis confirms that the MPCA's response to interim comments does not rectify the myriad shortcomings in the technical analysis behind the MPCA's EGU BART-determinations or ensure

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[3] Please note that we are not making comments on the appropriateness or selection of the set of EGUs for which BART is proposed by MPCA and have focused our comments on the set of EGUs MPCA identified as requiring BART.

[4] See Attached Statement of Dr. Ranajit Sahu, dated September 2, 2009. Dr. Sahu also provided an expert review and analysis of the Regional Haze SIP which was released for public comment in March 2008. Dr. Sahu's earlier review is attached to our May 2008 comments.

[5] Revised Haze SIP, App. 2.5.

[6] 40 CFR §51.308(i).

[7] Revised Haze SIP, App. 2.5.

that these BART determinations comply with the legal requirements of the Clean Air Act or the Regional Haze Rule.

As further developed in Dr. Sahu's analysis, the MPCA's BART determination process fails to conform to the intent and purpose of BART, fails to correctly implement the required methodology for determining BART, and improperly relies on inaccurate and inconsistent information submitted by the EGUs without independent verification by the MPCA. As a result of these inadequacies in the BART-determination process, the proposed BART emissions limits for Minnesota's BART-eligible EGUs do not comply with the requirements of the Clean Air Act or Regional Haze Rule.

While we do not repeat the analysis provide by Dr. Sahu in our comments, we are highlighting some specific areas of concern with the MPCA's EGU BART-determinations, including:

- Inconsistent and inaccurate EGU BART-determinations;
- Failure to ensure use of most stringent controls available;
- Failure to consider visibility impacts of individual facilities as part of BART determinations; and
- Continued degradation of visibility in Class I areas notwithstanding MPCA's EGU BART-determinations.

B. Inconsistent and Inaccurate EGU BART-Determinations.

In its EGU BART-determinations, the MPCA references various sections of the Regional Haze Rule and the BART Guidelines as justification for applying different standards to individual EGUs leading to inconsistent and sometimes conflicting results in the BART-determinations. Problems with MPCA's EGU BART-determinations are a result, in part, of the MPCA's use of a different BART-determination process depending on the size of the EGU.

When making BART-determinations for Minnesota's BART-eligible EGUs, MPCA makes a distinction between those BART-eligible EGUs for which total plant capacity is greater than 750 MW and those BART-eligible EGUs for which total plant capacity is less than 750 MW. The MPCA makes this distinction based on Appendix Y to Part 51—Guidelines for BART Determinations Under the Regional Haze Rule ("BART Guidelines") which states that:

> [t]he guidelines provide a process for making BART determinations that States can use in implementing the regional haze BART requirements on a source-by-source basis, as provided in 40 CFR 51.308(e)(1). States must follow the guidelines in making BART determinations on a source-by-source basis for 750 megawatt (MW) power plants but are not required to use the process in the guidelines when making BART determinations for other types of sources.

40 CFR Pt. 51, App. Y, I.F.1.

Even though strict compliance with the 5-step process provided by the BART Guidelines for smaller EGUs is not required, the absence of a requirement to complete the 5-step process does not eliminate the need to ensure that the same standards are applied to all of Minnesota's BART-eligible EGUs or that the ultimate goal of the Regional Haze Rule to improve visibility through the reduction of emissions from BART-eligible EGUs is achieved. For each source subject to BART, the Clean Air Act and federal regulations require that States identify the level of control representing BART through a determination of BART based on:

> an analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each BART-eligible source that is subject to BART within the State. In this analysis, the State must take into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

40 CFR §51.308(e)(1)(ii)(A).

The requirements of 40 CFR §51.308(e)(1)(ii)(A) apply regardless of the size of the EGU and indicate that BART-determinations should be applied in an even-handed and consistent manner. The MPCA's EGU BART-determinations do not meet this standard.

The FLMs and Dr. Sahu note significant disparities in emissions controls required by MPCA of Minnesota's BART-eligible EGUs, including significant inaccuracies and inconsistencies, not only in the determinations made regarding the effectiveness of the same emissions control technology, but also in the cost-effectiveness of the same or similar control technologies. Notwithstanding these inconsistencies and discrepancies, the MPCA approved the emissions controls proposed by individual BART-eligible EGUs even when the underlying analysis of the effectiveness and cost of similar emissions controls provided by individual EGUs were noticeably inconsistent and resulted in significantly different levels of emissions being allowed by different EGUs.[8]

While we recognize that the BART determinations are to be made on a case-by-case basis, there can be no legitimate justification for the lack of consistency in the effectiveness of emissions controls and projected costs of similar emissions control technology between EGUs of similar size and type.[9] Even though site-specific factors may contribute to some level of difference between EGU BART-determinations, neither the EGUs nor the MPCA have provided independently verified site-specific information which accounts for the degree of inconsistencies between controls or emissions limits and costs included in the BART analyses. In its response to the interim comments of the National Park Service, the MPCA notes that it "has chosen, in general, to accept each facility's determination of how effective a given control technology will

[8] We note that the MPCA did independently evaluate the cost-estimates provided by Northshore Mining and required Northshore Mining to evaluate alternative technologies..
[9] Statement of Dr. Sahu, General Comments.

be at that facility."[10] The MPCA's reliance on determinations of the effectiveness of control technology made by individual facilities in light of the significant discrepancies in both the information provided by individual facilities and the actual emissions controls required is not acceptable.

Considering the significant disparity between the anticipated effectiveness of the same controls at different facilities, both in Minnesota and at other EGUs in the United States, the MPCA should conduct an independent review of the effectiveness and costs of the control technology analyzed by individual EGUs to resolve these discrepancies and ensure that each of Minnesota's BART-eligible EGUs is being held to the same standard. The EGU BART analysis included in the Revised Haze SIP and MPCA's response to the interim comments of the National Park Service and Forest Service do not adequately address or justify these inconsistencies.

We maintain that the recommended 5-step process included in the BART Guidelines provides an established and consistent process through which EGU BART-determinations may be made. The failure of the MPCA to use this established 5-step process has resulted in a lack of transparency in the EGU BART-determinations, unequal treatment between individual EGUs, and a lack of emissions controls which will adequately improve or protect visibility in Minnesota's Class I areas. We urge the MPCA to reconsider its decision to forgo the 5-step process in making its EGU BART-determinations and ensure that the BART requirements for Minnesota's EGUs are even-handed, equitable, and consistently applied.

C. Failure to ensure use of most stringent controls available.

For Boswell Unit #3, King Unit #1, and Silver Lake Plant Unit #4, MPCA asserts that it is not required to complete the full BART analysis under 40 CFR Pt. 51, App. Y, because these facilities have or will be installing "BACT-like controls".

According to the BART Guidelines, if a State finds that

> a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long [as] these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section.

40 CFR Pt. 51, App. Y(IV)(D)(9).

[10] Revised Haze SIP, App. 2.5, 370.

The MPCA has relied on this provision of the BART Guidelines as a justification for its failure to conduct a full BART analysis for Boswell Unit # 3, King Unit #1, and Silver Lake Plant Unit #4. However, as discussed by Dr. Sahu, the proposed emissions controls for Boswell Unit #3, King Unit #1, and Silver Lake Plant Unit #4, are not the most stringent controls available.[11] In addition, even if the proposed emissions controls for Boswell Unit #3, King Unit #1, and Silver Lake Plant Unit #4 were Best Available Control Technology ("BACT"), BACT does not necessarily equal BART.[12] Accordingly, the proposed emissions controls for Boswell Unit #3, King Unit #1, and Silver Lake Plant Unit #4 do not comply with the legal requirements of the Regional Haze Rule.

D. Failure to consider visibility impacts of individual facilities as part of BART determinations

The Regional Haze Rule specifically requires that the MPCA analyze "the degree of improvement in visibility which may reasonably be anticipated to result from the use of [BART] technology." 40 CFR §51.308(e)(1)(ii)(A). Notwithstanding this requirement, the MPCA failed to quantitatively demonstrate visibility improvements which would result from the use of BART technology by Minnesota's BART-eligible EGUs. The only visibility impact analysis provided demonstrates visibility impacts from EGUs prior to the installation of BART controls, not the amount of improvement expected with BART controls in place.[13] The legal requirement that MPCA analyze the degree of improvement in visibility which may result from the use of BART technology mandates that the MPCA quantitatively demonstrate the changes in visibility which would result from the installation of BART technology for each BART-eligible EGU. As the MPCA failed to provide the legally required quantitative analysis of visibility impacts for Minnesota's BART-eligible EGUs, the MPCA's BART determinations do not comply with the requirements of the Regional Haze Rule.

E. MPCA's EGU BART-Determinations Will Allow Significant Continued Degradation of Visibility in Class I Areas.

The MPCA's failure to properly conduct EGU BART-determinations and require appropriate emissions controls on Minnesota's BART-eligible EGUs will result in continued degradation of visibility in Class I areas. As noted in the attached, "Petition to the United States Department of Interior, National Park Service" ("Petition"), Xcel Energy's Sherco facility will continue to cause significant impairment of visibility in Voyageurs and Isle Royale National Parks and the Boundary Waters Wilderness Area even with the emissions controls required by MPCA and included in the Haze SIP.[14] Notwithstanding the considerable impact on visibility caused by the Sherco facility, the MPCA did not conduct the 5-step BART analysis required by the BART Guidelines and accepted Xcel Energy's BART analysis for the Sherco facility even though the BART analysis for the Sherco facility contained numerous errors and inaccuracies.[15] The MPCA

[11] Statement of Dr. Sahu, 8-9, 12-14.
[12] Statement of Dr. Sahu, 5-6.
[13] Revised Haze SIP, Appendix 2.5, 371.
[14] Attachment 2.
[15] Statement of Dr. Sahu, 10.

must conduct a proper 5-step BART analysis and require Xcel Energy to install additional emissions controls on its Sherco facility to ensure that the significant degradation in visibility caused by this facility is remedied.

II. CONTROL AND MONITORING OF TACONITE FACILITIES

In our comments, dated May 16, 2008, we noted the lack of public notice of the Administrative Orders by Consent that allow some taconite facilities to install Predictive Emission Monitoring Systems ("PEMs") instead of Continuous Emissions Monitors ("CEMs"). In response, MPCA included the Administrative Orders for both CEMS and Alternative Methods on public notice as part of the Revised Haze SIP. We appreciate this opportunity to officially reiterate our strong opposition to the MPCA's decision to allow half of the taconite facilities to install an unproven emission estimation method, or Predictive Emission Monitoring Systems, instead of the legally required Continuous Emissions Monitors. MPCA's approval of PEMs for half of the taconite facilities rather than requiring all taconite facilities to utilize CEMs violates the requirements of the Regional Haze Rule. The Regional Haze Rule specifically requires determinations of BART to be "based on an analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each BART-eligible source that is subject to BART within the State." 40 CFR §51.308(e)(1)(ii)(A).

Throughout the development of the Haze SIP, MPCA emphasized the importance of reducing uncertainty surrounding actual emissions from taconite facilities to determine whether individual facilities in the region are providing an appropriate share of progress toward the 2018 visibility goal. As a result of the lack of adequate emissions information from taconite facilities, MPCA proposed to postpone the determination of BART for taconite facilities to allow for a period of time during which taconite facilities would be required to obtain more accurate emissions information which could then be used as a basis for determining BART. In our May 2008 comments we supported an extension of time to allow for more accurate and complete information to be obtained regarding the actual emissions from each taconite facility.

During the development of the draft Haze SIP, we were told that alternatives matching the accuracy and reliability of CEMs did not exist for taconite facilities, and that taconite facilities would ultimately be required to install CEMs as mandated by the Regional Haze Rule. By approving PEMs for half of the taconite facilities, MPCA is abandoning its commitment to reduce uncertainty surrounding actual emissions from the taconite industry in northern Minnesota and is losing a critical opportunity to establish reliable baseline data regarding emissions of taconite facilities and the effectiveness of future emission control strategies in this "under-controlled" sector.

In response to comments, the MPCA included earlier deadlines for the implementation of CEMs, determination of BART, and inclusion of BART emissions limits in the Title V permits for the taconite facilities. However, MPCA also indicated that the recent economic downturn will cause delays in emissions testing for some of the taconite facilities. Please provide additional information and clarification regarding this matter, and how these anticipated delays will impact the proposed timeline for inclusion of BART emissions limits in the Title V permits of the

affected facilities. Recent media reports indicate that the slow-down in taconite production has reversed.

III. NORTHEAST MINNESOTA PLAN

While we continue to support MPCA's efforts to assess cumulative visibility impacts from existing and proposed major point sources in Northeastern Minnesota, the establishment of reliable baseline data for actual emissions from the taconite industry is a cornerstone of Minnesota's Regional Haze SIP and the Northeast Minnesota Plan. Minnesota's taconite facilities must be required to install CEMs and the 2002 baseline should be adjusted to reflect actual emissions to ensure a real 30% reduction from actual, not estimated, emissions.

Furthermore, we strongly believe that the 2002 baseline for US Steel Minntac of 14,924 tpy of NO_X should be adjusted in the baseline or removed from the cumulative 30% reduction goal because the estimate is approximately 6,000 tpy over their actual 2006 emissions. More importantly, Minntac has operated without a permit for over 20 years, with the potential to emit more than 10,000 tpy NO_X over their pre-modification permit level of 4,458 tpy. A permit was issued for Minntac in December 2008 that requires NO_X emissions reductions to 7,300 tpy by February 2010 with a goal of greater than 70% reduction from the initial permit limit of 13,300 tpy. Finally, resolving the long overdue Minntac permit should not "free up" those emissions for new or existing sources. MPCA needs to ensure that real progress is made to significantly reduce emissions from taconite facilities which endanger visibility in both the Boundary Waters Canoe Area Wilderness and Voyageurs National Park.

We reiterate our comments of May 2008 regarding our objection to the proposed streamlining of new source review through a Memorandum of Understanding ("MOU") between MPCA and the FLMs which would remove FLM review of emissions from individual new sources. The loss to the public from the removal of FLM review of new sources is even more pronounced now that MPCA has backed away from their commitment to collect accurate emission levels through installation of CEMs for all taconite facilities. We do, however, appreciate MPCA's response and agreement to provide an opportunity for interested parties to review and comment on any MOU between the MPCA and FLMs. We ask that the MPCA provide additional information as to what will happen to the NE Minnesota Plan and the anticipated emissions reductions which will be achieved through this plan in the event that the FLMs and MPCA do not enter into an MOU as anticipated.

IV. CANADIAN EMISSIONS

We continue to be extremely concerned with the MPCA's failure to recognize the high probability that Canadian emissions will increase and cause additional visibility impairment to Minnesota's Class I areas.[16] MPCA notes that it chose to keep Canadian emissions constant in its emissions modeling. However, keeping Canadian emissions constant runs counter to the reality of the current industrial growth in Canada, in particular the current growth and development of the Alberta tar sands industry. The current growth of Canadian industry, such as the tar sands industry, will unquestionably lead to additional visibility impairment in VNP and Boundary Waters.

Even as MPCA requests that the EPA work with Canada to both allow for more accurate emissions estimates and modeling, and support reductions in haze-causing emissions,[17] MPCA has downplayed the potential impact from increased Canadian emissions on visibility impairment in VNP and Boundary Waters. Minnesota's Haze SIP must more clearly identify the risks associated with Canadian emissions and the high probability that Canadian emissions will increase and cause increased visibility impairment in Minnesota's Class I areas. While we recognize the difficulty in tracking Canadian emissions, as discussed by MPCA in the Revised Haze SIP, the MPCA should acknowledge the likelihood that Canadian emissions will increase and will cause greater visibility impairment in Minnesota's Class I areas to provide the public and EPA with an honest assessment of the risks to Minnesota's air quality as a result of industrial growth and development in Canadian.

V. CONTRIBUTIONS FROM OTHER STATES

In our May 2008 comments, we asked MPCA to include a direct appeal to the EPA in Minnesota's Haze SIP to address concerns with the failure of other states to make reasonable progress towards the Haze Goals, thereby putting an unfair burden on Minnesota emissions sources, or otherwise failing to protect the visibility in Minnesota's Class I areas. We wish to acknowledge the fact that MPCA has included in the Revised Haze SIP a request to EPA to make a determination as to whether controls from states contributing to visibility impairment in Minnesota's Class I areas are appropriate.[18]

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[16] Revised Haze SIP, p. 51.
[17] Revised Haze SIP, p. 106.
[18] Revised Haze SIP, 106-107.

VI. CONCLUSION

In conclusion we ask the MPCA to take the following actions:

- Ensure consistency in the effectiveness of emissions controls and projected costs of similar technology between EGUs of similar size and type.
- Conduct an independent verification of the effectiveness and costs of control technology analyzed by the EGUs.
- Implement the 5-step BART determination process for all EGUs.
- Ensure that BART requirements for Minnesota EGUs are applied consistently and equitably.
- Quantitatively demonstrate the degree of improvement in visibility which may reasonably be anticipated to result from the use of BART technology by EGUs.
- Require all taconite facilities to utilize CEMs
- Provide information regarding the impact of delays in emissions testing for taconite facilities on inclusion of BART limits in Title V permits.
- Adjust the 2002 baseline for US Steel Minntac.
- Provide additional information about what will happen to the NE Minnesota Plan if no MOU occurs between the MPCA and the FLMs.
- Recognize the likelihood that Canadian emissions will increase and cause additional visibility impairment to Minnesota's Class I areas.

Thank you for the opportunity to comment on the Revised Haze SIP. Please ensure that these comments, including all attachments and cited materials, in addition to our comments from May 2008, April 2009 and July 2009 are included in the record for any decision the PCA makes with regard to the Haze SIP.

Please feel free to contact us with any questions or concerns you would like to discuss.

Sincerely,

Mary Winston Marrow

Mary Winston Marrow
Staff Attorney
Minnesota Center for Environmental Advocacy

Betsy Daub, Policy Director
Friends of the Boundary Waters Wilderness

Cory McNaulty
Executive Director
Voyageurs National Park Association

Lynn McClure
National Park Conservation Association

Cc: David Thornton, Assistant Commissioner, MPCA (via electronic mail)
John Seltz, Air Policy, MPCA (via electronic mail)
Catherine Neuschler, Air Policy, MPCA (via electronic mail)
Cheryl Newton, US EPA (via electronic and U.S. mail)
James W. Sanders, Forest Service
Don Shepherd, National Park Service (via electronic and U.S. mail)
Chris Holbeck, National Park Service (via electronic mail)
Trent Wickman, Forest Service

Minnesota Center for
Environmental Advocacy

The Minnesota Center for Environmental Advocacy is a Minnesota-based non-profit environmental organization whose mission is to use law, science, and research to preserve and protect Minnesota's natural resources, wildlife, and the health of its people. MCEA has state-wide membership. MCEA's members live, work, and recreate in the BWCAW, VNP and Isle Royale National Park. The Regional Haze State Implementation Plan (Haze SIP) involves environmental impacts in many of the areas of MCEA's work, including air quality, public health, and protection of natural resources.

TO PROTECT
FRIENDS
of the BOUNDARY WATERS WILDERNESS
& PRESERVE

The Friends of the Boundary Waters Wilderness ("Friends") is the only organization in the country focused squarely on protecting the Boundary Waters Canoe Area Wilderness. The Friends, a non-profit organization, exists to protect, preserve, and restore the recreational and ecological treasures of the BWCAW, and to defend the BWCAW against pressures created by excessive logging, invasive species, overuse, development, and industrial pollution. The Friends represent nearly 4,500 individuals, family foundations, and organizations, many of whom live adjacent to or regularly visit the BWCAW. Friends' members, along with 258,000 visitors annually, travel to the BWCAW in part to enjoy and seek the health benefits of its clean air. That enjoyment and those health benefits are curtailed on days where high levels of pollutants cause low-visibility and render the air in and around the BWCAW less safe.

VOYAGEURS NATIONAL PARK ASSOCIATION

Voyageurs National Park Association ("VNPA") is a private, non-profit organization with the mission of protecting and promoting Minnesota's only National Park, Voyageurs National Park ("VNP"). The Voyageurs National Park Association meets its mission through a focus on protecting the park by addressing policy issues, providing direct support to Park projects, and advocating to ensure long-term protection of the Park's resources.

National Parks Conservation Association®
Protecting Our National Parks for Future Generations®

The National Parks Conservation Association ("NPCA") is a national non-profit organization working to protect and enhance America's National Parks for present and future generations. NPCA plays a crucial role in ensuring that these magnificent lands and landmarks are protected. The work of NPCA includes advocating for the national parks and the National Park Service, and educating decision makers and the public about the importance of preserving the parks. NPCA represents more than 330,000 members dedicated to park preservation and ensuring that our parks are protected for present and future generations. The NPCA's Midwest office works to protect national parks in the region, including Voyageurs and Isle Royale.

MINNESOTA POLLUTION CONTROL AGENCY

In the Matter of the
Minnesota Revised Draft Haze
State Implementation Plan

STATEMENT OF
DR. RANAJIT SAHU

RANAJIT SAHU, provides this statement in support of his review of the Minnesota Revised Draft Haze State Implementation Plan:

I. Experience and Qualifications

1. I have a Bachelor of Technology degree, with Honors (B.Tech Hons.) from the Indian Institute of Technology (IIT), a Masters of Science (Mechanical Engineering) degree and a Doctorate in Philosophy (Ph.D), the latter two from the California Institute of Technology (Caltech).

2. I have over eighteen years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services as well as design and specification of pollution control equipment. In that time, I have successfully managed and executed numerous projects. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

3. I have provided and continue to provide consulting services to numerous private sector, public sector and public interest group clients. My clients over the past eighteen years include various steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including the Environmental Protection Agency, the United States Department of Justice, California Department of Toxics Substances Control (DTSC), various municipalities, etc. I have performed projects in over 45 states, numerous local jurisdictions and internationally.

4. In addition to consulting, I have taught and continue to teach numerous courses in several Southern California universities including University of California Los Angeles (air pollution), University of California Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past sixteen years.

5. Finally, I have and continue to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies. For details, please see my resume provided in Attachment A. My fee for preparation of this report is $110 per hour.

II. Scope of Comments

6. I am submitting these comments on the Minnesota Pollution Control Agency's (MPCA's) current Best Available Retrofit Technology (BART) proposals for the Electric Generating Units (EGUs) located in Minnesota that are subject to BART. The comments focus mainly on the NO_x and SO_2 BART determinations for each of the EGUs. I am not making comments on the appropriateness or selection of the set of EGUs for which BART is proposed by MPCA. I note that many of my comments echo similar concerns raised by others, such as the National Park Service (NPS) and the US Forest Service (USFS), the Federal Land Managers (FLMs) for the impacted Class I areas. I urge the MPCA to revisit its BART determination process to conform it to the intent and purpose of BART as well as to correctly implement the methodology itself. From my review, I have concluded that MPCA, in almost every instance, has not conducted the necessary detailed technical fact-finding to confirm or independently verify data (especially on costs, etc.) submitted by the various EGUs throughout the BART process. Simple reliance on information submitted by the EGUs does not discharge MPCA's significant review responsibility in this regard. Nor can such simple reliance result in robust and correct BART determinations.

III. General Comments

7. As currently determined, MPCA's EGU BART determinations fail to comply with the basic regulatory requirements of both the Regional Haze Rule, 40 CFR §51.308[1], and Appendix Y to Part 51 – Guidelines for BART Determinations Under the Regional Haze Rule.[2]

8. Even as the MPCA's EGU BART determinations do not comply with federal regulations, the BART levels proposed by the MPCA will demonstrably not achieve the primary goals expected of the BART process – namely visibility improvements in the various Class I areas (Voyageurs NP, Isle Royale NP, and the Boundary Waters Canoe Area Wilderness) impacted by the EGUs in Minnesota. In making its EGU BART determinations, the MPCA has emphasized cost-effective

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[1] For each source subject to BART, federal regulations require that States identify the level of control representing BART through a determination of BART based on:

> "an analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each BART-eligible source that is subject to BART within the State. In this analysis, the State must take into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

40 CFR §51.308(e)(1)(ii)(A).

[2] Appendix Y to Part 51 – Guidelines for BART Determinations Under the Regional Haze Rule provides a process for making BART determinations for States to use in implementing the regional haze BART requirements on a source-by-source basis. Appendix Y includes 5 Basic Steps of Case-by-Case BART Analysis which must be used by States in making BART determinations for 750 MW power plants, and which may be used when making BART determinations for other types of sources. 40 CFR Pt. 51, App. Y, I(F)(1).

solutions at the expense of a broad consideration of technical, economic, energy, and environmental (including visibility improvement) factors. While cost-effective solutions are one consideration in making EGU BART determinations, the MPCA has improperly elevated this consideration.

9. Because the MPCA has not followed the proper and systematic process for BART determinations, it is not surprising that MPCA's BART determinations show inconsistencies. For example, it should be expected that similar emission sources should be treated in a similar manner. It is also to be expected that, given economies of scale, larger EGUs should be more stringently controlled than the smaller EGUs. In MPCA's EGU BART determinations, the opposite is true, as within the large EGU category, there appears to be a trend of declining stringency as the size of the EGU increases, with some of the smaller EGUs actually being required to meet tighter limits than some of the larger EGUs. This is especially apparent when one compares the higher limits proposed for Units #1 and #2 at Xcel's 1,400 MW Sherco facility to the lower limits proposed by Minnesota Power for its 375 MW Boswell Unit #3 (see tables below). In the smaller EGU category, where the EGUs are virtually identical in size, Minnesota Power has proposed the lowest Nitrogen Oxide (NO_X) limits for its Taconite Harbor Unit #3. Although BART determinations are to be made on a case-by-case basis and true consistency is not, in and of itself, a goal; nonetheless, the level of inconsistency found is striking. It is my opinion that the inconsistency is more a reflection of MPCA's ad-hoc process of BART determination than a result of careful case-by-case analysis.

Proposed NO_x Limits

Operating Company	Plant	Unit	Boiler Type	Fuel	Rating	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	tangential	sub-bituminous	690	LNB+SOFA	0.15
Xcel Energy	Sherburne County Generating Station	Unit #2	tangential	sub-bituminous	683	Combustion Optimization	0.15
Xcel Energy	Allen S. King Generating Plant	Unit #1	cyclone	sub-bituminous	550	SCR	0.10
Minnesota Power	Boswell Energy Center	Unit #3	tangential	sub-bituminous	375	LNB+OFA+SCR	0.07
Northshore Mining	Silver Bay Power Plant	Unit #2	wall-fired	sub-bituminous	75	LNB+OFA	0.372
Minnesota Power	Taconite Harbor	Unit #3	tangential	bit/sub-bituminous	75	ROFA/Rotamix	0.13
Rochester Public Utilities	Silver Lake Plant	Unit #4	wall-fired	bituminous	60	ROFA/Rotamix	0.25

Proposed SO_2 Limits

Operating Company	Plant	Unit	Fuel	Rating (MW)	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	sub-bituminous	690	FGD upgrade	0.12
Xcel Energy	Sherburne County Generating Station	Unit #2	sub-bituminous	683	FGD upgrade	0.12
Xcel Energy	Allen S. King Generating Plant	Unit #1	sub-bituminous	550	FGD upgrade	0.12
Minnesota Power	Boswell Energy Center	Unit #3	sub-bituminous	375	wet FGD	0.09
Northshore Mining	Silver Bay Power Plant	Unit #2	sub-bituminous	75	LSD+FF	0.06*
Minnesota Power	Taconite Harbor	Unit #3	bit/sub-bituminous	75	FSI and new FF	0.32
Rochester Public Utilities	Silver Lake Plant	Unit #4	bituminous	60	dry FGD	0.60

*MPCA has proposed an alternate limit for SO_2 at Northshore.

Proposed Total PM_{10} Limits

Operating Company	Plant	Unit	Fuel	Rating (MW)	Proposed Control	Proposed Limit (lb/mmBtu)
Xcel Energy	Sherburne County Generating Station	Unit #1	sub-bituminous	690	existing wet ESP	0.090
Xcel Energy	Sherburne County Generating Station	Unit #2	sub-bituminous	683	existing wet ESP	0.090
Xcel Energy	Allen S. King Generating Plant	Unit #1	sub-bituminous	550	FF	0.030
Minnesota Power	Boswell Energy Center	Unit #3	sub-bituminous	375	FF	0.035
Northshore Mining	Silver Bay Power Plant	Unit #2	sub-bituminous	75	existing FF	0.094*
Minnesota Power	Taconite Harbor	Unit #3	bit/sub-bituminous	75	FSI and new FF	0.012
Rochester Public Utilities	Silver Lake Plant	Unit #4	bituminous	60	dry FGD w FF	0.400

*0.046 gr/dscf

IV. Failure to Follow Five Basic Steps of BART Analysis

10. One of the most significant failures of MPCA's BART determination process is its failure to implement the correct, regulatory 5-step procedure in its entirety.[3] Among many good reasons, following such a systematic process is more likely to result in correct, equitable, and defensible BART emissions levels. While the BART regulations allow the consideration of controls that may already be implemented (or are in the process of being implemented) at a particular EGU, MPCA seems to have relied on this aspect to a far greater degree, effectively neglecting the other steps of the required five-step BART analyses. In doing so, MPCA has effectively pre-empted the required five-step BART analysis by simply accepting that BART is equivalent to whatever a particular EGU has already committed to installing. This approach is valid once MPCA demonstrates that the source has in place federally-enforceable limits that represent the most stringent level of control.[4] None of the sources for which the MPCA exempted the

[3] The five steps are:

STEP 1—Identify All Available Retrofit Control Technologies,
STEP 2—Eliminate Technically Infeasible Options,
STEP 3—Evaluate Control Effectiveness of Remaining Control Technologies,
STEP 4—Evaluate Impacts and Document the Results, and
STEP 5—Evaluate Visibility Impacts.

See 40 CFR Pt. 51, App. Y, IV(D).

[4] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long as these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART

five-step BART process meet this criteria. Without a complete five-factor analysis from the EGU or MPCA, it is impossible to expect correct BART determination outcomes. In some cases, MPCA asserts that a particular EGU has installed, is installing, or is planning to install controls that are Best Available Control Technology (BACT), required pursuant to the New Source Review (NSR)/Prevention of Significant Deterioration (PSD) regulations, and that BART is also BACT. This is flawed from two standpoints. First, even if it were true, MPCA does not provide any support for its assertion that what a specific EGU may be installing is, in fact, BACT. BACT is, by itself, usually determined by a five step process, analogous to but not exactly the same as the five-step BART process. Second, even if an EGU were to be installing controls capable of meeting BACT, the equivalence between BACT and BART is not assured. As noted, although each is set pursuant to a multi-step process, there are differences. One of the more significant differences is the consideration of visibility improvement that has to be accounted for in BART determinations (including analyses of cost-effectiveness for various options using visibility improvement metrics). Thus, in instances it has claimed that BACT is BART, MPCA's analysis rests on a flawed premise and is unsupported.

11. MPCA's failure to comply with the requirements of federal regulations is apparent as MPCA and the BART sources have consistently underestimated the abilities of established pollution control technologies (e.g., wet scrubbers of numerous designs, and Selective Catalytic Reduction) to reduce emissions and MPCA did not evaluate potential upgrades to the existing control equipment as required by the BART regulations.[5]

12. MPCA's estimates of control effectiveness are inconsistent. For example, MPCA has determined that a spray dryer/fabric filter system can meet 0.06 lb SO_2/mmBtu at Northshore Mining's Unit 2, but the same system would only be required to meet a limit ten-times higher (i.e., 0.60 lb/mmBtu) at Rochester Public Utilities' Silver Lake Unit #4. And, even for the inherently more-efficient wet scrubbing systems at the larger EGU, the SO_2 limits would be 50% to 100% higher than SO_2 BART at Northshore. MPCA did not explain these inconsistencies.

13. MPCA has accepted at face value cost estimates presented by the EGUs without conducting or documenting its own analyses. The only exception was for Northshore Unit 2, where those cost overestimates were so egregious that MPCA conducted its own analysis.

14. While it is sometimes appropriate to consider incremental cost effectiveness in addition to average cost effectiveness, the MPCA has generally improperly relied on incremental cost-effectiveness as a metric to eliminate otherwise cost-effective controls.[6] For example, contrary to EPA's guidance,[7] MPCA did not

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determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section." 40 CFR Pt. 51, App. Y, IV(D)(9).

[5] 40 CFR Pt. 51 App. Y.

[6] EPA BART Guideline: "You should consider the incremental cost effectiveness in combination with the average cost effectiveness when considering whether to eliminate a control option."... "You should

establish the least-cost envelope and resulting dominant control alternatives before applying the concept of incremental cost-effectiveness.

15. MPCA did not always consider the visibility reduction impacts as part of the BART controls analysis. This is not only required by the statute[8] but was specifically required by EPA in its implementing regulations.[9] Only for Sherco and Northshore were the visibility impacts of the BART options evaluated. This fifth-step of the BART process is essential for assessing the ability of a potential control strategy to address the fundamental purpose of the BART program. It is also, as noted earlier, the step that distinguishes BART from BACT.

16. Like the National Park Service, I believe that it is appropriate to consider both the degree of visibility improvement in a given Class I area as well as the cumulative effects of improving visibility across all of the Class I areas affected by a particular EGU. It is inappropriate to use the same metric to evaluate the effects of reducing emissions from a BART source that impacts only one Class I area as for a BART source that impacts multiple Class I areas. And, it is also inappropriate to evaluate impacts at one Class I area, while ignoring others that are similarly significantly impaired.

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exercise caution not to misuse these [average and incremental cost effectiveness] techniques... [but consider them in situations where an option shows]...slightly greater emission reductions..." 40 CFR Pt. 51, App. Y(IV)(D)(4)(e)(1, 5).

[7] EPA notes that, "You should exercise care in deriving incremental costs of candidate control options. Incremental cost-effectiveness comparisons should focus on annualized cost and emission reduction differences between 'dominant' alternatives. To identify dominant alternatives, you generate a graphical plot of total annualized costs for total emissions reductions for all control alternatives identified in the BART analysis, and by identifying a 'least-cost envelope' . . ." 40 CFR Pt 51, App. Y(IV)(D)(4)(e)(2).

[8] Section 169A(g)(7) of the CAA requires that States must consider the following factors in making BART determinations:

(1) The costs of compliance,
(2) The energy and nonair quality environmental impacts of compliance,
(3) Any existing pollution control technology in use at the source,
(4) The remaining useful life of the source, and
(5) The degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

[9] EPA notes that "Pursuant to the remand in *American Corn Growers,* we are amending the regional haze rule to require the States to consider the degree of visibility improvement resulting from a source's installation and operation of retrofit technology, along with the other statutory factors set out in CAA section 169A(g)(2), when making a BART determination. This has been accomplished by listing the visibility improvement factor with the other statutory BART determination factors in 40 CFR 51.308(e)(1)(A), so that States will be required to consider all five factors, including visibility impacts, on an individual source basis when making each individual source BART determination..." 40 FR 39106, July 6, 2005.

V. Comments on Specific EGU BART Determinations

1. Minnesota Power – Boswell Unit 3

The Boswell Energy Center (BEC) operated by Minnesota Power consists of four Electric Generating Units (EGUs) with a combined net generating capacity of approximately 1,025 megawatts (MW). Since Boswell Unit #3 (375 MW) was commissioned in 1973 and MPCA modeling has demonstrated that its emissions cause or contribute to visibility impairment in Boundary Waters Canoe Area, Isle Royale National Park, Seney National Wildlife Refuge, and Voyageurs National Park, Boswell Unit #3 is subject to BART.

Unit #3 is tangentially-fired with sub-bituminous coal. Particulate matter (PM) emissions are currently controlled by a wet scrubber which is thought to incidentally remove approximately 30% of the boiler flue gas SO_2. Minnesota Power also states that it lowers NO_X emissions by using over-fire air combustion.

As part of the Boswell Unit #3 Plan currently being installed, Minnesota Power proposes to install Low-NO_X Burners (LNB), Over-Fire Air (OFA) and Selective Catalytic Reduction (SCR) to reduce NO_X, as well as a Combustion Optimization System to optimize the balance between NO_X reductions and carbon monoxide control; a flue gas desulfurization (FGD) scrubber to further reduce SO_2, and a fabric filter to control PM. With a combination of LNB/OFA[10] and SCR, Minnesota Power expects a NO_X reduction of approximately 80% at Unit #3 compared to current levels. That is, a reduction in the NO_X emission rate from approximately 0.37 lbs/mmBtu to 0.07 lbs/mmBtu (30-day rolling average). Minnesota Power also expects a 90+% reduction of SO_2 that improves upon the current incidental 30% co-benefit SO_2 removal via the existing wet particulate scrubber, which will be replaced by the new FGD scrubber. The new SO_2 emission rate is expected to be approximately 0.09 lbs/mmBtu (30-day rolling average) compared to the current emission rate of approximately 0.95 lbs/mmBtu. With the proposed new fabric filter, Minnesota Power expects the total PM_{10} emissions rate to meet a limit of 0.035 lbs/mmBtu.

Minnesota Power was not required by the MPCA to perform a BART analysis for Boswell Unit #3, because of the Boswell Unit #3 Plan above and MPCA's belief that the emissions rates that will be achieved upon implementation of the Boswell Unit #3 Plan represent BART levels of control.

Issues with the Analysis

(i) First, Minnesota Power and the MPCA did not conduct the required 5-step BART analysis. As noted earlier, skipping the 5-step process is only allowed if MPCA

[10] Another benefit of reducing the initial formation of NO_x in the boiler is reduction in the amount of ammonia required to further reduce NO_x emissions.

demonstrates that the source has in place, or is committing to, federally-enforceable limits that represent the most stringent level of control.[11]

(ii) The proposed suite of pollution controls at Boswell Unit #3 are not the "most stringent controls available" as these controls can achieve even greater emission reductions if properly designed, operated and fully utilized, which they are not. For example, a modern wet scrubber can achieve 98% or even 99% control of SO_2 instead of the 90%+ level being required at Boswell Unit #3. With a 98% level of emissions reduction, and a current uncontrolled SO_2 level of 1.35 lb/mmBtu, the SO_2 outlet emissions level that can be expected is 0.027 lb/MMBtu, which is far lower than the 0.09 lb/mmBtu proposed. Although not at low as 0.027 lb/mmBtu, MPCA has proposed a level of 0.06 lb SO_2/mmBtu at Northshore Unit #2 on a 30-day average. Similarly, for NO_X, the proposed combination of combustion controls and SCR can achieve over 90% reduction from uncontrolled levels, which are 0.37 lb/mmBtu. With this, the outlet NO_X level should be around 0.037 lb/mmBtu. Levels of 0.05 lb/mmBtu have been proposed by others.[12] Even Minnesota Power, in its November 19, 2008 BART submittal for its Taconite Harbor facility notes that, "The use of an SCR is expected to achieve a NO_x emission rate of 0.05 lb/mmBtu based on recent emission guarantees offered by SCR system suppliers." Clearly, more stringent levels of control are being required of others than at Boswell Unit #3. Finally, with regards to PM_{10}, numerous units are proposing 0.018 lb/mmBtu for total PM or total PM_{10}, which is approximately half of what is proposed by the Boswell Unit #3 Plan.

As such, it is doubtful that what is proposed at Boswell Unit #3 is BACT. Even if this were so, MPCA's assertion that BACT is also BART is wrong, as discussed earlier.

For all these reasons, MPCA's determination that the Boswell Unit #3 Plan represents BART without a thorough 5-step BART analysis is erroneous.

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[11] According to the BART Guidelines, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long [as] these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section." 40 CFR Pt. 51, App. Y(IV)(D)(9).

[12] Permit issued July 31, 2008 by EPA to Sithe Global Power for the Desert Rock power plant, on a 24-hour basis. Or, the limit of 0.05 lb/mmBtu proposed by the Coletto Creek 2 plant in Texas, on an annual average basis.

2. Xcel Energy – Sherburne County Generating Plant (Sherco) Unit #1 and #2

Xcel Energy's (Xcel) Sherburne County generating plant (Sherco) consists of three units with a total plant electrical output rating of 2,255 megawatts (MW). Of these, tangentially-fired Units #1 (690 MW net) and 2 (683 MW net), firing sub-bituminous coal, are BART-eligible.

The air pollution control equipment for Units #1 and #2 consists of wet FGD for SO_2 and wet electrostatic precipitators (WESPs) for PM. In 2007 Xcel installed Low-NO_X Burners (LNB), separated/close coupled Over-Fire Air (OFA) systems, and a combustion optimization system to reduce NO_X emissions from Unit #1. For Unit #2 NO_X, Xcel installed a computer-based combustion optimization system for the OFA system in 2006. Following these, Units #1 and #2 are expected to achieve NO_X emission rates of 0.15 lb/mmBtu.

Issues with the Analysis

(i) As in the case of numerous other BART determinations, MPCA did not conduct the required 5-step BART analysis.

(ii) For NO_X, the MPCA has determined that the presumptive NO_X limits of 0.15 lb/mmBtu on a 30-day rolling average are BART at both Units. These limits are to be achieved with current technologies, as noted above. MPCA improperly rejected the use of SCR on cost-effectiveness grounds by noting that, "...SCRs are an order of magnitude more expensive than other NO_X controls. Xcel determined that implementing SCRs on these units would be $40 million (annualized) above the cost of proposed BART, and result in only 3,500 additional tons of NO_X removal. Getting only 1.5 times the pollutant reductions at greater than ten times the cost is not cost-effective for BART." MPCA's conclusions are based on numerous errors, as discussed below.

First, MPCA has improperly accepted Xcel's assertions as to the NO_X reductions that would result from the application of SCR. Xcel assumed that SCR can only achieve 0.08 lb/mmBtu on an annual basis. Since SCR's for this application are typically guaranteed to provide a minimum of 90% NO_X reduction, and since boiler-out NO_X with existing controls are in the 0.15 lb/mmBtu range, the target NO_X outlet emissions with SCR should be 0.015 lb/mmBtu. While this may seem low, limits lower than 0.08 lb/mmBtu via SCR are part of the record at some of the other BART-eligible units. Boswell Unit #3 proposed a limit of 0.07 lb/mmBtu and the Taconite Harbor BART analysis notes that SCR is capable of achieving 0.05 lb/mmBtu at that unit. Even using a value of 0.05 lb/mmBtu, SCR should remove more than 5,400 tons/yr of NO_X as opposed to MPCA's estimate of 3500 tons/year. Clearly, this alone considerably improves the cost-effectiveness of SCR.

Second, MPCA's assertion as to the 40 million dollars for SCR on an annualized basis is incorrect on its face. Using the costs presented by MPCA/Xcel, the total annualized cost for combustion controls plus SCR at both units is 33 million dollars.

Additionally, Xcel and MPCA have overestimated the cost of SCR. No vendor data were provided to support these costs. In the absence of vendor data, and instead of relying on the recommended EPA OAQPS Control Cost Manual to develop the cost estimate, Xcel relied upon the CueCost program to generate cost estimates. In doing so, Xcel used questionable and unsupported assumptions in its input to the CueCost model, which resulted in some extraordinarily high cost estimates. For example, Xcel chose the highest available retrofit factor with no justification or explanation of why such a high retrofit factor would be warranted using site-specific factors. Again, instead of relying upon the customary 7% interest rate recommended by the Cost Manual, Xcel used a higher value of 9.2%.[13] Numerous other assumptions included in Xcel's BART analysis also did not make sense.[14] The net result is that the SCR cost estimate is inflated, with apparent MPCA blessing. It is worth noting that the independent cost for SCR developed by the NPS, and as noted in their comments, resulted in an annualized cost of 14 million.

Taken together, (i.e., the lower cost of SCR and its higher removal efficiency), a revised analysis would result in a far lower cost-effectiveness for SCR at these Units. Without question, the elimination of SCR on the frivolous grounds noted by the MPCA, for units of this size, is a serious flaw in MPCA's BART determination.

(iii) For SO_2, MPCA determined that the BART limit should be 0.12 lb/mmBtu, to be achieved via retrofitting of the existing scrubbers with sparger tubes and lime injection. Xcel/MPCA have provided no justification for the proposed SO_2 BART limit. It is my professional opinion that the proposed scrubber upgrade may be able to achieve a lower SO_2 limit. I note that MPCA has proposed SO_2 limits of 0.09 lb/mmBtu at Boswell Unit #3 and 0.06 lb/mmBtu at Northshore Unit #2.

Based upon the coal quality data provided by Xcel, uncontrolled SO_2 emissions from the Sherco units are around 0.98 lb/mmBtu, using sub-bituminous coal. Since modern wet scrubbers can achieve controls of over 98%, and conservatively assuming that retrofit applications can achieve at least 95% reduction, the likely BART emissions levels should be no greater than 0.05 lb/mmBtu. Of course, as part of the 5-step process, levels of SO_2 controls as high as 98% should have been investigated. Therefore, the proposed 0.12 lb/mmBtu BART limits, which represents an overall control efficiency of about 88%, is not supportable as BART. As the National Park Service notes in its comments, various EGUs have proposed BART limits that rely on much greater than 88% SO_2 reduction using scrubbers: Coal Creek @ 94%; Stanton @ 90%; and M.R. Young @ 95%.

(iv) For PM_{10}, the MPCA has determined that the existing particulate control represents BART and the existing permit limit (0.09 lb/mmBtu) for PM_{10} is an appropriate BART limit. Considering that this limit is more than six times higher than the limit proposed for Minnesota Power's Boswell Unit #3, Xcel and MPCA should have evaluated the existing wet electrostatic precipitators for potential upgrades.

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[13] BART Analysis for Sherbourne County Generating Plant, Units 1 and 2, Appendix A, page 77 of 111, prepared by Xcel Energy, October 25, 2006.

[14] For example, Xcel estimated a catalyst cost of $356 per cubic foot compared to Minnesota Power's estimate of $189 cubic foot.

3. Xcel Energy – Allen S. King Generating Plant Unit #1

The Allen S. King (King) plant is a coal-fired electric utility operated by Xcel Energy (Xcel) and located in Oak Park Heights, Minnesota. Unit #1 is a coal-fired cyclone boiler with a generating capacity of 550 MW. Boiler Unit #1 causes or contributes to visibility impairment at Boundary Waters Canoe Area. Historically, the only air pollution control for Unit 1 was an electrostatic precipitator for PM control. In 2007, a pulse-jet fabric filter (PJFF) was added for additional PM control, SCR was added for NO_X control, and a lime-based spray dryer scrubber was added for SO_2 control. Emissions limits after the 2007 addition of controls are 0.10 lb/mmBtu for NO_X (30-day rolling average), 0.12 lb/mmBtu for SO_2 (also 30-day rolling average), and a limit of 0.03 lb/mmBtu for total PM_{10}.

MPCA did not require a BART analysis of King Unit #1 in view of the controls added in 2007. As with Boswell Unit #3, MPCA also notes, without support, that the controls at King Unit 1 constitute BACT.

Issues with the Analysis

(i) The required 5-step BART analysis was not completed in spite of the fact that the limits proposed for this unit do not represent the most stringent level of control.

(ii) The SCR for NO_X controls should be able to achieve over 90% control and a level of outlet NO_X lower than 0.10 lb/mmBtu. Since uncontrolled NO_X from this unit was approximately 0.7 lb/mmBtu during 2002-2004, the outlet, controlled NO_X should be no greater than 0.07 lb/mmBtu. A 5-step BART process should have seriously considered a wet-scrubber for SO_2 control, which would have provided greater than 98% control. Based on 2002 - 2004 CAM data, King Unit #1 had uncontrolled SO_2 emissions of 1.47 lb/mmBtu. With 98% control, an outlet SO_2 level of 0.03 lb/mmBtu (4 times lower than the current limit) should have been considered in the analysis. Even with dry-scrubbers, other units have proposed lower levels. For example, Sierra Pacific Power proposed that its Ely PC boiler meet a 30-day rolling average SO_2 limit of 0.060 lb/mmBtu using a dry scrubber while burning coal with uncontrolled emissions of 1.7 lb/mmBtu. Even the MPCA has proposed that BART for SO_2 at Northshore Unit #2 of 0.06 lb/mmBtu (30-day rolling average). As noted above for Boswell Unit #3, total PM/PM_{10} levels of 0.018 lb/mmBtu are common.

As with Boswell Unit #3, it is doubtful that what is proposed at King Unit #1 is BACT. Even if this were so, MPCA's assertion that BACT requires greater emissions controls and is therefore also BART is wrong, as discussed earlier.

For all these reasons, MPCA's determination that the 2007 limits represents BART without a thorough 5-step BART analysis, is erroneous.

4. Rochester Public Utilities – Silver Lake Plant; Units #3 and #4

Rochester Public Utilities (RPU) operates a bituminous coal and natural gas-fired steam-electric generating station known as the Silver Lake Plant (SLP) in Rochester, Minnesota. The facility has a total nominal generating capacity of 100 megawatts (MW) gross, and the largest unit (Unit #4) has a capacity of around 60 MW. Unit #3 has a capacity of 24 MW. Modeling analyses conducted by MPCA have determined that the SLP causes or contributes to visibility impairment in the Boundary Waters Canoe Area.

Rochester Public Utilities was not requested to submit a BART analysis for SLP Unit #4 since this Unit has installed a pollution control retrofit project for PM, SO_2, and NO_X pursuant to a 2006 settlement agreement to which MPCA is a party. At Unit #4, RPU is required to install and operate "a NO_X emission reduction system that is designed to achieve at least a 0.15 lbs/mmBtu emission rate for NO_X." This will be achieved through installation of the control technology known as 'Mobotec.' Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX Selective Non-Catalytic Reduction (SNCR) with furnace urea injection for NO_X control. The MPCA has determined that installation of the Mobotec system represents BART for NO_X on Unit #4. However, initial operation of Mobotec has shown that an emission rate of only 0.25 lbs/mmBtu is achievable on a 30-day rolling average basis. In other words, the design goal of 0.15 lb/mmBtu is not being achieved. SO_2 controls consist of installing a spray-dryer absorber designed to achieve a 70 - 85% removal rate. The MPCA has determined that installation of this system represents BART for SO_2 on Unit #4. To control PM, the existing electrostatic precipitator (ESP) will be replaced by a fabric filter that includes a bag leak indicator. The MPCA has determined that installation of this system represents BART for PM_{10} on Unit #4.

The MPCA has determined that BART for Unit #3 is no additional control because Units #3 and #4 combined were found to be only "marginally" subject-to-BART and, as described above, control upgrades are planned for Unit #4, the larger BART unit. Existing air pollution control for Unit #3 includes multi-cyclones in series with electrostatic precipitators for PM_{10} control. There are permit limitations for SO_2 (2.3 lb/mmBtu) and total PM_{10} (0.4 lb/mmBtu) but no limit for NO_X.

Issues with the Analysis

(i) The required 5-step BART analysis was not completed for either Unit #3 or #4 in spite of the fact that the limits proposed for these units do not represent the most stringent levels of control.

(ii) A 5-step analysis for Unit #4 would have fully explored the use of better controls such as SCR for NO_X and wet FGD for SO_2. Even with the controls proposed, lower limits can be achieved and should have been considered. For example, Minnesota Power and MPCA have proposed that Taconite Harbor Unit #3 meet 0.13 lb/mmBtu for NO_X using the same control technology on a similar-sized coal-fired boiler. This is glaringly inconsistent with what is being proposed for Rochester Public Utilities. MPCA must

explain why the RPU boiler should be allowed almost twice the NO_X emission rate as Taconite Harbor. Similarly, for SO_2, even with the proposed dry scrubber, far lower limits than the proposed 0.60 lb/mmBtu are routine and do not reflect even the minimal capability of the proposed spray dryer system. Although MPCA states that, "SO_2 controls consist of installing a spray-dryer absorber designed to achieve a 70 - 85% removal rate..."[15], this assertion is not reflected in the proposed BART limit. Of course, the assertion itself is incorrect since spray dryers can achieve over 90% controls.[16] Lastly, the proposed limit of 0.40 lb/mmBtu for total PM does not meet BART and is inconsistent with other proposals. For example, Minnesota Power and MPCA have proposed that Taconite Harbor Unit #3 meet 0.012 lb/mmBtu using the same control technology on a similar-sized coal-fired boiler – which makes the limit for Silver Lake Plant Unit #4 over 33 times greater.

As to Unit #3, simply requiring nothing additional, without doing the 5-step analysis, is incorrect and inappropriately short-circuits the BART determination process. MPCA should conduct the analysis and let the analysis determine the conclusions.

For all these reasons, MPCA's determination that the proposed limits represent BART for the two Units at Rochester Public Utilities' Silver Lake plant without a thorough 5-step BART analysis, is erroneous.

[15] MPCA Memorandum by Anne Jackson dated April 29, 2009, "BART Determination for Rochester Public Utilities-Silver Lake Plant, Units 3 and 4", page 4 of 6.

[16] Recently a 95% control spray dryer has been proposed for the Coletto Creek 2 unit in Texas. Even in the current proceedings, for the Northshore Mining Silver Bay power plant BART analysis, it is estimated that the spray-dryer/fabric filter combination can achieve 90% control.

5. Minnesota Power – Taconite Harbor Unit 3

Minnesota Power operates a coal-fired steam-electric generating station known as the Taconite Harbor Energy Center (THEC) near Schroeder, Cook County, Minnesota. The three tangentially-fired coal boilers (75 MW net each) at the facility can burn either bituminous or sub-bituminous coal. Only Unit #3 is subject to BART.

Minnesota Power has undertaken an emissions reduction project for the three generating units, referred to as the Arrowhead Regional Emissions Abatement (AREA) Project.[17] Minnesota Power proposed to install Mobotec multi-pollutant control technology[18] on each of the three 75 MW boilers to reduce SO_2 (by 65% to 0.24 lb/mmBtu) and NO_X (by 64% to 0.14 lb/mmBtu).

Operation of the Rotamix system throughout 2008 demonstrated that the ROFA/Rotamix system controlled emissions below the "presumptive BART" level [for NO_X] for very large power boilers of 0.15 lb/mmBtu. Operation of the system however did not achieve SO_2 removals as planned. Therefore, the MPCA requested Minnesota Power prepare a BART analysis for Unit #3. The analysis recommended the installation of a fabric filter to achieve up to 50% removal of SO_2 along with the use of Rotamix. Minnesota Power's BART analysis summary is provided below, along with cost-effectiveness calculated by Minnesota Power.

Control Technology	Post-BART emissions (lb/mmBtu)	Total Levelized Cost ($/yr)	Tons removed	Cost Effectiveness ($/ton)
NOx				
SCR	0.05	$5,085,000	1,100	$4,600
ROFA/Rotamix	0.13	$2,876,000	840	$3,400
ROFA	0.15	$1,616,000	750	$2,200
SO_2				
Semi-dry SD and new FF	0.08	$9,689,000	1,940	$5,000
FSI and ESP Conversion	0.42	$1,109,000	880	$4,000
FSI and new FF	0.42	$1,868,000	880	$5,300

The MPCA concurred with Minnesota Power's assessment of controls and their costs. MPCA proposes that Nalco-Mobotec is BART for NO_X, (limit of 0.13 lb/mmBtu, 30-day rolling average), that the furnace sorbent injection is BART for SO_2 (limit of 0.32

[17] On October 14, 2005, Minnesota Power submitted its Arrowhead Regional Emissions Abatement (AREA) proposal and accompanying rate rider, pursuant to Minn. Stat. § 216B.1692, to reduce SO_2 and NO_x emissions from its Syl Laskin and Taconite Harbor generating stations. The AREA plan submitted by Minnesota Power proposed to use Furnace Sorbent Injection (FSI) to reduce SO_2 by 64% from 0.67 lb/mmBtu to 0.24 lb/mmBtu.

[18] Mobotec is comprised of Rotating Opposed Fired Air ('ROFA') and ROTAMIX selective non-catalytic reduction (SNCR) with furnace urea injection for NO_X control. In addition, the system includes a Furnace Sorbent Injection ('FSI') system for injection of a calcium alkaline reagent (limestone) for SO_2 control, and a system to inject a clay-based sorbent (MinPlus) to adsorb and chemically bind vaporized elemental mercury.

lb/mmBtu, 30-day rolling average), and that the PM_{10} control limit of 0.012 lb/mmBtu, achievable with the installation of a new fabric filter, is BART for PM_{10}.

Issues with the Analysis

(i) The required 5-step BART analysis was not completed for NO_X in spite of the fact that the limits proposed for this unit do not represent the most stringent level of control. Even though a 5-step analysis was completed for SO_2, the proposed limit of 0.32 lb/mmBtu does not represent BART.

(ii) The cost effectiveness calculations over-estimate cost effectiveness since they underestimate control efficiency (for example, the spray dryer/fabric filter combination can achieve 90% control and should be able to reduce SO_2 emissions to 0.07 lb/mmBtu from the current 0.70 lb/mmBtu, instead of the 0.08 lb/mmBtu cited by Minnesota Power). Thus, improper elimination of valid controls due to incorrect cost-effectiveness calculations, cannot result in credible BART determinations. Also, the costs cited and used are not supported with documentation.

6. Northshore Mining – Silver Bay Power Plant Unit #2

The Silver Bay facility[19] includes two Units. Both units are permitted to fire natural gas and coal. Only Unit #2 is subject to BART. Unit #2 is a dry bottom, front-wall-fired unit rated at 75 MW. NO_X emissions are controlled through good combustion practices. There are no SO_2 controls. A fabric filter is used to control PM.

An initial BART analysis dated September 28, 2006, was submitted to the MPCA by Northshore Mining. In September 2008 Northshore Mining provided an updated BART analysis, adding the NO_X/SO_2 control technology Rotating Over-Fire Air (ROFA) +Rotamix+Furnace Sorbent Injection (FSI) by Nalco/Mobotec to the feasible control technologies it evaluated in 2006.

The BART determinations for Unit #2 are as follows: for NO_X, a limit of 0.37 lb/mmBtu and for SO2, a limit of 0.48 lb/mmBtu, both on a 30-day average basis; and a PM_{10} limit of 0.046 grains/dscf (approximately 0.09 lb/mmBtu).

Issues with the Analysis.

(i) SCR for NO_X control was rejected by Northshore Mining and the MPCA on false assumptions. Both rejected SCR in the so-called high-dust configuration noting that this can cause catalyst fouling. This is inconsistent with established practice as there are literally hundreds of SCRs that are installed on coal-fired boilers in the high dust configuration. Northshore Mining and MPCA do not point to any unique site-specific reasons why such SCR's could not be installed at Unit #2. Having rejected the high-dust configuration, Northshore Mining and MPCA conclude that the low-dust SCR configuration will not be cost-effective. That is irrelevant. Northshore Mining and MPCA should evaluate the high dust SCR. As a result of these errors, the proposed NO_X BART limits are almost three times higher than the limit proposed for Minnesota Power's Taconite Harbor plant and almost 50% greater than the proposed limit for Silver Lake Unit #4, both of which are similarly-sized facilities and burn coal. While Taconite Harbor and Silver Lake would be installing Mobotec's multi-pollutant control technology, Silver Bay would be allowed to install only the much-less-efficient (and cheaper) LNB/OFA to achieve 40% control.

(ii) Further, on NO_X, Northshore Mining underestimated the control effectiveness of ROFA+Rotamix by assuming that the reduction is 40%. By comparison, Minnesota Power estimated that this technology would reduce NO_X by 68% at its Taconite Harbor facility. MPCA does not seem to have noted this discrepancy or noted any reasons as to why case-specific factors may explain these differences. MPCA simply seems to have incorrectly accepted this 40% control estimate for NO_X for Northshore Mining at Unit #2. According to the vendor Mobotec, "While NO_X reduction with typical LNB and OFA

[19] Cliffs Natural Resources, Ltd. is the parent company of both Northshore Mining Company and Silver Bay Power Company. Northshore Mining Company operates a taconite processing plant at the Silver Bay facility; Silver Bay Power Company operates a power plant at the facility, which provides electricity both for the taconite processing operations and the grid.

systems can sometimes exceed 35%, ROFA NO_X reduction routinely exceeds 50% and, depending on furnace geometry, ROFA NO_X reduction can exceed 60%.[20] The Mobotec system has been reported to achieve NO_X reductions as high as 83% on a coal-fired boiler similar in size to Northshore Unit #2.[21] MPCA should simply re-evaluate the proposed NO_X BART for Unit #2.

(ii) The MPCA rejected pollutant removal technologies that rely on water to remove SO_2 and PM from the flue gases, under the assumption that they have potentially substantial negative non-air quality environmental impacts such as discharges to Lake Superior. MPCA mistakenly assumed that because dry controls without water treatment requirements are available to achieve equal or better results, without the same environmental drawbacks, the wet controls can be eliminated from further evaluation. Wet FGDs, for example, can achieve 98% or even 99% SO_2 reduction whereas the best dry technologies can achieve reductions of approximately 90-95%. The resultant reduction in discharge to the atmosphere is vast. To assume, as MPCA has done, that wet and dry SO_2 removal technologies are similar, is simply technically erroneous. Due to such fatal flaws, the SO_2 BART determination should be redone. Likely, a limit of 0.06 lb/mmBtu or even lower can be supported as BART.

MPCA should be commended in this instance for conducting its own due diligence relating to costs (i.e., by trying to acquire its own cost estimates, which turned out to be below those suggested by Northshore Mining[22]) and to also require Northshore Mining to

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[20] "The Viability and Economics of Adding a ROFA®/Rotamix® MobotecSystem to a Selective Catalytic Reduction (SCR) Installation", Edwin E. Haddad, P.E, Jay S. Crilley, P.E., and Brian S. Higgins, Ph.D., Mobotec USA Inc., NETL/DOE 2003 Conference on SCR and SNCR for NO_X Reduction, Pittsburgh, PA October 29-30, 2003.

[21] ROFA: At full load, ROFA alone reduced NO_X from 0.58 lb/mmBtu to 0.22 lb/mmBtu. This amounts to a 62% reduction in NO_X. There is a small power draw associated with the ROFA fan, but there is also a drop in stack temperature (discussed later). These two effects counter each other and we can assume that the efficiency does not change appreciably. Therefore, there are no significant O&M costs associated with the ROFA NO_X reduction.

Rotamix: At full load, Rotamix (urea) further reduced NO_X from 0.22 lb/mmBtu to 0.10 lb/mmBtu. This is a further 55% reduction in NO_X over-and-above the ROFA reduction. Since urea is injected, there are additional chemical costs. Further, there is an ambient fan installed at Vermilion for the Rotamix system. This fan draws less than 20 kW during full-load operation.

MobotecSystem: The costs per ton of NO_X removed can be calculated for the ROFA & Rotamix installation. At full load, the MobotecSystem (ROFA and Rotamix) reduced NO_X from 0.58 to 0.10 lb/mmBtu. This is an 83% reduction in NO_X.

"SCR Levels of NO_X Reduction with ROFA and Rotamix (SNCR) at Dynegy's Vermilion Power Station," Kristopher A. Coombs, Sr., Dynegy Midwest Generation; Jay S. Crilley, Mark Shilling, and Brian Higgins, Mobotec USA; Presented at: 2004 Stack Emissions Symposium Clearwater Beach, FL, July 28-30, 2004.

[22] However, it is all the more perplexing, given the disparity between the costs provided by Northshore Mining and by vendors directly to MPCA regarding SO_2 controls, that the MPCA did not do its independent due diligence and reviews for the SCR and other lower NO_X controls cost estimates in the case of Northshore Mining as well as all of the other BART determinations. For example, Northshore Mining estimated an Installed Capital Cost of $25,310,000 and an Annual Cost of $8,070,000 for ROFA+Rotamix for its 75 MW Unit #2. By comparison, Minnesota Power estimated an Installed Capital Cost of $8,113,000 and an Annual Cost of $2,876,000 at its same-sized Taconite Harbor facility. Neither Northshore Mining nor MPCA has noted why these costs are so divergent.

evaluate multi-pollutant controls such as ROFA with Rotamix and FSI and use of biomass as fuel.

(iii) While the MPCA correctly determined that the Northshore Mining-proposed total PM limit of 0.6 lb/mmBtu (which happens to also be the total PM emissions limit in the current operating permit) is not BART, its rationale for agreeing with the current permit limit for PM_{10} (i.e., 0.046 gr/dscf) is not supportable. Basically, MPCA notes that since this latter limit, is, in effect, the more controlling of the two limits, it should be BART. The proposed limit, which is approximately 0.09 lb/mmBtu is far greater than total PM limits that are being achieved at numerous plants. As noted earlier, Minnesota Power's Taconite Harbor Unit #3 has a proposed limit of 0.012 lb/mmBtu, almost 8 times lower.

(iv) While it was appropriate for the MPCA to require Northshore Mining to evaluate the use of multi-pollutant technologies, MPCA did not demonstrate that doing so will not adversely impact the improvement to visibility which may have resulted from a pollutant-by-pollutant BART determination at Unit #2.

SIGNATURE PAGE

Review of Minnesota Revised Draft Haze State Implementation Plan submitted by:

Dated: September 2, 2009

Dr. Ranajit Sahu

311 North Story Place
Alhambra, CA 91801
Ph: (626) 382 0001

Attachment A

Resume

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES

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EXPERIENCE SUMMARY

Dr. Sahu has over eighteen years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment; soils and groundwater remediation; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over eighteen years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past seventeen years include various steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Dept. of Justice, California DTSC, various municipalities, etc.). Dr. Sahu has performed projects in over 44 states, numerous local jurisdictions and internationally.

In addition to consulting, Dr. Sahu has taught and continues to teach numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past seventeen years. In this time period he has also taught at Caltech, his alma mater and at USC (air pollution) and Cal State Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.) public sector (such as the US Department of Justice) and public interest group clients with project management, air quality consulting, waste remediation and management consulting, as well as regulatory and engineering support consulting services.

1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for** Air Quality/Geosciences/Hazardous Waste Groups, Pasadena. Responsible for the

management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.

Parsons ES, **Manager for Air Source Testing Services.** Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.

1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.

1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.

1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.

1988-1989 Heat Transfer Research, Inc. **Research Engineer.** Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1984 M. S., Mechanical Engineering, Caltech, Pasadena, CA.

1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

"Thermodynamics and Heat Transfer," Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992-present.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-present.

Air and Waste Management Association, West Coast Section, 1989-present.

PROFESSIONAL CERTIFICATIONS

EIT, California (# XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2009.

PUBLICATIONS (PARTIAL LIST)

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C.Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R.Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

"From Puchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada," with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

"The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants," with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

PRESENTATIONS (PARTIAL LIST)

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

Annex A

Expert Litigation Support

1. Matters for which Dr. Sahu has have provided depositions and affidavits/expert reports include:

(a) Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill

(b) Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.

(c) Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the US Department of Justice in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (S.D. Ohio).

(d) Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the US Department of Justice in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (S.D. Ill.).

(e) Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the US Department of Justice in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (M.D.N.C.).

(f) Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the US Department of Justice in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (S.D. Ohio).

(g) Expert reports and depositions (10/31/2005 and 11/1/2005) on behalf of the US Department of Justice in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc.*, 5:04-cv-00034-KSF (E.D. KY).

(h) Deposition (10/20/2005) on behalf of the US Department of Justice in connection with the Cinergy NSR Case. *United States, et* al. *v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (S.D. Ind.).

(i) Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.

(j) Expert report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.

(k) Expert report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

(l) Expert report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.

(m) Expert report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.

(n) Expert reports and deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (W.D. Pennsylvania).

(o) Expert reports and pre-filed testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.

(p) Expert reports and deposition (October 2007) on behalf of MTD Products Inc., in connection with General Power Products, LLC v MTD Products Inc., 1:06 CVA 0143 (S.D. Ohio, Western Division)

(q) Experts report and deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.

(r) Expert reports, affidavit, and deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.

(s) Affidavit/Declaration and Expert Report on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6, under construction in North Carolina.

(t) Dominion Wise County MACT Declaration (August 2008)

(u) Expert Report on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis (June 13, 2008).

(v) Expert Report on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper's proposed Pee Dee plant in South Carolina (August 2009).

(w) Expert Report on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone's proposed Unit 3 in Texas (February 2009).

(x) Expert Report and deposition on behalf of MTD Products, Inc., in the matter of Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al. (June 2009, July 2009).

(y) Expert Report on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (August 2009).

2. Occasions where Dr. Sahu has provided testimony at trial or in similar proceedings include the following:

(z) In February, 2002, provided expert witness testimony on emissions data on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

(aa) In February 2003, provided expert witness testimony on regulatory framework and emissions calculation methodology issues on behalf of the US Department of Justice in the Ohio Edison NSR Case in the US District Court for the Southern District of Ohio.

(bb) In June 2003, provided expert witness testimony on regulatory framework, emissions calculation methodology, and emissions calculations on behalf of the US Department of Justice in the Illinois Power NSR Case in the US District Court for the Southern District of Illinois.

(cc) In August 2006, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Western Greenbrier) on behalf of the Appalachian Center for the Economy and the Environment in West Virginia.

(dd) In May 2007, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Thompson River Cogeneration) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) before the Montana Board of Environmental Review.

(ee) In October 2007, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Sevier Power Plant) on behalf of the Sierra Club before the Utah Air Quality Board.

(ff) In August 2008, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Big Stone Unit II) on behalf of the Sierra Club and Clean Water before the South Dakota Board of Minerals and the Environment.

(gg) In February 2009, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Santee Cooper Pee Dee units) on behalf of the Sierra Club and the Southern Environmental Law Center before the South Carolina Board of Health and Environmental Control.

(hh) In February 2009, provided expert witness testimony regarding power plant emissions, BACT issues and MACT issues on a permit challenge (NRG Limestone Unit 3) on behalf of the Sierra Club and the Environmental Integrity Project before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

PETITION TO THE UNITED STATES
DEPARTMENT OF INTERIOR
NATIONAL PARK SERVICE
DEPARTMENT OF AGRICULTURE

PETITION ASKING THE DEPARTMENTS OF INTERIOR AND AGRICULTURE FORMALLY TO CERTIFY TO THE MINNESOTA POLLUTION CONTROL AGENCY THAT VISIBILITY IMPAIRMENT IN VOYAGER AND ISLE ROYALE NATIONAL PARKS, AND IN BOUNDARY WATERS CANOE AREA WILDERNESS IS REASONABLY ATTRIBUTABLE TO POLLUTANT EMISSIONS FROM XCEL ENERGY'S SHERBURNE COUNTY GENERATING PLANT IN BECKER, MINNESOTA.

Respectfully Submitted by:

NATIONAL PARKS CONSERVATION ASSOCIATION, MINNESOTA CENTER FOR ENVIRONMENTAL ADVOCACY, FRIENDS OF THE BOUNDARY WATERS WILDERNESS AND VOYAGEURS NATIONAL PARK ASSOCIATION

September 3, 2009

The National Parks Conservation Association, Minnesota Center for Environmental Advocacy, Friends of the Boundary Waters Wilderness and Voyageurs National Park Association, (Petitioners), in accordance with 5 U.S.C. § 553(e), hereby petition the Departments of Interior and Agriculture formally to certify to the Minnesota Pollution Control Agency that impairment of visibility in Voyageurs and Isle Royale National Parks, and Boundary Waters Canoe Area Wilderness, is reasonably attributable to air pollutant emissions from Xcel Energy's coal-fired Sherburne County Generating Plant (Sherco) in central Minnesota. More than 20 years ago, the Department of Interior certified that visibility in both northern Minnesota parks was impaired. This petition asks DOI and DOA to certify, based on recent modeling information, that emissions of thousands of tons of nitrogen oxides, sulfur dioxide and particulate matter from Sherco are causing "reasonably attributable" visibility impairment in both Voyageurs and Isle Royale National Parks and in the Boundary Waters Canoe Area Wilderness.

I. Background

Sherco is a 2,255 megawatt coal-fired power plant located in Becker, Minnesota, approximately 45 miles northwest of Minneapolis. Sherco is operated by Xcel Energy, through its subsidiary Northern States Power Company. On an annual basis, Sherco's three generating units burn an average of nine million tons of coal, and, in that same span of time, discharge into the air of central Minnesota approximately 16,000 tons of nitrogen oxides (NO_x), 25,000 tons of sulfur dioxide (SO_2), and 16 million tons of carbon dioxide. EPA emissions database at: http://camddataandmaps.epa.gov/gdm/index.cfm. Sherco is the largest emitter of these pollutants in the state of Minnesota. *Id*.

Existing pollution control equipment at Sherco Units 1 and 2 includes wet electrostatic precipitators for particulate matter (PM) removal, SO_2 scrubbers, and low-NO_x burners. Between 2006 and 2007 Xcel installed new low NO_x burners, overfire air systems and a combustion optimization system for Unit 1, and a combustion optimization system for Unit 2. Although Xcel proposed in January of 2007 to install selective catalytic reduction (SCR) systems to significantly reduce NO_x from Sherco Units 1 and 2, and to install new dry scrubbing and baghouse systems to significantly reduce SO_2 and PM from those same units, Xcel withdrew that proposal in December of 2007.

In 1977, Congress amended the Clean Air Act to provide national parks and wilderness areas with the highest degree of protection from air pollution. 42 U.S.C § 7472. The "Class I" status provided to Voyageurs and Isle Royale parks, and to the Boundary Waters Canoe Wilderness Area meant, among other things, that existing visibility impairment would have to be eliminated. 42 U.S.C. §§ 7491-92.

On November 30, 1979, the Department of Interior classified Voyageurs and Isle Royale National Parks as Class I airsheds where visibility is an important value. 44 Fed.Reg. 69,122, 69,126 (November 30, 1979); 40 C.F.R. §§ 81.414, 415. On November 14, 1985, the Department of the Interior certified to EPA the existence of visibility

impairment in Voyageurs and Isle Royale National Parks, and all other Class I areas within its jurisdiction in the lower 48 States. Attachment 1.

Due to the fact that the Sherco plant is not operated with the most effective pollution control systems, its emissions exceed achievable industry standards. Sherco's excessive emissions have been shown to obscure the views from both within and outside Voyageurs and Isle Royale National Parks and Boundary Waters Canoe Area Wilderness. Sherco's on-going impact to visibility in Voyageurs and Isle Royale National Parks, and to the Boundary Waters Canoe Area Wilderness, is directly attributable to the power plant's emissions of NO_x and SO_2. These impacts are best demonstrated by modeling performed recently by Xcel. Had Xcel included Sherco's PM emissions the visibility impacts would have been shown to be even greater.

According to EPA's regional haze regulations, "A single source that is responsible for a 1.0 deciview change or more should be considered to ''cause'' visibility impairment." 40 C.F.R. Part 51, Subpart P, Appendix Y—Guidelines for BART Determinations Under the Regional Haze Rule, Section III A. 1. A deciview is a perceptually correct "haze index such that uniform changes in haziness correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to highly impaired." 40 C.F.R. § 51.301. Xcel's regional haze CALPUFF modeling, submitted to the Minnesota Pollution Control Agency in October of 2006, demonstrates that Sherco is "causing" visibility impairment in the Class I Voyageurs and Isle Royale National Parks, and Boundary Waters Canoe Area Wilderness.

As set forth in Xcel's modeling, the cumulative impact of Sherco's current NO_x and SO_2 emissions on visibility in Voyageurs and Isle Royale National Parks, and Boundary Waters Canoe Area Wilderness, was shown to be 5.37 deciviews – or over five times greater than EPA's causation threshold – on at least eight days every year. Xcel Best Available Retrofit Technology (BART) Analysis, October 25, 2006, pp. 74-75, Attachment 2. According to Xcel's modeling, Sherco's emissions impair visibility greater than 0.5 deciviews an astonishing average of 227 days every year in the Boundary

Waters Canoe Area Wilderness, 147 days in Voyageurs National Park, and 131 days in Isle Royale National Park. *Id.* As noted above, Sherco's identified visibility impacts would have been even greater had Xcel not failed to include Sherco's PM emissions in the model.

Xcel's modeling results are supported by recent photographs that show significant haze in Voyageurs Park and Boundary Waters Canoe Area Wilderness. Pictures of haze in Voyageurs National Park may be found at Attachment 3.

Xcel's modeling results that show Sherco's NO_x and SO_2 emissions are responsible for significant visibility impairment in Voyageurs and Isle Royale National Parks, and the Boundary Waters Canoe Area Wilderness, is no surprise given the quantity and characteristics of pollution discharged from the plant. According to the Park Service, "white light will tend to look reddish or brownish in color after passing through a nitrogen dioxide haze." Malm, "Introduction to Visibility," 1999, p. 10. Turning to sulfur dioxide, the Park Service has also found "[t]he collinearity between SO_2 emissions and visibility reduction is impressive." *Id.* at 41.

Visitors to the Class I areas downwind of Sherco often find their views impaired, thus corroborating the findings of Xcel's dispersion modeling. For example, according to Matthew J. Norton, staff attorney for the Minnesota Center for Environmental Advocacy, "I canoe, camp, fish, and hunt in the Boundary Waters Canoe Area Wilderness and when I do, I frequently notice that my views of the far lakeshore are diminished by haze, even on bright, sunny days. I have noticed the haze on both cool and warm days, on days falling in months from June through early November. When my view is diminished by pollution in the form of haze, my aesthetic experience of the Boundary Waters as untrammeled Wilderness is degraded."

II. Petition

Pursuant to 5 U.S.C. § 553(e) and 40 C.F.R. § 51.302(c)(2), Petitioners formally petition the Departments of Interior and Agriculture to certify that impairment of visibility in Voyageurs and Isle Royale National Parks and Boundary Waters Canoe Area Wilderness is reasonably attributable to pollutant emissions from the Sherco plant. Petitioners request expedited action on this petition so that any certification triggering a 40 C.F.R. § 51.302 "reasonably attributable" BART analysis for Sherco may be merged into, and not delay, the state of Minnesota's ongoing regional haze BART review process.

5 U.S.C. § 553(e) states, "[e]ach agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule." 5 U.S.C. § 551(4) defines the term "rule" as including, "the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy . . ."

In 1977, Congress amended the Clean Air Act to, among other things, declare:

> as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution.

42 U.S.C. § 7491(a)(1). As part of its obligation to meet this goal, Congress required EPA to promulgate regulations to ensure that:

> each major stationary source which is in existence on August 7, 1977, but which has not been in operation for more than fifteen years as of such date, and which . . . emits any air pollutant which may reasonably be anticipated to cause or contribute to any impairment of visibility in any [mandatory Class I] area, shall procure, install, and operate, as expeditiously as practicable (and maintain thereafter) the best available retrofit technology . . . for controlling emissions from such source for the purpose of eliminating or reducing any such impairment.

42 U.S.C. § 7491(b)(2)(A).

Pursuant to the regulations promulgated by EPA to remedy existing visibility impairment, the Federal Land Manager of any mandatory Class I area may certify to any state that it is reasonable to attribute visibility impairment to a single, or small group of air pollution sources. Accordingly, 40 C.F.R. § 51.302(c)(1) provides that "[t]he affected

Federal Land Manager may certify to the State, at any time, that there exists reasonably attributable impairment of visibility in any mandatory Class I Federal area." The term "reasonably attributable visibility impairment" is defined as "visibility impairment that is caused by the emission of air pollutants from one, or a small number of sources." 40 C.F.R. § 51.301. The term "visibility impairment" is defined as "any humanly perceptible change in visibility (light extinction, visual range, contrast, coloration) from that which would have existed under natural conditions." *Id*. The State of Minnesota is required to "identify and analyze for BART" any existing stationary facility that has been certified by the Federal Land Manager as causing reasonably attributable visibility impairment. 40 C.F.R. § 51.300(b)(2), 40 C.F.R. § 51.302(c)(4), 52 Fed.Reg. 45132, 45133 (November 24, 1987).

When presented with evidence of visibility impairment in a national park, the Park Service's Organic Act establishes an affirmative duty on the part of the Park Service to take action. According to 16 U.S.C. § 1,

> The service thus established **shall promote and regulate** the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purposes of the said parks, monuments, and reservations, which purpose is to **conserve the scenery** and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

(Emphasis added.)

The Park Service has acknowledged this obligation. According to the NPS's Management Policy at Section 4.7.1:

> The National Park Service has a responsibility to protect air quality under both the 1916 Organic Act and the Clean Air Act (CAA). Accordingly, the Service will seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas. Vegetation, visibility, water quality, wildlife, historic and prehistoric structures and objects, cultural landscapes, and most other elements of a park environment are sensitive to air pollution and are referred to as "air quality-related values." **The Service will actively promote and pursue measures to protect these values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential**

> **air pollution on park resources, the Service will err on the side of protecting air quality and related values for future generations**.

(Emphasis added.)

The Secretary of the Interior also has an affirmative duty under Park System Resources Protection Act to "undertake all necessary actions" to curb air pollution from any source that is injuring Voyageurs and Isle Royale national parks. As set forth in the Park System Resources Protection Act at 16 U.S.C. § 19jj-2(b)(1),

> The Secretary shall undertake all necessary actions to prevent or minimize the destruction, loss of, or injury to park system resources, or to minimize the imminent risk of such destruction, loss, or injury.

The Secretary of Agriculture has a similar affirmative duty under the Clean Air Act to remedy past, and prevent future, visibility impairment in the Class I areas within his jurisdiction. 42 U.S.C. § 7491. As described in Senate Report No. 95-127, 95th Congress, 1st Session, 1977,

> The Federal Land Manager holds a powerful tool. He is required to protect Federal lands from deterioration of an established value, even when Class I [increments] are not exceeded. … While the general scope of the Federal Government's activities in preventing significant deterioration has been carefully limited, the FLM should assume an aggressive role in protecting the air quality values of land areas under their jurisdiction. In cases of doubt the land manager should err on the side of protecting the air quality-related values for future generations.

As demonstrated above, the Department of the Interior, through its Park Service, should certify to the Minnesota Pollution Control Agency that visibility impairment in Voyageurs and Isle Royale National Parks is reasonably attributable to pollutant emissions from Sherco. The Department of Agriculture should make a similar certification with respect to the Boundary Waters Canoe Area Wilderness. The Departments of Interior and Agriculture have an affirmative duty to make these certifications due to Xcel's own modeling evidence that demonstrates Sherco causes significant, reasonably attributable air pollution impacts to these priceless Class I areas.

III. Conclusion

It is uncontested that thousands of tons of visibility impairing pollutants are discharged from the smoke stacks of Shereo every year. Because of Shereo's proximity to Voyageurs and Isle Royale National Parks and Boundary Waters Canoe Area Wilderness, and the local meteorology, some of this pollution inevitably enters, and impairs the beauty of, these national treasures. Now is the time for the Departments of Interior and Agriculture to take this important step to remedy reasonably attributable visibility impairment in the parks and wilderness area to benefit this and all future generations.

Dated: September 3, 2009

FOR PETITIONERS,

Reed Zars
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307-745-7979

FOR NPCA,

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Cory Counard MacNulty
Executive Director
Voyageurs National Park Association
126 N. Third St, Suite 400
Minneapolis, MN 55401

ATTACHMENTS

1. November 14, 1985, Department of the Interior certification of impairment.

2. October 25, 2006, Xcel Best Available Retrofit Technology (BART) Analysis for Sherburne County Generating Plant, excerpts.

3. Pictures of haze in Voyageurs National Park.

CERTIFICATE OF SERVICE

I certify that on this 3rd day of September, 2009, I caused to be sent via electronic and U.S. Mail a copy of the foregoing petition and attachments to the addressees below:

Secretary Ken Salazar
Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240

Secretary Tom Vilsack
Department of Agriculture
1400 Independence Ave., S.W.
Washington, DC 20250

Paul Eger, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road N
St. Paul, MN 55155-4194

Lisa Jackson, Administrator
United States Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Bharat Mathur
Acting Regional Administrator
U.S. EPA Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

Reed Zars

Reed Zars

minnesota power / 30 west superior street / duluth, minnesota 55802-2093 / 218-722-5642 / wwww.mnpower.com

August 20, 2009

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

RE: Revised Draft of the Regional Haze State Implementation Plan

Minnesota Power provides the following comments and proposed edits to the BART related sections of the Revised Draft of the MPCA's Regional Haze (RH) State Implementation Plan (SIP) and associated Appendices. We appreciate the opportunity to provide comments to this draft. We also wish to remind the MPCA that in addition to the BART retrofit proposed for Taconite Harbor Energy Center Unit 3 and the BACT retrofit equipment we are installing on Boswell Energy Center Unit 3 for SO2, NOx and PM removal (which will be in service in late 2009), we have voluntarily installed NOx reduction technology on many other of our units that are not BART affected. Furthermore, we are planning to voluntarily installing Low NOx Burners on our largest unit, Boswell 4, in the fall of 2010 which will further reduce NOx emissions. These significant voluntary "beyond BART" reductions will go a long way towards helping meet the goal of the Northeast MN Conceptual Plan.

Page 70, Table 9.3, and Appendix 9.4 (Page 657) Specific to Taconite Harbor Unit 3:

Discussion on Page 70 states that the existing pollution control equipment for Particulate Matter (PM) at subject-to-BART units satisfies BART for PM (filterable only?). Therefore, the emission rate for the existing hot-side electrostatic precipitator (ESP) on Taconite Harbor Unit 3 should be adequate for PM BART. However, based on the discussion on Page 657 in Appendix 9.4, the BART limit would be based on the proposed fabric filter retrofit. We believe the MPCA should clarify its intent related to the PM BART limit for Taconite Harbor Unit 3 as well as any other similarly affected subject-to-BART units. Should the BART limit for PM be based on the existing PM controls or future proposed PM controls?

Similarly, on Page 657 the MPCA depicts a BART emission limit in terms of PM_{10} (including condensibles) which is different from the PM discussion on Page 70 which states that existing PM (filterable only) controls satisfies BART. We have noted this discrepancy as well in other BART determinations in Appendix 9.4. We suggest the MPCA clarify whether the BART limit is PM or PM_{10}.

Again, specific to Taconite Harbor Unit 3, if the BART limit is to be based on the proposed fabric filter retrofit, it is unlikely the fabric filter will produce a 0.012 lbs/mmBtu PM_{10} emission rate as depicted on Page 657 in Appendix 9.4. We believe the limit is attainable if only filterable PM was included, which is what was reflected in the Burns & McDonnell attachment to the 2008 BART Study where the 0.012 lbs/mmBtu value was discussed. If PM_{10} is the BART limit, then for Taconite Harbor Unit 3 we would expect a higher limit. During the tuning of the newly installed pollution control equipment on Units 1 & 2, we performed a number of ESP performance tests for PM and PM_{10} emissions. Based on these results, we propose a PM10 emission rate of 0.10.

lbs/mmBtu. For reference, RPU Silver Lake Unit 4, which is most similar to Taconite Harbor #3 in size and proposed equipment, has a 0.4 lbs/mmBtu BART emission rate for PM_{10}.

Page 71, Table 9.4 & Appendix 9.4 (Page 657) Specific to Taconite Harbor Unit 3:

The proposed BART NOx emission rate for Taconite Harbor Energy Center Unit 3 (0.13 lbs/mmBtu) is unattainable with the ROFA only technology that we proposed in our November 19, 2008 BART Study submittal. In reviewing Appendix 9.4 of the draft SIP, which discusses the MPCA's BART determinations, the 0.13 lbs/mmBtu for NOx included both Mobotec's ROFA and RotaMix technologies. However, as we stated in the transmittal cover letter of the 2008 Study, we believe ROFA only is BART for NOx. We do not believe Mobotec's RotaMix (SNCR) is justified as part of BART based on the limited additional NOx reduction it would achieve beyond ROFA.

Furthermore, specific to the 30-day rolling average NOx emission rate depicted in Appendix 9.4, we have determined from the ROFA installations on Taconite Harbor Units 1 & 2 that an approximate emission rate of 0.16 - 0.17 lbs/mmBtu is sustainable but on a 365-day rolling average basis. Based on our experience we believe 0.20 lbs/mmBtu would be appropriate for a 30-day rolling average. We note that RPU Silver Lake #4, which has similar NOx control equipment, has a BART limit of 0.25 lbs/mmBtu for NOx.

We have also noticed a discrepancy in the BART SO2 emission rate in Table 9.4 and the BART emission limit in Appendix 9.4. In Table 9.4, the SO2 BART determination is depicted as 0.42 lbs/mmBtu. However, in Appendix 9.4 it is listed as 0.32 lbs/mmBtu. In the 2008 BART Study, Minnesota Power stated that with the proposed technology, we estimated a 0.32 lbs/mmBtu emission rate. However, that estimate was viewed as a 365-day rolling average, not a 30-day rolling average as depicted in Appendix 9.4. Given a 30-day rolling average, we believe that a 0.40 lbs/mmBtu value is a more appropriate value using the BART equipment we proposed in the November 2008 Study (hydrate lime boiler injection and a fabric filter). The current 365-day rolling average for Taconite Harbor Unit 2 is 0.44 lbs/mmBtu based on hydrate injection and an ESP.

These slightly higher emission rates we are proposing for NOx and SO2 are based on our actual operating experience with Taconite Harbor Units 1 & 2. These boilers use hydrated lime for SO2 control, ROFA/RotaMix for NOx control, and an ESP for PM control. Unit 3 will use ROFA only, hydrate injection and a fabric filter which we believe will result in slightly improved SO2 capture. We have noticed on Units 1 & 2 that boiler injection of hydrated lime does not produce a constant SO2 emission rate, or a constant NOx emission rate. The lime being injected into the boiler eventually coats the boiler tube surfaces. This results in improved SO2 removal due to the flue gas coming in contact with the lime-coated tube surfaces. However, over time (2-3 hours) lime (and ash) coated tube surfaces result in less and less heat being transferred to the steam being created by the boiler. Less heat transfer means higher flame temperatures in the furnace section of the boiler. Higher flame temperatures in turn cause the NOx emissions to increase slightly as NOx formation is a function of flame temperatures. Eventually, it is necessary to run the sootblowing system to remove the ash and lime deposits from the boiler tube surfaces. This removal of lime deposits on the boiler tubes results in poorer SO2 capture, but improved NOx reduction as the flame temperature in the furnace area of the boiler goes down. The cycle then repeats itself. This cycling effect results in the SO2 and NOx emission rates fluctuating throughout the day. If is for this reason we are seeking higher emission rates for SO2 and NOx.

We also note Table 9.4 (page 71) incorrectly states that Taconite Harbor Unit 3 will be converted to a cold-side ESP. Instead, we would be retrofitting a fabric filter onto the unit as discussed in both the 2008 BART Study and Appendix 9.4.

Pages 74 -75 of the Revised Draft RH SIP, BART Alternative:

Minnesota Power supports the opportunity for facilities to offer alternative BART options such as described in the Revised Draft. We do suggest however two edits to this section:

First, Minnesota Power recommends that the title of this section read "Taconite & EGU BART Alternative" in order to more clearly reflect that the alternative is available to both taconite and EGU facilities. Although the last sentence in the first paragraph under "BART Alternative" already reads as follows…"In addition, certain EGUs may desire to undertake similar projects," in reading a majority of the text in this section it appears to be targeted to taconite facilities. Re-titling the section as suggested makes it more apparent that this option exists for both facility types.

Second, we propose editing the following paragraph found on page 75:

> "Facilities may propose a BART alternative that covers multiple BART units or both BART and non-BART units at the facility in the same source category. A proposal covering BART and non-BART units must demonstrate greater emission reductions and more visibility improvement from the facility than MPCA's BART determination."

The suggested new paragraph would read as follows (different/new text underlined):

> "Facilities may propose a BART alternative that covers multiple BART units or both BART and non-BART units at facilities with the same owner/operator that are in the same source category within the northeast MN Conceptual Plan physical boundary. A proposal covering BART and non-BART units must demonstrate greater emission reductions and more visibility improvement than the MPCA's BART determination."

Page 705, Appendix 9.5:

In light of the Court's action on CAIR in Minnesota, is the text in this section stated correctly?

If you have any questions about these comments, please contact me at 218-723-3954.

Sincerely,

Brandon P. Krogh

Senior Engineer
Environmental Services Department

September 3, 2009

Commissioner Paul Eger
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

RE: Regional Haze State Implementation Plan, July 2009
Submitted via electronic mail

Dear Commissioner Eger:

The following comments regarding the Scoping Report for the Tracks Project are submitted by Northeastern Minnesotans for Wilderness (NMW). NMW is a regional grassroots, wilderness advocacy group. NMW's core mission is to preserve and protect wilderness and wild places in the Minnesota Arrowhead Region, especially the BWCAW. Since its founding in 1996, NMW has grown to represent over 400 members and supporters in Northeastern Minnesota.

Development of the SIP has now progressed to the point where basic comments appropriate to a citizen's group such as NMW have been placed in the record (see our comments letter of May 16, 2008 regarding the Draft SIP). In our view, several of the basic issues have not been resolved in a satisfactory manner, but we do not restate them here. **The basic purpose of this letter is to again place in the record our conclusion that the SIP should not receive Federal approval.**

The SIP is a document of minimal compliance rather than a plan for achieving the stated goals of reduction of regional haze. We pointed out in '08 that the State has achieved a waiver so that Minnesota will not meet reduction targets by the National target date of 2064. Just as important, the projected reduction rate is unrealistic since it effectively postpones needed major reductions until later (beyond 2018) in the time frame. Our view is that major reductions should begin in the early years if goals are to be achieved.

The ongoing discussion of the SIP has narrowed to a number of technical points, largely concerning the application of BART to EGU in Northeastern Minnesota. Here we point to the comments from the National Park Service (NPS), dated June 26, 2009, and two letters from the U.S. Forest Service (FS), dated April 28, 2009 and July 10, 2009. NMW specifically notes and endorses the comments by NPS that "BART is not necessarily the most cost-effective solution" and that "the cumulative effects of improving visibility across all of the Class I areas affected should be considered."

Without having the expertise to comment on the technical points involved in BART, NMW notes two patterns of MPCA response to the issues:

1) Where MPCA is accused of failing to follow federal procedural requirements and guidelines such as the five step procedure required for BART determination of EGU control programs (See NPS letter, and FS 7/10), MPCA has often claimed the right of a state to substitute an alternative procedure. But these procedures generally provide that the results should at least equal or exceed the anticipated outcomes that would be achieved under the general federal procedure, and MPCA has generally failed to provide adequate evidence this will occur.
2) MPCA is accused (by NPS) of generally accepting cost estimates provided by facilities and that facility sources and MPCA have, "consistently underestimated the abilities of established pollution control technologies… to reduce emissions" (NPS). MPCA has offered specific responses, but overall, "The MPCA has chosen in general to accept each facility's determination of how effective a given control technology will be at that facility" (MPCA response to NPS). Given the documented record of facility efforts to avoid the imposition of more effective air pollution controls, MPCA reliance on facility information is indefensible.

A more specific concern regarding BART (but reflecting the general concerns just stated) is the apparent failure of MPCA to ensure that the proposed emissions limits for BART-eligible EGU included in the SIP will comply with federal regulations. NMW endorses, and hereby incorporates as its own, the comments on this issue submitted by MCEA on July 15, 2009.

NMW appreciates the opportunity to submit comments on the Regional Haze SIP.
Our mail contact is,
Northeastern Minnesotans for Wilderness
821 E. Pattison ST
Ely, MN 55731
Email: hbsagen@cpinternet.com
Please notify us and if possible send us a copy of the SIP when it is released, as well as any other communications regarding the project. We also request notification regarding any subsequent meetings or field trips concerning the Project.

Sincerely,

Signed

Bradley Sagen
NMW Chairperson's Representative

Neuschler, Catherine

From: PJ Mielke

Sent: Monday, August 24, 2009 8:43 AM

To: Gordon.Andersson@state.mn.us; Margaret.Mccourtney@state.mn.us; Catherine.Neuschler@state.mn.us

Subject: Haze conditions in VNP area

I lived on Rainy Lake and plied its waters for 45 years. I no longer live in Minnesota, and could care less, but I hate to see my friends get stuck with some stupid, unworkable plan to kiss the EPA's butt. No one has mentioned the smokey haze produced from all of the forest fires in Canada. The predominant wind in the area is NW. How can a taconite mine 100 miles (south) away cause this? If this haze is from local industry, how come it is only evident in the summer forest fire season and not in the dead of winter? The mines are still running! I pity my former fellow citizens in Minnesota who will have to put up with decisions made by people who never lived there like I have, and will have their freedoms taken away. I have seen the NPS "Voyageur Trail' plan that encompasses all of northern Minnesota border country, and this is just another nail in the coffin to achieve that agenda. Stupid people telling local natives how to run their lives when thay don't have a clue. I'm glad I left.

Paul Mielke
Former Rainy Lake shoreland owner for 45 years
Jackson, AL

rpu

we pledge, we deliver

September 2, 2009

Ms. Catherine Neuschler
Minnesota Pollution Control Agency
Environmental Analysis and Outcomes Division
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: Comments on Minnesota's Revised Draft Regional Haze State Implementation Plan

Dear Ms. Neuschler

Rochester Public Utilities (RPU) appreciates this opportunity to comment on Minnesota's Revised Draft Regional Haze State Implementation Plan (SIP) and its efforts in addressing regional haze in national parks and wilderness areas. Furthermore, RPU values the comments articulated by the National Park Service and the Forest Service with regard to the Silver Lake Plant. It is RPU's intent to operate at or as near to the designed emission rate of 0.15 lbs NOx/mmBTU and at a level comfortably below the current permit limit of 0.6 lbs SO2/mmBTU. However, at the present time, RPU does not have sufficient data or operating experience of the installed Mobotec ROFA & Rotomix system to provide a solid commitment to a lower permit limit for NOx that we would be comfortable of not exceeding. Nor is there sufficient data to provide a solid commitment to a lower SO2 limit, even on a 30 day rolling average, or provide for a cost effective operating scenario of the new control equipment. Unlike the vast majority of the other BART-affected units in Minnesota that fires with low-sulfur, sub-bituminous coal, the normal operation of SLP Units 3 & 4 requires bituminous coal, which has significantly higher sulfur content. The result is that even with best controls installed on Unit 4, post-control emissions will be necessarily higher than would be observed in a sub-bituminous coal fired unit with similar control equipment. Furthermore, it is our understanding that the Silver Lake Plant was very narrowly modeled to be included in the pool of Minnesota units predicted to have a significant contribution to visibility events in Minnesota's Class I areas. We would expect that, had the current federally-enforceable SO2 limits been in place at the time of MPCA's modeling, SLP would have been shown to have a negligible impact on visibility in Minnesota's Class I areas. Perhaps MPCA could revisit the original modeling determination, in light of the relatively recent SO_2 SIP limits, as further qualitative substantiation for the current BART proposal. Alternatively, the visibility modeling could be re-opened in an attempt to quantitatively determine the amount of visibility improvement afforded by the current proposal, relative to originally-modeled SLP emission levels.

Rochester Public Utilities, 4000 East River Road NE, Rochester, Minnesota 55906-2813
telephone 507-280-1540 facsimile 507-280-1542

Should you have any questions related to RPU's comments, please contact Craig Diekvoss (507-280-1646) or Joe Hensel (507-280-1556). Again, thank you for the opportunity to provide comments on Minnesota's Revised Draft Regional Haze.

Sincerely,

Craig F. Diekvoss
Environmental & Regulatory Affairs Coordinator
Rochester Public Utilities

Xcel Energy®
RESPONSIBLE BY NATURE™

414 Nicollet Mall
Minneapolis, Minnesota 55401-1993

August 17, 2009

Ms. Catherine Neuschler
Environmental Analysis and Outcomes Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

SUBMITTED VIA EMAIL TO: *catherine.neuschler@pca.state.mn.us*

Re: Public Notice on Revised Draft Regional Haze State Implementation Plan Revision

The Minnesota Pollution Control Agency (MPCA) has made available for public comment a revised draft Regional Haze State Implementation Plan (SIP). Northern States Power Company, a Minnesota corporation (NSPM) doing business as Xcel Energy, respectfully submits these comments on the draft SIP. NSPM has units that are subject to Best Available Retrofit Technology (BART).

Planned Control Upgrades for Sherco

The draft SIP on page 70 states, "Table 9.3 shows that all but one subject-to-BART EGU will be adding controls with implementation expected by 2010." Table 9.3 includes boilers 1 and 2 at the NSPM Sherburne County Generating Plant (Sherco), with an estimated time of 2006-2008 for completion of NOx and SO2 control upgrade projects. Although NOx reduction equipment was installed by the end of 2008, NSPM proposed in its letter to MPCA of November 13, 2008 to complete the SO2 control equipment installation within 5 years of EPA approval of the SIP. NSPM requests that the Sherco SO2 controls timing be clarified in the SIP.

PM10 Limit for Sherco

The MPCA's memo dated May 19, 2009, BART Determination for Xcel Energy's Sherburne County Generating Plant (Sherco), says, "The MPCA has determined that the existing particulate control represents BART and the existing permit limit for PM10 is an appropriate BART limit." Actually, the MPCA earlier in 2009 told NSPM that a PM10 BART limit separate from the existing PM10 lb/hour limit is needed. NSPM in a letter of April 1, 2009 proposed a BART PM10 limit of 0.09 lb/mmBtu. NSPM suggests that the MPCA memo be corrected.

Conclusion

NSPM appreciates the opportunity to comment on the draft SIP and requests that the suggested changes be made. Please contact me at 612-330-5520 if you have questions.

Sincerely,

Nancy Glass
Senior Environmental Analyst

C: Mary Dieltz
Steffan Johnson
Richard Rosvold
Arthur Zimmerman
Environmental Services Record Center

Response to Comments on Revised Draft Regional Haze SIP

The majority of the comments on the Revised Draft Regional Haze SIP focus on the MPCA's BART determinations, particularly those made for the five power plants. Therefore, the MPCA has chosen to organize this response to comments by facility or issue, rather than by commenter. This response to comments document will summarize the comments received for each issue or specific facility, note which group or individual made each comment, and respond.

I. General Comments

A. Best Available Retrofit Technology

1. *Clean Air Act Requirements* (Minnesota Center for Environmental Advocacy (MCEA) with Friends of the Boundary Waters Wilderness (Friends), National Parks Conservation Association (NPCA), Voyageurs National Park Association (VNPA); and Northeastern Minnesotans for Wilderness)

Although these comments were primarily brought up in the context of the MPCA's electric generating unit (EGU) BART determinations, they speak generally to the purpose and requirements for BART. Some commenters suggest that MPCA's BART determinations fail to comply with the Clean Air Act. The commenters raise concerns that the MPCA's failed to use the specific five-step process provided in U.S. EPA guidance, stating that the failure results in inconsistent outcomes and lesser control.

The Clean Air Act sets out five factors that the states must consider when determining BART (42 U.S.C. § 7491 (§169A)). EPA provided *Guidelines for BART Determinations Under the Regional Haze Rule* to assist states in developing BART, but was very clear that the *Guidelines* are not required to make BART determinations for source other than EGUs at power plants with capacity greater than 750 MW (40 CFR Part 51, Appendix Y, 1.F.)

The intent and purpose of BART is for states to identify sources subject-to-BART and "identify the best system of continuous emission control technology for each source subject to BART taking into account the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, the remaining useful life of the source, and the degree of visibility improvement that may be expected from available control technology." 40 CFR 51.308(e)(1)(ii)(A) – incorporating and expanding upon the five required Clean Air Act factors. BART applies primarily to sources that have not otherwise been subject to control technology provisions of the Clean Air Act, and the MPCA believes that the use of the term "retrofit" clearly acknowledges the difference between BART and more stringent controls generally required on new or modifying sources.

The Clean Air Act gives states wide-ranging authority and discretion to make BART determinations, and that authority has been upheld in legal proceedings. In American Corn Growers v. EPA (291 F.3d 1 (D.C. Cir. 2002)), the D.C. Circuit Court of Appeals noted that "the Act's provisions giv[e] the states broad authority over BART determinations." The same decision cites the legislative history of the Clean Air Act Amendments of 1977, when section 169A was added to the Act. The Court notes that in Congress there was "an agreement to reject the House bill's provisions giving EPA the power to determine whether a source contributes to visibility impairment and, if so, what BART controls should be applied to that source…Pursuant to the agreement, language was inserted to make it clear that the states – not EPA – would make these BART determinations…The Conference Report thus confirms that Congress intended the states to decide which sources impair visibility and what BART controls should apply to those sources."

The MPCA has followed the EPA's *Guidelines*, where required, and given consideration to all the required factors laid out in the Clean Air Act for all BART-eligible units. MPCA notes that some commenters feel that adherence to the step-by-step analysis framework provided in the *Guidelines* is a better approach.

The commenters also raise concerns that MPCA's EGU BART determinations allow "continued degradation of visibility in Class I areas" particularly from the Sherco power plant. The MPCA appreciates that the commenters seek the most stringent emission limits possible to gain the biggest improvements in visibility. However, removal of all contribution to visibility impairment is not an appropriate consideration for evaluating BART determinations. The purpose of BART is to install controls on a certain set of emission sources to reduce their impact on visibility. If the sole consideration was elimination of visibility impairment, there would have been no need for EPA to lay out the other factors to be considered in making a BART determination. Instead, EPA recognized that these were facilities that, in general, had not previously installed pollution control equipment and that installation of such equipment may be difficult or cost-prohibitive. The Regional Haze SIP shows an improvement in visibility on the 20% worst days after the implementation of BART and other control strategies, although visibility remains above natural conditions. Because the regional haze program requires multiple SIP submittals and continued progress towards the ultimate visibility goal, it is clear that the implementation of BART was not intended to eliminate all degradation of visibility in the Class I areas, even that caused by the subject-to-BART sources alone.

EPA must determine if MPCA has met the requirements of the Clean Air Act; if these requirements are met, the MPCA believes our BART determinations must be approved. The MPCA received comments from EPA Region 5, requesting that the MPCA expand the documentation of the BART analyses. MPCA staff have responded to the EPA comments by providing expanded documentation in the BART determination memos. In addition, information such as how the MPCA considered the remaining useful life of the sources is included in the overall SIP documentation,

2. *Visibility Modeling and Sources Subject to BART* (MCEA, Friends, NPCA, and VNPA, National Park Service (NPS), EPA Region 5)

One of the factors that must be considered in making a BART determination is the resulting visibility improvement from the implementation of BART at the source. The commenters emphasized that the Regional Haze Rule (RHR) "requires that the MPCA analyze 'the degree of improvement in visibility which may reasonably be anticipated from the use of [BART] technology'."

In making the BART determinations, MPCA considered the resulting visibility improvement using the initial baseline visibility modeling used to determine which sources were subject to BART. For example, where a facility with a larger modeled visibility impact proposed minimal BART controls the MPCA made a BART determination that included more controls than proposed by the facility. Where a facility had a small modeled baseline visibility impact, the MPCA was more likely to accept less stringent and more cost-effective controls. The MPCA does not interpret BART to require a quantitative consideration of visibility improvement. However, many facilities did provide this quantitative visibility improvement analysis in their BART proposals.

The MPCA also demonstrated the overall degree of visibility improvement that could be anticipated from the use of BART through the modeling for the reasonable progress goals. The RPGs include BART-level emissions for the majority of the subject-to-BART sources.

Although the MPCA believes it has met the statutory requirements concerning considering and demonstrating visibility impact, the concerns raised by the Federal Land Managers (FLMs), MCEA,

Friends, NPCA, and VNPA, and EPA Region 5 has led MPCA to conduct additional visibility modeling. Summary results of the visibility modeling have been added to each BART determination memo, and a complete description of the visibility modeling with more detailed results has been added as Appendix 9.5 of the Regional Haze SIP.

The National Park Service (NPS) also suggested that MPCA calculate the improvement in visibility from BART across all impacted Class I areas, rather than just the most impacted Class I area. The NPS is also supportive of the MPCA developing a $/deciview metric to be used in analyzing controls to be determined as BART.

As MPCA responded previously, the MPCA has not used the $/deciview framework anywhere in the SIP. The MPCA has seen this framework primarily used to justify not installing controls at BART sources, and the MPCA feels that feasible, cost-effective controls for the main visibility impairing pollutants, SO_2 and NO_X, should be installed at subject-to-BART units, even if resulting in limited visibility improvement.

The NPS asks MPCA to reconcile this response with a discussion in the SIP of the decision not to deem sources contributing less than 0.5 deciviews to visibility impairment at any Class I area as subject-to-BART. The *Guidelines* indicate that a state may determine whether BART-eligible sources cause or contribute to visibility impairment and may refrain from making BART determinations for those sources that do not. 40 CFR Part 51, Appendix Y, III. The result is that although some sources are BART-eligible, MPCA does not consider them to be subject-to-BART. This approach is consistent with the treatment of BART-eligible sources in other jurisdictions. The *Guidelines* specifiy that it is generally acceptable to use a 0.5 deciview threshold to conclude that a BART-eligible source does not cause or contribute to visibility impairment and is not, therefore, subject-to-BART. *Id.* at III.A.1. As a result, MPCA determined that where feasible, cost-effective controls are available for a subject-to-BART source, it is appropriate to require the controls. Where a source is not subject-to-BART, however, because its contribution to visibility impairment is less than 0.5 deciviews, the MPCA is not requiring the installation of controls at this time.

The NPS also suggests that, due to the fact that the SIP does not project meeting the uniform rate of progress and the MPCA statement that feasible controls should be applied even where they result in limited visibility improvement, the MPCA should lower the BART threshold to expand the universe of subject-to-BART sources. The MPCA has described above that the statement concerning installation of cost-effective controls even when they result in limited visibility improvement applies to units that are already subject-to-BART due to their visibility impact, and to the main pollutants of concern to the MPCA. Once that level of initial visibility impact was determined, we found it reasonable to apply controls found cost-effective and feasible. The remaining BART-eligible sources, as shown in the initial response to comments, contribute very little to visibility impairment and are not considered subject-to-BART. They will, of course, be evaluated for reasonable progress in future SIPs.

3. *EGU BART* (MCEA, Friends, NPCA, and VNPA ,Northeastern Minnesotans for Wilderness)

In the public comment period on the Revised Regional Haze SIP, the commenters echoed comments received from the Federal Land Managers (FLMs) prior to this public comment period and raise concerns that the MPCA has not appropriately resolved the FLM comments.

The MPCA has held extensive consultation with the FLMs, discussing the BART process, determinations, and documentation of the BART determinations. Changes were made to the BART determinations as a result of the discussion with the FLMs, even prior to the official comments being received.

In many cases, the comments reflect different engineering judgement concerning appropriate emission limits for controls. The MPCA has responded to all comments, making changes and improvements to the proposed SIP where appropriate.

Generally, the commenters state that there are "significant inaccuracies and technical shortcomings in the MPCA's EGU BART-determinations." MPCA staff reviewed BART and control analyses provided by the subject-to-BART sources. Where the costs or control efficiencies, or other information, provided by the sources did not comport with MPCA's professional engineering judgement, additional information was sought from the facilities or control equipment vendors. The MPCA used the five factors required for consideration by the Clean Air Act in reaching the EGU BART determinations.

The commenters also raised specific concerns about the MPCA's acceptance of cost and control efficiency estimates provided by facilities. The commenters state that the MPCA has not conducted the necessary detailed technical fact-finding to confirm or independently verify data submitted by the various EGUs through the BART process, and that simple reliance on information submitted by the EGUs does not discharge MPCA's significant review responsibility in this regard. The MPCA has conducted the necessary examination of the analyses, the NO_X and SO_2 controls and their technical issues. Through its review, the MPCA learned that the material in the analyses is technically accurate and in most cases did not find it necessary to request modifications. As noted above, the MPCA sought additional information from facilities and other parties when necessary. The MPCA has expanded portions of BART determination memorandums where necessary to further explain the MPCA's judgement.

The commenters endorse NPS comments that "BART is not necessarily the most cost-effective solution." The MPCA agrees, and believes that the BART determinations only rely on the most cost-effective solution when other solutions are not cost-effective.

Commenters also expressed general concern about the results of the BART determination process for the smaller units, commenting on inconsistencies between determinations and stating that the outcomes, that is the emission limits, should have been more similar for similarly sized facilities. In addition, the NPS expressed concern that limits seemed to get less stringent for larger facilities.

The MPCA has expanded BART determination memos to address specific comments about each analysis and believes that these additions will resolve some of the concerns about differing outcomes. However, much of the difference is a result of utilities implementing projects with the intent of complying with CAIR, and acknowledging requirements for regional haze reductions. All but one of the subject-to-BART power plants have undertaken reduction projects, and some have completed construction and are operating new emissions controls. The MPCA believes that a significant amount of the difference in controls and emission limits among power plants is a result of different approaches in addressing CAIR requirements, which resulted in different planned equipment.

The NPS stated, in their revised comments, that "it appears that MPCA has attempted to 're-brand' control programs already adopted by the EGUs to meet other requirements…as satisfying BART."This characterization is not accurate. One of the factors that must be considered in making BART determinations is the pollution control equipment already in place at the source. Although these projects were not all existing controls when the BART *Guidelines* were promulgated, they were existing or planned controls when the MPCA began making BART determinations. Therefore, the MPCA concluded that it was appropriate to give weight to this factor; it likely played into more BART determinations in Minnesota than in other states, because of the large number of controls being installed at BART-eligible EGUs. However, the MPCA did look at the controls proposed by the power plants compared to other control options, and completed BART analyses to ensure and demonstrate that these controls meet the BART requirements

Some of this concern about different outcomes is a result of the BART determination for Boswell 3 relying on the NO_X emissions reduction achieved with the use of Selective Catalytic Reduction (SCR). Minnesota Power proposed SCR under the emissions reduction rider that the Minnesota Legislature adopted to encourage older power plants to upgrade air pollution controls. The MPCA is including the SCR in Minnesota Power's BART determination, not because it is the only technology that could be deemed BART, but because it is now *existing* equipment, and no further controls to reduce NO_X are technically feasible. As noted in the response to comments on Sherco, EPA has determined that as a general matter SCRs are not cost effective for BART. While the SCR must be included in a facility's site-specific assessments of BART technologies, nationally they are routinely found to be not cost-effective. The MPCA has made the proper determination in both cases, but it results in one large boiler having less stringent of controls than another large boiler half its size.

Some comments were also received on the particulate matter controls and limits for EGU BART. The MPCA decided that BART determinations for PM at EGUs are existing controls and permit limits; in some cases, if an appropriate permit limit did not exist, a limit was added to reflect current operations. As the PM BART determinations were made prior to the initial draft Regional Haze SIP, the MPCA believes that these comments are beyond the scope of this public notice and has not responded to them in detail.

4. *Taconite BART* (NPS, Cliffs Natural Resources)

The NPS provided several comments relating to BART for the taconite facilities as a source category. However, with the exception of the BART determination for United Taconite and the addition of several signed Administrative Orders requiring continuous emission monitors (CEMs) or predictive emission monitoring systems (PEMS) at the taconite facilities, these have remain unchanged since the Initial Draft Regional Haze SIP. In comments on the Initial Draft, the NPS was supportive of the MPCA's decision to delay setting numerical BART limits. The NPS did comment that they felt some post-control NO_X emission reduction technologies were feasible, but did not raise the detailed and specific comments concerning the taconite BART analyses that are being raised at this time.

The comments are beyond the scope of this public notice. In so much as the comments discuss ideas of controls that could or should be applicable to the taconite sources, but which the MPCA found were not adequately demonstrated or available to be deemed BART, the MPCA may consider these in future as part of the long term strategy.

Cliffs Natural Resources also provided some comments relating to the BART determinations and documentation for the taconite facilities. Again, these comments are beyond the scope of the public notice. To the extent that the MPCA can clarify the portions of the SIP for which public comment has already been taken, it has chosen to do so.

Cliffs requested that it be made clear that the BART limits at the taconite facilities represent 30-day rolling averages with CEMs or PEMS. The MPCA believes this is an important clarification and has made clear in the SIP generally and in the BART determination memos where specific emission limits have been set that all BART limits are 30-day rolling averages. The requirements for determining compliance with the limit will be added to permits when the BART limits are incorporated into the permits. Although the MPCA certainly anticipates that compliance will be determined through the use of CEMs or PEMS, as noted in the discussions of CEMs and PEMS below, the requirements for a PEMS system to measure compliance might change from those for a PEMS system to gather initial data.

Cliffs also requested that the MPCA describe the cost threshold for economic feasibility that the MPCA used to determine BART. The MPCA did not set a specific cost threshold for BART, but evaluated feasible costs on a facility and project-specific basis.

In Table 9.6 and 9.7, Cliffs questions the listing of a 93% capacity factor for the pellet furnaces, stating that the derivation of this number is not readily apparent, and asking the MPCA to clarify. This number comes directly from the BART analyses provided by the facilities, which assumed 93% capacity utilization. The MPCA will add a footnote on the table to this effect.

5. *BART Alternative* (Minnesota Power)

Minnesota Power provided comments supporting the concept of a BART alternative, but expressing concern that the BART alternative appears to be targeted solely at the taconite companies. The MPCA has adjusted the language to remove explicit reference to the taconite facilities, to ensure it is clear that this option is available to all facilities.

In addition, Minnesota Power suggested that the language be modified to state that facilities can propose a BART alternative that covers multiple BART units or both BART and non-BART units at facilities with the same ownership and within the Northeast Minnesota Plan geographic boundaries. The MPCA's intent was not to allow a single owner/operator to effectively "bubble" all of their sources in order to meet a BART alternative. Rather, the MPCA desired simply to allow flexibility to reduce emissions from various units at a single facility that has a subject-to-BART unit or units. The MPCA has not made this change.

B. Taconite Administrative Orders (Arcelor Mittal)

Arcelor Mittal expressed a concern about MPCA's request that EPA include the Administrative Orders by Consent issued to the taconite facilities requiring the use of CEMs or PEMS into the SIP. Because the main requirements of the Orders concern submittal of plans, and the deadlines for such submittals have already passed, Arcelor feels that this inclusion will render the SIP immediately obsolete.

Because the MPCA is not setting many BART limits at this time, the MPCA believes it is important that there are enforceable documents for obtaining the data to set the BART limits. In particular, the Orders include requirements for the submission of data that the MPCA will use to set the NO_X BART limits, which we believe is a key component of the MPCA's BART strategy. Using Administrative Orders in the SIP is something that the MPCA has done in many previous cases for criteria pollutant SIPs.

It is also appropriate that the SIP include all elements that the MPCA has used or will use to demonstrate that it is properly implementing BART. The SIP should not have gaps in implementation approach for which MPCA seeks approval.

However, the MPCA recognizes the commenter's concern, and upon reviewing the documents has concerns that specifically including these documents in the SIP could lead to many SIP revisions, with heavy procedural requirements, for simple changes such as deadline extensions. The MPCA believes that once BART limits are set and included in permits, along with any associated recordkeeping and reporting requirements, these will have to be included in the SIP, and that such permits are the key enforceable document to include in the SIP. In addition, the MPCA's intent is to terminate the Administrative Orders once BART limits are set and BART limits and associated compliance mechanisms are moved into facility permits.

The MPCA will continue to include the Administrative Orders in the SIP, as Appendix 9.7, but has removed the language explicitly requesting EPA to approve the Orders into the SIP, allowing EPA to determine if such approval is necessary.

C. *Research and Pilot Testing at Taconite Facilities* (Cliffs Natural Resources)

In its comment letter, Cliffs Natural Resources states that Minnesota's proposed Regional Haze SIP suggests millions of dollars in research and controls for the taconite industry, while not recognizing that Minnesota's taconite ore will likely be exhausted and all taconite operations closed (and therefore not contributing to visibility impairment) by 2064. The letter goes on to state that MPCA has not appropriately considered the remaining useful life of the facilities, and therefore MPCA should not be requiring any controls beyond BART.

As noted in the SIP, "In no instance did the MPCA or an affected facility identify units where the emitting unit's remaining useful life mitigated the selected control option. All units are presumed to continue operating for at least 20 years for the cost estimating procedures." The MPCA would consider the remaining useful life of the source if its useful life is enforceably constrained, such as through a permit condition. Should the taconite facilities wish to take permit conditions that require them to shut down prior to 2064, that constraint would certainly be considered in determining in future if additional controls are reasonable.

Cliffs Natural Resources goes on to state that requiring research and pilot testing into additional controls, and then implementation of any additional controls that are found to be reasonable, is not authorized under the Clean Air Act or Regional Haze Rule. Cliffs Natural Resources also states that, even if such research, pilot testing, and addition of controls was allowable under the Regional Haze Rule, the timeline laid out by the MPCA in Table 10.5 is unrealistic. The timeline in Table 10.5 has been adjusted to account for the recent economic downturn and its impact on the taconite facilities, particularly in terms of providing data to support BART emission limits and subsequent control technology investigations.

The comments are beyond the scope of this public notice.

D. Continuous Emission Monitors (CEMs) and Predictive Emission Monitoring Systems (PEMS) at Taconite Facilities (MCEA, Friends, NPCA, and VNPA, NPS, Cliffs Natural Resources)

MPCA received many comments concerning the installation, operation and/or use of CEMs and PEMS at the taconite facilities.

The first area of comment relates to the ability to use CEMs to assist in optimizing combustion practices. The MPCA stated in the Regional Haze SIP that the use of CEMs could result in a reduction in NO_X emissions. Cliffs Natural Resources commented that it is inappropriate to refer to CEMs as a control technology, and requests that MPCA document where they have been shown to result in reduced emissions. This statement was made in the initial draft SIP, and no comments were received from Cliffs at that time. However, as much of information concerning CEMs is new in the Revised Draft Haze SIP, the MPCA will simply note that the paragraph referenced here does not claim that CEMs are a control technology. It simply points out that the information received from the operation of CEMs has allowed a facility to manage its combustion processes to be more efficient, using less fuel and producing fewer emissions. The MPCA believes that facilities that current operate CEMs have been able to optimize combustion and reduce emissions due to the use of NO_X CEMs data.

The second area of comments concerns the requirements imposed on the taconite facilities to either install CEMs or use PEMS to monitor and report their emissions. The Revised Draft Regional Haze SIP contains Administrative Orders whereby Keetac, Minntac, and United Taconite have agreed to install CEMs, while Hibbing Taconite, Northshore Mining, and Arcelor Mittal have agreed to use PEMS. The NPS and MCEA, Friends, NPCA, and VNPA raise significant concerns with the use of PEMS. Although PEMS were part of the initial draft Regional Haze SIP, the details of their operation were not complete. Therefore, the MPCA will respond to these comments.

NPS comments that they do not believe that PEMS will result in emission measurements that are equivalent to those provided by CEMs, and states that MPCA has not provided evidence or examples that PEMS will provide data as accurate as that provided by CEMs. The NPS states that PEMS should only be used if site-specific circumstances prevent the use of CEMs or if the PEMS alternative meets or exceeds EPA criteria for such systems.

Similarly, the comments by MCEA, Friends, NPCA, and VNPA voice strong opposition to any use of PEMS, and indeed state that CEMs are legally required, because BART requires "the best system of continuous emission control technology available". The groups note that, particularly due to the decision to postpone setting some BART emission limits for the taconite facilities, CEMs are necessary to reduce uncertainty in emissions monitoring and establish reliable baseline criteria. The commenters , Friends, NPCA, and VNPA do not believe that PEMS would reduce the uncertainty surrounding taconite emissions.

Another commenter (Cliffs) was supportive of MPCA's decision to allow taconite facilities to use CEMs or PEMS, and requests that the MPCA provides additional documentation of the viability of PEMS. (Cliffs refers to these as parametric monitoring systems, but it should be clarified that the MPCA is requiring predictive emission monitoring systems, which are different from parametric monitoring systems.) Cliffs also notes that there have been fairly major difficulties in installing and calibrating CEMs at United Taconite and Northshore Mining.

The MPCA does not believe that the use of CEMs is legally required. As noted above, CEMs (and PEMS) are monitoring techniques and not control technologies, therefore CEMs are not required under the BART definition of continuous emission control technology. The BART *Guidelines* state that emission limits such as those set under BART must be met continuously, but that "this provision does not necessarily require the use of continuous emissions monitoring (CEMs)." 40 CFR Appendix Y to Part 51, V. Although the MPCA would prefer that all the taconite facilities were able to install and operate CEMs, high-quality emission data sufficient to ensure continuous compliance will be obtainable through the use of PEMS.

The use of either CEMs or PEMS will provide much more accurate and useful emission information than that currently received from many of the facilities, which is based solely on stack tests conducted every five years. PEMS require monitoring of process parameters and use a regression equation to relate process parameters to emissions; this must also be supplemented by stack tests every two years. Therefore, the MPCA believes that both CEMs and PEMS will allow the MPCA and the taconite facilities to accurately characterize emissions from the taconite facilities, in order to set BART emission limits and track emissions under the Northeast Minnesota Plan.

EPA has developed a performance specification for PEMS and in the preamble notes, "various State and Local regulations are incorporating PEMS as an emissions monitoring tool." 74 FR 12575. It seems clear that these predictive systems are becoming an increasingly useful and accurate alternative to CEMs. In the interim comments, it was requested that MPCA use the EPA performance specifications to evaluate the methods proposed by the taconite facilities. Our response to interim comments stated that the final EPA performance specification for PEMS was not available during the development of the Administrative Orders that allow for the use of PEMS, or prior to the deadline for the taconite facilities to submit their proposed alternative methods. The NPS commented that this response was a rejection of the use of the EPA performance specification. It is not. Without a final PEMS specification from the EPA when the MPCA was developing the Administrative Orders in order to submit the Regional Haze SIP in a timely fashion, the MPCA had to create our own system for determining what should be required for PEMS. MPCA does not believe it is appropriate to make the performance specification set forth by EPA retroactive, particularly as the facilities are already in the process of gathering and reporting data.

However, it should be noted that the Orders only cover the data necessary in order to set a BART limit. When BART limits are placed into facility permits, a compliance methodology will be needed to show continuous compliance. It has not yet been determined what methodology would be appropriate; if PEMS are deemed appropriate, they will have to be evaluated for their ability to meet the EPA's performance specification.

MCEA, Friends, NPCA, and VNPA also raise concerns about the timeline for obtaining information from the CEMs and PEMS, making BART determinations, and including BART emission limits in Title V permits. The MPCA updated the table in the SIP (Table 10.5) to account for the fact that the recent economic slowdown has lead to the idling of the taconite facilities, impacting how long it will take to get the full year of operating data necessary to finalize the BART determinations by setting corresponding emission limits. The MPCA believes many of the facilities will begin operating this fall and early 2010, and therefore would expect to be able to set BART emission limits sometime in 2011.

Finally, the NPS raises concerns about the MPCA's ability to receive the data necessary to assess the accuracy of PEMS. The MPCA notes that the Administrative Orders signed by the facilities require submission of emissions and parameter data, so failure to provide necessary data would likely be non-compliance with these Orders. Such non-compliance is subject to enforcement action.

E. Northeast Minnesota Plan (MCEA, Friends, NPCA, and VNPA, NPS, Excelsior Energy)

The commenters continue to comment that the 2002 baseline established in the Northeast Minnesota Plan should be adjusted to reflect actual emissions (due to concerns over the accuracy of the reported emissions from the taconite facilities); NPS raised similar concerns. In addition, due to the issuing of the Minntac backwards looking PSD permit since the public notice of the initial draft SIP, they state that the 2002 NO_X emissions from Minntac should be adjusted or removed from the baseline because that estimate is almost 6,000 tons higher than the 2006 emissions. Also, they state that Minntac was operating in 2002 without a permit, with a modification allowing NO_X emissions to increase more than 10,000 tons. NPS states that, after reviewing the tracking spreadsheet provided by the MPCA, it appears that the 2018 target will be met without any additional modifications at the taconite facilities. NPS requests an explanation for the reduction in Minntac's emissions from 2002 to 2012 and 2018.

Although the Northeast Minnesota Plan and baseline emissions have been available since the initial draft SIP, the MPCA is responding to this comment due to the new availability of the MPCA's emission tracking and projected future emissions for the Northeast Minnesota Plan.

The MPCA understands the commenters' concern, which has been articulated many times during the development of the Northeast Minnesota Plan. The language of the Regional Haze SIP notes "there is the potential for adjusting the baseline level from which emissions must be reduced in light of additional information." However, at this point the MPCA does not know if it will be technically feasible to adjust the 2002 baseline. Many of the taconite facilities have made adjustments to their indurating furnaces since 2002, making a comparison between emissions going forward (measured by CEMs or PEMS) to emissions in 2002 (measured with stack tests) very difficult, if not impossible. Additional information would need to be gathered from the CEMs and PEMS before the MPCA can determine if an adjustment is feasible.

In the case of Minntac, 2002 admittedly represented a year of high NO_X emissions due to the fact that the facility was burning almost entirely natural gas. Since 2002, different fuel mixes have been used and CEMs have been installed, helping the facility optimize combustion. The MPCA's estimate for future NO_X emissions is based on the recently issued backwards looking PSD permit. 2002 is the baseline

designated for the regional haze program, and those high levels were real emissions impairing visibility in 2002. Any decrease from that level will have a beneficial impact on visibility.

The commenters' main concern seems to be that the Northeast Minnesota Plan will not require additional reductions prior to 2018 from the majority of the taconite facilities, due to large reductions from Minntac and the electric utilities in the area. The MPCA's current projections do not show that the 30% reduction goal in 2018 will be me, due to the addition of new facilities. Some additional reductions will be required. In addition, the MPCA reiterates that the Northeast Minnesota Plan was adjusted during development to address this particular concern. As stated in the SIP, "The MPCA believes that the pilot tests at existing facilities and installation of emission control equipment at new taconite facilities will demonstrate that feasible, reasonable controls exist for the taconite facilities. *Regardless of the status of the overall Northeast Minnesota emission target,* such reasonable emission reduction measures will be required to be implemented as part of the state's long-term strategy."

MCEA, Friends, NPCA, and VNPA also continues to object to any memorandum of understanding (MOU) between the MPCA and the FLMs that would streamline the visibility review process for facilities covered by the Northeast Minnesota Plan. Such an MOU was envisioned as part of the Plan. The commenters request clarification on the status of the Northeast Minnesota Plan if an MOU is not agreed upon. Part of the motivation of the Northeast Minnesota Plan was to allow for more holistic, and yet more streamlined, FLM visibility review for new sources locating in the six northeastern counties, since as long as emissions were on track to meet the reduction goal, visibility would improve. The inclusion of the Northeast Minnesota Plan in the SIP represents the MPCA's commitment to requiring the emission reductions. That commitment remains regardless of the status of any MOU with the FLMs that may provide for the FLMs to perform a streamlined visibility review.

Excelsior Energy provided comments on the Northeast Minnesota Plan. Excelsior Energy is proposing to construct and operate an integrated gasification combined cycle (IGCC) baseload coal power plant in the six county area subject to the Northeast Minnesota Plan. Excelsior states that its project will push other states (particularly those that impact visibility in Minnesota's Class I areas) to consider this lower-emitting technology. The comments also note that the project will provide clean baseload power, which will help to meet increased electric demand in the Northeast Minnesota area. Excelsior states that the MPCA should support the project as it is consistent with the goals of the Regional Haze SIP. The MPCA does not believe that the Regional Haze SIP is place to support a project that is still going through environmental review and permitting processes.

F. Canadian Emissions (MCEA, Friends, NPCA, and VNPA)

Commenters reiterate their concern that MPCA did not recognize the high probability that Canadian emissions will cause additional visibility impairments at the Class I areas. The MPCA, in response to initial comments added a request to the SIP that EPA work with Canada to allow more open exchange of emission information from Canada and to reduce emissions. The MPCA kept Canadian emissions constant in its future projections of emissions and visibility impairment in order to prevent potential over-control of Minnesota sources to account for these emissions beyond our control. However, we continue to believe that emissions from Canada are an issue for the federal government. If better emission inventory and projections for Canada become available, we may be able to predict the impact of Canadian emissions on our Class I area. At present, any such predictions would be merely conjecture.

G. Federal Approval of the Haze SIP (Northeastern Minnesotans for Wilderness)

The commenter states that Minnesota's Regional Haze SIP should not receive federal approval, reiterating comments made during the comment period on the initial draft Regional Haze SIP. The MPCA is responding here only to a factual error. The group states that the SIP "is a document of minimal

compliance rather than a plan for achieving the stated goals of reduction of regional haze…the State has achieved a waiver so that Minnesota will not meet reduction targets by the National target date of 2064."

The Regional Haze SIP contains 2018 visibility goals that provide for an improvement in visibility (a reduction in haze) at both BWCAW and VNP, and plans for the emission reductions necessary to achieve these goals. There is no a "waiver" concerning the 2064 reduction targets; although the goal of the rule is to have no man-made visibility impairment by 2064, the rule explicitly acknowledges that states may be setting, in this first SIP period, visibility goals with annual progress that would not meet the 2064 goal.

H. Smoke and Local Industrial Emissions (Mielke)

The commenter is a former Minnesota resident, who was concerned about the unworkability of the Regional Haze SIP. The commenter raised questions as to the contribution of local industrial sources to haze, stating that the taconite mines are not located downwind, that haze is only evident during the summer forest fire season and not in winter when the mines are still running. As shown in the SIP, the MPCA's modeling demonstrates that local industry, including the taconite mines, impacts visibility. In addition, although smoke is a contributor to haze on some days, it is not a contributor on the majority of the 20% worst days. Monitoring also shows that days with visibility impairment occur year-round, not solely in the summer.

I.Keep BWCA Haze Free (Davis)

The commenter is a frequent visitor to the BWCAW who hopes that there are actions MPCA can take to keep the area haze free. The MPCA believes that the Regional Haze SIP documents actions that will help reach this goal, and will provide appropriate progress towards the ultimate goal of no man-made haze in the Class I areas.

II. Facility Specific Comments

A. Arcelor Mittal

The comments concerning the Arcelor Mittal facility came directly from the facility itself. First, Arcelor raised continued concerns about the SO_2 BART limit proposed by the MPCA for the facility. The MPCA has previously stated that the SO_2 BART limits for facilities that burn low-sulfur fuels were developed to recognize the existence of sulfur in the ore, and that our intent is not to direct the ore choice made by facilities. Arcelor raised concerns about compliance with the MPCA's limit due to the standard deviation of the sulfur content of the ore, and suggested a limit of 0.216 lbs/long ton (LT) of pellets produced, compared to MPCA's proposed limit of 0.123 lbs/LT. The MPCA believes that it is appropriate to set an SO_2 BART limit at this time and has done so for all other facilities that burn low-sulfur fuels.

The MPCA reviewed the SO_2 data provided by Arcelor Mittal, and does not concur that the SO_2 BART limit should be as high as 0.216 lbs/LT. However, the data, which consisted of 146 hourly data points, showing that SO_2 emissions averaged 0.112 lb/LT with a standard deviation of 0.034, do suggest that a slightly higher BART limit is appropriate. Using statistical analysis techniques to estimate a year's worth of daily data based on these parameters, the MPCA determined that an SO_2 BART limit of 0.165 lb/LT is appropriate for this facility. The MPCA also notes that the BART limit applies on a 30-day rolling average.

Arcelor also reiterated their contention that the BACT limit established in Arcelor's permit should be considered to be the BART emission limit, and added the information that meeting the BACT limit at the facility has required the use of good combustion practices. As stated in the prior response to comments, the MPCA does not agree that BACT should, by default, substitute for BART. However, should the

existing BACT limit for the Arcelor facility be shown to be consistent with the good combustion practices that the MPCA has determined to be BART, it certainly may be considered the BART limit when the MPCA sets NO_X BART limits after acquiring a year of operating data from the taconite facilities.

Arcelor also commented that the emissions data collected to date is insufficient to establish an achievable SO_2 BART limit due to the natural variability of sulfur in the ore. The MPCA agreed to use the collected data to establish a SO_2 BART limit. Nonetheless, if Arcelor believes that the data is not sufficient, the MPCA is agreeable to Arcelor installing and operating CEMS to collect data. Should Arcelor provide such additional data, the MPCA will consider amending the BART limit in the future.

B. Hibbing Taconite (Cliffs Natural Resources)

Cliffs Natural Resources noted in their comments that the schedule of compliance in Table 9.7 reflects dates originally shown in the Administrative Orders, but not subsequent extensions to deadlines granted by the MPCA. The MPCA has modified Table 9.7 to ensure that the dates listed are consistent with the most recent agreements between MPCA and Hibbing Taconite.

C. Keewatin Taconite (NPS)

The NPS provided comments on the SO_2 BART determination for Keewatin Taconite (Keetac). The BART determination was available during the public notice of the initial draft Regional Haze Plan was placed on notice, and although the NPS stated that they felt requiring SO_2 BART limits was appropriate, did not make specific comments at that time. Because the comment is beyond the scope of the public notice, the MPCA is not responding to the comment.

D. Minnesota Power – Boswell Unit 3 (MCEA, Friends, NPCA, and VNPA, NPS)

The MPCA performed a streamlined BART analysis for Boswell 3, because the unit was installing the most stringent controls available. The BART *Guidelines* state, "If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis." However, some commenters stated that the emission limits at Boswell 3 do not represent the most stringent controls available, and therefore the MPCA must complete the full BART process laid out in the *Guidelines*, not the streamlined process. (MCEA, Friends, NPCA, and VNPA, NPS)

The MPCA did not require Minnesota Power to submit a BART analysis because in 2007 the MPCA completed permitting for the construction of combustion and post combustion controls. To control NO_X emissions Minnesota Power is installing low NO_X burners with overfire air and selective catalytic reduction. Minnesota Power is installing wet flue gas desulfurization (wet FGD) to controls SO_2 emissions. These are BACT-like controls.

EPA's *Guidelines*, when giving instructions for identifying all available retrofit control technologies, states that "you must identify the most stringent option and a reasonable set of options for analysis that reflects a comprehensive list of available technologies." In the MPCA's technical judgement, SCR and wet FGD would clearly be the most stringent options available in a full BART analysis. Because the analysis is a case by case assessment, site-specific conditions of a retrofit technology may influence how stringent (that is, how low) an emissions limit can be.

SCR and wet FGD technologies are described frequently by commenters in their comments on the MPCA's BART determination for other facilities as "most stringent technology", and the MPCA believes the emissions limits reflect appropriate site-specific conditions.

The commenters also express concern that the controls being constructed at Boswell Unit 3 are not properly designed, and will not be fully utilized. The commenters believe that if the controls had been properly designed, they should achieve an SO_2 emissions rate of 0.027 lb/MMBtu, and a NO_X emissions rate of 0.037 lb/MMBtu. They compare this to a recently issued EPA permit for new construction with an SO_2 emissions rate of 0.06 lb/MMBtu, and a NO_X emissions rate of 0.05 lb/MMBtu.

Commenters point to the permit recently issued for the construction of Desert Rock Power Plant in New Mexico. This permit contains a multitude of NO_X emission limits, structured to allow construction of a new facility that will optimize operation with the goal of achieving 0.05 lb/MMBtu on a 30-day rolling average. However, Desert Rock's permit prevents enforcement of this emissions limit until after a five year optimization period, and further, allows the Permittee to amend the permit should the 0.05 lb/MMBtu limit be demonstrated to be unachievable. Because it is evident that EPA is uncertain that Desert Rock will achieve a 0.05 lb/MMBtu limit, even though this facility has the opportunity to construct its boilers with every state of the art feature to minimize NO_X formation and emissions, the MPCA does not believe this limit is an appropriate comparison. The MPCA will not modify the NO_X limit for the existing Boswell Unit 3 to impose the same limit.

Minnesota Power is constructing technology described as the most stringent technology for SO_2 control; the emissions limit of 0.09 lb/MMBtu requires significant SO_2 control from this boiler. While commenters also point to the sulfur dioxide emissions limit in the Desert Rock permit of 0.06 lb/MMBtu, the MPCA declines to modify the emissions limit for this pollutant. At the time of permitting in 2007, the permitted emissions rate of 0.09 lb/MMBtu was the lowest emissions rate reported by permitting authorities to the BACT clearinghouse. As mentioned, because this control device has not yet begun operation, it is not possible to suggest how the design or operation of the device might be improved.

Because Boswell 3 emissions will be controlled through use of the most stringent control technology, and the emission limits are equivalent to emission limits set through top-down BACT analyses, the MPCA determined that a complete five factor analysis is unnecessary.

The MPCA notes that had the MPCA conducted a full analysis in the absence of any controls proposed, it is not clear that SCR and FGD would have been selected as BART, as the dollars per ton of pollutant reduced would likely have been deemed not cost-effective in the BART context. Initial cost effectiveness estimates were \$3,201/ton of NO_X removed and \$1,640/ton of SO_2 removed[1], but Minnesota Power has experienced somewhat significant cost increases in the construction of the controls, and actual cost per ton calculations today would be greater.[2]

The control project at Boswell 3 was a *voluntary* project proposed by Minnesota Power in response to many influences and pressures to lower emissions from power plants, including the Clean Air Interstate Rule and BART. The project was proposed, approved and permitted under Minnesota's emissions reduction rate rider statute (Minn. Stat. 216B.1692) that allows favorable rate treatment for emission reduction projects that can show substantial health and environmental benefits.

[1] Minnesota Power Boswell 3 Environmental Improvement Plan, October 27, 2006

[2] David Moeller, Minnesota Power. In the Matter of Minnesota Power's Petition for Approval of Cost Recovery under Boswell 3 Environmental Improvement Rider (Boswell 3 Rider) Docket No. E-015/M-08-1108. January 28, 2009

E. Minnesota Power – Taconite Harbor Unit 3 (MCEA, Friends, NPCA and VNPA, NPS, Minnesota Power)

Comments on Taconite Harbor Unit 3 generally fall into two categories – technical comments concerning the evaluation of controls for BART, and technical comments concerning detailed application of emission limits, etc., for the proposed BART.

Comments concerning the controls evaluated for BART were received from NPS and MCEA, Friends, NPCA, and VNPA.

The first issue raised by these commenters was that SO_2 removal rates for spray drying with a fabric filter should be assumed to be higher than the 89% represented in the analysis, and therefore spray drying should be reconsidered. The MPCA believes that Minnesota Power appropriately described the efficiencies of SO_2 controls at the Taconite Harbor plant. Spray drying is understood to control SO_2 at efficiencies of 90%. Minnesota Power reports spray drying removal efficiency at 89%, a reasonable estimate for SO_2 removal at a unit using a low-sulfur coal.

Additionally, commenters believe that because the BART determination at RPU Silver Lake relies on a spray dryer/fabric filter, so too should the BART determination for Taconite Harbor. Determinations are based on site-specific factors, and results can differ due to those factors. NPS suggested that because a fabric filter is proposed, the additional scrubbing components should be included. Spray drying has already been evaluated, its costs described, and has been rejected as a cost-effective technology for Taconite Harbor BART.

The commenters state that technically feasible options, such as wet flue gas desulfurization (FGD), cannot be eliminated from a full five-factor BART analysis. The MPCA believes that wet FGD was appropriately eliminated as a BART technology through consideration of the factors. Minnesota Power and its consultant identified technologies capable of controlling SO_2. Wet FGD was identified as a potentially feasible technology, and its capital cost preliminarily estimated. However, the technology has higher energy penalties for managing water in the scrubber and dewatering sludge; wet sludge disposal will create another operational barrier.

Costs of furnace sorbent injection are known for this project, as the controls have already been employed at Units 1 and 2 and Minnesota Power provides cost information to Minnesota's Public Utility Commission in order to recover capital and operating costs. The costs of the proposed SO_2 controls at Taconite Harbor are high relative to other SO_2 projects. Estimated per ton costs of the proposed technology are $3,900 for SO_2, which is above EPA's calculated nation-wide cost effectiveness of $2,399 for EGUs in the 50 to 100 MW range to achieve "presumptive BART" for SO_2.

The MPCA believes that it has appropriately weighed the technical feasibility of this technology and its cost-effectiveness and is in agreement that wet FGD is not an appropriate BART technology.

The commenters also state that the analysis conducted did not address visibility improvements. The MPCA has added to the BART determination memo a summary of the results of visibility modeling conducted by Minnesota Power to demonstrate the impacts of changing PM controls from an ESP to a fabric filter. This included some changes to NO_X and SO_2 emissions, which approximate the MPCA's BART determination. In addition, the MPCA conducted additional visibility modeling as described previously. These additional measures assess the visibility improvements from the BART determinations.

The commenters state that the costs of selective catalytic reduction (SCR) have been over-estimated. As noted in the discussion of the use of SCRs at Sherburne County, EPA has found that SCR is not generally cost-effective. The MPCA is satisfied that Minnesota Power and its consultants have appropriately estimated the capital and annualized costs for SCR for this unit. The MPCA had previously reviewed and accepted the cost estimates for NO_X controls when Minnesota Power proposed the AREA project. The current capital cost of the SCR, $28.9 million is slightly higher than the approximately $22 million cost estimated by Minnesota Power in 2005. Since then, costs for air pollution controls have been documented to have increased substantially; therefore the higher costs are expected.

Finally, the commenters state that cost estimates should follow EPA guidance and that sufficient documentation should be provided. The MPCA acknowledges that the material provided with Minnesota Power's BART analysis does not meet the guidance provided by EPA on the documentation of costs. Because of the MPCA's analysis of the AREA project in 2005 and 2006 (which included a retrofit project at the entire Taconite Harbor facility and NO_X control at Minnesota Power's Laskin generating station), the analysis of Minnesota Power's Boswell 3 retrofit of air pollution controls in 2006, and the review of NO_X controls at Boswell Units 1, 2 and 4 in 2008 and 2009, significant cost information was already available to the MPCA. Nonetheless, the MPCA has requested that Minnesota Power submit the cost information and estimates in the form in which the guidance requests, in order to further the documentation of the BART determination.

Minnesota Power raised concerns specific to the proposed BART determination at the facility. Concerning the NO_X BART determination, the MPCA selected ROFA as the appropriate NO_X emissions control; however, the MPCA inadvertently listed the BART emission limit as 0.13 lb/MMBtu. This rate is associated with ROFA/Rotamix. The emission rate that should have been associated with ROFA alone was 0.16 lb/MMBtu. However, Minnesota Power commented that the effectiveness of the various technologies in its submitted BART analysis should be considered as demonstrating what is achievable on an annual basis and not reflective of an emissions rate that has a shorter averaging period. Therefore, Minnesota Power proposes to amend the NO_X limit to 0.20 lb/MMBtu to reflect a 30-day rolling average.

The MPCA recognizes that emission rates of pollutants are variable, and that emission limits must account for variability within the normal operating range of a well-operated emissions unit. Emission limits set to limit emissions over a long time frame can be set lower than those for shorter periods because short timeframes include high emission rates, while these high emission rates are averaged out in longer timeframes. Minnesota Power's BART analysis was silent about the averaging period emission rates represented.

The BART *Guidelines* recommend states to establish 30-day rolling averages for NO_X and SO_2 limits from EGUs. In order to properly establish short term averages, the MPCA requested that Minnesota Power submit additional data to demonstrate the operating ranges of ROFA/Rotamix at Units 1 and 2 at Taconite Harbor, which are very similar to Unit 3. Minnesota Power provided additional monitoring data to demonstrate the variability of controlled NO_X emissions at Units 1 and 2, where actual emissions for that period average around 0.17 lb/MMBtu, above the 0.16 lb/MMBtu emissions limit originally proposed.

Minnesota Power also stated that 30-day averages can be both higher and lower than the 0.17 lb/MMBtu. While ROFA is described by EPA in the BART *Guidelines* as "advanced combustion controls", it appears to not be capable of continuously achieving the presumptive BART rate of 0.15 lb/MMBtu on a 30-day basis.

The MPCA obtained Taconite Harbor's daily NO_X emission rates for 2008 and 2009 from EPA's Clean Air Markets Division and calculated the 30-day rolling average for Unit 2. The lowest NO_X average was

0.13 lb/MMBtu and the highest was 0.20 lb/MMBtu. Based on Minnesota Power's demonstration and the review of the achievable emissions rates, the MPCA will amend the BART determination for NO_X to 0.20 lb/MMBtu.

Similarly, Minnesota Power stated that the proposed SO_2 emissions rate of 0.32 lb/MMBtu is an annual average SO_2 limit, not a short term limit, and proposed an amended SO_2 rate of 0.40 lb/MMBtu 30-day rolling average.

Minnesota Power describes the "cycling" of SO_2 and NO_X emissions caused by the use of furnace sorbent injection for SO_2 control. Lime injected into the boiler to react with sulfur species eventually coats the boiler, impeding the ability to transfer heat, thereby raising the temperature of the boiler and the amount of NO_X created. When the boiler tubes are cleaned, the temperatures fall, along with NO_X emissions. Cleaning the tubes however decreases the removal efficiency of SO_2. SO_2 and NO_X emission rates fluctuate throughout the day. Minnesota Power believes that the presence of a fabric filter will smooth the variations. Minnesota Power reports that the 365 day rolling average emissions rate for SO_2 is 0.44 lb/MMBtu at Unit 2. Minnesota Power supplied hourly emissions data demonstrating the frequent fluctuations in SO_2 emissions.

The MPCA obtained Taconite Harbor's daily SO_2 emission rates for 2008 and 2009 from EPA's Clean Air Markets Division and calculated the 30-day rolling average for Unit 2. The lowest SO_2 average was 0.29 lb/MMBtu and the highest was 0.53 lb/MMBtu. The MPCA will revise the SO_2 emissions rate for Taconite Harbor to 0.40 lb/MMBtu on a 30-day rolling average reflecting the use of a fabric filter to improve SO_2 capture. At this emissions rate, the expected annual average SO_2 rate will remain at or below 0.32 lb/MMBtu, representing no change in the total SO_2 reductions achieved with the use of furnace sorbent injection and a fabric filter for particulate matter control.

Finally, Minnesota Power requested that the MPCA clarify the intent of the BART determination for particulate; it is unclear if the limit should be based on existing particulate matter (PM) controls or the future PM controls. Additionally, they state that it appears that there is differing treatment of particulate matter with an aerodynamic diameter of 10 microns and less (PM_{10}), and if it should consider the "filterable" portion or both "filterable" and "condensible" fractions of PM_{10}

Minnesota Power appropriately identified inconsistencies in the treatment of particulate matter. The MPCA is clarifying its intent related to establishing PM_{10} emission limits for Taconite Harbor Unit 3. As described in the proposed SIP, the MPCA has conducted visibility modeling for PM_{10}[3] emitted from each subject-to-BART EGU, and determined that the small impact (less than 0.20 deciview for all units) did not justify requiring addition controls in the BART analysis. Each facility's existing controls, and their emission limits for PM_{10} were to be considered for BART.[4] As described in the proposed SIP, the MPCA intends to impose a PM_{10} limit for each facility that represents current controls. The PM_{10} limit is to include both the "filterable" and "condensible" fractions of PM_{10}.

Minnesota Power proposed a PM_{10} limit for Taconite Harbor Unit 3 of 0.10 lb/MMBtu based on the performance of the existing electrostatic precipitators. The MPCA requested further information from Minnesota Power to demonstrate the basis for this emissions limit. The air emissions permit (as of September 2009) does not contain a PM_{10} limit for Unit 3; the permit contains a total particulate matter limit of 0.30 lb/MMBtu. PM_{10} emissions limit both the "filterable" and condensible fractions of particulate matter emitted from this coal fired boiler. The total PM emissions limit controls the emissions rate of the filterable fraction.

[3] Page 66 of proposed SIP
[4] Page 70 of proposed SIP

Minnesota Power expanded on its request to revise the PM_{10} limit for Unit 3. The 0.012 lb/MMBtu value reflects the filterable emissions rate the fabric filter is capable of achieving. Stack test measurements of condensable emissions at Unit 2 where ROFA/Rotomix and furnace sorbent injection is currently employed shows condensible PM emissions ranging from 0.005 to 0.027 lb/MMBtu.[5] While the proposed PM_{10} limit of 0.10 lb/MMBtu is considerably higher than the sum of the filterable and condensible values (0.04 lb/MMBtu), the emissions rate is well below 0.3 lb/MMBtu, the PM_{10} limit the MPCA would have imposed in following its strategy for PM_{10} BART limits. The MPCA will amend the PM_{10} limit to 0.10 lb/MMBtu to reflect the operations of the fabric filter.

Finally, Minnesota Power requested that MPCA correct errors in Table 9.4 and Appendix 9.4. The MPCA has corrected the tables to correcntly reflect the technology to be used for BART: ROFA, furnace sorbent injection, and a fabric filter.

F. Northshore Mining – Silver Bay Power (Cliffs, MCEA, Friends, NPCA and VNPA, and NPS)

Cliffs:

Cliffs Natural Resources stated in its comments that the only proper BART determination for SBP is low NO_X burners and over-fired air to reduce NO_X emissions on Unit 2.

Cliffs states that the MPCA has not conducted the BART determination process properly, and has erred in relying on biomass and by including Unit 1 in the determination. Cliffs commits to achieve emission reductions equal to or better than BART at the facility via the proposed the BART Alternative described in the SIP.

Cliffs states that biomass co-firing constitutes fuel switching, which is not allowable as BART. The MPCA has treated the co-firing of biomass as a BART control strategy, which is appropriate. EPA has provided written confirmation to the MPCA that blending of fuels is allowable as BART – this is discussed further in the response to Cliffs' comments on the BART determination for United Taconite below.

Cliffs also notes that MPCA's BART determination includes Unit 1, which is not BART-eligible, and states that a BART determination is not allowable for Unit 1. Although only Unit 2 is subject-to-BART, the MPCA's BART determination includes Unit 1 based on information in the EPA's BART *Guidelines,* describing when it may be appropriate to control non-BART-eligible units. The BART *Guidelines* at 40 CFR 51, Appendix Y state, "There may be situations where a specific set of units within a fenceline constitutes the logical set to which controls would apply and that set of units may or may not all be BART-eligible. (For example, some units in that set may not have been constructed between 1962 and 1977.)" This is precisely the situation at SBP. In evaluating biomass co-firing as an available control technology under BART, it became clear to the MPCA that much of the related handling and other equipment needed to enable biomass co-firing would be sized for both Unit 1 and Unit 2. Therefore, in the instance of biomass control technology, and only in that instance, the MPCA deemed both units to be the logical set to which controls would apply.

Other Commenters:

Other commenters raised concerns about the stringency of the MPCA's BART determination for SBP, particularly focusing on how the MPCA evaluated add-on controls as potential BART. Regarding NO_X control, commenters stated that the installation of Selective Catalytic Reduction (SCR) was improperly

[5] Brandon Krogh, Minnesota Power. Revised Draft of the Regional Haze State Implementation Plan Responses to Information Request. September 24, 2009.

determined to be technologically infeasible due to the high dust configuration needed, leading to SCR in the low dust configuration being rejected due to high cost. The commenters state that many SCRs are installed in high dust locations and more information is needed to show that an SCR is infeasible.

The MPCA has properly considered SCR control. As noted in the response to comments on Xcel's Sherburne County facility, the EPA has noted that SCRs will generally not be cost-effective for BART. The MPCA believes this would be the case even if SCRs had been determined to be technologically feasible, and therefore did not further evaluate SCRs.

These commenters also state that SBP under-estimated the likely control effectiveness of ROFA+Rotamix, estimating its NO_X removal efficiency at only 40%. The commenters point to the 68% control efficiency estimated for the Taconite Harbor facility, and the fact that this system has been reported to achieve NO_X reductions as high as 83% on a coal-fired boiler similar to SBP, the Dynegy Vermilion Power Station #1.

Evidence is accumulating that suggests that the NO_X reductions achieved at Dynegy Vermilion Power Station may be a site-specific accomplishment, not necessarily capable of being translated to other retrofit projects. Minnesota now has three boilers retrofitted with ROFA, and/or Rotamix, Units 1 and 2 at Taconite Harbor and Unit 4 at Rochester Public Utilities. The Taconite Harbor units have demonstrated a 30-day average of 0.20 lb/MMBtu, while RPU's installation is just now approaching 0.25 lb/MMBtu, representing about 50% and 40% control respectively. The MPCA has noted that, although similar in size to SBP (80 MW, compared to SBP #2 at 75 MW), the boilers have different configurations. Both the Vermilion and Taconite Harbor boilers are tangential fired boilers, while SBP #2 is a front-wall fired boiler. This difference has to be taken into account. Based on the evidence of existing installations, the MPCA is satisfied that the 40% removal rate is a reasonable estimate of NO_X control for this unit.

The commenters also state that the costs of ROFA+Rotamix at SBP are inflated. Alternatively, Cliffs notes in their comments that reviews of costs for ROFA alone show that installed costs have been as high as 175 – 250% of initial estimates. The MPCA reviewed the initial cost estimates for this boiler and compared them to the capital costs reported by Minnesota Power in its AREA proposal. Cliffs' reported cost of $25.8 million ($322/kW) is higher than that reported by Minnesota Power for AREA ($220/kW), but Minnesota Power describes the pricing by Nalco/Mobotec for Taconite Harbor as "extremely attractive." After discussion with Minnesota Power, the MPCA understands that the pricing of ROFA was specific to Minnesota Power's project, and should not be expected at any other project. Given this, the MPCA believes the cost estimates for SBP are reasonable, and is satisfied that the option was evaluated appropriately.

In terms of the SO_2 BART determination, MCEA, Friends, NPCA, and VNPA and NPS contend that the MPCA should not have rejected SO_2 removal technologies that rely on water (wet scrubbing) due to the potential for adverse non-air quality environmental impacts when sulfate burdened water is discharged. The MPCA felt this was appropriate as dry scrubbed alternatives could provide similar or better control efficiencies without the potential for adverse water impacts. MCEA, Friends, NPCA, and VNPA, state that this is an incorrect assumption, as flue gas desulfurization (FGD) can achieve control efficiencies of 98 – 99%, compared to 90-95% for dry scrubbed options, leading to the potential for an SO_2 BART limit as low as 0.06 lb/MMBtu. The NPS also believes that the BART analysis underestimates the potential control effectiveness for wet scrubbing. The commenters urged the MPCA to re-evaluate the costs of wet scrubbing.

The MPCA believes it has conducted the evaluation of technical feasibility appropriately, and has rejected the use of wet scrubbing with sufficient justification. The MPCA's guidelines to the facilities require identification of the most stringent control technology; in this instance, wet scrubbing. The guidelines

also instruct that operating problems specific to the facility's circumstances is an important factor when determining if a technology is applicable to the facility. The guidelines do not require the development of cost-effectiveness values for alternatives that are rejected as technically infeasible.

A quantitative evaluation of the costs of wet scrubbing was not necessary because including water treatment costs, along with wet sludge disposal costs, would clearly make the wet scrubbing options even more expensive than the dry scrubbed options for modest improvements in pollutant control, and would have related energy penalties. The additional tons removed will not significantly improve the cost-effectiveness of the option.

The MPCA believes that it appropriately evaluated several potential add-on SO_2 controls, and is justified in not designating any of these controls as BART due to non-air quality impacts or cost-effectiveness. In their comments, Cliffs mentions several site-specific factors that must be considered in any cost-estimation for SBP, and which result in installation challenges and project cost increases at the facility. These include: limited plot space, complex ductwork geometry, limited station electrical power supply, challenging terrain, and proximity to Lake Superior. SBP states that these factors are not captured in the MPCA's cost-estimates, and provides revised cost estimates. The attached table shows the comparison:

Control Technology	NOX Emissions Rate lb/MMBtu	SO2 Emission Rate lb/MMBtu	Tons Reduced (tpy)	Emissions reduction (%)	$/Ton Pollutant reduced (Cliffs/SBP)	$/Ton Pollutant reduced (MPCA)
Low NO_X Burners w/overfire air	0.40	NA	808	40%	$596	$596
Dry Sorbent Injection/Baghouse	NA	0.30	905	50%	$11,990	$3,778
Spray Dryer/Baghouse	NA	0.06	1628	90%	$8,446	$3,547
Biomass Co-Firing	Unit 1: 0.41 Unit 2: 0.40	Unit 1: 0.41 Unit 2: 0.48	1981	NO_X: 40% SO_2: 20%	$2,427	$2,761

The MPCA believes that Cliffs' cost estimate are unreasonably high; nonetheless, both Cliffs and the MPCA cost estimates show that the spray dryer/ baghouse option is more costly than the biomass option for NOx and SO2 control.

The NPS and EPA Region 5 indicate in their comments that they viewed the MPCA's BART determination for SBP #2 as a pollutant-by-pollutant approach leading to BART limits of 0.40 lb/MMBtu for NO_X and 0.06 lb/MMBtu for SO_2. The NPS specifically supports an SO_2 BART determination of spray dryer/baghouse resulting in a 0.06 lb/MMBtu emission limit. However, the MPCA did NOT ultimately determine that this option was BART.

Instead, the MPCA's BART determination is biomass co-firing. The NPS, MCEA, Friends, NPCA, and VNPA and EPA comments are framed as if the biomass co-firing option was evaluated as an alternative to BART, in which case MPCA would have to demonstrate that the alternative results in greater reductions of each BART pollutant or in greater visibility improvement than the BART determination. However, the biomass co-firing option was evaluated as part of the MPCA's BART analysis, and was deemed to be BART. The MPCA believes that this approach was correctly executed.

In regards to the BART determination for PM_{10}, the MPCA and the commenters agree that BART for PM is no additional control. However, commenters believe that the limit of 0.046 gr/dscf set to reflect current

controls is too high, when other plants are achieving much lower PM limits. As described in the SIP, because of the small impact from PM emissions, the MPCA determined that any additional control would not be cost-effective, particularly when weighed against the small amount of visibility improvement and other environmental impacts. In addition, all of the subject-to-BART EGUs already have PM controls installed. The permit already contains a PM_{10} limit. The MPCA therefore declines to revise its PM_{10} BART limit for SBP.

Finally, EPA Region 5 raises a question concerning the MPCA's response to comments previously raised by the US Forest Service. The MPCA stated that the boilers at SBP primarily generate power for the adjacent taconite operations, making operations somewhat different from those at power plants that operate to supply power to the grid. EPA states that the ultimate use of the electricity should not be considered. Cliffs stated in its comments that it is inappropriate to directly compare utility power generation to taconite power generation because SBP has no ability to pass costs on to customers. The MPCA agrees with EPA that there is no difference between generating electricity at a taconite facility (that then sells electricity to grid) and an electric generating utility, and therefore has not determined appropriate BART cost thresholds, preferring to look at individual facility costs within a source category.

G. United Taconite (Cliffs Natural Resources, NPS)

Cliffs Natural Resources provided comments on the MPCA's BART determination for the United Taconite facility. Cliffs states that the only BART determination that is applicable to the facility is the determination of good combustion practices for NO_X. Cliffs states that there is no appropriate BART limitation for SO_2; add-on SO_2 controls are too expensive, or result in other adverse environmental impacts, namely water impacts from discharged scrubber water. Cliffs also states that fuel-switching cannot be considered to be BART.

The MPCA believes it has properly exercised its authorities and responsibilities in preparing the BART determination for this taconite induration furnace. The MPCA believes there are feasible and cost-effective controls that will successfully reduce this facility's SO_2 emissions, which are high compared to the other taconite facilities. The cost of controls is fully accounted for through the cost analyses and the MPCA's deliberations; Cliffs has not provided the information described by the *Guidelines* for the MPCA to use to consider cost impacts in the MPCA's determination.

The potential water quality impacts of increased scrubbing are a prime reason why the MPCA chose to designate changes to United Taconite's fuel blends as BART. The MPCA has no designated use of a new fuel, but has designated a change in the proportions of United Taconite's blend of existing fuels as BART. The MPCA consulted with EPA prior to making a BART determination based on the use of a cleaner fuel blend, and has documented EPA's legal opinion that "use of a cleaner blend of the type of fuel already in use at the source…is not an example of 'fuel switching,' but rather an example of 'clean fuels'."[6] Therefore, such fuel blending is considered as BART. Accordingly, the MPCA has made an SO_2 BART determination for United Taconite that relies on a change in the blend of existing fuels.

In previous comments, the Forest Service has commented that the BART determination should have selected a different option for SO_2 control (the use of both a lower sulfur fuel blend and a polishing scrubber), which results in an SO_2 limit of 0.68 lb/MMBtu, rather than the MPCA's proposed BART determination. The NPS, in its comments, also disagrees with the MPCA's rejection of additional wet scrubbing options as BART due to energy and non-air quality environmental impacts. The NPS asks MPCA to document why sulfate treatment at United Taconite could not improve the quality of the water discharge.

[6] EPA's letter documenting this opinion is attached to this document.

The MPCA does not dispute that treatment could improve the quality of the scrubber water discharge, and included the cost of constructing and operating a reverse osmosis system with each scrubbing system. Despite the inclusion of RO, the MPCA is not yet convinced that this treatment method will be effective, as already noted in our previous response to comments. United Taconite is already believed to be negatively impacting sensitive receiving water bodies; the MPCA declines to compound an existing problem with additional sulfate loading until treatment options have been identified that satisfy MPCA's water quality staff. The *Guidelines* discuss impacts, stating that "scrubber effluent, for example, may affect water quality….Generally, these types of environmental concerns become important when sensitive site-specific receptors exist". United Taconite discharges to a water body classified as a sensitive receptor. The MPCA has appropriately assessed non-air equality factors in its determination.

The NPS also asks that MPCA more clearly demonstrate how the SO_2 limit was derived. United Taconite has stated that it aims for a particular heat rate with its fuel blend, and relies on the high heat content of petroleum coke to make up heat content as the coal cannot provide sufficient heat alone. The MPCA has identified coals that are of higher heat content (and similar sulfur content) than United Taconite's current coal that could be substituted for the current coal and some portion of the petroleum coke. Based on that substitution, the MPCA then calculated the corresponding uncontrolled SO_2 rate and applied the SO_2 control efficiency of the existing scrubber to obtain the emission limit value. Note also that there is some sulfur in the iron ore itself that is present irrespective of fuel choice.

Cliffs also requested that MPCA revise the SIP to note that Line 1 is a straight grate (not grate kiln) furnace, and to reflect the later dates for certification of continuous emission monitors (CEMs) agreed to by the MPCA. The MPCA has made these changes. Cliffs also requested that the term "acid pellets" be replaced with the term "standard pellets" in order to prevent confusion with "acid drainage." The MPCA had made this change.

H. Rochester Public Utilities – Silver Lake (MCEA, Friends, NPCA, and VNPA, NPS, Region 5)

MPCA received several comments concerning its determination of BART limits at Rochester Public Utilities' (RPU) Silver Lake Plant (SLP). The MPCA determined that BART for SLP Unit 3 was no additional control, with an SO_2 limit of 2.30 lbs/MMBtu on a 24-hr basis and no NO_X limit. BART for SLP Unit 4 was determined to be installation of ROFA+Rotamix and a spray-dryer absorber, with emission limits of 0.25 lb/MMBtu for NO_X and 0.6 lb/MMBtu for SO_2 on a 24-hr basis. As with all the power plants, the MPCA determined that BART for particulate matter was no additional controls.

Commenters raised concerns that the MPCA did not conduct the required five-step BART analysis, and states that the MPCA attempted to use the provision in the *Guidelines* allowing for a streamlined BART analysis where a facility has installed the most stringent controls. In addition, commenters raised concerns that a BART analysis was not conducted at Unit 3. EPA Region 5 also stated that MPCA needed to demonstrate that controls on Unit 4 provided more visibility improvement than BART on both Unit 3 and Unit 4, in order to use the controls on Unit 4 in lieu of BART for both units.

The MPCA believes that both of these commenters misunderstood the nature of the MPCA's BART determination. Some general language in the BART memo may have implied that the MPCA was using this "most stringent" controls section of the *Guidelines*. The MPCA did not intend to convey that impression and the language has been removed. The MPCA did not determine that RPU was installing the most stringent controls available, but that the controls being installed represented BART on Unit 4, while BART on Unit 3 was no additional controls. The MPCA based this determination on information concerning evaluation of controls at Silver Lake.

As discussed previously, the five-step analysis process in the BART *Guidelines* are not mandatory for this facility, due to its small size (less than 750 MW). However, the MPCA has added additional information to the BART determination, showing analyses of a wide range of control strategies that were done for both Unit 3 and Unit 4 to demonstrate more clearly how the MPCA evaluated the required Clean Air Act factors. After identification of available controls for Unit 3, based on the cost of those controls and the fact that the small size of Unit 3 makes controls less cost-effective and the fact that Unit 3 contributes less to visibility impairment, the MPCA determined that BART for Unit 3 is no additional controls or added emission limits.

Commenters also state that a full BART analysis for Unit 4 would have looked at other controls, such as an SCR for NO_X and wet FGD for SO_2. The MPCA notes that, in a settlement agreement with MCEA concerning controls at SLP, the parties explicitly stated that "operation of a conventional SCR system is not feasible at Silver Lake Plant Unit 4 due to the flue gas temperature and expected conversion of sulfur trioxide to ammonium sulfates and ammonium bisulfates." Therefore, the MPCA finds that an SCR could not be considered to be BART. In addition, information has been added to the BART determination memo explaining that wet FGD was rejected due to higher lifecycle costs; additional information has been added, to clarify what controls were evaluated and considered at RPU.

In general, however, the comments concerning BART for SLP focus on the emission limits determined to be BART. Commenters note that the NO_X limit for use of ROFA+Rotamix is much higher at SLP than at Taconite Harbor, and does not meet the limit set forth in the referenced settlement agreement. The settlement agreement states that a control capable of achieving 0.15 lb/MMBtu of NO_X must be installed at SLP and operated. This 0.15 lb/MMBtu level was to establish how to engineer the control project, which is based on different considerations than a permit limit. The settlement does not require permitting at that, or any specified, level. The BART determination will result in a decrease in the NO_X permit limit for Unit 4 from 0.46 lb/MMBtu to 0.25 lb/MMBtu. As noted in the comments provided by RPU, the intent is to operate as near to the 0.15 lb/MMBtu NO_X level as possible, but sufficient data and operating experience is not available to show that a limit below the permitted 0.25 lb/MMBtu NO_X is achievable. The 0.25 lb/MMBtu level is lower than the presumptive BART level for this type of boiler.

The commenters note that the SO_2 emission limit does not represent the 70 – 85% control described, and believe that the spray dryer absorber technology could result in over 90% control. The NPS also raises concern that a 0.6 lb/MMBtu SO_2 limit on a 24-hr basis could result in the facility running at this high rate continuously, limiting the visibility improvement, and requests that the MPCA set BART limits "to maximize the capabilities of the chosen control technology."

As shown in the BART memo and noted in the RPU comment letter, SLP burns primarily bituminous coal. This has higher sulfur content than the sub-bituminous coal burned at Taconite Harbor, resulting in higher sulfur emissions even after the application of controls. In addition, although the final emission limit seems high, the MPCA notes that previously Unit 4 (operating alone) could emit up to 3.2 lbs SO_2/MMBtu; the new emission limit represents a considerable reduction from that limit. Finally, it is the MPCA's experience that facilities desire to operate some degree below their permitted limit to ensure continuous compliance with the limit; the MPCA believes that the SO_2 BART limit appropriately allows that margin while requiring that the emission control technology be operated continuously. RPU notes its intent to operate below the SO_2 limit, but again, at this time it is not clear that a lower limit is achievable.

EPA Region 5 has suggested that MPCA consider a phased NO_X limit for the source. The MPCA will certainly evaluate a lower limit for both pollutants as part of reasonable progress in future SIP revisions, but does not believe it is appropriate to do so at this time.

Finally, the commenters express concern that the proposed 0.4 lb/MMBtu particulate matter limit for this facility for total PM does not meet BART. The MPCA notes that this limit is for PM_{10}. However, the MPCA will not respond further to this comment, as the PM_{10} limit was available and established during the initial notice of the SIP, which contained the MPCA's determination that BART for particulate matter was no additional controls.

I. Xcel Energy – Allen S King #1

Commenters stated that the five-step BART analysis was not completed, that the emission limits for the SCR installed for NO_X control should be more stringent, and that a wet scrubber should have been investigated for SO_2 control.

The NPS comment letter also states that "presumptive BART probably does not apply, [as] King #1 has avoided BART by reducing impacts to below 0.5 dv"; the comments then relate to review of reasonable controls under the reasonable progress requirements. In reviewing and responding to the comments, the MPCA took another look at the initial modeling performed to determine subject-to-BART sources. As shown in the March 2006 document *Results of Best Available Retrofit Technology (BART) Modeling to Determine Sources Subject-to-BART in the State of Minnesota*, Allen S. King # 1 was modeled including enforceable controls. With these controls in place, King #1 fell below the threshold for determining if a facility was subject-to-BART, with a 98^{th} percentile visibility impact greater than or equal to 0.5 dv on only 13 days over three years, which is below the subject-to-BART threshold of 21 days.

Based on a review of the modeling documentation, and a BART presentation made to stakeholders in January 2007 which did not list King #1 as subject-to-BART, the MPCA is removing the BART determination for Allen S. King, and clarifying throughout the SIP that Allen S. King is *not* subject-to-BART.

In terms of evaluating controls for reasonable progress, the MPCA believes that the current controls are all that are currently known to be reasonable for this facility. The NO_X emission rates for King #1 are on a 30-day rolling average, and therefore not directly comparable to the annual emission rates mentioned above. The facility will be evaluated for reasonable progress in future SIP revisions.

J. Xcel Energy – Sherburne County 1 & 2 (NPS, MCEA, Friends, NPCA, and VNPA)

MPCA received several comments on the BART determination for the Sherco power plant. In order to address some of these comments, the MPCA made a further inquiry of Xcel Energy, and Xcel's written response is attached.

First, the commenters state that the MPCA did not properly conduct the BART determination. Because this facility has a total generating capacity greater than 750 MW, the determination of BART is prescribed by the BART *Guidelines* found in 40 CFR Part 51 Appendix Y. To make the BART determination, the MPCA relied on material contained in the Xcel BART analysis, which was prepared in accordance with the *Guidelines*. To further document the MPCA's evaluation, the BART determination memorandum has been expanded.

The commenters also state that the MPCA improperly rejected selective catalytic reduction (SCR) as an appropriate BART determination at Sherco. The MPCA evaluated SCR as resulting in a NO_X emission limit of 0.08 lb/MMBtu, but the commenters state that SCR can achieve greater control, providing as examples 30-day average limit of 0.07 lb/MMBtu on Boswell 3, and units in other states with emission limits of 0.05 lb/MMBtu. Further, the commenters believe that MPCA and Xcel overestimated the cost of SCR.

EPA's BART *Guidelines* were promulgated after EPA completed an analysis of emission controls for electric generating units nationwide. One critical conclusion EPA reached was that post-combustion NO_X controls were not cost-effective at most units; EPA then promulgated in the BART *Guidelines* "presumptive" NO_X emission limits based on the nationwide deployment of combustion control modifications.

The *Guidelines* require states and facility owners to include in the site-specific analysis "the most stringent option and a reasonable set of options for analysis" for controlling a pollutant. By including the most stringent option among the range of alternatives, states are able to determine whether site-specific factors might be favorable to installing post-combustion control technologies. Xcel included both selective noncatalytic reduction (SNCR) and SCR in its assessment.

A number of factors restrain the MPCA from revising the target emissions limit for SCR to a lower value, such as those suggested by the commenters. First, emissions are monitored with a continuous emissions monitor, and all measurements are used to calculate emission rates to compare with the limit. Emissions are higher during periods of unstable operations, which are periodically experienced during start up and shutdown or during low load operations. These periods are especially problematic for SCR because these periods may adversely affect the operating temperature range of the SCR, which determines its control efficiency.

The MPCA asked Xcel to provide additional information concerning the potential operation of SCR at Sherco. In its response, Xcel acknowledged that some SCRs are indeed achieving emission rates below 0.08 lb/MMBtu. However, Xcel states:

> *"Given the difficulty of retrofitting Sherco Units 1 and 2, our analysis indicated that levels of 0.05 lb/MMBtu could be attained at optimum operating conditions (extended stable, full load operation). However, the BART rules indicated that values should be based on 30-day rolling averages. Our expectation is that emissions during all periods of operation would need to be counted, including startup and shutdown operation. By doing so, the limit [0.05 lb/MMBtu] is no longer representative of optimum operating conditions as it is no longer extended, stable full load operation."*[7]

In particular, Xcel describes the operating difficulties under two types of operating conditions: reduced loads and during startup and shutdown. These two units are very large, and can take considerable time to warm up. SCRs have an optimum operating temperature around 750 degrees F. During start up, and when cycling between low and high loads, flue gas temperatures will drop below this temperature, causing SCR removal efficiencies to drop as well. Cycling from low loads to high loads is now occurring more frequently at units such as Sherco due to the expansion of wind-generated electricity.

In addition to being technologically infeasible, the MPCA views the commenters' recommendation of 0.05 lb/MMBtu unreasonable. This emissions limit is being included in permits for construction of new coal fired boilers, which are able to incorporate state of the art NO_X control from initial stages of design, not a retrofit project on boilers that are about 40 years old. The MPCA has reviewed the permit issued by EPA and referenced by the commenters. In the permit, the NO_X emissions limit being suggested is not applicable until after a five year optimization period, which suggests that, even in new construction, the limit will be challenging to meet.

[7] Richard Rosvold, Xcel Energy. Additional Information on Xcel Energy's Best Available Retrofit Technology Study for the Sherburne County Generating Plant. September 25, 2009.

The commenters also claim that the cost of SCR has been over-estimated. Based on the MPCA's review of total and incremental cost-effectiveness, the MPCA has determined that it is not cost-effective to require the installation of post-combustion controls. Xcel prepared costs for all control options according to the MPCA's directions provided in 2006. The BART analysis acknowledges they are order of magnitude estimates, which allows for comparison between alternatives. SCRs are estimated to have a capital cost at Unit 1 of $86 million and Unit 2 of $85 million. The MPCA compared this estimate to budgetary estimate for the Allen S. King SCR (a 600 MW unit) of about $60 million,[8] and Minnesota Power's more recent budgetary estimate of $77 million at Boswell 3 (350MW).[9] Given the larger boiler, and widespread published reports of significant increases in the cost of recent construction of power plant and related projects, the MPCA believes the cost of SCRs to be reasonably estimated.

In addition, the commenters questioned the incremental cost difference between alternatives, stating that it is $33 million, not $40 million. The MPCA has corrected the reference to the incremental cost difference to $33 million. This changes the calculated cost of each additional ton of NO_X to $8,500. This does not affect the MPCA's determination that SCRs are not a cost effective BART control technology.

The commenters made several comments concerning the SO_2 BART determination for Sherco, stating the SO_2 limit is improperly justified. The commenters believe that scrubber improvements should achieve higher removal rates, and that new wet scrubber should achieve SO_2 removal efficiencies of 98%, resulting in lower SO_2 emission limits, such as the 0.09 lb/MMBtu SO_2 BART limit for Boswell 3.

The MPCA has expanded the rationale in the BART memorandum to describe its assessment of the SO_2 emission controls. The existing scrubber configuration is controlling 75% of the SO_2 generated from burning low-sulfur Power River Basin coal. The BART *Guidelines* require that where existing SO_2 controls are already achieving at least 50% control, equipment upgrades to improve overall performance should be evaluated. The *Guidelines* do not require the equipment be replaced. The option identified as BART will result in an emissions limit of 0.12 lb/MMBtu; this limit is more stringent than the presumptive BART SO_2 emissions limit of 0.15 lb/MMBtu for facilities installing new controls. The BART determination has met the requirements of the *Guidelines.*

Xcel has recently done testing of sparger tube retrofitting. Xcel reports to the MPCA that the sparger tubes are capable of achieving the target emission rates, but that balance of plant issues must be investigated. Specifically, changes to the operation of the wet scrubber may affect the ability to control particulate matter, thus potentially affecting the plant's ability to meet opacity limits at the stack. These issues indicate that it is inappropriate to assume that retrofitting existing controls will allow these units to meet standards set for new wet scrubbers.

The BART analysis submitted by Xcel describes wet flue gas desulfurization as achieving SO_2 removal efficiencies of 92% to 98%, in some agreement with the commenter. Regardless, new wet FGDs are not cost effective BART controls.

The commenters also state that the PM_{10} BART limit is too high, and that the wet electrostatic precipitators should have been evaluated for upgrades. The MPCA modeled the PM visibility impacts from existing PM emissions at all EGUs. That modeling showed visibility impacts of 0.047 deciview

[8]Mark Suel, Xcel Energy. In the Matter of the Petition of Northern States Power Company, a Minnesota corporation, Regarding Emissions Reduction Project 2010 Revenue Requirement and Tracker Balance Report. Docket No. E002/M-02-633. October 1, 2009.
[3] MPCA, 2007. MPCA Review of Minnesota Power's Boswell 3 Emissions Reduction Plan. http://www.pca.state.mn.us/hot/mnpower-boswell.html

from Sherco; because of this small impact, the MPCA determined that any additional control would not be cost effective, particularly when weighed against the small amount of visibility improvement and other environmental impacts. Therefore, each facility's existing controls and emission limits for PM are to be considered to be BART. This approach was included in the initial draft Regional Haze SIP, and has remained unchanged.

The current permit for Sherco has a total particulate matter limit of 0.09 lb/MMBtu, but does not have a PM_{10} limit. The MPCA requested Xcel Energy propose a limit that reflects current operations. This limit is intended to reflect actual emission rates used in the visibility impacts modeling. The MPCA has accepted Xcel Energy's proposal of 0.09 lb/MMBtu as an acceptable PM_{10} limit for Sherco Units 1 and 2, based on the visibility impacts modeling. The proposed emissions limit represents a reduction in allowable emissions, as this limit will control emissions of both filterable and condensable particulate matter, where the existing total particulate matter limit in the permit controls only filterable particulate matter. The MPCA will not revise this emissions limit.

The commenters also express concern that the MPCA is basing its rationale for the Sherco BART determination on the reductions achieved with the Metropolitan Emissions Reduction Project (MERP) which benefits air quality in the Twin Cities. As described in the expanded BART memorandum, the MPCA has made its BART determination for Sherco Units 1 and 2 following the BART *Guidelines* and considering the statutory factors: the costs of compliance, the energy and nonair quality environmental impacts of compliance, any existing pollution control technology in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

While the MPCA's BART determination for Sherco was made according to the *Guidelines* and not in consideration of MERP, the value of MERP is significant for several reason, including visibility. Xcel has completed major projects within its generating system in Minnesota that have reduced air pollution substantially. Xcel has completed the retrofit of SCR and spray dryer/fabric filter at the Allen S. King station in Oak Park Heights, and repowered the High Bridge and Riverside stations by retiring the coal fired units and constructing natural gas-fired combined combustion turbines.[10] This resulted in units at Allen S. King and Riverside not being subject to BART. This entire MERP will be completed in 2010 and results in the reduction of about 22,000 tons of NO_X and 38,000 tons of SO_2 annually. These emission reductions are real, and their absence has already materially affected visibility in the parks, far ahead of any scheduled reductions under BART.

Finally, commenters (MCEA, Friends, NPCA and VNPA) have included with their comments a petition to the federal land management agencies to certify Sherco as causing Reasonably Attributable Visibility Impairment (RAVI). RAVI is the precursor program to the Regional Haze Rule with its BART component. 40 CFR 51.302 sets forth implementation control strategies for reasonably attributable visibility impairment. Identified states, including Minnesota, were to submit a SIP under this section by September 1981. This SIP was to include emission limitations representing BART and schedules for BART compliance for each existing stationary source that an affected FLM had certified to cause reasonably attributable impairment of visibility in any Class I area. The MPCA did not complete a RAVI SIP, because no stationary sources in Minnesota had been designated as causing reasonably attributable visibility impairment. In 1987, EPA issued a Federal Implementation Plan (FIP) for Minnesota to address the general plan and long-term strategy requirements of 40 CFR 51.302. 52 FR 45132. EPA at that time deferred a decision on the necessity of BART as part of the implementation plan for Minnesota. In 1989,

[10] Originally identified as subject to BART, the completion of these facility changes resulted in the King plant now has visibility impacts below the 0.5 dV threshold, thus a BART analysis is no longer required. The project also retired Riverside Unit 8, a cyclone boiler identified as BART-eligible.

EPA found that the visibility impairments in Minnesota are not reasonably attributable to any specific source and considered it unnecessary to revise the implementation plan for Minnesota to include BART requirements or other control strategies. 54 FR 21904. The MPCA has never attempted to remove the FIP. Therefore, the MPCA believes that a certification of reasonably attributable visibility impairment would have to be made to EPA, and EPA would have to determine if it is necessary to revise the RAVI FIP to include BART for Sherco. At this time, MPCA has taken steps to comply with the Regional Haze Rule, which includes making a BART determination for Sherco. Because Sherco is going through BART under the regional haze rule (40 CFR 51.308) the MPCA views such a certification as unnecessary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

APR 0 9 2008

REPLY TO THE ATTENTION OF:

AR-18J

Mr. John Seltz, Chief
Air Policy and Mobile Sources Unit
Minnesota Pollution Control Agency
520 Lafayette Road N.
Saint Paul, Minnesota 55155

Dear Mr. Seltz:

You have informed us that the MPCA has requested United Taconite to perform, as part of its BART analysis for its Fairlane Plant facility in Forbes, Minnesota, an analysis of the cost and expected SO_2 emission reductions associated with the use of the various blends of fuels that Line 2 at its facility is currently capable of using, but that United Taconite has taken the position that the MPCA lacks authority to require United Taconite to provide such an analysis. You have forwarded to us a Memorandum dated November 27, 2007, from James Mennell, United Taconite's legal counsel, explaining United Taconite's apparent view that the BART regulations do "not mandate fuel switches." We disagree with United Taconite's analysis regarding your authority and consider your request that United Taconite analyze the use of various bends of fuels to be consistent with the BART requirements.

"Best Available Retrofit Technology" is broadly defined in 40 C.F.R. 51.301 as "an emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction..." In 40 C.F.R. Part 51, Appendix Y, in the Guidelines for BART Determinations under the Regional Haze Rule, ("BART Guidelines") EPA suggested a process for states to follow in making BART determinations. Part IV.D of the BART Guidelines explains the basic steps for undertaking a case-by-case BART analysis, the first step of which requires the identification of all available retrofit emission control techniques. The BART Guidelines note that:

> Air pollution control technologies can include a wide variety of available methods, systems, and techniques for control of the affected pollutant. *Technologies required as BACT or LAER are available for BART purposes and must be included as control alternatives.*

BART Guidelines, Part IV.D (emphasis added). We clearly disagree accordingly with the conclusion that the differences in the statutory definitions of Best Available Control Technology ("BACT") and BART precludes the consideration of certain control methods, such as the use of clean fuels, in a BART analysis.

We note that the analysis by United Taconite appears to equate "fuel switching" with the use of "clean fuels." However, these terms are not typically viewed as synonymous. EPA agrees generally with United Technology's conclusion that the BART Guidelines do not suggest that states must consider, as part of the BART analysis, a switch in the form of fuel used at a facility (*e.g.* from coal to gas). However, use of a cleaner blend of the type of fuel already in use at a facility (*i.e.* using more coal to displace petroleum coke), or is currently capable of using, is not an example of "fuel switching," but rather an example of the use of "clean fuels."

As noted, states should include a wide variety of available methods, systems, and techniques for controlling pollutants in making BART determinations. There is no question that the consideration of clean fuels is clearly part of a BACT analysis. *See* Clean Air Act Amendments of 1990, adding the words "clean fuels" as part of the definition of "best available control technology in Section 169(3) of the Act, 42 U.S.C.§ 7479(3), that has long been considered an available method for reducing emissions; Letter from William G. Rosenberg, Assistant Administrator for Air and Radiation, U.S. EPA, 136 Cong. Rec. 16,917 (October 27, 1990) ("EPA views this amendment as merely codifying its present practice, which holds that clean fuels are an available means of reducing emissions to be considered along with other approaches identifying BACT level controls."). As BART is a retrofit control, EPA has not focused on the use of clean fuels as part of the BART analysis, given the significant expense that would be associated with the changes that would be necessary to allow most existing sources to use a cleaner form of a fuel. Where the use of a cleaner form of fuel would not necessitate significant changes at an existing facility, however, a state should require consideration of this method for controlling emissions in the BART analysis.

Step 2 of the BART analysis eliminates technically infeasible options. United Taconite identified the use of alternative fuels and energy efficiency projects as technically feasible, but did not evaluate the costs associated with these options. Because the use of alternative fuels is not technically infeasible, United Taconite is required to evaluate this option according to Steps 3 through 5 of the BART analysis. Once a thorough evaluation is completed according to the five steps, the best alternative may then be selected according to the criteria set forth in Part IV, E, of Appendix Y.

Please feel free to contact Susan M. Tennenbaum, Associate Regional Counsel, with any legal questions at (312) 886-0273, or, for technical questions, you may contact Matt Rau of my staff at (312) 886-6524.

Sincerely yours,

Steve Rosenthal, Acting Chief
Criteria Pollutant Section

cc: M. Lea Anderson, U.S. EPA Office of General Counsel

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September 25, 2009

Ms. Anne Jackson
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Re: Additional Information on Xcel Energy's Best Available Retrofit Technology Study for the Sherburne County Generating Plant

Dear Ms. Jackson:

The Minnesota Pollution Control Agency ("MPCA") is developing the State Implementation Plan ("SIP") for regional haze for the State of Minnesota. The MPCA requested additional information on the Best Available Retrofit Technology ("BART") Study for the Sherburne County Generating Plant ("Sherco"), Units 1 and 2. These units are owned and operated by Northern States Power Company, a Minnesota Company doing business as Xcel Energy ("NSPM"). This letter responds to the MPCA's request for additional information.

1. Additional modeling results

MPCA Request: Provide additional modeling results to append to Tables 24 and 25 of the BART analysis.

Response: Attached are replacement pages 74 and 75 to the BART analysis, to add tables showing results for combined control cases 1 & 3 and 2 & 3 for Boundary Waters Canoe Area ("BWCA") and Voyageurs National Park ("VNP"). The BART analysis submitted to MPCA in October 2006 included combined cases for Isle Royale National Park ("IRNP") only.

The tables show the modeling prediction that implementation of combined cases 1 & 3[1] results in a visibility improvement of 1.1 deciview ("dV") in the BWCA, 0.98 dV in VNP and 0.81 dV in IRNP. The tables also show that to move to the next most cost-effective technology, combined cases 2 & 3, would result in a further visibility improvement of 0.26 dV in the BWCA, 0.28 dV in VNP and 0.16 dV in IRNP, at a total annualized cost increase of approximately $30 million. This translates into an incremental cost of $115.4 million per dV improvement in the BWCA, $107.1 million per dV improvement in VNP and $187.5 million per dV improvement in IRNP. NSPM believes that these incremental costs are excessive for the very limited amount of visibility improvement achieved.

[1] Case 1: Combustion Optimization/Low NO_x Burners/Separated Over Fire Air for Sherco 1, and Combustion Optimization for Sherco 2. Case 3: Retrofit existing scrubbers with sparger tubes and lime injection for Sherco 1 and 2.

2. NOx control

a. NOx limits

MPCA Request: BART guidance directs states to specify an averaging time of a 30-day rolling average for the BART limits, and the MPCA intends to maintain that requirement for NOx emissions at Sherco. Describe (1) the technical feasibility of maintaining compliance with a 0.08 lb/mmBtu NOx average, (2) how you determined what NOx limit retrofitting SCRs at Sherco would achieve, and (3) the effects on Units 1 and 2 NOx emissions during startup and shutdown with the use of combustion controls and low NOx burners.

Response: (1) and (2) At the time the BART analysis was developed and submitted, NSPM was aware that some coal units had been permitted with a limit below 0.08 lb/mmBtu. Given the difficulty of retrofitting Sherco Units 1 and 2, our analysis indicated that levels of 0.05 lb/mmBtu could be attained at optimum operating conditions (extended stable, full load operation). However, the BART rules indicated that values should be based on 30-day rolling averages. Our expectation is that emissions during all periods of operation would need to be counted, including startup and shutdown operation. By doing so, the limit is no longer representative of optimum operating conditions as it is no longer extended stable, full load operation.

Two examples of non-optimum operating conditions are operating at reduced loads and startup / shutdown conditions. Operating at reduced load (usually less than 350 MW) decreases the flue gas temperature at the location where an SCR would be installed to below 600 degrees F. An example of a startup condition occurred during a cold start this summer, where it took Unit 2 approximately 12 hours to reach 500 degrees F and 15 hours to reach 600 degrees F at the economizer outlet. Based on the "NOx Removal versus Temperature" curve in the EPA Control Cost Manual (attached), SCR removal efficiency at a reduced flue gas temperature of 600°F drops to approximately 75% from the optimum of 90%. In addition, Units 1 and 2 are moving more and more into cycling operation where daily loads fluctuate from 300 MW to 750 MW, thereby resulting in additional time periods with lower NOx removal efficiency. This cycling is anticipated to increase in the future as a result of having increased levels of wind generation on the system. Wind generation results in lower base generation demand during off-peak periods such as at night and on weekends.

When SCR inlet NOx levels are decreased by use of low NOx burner technology to levels between 0.15 and 0.18 lb/mmBtu, removal efficiencies will be significantly less as well, likely 70% at optimum temperatures and less at low loads.

Based on the above information, NSPM concluded that achieving 0.08 lb/mmBtu is technically feasible .

(3) Units 1 and 2 currently control NOx by each using a combustion optimization system, low-NOx burners and separated over fire air. Operational and emissions data analyzed does not indicate an increase in NOx emissions during startup, shutdown or low load operations. Although any decline in combustion efficiency during these times would increase NOx, lower temperatures in the boiler at lower loads would reduce NOx.

b. Cost estimates for NOx controls

MPCA Request: The MPCA in 2006 directed owners of BART-affected electric utility generating units to use CUECost to estimate control costs, and maintains that the use of CUECost is an appropriate estimating tool because it is designed specifically for electric utility generating units. Commenters did ask for clarification related to the following items in the cost estimates. What interest rate was used in preparing the cost estimates? The inputs to CUECost identify an after tax discount rate of 9.20%. Explain the relationship between these two values.

Response: NSPM used the default values for the basic economic inputs in CUECost version 3. These include the 9.2% after tax discount rate, the 10.8% AFDC rate, and the 3.0% inflation rate. Service life was reduced from the default value of 30 years to 20 years to reflect retrofit of units that are already more then 30 years old.

The interest rate is the price paid to borrow money. The discount rate is the interest rate for discounting expected future cash flows, to adjust for risk and the time value of money. It reflects the appropriate cost of capital or rate of return on investment. AFDC stands for Allowance for Funds Used During Construction, and is the capitalization of the financing costs of construction.

MPCA Request: Describe the basis of the estimate for catalyst for the SCR.

Response: The cost of $356.34/cubic foot was the default value in CUECost as revised in 2000, version 3 (the current version available from EPA). It is likely that actual catalyst costs would be lower than the default CUECost value. We also note that one reason why catalyst costs cannot necessarily be meaningfully compared from installation to installation is because of catalyst material and design differences.

3. SO2 controls

MPCA Request: Describe current findings related to Xcel's investigation of modifying the venturi to install sparger tubes.

Response: Tests of the sparger design on one of twelve scrubber modules for Unit 1 are ongoing. While the sparger design module does appear to be capable of achieving the desired amount of SO_2 removal, it remains to be seen whether the following issues will be problematic with this design:

(1) Carryover of slurry past the demisters situated above the sparger fingers, which degrades the wet electrostatic precipitator (WESP) lower field's kV levels. A drop in the kV levels results in a reduction in the particulate removal capability to achieve opacity compliance.
(2) A need for too-frequent module cleanings. Shorter time intervals between cleanings increases labor costs and impacts scrubber availability.
(3) Controlling flue gas flow and slurry level during sparger module startups, resulting in opacity spikes.

The results of the first test run appear to show that we can achieve the desired SO_2 emissions target that was set for sparger operation alone (0.14 lbs/mmBtu). The results also indicate we may be able to consistently meet a level of 0.12 lbs SO_2/mmBtu.

The BART report also projected that 0.12 lbs SO_2/mmBtu emissions was achievable with lime injection in addition to sparger modules. If it can be proven that 0.12 lbs/mmBtu can be reached with the sparger design, then a correlating lower level of 0.10 lbs/mmBtu should be achievable with lime injection. However, there has not been any testing of the lime addition option yet, so it is not known for certain what level is achievable. We are not able to conclude at this time that the scrubbers could do significantly better than 0.12 lb SO_2/mmBtu.

NSPM appreciates the opportunity to provide this additional information. Please contact me with any questions on these comments at (612) 330-7879 or at *richard.a.rosvold@xcelenergy.com*.

Sincerely,

Richard A. Rosvold

Richard Rosvold
Air Quality Manager
Environmental Services Department
Xcel Energy Services, Inc.

Enclosures

C: Mary Dieltz
Greg Ford
Nancy Glass
Bob Henningsgaard
William Myers
Arthur Zimmerman
Lauren Buehler

Table 23. Visibility Modeling Results: Boundary Waters Canoe Area

Control Scenario	2002		2003		2004		2002 through 2004	
	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv
Baseline	2.60	85	2.93	87	2.77	91	2.68	263
Case 1	2.02	73	2.33	77	2.22	77	2.11	227
Case 2	1.74	63	1.95	74	1.94	69	1.80	206
Case 3	2.01	64	2.36	72	2.28	72	2.13	208
Case 4	1.92	64	2.51	69	2.09	73	2.00	206
1 &3	1.51	48	1.72	62	1.78	58	1.57	168
2 & 3	1.17	40	1.41	49	1.46	42	1.31	131

Table 24. Visibility Modeling Results: Voyageurs National Park

Control Scenario	2002		2003		2004		2002 through 2004	
	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv
Baseline	1.98	54	2.51	55	2.39	56	2.34	165
Case 1	1.66	46	1.92	51	1.76	50	1.82	147
Case 2	1.48	41	1.74	50	1.59	45	1.59	136
Case 3	1.46	39	1.86	45	1.87	39	1.75	123
Case 4	1.54	45	1.89	44	1.78	39	1.65	128
1 & 3	1.14	32	1.42	37	1.38	28	1.36	97
2 & 3	0.91	24	1.12	30	1.06	24	1.08	78

Table 25. Visibility Modeling Results: Isle Royale National Park

Control Scenario	2002		2003		2004		2002 through 2004	
	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv	98th % Δdv	# of days > 0.5 Δdv
Baseline	1.69	50	2.04	52	1.95	57	1.79	159
Case 1	1.35	41	1.59	44	1.47	46	1.44	131
Case 2	1.20	39	1.40	36	1.30	42	1.30	117
Case 3	1.16	38	1.38	40	1.47	43	1.34	121
Case 4	1.22	38	1.37	35	1.73	45	1.37	118
1 & 3	0.90	30	1.11	23	1.07	34	0.98	87
2 & 3	0.71	24	0.91	19	0.84	26	0.82	69

Case 1: Combustion Optimization/Low NO_x Burners/Separated Over Fire Air – Sherco 1, Combustion Optimization – Sherco 2
Case 2: Combustion Optimization/Low NO_x Burners/Separated Over Fire Air /Selective Catalytic Reduction – Sherco 1, Combustion Optimization/Selective Catalytic Reduction – Sherco 2
Case 3: Retrofit existing scrubbers with sparger tubes and lime injection – Sherco 1 and 2
Case 4: Install new wet FGD systems – Sherco 1 and 2

lysts (metal oxides), the optimum temperatures for the SCR process range from 480 °F to 800 °F (250 °C to 427 °C) [11]. Figure 2.2 is a graph of the NO_x removal efficiency as a function of temperature for a typical metal oxide-type catalyst [11]. The figure shows the rate of the NO_x removal increases with temperature up to a maximum between 700°F to 750°F (370°C to 400°C). As the temperature increases above 750°F, the reaction rate and resulting NO_x removal efficiency begin to decrease.

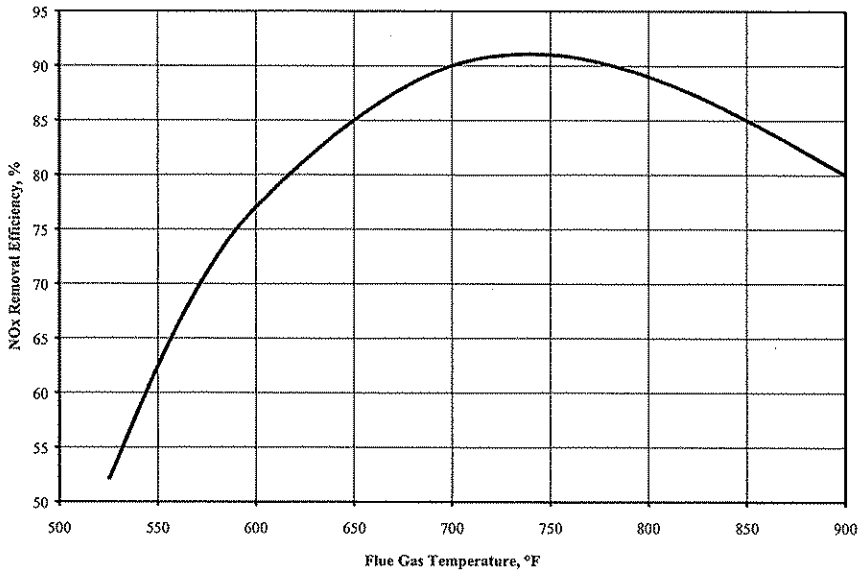


Figure 2.2: NOx Removal versus Temperature [11]

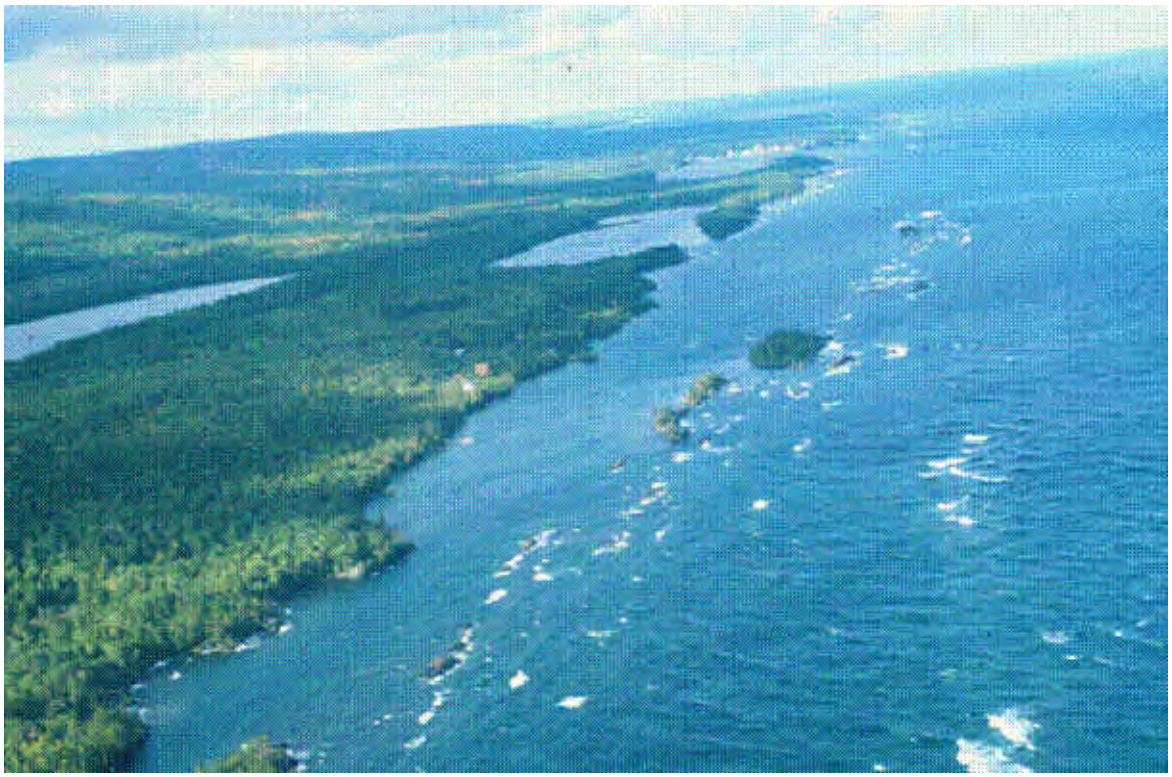
As flue gas temperature approaches the optimum, the reaction rate increases and less catalyst volume achieves the same NO_x removal efficiency. Figure 2.3 shows the change in the required catalyst volume versus temperature [10]. There is approximately a 40% decrease in the required catalyst volume as flue gas temperature increases from 600 °F (320 °C) to the optimum range, 700 to 750 °F (370 °C to 400 °C). This decrease in catalyst volume also results in a significant decrease in capital cost for the SCR system.

The relationships between flue gas temperature, catalyst volume, and NO_x removal are complicated functions of the catalyst formulation and configuration. The physical and chemical properties of each catalyst are optimized for a different operating conditions. For a given catalyst formulation, the required catalyst volume and/or temperature range can even change from one manufacturer of the catalyst to another. The selection of catalyst, therefore, is critical to the operation and performance of the SCR system.

Appendix 3.1: Summary of Technical Information

Regional Haze in the Upper Midwest:

Summary of Technical Information



Isle Royale National Park

January 9, 2007

Scope of Document

This document provides a summary of available technical information about regional haze and visibility impairment in the four northern class I areas: Boundary Waters Canoe Area Wilderness, Voyageurs National Park, Isle Royale National Park, and Seney Wilderness Area. This information includes a conceptual model of haze, the technical basis for visibility analysis, and the effectiveness of control measures in improving visibility. The document represents the technical information agreed to by the responsible states and satisfies, in part, the consultation requirements of the Regional Haze Rule.

This document does not address policy issues and strategies necessary to deal with regional haze. States can use this technical information to highlight the relevant issues for their state policymakers. For policy issues or decisions that require agreement between the northern class I area states, a separate policy document will be developed. This other document will address the development of the reasonable progress goal, each state's share of emission reductions, and coordinated emission control strategies. These decisions will be based on, but be separate from, the technical information.

Executive Summary

The States of Michigan and Minnesota, along with representatives of other states, tribal governments, and federal agencies[1], are working to address visibility impairment due to regional haze in four northern class I areas: Boundary Waters Canoe Area Wilderness, Voyageurs National Park, Isle Royale National Park, and Seney Wilderness Area. Pursuant to the Clean Air Act, states are required to make reasonable progress toward meeting a national goal of natural conditions (i.e., visibility levels in the absence of manmade air pollution).

Class I areas in Michigan and Minnesota[2]

Based on a review of technical information, several key findings should be noted:

- The chemical species which affect visibility impairment include ammonium sulfate and, to a lesser degree, ammonium nitrate and organic carbon.

- The pollutants and source sectors which contribute the most to visibility impairment include SO2 emissions from electrical generating units (EGUs) and certain non-EGUs, which lead to sulfate formation, and NOx emissions from a variety of source types (e.g., motor vehicles), which lead to nitrate formation. Ammonia emissions from livestock waste and fertilizer applications are also important, especially for nitrate formation. (Organic carbon concentrations are thought to be mostly secondary organic aerosols of biogenic origin and, on an occasional episodic basis, from fire activity.)

- The source regions which contribute the most to visibility impairment are the States of Michigan, Minnesota, and Wisconsin. Other nearby states, including North Dakota, Iowa, and Illinois, also contribute to visibility impairment.

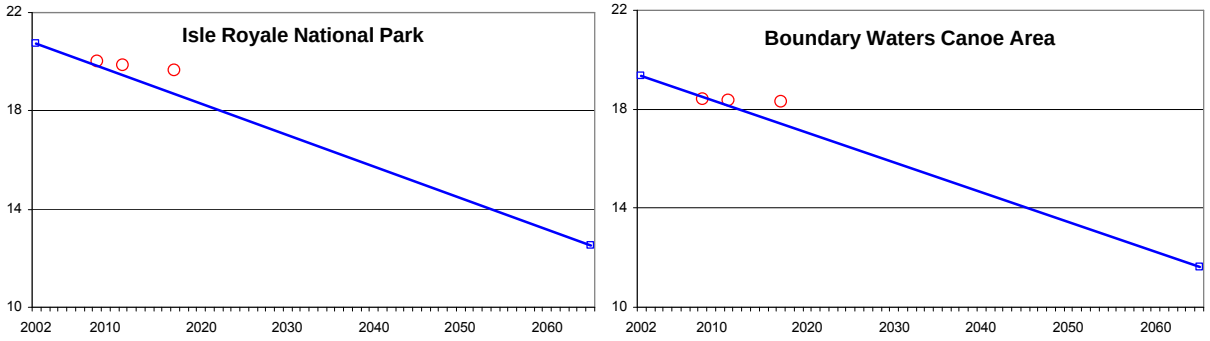
- Current (baseline) visibility levels are well above natural conditions (see, for example, picture below for Boundary Waters Canoe Area).

[1] Representatives from the following entities are participating in the northern states class I area consultation process: States of Minnesota, Michigan, Wisconsin, North Dakota, Iowa, Missouri, Illinois, and Indiana; Ontario Ministry of Environment; Mille Lacs, Fond du Lac, Grand Portage, and Leech Lake Tribes; and U.S. Forest Service, U.S. National Park Service, and U.S. EPA.

[2] Visibility is not an air quality related value in Rainbow Lake, so visibility impairment due to regional haze is not a concern in this Class I area.

Boundary Waters Canoe Area – current visibility conditions on 20% worst days are represented on the left hand side and the natural conditions goal are represented on the right hand side

- Projected near-term visibility conditions based on existing ("on the books") controls are above the uniform rate of progress line (see figure below). The regional haze rule calls for class I areas to meet natural visibility conditions by the year 2064, with an initial implementation period extending to the year 2018. Consequently, additional candidate control measures for improving visibility levels need to be considered (e.g., SO2 emission reductions from EGUs). To determine whether these measures provide for reasonable progress, an assessment of four factors (i.e., costs of compliance, time necessary for compliance, energy and non-air quality environmental impacts, and remaining useful life) is being conducted.



Projected future year visibility levels (represented by the "red circles") in Isle Royale National Park (left) and Boundary Waters Canoe Area (right) based on existing controls

- The same particles (sulfates, nitrates, organic carbon, smoke, and soil dust) which affect visibility, are linked to serious health effects (e.g., National Ambient Air Quality Standards for $PM_{2.5}$) and environmental effects (e.g., ecosystem damage). Thus, actions to reduce levels of visibility-impairing pollutants will benefit public health and reduce certain adverse effects to the environment.

Table of Contents

Section 1
Regulatory Requirements

Section 169A of the Clean Air Act sets as a national goal "the prevention of any future and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which implementation results from manmade air pollution."

Section 169A requires states to "make reasonable progress toward meeting the national goal." In determining reasonable progress, states shall consider:

- costs of compliance
- time necessary for compliance
- energy and non-air quality environmental impacts of compliance
- remaining useful life of any existing source subject to such requirements

On July 1, 1999, EPA adopted a regional haze rule to implement the provisions of section 169A by establishing a program to address regional haze visibility impairment. Pursuant to the regional haze rule, the determination of reasonable progress shall also consider:

- uniform rate of visibility improvement (needed to attain natural visibility conditions by 2064) – i.e., "the line" (see, for example, Figure 5)

EPA's regional haze rule requires states to set reasonable progress goals for each class I area which provide for an improvement in visibility for the most impaired days (i.e., 20% worst visibility days) and ensure no degradation in visibility for the least impaired days (i.e., 20% best visibility days).

The regional haze rule also requires states to develop a long-term strategy for regional haze which covers an initial implementation period extending to the year 2018, with a reassessment and revision of the strategy every 10 years.

Section 2
Technical Information

1. Conceptual model of haze

   a. What are the chemical constituents that cause visibility impairment in the northern class I areas?

   The most important chemical species are ammonium sulfate, ammonium nitrate, and organic carbon. The contribution of these species on the 20% best and 20% worst visibility days (based on 2000 – 2004 data) is provided in Figure 1. For the 20% worst visibility days, the contributions are: sulfate = 35-55%, nitrate = 25-30%, and organic carbon = 12-22%. It should also be noted that sulfate and nitrate contribute more to light extinction than to $PM_{2.5}$ mass because of their hygroscopic properties.

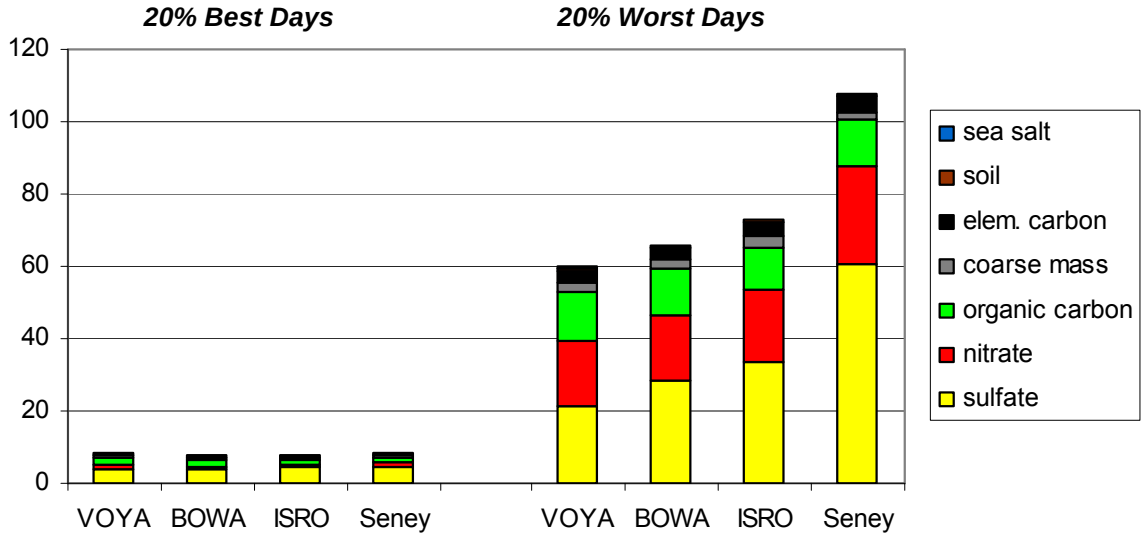


Figure 1. Chemical composition of light extinction for 20% best visibility days (left) and 20% worst visibility days (right) in terms of Mm^{-1}

   b. Which geographic areas and sources contribute to regional haze in the northern class I areas?

   Air quality data analyses and dispersion modeling were conducted to provide information on source region and source sector contributions to regional haze in the northern class I areas (see Appendix: Contribution Assessment for Northern Class I Areas). Based on this information, the most important contributing states are Michigan, Minnesota, and Wisconsin, as well as North Dakota, Iowa, and Illinois. For example, Figure 2 presents the results of composite back trajectories for light extinction on the 20% worst visibility days. The orange areas are where the air is most likely to come from on poor air quality days, and the green areas are where the air is least likely to come from on poor air quality days. As can be seen, bad air days are generally associated with transport from regions located to the south of these class I areas.

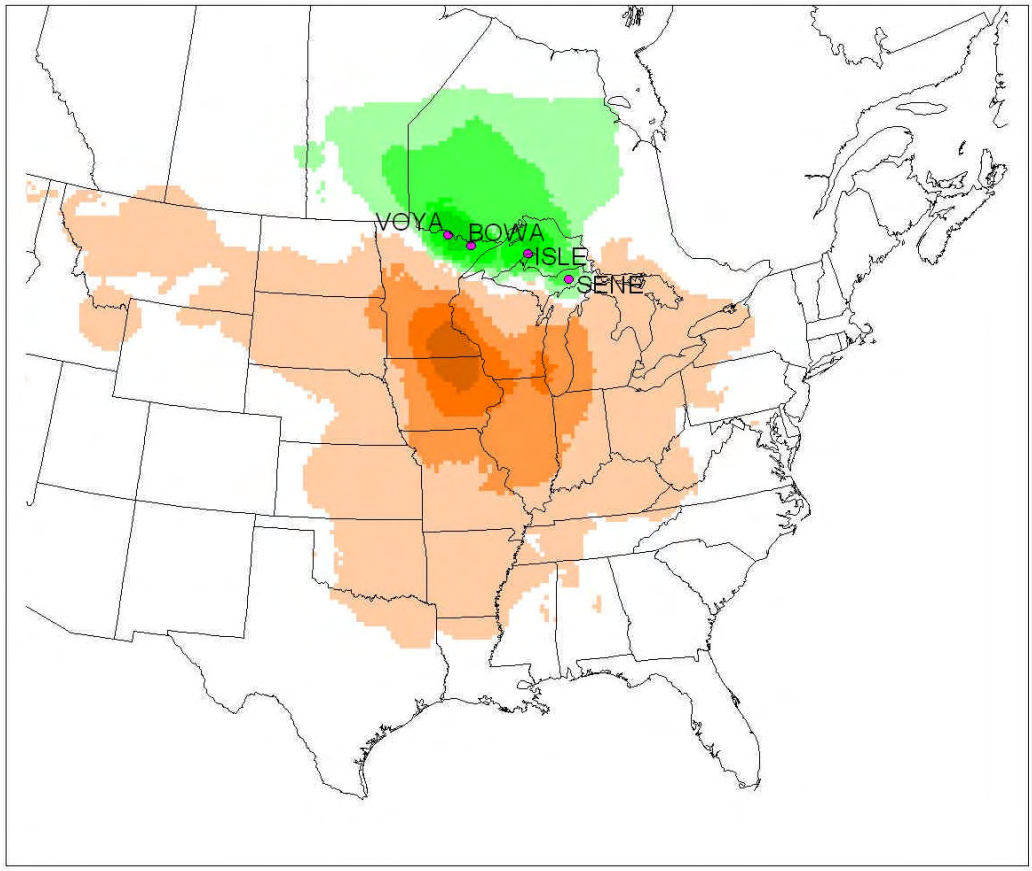


Figure 2. Composite back trajectories for light extinction

The most important contributing pollutants and source sectors are SO2 emissions from electrical generating units (EGUs) and certain non-EGUs, which lead to sulfate formation, and NOx emissions from a variety of source types (e.g., motor vehicles), which lead to nitrate formation. Ammonia emissions from livestock waste and fertilizer applications are also important, especially for nitrate formation. (As discussed below, organic carbon concentrations are thought to be mostly secondary organic aerosols of biogenic origin and, on an occasional episodic basis, from fire activity.)

c. What are the meteorological conditions that are associated with good visibility and poor visibility in the northern class I areas? Is there a seasonal effect to visibility impairment in those areas?

As noted above, bad air days are generally associated with southerly transport (see Figure 2). Examination of the 20% worst visibility days for the northern class I areas shows that these days occur throughout the year, suggesting a range of other meteorological parameters (see, for example, Boundary Waters data in Figure 3). This figure, as well as Figure 4 (which presents the monthly average light extinction values based on all sampling days), also show that sulfate and organic carbon concentrations are higher in the summer, and nitrate concentrations are higher in the winter, suggesting the importance of different sources and meteorological conditions at different times of the year.

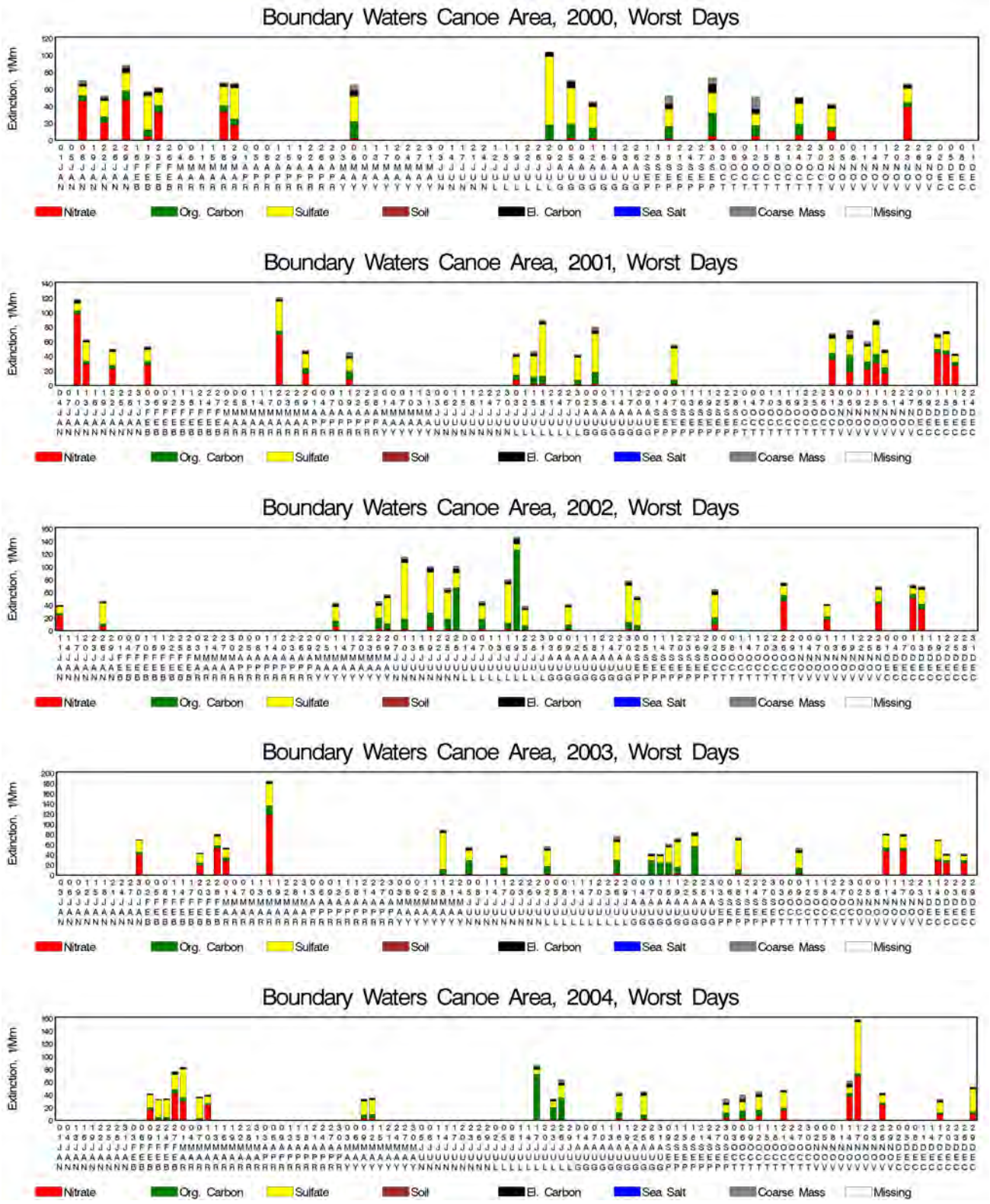


Figure 3. Daily light extinction values for 20% worst days at Boundary Waters (2000 – 2004)

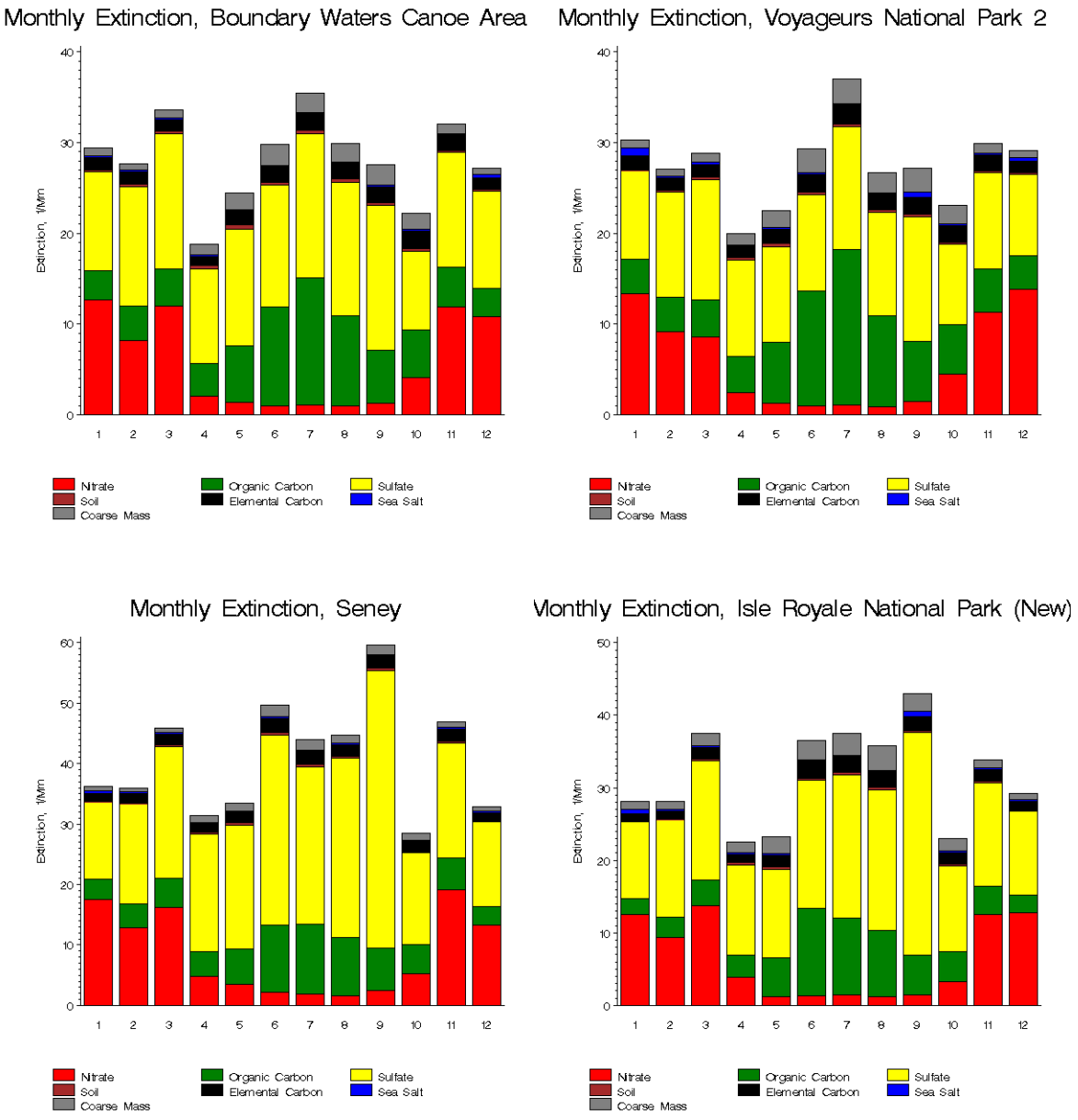


Figure 4. Monthly average light extinction values for northern class I areas

2. Technical basis for visibility-related analyses

a. What are the present visibility conditions and how were the values calculated? How were the 20% worst and 20% best days determined?

Initially, the baseline (2000 – 2004) visibility conditions values were derived using the average for the 20% worst and 20% best days for each year, as reported on the VIEWS website: http://vista.cira.colostate.edu/views/Web/IMPROVE/SummaryData.aspx . These values were calculated using the original IMPROVE equation. This equation was revised by the IMPROVE Steering Committee in 2005, and the new IMPROVE equation was used to calculate updated baseline values. The updated values are reported on the VIEWS website.[3]

A summary of the initial and updated baseline values are presented in Table 1. The updated baseline values (based on the new IMPROVE equation) reflect the most current, complete understanding of visibility impairing effects and, as such, will be used for state implementation plan (SIP) planning purposes.

b. What are natural conditions and how were the values calculated?

Initially, the values for the natural conditions goal for each class I area were taken directly from "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program", EPA-454/B-03-005, September 2003. These values were calculated using the original IMPROVE equation. This equation was revised by the IMPROVE Steering Committee in 2005, and the new IMPROVE equation was used to calculate updated natural conditions values. The updated values are reported on the VIEWS website.

A summary of the initial and updated natural conditions values are presented in Table 1. The updated natural conditions values (based on the new IMPROVE equation) will be used for SIP purposes. As noted previously, the states must establish goals that provide for reasonable progress towards achieving national conditions (i.e., an improvement in visibility for the 20% worst days, and no degradation in visibility for the 20% best days).

[3] Due to sampler problems, the 2002-2004 data for Boundary Waters were invalid for certain chemical species. (Note, sulfate and nitrate data at Boundary Waters were valid.) A "substituted" data set was developed by using values from Voyageurs for the invalid species.

Table 1. Summary of Visibility Metrics (deciviews) for Northern Class I Areas

	20% Worst Days					Baseline	Natural	20% Best Days					Baseline
	2000	2001	2002	2003	2004	(Average)	Conditions	2000	2001	2002	2003	2004	(Average)
Old IMPROVE Equation (Cite: VIEWS, November 2005)													
Voyageurs	18.50	18.00	19.00	19.20	17.60	18.46	11.09	6.30	6.20	6.70	7.00	5.40	6.32
BWCA	19.85	19.99	19.68	19.73	17.65	19.38	11.21	5.90	6.52	6.93	6.67	5.61	6.33
Isle Royale	20.00	22.00	20.80	19.50	19.10	20.28	11.22	5.70	6.40	6.40	6.30	5.30	6.02
Seney	22.60	24.90	24.00	23.80	22.60	23.58	11.37	5.80	6.10	7.30	7.50	5.80	6.50
New IMPROVE Equation (Cite: VIEWS, March 2006)													
Voyageurs	19.05	18.57	20.14	20.15	18.40	19.26	12.20	7.01	7.12	7.53	7.68	6.37	7.14
BWCA	19.93	20.04	20.11	20.07	17.79	19.59	11.60	6.00	6.92	7.00	6.45	5.77	6.43
Isle Royale	20.14	22.50	21.51	19.93	19.59	20.73	12.50	6.49	7.16	7.07	6.99	6.12	6.77
Seney	23.01	25.58	24.59	24.48	23.15	24.16	12.80	6.50	6.78	7.82	8.01	6.58	7.14
	URP		**2018 Goal**										
Old IMPROVE Equation													
Voyageurs	0.119		16.56										
BWCA	0.132		17.27										
Isle Royale	0.146		17.94										
Seney	0.197		20.43										
New IMPROVE Equation													
Voyageurs	0.114		17.44										
BWCA	0.129		17.53										
Isle Royale	0.133		18.61										
Seney	0.183		21.23										

Notes: (1) BWCA values for 2002 - 2004 reflect "substituted" data.
(2) Natural haze levels II taken from July 2006 PowerPoint presentation by Natural Haze Levels II Committee
(3) URP (uniform rate of progress) = (baseline - natural conditions)/(2064-2002)

3. Evaluation of control measure effectiveness

   a. What tools are available to evaluate the effectiveness of emission reductions?

      USEPA's modeling guidelines[4] recommend using air quality models, along with complementary analyses of ambient monitoring, emissions, and meteorological data to determine whether a given control strategy meets the air quality goal. The Midwest RPO is using CAMx for its regional, multi-pollutant air quality modeling, and CENRAP is using both CMAQ and CAMx for its regional haze modeling. Both models have been shown to provide reasonable estimates for sulfates and can, therefore, be used to examine sulfate control strategies. The models are less reliable for nitrates and organic carbon. To compensate for model uncertainty and to provide a more robust visibility assessment, additional information should be considered as part of a weight-of-evidence demonstration (see, for example, results of ambient data analyses in Figure 8 below).

   b. How effective will existing ("on the books") controls be in improving visibility in the northern class I areas?

      Air quality modeling was conducted by the Midwest RPO to assess future year visibility levels based on the following existing ("on the books") controls:

      On-Highway Mobile Sources
      - Tier II/Low sulfur fuel
      - Inspection/Maintenance programs (nonattainment areas)
      - Reformulated gasoline (nonattainment areas)

      Off-Highway Mobile Sources
      - Federal control programs incorporated into NONROAD model (e.g., nonroad diesel rule), plus the evaporative Large Spark Ignition and Recreational Vehicle standards
      - Heavy-duty diesel (2007) engine standard/Low sulfur fuel
      - Federal railroad/locomotive standards
      - Federal commercial marine vessel engine standards

      Power Plants
      - Title IV (Phases I and II)
      - NOx SIP Call
      - Clean Air Interstate Rule
      - Clean Air Mercury Rule

      Other Point Sources
      - VOC 2-, 4-, 7-, and 10-year MACT standards
      - Combustion turbine MACT
      - Industrial boiler/process heater/RICE MACT

      The model results for this scenario (and other control scenarios, which are discussed further below) are provided in Table 2 and Figures 5 and 6. (Note, Table 2 and Figure 5 also include results for a scenario based on existing controls and BART. The assumed BART controls reflect preliminary information on BART facilities and possible emission reductions. Further review of the affected BART facilities and actual emission reductions is necessary.) As can be seen, even with these control programs fully implemented in 2018, the projected visibility levels are above the uniform rate of progress line.

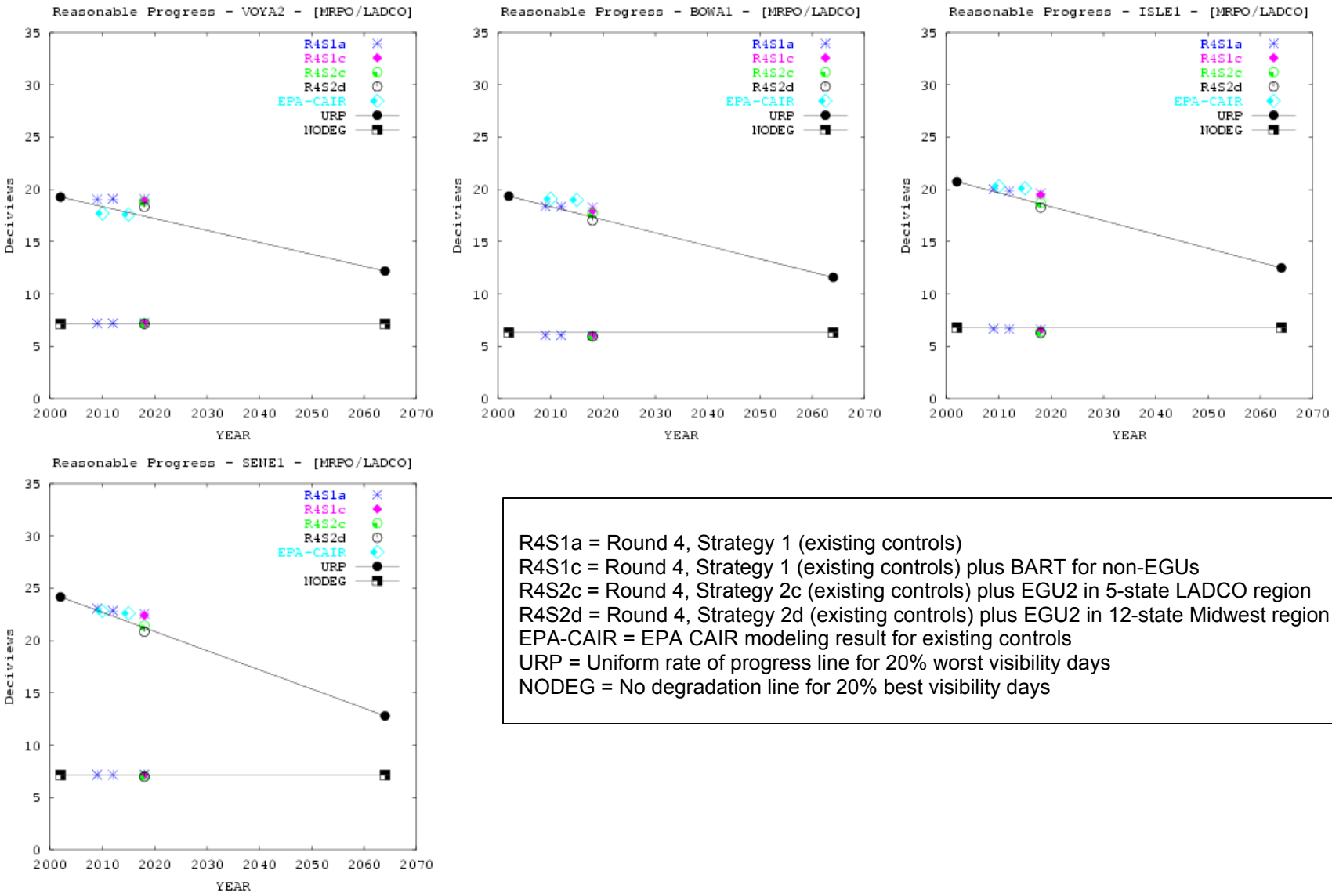
[4] "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze", Draft 3.2, September 2006

Table 2. Summary of Midwest RPO Round 4 Modeling for Class I Areas in Eastern U.S.

Site	Type	Baseline DV	2018 Goal		2009 R4S1a Existing Controls	2012 R4S1a Existing Controls	2018 R4S1a Existing Controls	2018 R4S1c Existing Controls + BART	2018 R4S2c Existing Controls + EGU2 in 5-State LADCO Region	2018 R4S2d Existing Controls + EGU2 in 12-State Midwest Region
VOYA2	Worst 20%	19.27	17.44		19.05	19.10	19.09	18.93	18.86	18.32
BOWA1	Worst 20%	19.35	17.35		18.39	18.36	18.29	17.94	17.73	17.03
ISLE1	Worst 20%	20.74	18.61		20.03	19.86	19.63	19.48	18.73	18.27
SENE1	Worst 20%	24.16	21.23		23.06	22.84	22.54	22.40	21.44	20.84
BRIG1	Worst 20%	29.01	24.69		25.69	25.01	24.05	24.02	23.48	23.02
MACA1	Worst 20%	31.37	26.17		27.62	26.58	25.02	24.96	23.73	22.07
MING1	Worst 20%	29.54	25.14		27.18	26.83	26.28	26.23	25.37	24.61
SHEN1	Worst 20%	29.31	24.69		24.03	22.76	21.55	21.49	20.40	19.41
DOSO1	Worst 20%	29.04	24.23		24.81	23.47	22.28	22.23	21.44	19.94
LYBR1	Worst 20%	24.45	21.21		22.16	21.69	21.11	21.07	20.56	20.17
VOYA2	Best 20%	7.14	7.14		7.19	7.20	7.23	7.17	7.21	7.15
BOWA1	Best 20%	6.33	6.33		6.07	6.07	6.03	6.00	6.01	5.94
ISLE1	Best 20%	6.77	6.77		6.68	6.65	6.62	6.56	6.41	6.27
SENE1	Best 20%	7.14	7.14		7.16	7.16	7.21	7.16	7.10	6.97
BRIG1	Best 20%	14.33	14.33		13.80	13.74	13.55	13.52	13.38	13.26
MACA1	Best 20%	16.51	16.51		16.12	16.01	15.72	15.67	15.30	14.88
MING1	Best 20%	13.67	13.67		13.24	13.18	13.18	13.15	12.95	12.51
SHEN1	Best 20%	10.93	10.93		9.78	9.59	9.22	9.21	9.08	8.92
DOSO1	Best 20%	12.28	12.28		11.65	11.40	11.17	11.14	10.91	10.64
LYBR1	Best 20%	6.36	6.36		6.12	6.06	5.97	5.96	5.90	5.84

Notes: (1) Model results are expressed in deciviews, and were processed using the new IMPROVE equation.

(2) EGU1, EGU2 represent more stringent SO2 and NOx emission requirements for power plants (see Midwest RPO EGU White Paper).



R4S1a = Round 4, Strategy 1 (existing controls)
R4S1c = Round 4, Strategy 1 (existing controls) plus BART for non-EGUs
R4S2c = Round 4, Strategy 2c (existing controls) plus EGU2 in 5-state LADCO region
R4S2d = Round 4, Strategy 2d (existing controls) plus EGU2 in 12-state Midwest region
EPA-CAIR = EPA CAIR modeling result for existing controls
URP = Uniform rate of progress line for 20% worst visibility days
NODEG = No degradation line for 20% best visibility days

Figure 5. Uniform rate of visibility improvement for 20% worst and 20% best days (Midwest RPO Round 4 Modeling)

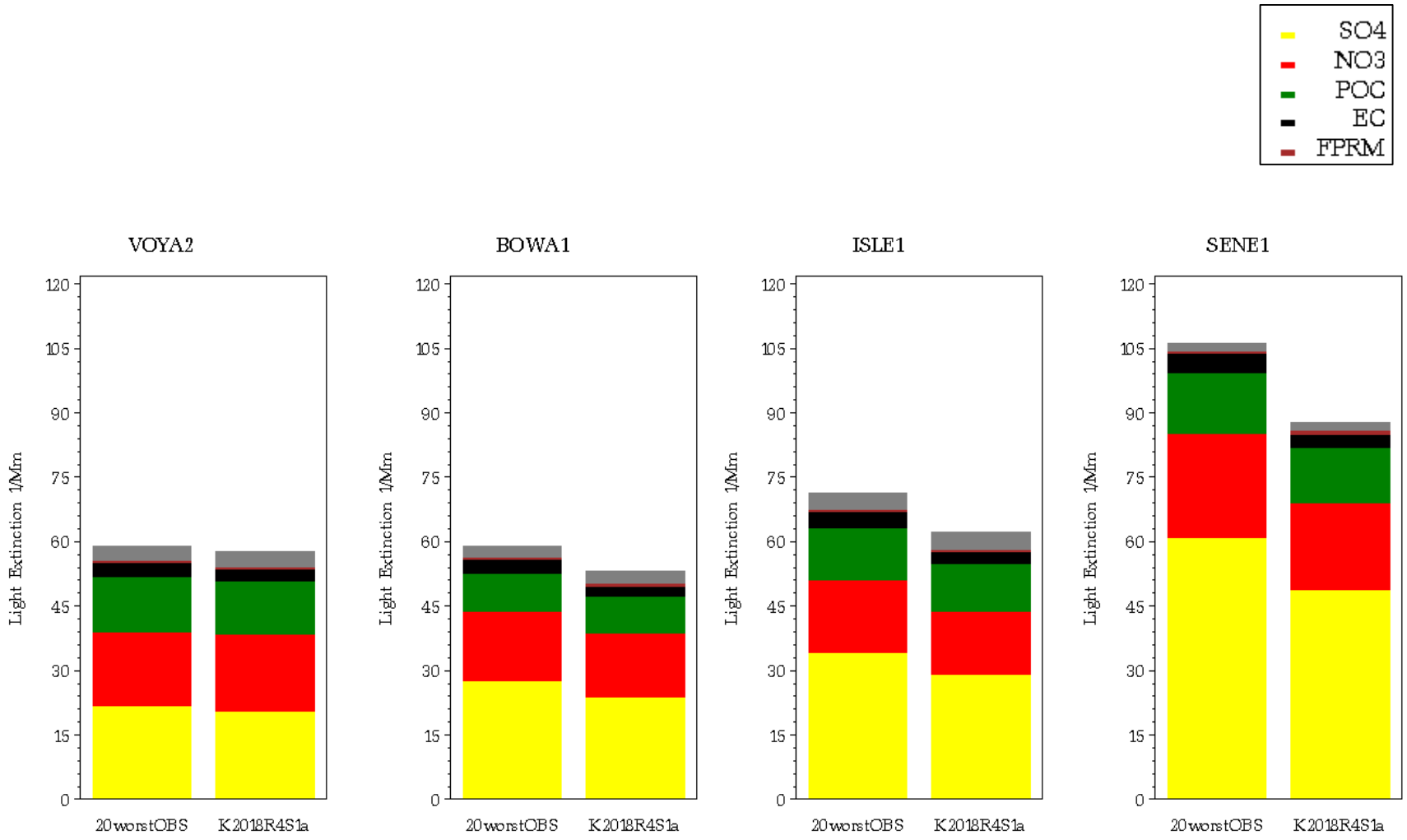


Figure 6. 2002 base year v. 2018 future year visibility levels (Midwest RPO Round 4 Modeling)

c. What additional control measures will be effective in improving visibility in the northern class I areas?

The Midwest RPO's air quality modeling also examined several additional control measures, as summarized below.

Sulfate Control Strategies: Reductions in SO2 emissions will decrease sulfate concentrations. Most the SO2 emissions in the upper Midwest are from EGUs. As such, additional EGU SO2 control measures were examined. In particular, the SO2 emission targets identified in the Midwest RPO's White Paper for EGUs were modeled:

	SO2 (lb/MMBTU)	NOx (lb/MMBTU)
EGU1	0.15	0.10
EGU2	0.10	0.07

The modeling shows that these controls will improve visibility in the northern class I area for both the 20% worst and 20% best days (see Table 2 and Figure 5). There is more improvement with greater emission reduction (e.g., EGU2 provides more benefit than EGU1) and with greater spatial coverage (e.g., 12-state control program provides more benefit than 5-state control program).

Nitrate Control Strategies: Reductions in NOx emissions will decrease nitrate concentrations. NOx emissions in the upper Midwest are from a variety of sources, principally, mobile sources (on-road and off-road) and stationary sources (EGUs and non-EGUs). The modeling for EGU1 and EGU2 reflect the lower NOx emission limitations. No additional NOx-specific strategies have been modeled by the Midwest RPO to address regional haze at this time.

To determine whether these additional control measures satisfy the requirement for reasonable progress, an assessment of four factors is needed (i.e., costs of compliance, time necessary for compliance, energy and non-air quality environmental impacts, and remaining useful life). The Midwest RPO and the State of Minnesota are currently cooperating on this assessment. Draft results for several candidate control measures are expected in early 2007.

Although organic carbon is also an important contributor to visibility impairment, no organic carbon control strategies were considered for the following reason. A special study was performed in Seney to identify sources of organic carbon (Cite: "Source Apportionment of Atmospheric Fine Particulate Matter Collected at the Seney National Wildlife Refuge", May 2004, UW-Madison). As seen in Figure 7, the highest $PM_{2.5}$ concentrations occurred during the summer, with organic carbon being the dominant species. The higher summer organic carbon concentrations were attributed mostly to secondary organic aerosols of biogenic origin because of the lack of primary emission markers in the summer[5], and concentrations of known biogenic-related species (e.g., pinonic acid) were also higher during the summer. Thus, the organic carbon contribution in the northern class I areas is considered to be largely uncontrollable.

[5] Analysis of primary source emission markers and chemical mass balance modeling of the Seney data showed that the impact of primary emission sources (e.g., biomass burning, motor vehicles, and road dust) was fairly low. Biomass burning, in particular, contributed less than 1% on an annual average basis, although episodic impacts were found (e.g., see high organic carbon days in Figure 3).

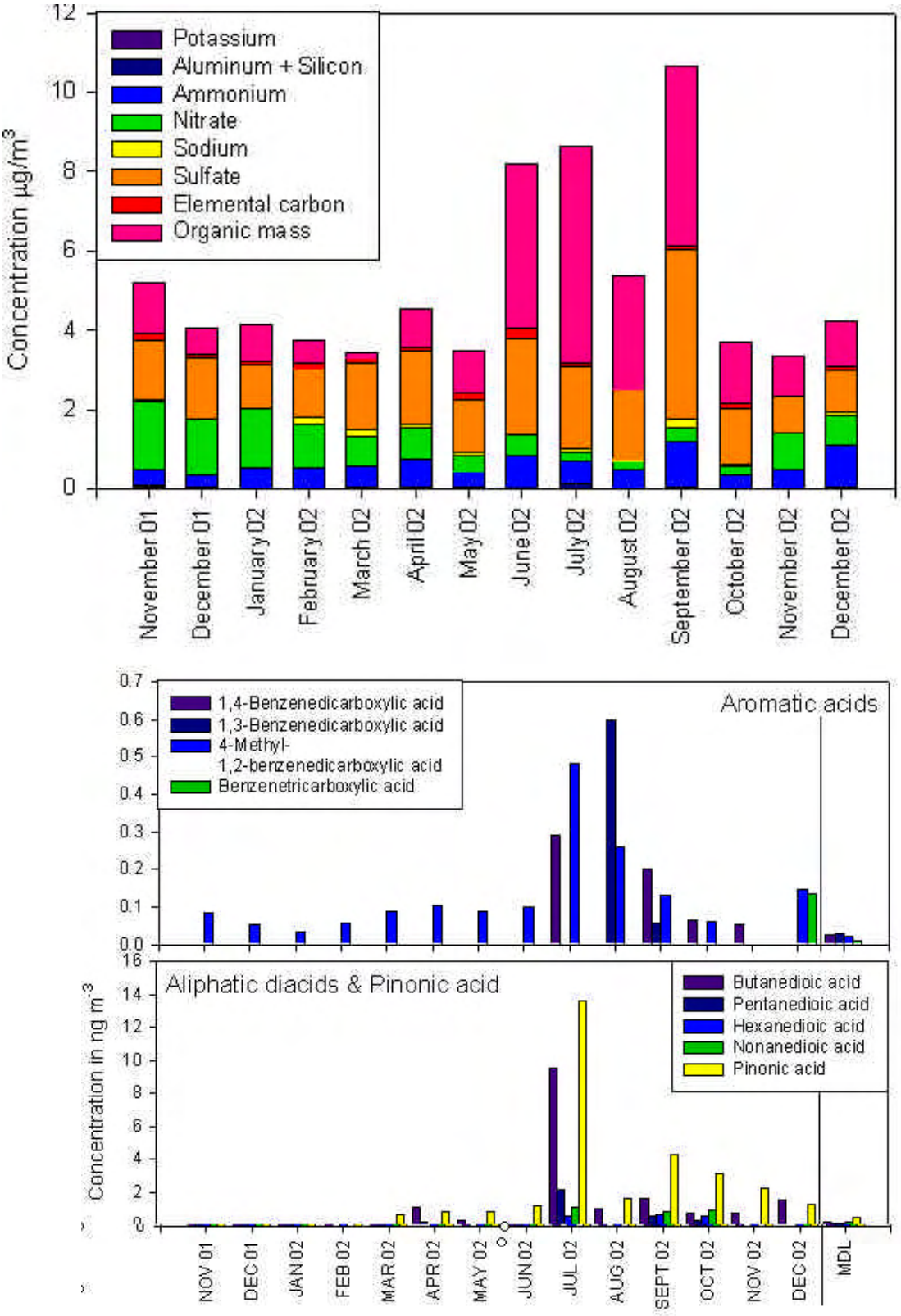


Figure 7. Monthly concentrations of $PM_{2.5}$ species (top) and biogenic-related organic carbon species in Seney (bottom)

d. Should we consider control measures for ammonia?

Technical analyses have shown that $PM_{2.5}$ concentrations will respond to reductions in sulfate, nitrate (nitric acid), and ammonia – see, for example, plots in Figure 8 based on data from the Great River Bluffs, MN site in the Midwest regional ammonia network (Cite: "Draft Final Technical Memorandum, Analysis of Data from the Midwest Ammonia Monitoring Project", March 31, 2005, C. Blanchard and S. Tannenbaum). Thus, ammonia emission reductions will lower $PM_{2.5}$ concentrations and improve visibility levels in the northern class I areas. (Note that current regional inventories show most ammonia emissions come from livestock waste and fertilizer applications.)

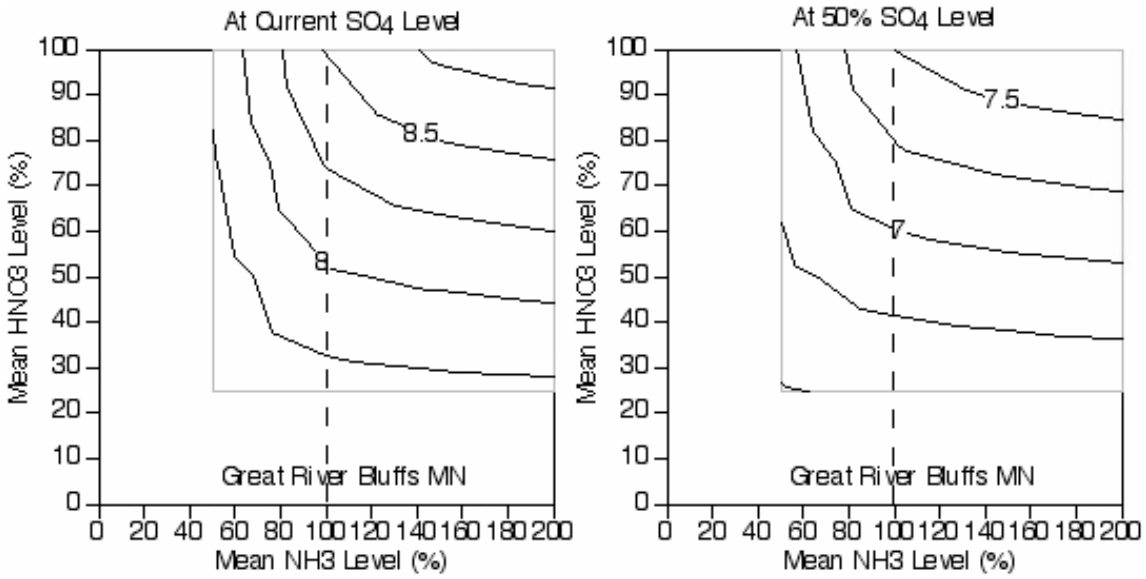


Figure 8. Predicted $PM_{2.5}$ mass concentrations at Great River Bluffs, MN as functions of changes in ammonia and nitric acid at fixed sulfate levels

In deciding whether to pursue control measures for ammonia, several issues need to be taken into account. First, there are technical uncertainties, including the reliability of emission estimates, treatment of ammonia by current photochemical modeling systems, and lack of ambient measurements. It is worth noting, however, that the Midwest RPO and CENRAP have attempted to address these uncertainties by supporting development of a new process-based emissions model, conducting model sensitivity studies of ammonia deposition, and collecting ambient ammonia data as part of the Midwest regional ammonia network. Second, as noted by USEPA in its final CAIR rulemaking, "reductions in ammonia emissions alone would also tend to increase the acidity of PM2.5 and precipitation…. this might have untoward environmental or health consequences."

APPENDIX
Contribution Assessment for Northern Class I Areas

Air quality data analyses involving back trajectories[6], dispersion modeling, and emissions inventories were examined to provide information on source region and source sector contributions to regional haze in the northern class I areas. Based on this information, the following key findings should be noted:

- The most important contributing states are Michigan, Minnesota, and Wisconsin, as well as North Dakota, Iowa, and Illinois.

- The most important contributing pollutants and source sectors are SO2 emissions from electrical generating units (EGUs), which lead to sulfate formation, and NOx emissions from a variety of source types (e.g., motor vehicles), which lead to nitrate formation. Ammonia emissions from livestock waste and fertilizer applications are also important, especially for nitrate formation.

LACO Back Trajectory Analysis (1997-2001 Data)
The first data analysis study consists of back trajectories using data for 1997-2001 (all sampling days), a start height of 200 m, and a 72-hour (3-day) trajectory period (Cite: "Quantifying Transboundary Transport of PM2.5: A GIS Analysis", May 2003, LADCO). By combining trajectory frequencies with concentration information, the average contribution to $PM_{2.5}$ mass and individual $PM_{2.5}$ species was estimated (which, in turn, was used to estimate the average contribution to light extinction). The results for three northern class I areas are provided in Table 1 for the 20% best days, all days, and 20% worst days. The tables shows that the most important contributing states are Michigan, Minnesota, and Wisconsin, and, to a lesser degree, Illinois, Iowa, Missouri, North Dakota, South Dakota, Ontario, and Manitoba.

LACO Back Trajectory Analysis (2000-2003 Data)
The second data analysis study consists of back trajectories using data for 2000-2003 (20% highest and lowest days), a start height of 200m[7], and a 120-hour (5-day) trajectory period (Cite: "Sensitivity Analysis of Various Trajectory Parameters", June 2005, LADCO). Composite back trajectory plots were prepared for light extinction, sulfate, and nitrate (see Figures 1 and 2). For the high light extinction (poor visibility) and high sulfate and nitrate concentration days, the orange areas are where the air is most likely to come from, and the green areas are where the air is least likely to come from. As can be seen, bad air days are generally associated with transport from Michigan, Minnesota, and Wisconsin, as well as North Dakota, South Dakota, Iowa, Illinois, and Indiana. On the other hand, the good air days (low extinction) are generally associated with transport from Canada.

[6] Another type of data analysis – receptor modeling – was performed to identify important source sectors. Using statistical tools, the relative contributions associated with various primary and secondary emissions was estimated. Because most of the fine particle mass in these northern class I areas is secondary in nature, the tools were unable to provide much definition - e.g., over 80% of the impacts on the 20% worst visibility days at Voyageurs was due to a combination of secondary sulfate, secondary nitrate, and (mostly secondary) organic carbon. As such, the results of these data analyses are not included here.

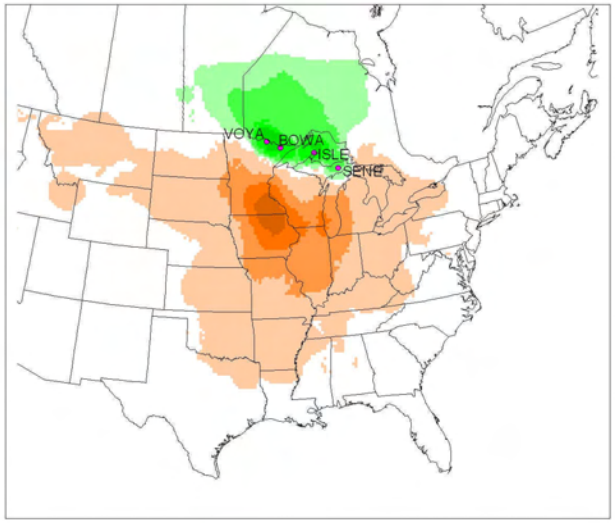
[7] A sensitivity analysis was performed to determine the effect of start height. Increasing westerly influence was seen as start height increases. 200 m was assumed to be an appropriate compromise to represent the mixed boundary layer, but not unduly influenced by surface features.

Table 1. Estimated Contributions to Visibility (Light Extinction) – Percentages

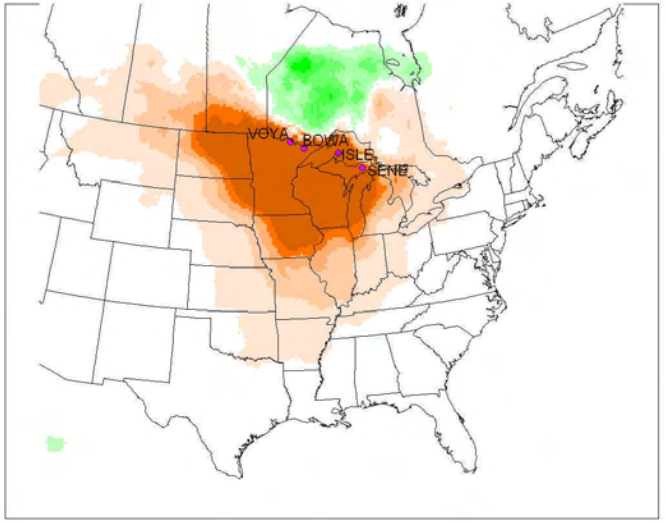
		Boundary Waters Extinction			Voyageurs Extinction			Seney Extinction		
		Best	All Days	Worst	Best	All Days	Worst	Best	All Days	Worst
US	Alabama		0.03						0.20	0.39
	Arkansas		0.30	0.40		0.10	0.19		1.54	2.93
	Florida								0.09	0.17
	Georgia								0.21	0.39
	Illinois		1.68	2.74		0.50	1.22		4.99	7.43
	Indiana		0.57	1.18					1.67	2.17
	Iowa		5.14	7.44		6.12	10.24		5.27	5.66
	Kentucky								1.14	2.18
	Louisiana		0.12	0.23		0.03	0.06		0.78	1.23
	Massachusetts								0.01	
	Michigan	0.78	1.17	0.66	0.27	1.22	1.57	14.51	13.68	14.68
	Minnesota	22.04	34.75	37.63	20.96	34.60	36.88	1.46	5.41	3.79
	Mississippi		0.06						0.62	1.04
	Missouri		2.17	3.26		1.02	0.30		2.42	3.17
	New Hampshire								0.02	
	New York								0.07	0.10
	North Carolina		0.09						0.19	0.36
	North Dakota	1.21	5.13	5.91	1.59	6.51	7.11		1.26	0.64
	Ohio		0.19	0.23				0.07	1.61	2.80
	Pennsylvania							0.49	0.15	0.26
	South Carolina								0.21	0.39
	South Dakota	0.45	3.06	4.38		4.08	6.93		1.13	1.12
	Tennessee		0.01						0.47	0.85
	Vermont								0.02	
	Virginia		0.03						0.17	0.33
	West Virginia		0.05						0.54	1.02
	Wisconsin	1.31	7.86	10.06		5.50	9.66	0.26	10.63	8.44
	Western States	1.10	4.31	5.74		7.05	9.53		5.80	5.90
Canada	Manitoba	9.95	7.45	3.71	17.65	10.35	6.04	3.77	2.37	0.77
	Ontario	47.52	15.96	8.92	49.56	13.59	4.98	50.97	12.86	7.66
	Quebec	1.77	0.15		0.21	0.01		0.97	0.93	0.41
	Other Provinces	2.27	3.73	2.46	6.05	6.29	2.35	0.86	1.72	2.28
Other (over water, etc.)		11.61	6.02	5.05	3.72	3.05	2.94	26.65	21.86	21.44
Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: Because Seney is more surrounded by water (the Great Lakes) than the other monitoring sites, the analysis shows greater impacts associated with the Other (over water) category. Actually, most of the Other (over water) impacts at Seney are from nearby (over land) emission sources, not over water emission sources.

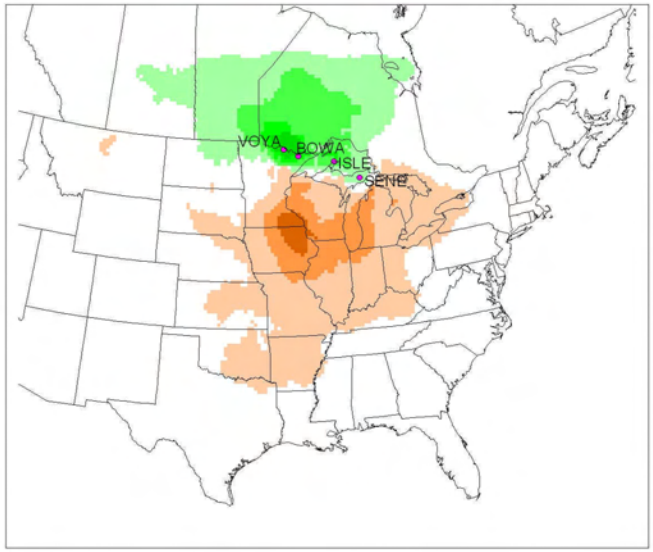
Figure 1. Composite back trajectories for light extinction, sulfates, and nitrates



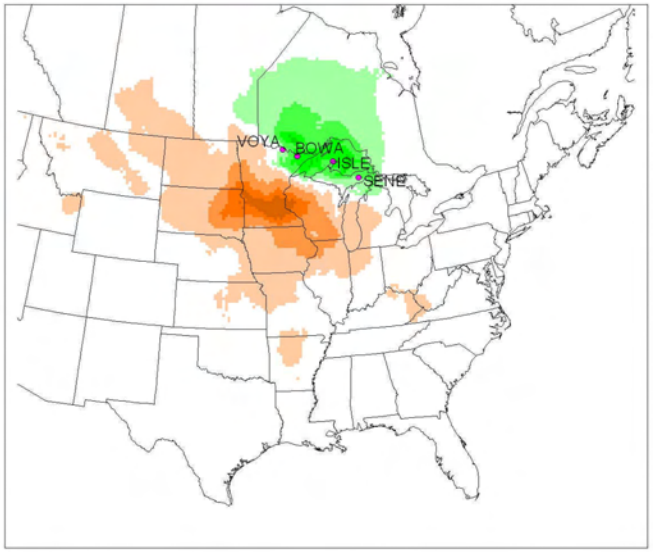
High extinction days – orange is where air is most likely to come from on poor air quality days, green is where air is least likely to come from on poor air quality days



Low extinction days – green is where are is most likely to come from on good air quality days, orange is where air is least likely to come from on good air quality days

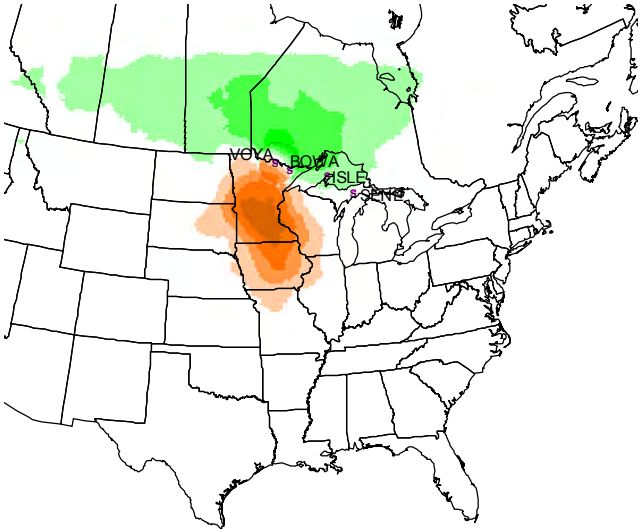


High sulfate concentration days

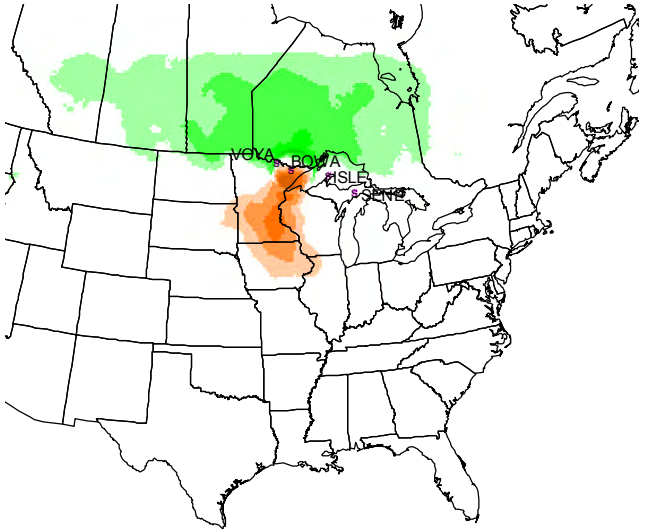


High nitrate concentration days

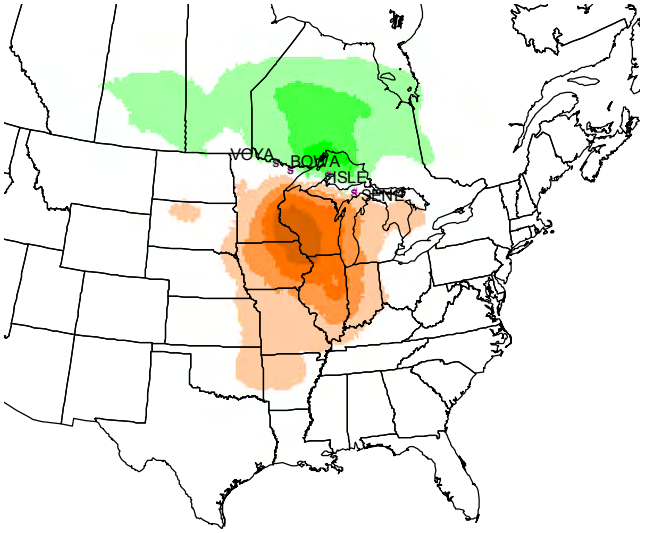
Figure 2. Back trajectories for light extinction for each class I area



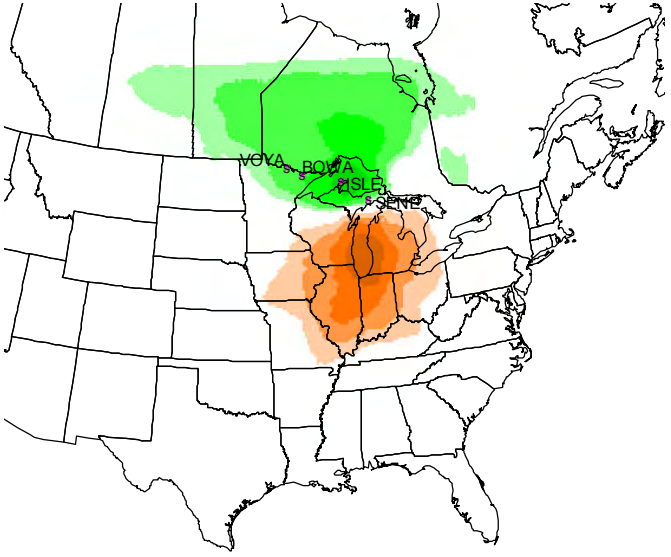
Voyageurs



Boundary Waters



Isle Royale



Seney

CENRAP Areas of Influence Assessment Using Back Trajectories and Other Tools

The third data analysis study involves an assessment of Areas of Influence (AOI) using several back trajectory analyses, including Residence Time Difference Plots, the Probability of Regional Source Contribution to Haze plots, and Tagged Species Source Apportionment Results (Cite: "CENRAP Regional Haze Control Strategy Analysis Plan", May 9, 2006, Alpine Geophysics). AOIs were constructed for 10 class I areas in the CENRAP region, including Boundary Waters/Voyageurs (see Figure 3). Green contours represent AOIs for nitrates, and red contours represent AOIs for sulfates. Similar to LADCO's composite trajectory plots in Figure 1, nitrate impacts are associated with more westerly transport, while sulfate impacts are associated with more southerly transport.

Figure 3. AOIs for nitrates and sulfates for Boundary Waters/Voyageurs

CENRAP Emissions Inventory Potential Analysis

The fourth data analysis study combines back trajectories with emissions inventory data to estimate the Emissions Impact Potential (EIP). This approach weights emissions at a particular location by the probability of transport from that location to a given receptor under days of high sulfate or nitrate concentrations. The EIP results for SO2 and NOx for Voyageurs, which are provided in Figure 4, show that contributions are greatest from source regions in northeastern Minnesota and the Twin Cities urban area.

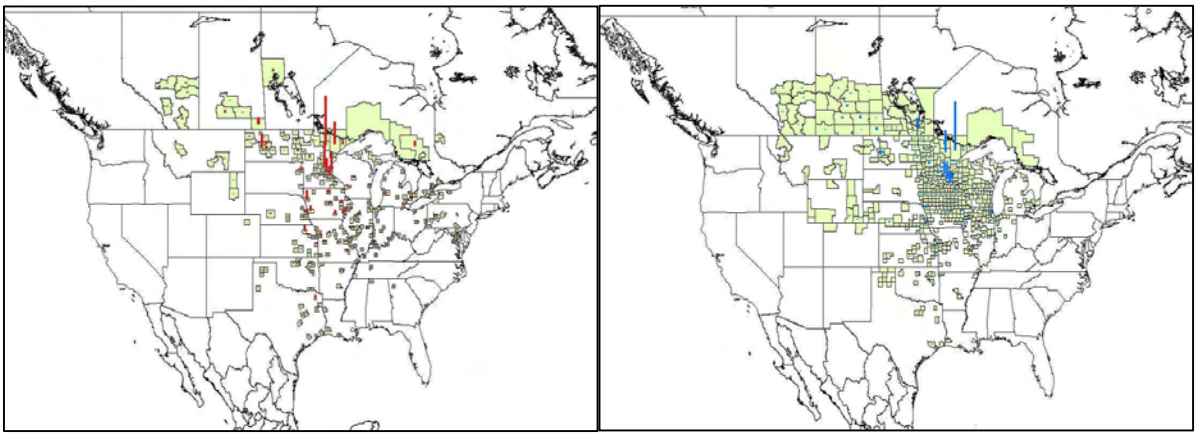


Figure 4. EIP for SO2 (left) and NOx (right) as calculated for Voyageurs

Dispersion Modeling Studies: MPCA (2002) and LADCO (2018)

The dispersion modeling studies rely on the particle source apportionment tool (PSAT) in CAMx. One PSAT analysis was conducted by the Minnesota Pollution Control Agency (MPCA) using the Base K/Round 4 emissions inventory for 2002 and another PSAT analysis was conducted by LADCO using the Base K/Round 4 emissions for 2018 ("on the books" controls). MPCA's 2002 analysis included 19 source regions and LADCO's 2018 analysis included 18 source regions (see Figure 5). Both analyses included similar source groups: EGU point, non-EGU point, on-road, nonroad, area, and ammonia.

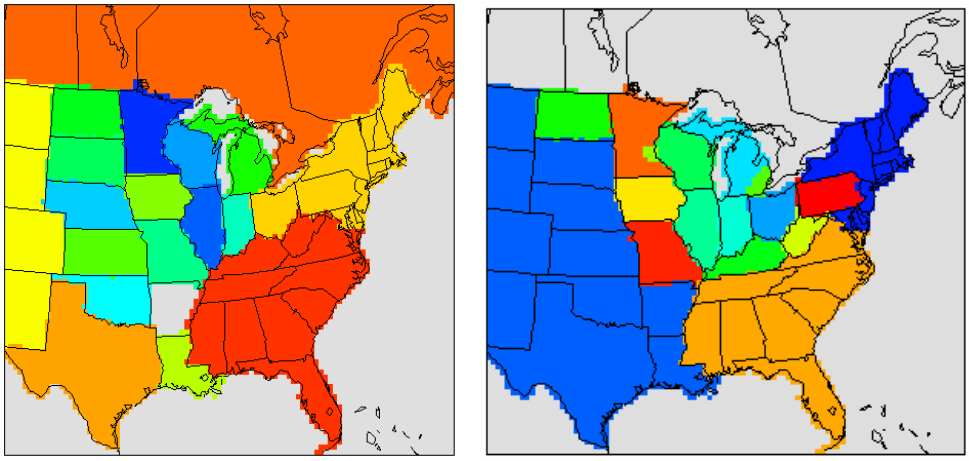


Figure 5. Source regions in MPCA's analysis (left) and LADCO's analysis (right). Contiguous areas of the same color represent a source region.

The contributions to light extinction on the 20% worst visibility days at each of the four class I areas are shown in Figures 6 – 9. A few comments on these results should be noted:

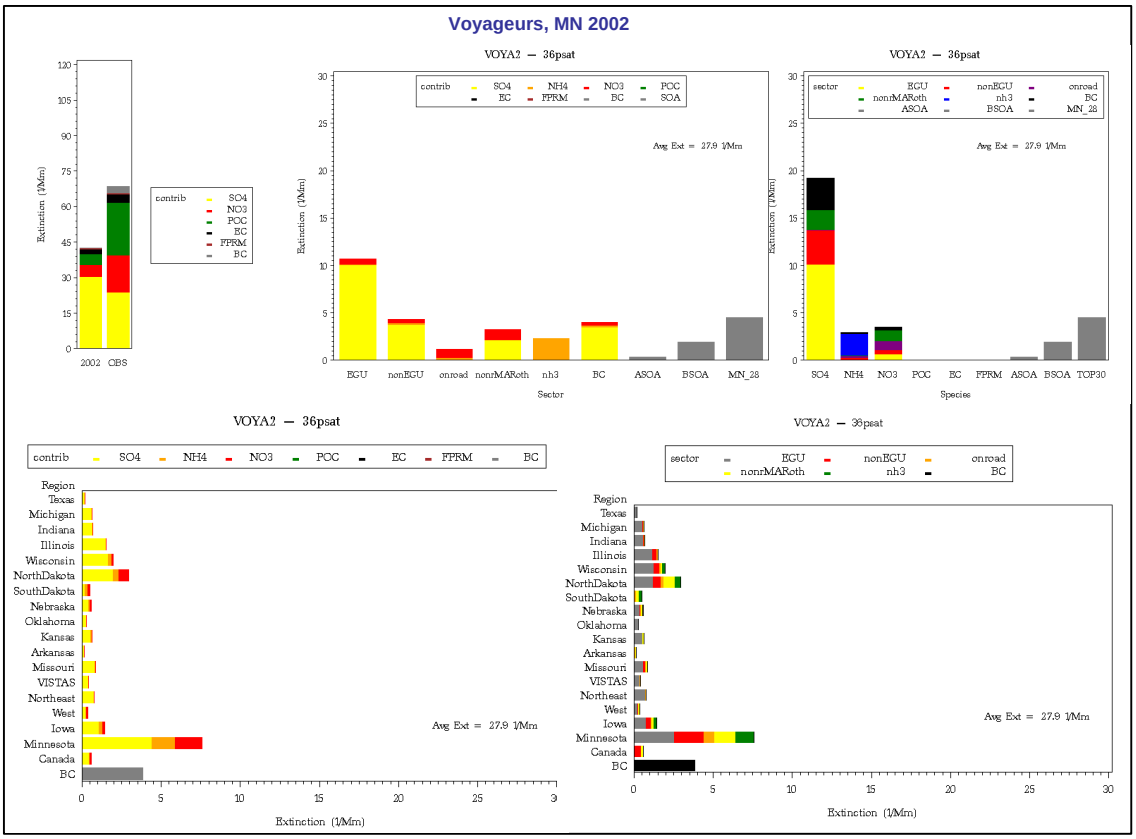
- Source apportionment differs from source response. The source apportionment results represent how much a given source sector and source region contribute to light extinction, whereas the source response is how much light extinction changes due to changes in emissions from a given source sector and source region.

- The bar chart in the upper left hand corner of each figure compares the base year (2002) absolute modeled and observed light extinction values. As can be seen, there is good agreement for sulfates, but not for nitrates or organic carbon. This may be due to emissions or chemistry problems. This underestimation for nitrates and organic carbon should be kept in mind when considering the absolute modeled values for these species.

- The source sector and source region contributions are similar for 2002 and 2018.

- Sulfate impacts are dominated by point source (EGU and non-EGU) SO2 emissions. Nitrate impacts, which as noted above are underestimated, are due to a variety of source sectors.

- The contributions in the two Minnesota class I areas are dominated by emissions from Minnesota, while the contributions in the two Michigan class I areas come from several northern and midwest states.



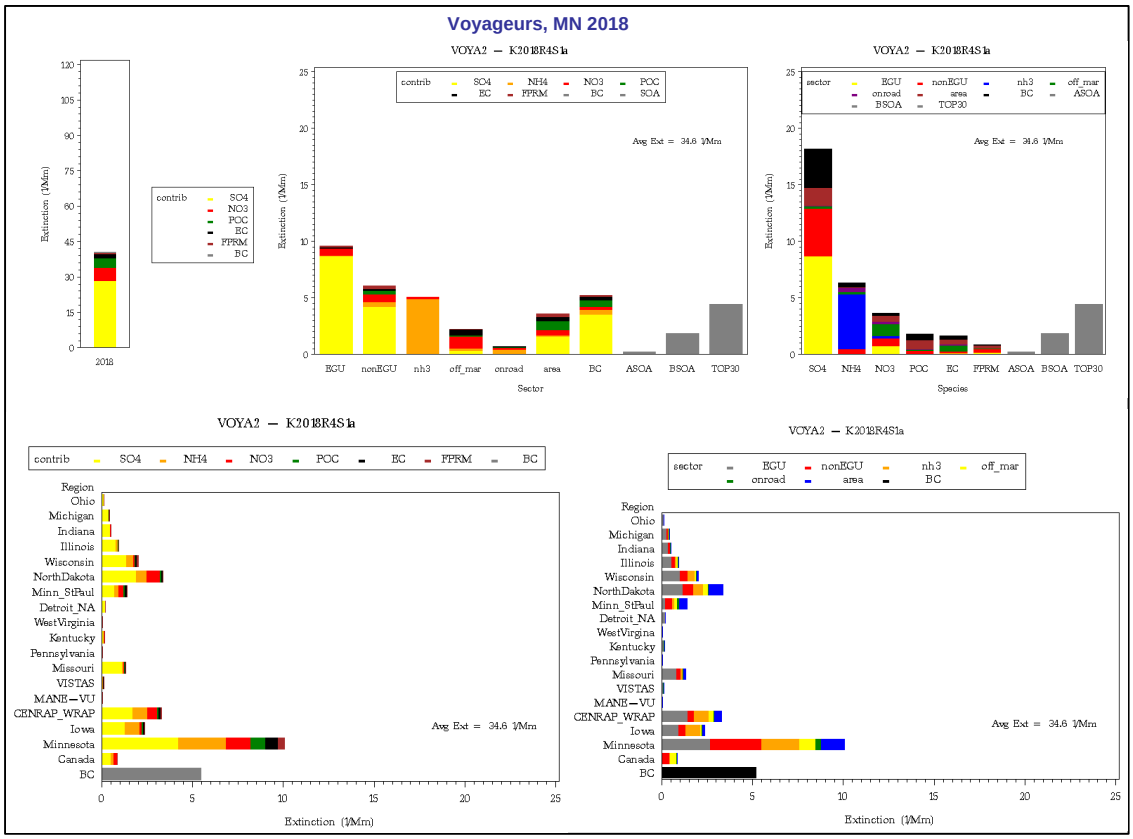
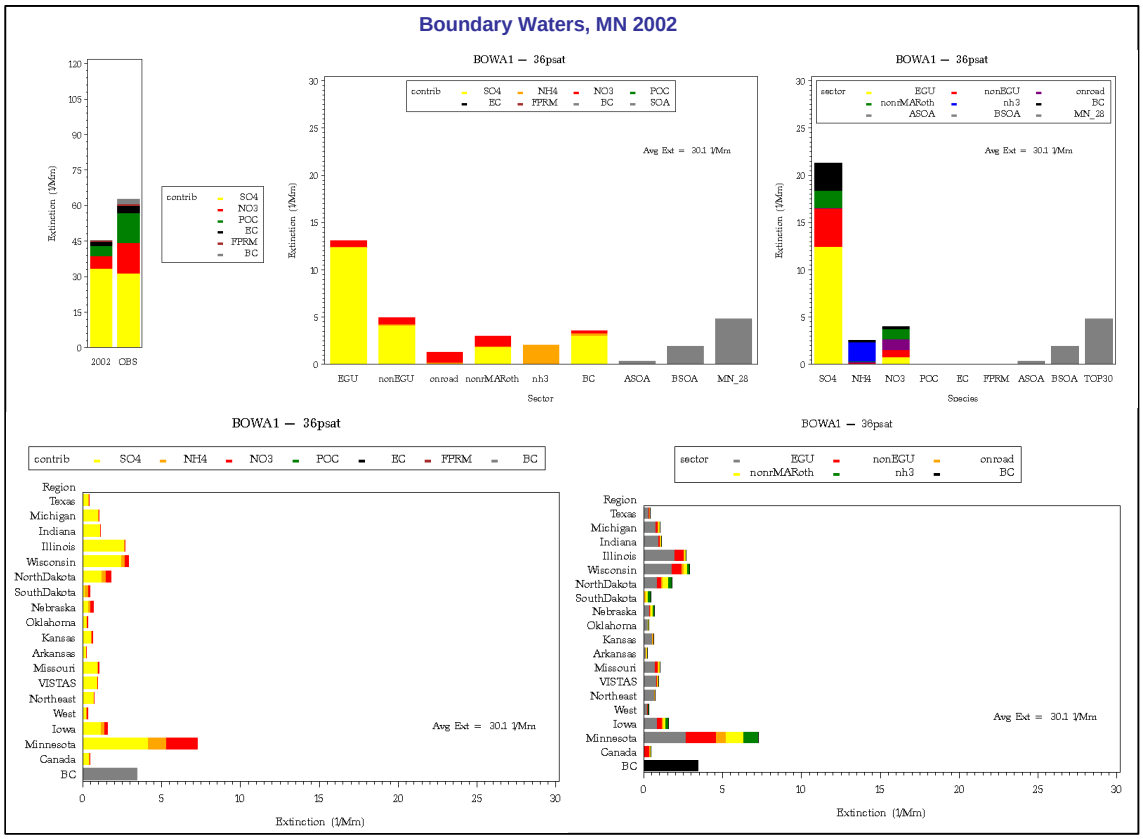


Figure 6. Model-based source apportionment for 20% worst days – Voyageurs



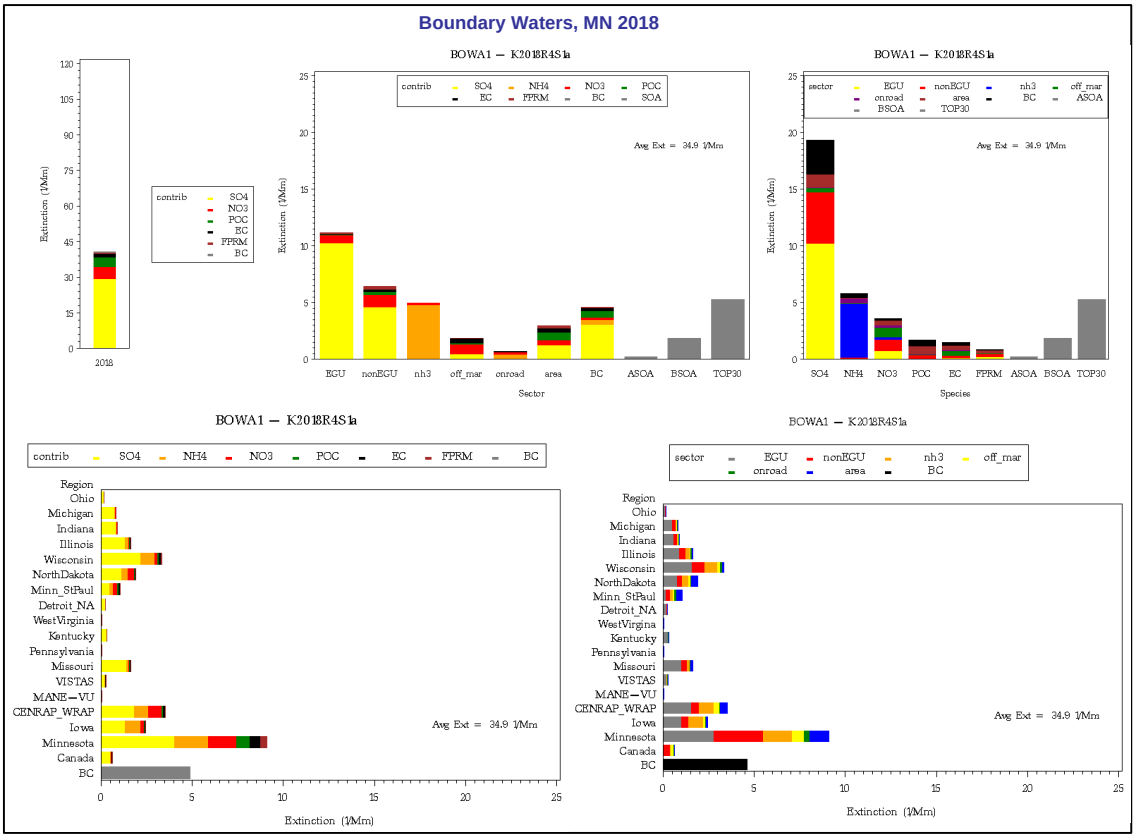
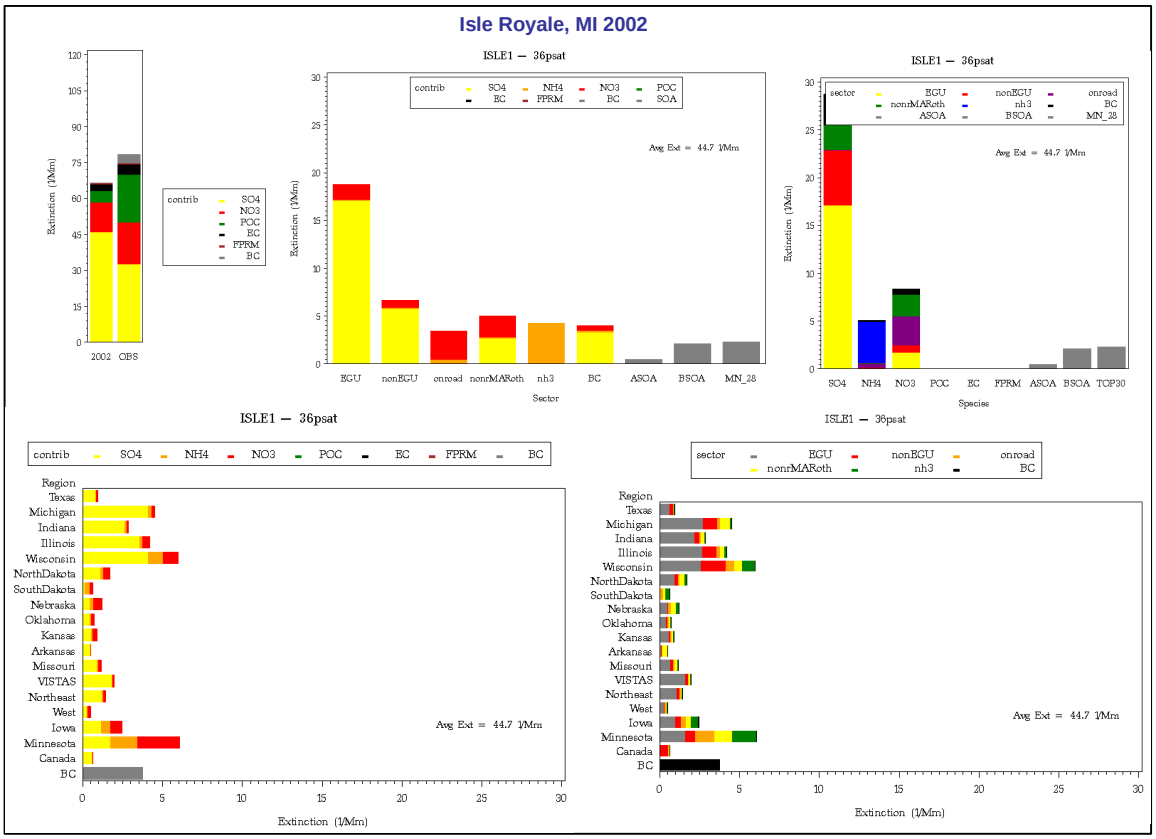


Figure 7. Model-based source apportionment for 20% worst days – Boundary Waters



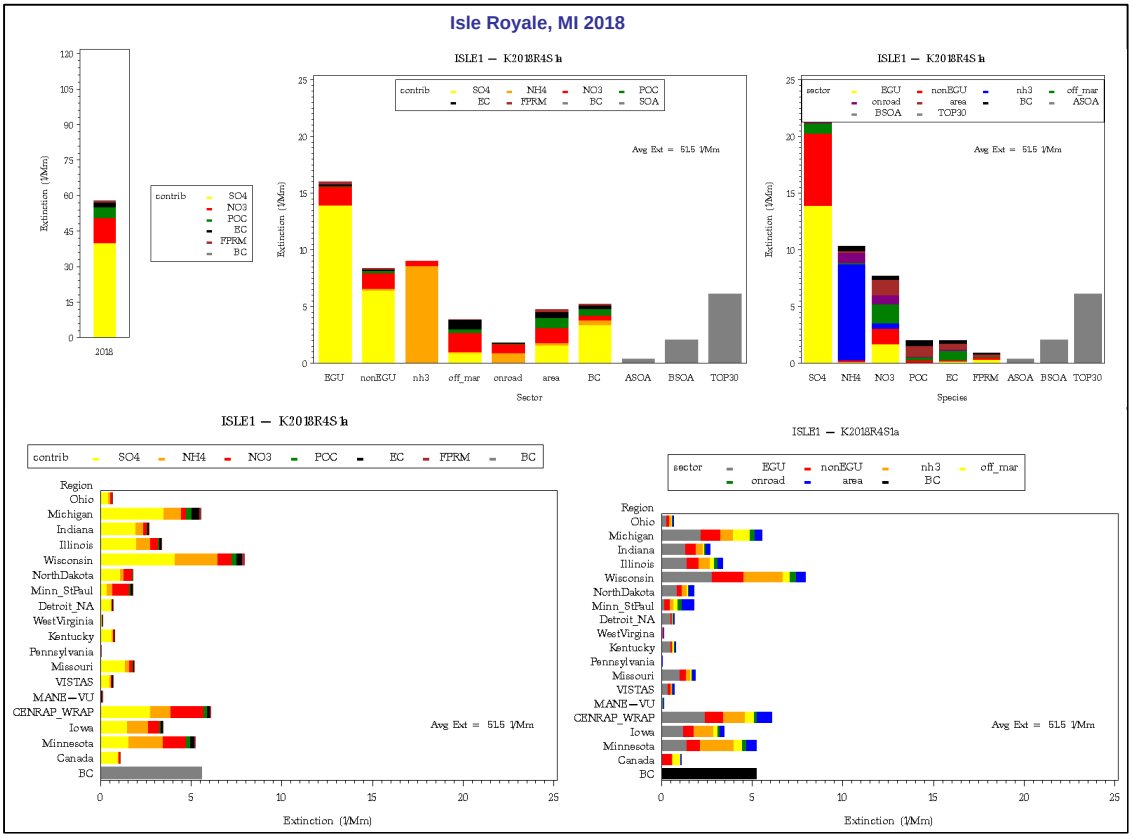
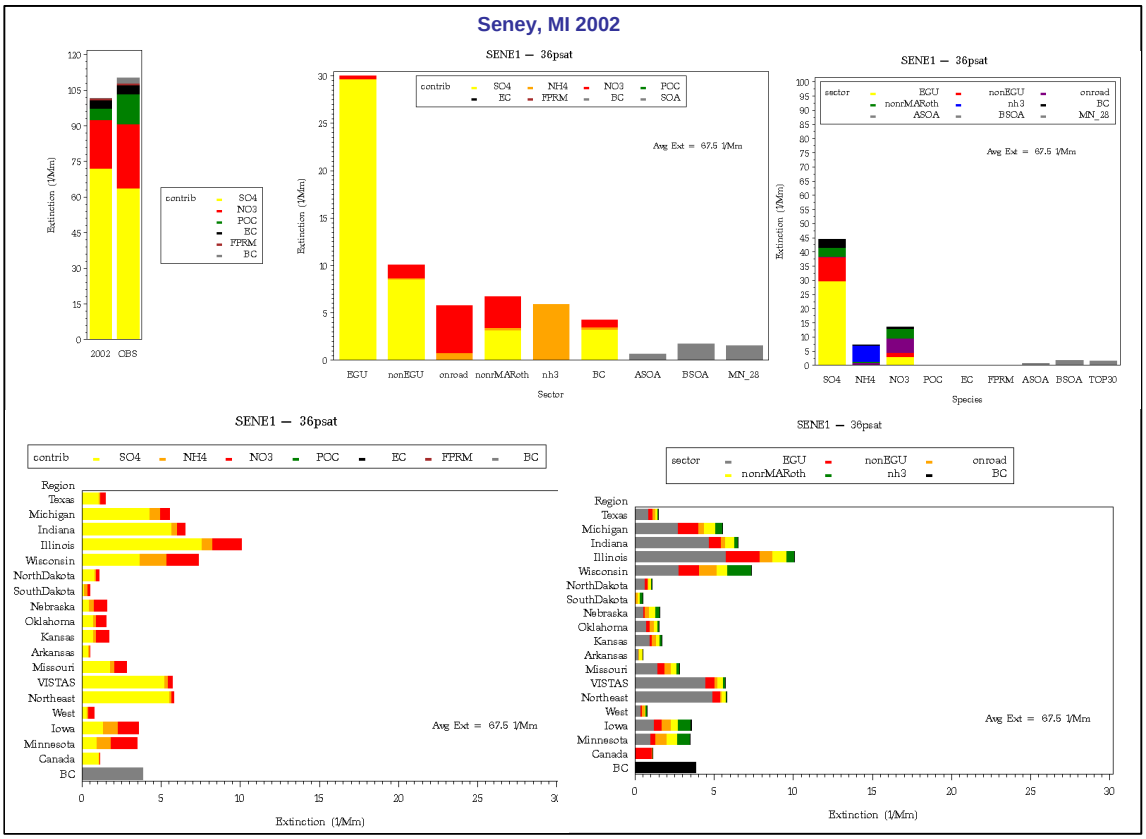


Figure 8. Model-based source apportionment for 20% worst days – Isle Royale



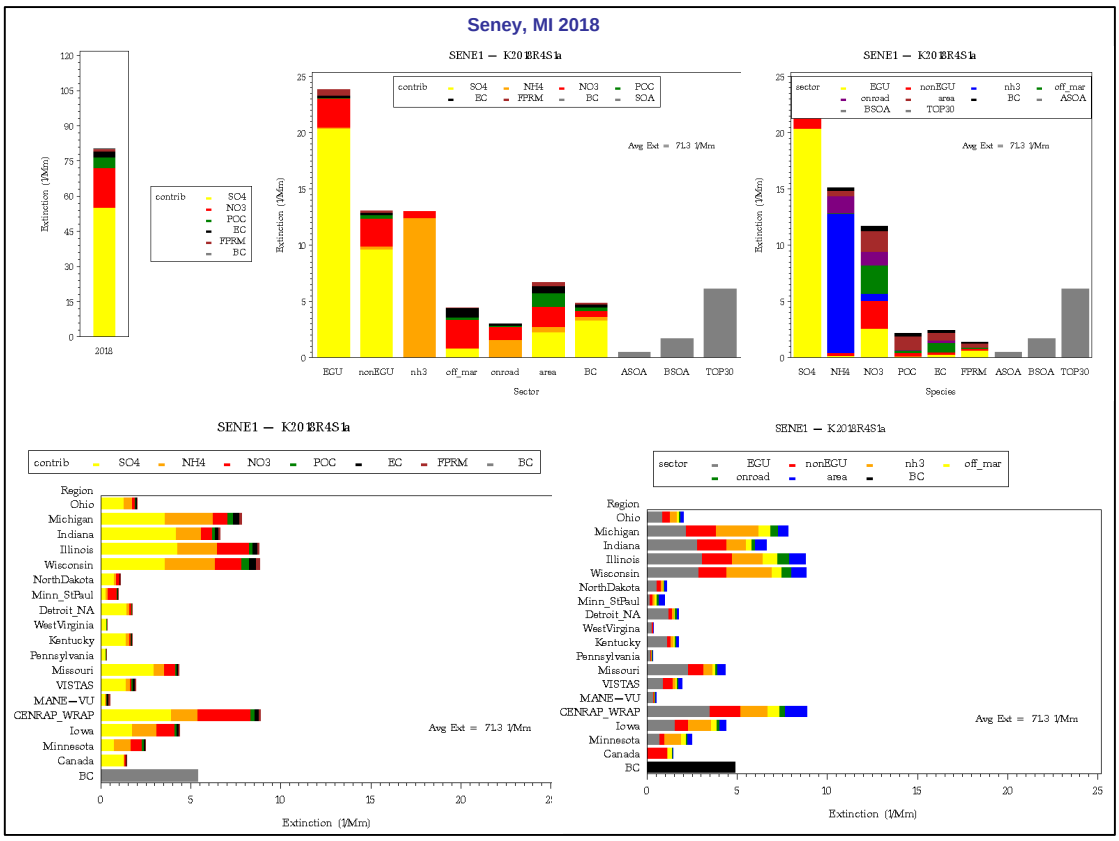


Figure 9. Model-based source apportionment for 20% worst days – Seney

LADCO Emissions Inventory Comparison

Emissions inventories were examined for the northern states which have the greatest impact on the northern class I areas (i.e., Michigan, Wisconsin, and Minnesota). The sector-level emissions for 2002, 2009, 2012, and 2018 are presented in Figure 10.[8] The future year SO2 emissions are dominated by EGUs, suggesting that an SO2 emission reduction strategy, which is needed to reduce sulfate concentrations, should focus on control measures for EGUs. The future year NOx emissions come from a variety of sources, suggesting that a NOx emission reduction strategy, which is needed to reduce nitrate concentrations, may need to consider control measures for a variety of source sectors.

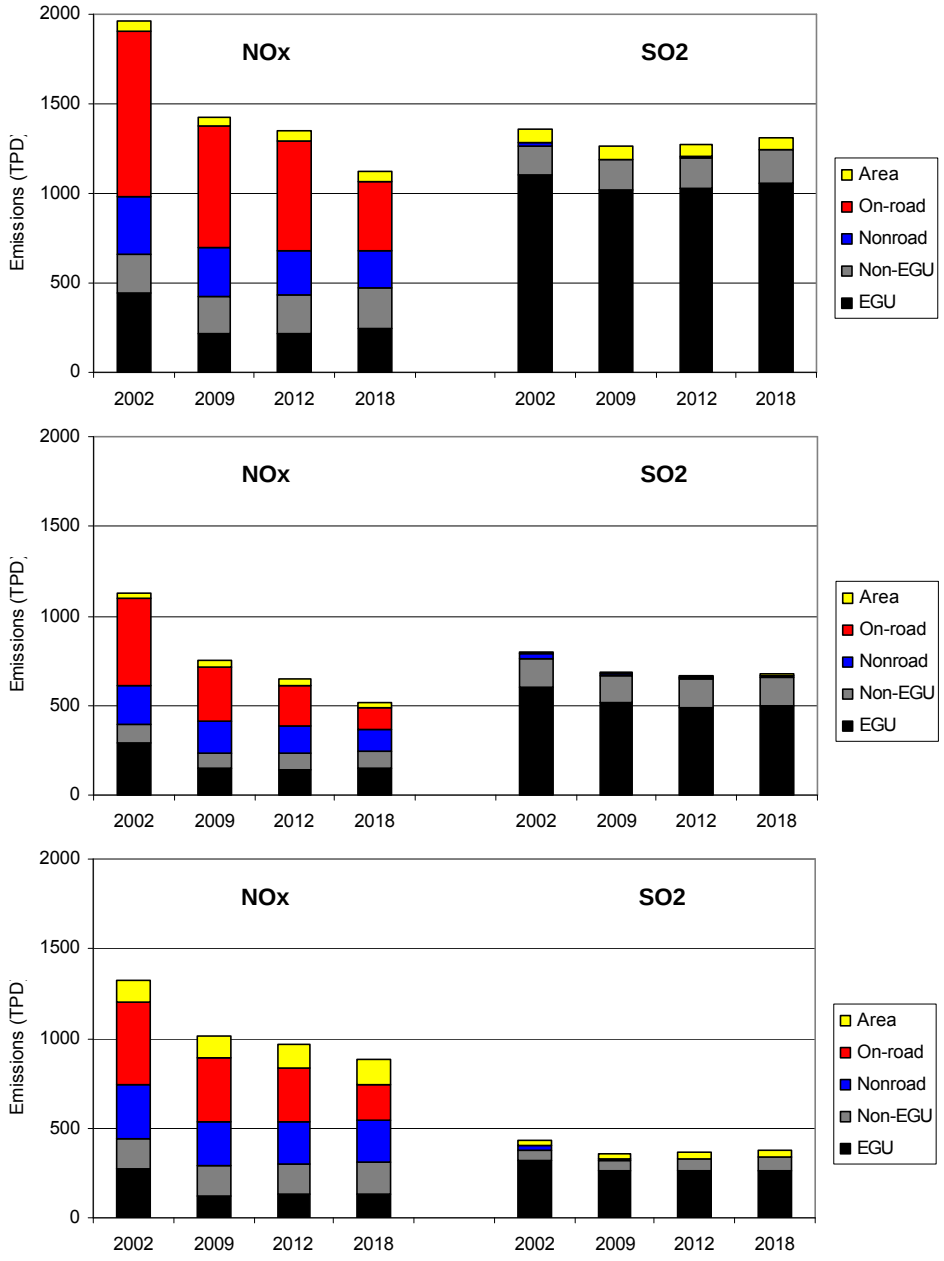


Figure 10. Emissions for Michigan (top), Wisconsin (middle), and Minnesota (bottom) - Base K/Round 4

[8] It is worth noting that the base year (2002) NOx and SO2 emissions for the adjacent Canadian province (Ontario) are considerably less than the combined NOx and SO2 emissions for the three northern states.

Appendix 3.2: Formal Consultation Letter

Minnesota Pollution Control Agency

September 19, 2007

TO: Participants in the Northern Class I Areas Consultation Process

RE: Northern Class I Areas Consultation Conclusion

As you are aware, Minnesota is home to two federal Class I areas, Voyageurs National Park (VNP) and the Boundary Waters Canoe Area Wilderness (BWCAW), located in the northern portion of the state. Under the federal Regional Haze Rule (40 CFR 51.300-309), the State of Minnesota is required to work to improve visibility in these two areas, with a goal of no man-made visibility impairment by 2064.

Under the portion of the Regional Haze regulations at 40 CFR 51.308(d)(1)(iv), states with Class I areas are required to develop reasonable progress goals (RPG) for visibility improvement at their Class I areas and associated measures to meet those goals, in consultation with any other State or Tribe that may reasonably cause or contribute to visibility impairment in those areas. This letter provides information on how Minnesota intends to address the reasonable progress goals, identification of the states that cause or contribute to visibility impairment in Minnesota's Class I areas, and our expectations for continued coordination with those states on haze-reducing strategies.

Beginning in 2004 and 2005, a number of discussions were held between state and tribal representatives in the upper Midwest concerning air quality planning to address regional haze in the four Class I areas in Michigan and Minnesota. Formal discussions geared toward the State Implementation Plans (SIP) consultation requirements began in July 2006, in a conference call among representatives from Iowa, Michigan, Minnesota, North Dakota, Wisconsin, the Mille Lacs and Leech Lake bands of Ojibwe, and Federal Land Managers (FLM), Regional Planning Organization (RPO) and U.S. Environmental Protection Agency (EPA) personnel. It was decided that other potentially contributing states should be asked to participate in the consultation process, and that consultation should continue through ongoing conference calls during the development of the regional haze SIP. Minutes of the conference calls and other documentation can be found on the Lake Michigan Air Directors Consortium/Midwest Regional Planning Organization (LADCO/MRPO) Web site.[1]

The group consulted on technical information, producing a document entitled *Regional Haze in the Upper Midwest: Summary of Technical Information*, which lays out the basic sources that cause and contribute to haze in the four Northern Class I areas, as agreed to by all the participating states.[2]

[1] http://www.ladco.org/Regional_haze_consultation.htm
[2] http://www.ladco.org/Final%20Technical%20Memo%20-%20Version%205d1.pdf

Based on the technical information contained in this document and other supporting analyses, Minnesota has determined that, in addition to Minnesota, Illinois, Iowa, Missouri, North Dakota**,** and Wisconsin are significant contributors to visibility impairment in VNP and the BWCAW. Attachment 1 to this letter provides a summary of how Minnesota reached this conclusion.[3]

The Minnesota Pollution Control Agency (MPCA) has not yet completed modeling to determine the RPG for these two Class I Areas. However, because of the varying timelines and different non-attainment issues impacting Minnesota and other contributing states, Minnesota intends to submit a RPG resulting from implementation of the minimum interim control measures Minnesota would consider to be reasonable. This decision reflects the need for more in-depth analysis before additional control measures can be determined to be reasonable. The RPG would be revised in the Five Year SIP Assessment to reflect final control measures.

In addition to on-the-books controls, such as the Clean Air Interstate Rule (CAIR), Minnesota expects the RPG to reflect Best Available Retrofit Technology (BART) determinations in Minnesota and surrounding states (where known), the plan for a 30 percent reduction in combined sulfur dioxide (SO_2) and nitrogen oxides (NO_X) emissions in Northeastern Minnesota, voluntary emission reductions planned by Minnesota utilities beyond those predicted from CAIR, and, where known, any additional control measures undertaken in other states for regional haze or attainment purposes. The MPCA expects that the modeling information needed to set the RPG would be available by October 2007.

Minnesota commits to evaluating additional control measures and implementing those that are reasonable under the four factors listed in 40 CFR 51.308(d)(1)(i)(A) in the 2008 SIP. Minnesota expects that additional control measures may be found to be reasonable, and commits to including a plan for implementation of those additional reasonable measures in the Five Year SIP Assessment. Minnesota asks the five other significantly contributing states to make these same commitments for further evaluation and implementation of reasonable control measures.

In particular, Minnesota asks Iowa, Missouri, North Dakota, and Wisconsin to evaluate further reductions of SO_2 from electric generating units (EGU) in order to reduce SO_2 emissions by 2018 to a rate that is more comparable to the rate projected in 2018 for Minnesota, approximately 0.25 lbs/mmBtu. Minnesota believes that Illinois is already in the process of meeting this goal. Emission reductions in Wisconsin are particularly important, as Wisconsin is the highest contributor outside Minnesota to visibility impairment in Minnesota's Class I areas.

Minnesota also asks North Dakota to evaluate the potential for reductions of NO_X from EGUs due to predicted higher NO_X emission rates compared with Minnesota and other contributing states. Illinois, Missouri, and Wisconsin are in the process of evaluating NO_X emission

[3] Minnesota is relying primarily on data analysis and technical work done by MRPO and CENRAP.

reductions for their ozone SIPs. Minnesota would expect these three states to share information on the NO_X controls being undertaken as part of those ozone SIPs.

Minnesota acknowledges that each state is in a unique position; for example, North Dakota has a different regulatory background and a different fuel mix than other contributing states. Minnesota's use of emission rates to point towards areas where additional emission control strategies should be investigated does not mean that Minnesota expects all the contributing states to achieve the same emission rates. However, the contributing states with higher emission rates should evaluate potential control measures, and should, in their initial SIPs or Five Year SIP Assessments, show either enforceable plans to reduce emissions or a rationale for why such emission reductions are not reasonable (e.g., an overly high cost in $/ton or $/deciview, or lack of visibility improvement).

Minnesota, in turn, also commits to a more detailed review of potential emission reductions from large Industrial, Commercial, and Institutional (ICI) Boilers and other point sources (such as reciprocating engines and turbines) with regulations or permit limits developed by 2013 and included in the Five Year SIP Assessment if control measures on these source categories appear to be reasonable. Minnesota asks the five contributing states to make a similar commitment.

It is the intent of Minnesota to proceed with the development and submittal of a Regional Haze Plan which includes the aforementioned RPG and expectations for contributing states. Minnesota commits to continuing work with the other states to review and analyze potential region-wide control strategies and emission reductions plans and to continue on-going assessments of progress towards visibility improvement goals.

Minnesota asks that any additional control measures found to be reasonable will be included in each state's SIP or Five Year SIP Assessment in an enforceable form. This will ensure that the control measures are on track to be implemented by the 2018 deadline for submittal of SIPs covering the second phase of the Regional Haze process.

Minnesota believes that the consultations conducted to date satisfy the consultation process requirements, providing for consistency between state SIPs and allowing each state to move forward with SIP preparation and submittal. As necessary, Minnesota will engage in future consultation to address any issues identified in the review of the Regional Haze SIPs, any additional technical information, and to ensure continued coordinated efforts among the Midwestern states.

Attached to this letter is an outline of the reasonable progress discussion to appear in our SIP and additional supporting tables and graphs.

In order to document the consultation process, the MPCA is asking that the State and Tribal recipients of this letter respond within 30 days with a letter documenting that these consultations have taken place to the satisfaction of your State or Tribe, or detailing areas where additional

consultation should occur. Those states that Minnesota has identified as additional contributing states should respond with your agreement or disagreement with the determination of contributing states and the additional controls strategies that will be evaluated.

Thank you for your participation and contributions in this consultation process. Your time and efforts are appreciated. If you require additional information regarding this matter, please contact John Seltz at 651-296-7801 or john.seltz@pca.state.mn.us.

Sincerely,

Brad Moore
Commissioner

Attachment 1: Supporting Technical Information – Determination of Contributing States

Minnesota used the LADCO 2002 – 2003 Trajectory Analyses and the LADCO 2018 PSAT analysis, using a 5% threshold of contribution from either analysis to either of Minnesota's Class I areas, to define a contributing state. Based on this information, the States identified as contributing to visibility impairment in Minnesota's Class I Areas are: Minnesota, Wisconsin, Illinois, Iowa, Missouri, and North Dakota.

The table below documents the percent contribution to visibility impairment by the States that have participated in the Northern Class I consultation process, estimated from 2000 – 2003 LADCO trajectory analysis, with supporting information from the CENRAP 2002 PSAT model of the 20% worst days.[1]

State Impacts on Minnesota's Class I Areas – Baseline Period

	LADCO Trajectory Analyses (2000-2003)		CENRAP PSAT Modeling (2002)	
	BWCAW	VNP	BWCAW	VNP
Michigan	0.7%	1.6%	2.3 (2.6)%	1.4%
Minnesota	37.6%	36.9%	25.4%	27.6
Wisconsin	11.1%	9.7%	7.8 (8.6)%	5.6%
Illinois	2.7%	1.2%	7.0 (7.3)%	3.7%
Indiana	1.2%		4.5 (3.8)%	1.8%
Iowa	7.4%	10.2%	3.5 (3.9)%	3.8%
Missouri	3.3%	0.3%	2.9 (2.7)%	2.1%
N. Dakota	5.9%	7.1%	4.8%	7.1%
TOTAL	69.9%	67.0%	58.2 (59.2)%	53.1%

The following table documents the percent contribution from these same states projected for the future based on LADCO's 2018 Particulate Matter Source Apportionment Technology (PSAT) analysis, with supporting information from the CENRAP 2018 PSAT model of the 20% worst days.[2] Although in some cases the percentage impacts predicted by CENRAP are lower than those predicted by the MRPO PSAT analysis (Iowa, Missouri), the identified states remain the higher contributors. The relative order of contributing states does not change much between 2002 and 2018.

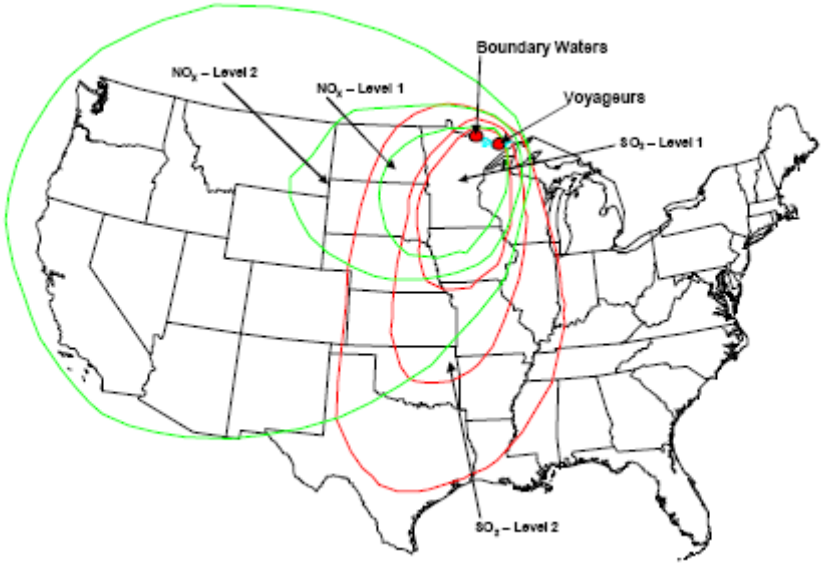
[1] Environ. (2007, July 18). *CENRAP PSAT Visualization Tool*. (Corrected Version). Available on the CENRAP Projects webpage
[2] Ibid.

State Impacts on Minnesota's Class I Areas – Future Year (2018 PSAT)

	LADCO PSAT Modeling (2018)		CENRAP PSAT Modeling (2018)	
	BWCAW	VNP	BWCAW	VNP
Michigan	2.6%	1.3%	2.6 (2.2)%	1.5 (1)%
Minnesota	30.5%	35.0%	28 (19.8)%	30 (18.0)%
Wisconsin	10.4%	6.3%	8.0 (6.0)%	5.0 (3.1)%
Illinois	5.2%	3.0%	4.8 (3.7)%	2.5 (1.6)%
Indiana	2.9%	1.6%	2.7 (1.8)%	1.2 (0.8)%
Iowa	7.6%	7.4%	3.8 (2.9)%	4.0 (2.5)%
Missouri	5.2%	4.3%	3.5 (2.3)%	2.5 (1.6)%
N. Dakota	5.7%	10.3%	5.3 (3.7)%	7.5 (4.7)%
TOTAL	70.1%	69.2%	58.7 (42.5)%	54.2 (33.3)%

The states with contributions over 5% to the Class I areas in these analyses generally match well with the impacting states shown in the Area of Influence (AOI) analysis done by Alpine Geophysics for CENRAP.

AOIs for Minnesota's Class I Areas[3]



[3] Stella, G.M et al. (2006, May 9). *CENRAP Regional Haze Control Strategy Analysis Plan.* Prepared by Alpine Geophysics. Available on the CENRAP Projects webpage http://www.cenrap.org/projects.asp

Attachment 2: Outline of an Approach to Defining Reasonable Progress for Minnesota Class I Areas in the Minnesota Regional Haze SIP

Under EPA rules, Minnesota has a responsibility to set a Reasonable Progress Goal (RPG) for visibility in the Boundary Waters and Voyageurs Park. Because the states that contribute to our Class I areas will submit their SIPs at different times, Minnesota sets forth the following proposal for setting a RPG for our two Class I areas. This document lays out the elements that we plan to include.

Minnesota's Long Term Strategy section will include those control strategies which we plan to undertake and which we consider to be reasonable. It will also include any known controls that are being undertaken in the nearby states, particularly the five states (IL, WI, ND, IA, and MO) that have been identified as contributors to BWCAW and VNP.

- Minnesota's LTS Contains
  - BART
    - For Minnesota: Minimal emission reductions
    - As known for other states
  - CAIR and resulting EGU reductions
    - For Minnesota
    - As known for other states
  - Control strategies for $PM_{2.5}$ and Ozone attainment SIPs
    - As known for other states
  - Other federal on-the-books (OTB) controls:
    - Tier II for on-highway mobile sources
    - Heavy-duty diesel (2007) engine standards
    - Low sulfur fuel standards
    - Federal control programs for nonroad mobile sources
  - Additional Emission Limitations
    - NE Minnesota Plan (30% reduction in combined SO_2/NO_X as a fair share)
    - Additional voluntary reductions as a result of MN Statutes 216B.1692 (emission reduction rider)
    - Anything known for other states
  - Other long term strategy (LTS) Components (without specific emission reductions)
    - Measures to mitigate emissions from construction
    - Source retirement and replacement
    - Smoke management for prescribed burns in Minnesota

After documenting all the components of the LTS, Minnesota will lay out the RPG determined for the best and worst days at VNP and BWCAW.

Reasonable Progress Goals

Once determined, the RPG submitted in Minnesota's SIP will represent an **interim**, **minimum** visibility improvement Minnesota would consider to be reasonable, and contain emission reductions resulting from the elements of the long term strategy.

At this time, Minnesota believes that this is an appropriate goal because other impacting states are working on a multi-SIP approach and have yet to determine what reductions are reasonable in their states for both haze and attainment purposes. Although we cannot compel the states to undertake reductions, Minnesota would expect further emissions reductions than are documented here, resulting in larger visibility improvement. Minnesota intends to revise the RPG for 2018 in the Five Year SIP Assessment, in order to reflect the additional control strategies found to be reasonable.

Steps in Reviewing Control Strategies and Revising RPG

In reviewing additional control strategies to determine those that are reasonable under the Regional Haze rule, Minnesota will focus on strategies that will result in emission reductions in those states that are significant contributors to visibility impairment in either BWCAW or VNP: Minnesota, Wisconsin, Iowa, N. Dakota, Missouri and Illinois.

The MPCA commits to further evaluation of reasonable control strategies that are possible within Minnesota. Minnesota will work with the other contributing states through their submittals of the first haze SIP and through 2013 to develop reasonable control strategies.

In the Five Year SIP Assessment, the MPCA would submit enforceable documents for any additional control measures found to be reasonable within Minnesota. In addition, that report would contain a listing of the additional control measures to be implemented by the other contributing states. Minnesota would then submit modeling that includes all these enforceable measures and would revise the 2018 RPG to reflect the larger degree of visibility improvement expected from the chosen control strategies.

Specific Control Strategies to Be Reviewed

Minnesota will use the EC/R five factor analysis report, the control cost analysis carried out by Alpine Geophysics for CENRAP and the CENRAP Control Sensitivity Model run to identify reasonable region-wide emission reduction strategies. (*See Attachment 3*).

The specific strategies that at this time appear to potentially be reasonable, and Minnesota's expectation for each of these strategies for other states, are outlined below.

EGU SO_2 Reductions

Minnesota will ask the contributing states to look at their EGU emissions of SO_2; Minnesota will particularly focus on possible reductions in states with emission rates that appear to be higher than the average among the Midwestern states. Since contributor states face a variety of regulatory demands and fuel types, it may not be possible to attain uniform emission performance. An emission rate of about 0.25 lb/mmBTU should be achievable in a cost-effective manner; this is the level being achieved in Minnesota and Illinois, and the EC/R report

shows that the "EGU1" scenario, a 0.15 lb/mmBTU emission rate, is generally achievable in the Midwest at a reasonable $/ton figure. (See Attachment 3).

Minnesota asks the identified states to demonstrate that reductions are occurring or being undertaken that will allow the state to reach at least the 0.25 lb/mmBTU emission rate, or to describe in their SIPs or Five-Year SIP Assessments why further reductions of SO_2 from EGU are not reasonable. Further reductions may not be reasonable due to the cost of implementation in $/ton or $/deciview or lack of impact on visibility impairment, but they should be evaluated.

At present, it appears as though Illinois has planned or proposed reductions that appear reasonable. It appears that more cost effective reductions are possible in Iowa, Missouri, North Dakota, and Wisconsin. Since Wisconsin is the largest non-Minnesota contributor to Minnesota's Class I areas, their efforts to reduce EGU SO_2 emissions are particularly important.

EGU NO_X Reductions

Wisconsin, Missouri, and Illinois have already reduced NO_X emissions to alleviate ozone standard violations, and Iowa appears to already have relatively low EGU NO_X emissions.

Minnesota will ask North Dakota to look at their EGU emissions of NO_X and to describe in their SIP or Five-Year SIP Assessment why further reductions of NO_X from EGU are not reasonable. Again, an emission rate of approximately 0.25 lb/mmBTU appears to be a reasonable benchmark. Further reductions may not be reasonable due to the cost of implementation in $/ton or $/deciview or lack of impact on visibility impairment, but they should be evaluated.

ICI Boiler Emission Reductions

Minnesota will commit to a more detailed review of potential NO_X and SO_2 reductions from large ICI boilers. Regulations or permit limits will be developed by 2013 if significant cost effective reductions prove feasible from this sector. Minnesota will expect the five contributing states to make at least this level of commitment.

Other Point Source Emission Reductions

Reciprocating engines and turbines appear to be a sector with potential cost effective NO_X controls. Minnesota commits to review this sector in more detail and if, after consideration of planned federal control programs, cost effective reductions appear feasible, Minnesota commits to develop regulations or permit limits for major sources by 2013. Minnesota will expect the five contributing states to make a similar commitment.

Mobile Source Emission Reductions

There appear to be relatively few cost effective NO_X controls for transportation available to states. Minnesota commits to work with LADCO states to implement appropriate cost effective NO_X controls to improve visibility and lower ozone levels in non-attainment areas.

NO_X Modeling, Ammonia, Agricultural Sources

It is not appropriate to commit to control of ammonia sources at this time. However, there is a clear need to improve 1) our understanding of the role of ammonia in haze formation, 2) our understanding of potential ammonia controls, and 3) the accuracy of particulate nitrate

predictions. Minnesota does not consider it our responsibility to conduct such research. Minnesota therefore encourages EPA and the regional planning organizations to continue work in these areas and commits to work with EPA and the RPOs to these ends.

Timeline for Reviewing Control Strategies

Minnesota commits to reviewing these control strategies on such a timeline that the 2013 SIP Report will include the four factor analysis for these control strategies, and that any control strategies deemed to be reasonable will be in place with an enforceable document (state rule, order, or permit conditions). Although any control measures ultimately deemed to be reasonable may not be fully implemented by 2013, they will be clearly "on the way" and the SIP Report will include estimates of emission reductions and projected 2018 visibility conditions.

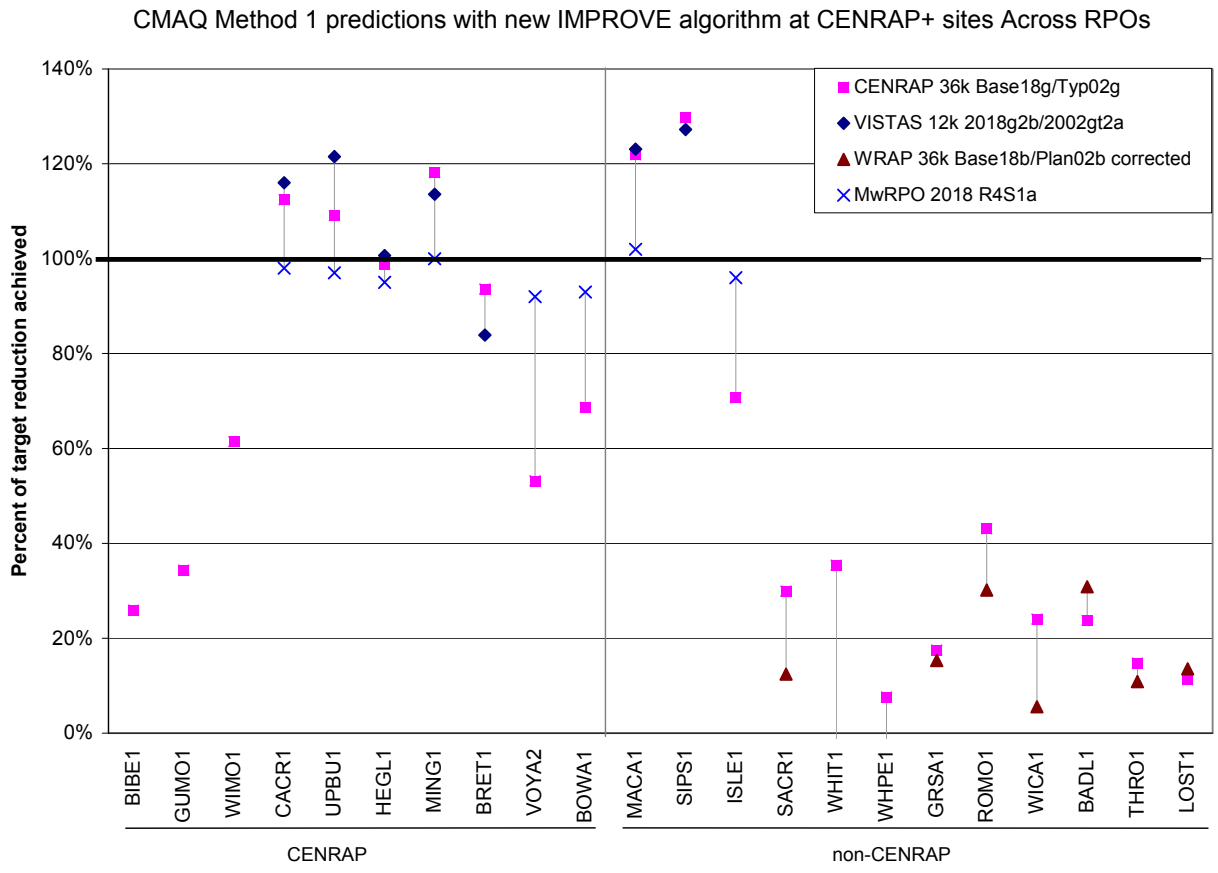
Acknowledging that most states are far along in the process of writing their Regional Haze SIPs, Minnesota would expect that all other contributing states would commit to a timeline that would allow reasonable predictions of the emission reductions and visibility improvement by 2018 from those states in the 2013 SIP Report.

Attachment 3: Supporting Technical Information – Need for Additional Control Strategies

Although there are some fairly major differences in the degree of visibility improvement expected at VNP and BWCAW due to on- the- books controls, projections by both CENRAP and Midwest RPO show that Minnesota's Class I areas are not yet projected to meet the Uniform Rate of Progress, as shown in the graph below.[7] In this graph, the URP is the "target reduction."

EPA's recent guidance on determining the reasonable progress goal (RPG) indicates that states may set a RPG that provides for more, less, or equivalent improvement as the URP. However, the guidance continues to emphasize that an analysis of control strategies with the four factors is necessary; Minnesota believes this is particularly true in light of the lesser degree of visibility improvement shown from on- the- books controls in Minnesota's Class I Areas.

The EGU 2018 Summary table, following, shows projected 2018 EGU SO2 and NOX emissions. Highlighted cells indicate specific states and pollutants of concerns, where Minnesota has requested evaluation of potential reasonable control measures.[8]



[7] Morris, R. (2007, July 24). *CENRAP Emissions and Modeling Technical Support Document,* Prepared by Environ. Presentation Given at CENRAP Workgroup/POG Meeting.
[8] Provided by Midwest RPO from the IPM 3.0 base run and edits made by certain states.

EGU Summary for 2018

	Heat Input (MMBTU/year)	Scenario	SO2 (tons/year)	SO2 % Reduction (From 2001 - 03 Average)	SO2 (lb/MMBTU)	NOx (tons/year)	NOx % Reduction (From 2001 - 03 Average)	NOx (lb/MMBTU)
IL	**980,197,198**	**2001 - 2003 (average)**	**362,417**		**0.74**	**173,296**		**0.35**
	1,310,188,544	IPM3.0 (base)	277,337	23.5	0.423	70,378	59.4	0.107
		IPM3.0 - will do	140,296	61.3	0.214	62,990	63.7	0.096
		IPM3.0 - may do	140,296	61.3	0.214	62,990	63.7	0.096
IA	**390,791,671**	**2001 - 2003 (average)**	**131,080**		**0.67**	**77,935**		**0.40**
	534,824,314	IPM3.0 (base)	115,938	11.6	0.434	59,994	23.0	0.224
		IPM3.0 - will do	115,938	11.6	0.434	59,994	23.0	0.224
		IPM3.0 - may do	100,762	23.1	0.377	58,748	24.6	0.220
MN	**401,344,495**	**2001 - 2003 (average)**	**101,605**		**0.50**	**85,955**		**0.42**
	447,645,758	IPM3.0 (base)	61,739	39.2	0.276	41,550	51.7	0.186
		IPM3.0 - will do	54,315	46.5	0.243	49,488	42.4	0.221
		IPM3.0 - may do	51,290	49.5	0.229	39,085	54.5	0.175
MO	**759,902,542**	**2001 - 2003 (average)**	**241,375**		**0.63**	**143,116**		**0.37**
	893,454,905	IPM3.0 (base)	243,684	(1.0)	0.545	72,950	49.0	0.163
		IPM3.0 - will do	237,600	1.6	0.532	72,950	49.0	0.163
		IPM3.0 - may do	237,600	1.6	0.532	72,950	49.0	0.163
ND	**339,952,821**	**2001 - 2003 (average)**	**145,096**		**0.85**	**76,788**		**0.45**
	342,685,501	IPM3.0 (base)	41,149	71.6	0.240	44,164	42.5	0.258
		IPM3.0 - will do	56,175	61.3	0.328	58,850	23.4	0.343
		IPM3.0 - may do	56,175	61.3	0.328	58,850	23.4	0.343
WI	**495,475,007**	**2001 - 2003 (average)**	**191,137**		**0.77**	**90,703**		**0.36**
	675,863,447	IPM3.0 (base)	127,930	33.1	0.379	56,526	37.7	0.167
		IPM3.0 - will do	150,340	21.3	0.445	55,019	39.3	0.163
		IPM3.0 - may do	62,439	67.3	0.185	46,154	49.1	0.137

Minnesota also used the cost-curve analysis performed for CENRAP by Alpine Geophysics, originally included in the *CENRAP Regional Haze Control Strategy Analysis Plan* and updated in March 2007, to determine which states might have additional reasonable control strategies. The cost curves were used to perform a modeling run (the "Control Sensitivity Run") in order to determine the visibility improvement that could result from implementing certain control strategies.[9]

The following tables show which point sources are controlled in the CENRAP states that the MPCA has identified as contributing to visibility impairment in BWCAW and VNP (Iowa, Minnesota, Missouri) under the following assumptions: 1) a cost less than $5000/ton, and 2) facility emissions divided by the facility's distance from any Class I area, is greater than or equal to five (often called the Q/5D criteria). The tables include sources that are within Q/5D of either VNP or BWCAW.

The report prepared for the MPCA and Midwest RPO by EC/R, entitled "Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis," also provides documentation that the various control strategies mentioned in Attachment 2 are likely to be reasonable, at least for some states. A summary table follows the tables of units controlled in the CENRAP control sensitivity run.[10]

[9] Information on the Control Sensitivity run is available on CENRAP's Project website, http://www.cenrap.org/projects.asp, under the link entitled *Results from Control Sensitivity Run, Base18Gc1 - Cost Curve Criteria of 5k per ton, Q over 5D*

[10] Battye, W. et al (2007, July 18). Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis. Prepared for MPCA and MRPO by EC/R. http://www.ladco.org/MRPO%20Report_071807.pdf. See Table 6.5-3, page 110.

NO_X Controls, Q/5D for BWCAW and VNP

State	County	Plant Name	Point ID	Source Type for Control	Control Measure	Tons Reduced	Annualized Cost ($2005)	Cost Per Ton Reduced
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL NOR	148766	Utility Boiler - Coal/Wall	SCR	3739	$5,252,502	$1,405
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL SOU	147140	Utility Boiler - Coal/Wall - Other Coal	LNBO	1191	$2,900,440	$2,435
Iowa	Wapello	IPL - OTTUMWA GENERATING STATION	143977	Utility Boiler - Coal/Tangential	SCR	4708	$13,000,038	$2,761
Iowa	Pottawattamie	MIDAMERICAN ENERGY CO. - COUNCIL BLUFFS	143798	Utility Boiler - Coal/Wall - Other Coal	LNBO	671	$2,960,866	$4,413
Minnesota	Cook	MINNESOTA POWER - TACONITE HARBOR ENERGY	EU001	Utility Boiler - Coal/Tangential	SCR	411	$1,536,959	$3,737
Minnesota	Cook	MINNESOTA POWER - TACONITE HARBOR ENERGY	EU002	Utility Boiler - Coal/Tangential	SCR	411	$1,574,337	$3,828
Minnesota	Cook	MINNESOTA POWER - TACONITE HARBOR ENERGY	EU003	Utility Boiler - Coal/Tangential	SCR	411	$1,592,948	$3,873
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU004	Utility Boiler - Coal/Tangential - POD10	LNC3	806	$1,413,275	$1,753
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU003	Utility Boiler - Coal/Tangential - POD10	LNC3	600	$884,162	$1,474
Minnesota	Koochiching	Boise Cascade Corp - International Falls	EU320	Sulfate Pulping - Recovery Furnaces	SCR	361	$939,170	$2,603
Minnesota	St. Louis	MINNESOTA POWER INC - LASKIN ENERGY CTR	EU001	Utility Boiler - Coal/Tangential	SCR	1064	$1,346,571	$1,265
Minnesota	St. Louis	MINNESOTA POWER INC - LASKIN ENERGY CTR	EU002	Utility Boiler - Coal/Tangential	SCR	1063	$1,346,571	$1,267
Minnesota	St. Louis	EVTAC Mining - Fairlane Plant	EU042	ICI Boilers - Coke	SCR	1365	$3,142,325	$2,302
Minnesota	Sherburne	NSP - SHERBURNE GENERATING PLANT	EU002	Utility Boiler - Coal/Tangential - POD10	LNC3	998	$1,873,316	$1,877
Minnesota	Sherburne	NSP - SHERBURNE GENERATING PLANT	EU001	Utility Boiler - Coal/Tangential - POD10	LNC3	701	$1,880,449	$2,682
Missouri	Pike	HOLCIM (US) INC-CLARKSVILLE	16745	Cement Manufacturing - Wet	Mid-Kiln Firing	1808	$149,510	$83
Missouri	Randolph	ASSOCIATED ELECTRIC COOPERATIVE INC-THOM	17575	Utility Boiler - Coal/Wall - Other Coal	LNBO	682	$3,114,256	$4,563

SO_2 Controls, Q/5D for BWCAW or VNP

State	County	Plant Name	Point ID	Source Type for Control	Control Measure	Tons Reduced	Annualized Cost ($2005)	Cost Per Ton Reduced
Iowa	Muscatine	CENTRAL IOWA POWER COOP. - FAIR STATION	100125	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	4504	$5,854,468	$1,300
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL NOR	148766	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	11440	$20,886,351	$1,826
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL NOR	148765	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	7020	$13,365,237	$1,904
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL SOU	147140	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14255	$35,558,570	$2,494
Iowa	Wapello	IPL - OTTUMWA GENERATING STATION	143977	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	15894	$40,687,209	$2,560
Iowa	Louisa	MIDAMERICAN ENERGY CO. - LOUISA STATION	147281	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	12964	$36,698,267	$2,831
Iowa	Pottawattamie	MIDAMERICAN ENERGY CO. - COUNCIL BLUFFS	143798	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	12141	$36,299,373	$2,990
Iowa	Des Moines	IPL - BURLINGTON GENERATING STATION	145381	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5384	$17,059,783	$3,169
Iowa	Allamakee	IPL - LANSING GENERATING STATION	145136	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5926	$19,213,055	$3,242
Iowa	Clinton	IPL - M.L. KAPP GENERATING STATION	144559	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5036	$17,331,069	$3,441
Iowa	Linn	IPL - PRAIRIE CREEK GENERATING STATION	144096	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	3753	$13,730,673	$3,658
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU001	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	2329	$9,472,980	$4,068
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU002	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	2315	$9,472,980	$4,092
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU004	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	7403	$30,486,914	$4,118
Missouri	Clay	INDEPENDENCE POWER AND LIGHT-MISSOURI CI	5430	Utility Boilers - Very High Sulfur Content	FGD Wet Scrubber	8058	$6,232,581	$774
Missouri	Franklin	AMERENUE-LABADIE PLANT	6964	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14741	$34,190,931	$2,319

State	County	Plant Name	Point ID	Source Type for Control	Control Measure	Tons Reduced	Annualized Cost ($2005)	Cost Per Ton Reduced
Missouri	Franklin	AMERENUE-LABADIE PLANT	7408	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14988	$34,874,750	$2,327
Missouri	Franklin	AMERENUE-LABADIE PLANT	7262	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14912	$34,874,750	$2,339
Missouri	Jefferson	AMERENUE-RUSH ISLAND PLANT	11565	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	13979	$32,994,250	$2,360
Missouri	Franklin	AMERENUE-LABADIE PLANT	7087	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14285	$34,019,977	$2,382
Missouri	Henry	KANSAS CITY POWER & LIGHT CO-MONTROSE GE	7847	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	6362	$15,425,097	$2,425
Missouri	Henry	KANSAS CITY POWER & LIGHT CO-MONTROSE GE	7849	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	6191	$15,134,675	$2,445
Missouri	Jefferson	AMERENUE-RUSH ISLAND PLANT	11563	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	13276	$32,994,250	$2,485
Missouri	Henry	KANSAS CITY POWER & LIGHT CO-MONTROSE GE	7848	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5928	$14,840,835	$2,504
Missouri	St. Louis	AMERENUE-MERAMEC PLANT	21421	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	8494	$21,733,761	$2,559
Missouri	St. Louis	ANHEUSER-BUSCH INC-ST. LOUIS	20274	Bituminous/Subbituminous Coal (Industrial Boilers)	SDA	1996	$5,303,934	$2,658
Missouri	Platte	KANSAS CITY POWER & LIGHT CO-IATAN GENER	16912	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14332	$38,179,875	$2,664
Missouri	Jackson	AQUILA INC-SIBLEY GENERATING STATION	9953	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	9166	$24,430,935	$2,665
Missouri	St. Louis	AMERENUE-MERAMEC PLANT	21423	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	7081	$19,721,240	$2,785
Missouri	Randolph	ASSOCIATED ELECTRIC COOPERATIVE INC-THOM	17575	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	9469	$38,179,875	$4,032
Missouri	New Madrid	ASSOCIATED ELECTRIC COOPERATIVE INC-NEW	14944	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	8132	$33,051,234	$4,064
Missouri	New Madrid	ASSOCIATED ELECTRIC COOPERATIVE INC-NEW	14942	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	8026	$33,051,234	$4,118
Missouri	Jefferson	DOE RUN COMPANY-HERCULANEUM SMELTER	11722	Primary Metals Industry	Sulfuric Acid Plant	10653	$46,396,391	$4,355

Table 6.5-3. Summary of Visibility Impactes and Cost Effectiveness of Potential Control Measures

Emission category	Control strategy	Region	Pollutant	Average estimated visibility improvement for the four Midwest Class I areas (deciviews)	Cost effectiveness ($/ton)	Cost effectiveness per visibility improvement ($million/deciview)
EGU	EGU1	3-State	SO2	0.32	1,540	2,249
			NOX	0.06	2,037	2,585
		9-State	SO2	0.74	1,743	2,994
			NOX	0.17	1,782	2,332
	EGU2	3-State	SO2	0.41	1,775	2,281
			NOX	0.09	3,016	3,604
		9-State	SO2	0.85	1,952	3,336
			NOX	0.24	2,984	4,045
ICI boilers	ICI1	3-State	SO2	0.055	2,992	1,776
			NOX	0.043	2,537	1,327
		9-State	SO2	0.084	2,275	2,825
			NOX	0.068	1,899	2,034
	ICI Workgroup	3-State	SO2	0.089	2,731	1,618
			NOX	0.055	3,814	1,993
		9-State	SO2	0.136	2,743	3,397
			NOX	0.080	2,311	2,473
Reciprocating engines and turbines	Reciprocating engines emitting 100 tons/year or more	3-State	NOX	0.015	538	282
		9-State	NOX	0.052	506	542
	Turbines emitting 100 tons/year or more	3-State	NOX	0.008	754	395
		9-State	NOX	0.007	754	810
	Reciprocating engines emitting 10 tons/year or more	3-State	NOX	0.037	1,286	673
		9-State	NOX	0.073	1,023	1,095
	Turbines emitting 10 tons/year or more	3-State	NOX	0.011	800	419
		9-State	NOX	0.012	819	880
Agricultural sources	10% reduction	3-State	NH3	0.10	31 - 2,700	8 - 750
		9-State	NH3	0.16	31 - 2,700	18 - 1,500
	15% reduction	3-State	NH3	0.15	31 - 2,700	8 - 750
		9-State	NH3	0.25	31 - 2,700	18 - 1,500
Mobile sources	Low-NOX Reflash	3-State	NOX	0.007	241	516
		9-State	NOX	0.010	241	616
	MCDI	3-State	NOX	0.015	10,697	7,595
		9-State	NOX	0.015	2,408	4,146
	Anti-Idling	3-State	NOX	0.009	(430) - 1,700	(410) - 1,600
		9-State	NOX	0.006	(430) - 1,700	(410) - 1,600
	Cetane Additive Program	3-State	NOX	0.009	4,119	3,155
		9-State	NOX	0.008	4,119	10,553

Attachment 4: Organizations Participating in Northern Class I Consultation Process

States and Provinces
Illinois Environmental Protection Agency
Indiana Department of Environmental Management
Iowa Department of Natural Resources
Michigan Department of Environmental Quality
Minnesota Pollution Control Agency
Missouri Department of Natural Resources
North Dakota Department of Health
Wisconsin Department of Natural Resources
Ontario Ministry of the Environment

Tribes
Leech Lake Band of Ojibwe
Fond du Lac Band of Lake Superior Chippewa
Mille Lacs Band of Ojibwe
Upper and Lower Sioux Community
Red Lake Band of Chippewa
Grand Portage Band of Chippewa
Nottawaseppi Huron Band of Potawatomi

Regional Planning Organizations
Midwest Regional Planning Organization
Central Regional Air Planning Association

Federal Government
USDA Forest Service
U.S. Fish and Wildlife Service
National Park Service
USDA Forest Service
Environmental Protection Agency, Region 5

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

December 5, 2007

Mr. Brad Moore
Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Mr. Moore:

This letter is written in response to your letter dated September 19, 2007 regarding the Northern Class 1 Areas Consultation. Subsequent to the consultation process initiated by your agency, you requested a response from several states including Missouri as to our agreement or disagreement with the determination of contributing states to Minnesota Class I Areas. PM Source Apportionment Test (PSAT) analysis of Lake Area Directors Consortium 2018 modeling was cited as indicating that Missouri contributed significantly to visibility impairment at the Boundary Waters Class I Area. A marginal value of 5.2 percent total contribution of haze (based on criteria of 5 percent) was indicated.

We find we are unable to agree with your agency's finding. Review of the Causes of Haze II Study conducted by the Central States Regional Air Planning Association and the most recent PSAT analysis indicates the high impact of Minnesota sources at Voyageurs National and Boundary Waters Class I Areas, with very small impact from Missouri sources. The Area of Influence (AOI) analysis you cite also does not support the inclusion of Missouri as a significant contributor, given that only a small portion of the state is included in Level 1 of the AOI.

Based on these analyses, additional controls from Missouri sources at the same level as Minnesota sources will not be effective in improving the visibility at the Boundary Waters and Voyageurs Class I areas. Respectfully, we do not believe it would be reasonable to conduct the additional control strategy evaluations you have requested under the current SIP schedule.

We do thank you for the opportunity to participate in your consultation process. Our Regional Haze Plan provides further clarification on the information we have cited, and can be found at: http://www.dnr.mo.gov/env/apcp/docs/mo-reghaze.pdf. Should you have further questions, please contact me at (573) 751-4817 or the Air Pollution Control Program at P.O. Box 176 Jefferson City, MO 65102.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Calvin Ku
Air Quality Analysis Section Chief

CK:trt

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

October 5, 2007

Mr. Brad Moore, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Commissioner Moore:

Thank you for your letters of September 19, 2007, to Director Steven E. Chester and me regarding the Regional Haze consultation process for the northern Class I areas. Director Chester has asked me to respond to your letter.

Michigan has co-chaired the Regional Haze consultation process for the northern Class I areas with Minnesota over the last several months. Constructive dialogue between Michigan, Minnesota, and the other states listed in your letter occurred on the monthly calls. The consultation process has produced a good working relationship with our states as well as the Minnesota plan described in your letter. Michigan will be submitting our own consultation letter to you and the other states shortly.

The Michigan Department of Environmental Quality (MDEQ) appreciates the opportunity we've had to work with the Minnesota Pollution Control Agency staff on the consultation and look forward to continued work in the future as needed.

If you have any questions regarding this matter, please contact Ms. Cindy Hodges, Air Quality Division, at 517-335-1059, or you may contact me.

Sincerely,

G. Vinson Hellwig, Chief
Air Quality Division
517-373-7069

cc: Mr. Steven E. Chester, Director, MDEQ
Mr. Jim Sygo, Deputy Director, MDEQ
Ms. Cindy Hodges, MDEQ

115 6th Street NW, Suite E, Cass Lake, MN 56633
(218) 335-8200 * Fax (218) 335-8309

Commissioner Brad Moore
Minnesota Pollution Control Agency
520 Lafayette Rd. N.
St. Paul, MN 55155

October 22, 2007

Dear Commissioner Moore,

The Leech Lake Band of Ojibwe is pleased to respond to your request of documentation of consultation with the States and Tribes regarding the Northern Class I Areas Consultation.

The Leech Lake Tribal Council has appointed myself as the Air Quality Specialist to represent the Leech Lake Band in the region planning process and on the Region Planning Organization CENRAP. We have been apart of CENRAP since 2001 and share a vital interest in improving regional haze.

We are satisfied with the current consultation by the State of Minnesota for co-hosting the conference calls and disseminating information regarding regional haze and proposed controls as it relates to Minnesota's SIP. We look forward to continuing these communications and seeing progress to curb regional haze for future generations.

As a note, on October 4th, 2007 the Leech Lake Band of Ojibwe was officially granted Treatment as an Affected State Status by EPA Region V. We look forward to continuing our working relationship and discussing matters such as regional haze, facility permits, and other air quality issues to better the air quality of the Leech Lake Reservation and Minnesota.

Regards,

Brandy Toft
Air Quality Specialist
Division of Resource Management

Fields of Opportunities

STATE OF IOWA

CHESTER J. CULVER, GOVERNOR
PATTY JUDGE, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
RICHARD A. LEOPOLD, DIRECTOR

November 1, 2007

Brad Moore
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

RE: Northern Class I Areas Consultation Process

Dear Commissioner Moore:

I am writing in response to your recent letter concerning the consultation process undertaken in the context of the Regional Haze Rule (40 § CFR 51.308). Current conclusions identify Iowa as a state which reasonably contributes to visibility impairment in the two Class I areas in Minnesota, Voyageurs National Park and the Boundary Waters Canoe Area Wilderness.

Your correspondence requests that Iowa evaluate additional control measures and implement those that are reasonable under the four factors listed in 40 § CFR 51.308(d)(1)(i)(A). In particular, your letter asks Iowa to consider additional control measures for electric generating units (EGU) for SO_2 to meet approximately a 0.25 lbs/mmBtu average emission rate. The letter also requests that Iowa commit to a more detailed review of potential emission reductions from large Industrial, Commercial, and Institutional (ICI) boilers and other point sources such as reciprocating engines and turbines.

Iowa cannot commit at this time to requiring additional controls to units already in the Clean Air Interstate Rule (CAIR) program. The CAIR program permanently caps emissions from SO2 and NOx through a federal trading program. Iowa participates in CAIR in both the ozone season and the annual program. CAIR needs the opportunity to succeed without additional impediments that would hinder its implementation. Within the context of the four factor analysis, this decision is based upon the costs associated with additional EGU SO2 controls.

The LADCO/Minnesota Four-Factor analysis of cost of EGU controls, in terms of dollars per ton, provides a limited view of overall effectiveness. A more rigorous review also requires the consideration of control costs commensurate with their potential for visibility improvement. Such a measure is achieved by coupling the modeled visibility impacts of control projects with their associated costs to arrive at a dollar per deciview metric. While not available for all individual states, the report does quantify dollar per deciview costs in the nine-state region. Examining the EGU1 and EGU2 scenarios, the cost

effectiveness for SO2 ranges $2,994,000,000/dv - $3,336,000,000/dv and NOx ranges $2,332,000,000/dv - $4,045,000,000/dv for the nine-state region. Expanding this analysis beyond EGU controls, the cost effectiveness of ICI boiler controls is nearly as expensive, ranging from $2,825,000,000/dv - $3,397,000,000/dv for SO2 and $2,034,000,000/dv – 2,473,000,000/dv for NOx. In terms of dollars per ton, one estimate (EC/R's) of Iowa EGU SO2 average control costs totals $1,900/ton, a value which may be underestimated given the assumptions used by EC/R.[1] This cost is well above the estimated costs of CAIR, at $700-1200/ton.[2] Iowa does not find theses costs to be cost effective for visibility improvement.

Iowa has concluded that additional review of our ICI boilers is unwarranted. Costs across the nine-state region, in terms of dollars per deciview, exceed two billion dollars. While state specific dollar per deciview figures are not available, Iowa's projected 2018 ICI SO2 and NOx emissions represent 8.2% and 6.4%, respectively, of the total emissions within the nine-state region.[3] The combination of a low percentage of contributing emissions compounded by the necessary transport distances suggests the above ICI cost estimates would be conservative if calculated for Iowa sources alone. Such costs, in combination with a low potential for discernable visibility improvement, are unreasonable for Iowa sources to incur. Similar arguments apply to other point sources, such as reciprocating engines and combustion turbines.

The vacature of the NESHAP for ICI boilers leaves many unanswered questions. It is unproductive to work on a standard for these sources at the same time that EPA will be working on the standard. The revised NESHAP may expand the standard to include more sources. The likely co-benefits of the revised standard will also assist States with their regional haze goals.

Attachment 1 of your correspondence shows state impacts from a LADCO trajectory analysis and CENRAP PSAT modeling results. Iowa questions the numerical accuracy of a trajectory analysis due to the numerous uncertainties. A trajectory analysis is based upon theoretical air flow and does not account for chemical reactions in the atmosphere. The 2002 CENRAP PSAT[4] modeling indicates that Iowa contributes 3.7% and 3.8% to the Boundary Waters Canoe Area and Voyageurs National Park, respectively, with the majority of this visibility impairment attributable to elevated point source SO2 emissions (predominantly EGUs). In 2018 the modeled percentage contributions increase slightly to 3.9 and 4.0 percent, however, results are based upon outdated emissions forecasts. Based upon the most recent EGU forecasts[5], Iowa EGU SO2 emissions are projected to decline by approximately 15% between 2002 and 2018. Iowa finds this reduction reasonable considering the level of contribution, the distance to the Class I areas, and the timeline to achieve natural background visibility.

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[1] Battye, W. et al (2007, July 18). Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis. Prepared for MPCA and MRPO by EC/R. See Table 5.1-3 and discussion on page 27.
[2] Ibid. See Table 6.1-2, page 101.
[3] Ibid. See Tables 5.2-1 and 5.2-2, page 40.
[4] Results from Environ's August 27th, 2007 source apportionment tool.
[5] IPM3.0 results for year 2018.

In closing, I would like to reiterate that Iowa has concluded its evaluation of the feasibility of requiring additional controls for EGUs and other boilers, and has determined that no further reductions are reasonable at this time.

If you have any questions regarding this submittal, please contact Wendy Rains at (515) 281-6061 or wendy.rains@dnr.iowa.gov.

Sincerely,

Catharine Fitzsimmons

Catharine Fitzsimmons
Chief, Air Quality Bureau

cc: John Seltz, Minnesota Pollution Control Agency

Fond du Lac Reservation

October 15, 2007

Brad Moore, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

RE: Northern Class I Areas Consultation Conclusion

Dear Commissioner Moore:

The Fond du Lac Band of Lake Superior Chippewa ("the Band") wishes to respond to the Minnesota Pollution Control Agency's September 2007 letter detailing its plan for addressing regional haze in Minnesota's Class I areas and asking for a response as to the Band's satisfaction with the consultation that has occurred.

This letter is to inform you that the Band considers adequate consultation to have taken place. We appreciate your efforts in reaching out the Minnesota Tribes and respecting the unique government-to-government relationship that exists between the State of Minnesota and the Band.

Thank you for seeking our comments and input on this matter. If you have any further questions about this letter, please contact Joy Wiecks of my staff at 218-878-8008.

Sincerely,

Karen R Diver

Karen Diver
Chairwoman, Fond du Lac Reservation Business Committee

c.c. Annette Sharp, Executive Director – CENRAP
Michael Koerber, Director - Midwest RPO

Appendix 4.1: Agency Contacts Provided to FLMs

August 23, 2006

Mr. Tim Allen
U.S. Fish and Wildlife Service
7333 W. Jefferson, Suite 375
Lakewood, CO 80235

Mr. Bruce Polkowsky
National Park Service
Air Resources Division
PO Box 25287
Denver, CO 80225

Re: Regional Haze Rule Consultation with Federal Land Management Agencies

Dear Mr. Allen and Mr. Polkowsky:
The Minnesota Pollution Control Agency (MPCA) intends to continue to work in consultation with the Regional Planning Organizations (RPOs) to develop our regional haze State implementation plan (SIP). As you know, we have begun to confer with the federal land managers (FLMs) from the U.S. Fish and Wildlife Service, National Park Service, and Forest Service. We plan to continue to work cooperatively with all FLMs throughout development of the regional haze SIP, and look forward to communicating with you during these early phases as well as the formal FLMs 60-day review and consultation.

The main point of contact at the MPCA for the regional haze rule and SIP development is:

John Seltz
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155
Phone: (651) 296-7801
Email: john.seltz@pca.state.mn.us

In his absence, you can contact Mary Jean Fenske by phone at (651) 297-5472 or email mary.jean.fenske@pca.state.mn.us; you may also contact Catherine Neuschler by phone at (651) 296-7774 or email catherine.neuschler@pca.state.mn.us.

MPCA anticipates submitting the regional haze SIP by the December 2007 deadline. MPCA is currently engaged in consultation with States in the Central Regional Air Planning Association and Midwest Regional Planning Organization on the four Class I areas located in Minnesota and Michigan. BART analyses from affected facilities are due in September; control strategy analyses will begin soon.

Again, we look forward to working with you as our regional haze SIP development progresses.

Sincerely,
David Thornton
Assistant Commissioner

Appendix 5.1: Determination of Visibility Conditions

Procedures for Determining Baseline Conditions[147]

The visibility Baseline Conditions for the Worst 20% (W20%) and Best (B20%) days are calculated from the fine and coarse particulate matter concentrations measured at IMPROVE monitors from the 2000-2004 period for each Class I area following EPA's guidance.[148] Currently, each Class I area in the CENRAP domain has an associated IMPROVE monitor. The IMPROVE monitors do not directly measure visibility, but instead measure speciated fine particulate ($PM_{2.5}$) and total $PM_{2.5}$ and PM_{10} mass concentrations from which visibility is obtained through the IMPROVE equation.

Visibility conditions are estimated starting with the IMPROVE 24-hour average mass measurements for six PM species:

- Sulfate [$(NH_4)_2SO_4$];
- Particulate Nitrate [$(NH_4NO_3$];
- Organic Matter Carbon or Organic Mass by Carbon [OMC];
- Elemental Carbon [EC] or Light Absorbing Carbon [LAC];
- Other fine particulate [Soil]; and
- Coarse Matter or Coarse Mass [CM].

The IMPROVE monitors do not directly measure some of these species so assumptions are made as to how the IMPROVE measurements can be adjusted and combined to obtain these six components of light extinction.

The basic procedures for calculating the Baseline Conditions are as follows:

1. Determine whether the observed IMPROVE data for each site and year satisfies EPA's minimal data capture criteria. If there are less than three years with valid data capture for the 2000-2004 Baseline, then the Baseline Conditions cannot be calculated and data filling is needed.
2. For each of the five years of in 2000-2004 period, rank the visibility in terms of extinction or deciview using either the IMPROVE equation and monthly average f(RH) factors.
3. For the W20% days, determine the 20% most impaired visibility days for each year, and for the B20% days pull out the 20% cleanest days. With a complete yearly data capture of one sample ever three days, this would result in 24 W20% and 24 B20% days in a year.
4. For each W20% (or B20%) day in each year, calculate 24-hour average visibility extinction using the IMPROVE measurements and the IMPROVE equation, convert the daily extinction to daily deciview and then average across each year to get yearly average deciview extinction fort the W20% (or B20%) days for each valid year from the 2000-2004 period.
5. Average the annual average W20% (or B20%) days deciview across each valid year in the 2000-2004 period (minimum of 3 valid years required) to get the W20% (or B20%) Baseline Conditions.

Data Filling for Sites with Insufficient Valid Data to Calculate Baseline Conditions

Three CENRAP CIAs did not contain sufficient IMPROVE observations during the five-year 2000-2004 Baseline to have three valid years of data from which Baseline Conditions could be constructed: Breton Island, Louisiana; Boundary Waters, Minnesota and Mingo, Missouri. For these three CIAs, data filling was used to obtain sufficient data so that at least three-years of valid data were available from which

[147] Taken from ENVIRON & UCR, 2007.
[148] EPA, 2003b.

Baseline Conditions could be calculated. These data filled IMPROVE database were prepared and made available on the VIEWS website, where more information on the data filling procedures can be found.

In addition, as noted in Chapter 5, Minnesota and Michigan chose to include in the baseline conditions several days where measurements for some chemical species were not included but light extinction from measured components remained in the highest 20%.

Procedures for Determining Natural Visibility Conditions
For more information on the calculation of natural visibility conditions, please see the VIEWS website.

Appendix 5.2: Impact of Missing Data on Worst Days at Midwest Northern Class I areas[149]

Midwest RPO has identified a number of days during 2000-2004 where data capture at the Class 1 monitors was incomplete (typically, coarse mass and soil are missing species). The missing data causes the days to be excluded from the IMPROVE regional haze baseline calculations. However, the light extinction due to the remaining measured species is significant (above the 80th percentile). If these days were included in the baseline worst days, they would have a small but measurable effect on the average worst-day deciview calculation.

Table 5.2.1 summarizes these days, the measured and missing species, and the light extinction values for the non-missing components. Similarly, Table 5.2.2 summarizes the impact on 5-year baseline values if these days are retained in the regulatory dataset. Values increase from 0.25 to 0.88 dv.

Graphs 5.2.1 through 5.2.10, prepared by the MPCA, illustrate the components of the overall light extinction for the 20% worst days at Minnesota's Class I areas for each year of the baseline period 2000 – 2004 and for 2005, which MRPO added to their baseline period. The difference in the 20% worst days caused by adding the days with missing species can be seen by comparing these graphs to those in Figure 3 of the Technical Summary of Haze document that is attached as Appendix 3.1.

Coarse mass and soil are the components most frequently missing, yet they account for a small fraction of light extinction in this region of the country. It makes sense to include these days in our baseline calculations, even though the RH guidelines call for them to be excluded, because they appear to be largely dominated by anthropogenic sources. Only one of these days is driven by high organic carbon, which might indicate non-anthropogenic aerosol from wildfires. Model evaluation and control programs need to target precisely this subset of days that have the highest anthropogenic influence. Retaining these days in the dataset assures that they will receive adequate scrutiny.

The RPO Data Workgroup, which includes representatives from VIEWS and IMPROVE, have agreed that the guidelines were not meant to exclude these types of days and that retaining them is a more reasonable approach. VIEWS maintains a 'substitute' dataset to incorporate various changes to the 'regulatory' dataset, and this is a candidate change proposed to be incorporated. This substitute dataset includes other changes like the use of Voyageurs data for some missing Boundary Waters data, for example.

[149] Drawn from the information in Kenski, 2007.

Table 5.2.1: Northern Class I area Days Exceeding p80, Despite Missing Components

(2000-2004, Mm^{-1})

site[150]	date	Esoil	Eamm_no3	ELAC	ECM	Eamm_so4	EOMC	p80	dv
BOWA1	1/15/2000		75.4	4.1		20.2	8.1	16.7	24.7
BOWA1	7/22/2002	0.5		2.2	3.8	40.8	8.7	15.9	19.0
BOWA1	9/8/2002		2.5	4.4		118.5	19.8	15.9	27.5
BOWA1	9/9/2003	0.5		2.7	3.2	28.7	9.4	16.0	17.1
BOWA1	9/12/2003	0.3		1.8	2.0	29.8	8.2	16.0	16.7
BOWA1	3/25/2004		44.5	3.2		28.7	21.4	14.7	23.9
ISLE1	2/23/2000		83.0	4.9		33.7	11.4	16.4	26.7
ISLE1	8/5/2000	0.4		3.6	7.9	22.7	13.0	16.4	17.8
ISLE1*	8/12/2000	0.3		2.8	7.8	20.2	10.2	16.4	16.7
ISLE1	3/29/2001		53.8	4.0		36.7	6.9	18.0	24.3
ISLE1	4/1/2001		5.2	3.1		53.6	5.2	18.0	20.7
ISLE1	9/8/2002		1.6	4.1		132.9	18.9	16.9	28.3
ISLE1	2/26/2003	0.5	61.4		4.4	16.2		15.9	22.5
ISLE1	3/16/2003		140.3	6.2		51.6	12.3	15.9	31.0
ISLE1	7/26/2003		3.8	5.8		50.1	21.3	15.9	22.3
ISLE1	8/19/2003		3.4	5.4		62.0	21.5	15.9	23.4
ISLE1	9/9/2003		3.7	5.4		88.1	15.4	15.9	25.2
ISLE1	9/12/2003		2.2	6.7		299.7	11.7	15.9	35.0
ISLE1	3/25/2004		47.6	5.2		58.0	15.5	15.7	26.3
SENE1	3/22/2000	0.2	25.7		0.8	48.3		19.5	21.6
SENE1	12/12/2001		105.9	5.8		60.8	17.7	22.0	30.1
SENE1	9/8/2002		4.1	6.4		351.6	19.5	21.6	36.7
VOYA2	1/15/2000		67.2	3.8		17.7	8.5	17.1	23.9
VOYA2	8/25/2003		0.6	6.7		17.8	57.5	16.4	22.5
VOYA2	3/25/2004		64.9	4.8		32.6	21.8	15.4	26.1

*This day is above the 80th percentile as calculated by RHR Guidelines, but below the new 80th percentile when recalculated including days with missing data.

Table 5.2.2: Comparison of Average of 20% Worst Days

	Average Worst Day dv, per RHR	Average Worst Day dv, with Missing Data Days[a]	Difference
BOWA	19.59	19.86	0.27
ISLE	20.74	21.59	0.85
SENE	24.16	24.38	0.22
VOYA	19.27	19.48	0.21

[a]Days were selected for inclusion in this revised baseline if the extinction resulting from the sum of measured species (despite missing species) was equal or greater than the 80th percentile value as calculated according to the Regional Haze Tracking Progress Guidelines. A new 80th percentile was then calculated based on the revised dataset. To make these calculations, two data files were combined. Data for Boundary Waters are the substituted values from Scott Copeland's analysis, given in the file bowav_nia_substituted.xls found on VIEWS (ftp://vista.cira.colostate.edu/public/airquality/data/aerosol/improve/substitute/bowa/). Data for other sites are from the VIEWS raw data file, daily budgets 3_07.csv (ftp://vista.cira.colostate.edu/public/IMPROVE_RHR_Budgets_2005).

[150] BOWA1 is the IMPROVE monitor at BWCAW, ISLE1 at Isle Royale, SENE1 at Seney, and VOYA2 the IMPROVE monitor at VNP. See Chapter 6.

Figure 5.2.1: BWCAW 2000 Light Extinction by Species (20% Worst Days)

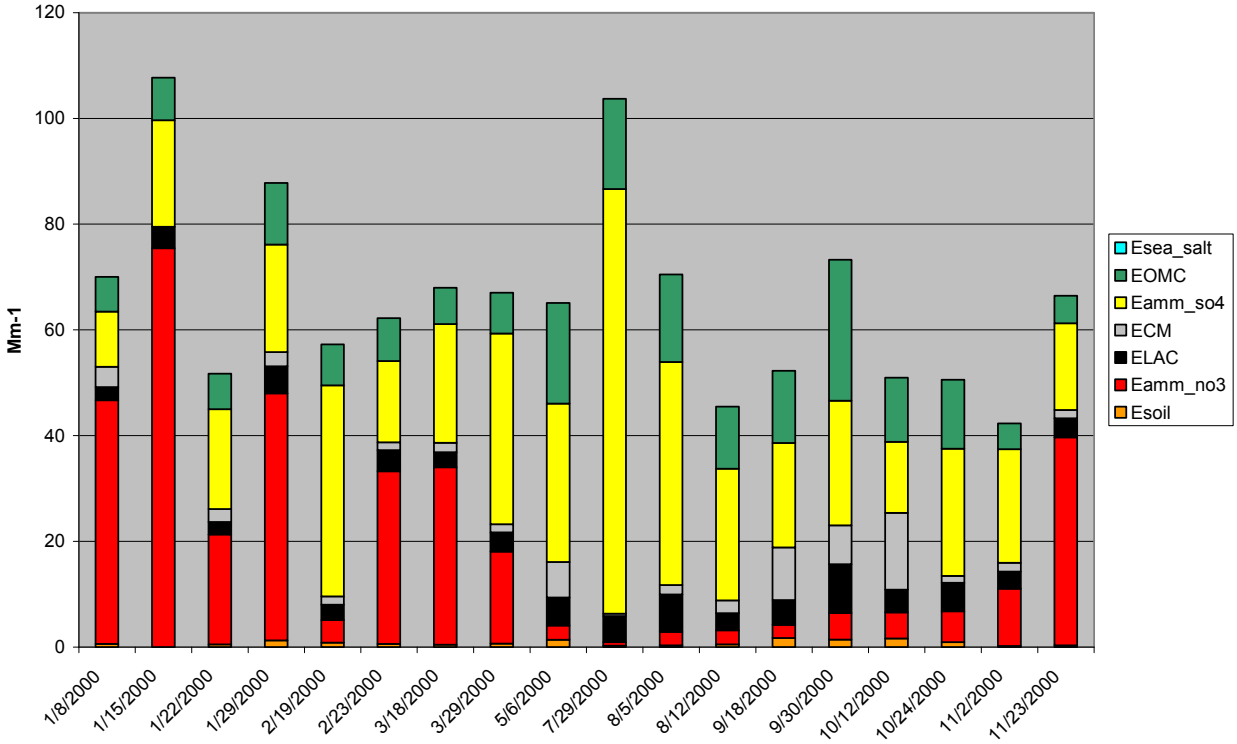


Figure 5.2.2: BWCAW 2001 Light Extinction by Species (20% Worst Days)

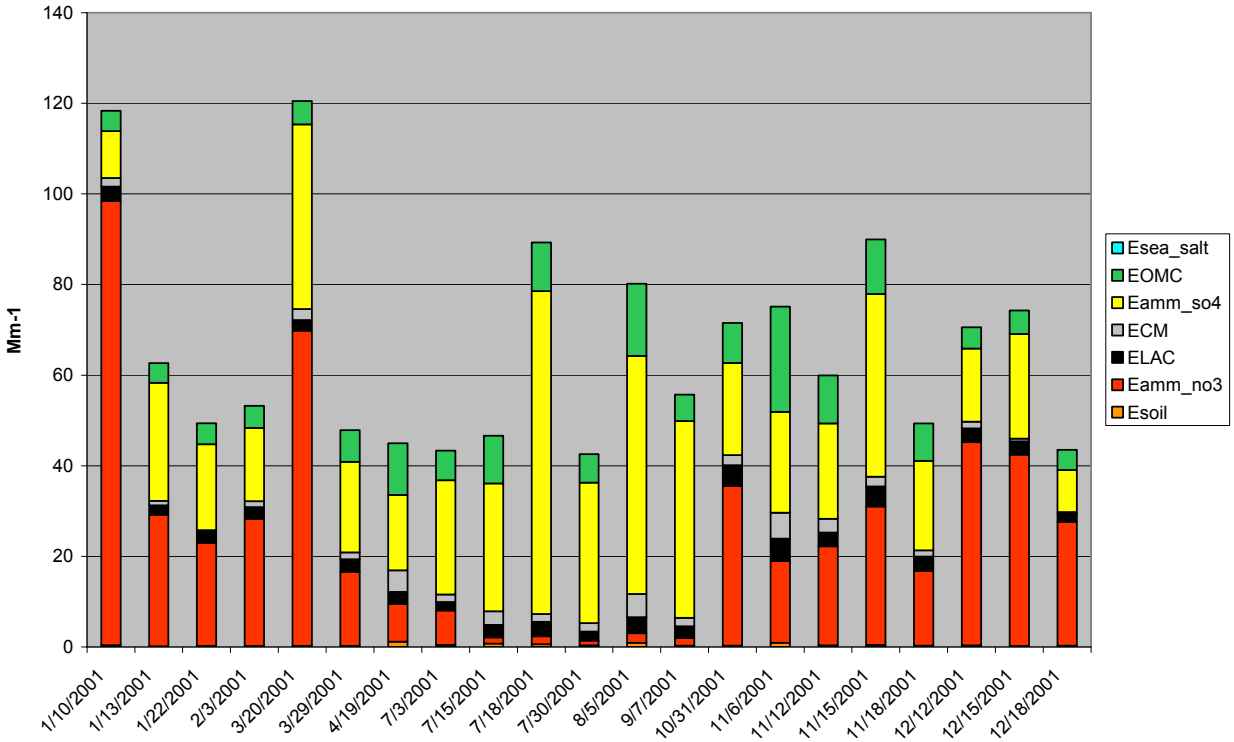


Figure 5.2.3: BWCAW 2002 Light Extinction by Species (20% Worst Days)

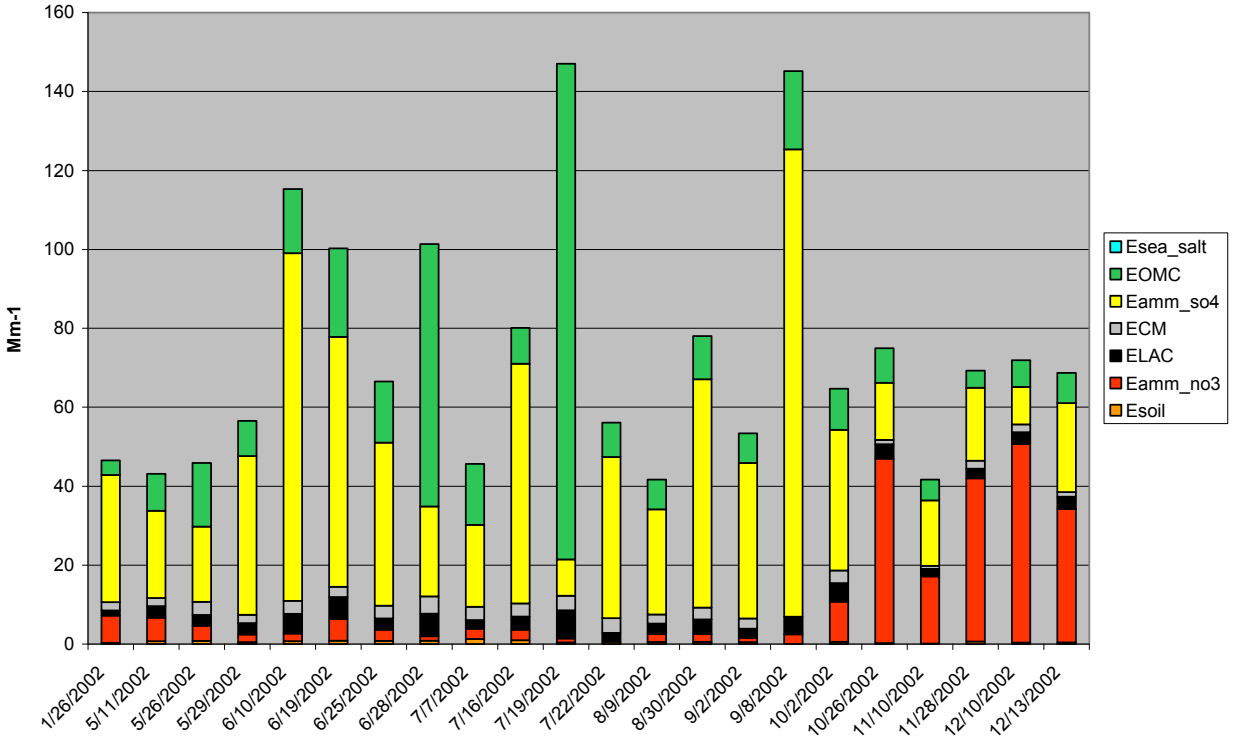


Figure 5.2.4: BWCAW 2003 Light Extinction by Species (20% Worst Days)

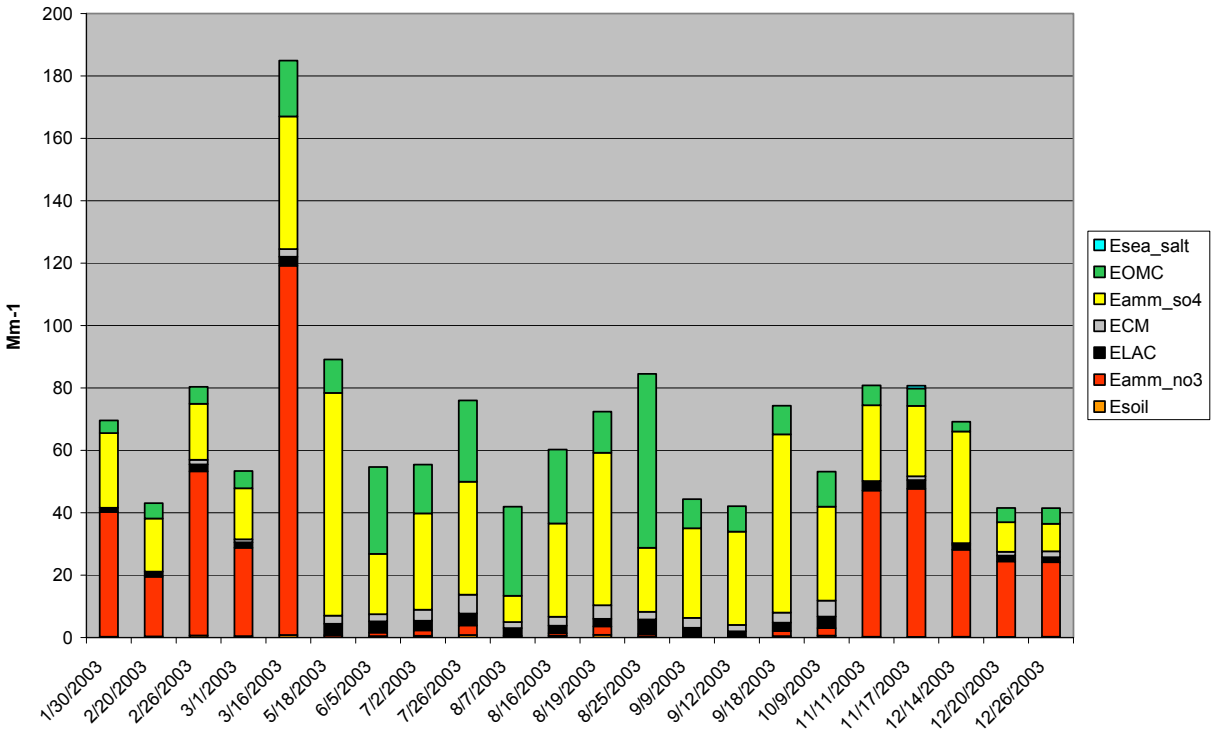


Figure 5.2.5: BWCAW 2004 Light Extinction by Species (20% Worst Days)

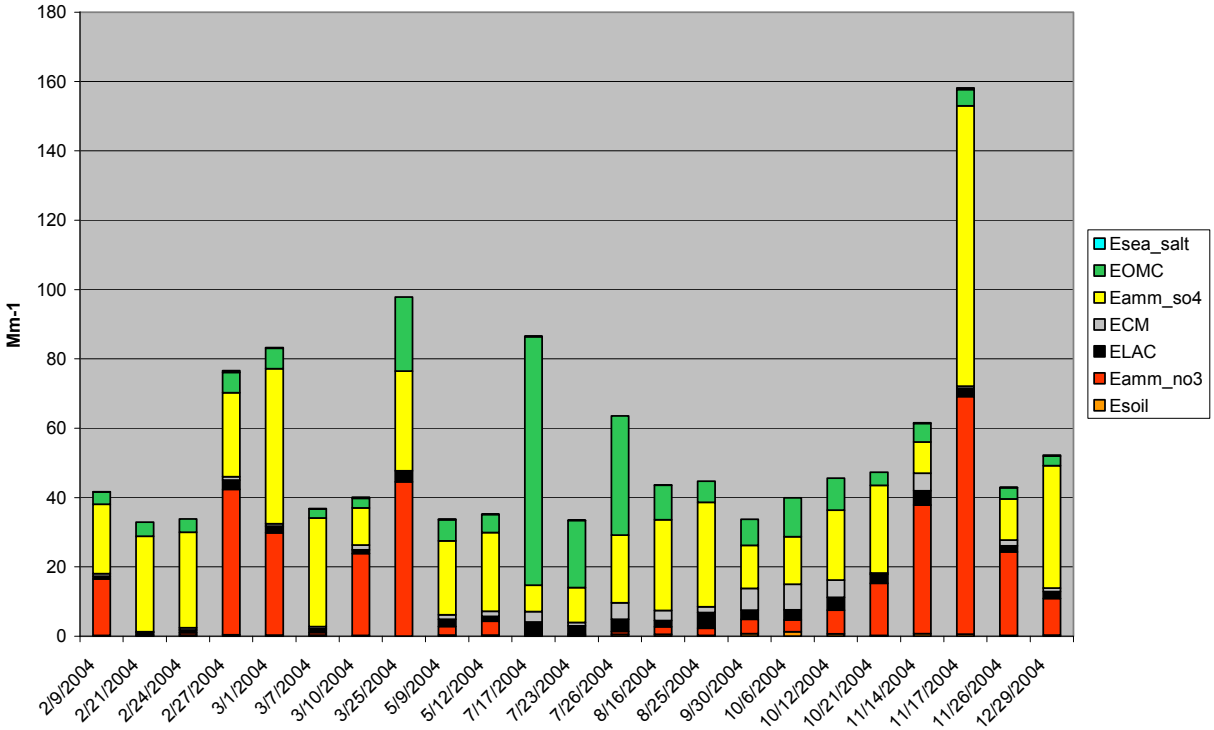


Figure 5.2.6: BWCAW 2005 Light Extinction by Species (20% Worst Days)

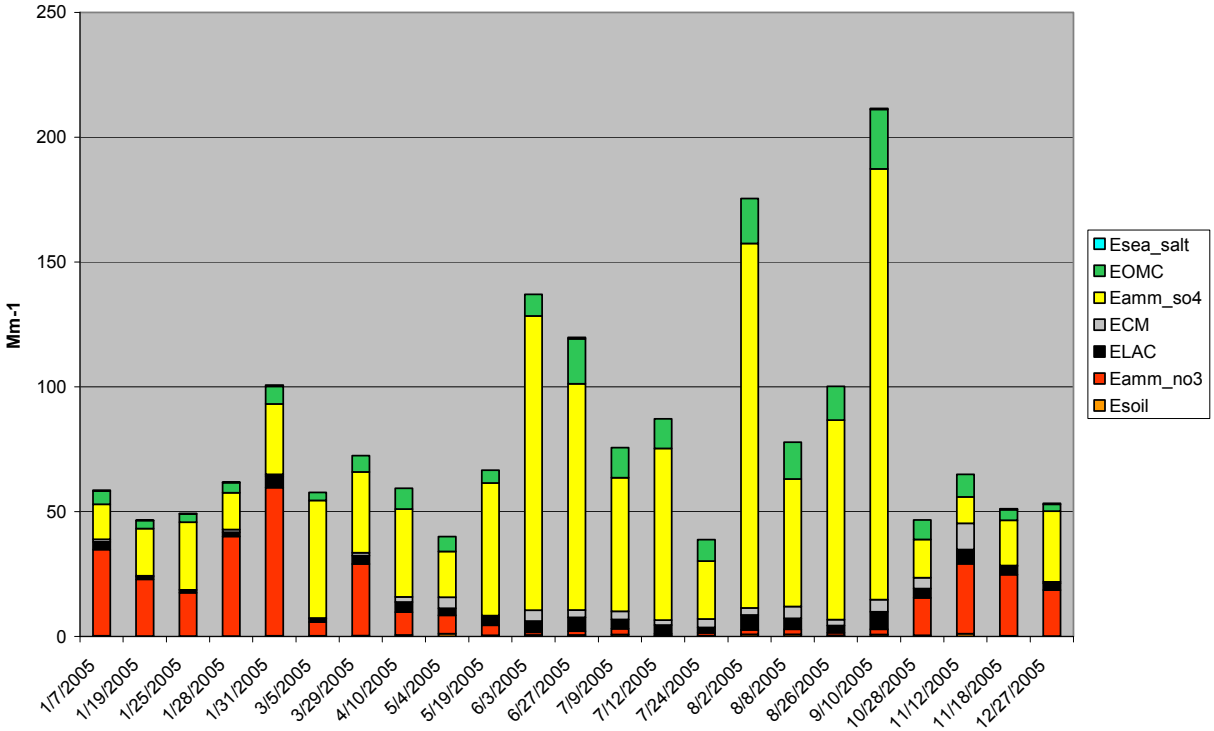


Figure 5.2.7: VNP 2000 Light Extinction by Species (20% Worst Days)

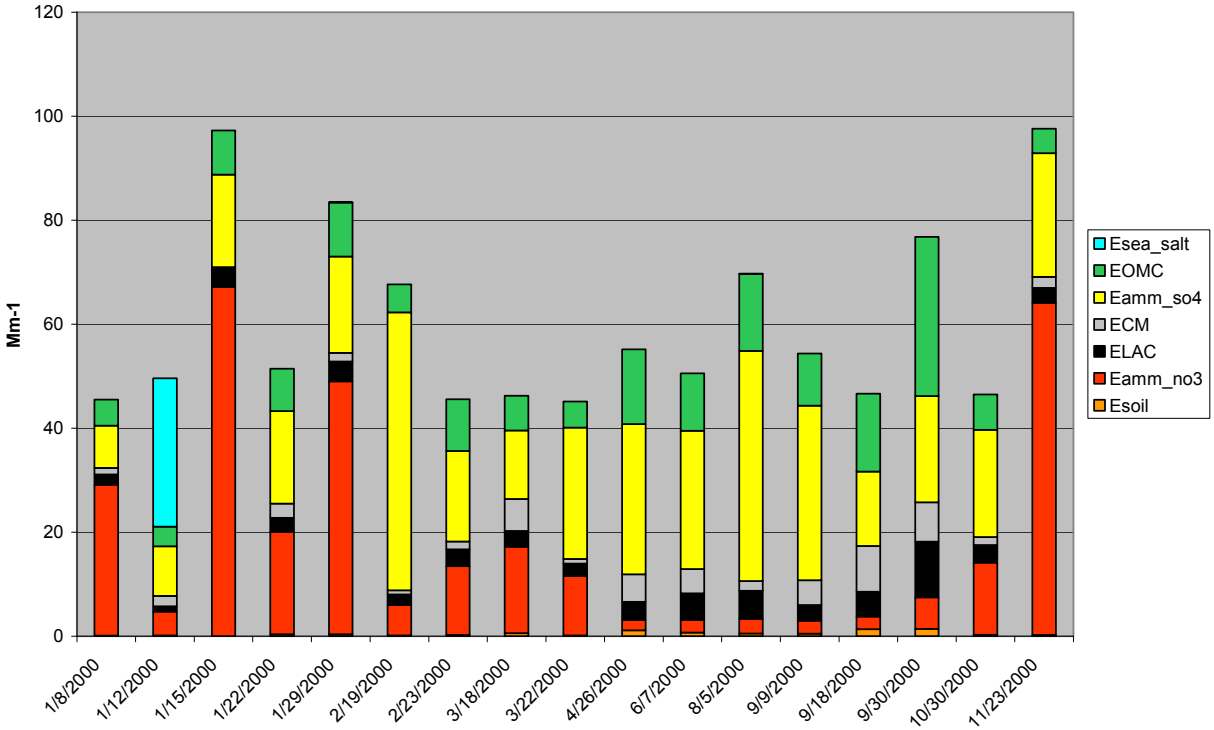


Figure 5.2.8: VNP 2001 Light Extinction by Species (20% Worst Days)

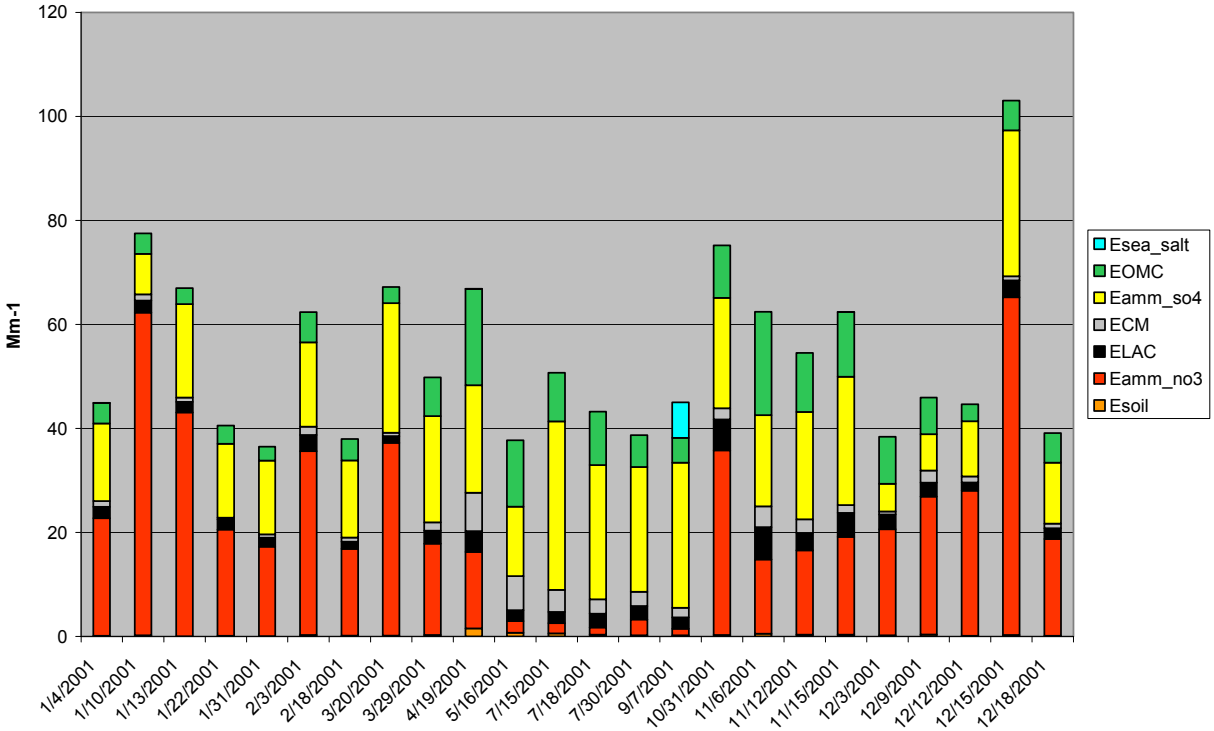


Figure 5.2.9: VNP 2002 Light Extinction by Species (20% Worst Days)

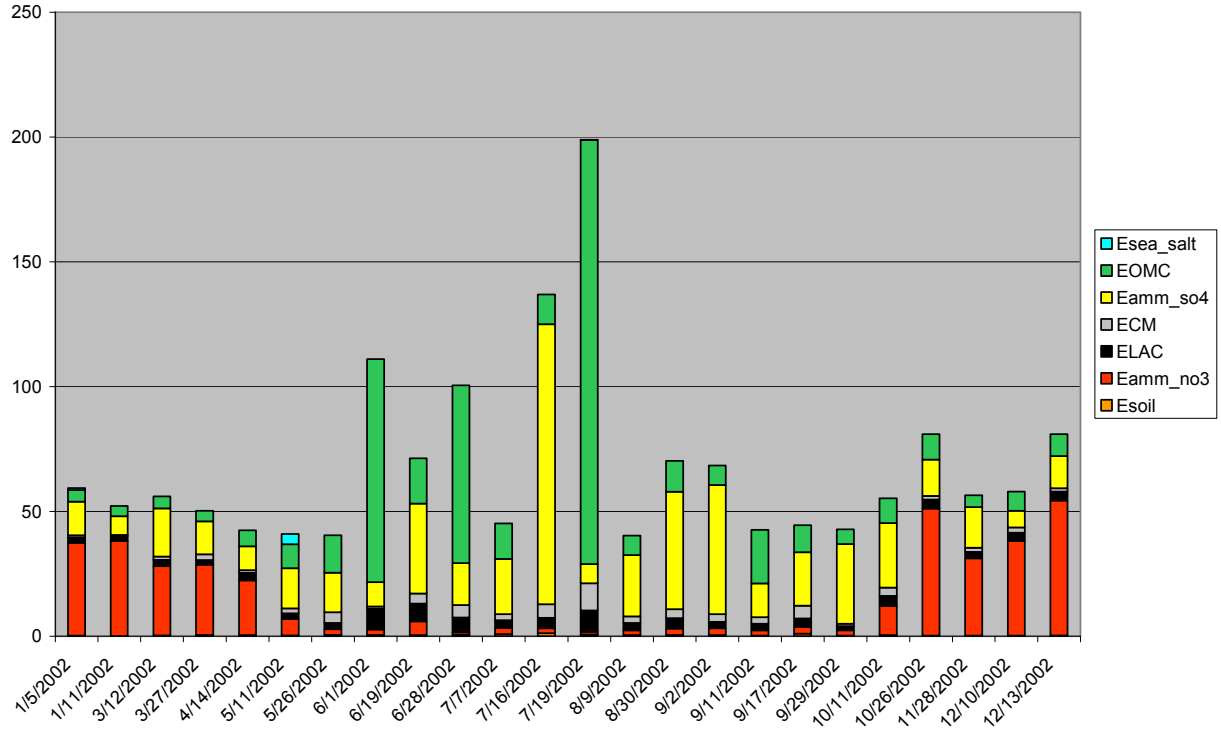


Figure 5.2.10: VNP 2003 Light Extinction by Species (20% Worst Days)

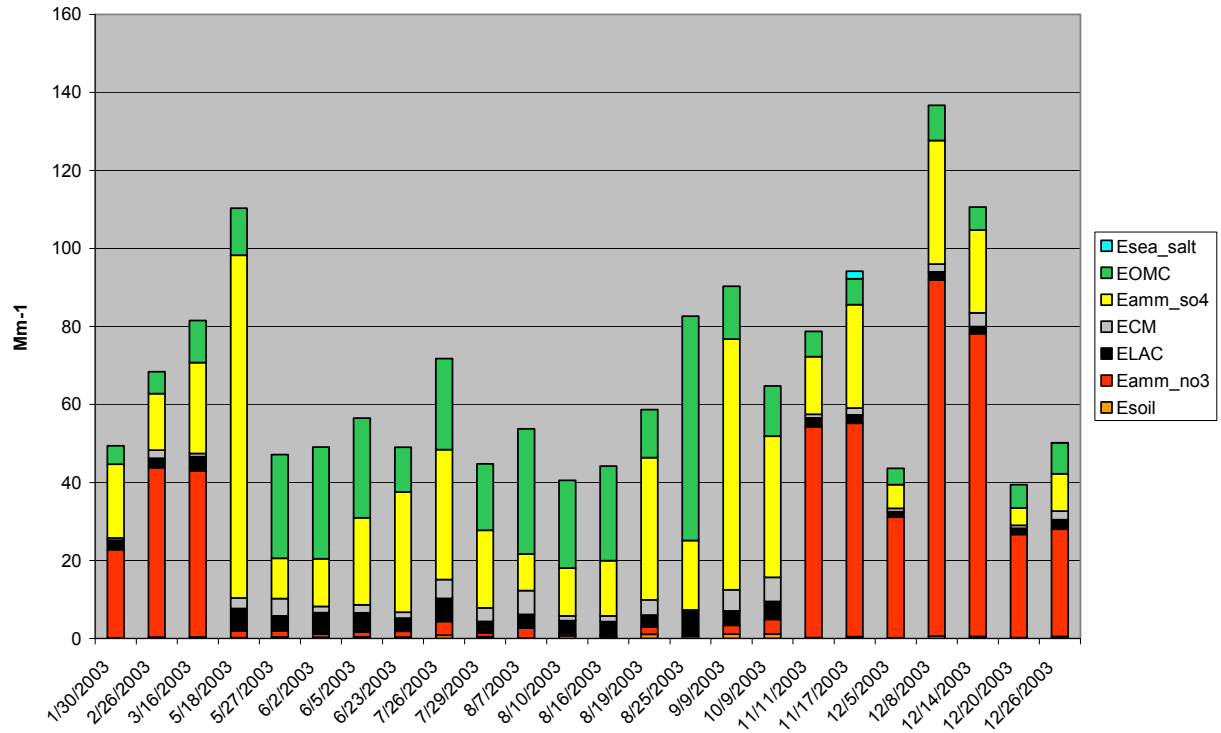


Figure 5.2.11: VNP 2004 Light Extinction by Species (20% Worst Days)

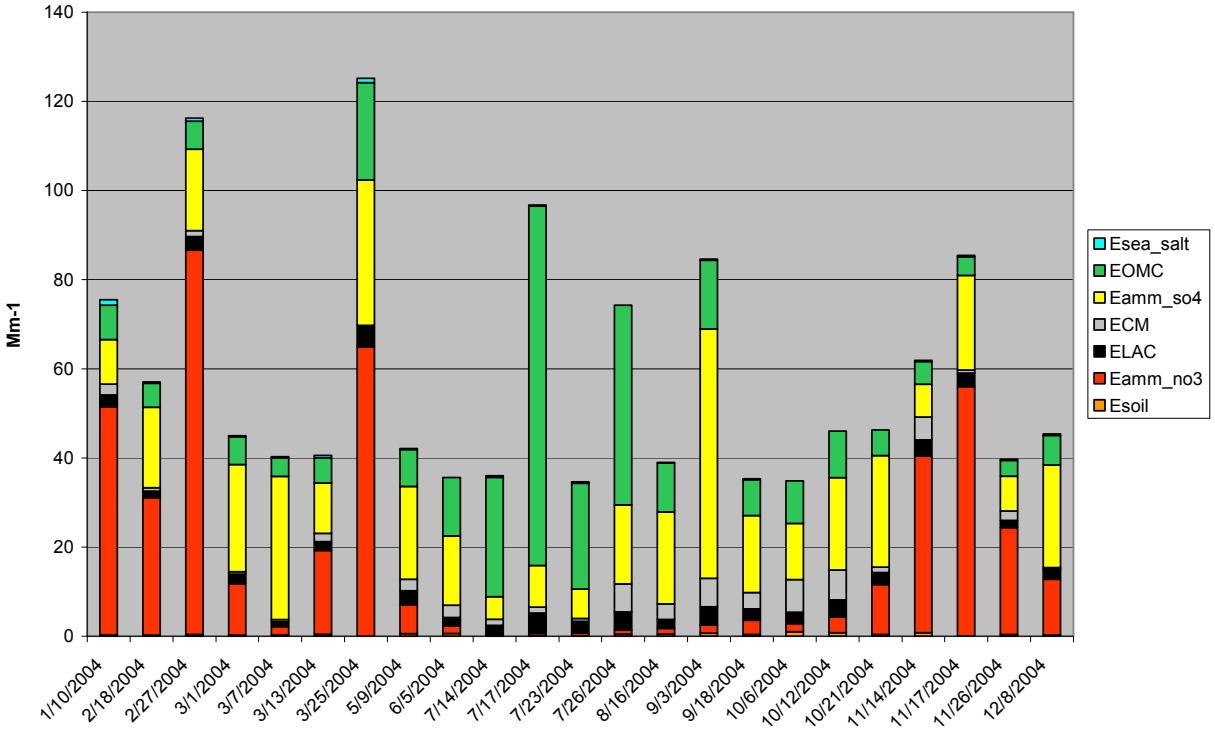
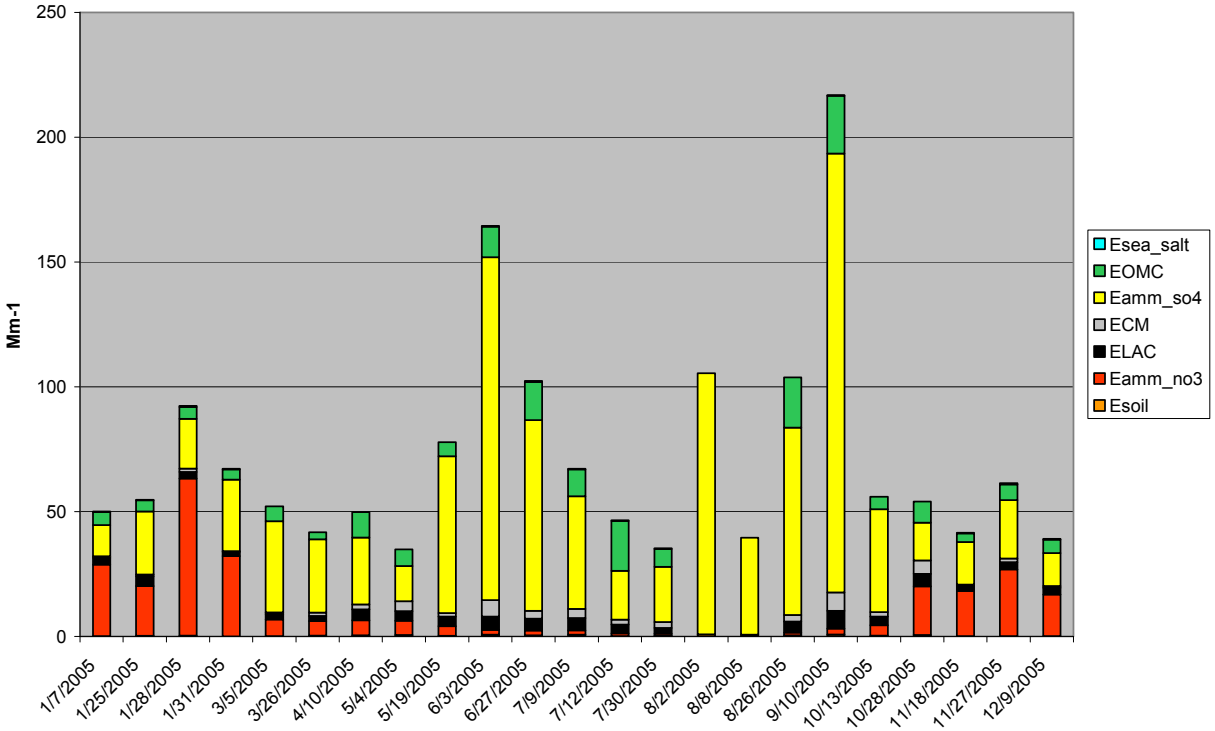


Figure 5.2.12: VNP 2005 Light Extinction by Species (20% Worst Days)



Appendix 5.3: Additional Visibility Metrics

Minnesota used the new IMPROVE equation for calculating all visibility metrics. However, visibility metrics with the old IMPROVE equation are shown here in Table 5.3.1 and 5.3.2 for comparison.

Table 5.3.1: Northern Class I areas Visibility Metrics in dv; Old IMPROVE Equation[151]

		2000	2001	2002	2003	2004	Baseline (Average)	Natural Conditions
VNP	20% Worst	18.5	18.0	19.0	19.2	17.6	18.5	11.1
	20% Best	6.3	6.2	6.7	7.0	5.4	6.3	
BWCAW	20% Worst	19.9	20.0	19.7	19.7	17.7	19.6	11.2
	20% Best	5.9	6.5	6.9	6.7	5.6	6.3	
Isle Royale	20% Worst	20.0	22.0	20.8	19.5	19.1	20.3	11.2
	20% Best	5.7	6.4	6.4	6.3	5.3	6.0	
Seney	20% Worst	22.6	24.9	24.0	23.8	22.6	23.6	11.4
	20% Best	5.8	6.1	7.3	7.5	5.8	6.5	

Table 5.3.2: Northern Class I areas URP in dv; Old IMPROVE Equation

	URP	2018 URP Goal	DV Improvement by 2018 (URP)	DV Improvement to Natural Conditions
VNP	0.12	16.6	1.9	7.4
BWCAW	0.13	17.3	2.11	8.2
Isle Royale	0.15	17.9	2.34	9.1
Seney	0.20	20.4	3.15	12.2

Tables 5.3.3 and 5.3.4 show visibility metrics for all four Northern Class I areas, calculated with the new IMPROVE equation but using only the substituted data for BWCAW, and not including any of the dropped days documented in Appendix 5.2.

Table 5.3.3: Northern Class I areas Visibility Metrics in dv; New IMPROVE Equation[152]

		2000	2001	2002	2003	2004	Baseline (Average)	Natural Conditions
VNP	20% Worst	19.1	18.6	20.1	20.2	18.4	19.3	12.2
	20% Best	7.0	7.1	7.5	7.7	6.4	7.1	4.3
BWCAW	20% Worst	19.9	20.0	20.1	20.1	17.8	19.6	11.6
	20% Best	6.0	6.9	7.0	6.5	5.8	6.4	3.4
Isle Royale	20% Worst	20.1	22.5	21.5	19.9	19.6	20.7	12.5
	20% Best	6.5	7.2	7.1	7.0	6.1	6.8	3.7
Seney	20% Worst	23.0	25.6	24.6	24.5	23.2	24.2	12.8
	20% Best	6.5	6.8	7.8	8.0	6.6	7.1	3.7

[151] VIEWS, 2005

[152] VIEWS, 2007 and *Natural Haze Levels II*. Includes only substituted data at BWCAW. Natural condition estimates were provided by Scott Copeland of CIRA in August 2007, and represent re-calculations to fix errors in previous calculations of natural conditions.

Table 5.3.4: Northern Class I areas URP in dv; New IMPROVE Equation

	URP	2018 URP Goals	DV Improvement by 2018 (URP)	DV Improvement to Natural Conditions
VNP	0.12	17.6	1.7	7.1
BWCAW	0.13	17.8	1.8	8.0
Isle Royale	0.14	18.8	1.9	8.2
Seney	0.19	21.5	2.7	11.4

Appendix 6.1: Monitoring and Data Analysis to Support the Regional Haze Rule

CENRAP MANE-VU Midwest RPO VISTAS

November 29, 2005 Final Draft
Monitoring & Data Analysis to Support the Regional Haze Rule – A Strategic Plan

I. Objectives of this RHR Monitoring Strategy

The purpose of this document is to identify the ambient haze related monitoring and data analysis activities that are required over the next 10 years of the regional haze implementation plans (i.e., over the first planning period of 2008 to 2018) to successfully implement the RHR. It provides a framework for the integration of the core national IMPROVE monitoring program and the monitoring and analysis activities that are needed to support continued improvement in the monitoring methods and understanding of the contributors to visibility impairment. This document was prepared by representatives of the five regional planning organizations (RPOs) to describe the monitoring activity needed and desired to support the collection of haze-related data of sufficient quality, representativeness, and quantity to support both the national visibility goal and the efforts of states, tribes, and RPOs in the initial regional haze SIPs and TIPs.

The document provides a list and description the RPOs expected needs to provide the federal, state, tribal, and non-governmental organizations that sponsor or conduct air quality/haze monitoring programs information to support their planning for resource needs The framework can also help illuminate potential for collaboration, efficiencies and opportunities associated with future work. This document may also be included or referenced in regional haze SIPs and TIPs to provide a description of the national monitoring activity needed to support their programs and context for the additional monitoring and analysis States and Tribes believe are necessary to support their implementation plans.

The description of the monitoring activities that are required for progress tracking and the activities the RPOs see as important for the initial, and future plans to be based on the most current science, is included to support considerations by EPA and the federal land management agencies in their fiscal planning. This document is limited to national and regional monitoring needs, so it does not attempt to include any of the site-specific or local issues that individual SIPs and TIPs may address. Table 1 following identifies the existing and future needs for regional haze monitoring and data analysis programs. The balance of the document is organized into sections that describe the objectives of ambient monitoring and data assessment, the relevance and relationship of haze monitoring to other national air monitoring programs, and a priority rating of various monitoring and assessment activities based on their support of the RHR. Two appendices are included as well.

Table 1: Priority and ranking of activities for the RHR and other air quality issues.

Activity	Scope		Issues & Requirements	Resources		Rating & (Rank TBD)[1]	
	Geographic	Temporal		Funds	Sponsors	RHR	Non-RHR
IMPROVE 110-site aerosol speciation monitoring	National	Long-term trends network	Trends tracking for each of the visibility protected class I areas;	$3.85M/yr[2] $0.55M/yr	EPA FLM	Required	Important
VIEWS data archive & analysis tools	National	Long-term	Integrated data access & analyses tools to promote consistency & efficiency in assessments among RPOs, states, tribes, etc.	$120k/year	RPOs (EPA)	Essential	Helpful
5-year technical assessment	National	Periodic	Progress assessment in 2013 will require 2 to 3 years of effort	$100k/year/RPO	RPOs (EPA)	Required	Helpful
10-year technical assessment for SIP revisions	National	Periodic	Technical assessment to support RHR SIP revisions in 2018 will require 2 to 3 years of effort	$100k/year/RPO	RPOs (EPA)	Required	Important
Ammonia/ Ammonium monitoring	CenRAP, MWRPO & VISTAS	Special studies for X years (or trends)	Ammonia emissions inventory assessment & the role of ammonia in nitrate formation	$200K/year	RPO (EPA)	Important	Important
RAIN program oversight & data analysis	MANE-VU	Long Term	Detailed aerosol & precursor gases at 3 regional scale sites	$100k/year	MANE-VU (EPA)	Important	Important
FASTNET	National	Long-term	Real-time PM event tracking component of datafed.net (Husar)	$50k/year	RPOs (EPA)	Helpful	Helpful
IMPROVE remote-area protocol sites	Regional	Long-term	Track trends for those representative of class I areas; fill spatial gaps for regions without class I areas	$35k/site/yr	State, RPO, or tribe	Site-dependent	Helpful

[1] The rating scale for the RHR includes RHR-Required, Essential for efficient RHR implementation, Important for effective RHR-SIP development and Helpful for better understanding of the causes of haze. Ratings are also suggested for other-than-RHR utility of the monitoring and data analysis activities with a different scale: Important, Helpful, Limited or Unknown utility

[2] Totals are assuming $35k/site/year for EPA for laboratory/data/QA support, and $5k/site/year for FLM operator support.

Activity	Scope		Issues & Requirements	Resources		Rating & (Rank TBD)[1]	
	Geographic	Temporal		Funds	Sponsors	RHR	Non-RHR
Carbonaceous aerosol speciation	Regional	Special studies	Source attribution for carbonaceous aerosol	$200K/yr	RPOs	Important	
Additional ambient characterization of the sources of ammonia emissions, their flux in the atmosphere, and the associated visibility and air quality impacts	National	Special studies for X years to support 5- and 10-year SIP assessments	Studies' scope to be defined in regional haze plans submitted in 2007, to include emissions inventories, additional monitoring, and modeling analyses	$500k/year	EPA (RPOs)	Required	Important
Additional ambient characterization of the sources and chemical constituents of dust and fire emissions, their flux in the atmosphere, and the associated visibility and air quality impacts	West of the 100th meridian	Special studies for X years to support 5- and 10-year SIP assessments	Studies' scope to be defined in regional haze plans submitted in 2007, to include emissions inventories, additional monitoring, and modeling analyses	$1,000k/year	EPA (RPOs)	Required	Important
IMPROVE optical monitoring	National	Long-term	Refine aerosol extinction algorithms used in the RHR		FLM, RPOs, EPA	Important	Helpful
Haze cams	National & Regional Programs	Long-term	Document actual scene and visual range in near-real time for outreach/education and research use	$6k/site/yr	RPOs, FLMs	Helpful	Helpful
Optical method development	National	Long-term	Development and deployment of routine continuous direct measurement of visibility or highly correlated indicators		EPA, RPOs	Helpful	Helpful

II. Introduction

Regional Haze Rule monitoring requirements

The goals of monitoring and data analysis activities supporting the Regional Haze Rule (RHR) are to provide the data necessary to track the expected visibility improvements resulting from emissions reductions obligations identified in regional haze plans and provide the interpretation of the available data to identify areas where progress is being made and improvements are possible. Through routine regular sampling, the RHR monitoring program must provide comprehensive, consistent and ongoing standardized tracking of species (and by analysis, the source types) causing contributing to visibility impairment. Beyond the application to calculation of the visibility metric, analysis of the variation in haze species, including contributors, source types, temporal and spatial variations and the distribution of visibility-impairing species, will provide the basic information needed to make sound decisions to support continued progress. Specific requirements of the RHR involving assessment of monitoring data are shown in Table 2.

The history of Class I area visibility and regional haze regulatory monitoring since the 1977 CAAA shows that EPA's policy choices leading to the adoption of a consistent federally-specified, operated, and funded system in their rulemakings[3] was a good approach. The process that has allowed the Interagency Monitoring of Protected Visual Environments (IMPROVE) Steering Committee to build and evolve a robust monitoring network and the sample collection and analysis systems is providing a rich accessible national dataset for analysts. Given the historical success of the IMPROVE network (discussed in more detail later), future regional haze monitoring strategies must be based on, or directly comparable to IMPROVE.

The primary monitoring network for regional haze is IMPROVE. The program currently consists of 110 aerosol visibility monitoring sites and additional instrumentation that operates according to IMPROVE protocols. The 110 IMPROVE network monitoring sites were selected to provide regionally representative coverage and data applicable to all 156 Class I federally protected areas. The additional IMPROVE protocol sites include 65 aerosol samplers, plus transmissometers, nephelometers, and cameras that fill identified data needs and enhance and fill spatial gaps in the core IMPROVE network. The first sites began collecting data in 1988, and along with the IMPROVE network expansion in 2000-01; provide the only long-term record available for tracking visibility improvement and degradation.

In recent years, additional haze related measurements have been made by a number of organizations (principally the RPOs) to supplement IMPROVE and answer fundamental questions about particle formation, speciation, transport, and precursors. All of these studies are tied through collocation, correlation, or method to the foundation provided by IMPROVE. These measurements are typically more specialized, regionally focused, and generally have a 1-3 year lifetime. Establishing a longer-term or permanent monitoring network is difficult for RPOs or States because a stable funding mechanism is not available and the available funding varies from year to year. The data collected is used in multiple

[3] Mid-1980s Attributable Haze Monitoring requirements resulting from the Environmental Defense lawsuit settlement in 1985 (date & citation) and 1999 Regional Haze (64 FR 35764, July 1, 1999) rulemakings.

ways, but the overarching goal of most monitoring programs is to provide information that can be used to develop more technically sound State and Tribal Implementation Plans (SIPs and TIPs). For example, data collected from the Midwest RPO urban organic speciation study is being used as part of a comprehensive source apportionment analysis, which includes comparison with previous source apportionment studies based on less detailed data. The study data will also be used in photochemical model evaluation, emission inventory evaluation, and model development, as well as contributing to the general characterization of organic carbon in urban environments (sources, concentrations, seasonality) and continued growth of the regional conceptual model for $PM_{2.5}$ and haze. All of these analyses are part of a weight-of-evidence approach to determining the contribution of emissions from states to downwind Class I areas, as required by 40CFR 51.308. Table 3 summarizes recent monitoring studies and programs sponsored by RPOs and stakeholders that have been implemented to investigate various aspects of regional haze.

Continuing the IMPROVE network approach provides the stable foundation for long-term tracking and trend analysis. The centralized funding used for IMPROVE supports the stability needed, but leaves individual states or Regional Planning Organizations little capability to augment or enhance IMPROVE regional haze monitoring for specific regional or subregional monitoring needs. The work done in RPO-sponsored studies shown in Table 3 in preparation for the initial SIP and TIP development has addressed regional questions, raised others and helped advance understanding, capability and capacity to address both the requirements and needs of visibility improvement. The capability to build on a stable base of IMPROVE network data will be a valuable component of improving our understanding of the processes and effects, and the efficiency, representativeness, and quality of the ambient data collection. Options for funding needed for special monitoring studies and data analyses in support of RHR implementation will need to be identified, while maintaining the resources necessary to support IMPROVE program and the essential state and RPO activities. Additional or ongoing special monitoring studies, and/or a better and more complete regional haze monitoring network will likely be needed address data gaps and questions identified as a result of the intensive study and evaluation of the analytical results and their inherent uncertainties driven by the development of the regional haze plans due at the end of 2007.

This document references the RHR requirements associated with monitoring and data analysis activities in 40CFR Part 50 Subpart P. (Reproduced in Appendix I of this document).

Table 2. Regional Haze Rule requirements needing monitoring data collection and data analysis support

	Due Date (period)	Supporting Activities	Responsibility	
Regional Haze Rule Requirements				
Reasonable Progress Goals		IMPROVE	States, Tribes	308(d)(1)
Calculation of Baseline Conditions	2005	IMPROVE	States, Tribes	308(d)(2)
Monitoring Strategy		IMPROVE	States, Tribes	308(d)(4)
Reporting of visibility monitoring data	Annually	IMPROVE	States, Tribes	308(d)(4)(iv)
Assessment of Default Rate of Progress	(5 year)		States, Tribes	308(g)(4)
Technical Progress Review	(5 year)		States, Tribes	
Comprehensive SIP /TIP Revisions	2018 (10 year)		States, Tribes	308(f)
Additional Activities				
Additional ambient characterization of the sources of dust, fire, and ammonia emissions, their flux in the atmosphere, and the associated visibility and air quality impacts	As needed, result of regional haze plans, especially west of the 100th meridian for dust and fire	IMPROVE	EPA, RPOs	308
Natural Background Level Refinement				
Model Evaluation			EPA, RPOs	

Table 3: Existing/completed RHR-related monitoring and data analysis studies

Project	Sponsor	Target Areas	Parameters	Goal	Reference/Issues
Focus Sites	VISTAS	Class 1 and Urban Areas	Mass, NO_3, SO_4, EC/OC, LAC, NO_y, CO, SO_2, O_3	Collocated with IMPROVE or STN protocol, collect continuous speciated particulate, precursor gasses and met for model performance and method evaluation	http://www.vistas-sesarm.org/documents/RPOTech0605.ppt Temporal variability in source and receptor areas Model evaluation Method comparison
RAIN	MANE-VU	Rural	Mass, SO_2, O_3, SO_4, EC/OC, b_{scat}	Characterization of transported aerosol in the NE	http://bronze.nescaum.org/committees/haze/Allen-awma_haze-rain-paper-Oct%202004_proceedings.pdf
SEARCH	EPRI	Urban and Rural pairs	Mass, SO_4, NO_3, NH_4, NO_y, O_3, NH_3 CO, SO_2, EC/OC, crustal, b_{scat}, b_{abs}	Collect data for model evaluation, characterization of PM constituents and precursors, differences between urban/rural and coastal/inland aerosols, method investigation and development.	http://www.atmospheric-research.com/studies/SEARCH/
Ammonia and HNO_3	MRPO CENRAP	9 Rural (IMPROVE), 1 Urban site	NH_3, HNO_3, SO_2, SO_4, NH_4, NO_3, Mass	Determine $PM_{2.5}$ limiting N species, characterize precursor gases, validate models and refine methods.	http://64.27.125.175/reports/rpo/MWRPOprojects/Monitoring/YearOneReport(Final).pdf
Rural and Urban OC Speciation	MRPO	2 rural sites (1 Class 1), 5 urban sites	Speciated OC	Collection and analysis of organic compounds for use in CMB and PMF source attribution analysis, determination of primary/secondary source contributions.	http://64.27.125.175/reports/rpo/MWRPOprojects/Monitoring/SENEY%20FINAL%20REPORT%20-%20UW%20MADISON1.pdf, http://64.27.125.175/reports/rpo/MWRPOprojects/Monitoring/Interim_Report.pdf
Sources of Carbon	VISTAS	Southeast Class 1 areas	SVOCs, C^{14}	Collection and analysis of organic compounds for use in CMB source attribution analysis.	http://www.vistas-sesarm.org/documents/RPOTech0605.ppt
BRAVO Study	EPA, NPS, Texas, EPRI	Big Bend National Park, ~40 remote locations in Texas	Mass, elements, ions, optical, artificial tracer, & meteorology	Assess the causes of haze at Big Bend National Park.	http://vista.cira.colostate.edu/improve/Studies/BRAVO/Studybravo.htm#FinalReport Impacts from sources in Mexico. Improved understanding of aerosol optical relationships. Improving regional met and air quality models.

III. Overall objectives of gathering and interpreting monitoring data for implementation of the regional haze rule through state and tribal plans

A continuing program of haze-related measurements and data assessment generate information required to meet five broad objectives that support regional haze rule implementation:

- Documentation of haze trends for the protected areas;
- Improved understanding of the haze-important atmospheric properties;
- Identification of particulate species and emission sources responsible for haze;
- Evaluation of regional atmospheric simulation models; and
- Utilization, integration, and communication of monitoring data and derived policy-relevant information (e.g. regional haze conceptual models).

Each of these is discussed in the sections that follow.

A. Track long-term trends as called for by the RHR

The RHR calls for tracking of haze trends for all of the mandatory federal class I areas with visibility protection as a means to assess the effectiveness of SIP and TIP mandated emission control programs designed to reduce haze levels. There are 156 such areas in 32 states. The 110-site Interagency Monitoring of Protected Visual Environment (IMPROVE) Network collects and analyzes every third day 24-hour duration particle samples at sites chosen to represent 155 of the federal class I areas[4]. Specifically, aerosol speciation data collected and processed in the manner of the IMPROVE Network from monitoring sites that are representative of the visibility protected federal class I areas are required to establish the five-year averaged baseline and subsequent five-year averages of haze levels for the haziest (worst) and clearest (best) 20% of days for as long as the regional haze rule is in effect (currently envisioned as a 60-year process).

The IMPROVE Network has been generally viewed as an efficient, uniform, and cost-effective means to generate the required class I area representative data needed for regional haze trends tracking. While long-term consistency is the hallmark of a successful trends monitoring program, a number of issues should be explored that may result in changes to monitoring for trends tracking over the next 10 years. These include: the degree to which the current monitoring sites represent the visibility-protected Class I areas, and the advisability of continued use of filter-based sampling with the current suite of analyses.

The ultimate question for the issue of representativeness is whether the current network sites adequately represent all of the class I areas without redundancy. Some of the class I areas are large and situated in complex terrains, so that even if a monitoring site represents some portion of the class I area, it may not represent conditions in other parts of the same area. This type of concern motivated Arizona to apply a share of its state and federal air quality

[4] Bering Sea Wilderness, on an uninhabited island in the Bering Sea about 200 miles off the Alaska Coast, was deemed impractical for routine monitoring

monitoring resources to expand the IMPROVE monitoring for their Class I areas[5]. On the other hand, the levels and temporal variations of some of the measured species (e.g. sulfates, nitrate, and organic carbon) are similar at multiple IMPROVE monitoring sites within a region, which raises the question of redundancy. However, simple comparisons of data from neighboring sites could be misleading since sites that currently measure similar concentrations may not do so under future emissions configurations. IMPROVE is planning to conduct a network assessment that should be complete early in 2006 to explore these concerns.

Possible changes to the IMPROVE sampling and analysis protocols need to be carefully tested and considered prior to implementation because of the possibility of introducing artifacts that would detrimentally impact trends assessments. However it is likely that some changes will be made over the next ten years. These may result from monitoring technology advancements (e.g. high-time resolution speciation instrumentation for long-term monitoring application), or changes in our understanding of atmosphere processes that identify other critical components that should be monitored (e.g. inclusion of ammonium ion monitoring), or identification of problems with the current monitoring approach that need to be rectified in order to generate data of adequate quality. In addition to understanding their impacts on the data trends, any potential change in the funding and practical consequences of potential changes need to be factored into all protocol change decisions. The IMPROVE program continually assesses and adjusts protocol for issues related to data quality, as well as considering the possible application of innovated technology or changes to characterize additional atmospheric parameters.

In summary the regional haze rule clearly calls for tracking haze trends via monitoring of aerosol species at sites representative of the class I areas over the anticipated 60-year period of haze reductions as a means to assess the effectiveness of SIP-mandated emissions changes. The 110-site IMPROVE network supplemented by some IMPROVE Protocol sites selected to represent some of the larger class I areas currently fills this need. Over the next 10 years this trends monitoring approach may evolve somewhat (i.e. minor changes in the number of sites and/or monitoring protocols), but remains necessary for implementation of the regional haze rule.

B. Support a better understanding of the atmospheric processes of importance for haze formation, movement and dissipation

The IMPROVE network provides the foundation for determination of long-term trends, detailed seasonal and spatial patterns, and ultimately compliance with the haze rule's "glide path" requirements. To go beyond that and obtain data that can be used to better understand the underlying processes of the formation, transport, and fate (removal or dissipation) of haze relevant aerosols in the boundary layer in sufficient detail to determine appropriate control strategies, we need more temporally detailed measurements than those provided by the 3rd-day integrated data provided by programs like IMPROVE, STN, or CASTNET.

[5] Aerosol monitoring funded by individual state, federal or tribal agencies at sites beyond the 110-site IMPROVE Network but using identical procedures is referred to as IMPROVE Protocol. There are about 60 IMPROVE Protocol sites that serve a number of objectives with respect to the regional haze rule and other air quality programs. Only about 8 of those sites are representative of some of the larger class I areas, so are appropriate for use in regional haze trends tracking.

RPO programs such as the VISTAS "Focus" sites or the MANE-VU "RAIN" sites provide highly time-resolved (one to 3 hours) hourly aerosol mass and composition data and related precursor gases (such as SO_2, O_3, and NO_y) that allow enhanced insight into source characterization, aerosol formation processes (SO_2 to SO_4 conversion rates, secondary organic aerosol formation, etc.), factors that drive short-term visibility, the role of meteorology in transport, and aerosol model performance and evaluation. The latter is perhaps ultimately the most important use of these enhanced sites, since it is the modeling process that is used in generation of SIPs and TIPs. Many aspects of modeling need to take into account non-linear chemical processes, meteorology, and deposition factors that are highly variable on a sub-daily time scale; 24-hour integrated samples do not allow evaluation of how well models handle these factors.

Deposition, both of haze-related aerosols and key gas-phase precursors, is another area where detailed monitoring can provide valuable insight. Wet deposition of aerosols can be through "in-cloud" processes or via a "wash-out" process (less likely). SO_2 measurements can help quantify the dry deposition of this critically important haze-aerosol precursor. With a network that has sufficient spatial scale, better understanding of the dispersion and fate of haze-related aerosols can be obtained. When coupled with actual visual range measurements ("wet" nephelometry), these data can also be used to validate and possibly improve some of the underlying assumptions used in the IMPROVE reconstructed extinction equation.

What is most notably missing in our current ability to routinely measure important haze-relevant pollutants with high time resolution is the nitrogen species -- nitrate, ammonia, nitric acid, nitrous acid, et cetera. Real-time methods exist for these parameters, but are not yet sufficiently robust for routine deployment, or do not provide sufficient data quality to justify the resources for deployment. Progress is being made in this area however, and over the next few years we expect to be able to add these parameters to these enhanced monitoring sites.

C. Identify chemical species and make connections to man-made and natural emissions sources that contribute to existing haze levels

The IMPROVE program is the primary source of data on PM composition in Class 1 areas. Its national scope and consistent protocols allow us to make valid comparisons of data from one part of the country to another and to characterize the major components of haze. Its suite of measurements is also the basis for source apportionment analyses that indicate the relative importance of various sources (e.g., power plants, wildfires, cars and trucks) to visibility impairment. These analyses are critical to the development of defensible control programs. In addition, source apportionment analyses based on ambient measurements serve as the only independent verification of modeled estimates of source contributions, as well as the emission inventories that are input to the models. Thus they provide an invaluable real-world check on these vital components of regional haze implementation plans. Source apportionment analyses also provide key information for tracking progress, since trends in source contributions must be tracked over time as controls are implemented. Without a long term consistent dataset like IMPROVE these analyses are severely hampered.

Given these required applications of IMPROVE data, it is important to note that the IMPROVE data have some weaknesses that limit our ability to discriminate among important sources. The chemical similarity of many organic carbon sources (mobile sources, industrial combustion, vegetative burning) makes them difficult to separate on the basis of the carbon components provided by IMPROVE. Because organic carbon makes up a large percentage of $PM_{2.5}$ mass, and because some emissions are from natural biogenic sources and some from anthropogenic sources, better understanding of these particular source contributions is necessary to establish realistic targets for potential reductions. More specialized monitoring, carbon analyses, and apportionment studies are required to truly discern and quantify source contributions, to separate natural from anthropogenic influences, and to adequately distinguish impacts from local sources. These issues are critical elements to be addressed to support ongoing implementation of the RHR.

The identity of the sources of dust and soil components monitored by IMPROVE is also limited by many of the same factors as organic carbon, i.e., many similar chemical sources, composition is assumed for the coarse ($PM_{2.5}$ to PM_{10}) fraction, some emissions are natural and some anthropogenic in origin, while dust and soil are at the same time, noticeable contributors to visibility impairment west of the 100^{th} meridian of longitude. Again, specialized monitoring and apportionment studies to identify sources are needed.

While the IMPROVE program, and to a lesser extent the EPA speciation network, can provide data suitable for continued tracking of trends for haze and some of its major components (sulfate and nitrate), it has more limited utility for determining sources of OC, dust, and soil components. Consequently it will be more difficult to track the effects of PM and haze controls on OC sources using this data. Differences among regions, and even among individual Class 1 areas, demand more specialized monitoring to truly discern and quantify source contributions, to separate natural from anthropogenic influences, and to adequately distinguish impacts from local sources. Resources to address these issues through ongoing apportionment studies are needed critical elements to support implementation of the RHR.

D. Evaluate regional meteorological and air quality models that are used for regional haze rule implementation

The outputs of atmospheric models are a critical component in the development of emission reduction strategies and demonstration of reasonable progress toward the goals of the Regional Haze Rule. Proposed strategies will be tested by application of the models and the most promising options will be incorporated into the $PM_{2.5}$ and regional haze State and Tribal Implementation Plans. Measurements gathered through the fine particulate monitoring networks are the reference for the critical first step in the demonstration of atmospheric model performance and the credibility of the modeling results. The quality, consistency and availability of the monitoring data affect the ability of organizations to evaluate model performance and refine the models as the understanding of the processes involved, and our ability to account for them, improves.

Implementation plans require a demonstration that the performance of the atmospheric model meets established performance goals. Model performance is constrained by measurement uncertainty, including that associated with fine particulate matter, precursor

gases, and meteorological parameters, as well as the uncertainties in emissions inventories and the representation of chemical and transport processes in the model. Monitoring data sufficient to represent the spatial variability across the domain for speciated aerosol data and optical measurements and gaseous parameter measurements are needed to test the model outputs. Sulfate measurements are comparable across the fine particulate monitoring networks but differences in existing network measurement methods contribute to measurement uncertainty for other components, especially for organic carbon mass. These differences, and others, need to be considered when evaluating model performance using data from different networks.

Proper evaluation of the models demands not only adequate spatial distribution to capture variability, but also the temporal resolution sufficient to capture the short-term variability in the contributors and the results of particle production. Most ambient monitoring has been designed around the need to demonstrate compliance with the NAAQS and track long-term trends in visibility. The species monitored that are most closely related to regional haze are primarily sampled and reported as 24-hour average data. Related gaseous data, while available as hourly concentrations, are typically not collocated with the particulate samplers. The atmospheric models generate hourly predictions and a comprehensive suite of collocated, hourly ambient data is needed to ensure adequate characterization of the diurnal profiles of the various species. The availability and comprehensiveness of the hourly gaseous, fine mass, speciated aerosol and optical data is critical to model performance evaluation.

The availability of vertical profiles of atmospheric conditions, whether gained through periodic soundings or continuously collected with the various profiler systems; provide the raw inputs to the met fields prepared for the models. On the local scale, detailed understanding of the lower atmosphere is needed to understand the causes and contributors to short term variability. Profile data collection tends to be associated with population centers and is spatially removed from the typically more remote Class 1 areas. In many cases, topography and local meteorology in the areas of interest is markedly different from the profiler locations. Collocation of profilers with fine particulate or haze related monitoring or at locations more representative of the areas of interest would provide the inputs needed to improve the met fields, investigate local influences and better evaluate latest model performance.

Remote sensing is becoming a powerful tool for the tracking of particulate and visibility related events on the scale of the regional, national and global models. The ground truth provided by meteorological, particulate, gaseous and optical measurements contribute to our ability to improve the quality of the analysis and improve the confidence in the interpretation of remote sensing data at locations between the monitor locations. The availability of the large view provided by the sensors now available, and those planned, provide another tool, that when validated against the available monitoring data, can allow a large scale check of model performance.

As the understanding of the atmosphere and the processes effecting visibility impairment improve and the representation of those processes are captured in the models, there will likely be a need for improvement in the current measurement systems and enhanced

measurement of additional species. Ammonia is recognized as a significant contributor, but ambient concentrations are not widely and consistently measured. The importance of speciated organic carbon, now only available for limited areas and time periods, will likely grow as sulfate concentrations decrease. The measurement of the impact of sea salt has not been a priority, but is being recognized as significant at coastal sites. As visibility goals are approached, the contribution of ambient gasses may become significant enough to make collocated measurements valuable.

Changes in the relative importance of contributors to visibility impairment, improvement in the understanding or the processes and their incorporation into more refined models will require that monitoring anticipate and collect the data needed to evaluate the next revisions of the models.

E. Utilization, Integration and Communication of the Monitoring Data

For each individual Class I federal area, the characterization of current baseline visibility conditions and future trends in the haziest and clearest days (Section IIIA) can be considered a critical but minimal requirement of a visibility-monitoring plan. To provide useful support for achieving the national visibility goal encoded in the 1999 Regional Haze Rule, these "minimal" monitoring data need to be efficiently stored, distributed, analyzed, integrated with other measurement or model data and utilized to support many additional objectives. These include: developing a clear understanding of the atmospheric processes, aerosol species and emissions sources which cause or contribute to regional haze (sections II B and C), developing and evaluating efficient regulatory strategies to reduce those contributions which are controllable (section IIC), providing continuing and timely feedback on the effects of emissions control programs and new source influences, adding technical support for possible future refinements to the regional haze regulatory metrics, and efficiently communicating all of the above to policy decision makers and to the public.

Efficiently integrating the monitoring data with various other sources of information provides a "weight of evidence" approach for distilling the complex technical details of the regional haze phenomenon into a "conceptual model", in which our continually evolving scientific knowledge is summarized, updated and communicated in terms that clearly define and link the goals of the regional haze rule, regional strategies to attain those goals, and short and long-term measures of performance. For example, in most eastern US Class I areas, the monitoring data indicate that reconstructed extinction on the haziest 20% of the days tends to be predominantly due to hygroscopic aerosol sulfur compounds. The EPA Clean Air Interstate Rule (CAIR) calls for SO_2 emissions reductions by 2015 of up to 70% in 28 eastern states. Have past eastern SO_2 emission reductions, such as those required by the 1990 Clean Air Act Amendments, resulted in measurable improvements in reconstructed extinction in eastern Class I areas? Can these past changes in measured extinction be reproduced by currently available emissions-based models? Are the aerosol measurements and emission-based model results consistent with results from mathematical and trajectory-based receptor models? Are future CAIR reductions in eastern SO_2 emissions expected to result in "linear" reductions in extinction, or will reductions in sulfate be partially offset by increases in aerosol nitrate at some locations? Will these improvements be sufficient to meet the 2018 reasonable progress requirements of the Regional Haze Rule in all eastern

Class I areas, and will CAIR SO_2 emissions reductions have any benefits in the central or western Class I areas? What kinds of additional control strategies have been effective or will be needed to assure progress in central and western class I areas where current baseline visibility is clearer, and where extinction is proportionately less dominated by sulfates and more influenced by a more diverse mixture of aerosol species and emission sources? What additional data and analyses are needed for areas not dominated by sulfate, such as most of the western Class I areas? How will 5- and 10-year SIP assessments and updates be accomplished, i.e., what technical data, analyses, and studies need to be completed in advance of those SIP/TIP assessment milestone dates?

Developing and clearly illustrating answers to these kinds of questions with ambient measurement data is dependent, in part, on data and metadata which are of uniformly high quality relative to data quality objectives, have clearly documented uncertainties, and are consistently collected and archived for multiple monitoring sites over long periods of time. The ability to acquire these data and associated data quality information, the potential to analyze and illustrate their spatial, temporal and compositional patterns, and the ability to merge and integrate these data with other forms of haze-related data and information are all key elements of a comprehensive visibility monitoring strategy. These critical data usage, integration and communication functions require efficient data storage/retrieval and analysis systems, such as the VIEWS (http://vista.cira.colostate.edu/views/), CATT and FASTNET (http://datafed.net) tools developed by the RPOs. These analysis tools take on added value over time, as basic IMPROVE data accumulate, and are enhanced by new IMPROVE protocol sites adding more detail for especially large or topographically complex Class I areas, or filling regional holes between Class I areas to provide better regional characterization of spatial, temporal and compositional trends. These data and analysis products are further enhanced with measurements from and access to data from various IMPROVE special studies, the regional SEARCH, FOCUS and RAIN networks, methods inter-comparisons with the EPA STN and Canadian Speciation Networks, other national or international fine and coarse particle monitoring programs, various NOAA and NASA satellite data and results from regional, national or global aerosol modeling efforts.

IV. Haze Monitoring as a Component of National (& Regional) Ambient Air Monitoring Strategy (NAAMS)

Section III summarized monitoring needs to meet the specific objectives required under the Regional Haze Rule. As measurements have been and continue to be conducted for these Class I area/visibility-centric objectives, the resultant data can and should also be viewed in the larger context of a comprehensive National Ambient Air Monitoring Strategy (NAAMS see: http://www.epa.gov/ttn/amtic/monitor.html). Through this dynamic NAAMS process, all EPA supported ambient monitoring activities are being reviewed, and in many cases revised, to provide more efficient, timely information on criteria pollutants of greatest concern from a human health perspective – ozone and $PM_{2.5}$ – and more comprehensive information on pollutant precursors and interactions.

IMPROVE data from Class I areas are the key component of the regional haze monitoring strategy, but because these Class I areas are nationally distributed, and since there is also a relatively widespread incidence of urban areas (and some regions) which fail to meet the primary health standard for $PM_{2.5}$ (15 ug/m3 annual average), IMPROVE data have taken on

an important added objective of defining both the fine mass and chemical composition of "regional background" $PM_{2.5}$. The value of these data for illuminating PM attainment issues may take on added future importance as EPA is currently considering revisions to standards which include: a large reduction in the 24-hour primary $PM_{2.5}$, a new secondary sub-daily $PM_{2.5}$ standard (for protecting visibility outside of Class I areas) and new primary and secondary $PM_{10-2.5}$ standards (see for example: http://www.epa.gov/ttn/naaqs/standards/pm/data/pmstaffpaper_20050630.pdf).

A large new $PM_{2.5}$ Speciation Trends Network (STN) was established in 1999, using methods adapted from (but not identical to) IMPROVE. STN sites are primarily urban but there are also a number of new rural speciation sites, many of which employ IMPROVE methods. These include the former CASTNet "Visibility" sites, a number of State operated "SIP" sites, and several rural and urban methods comparison sites where IMPROVE and STN sampling is conducted concurrently. The new rural IMPROVE protocol sites help fill in the national map, enhancing regional coverage in areas where Class 1 areas are sparse, and this expanded IMPROVE coverage, in turn, defines regional-scale $PM_{2.5}$ concentration and composition, enhancing the value of the urban STN data, by allowing distinction between regional and local species composition and source contributions. The urban STN data may in turn help identify the nature and location(s) of urban or industrial sources that contribute to haze in downwind class I areas, and can also help quantify the spatial and temporal scales of large regional events (forest fires, dust storms, sulfate or nitrate episodes) that affect urban and rural sites alike. Haze-inspired data tools like VIEWS, CATT and FASTNET have also been modified to accommodate analyses of STN and other haze-related PM data from other networks.

This added new usage and expanded spatial coverage of data originally collected exclusively for regional haze purposes also may impose constraints, as it becomes increasingly important to employ consistent methods (for carbon for example) at our rural and urban monitoring sites, and to maintain this consistency in the future. Conversely, the current NAAMS calls for a substantial reduction in the number of $PM_{2.5}$ speciation sites, and this may jeopardize continued operation of new rural and urban IMPROVE protocol sites which are not in Class I areas. Maintaining rural and urban IMPROVE and STN protocol sites should be given a high priority, since they already employ "consistent methods", include both fine and coarse mass, and so contribute most effectively to both regional haze and PM monitoring objectives.

While the NAAMS calls for a general reduction of filter-based speciation sites, it also emphasizes an increased number of sites (about 500) using continuous methods for ozone and $PM_{2.5}$, and a smaller number (about 75) of more comprehensive National Core monitoring (NCore Level 2) sites with continuous methods for $PM_{2.5}$ (and likely soon for $PM_{10-2.5}$) mass, species (SO_4, EC, OC, etc.) and precursor gases or tracers (low level SO_2, CO, NOy, NH_3, O_3). The NAAMS also advocates a few (3 to 10) intensive (NCore Level 1) methods evaluation and technology transfer sites. While most NCore Level 1 and Level 2 sites would be urban, some will be intentionally located in rural locations. This kind of multi species, highly time-resolved information would provide a valuable complement to existing routine regional haze monitoring programs (see section IIIB), and every effort

should be made to assure that rural NCore sites are collocated with IMPROVE sites in Class I areas.

The CASTNET (Clean Air Status and Trends Network) includes "visibility sites" which have already been folded into the IMPROVE program, and also includes "dry deposition" sites which, like IMPROVE, are rural, regionally representative and intended to evaluate long-term trends, which include some haze-relevant aerosol species (sulfate, nitrate and ammonium) and precursors (SO_2, HNO3, NH3), and which have been useful in combination with IMPROVE for evaluating spatial and temporal trends. Under NCore, a subset of the CASTNET sites will deploy and evaluate sophisticated experimental continuous methods for multiple ionic aerosol species and gaseous precursors. For purposes of assessing both regional haze and deposition and trends in acidifying compounds, every effort should be made to coordinate, and if possible collocate IMPROVE and CASTNET sites, especially if new CASTNET continuous methods prove to be effective. In a similar way, NADP wet deposition chemistry measurements (some of which are already collocated at IMPROVE sites and which have otherwise good long-term national spatial coverage) are not conducted with an objective of adding information on regional haze, but unavoidably provide useful indirect information by quantifying the removal of sulfate, nitrate, ammonium, sodium chloride and soil-related cations from the atmosphere. The combination of data from routine IMPROVE, IMPROVE special studies, STN, CASTNET, NADP, continuous PM and gaseous precursor monitoring programs, and intensive NCore Level I and II, and regional continuous monitoring projects (i.e., VISTAS Focus and MANE-VU RAIN sites) provides a much more comprehensive view of atmospheric concentrations, compositions, sources, sinks and trends than is possible from any single monitoring network.

Other valuable aerosol and haze-relevant information is provided by other national or international monitoring programs, such as airport (ASOS) visibility observations, various real-time fire monitoring and forecast systems, solar radiation networks (AERONET, USDA UVB), lidar networks, a growing number of NOAA and NASA satellite sensors and data products, and aerosol forecast models like NAAPS and WRF – none of which have implementation of regional haze regulations as an objective, but all of which provide haze-relevant information, and can add dimensions to our understanding that can't be provided by any one monitoring approach alone. Regional haze monitoring can be substantially enhanced if the resulting data can be merged and integrated with these other information sources, in the same way that haze monitoring data can provide invaluable "ground truth" to enhance the value of these other measurement programs.

Appendix I

[45 FR 80089, Dec. 2, 1980, as amended at 64 FR 35764, July 1, 1999]
[Revised as of July 1, 2004]
[CITE: 40CFR51.308]
[Page 259-267]
(**selected parts related to Visibility Monitoring**)

TITLE 40--PROTECTION OF ENVIRONMENT

CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY (CONTINUED)

PART 51_REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS

Subpart P - Protection of Visibility

Section 51.305 - Monitoring for reasonably attributable visibility impairment.

(a) For the purposes of addressing reasonably attributable visibility impairment, each State containing a mandatory Class I Federal area must include in the plan a strategy for evaluating reasonably attributable visibility impairment in any mandatory Class I Federal area by visual observation or other appropriate monitoring techniques. Such strategy must take into account current and anticipated visibility monitoring research, the availability of appropriate monitoring techniques, and such guidance as is provided by the Agency.

(b) The plan must provide for the consideration of available visibility data and must provide a mechanism for its use in decisions required by this subpart.

(4) Monitoring strategy and other implementation plan requirements. The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State. This monitoring strategy must be coordinated with the monitoring strategy required in Sec. 51.305 for reasonably attributable visibility impairment. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. The implementation plan must also provide for the following:

(i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.
(ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.
(iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.
(iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

(g) Requirements for periodic reports describing progress towards the reasonable progress goals. Each State identified in Sec. 51.300(b)(3) must submit a report to the Administrator every 5 years evaluating progress towards the reasonable progress goal for each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by emissions from within the State. The first progress report is due 5 years from submittal of the initial implementation plan addressing paragraphs (d) and (e) of this section. The progress reports must be in the form of implementation plan revisions that comply with the procedural requirements of Sec. 51.102 and Sec. 51.103. Periodic progress reports must contain at a minimum the following elements:

(1) A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the State.

(2) A summary of the emissions reductions achieved throughout the State through implementation of the measures described in paragraph (g)(1) of this section.

(3) For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired and least impaired days expressed in terms of 5-year averages of these annual values.

(i) The current visibility conditions for the most impaired and least impaired days;

(7) A review of the State's visibility monitoring strategy and any modifications to the strategy as necessary.

(i) What are the requirements for State and Federal Land Manager coordination?

(1) By November 29, 1999, the State must identify in writing to the Federal Land Managers the title of the official to which the Federal Land Manager of any mandatory Class I Federal area can submit any recommendations on the implementation of this subpart including, but not limited to:

(i) Identification of impairment of visibility in any mandatory Class I Federal area(s); and

(ii) Identification of elements for inclusion in the visibility monitoring strategy required by Sec. 51.305 and this section.

(2) The State must provide the Federal Land Manager with an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on an implementation plan (or plan revision) for regional haze required by this subpart. This consultation must include the opportunity for the affected Federal Land Managers to discuss their assessment of impairment of visibility in any mandatory Class I Federal area; and

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Appendix 7.1: Minnesota's 2002 Emissions Inventory and Methodology[153]

Methodology

The development of Minnesota's emissions inventory is documented here. Presented in the following sections is a detailed discussion on data acquisition, emission estimation, quality assurance and quality control plans, and uncertainties inherent in the inventory.

Data Acquisition

The 2002 Minnesota emission inventory includes three principal source categories: point, area, and mobile sources.

Point Source

Emission data for point sources are collected for the Minnesota criteria pollutant emission inventory (MCEI). Point sources are identified as facilities that are required to submit their annual inventories of criteria pollutants (carbon monoxide, nitrogen oxides, particulate matter, particulate matter smaller than 10 microns, lead, sulfur dioxide, and volatile organic compounds) to the MPCA According to this definition, there were a total of 1750 point sources in Minnesota in calendar year 2002.

Point sources were also extended to include 6 facilities from the 2002 tribal inventories. The tribal data were obtained from the Central Regional Air Planning Association (CENRAP) Regional Planning Organization (RPO) for the Fond du Lac Band of the Minnesota Chippewa Tribe and the Leech Lake Band of Ojibwe Tribe.

Area Source

Area sources are stationary sources that are not required to submit criteria pollutant data to the MPCA. The categories of area sources have been determined by the Great Lakes States after reviewing the Documentation For The Draft 2002 Nonpoint Source National Emission Inventory For Criteria And Hazardous Air Pollutants (March 2005 Version), Emission Inventory Improvement Program (EIIP) documents and other available information.[1,2] The emission data for area sources were obtained from surveys, literature, and the submittals for the National Emission Standards for Hazardous Air Pollutants. There are 40 categories and 126 sub-categories of area sources included in Minnesota portion of the regional emission inventory. Table A-1 lists all these categories along with activity data and information sources.

Tribal area source inventories were available from CENRAP.

Mobile Source

There are two categories of Mobile Source Emissions: on-road sources and non-road sources. Non-road sources are further divided to four subcategories: non-road equipment, aircraft, commercial marine vessels, and locomotives. MPCA used default activity data from the EPA's National Mobile Inventory Model (NMIM) for non-road equipment except snowmobile and pleasure craft.[3] For those two categories, MPCA revised the results with survey data on fuel usage from the MN Department of Natural Resources.[4] The MPCA used state-specific data to calculate emissions estimates for on-road sources, aircraft, ground support equipment, and locomotives. Emissions estimates for commercial marine vessels produced for CENRAP using state-specific data were used in place of EPA commercial marine vessel emissions estimates.

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[153] Prepared by MPCA Emission Inventory Staff. Please note that this Appendix has its own references and reference numbering, as well as table and figure numbering.

Emission Estimation

Point Sources

The approach was to first separately identify each device/process at each facility, and then estimate emissions for each device/process. The following describes the available emission estimation methods and their prioritization for use in the emission inventory.

1. Direct reporting values

2. Emission factors
   An emission factor is defined as "a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant."[5] Emission factors can be either source-specific or generic. In the current version of RAPIDS, the emission factors from the EPA Factor Information Retrieval (FIRE) Data System, version 6.24 was used as generic emission factors.[6] In most cases, these emission factors are derived from actual measurements of the emissions from representative sources/processes, and are assumed to be the long-term averages for all facilities in the source category. The source-specific emission factors are derived from source-specific emission testing, mass balance, or chemical analysis. Therefore, they are preferred for estimating emissions from a source.

   The MPCA has focused on developing source-specific emission factors. Some source-specific emission factors were developed based on the information in facility permit applications and stack testing reports. Metal Mining/Iron Ores Process and Electric Services/Coal Burning facilities were selected for this special effort. A detailed discussion on the development of emission factors and the emission inventory for these two industrial sectors was presented in two papers.[7,8]
   Since FIRE does not contain emission factors for all processes, generic emission factors from similar processes were used as state-specific emission factors for processes that didn't have generic emission factors. In processes, where only controlled emission factors were available, controlled emission factors were adopted as state-specific uncontrolled emission factors.

Area Source

Source-specific emission factors and speciation profiles were developed for each area source category. Then, the county-level activity data were imported to RAPIDS and emission estimates were calculated by using the emission factor method and speciation method.

Activity Data Pre-Treatment

There are different levels of source activity data available for different categories of area sources. Source activities are any parameters associated with the source that are surrogates for emissions. Spreadsheets were used to aggregate emission data for all similar or identical device/processes within each county.

However, for some area sources direct activity data are not available at the county level. In these cases, statewide activity data were apportioned to each county based on appropriate activity indicators. For example, fuel consumption data for Residential Fuel Combustion were calculated from the state fuel consumption by using population data. If state-level activity data were not available, appropriate surrogate activity data were used. For example, county-based population data were used as the most appropriate or applicable activity data for commercial and consumer solvent products and architectural surface coating.

Source-Specific Emission Factors and Speciation Profiles

Since FIRE versions 6.24 and 6.25 and SPECIATE version 3.2 contain few emission factors and speciation profiles for area sources, source-specific emission factors and speciation profiles were developed for the area sources included in the Minnesota portion of the regional emission inventory.[6,9]

These emission factors and speciation profiles were compiled from a review of available literature. Given first preference were EPA publications or studies, such as the 2002 NEI documents and Emission Inventory Improvement Program (EIIP) documents.[2,1] If information was not available for a source category, emission factors for similar processes or sources were used as surrogates such as the use of emission factors for commercial/institution combustion to estimate emissions from residential fuel combustion.

The resulting approaches and methodologies have been documented in the emission estimation protocols for Minnesota area sources.[10]

On-Road Sources

Minnesota's 2002 statewide air emissions inventory used the MOBILE6.2 Vehicle Emission Modeling Software.[11] County air emissions estimates are the sum of the emissions estimates for 26 vehicle types and up to 12 roadway types. The 26 vehicle types included are:

- Light Duty Gas Vehicles
- Light Duty Gas Trucks 1
- Light Duty Gas Trucks 2
- Light Duty Gas Trucks 3
- Light Duty Gas Trucks 4
- Class 2b Heavy Duty Gas Vehicles
- Class 3 Heavy Duty Gas Vehicles
- Class 4 Heavy Duty Gas Vehicles
- Class 5 Heavy Duty Gas Vehicles
- Class 6 Heavy Duty Gas Vehicles
- Class 7 Heavy Duty Gas Vehicles
- Light Duty Diesel Vehicles
- Light Duty Diesel Trucks 1 And 2
- Class 2b Heavy Duty Diesel Vehicles
- Class 3 Heavy Duty Diesel Vehicles
- Class 4 Heavy Duty Diesel Vehicles
- Class 5 Heavy Duty Diesel Vehicles
- Class 6 Heavy Duty Diesel Vehicles
- Class 7 Heavy Duty Diesel Vehicles
- Class 8a Heavy Duty Diesel Vehicles
- Class 8b Heavy Duty Diesel Vehicles
- Motorcycles
- Gas Buses (School, Transit And Urban)
- Diesel Transit And Urban Buses
- Diesel School Buses
- Light Duty Diesel Trucks 3 And 4

The twelve roadway types included are:

- Rural Interstate
- Rural Local
- Rural Major Collector
- Rural Minor Arterial
- Rural Minor Collector
- Rural Other Principal Arterial
- Urban Collector
- Urban Interstate

- Urban Local
- Urban Minor Arterial
- Urban Other Freeways and expressway
- Urban Other Principal Arterial

Non-Road Equipment

The Minnesota's 2002 statewide emissions for non-road equipment were estimated by using the EPA's National Mobile Inventory Model (NMIM) except snowmobile and pleasure craft. For those two categories, MPCA revised the emissions with survey data on fuel usage from the MN Department of Natural Resources...[3,4] County air emissions estimates are the sum of the emissions estimates for 205 equipment types in ten categories. The equipment categories included are:

- Agricultural Equipment
- Commercial Equipment
- Construction and Mining Equipment
- Industrial Equipment
- Lawn and Garden Equipment
- Logging Equipment
- Pleasure Craft
- Railroad Equipment
- Recreational Equipment

Aircraft auxiliary power units, however, were treated differently. Emissions estimates for auxiliary power units were compiled from criteria pollutant estimates generated by the Emissions and Dispersion Modeling System (EDMS) version 4.12 produced by the Federal Aviation Administration and commercial aircraft activity data received from the Bureau of Transportation Statistics.[12,13]

Aircraft, Ground Support Equipment, and Auxiliary Power Units

Commercial Aircraft

MPCA used detailed Bureau of Transportation Statistics landing and takeoff (LTO) data and the Emissions and Dispersion Modeling System (EDMS) version 4.12 model data to estimate hydrocarbon emissions.[13, 12] Hydrocarbon emissions were converted to VOC using NEI conversion factors.[14]

Air Taxis and General Aviation

MPCA used two sources of activity data to calculate Air Taxis and General Aviation air toxics emissions estimates. One source of data was the Air Traffic Activity Data System (ATADS).[15] ATADS provides the actual number of aircraft operations for a limited number of airports. Since landing and taking off are both counted as aircraft operations, the number of LTOs is one half of the number of operations. MPCA also used information from the Terminal Area Forecast System (TAF).[16] TAF provides estimates of the number of aircraft operations for a large number of airports. For airports that were included in both ATADS and TAF, the ATADS data was used instead of the TAF activity estimate. While there is some concern over using the TAF activity estimates, it is reasonable to use the TAF estimates for calculating emissions estimates for the following reasons:

- TAF is the official aviation activity forecast of the Federal Aviation Administration and is intended to be used by state authorities for planning purposes.
- TAF estimates are very similar to ATADS data for the Minnesota airports that are included in both data sets.
- Contact with airport managers in Minnesota indicated that TAF estimates are usually reasonable.
- Excluding the TAF estimates would underestimate the air taxi and general aviation activity in Minnesota because few airports are included in ATADS.

MPCA converted aircraft operations to LTOs, then applied NEI emission and speciation factors to estimate air emissions for air taxis and general aviation.[17]

Commercial Marine Vessels
Commercial marine vessel emissions are divided into *underway* and *in port* emissions. These emissions were estimated by SonomaTech, Inc. for CENRAP.[18]

Locomotives
Line haul locomotive air toxics emissions estimation was split into three categories: Class I Railroads, Class II and Class III Railroads, and Passenger railroads. Minnesota used Class I fuel consumption data from CENRAP and contacted Class II, Class III and Passenger Railroads for fuel consumption data. For each railroad category, MPCA distributed diesel fuel to the counties of operation using either a simple average or a weighted average for each railroad.

Weighted averages were used whenever the railroad was able to provide some measure to indicate which counties had greater operations than others. The most common measure provided was the number of miles of track operated by the railroad in each county. This assumes that railroads use more fuel in counties with more track than in counties with less track. Although fuel consumption is determined by many factors, the use of weighted averages based on track length should produce more accurate distribution of emissions estimates than using simple averages. Emissions estimates were calculated using NEI emission factors and Speciation factors.[19, 9]

QUALITY ASSURANCE AND QUALITY CONTROL

To develop a reasonable and comprehensive air emission inventory, procedures have been developed to provide quality assurance/quality control (QA/QC) of the data throughout the entire process of emission inventory development. Quality assurance is a planned set of external activities that are conducted by personnel not directly involved in the development of the inventory to evaluate data quality. On the other hand, quality control is a planned set of internal activities conducted by inventory development personnel to ensure data accuracy and completeness.

Quality Control

The QC procedures in the inventory development include technical reviews, accuracy checks, and use of approved standardized procedures for emission calculations. The QC activities have been performed and will be performed in the following three aspects.

Activity Data

For point sources, Minnesota emission inventory data for criteria pollutants minimizes errors in the activity data because these data are the bases for emission fees. For this reason, facilities pay close attention to the quality of these data.

For area sources, the activity data were compared with other states data. Special attention was paid to point and area source reconciliation to eliminate double counting of emissions. This is because a given category of emissions can be comprised of both point and area sources.

Emission Results

To assess the reasonableness of estimated emission results for point sources, the process-based emissions for each pollutant were examined. The extraordinary emission values were re-calculated. The activity data and emission factors, which led to the extraordinary emissions, were verified. For area sources, the emissions were calculated using the RAPIDS software and spreadsheets. The results from these two approaches were compared and evaluated until a perfect match was reached.

Quality Assurance

The QA plan included the following activities:

- Release of the process-level emission inventories to facilities. Requested their validation of the emission data and estimates. The information and comments in the facility responses were also incorporated into the emission inventory.
- Requested technical review at Great Lakes regional level. Minnesota emission estimates for 2002 were compared with the 2002 estimates from other Great Lakes States and emission estimates in previous years. Extraordinary values, missing pollutants, and extra pollutants were examined. Errors were corrected.

RESULTS AND DISCUSSIONS

The following results represent emissions from all point, area, and mobile sources in State of Minnesota.

UNCERTAINTIES

Although QA/QC plans were established to ensure optimum results, there are uncertainties in the Minnesota emission inventory. Some uncertainties are common for all emission inventories. For example, not all pollutants are included in the inventory and some emission factors are missing or are of poor quality, resulting in unrepresentative emission estimates. These uncertainties are not discussed here. The following discussions focus on three uncertainties specifically for Minnesota.

Source Classification Code Assignment

The emission data in the Minnesota emission inventory for point sources includes facility identification, device identification, process identification, and process activities, which were submitted by the individual facilities. However, the quality of a key component, source classification codes (SCC), is in question. Although these codes are reviewed by facilities in Minnesota's reporting system, the relationship of emissions and SCC codes is not extremely sensitive and an incorrect SCC assignment may still give correct emission values. MPCA staff did identify some areas where misapplied SCC codes may have impacted emission inventories.

Small Point Sources

There are 492 facilities in the MCEI with registration permit Options B. These facilities do not report process level throughput data and have no SCC assigned to them. These sources are relative small, including auto body shops, small painting shops, and others. These small point sources had to be treated as area sources.

Control Efficiencies

Most control efficiencies used in the MCEI are default values and may not reflect the operating conditions in facilities. Therefore, uncertainties are introduced for criteria pollutant emission estimates.

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Table A-1. Area source categories and information sources for their activity data.

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Fuel Combustion - Industrial	Coal Boiler	2102002000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Industrial	Distillate Oil Boiler	2102004000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Industrial	Distillate Oil IC Engine	2102004000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Industrial	Natural Gas Boiler	2102006000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Industrial	LPG Boiler	2102007000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Industrial	Kerosene Boiler	2102011000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Coal Boiler	2103002000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Distillate Oil Boiler	2103004000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Distillate Oil IC Engine	2103004000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Residual Oil Boiler	2103005000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Natural Gas Boiler	2103006000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	LPG Boiler	2103007000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Wood Boiler	2103008000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Fuel Combustion - Commercial/Institutional	Kerosene Boiler	2103011000	Apply emission factors to fuel consumed	U.S. Department of Energy & MCEI
Residential Fossil Fuel Combustion	Bituminous/Subbituminous Coal	2104002000	Apply emission factor to estimated fuel consumption	U.S. Department of Energy and Census Data
Residential Fossil Fuel Combustion	Distillate Oil	2104004000	Apply emission factor to estimated fuel consumption	U.S. Department of Energy and Census Data
Residential Fossil Fuel Combustion	Natural Gas	2104006000	Apply emission factor to estimated fuel consumption	U.S. Department of Energy and Census Data

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Residential Fossil Fuel Combustion	Liquified Petroleum Gas (LPG)	2104007000	Apply emission factor to estimated fuel consumption	U.S. Department of Energy and Census Data
Residential Fossil Fuel Combustion	Kerosene	2104011000	Apply emission factor to estimated fuel consumption	U.S. Department of Energy and Census Data
Residential Wood Burning	Fireplaces: General	2104008001	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Residential Wood Burning	Fireplaces: Insert; non-EPA certified	2104008002	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Residential Wood Burning	Fireplaces: Insert; EPA certified; non-catalytic	2104008003	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Residential Wood Burning	Fireplaces: Insert; EPA certified; catalytic	2104008004	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Residential Wood Burning	Woodstoves: General	2104008010	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Residential Wood Burning	Catalytic Woodstoves: General	2104008030	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Residential Wood Burning	Non-catalytic Woodstoves: EPA certified	2104008050	Apply emission factor to estimated fuel consumption	Survey by DNR, MPCA, & Forest Service in U.S. Department of Agriculture
Paved Roads	Total: Fugitives	2294000000	Accept EPA estimate	EPA
Unpaved Roads	Total: Fugitives	2296000000	Accept EPA estimate	EPA
Commercial Cooking	Conveyorized Charbroiling	2302002100	Accept EPA estimate	EPA
Commercial Cooking	Under-fired Charbroiling	2302002200	Accept EPA estimate	EPA
Commercial Cooking	Flat Griddle Frying	2302003000	Accept EPA estimate	EPA
Commercial Cooking	Flat Griddle Frying	2302003100	Accept EPA estimate	EPA
Commercial Cooking	Flat Griddle Frying	2302003200	Accept EPA estimate	EPA
Miscellaneous Food and Kindred Pr	Refrigeration	2302080002	Accept EPA estimate	EPA
Mineral Processes	Mineral Processes	2305070000	Accept EPA estimate	EPA

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Construction	Residential	2311010000	Accept EPA estimate	EPA
Construction	Industrial/Commercial/Institution	2311020000	Accept EPA estimate	EPA
Construction	Road Construction	2311030000	Accept EPA estimate	EPA
Architectural Surface Coating	Architectural Surface Coating	2401001000	Use per capita emission factor for VOC and apply speciation profiles to VOC emissions.	Census data
Autobody Refinishing	Autobody Refinishing	2401005000	Use per capita emission factor for VOC and apply speciation profiles to VOC emissions.	Census data
Traffic Markings	White Latex Paint	2401008000	Mass Balance based on usage data	Minnesota Department of Transportation
Traffic Markings	Yellow Latex Paint	2401008000	Mass Balance based on usage data	Minnesota Department of Transportation
Industrial Surface Coating	High Performance Surface Coating, Water Based	2401100000	Apply per capita emission factors	Census data and MCEI
Industrial Surface Coating	High Performance Surface Coating, Solvent Based	2401100999	Apply per capita emission factors	Census data and MCEI
Industrial Surface Coating	General Surface Coating	2401990000	Apply emission factors to employment data	Census data and MCEI
Solvent Cleaning	Cold, Vapor, & In-Line Cleaning	2415000000	Apply emission factors to employment data	Census data and MCEI
Solvent Cleaning	Solvent Cleanup	2415000000	Apply emission factors to employment data	Census data and MCEI
Graphic Arts	Graphic Arts	2425000000	Apply Minnesota-specific speciation factors to VOC estimates based on population	Census Data
Commercial & Consumer Product Use	Miscellaneous	2460100000	Use national per capita emission factors	Census data
Commercial & Consumer Product Use	Household Products	2460200000	Use national per capita emission factors	Census data
Commercial & Consumer Product Use	Automotive Aftermarket Products	2460400000	Use national per capita emission factors	Census data
Commercial & Consumer Product Use	Coating & Related Products	2460500000	Use national per capita emission factors	Census data
Commercial & Consumer Product Use	Adhesives & Sealants	2460600000	Use national per capita emission factors	Census data
Commercial & Consumer Product Use	FIFRA-Regulated Products	2460800000	Use national per capita emission factors	Census data

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Commercial & Consumer Product Use	Personal Care Products	2460900000	Use national per capita emission factors	Census data
Asphalt Paving	Cutback Asphalt	2461021000	Use state-specific activity data and emission factors.	Survey of asphalt suppliers
Tank & Drum Cleaning	Tank & Drum Cleaning	2461160000	Accept EPA estimate	EPA
Agricultural Pesticide Use	Corn	2461850001	Emissions calculated based on application method	Minnesota Agricultural Statistics Service
Agricultural Pesticide Use	Soybeans	2461850005	Emissions calculated based on application method	Minnesota Agricultural Statistics Service
Agricultural Pesticide Use	Spring Wheat	2461850006	Emissions calculated based on application method	Minnesota Agricultural Statistics Service
Gasoline Bulk Stations/Terminals	Breathing Loss	2501050120	Accept EPA estimate	EPA
Gasoline Service Stations	Stage I - Submerged Fill without Control	2501060051	Use EPA emission factor for VOC and some air toxics. County activity data are allocated from state fuel consumption based on vehicle registrations. Applied speciation profiles to VOC emissions for air toxics without emission factors.	Minnesota Department of Revenue
Gasoline Service Stations	Stage I - Splash Fill	2501060052	Use EPA emission factor for VOC and some air toxics. County activity data are allocated from state fuel consumption based on vehicle registrations. Applied speciation profiles to VOC emissions for air toxics without emission factors.	Minnesota Department of Revenue
Gasoline Service Stations	Stage I - Submerged Fill with Control	2501060053	Use EPA emission factor for VOC and some air toxics. County activity data are allocated from state fuel consumption based on vehicle registrations. Applied speciation profiles to VOC emissions for air toxics without emission factors.	Minnesota Department of Revenue

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Gasoline Service Stations	Stage II - Vapor Loss	2501060101	Use EPA emission factor for VOC and some air toxics. County activity data are allocated from state fuel consumption based on vehicle registrations. Applied speciation profiles to VOC emissions for air toxics without emission factors.	Minnesota Department of Revenue
Gasoline Service Stations	Stage II - Spill Loss	2501060103	Use EPA emission factor for VOC and some air toxics. County activity data are allocated from state fuel consumption based on vehicle registrations. Applied speciation profiles to VOC emissions for air toxics without emission factors.	Minnesota Department of Revenue
Gasoline Service Stations	Stage I - Tank Breathing	2501060201	Use EPA emission factor for VOC and some air toxics. County activity data are allocated from state fuel consumption based on vehicle registrations. Applied speciation profiles to VOC emissions for air toxics without emission factors.	Minnesota Department of Revenue
Gasoline Trucks in Transit	Gasoline Trucks in Transit	2505030120	Use EPA emission factor for VOC. County activity data are allocated from state fuel consumption based on population. Apply speciation profiles to VOC emissions for air toxics.	Minnesota Department of Revenue
Incineration	Commercial/Institutional	2601020000	Accept EPA estimate	EPA
Open Burning	Yard Waste - Leaf Species Unspecified	2610000100	Accept EPA estimate	EPA
Open Burning	Yard Waste - Brush Species Unspecified	2610000400	Accept EPA estimate	EPA
Open Burning	Land Clearing Debris (use 28-10-005-000 for Logging Debris Burning)	2610000500	Accept EPA estimate	EPA
Open Burning	Household Waste (use 26-10-000-xxx for Yard Wastes)	2610030000	Accept EPA estimate	EPA
Municipal Solid Waste Landfills	Flaring MSW Landfill gas	2620030000	Use generic emission factors.	MPCA

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Municipal Solid Waste Landfills	Non-flaring MSW Landfills	2620030000	Create a model based on AP-42, Section 2.4. Most concentrations of air toxics are obtained from MPCA landfill gas study.	MPCA
POTW Facilities	Entire Plant	2630020000	Apply emission factor to throughput data	MPCA
Agriculture - Crops	Tilling	2801000003	Accept EPA estimate	EPA
Agricultural Field Burning	Field Crops Unspecified	2801500100	Accept EPA estimate	EPA
Agricultural Field Burning	Alfalfa : Headfire Burning	2801500111	Accept EPA estimate	EPA
Agricultural Field Burning	Alfalfa: Backfire Burning	2801500112	Accept EPA estimate	EPA
Agricultural Field Burning	Barley: Burning Techniques Not Significant	2801500130	Accept EPA estimate	EPA
Agricultural Field Burning	Bean (red): Headfire Burning	2801500141	Accept EPA estimate	EPA
Agricultural Field Burning	Corn: Burning Techniques Not Important	2801500150	Accept EPA estimate	EPA
Agricultural Field Burning	Grasses: Burning Techniques Not Important	2801500170	Accept EPA estimate	EPA
Agricultural Field Burning	Hay (wild): Headfire Burning	2801500181	Accept EPA estimate	EPA
Agricultural Field Burning	Hay (wild): Backfire Burning	2801500182	Accept EPA estimate	EPA
Agricultural Field Burning	Oats: Headfire Burning	2801500191	Accept EPA estimate	EPA
Agricultural Field Burning	Oats: Backfire Burning	2801500192	Accept EPA estimate	EPA
Agricultural Field Burning	Pea: Headfire Burning	2801500201	Accept EPA estimate	EPA
Agricultural Field Burning	Wheat: Headfire Burning	2801500261	Accept EPA estimate	EPA
Agricultural Field Burning	Wheat: Backfire Burning	2801500262	Accept EPA estimate	EPA
Fertilizer Application	Anhydrous Ammonia	2801700001	Accept EPA estimate	EPA
Fertilizer Application	Nitrogen Solutions	2801700003	Accept EPA estimate	EPA
Fertilizer Application	Urea	2801700004	Accept EPA estimate	EPA
Fertilizer Application	Ammonium Nitrate	2801700005	Accept EPA estimate	EPA
Fertilizer Application	Ammonium Sulfate	2801700006	Accept EPA estimate	EPA
Fertilizer Application	Ammonium Thiosulfate	2801700007	Accept EPA estimate	EPA
Fertilizer Application	N-P-K (multi-grade nutrient fertilizers)	2801700010	Accept EPA estimate	EPA
Fertilizer Application	Calcium Ammonium Nitrate	2801700011	Accept EPA estimate	EPA
Fertilizer Application	Potassium Nitrate	2801700012	Accept EPA estimate	EPA
Fertilizer Application	Diammonium Phosphate	2801700013	Accept EPA estimate	EPA

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Fertilizer Application	Monoammonium Phosphate	2801700014	Accept EPA estimate	EPA
Fertilizer Application	Liquid Ammonium Polyphosphate	2801700015	Accept EPA estimate	EPA
Fertilizer Application	Miscellaneous Fertilizers	2801700099	Accept EPA estimate	EPA
Livestock	Beef cattle - finishing operatio	2805001000	Accept EPA estimate	EPA
Livestock	Poultry Operations	2805005000	Accept EPA estimate	EPA
Livestock	Hog Operations	2805015000	Accept EPA estimate	EPA
Livestock	Cattle and Calves Waste Emissions, Milk Cows	2805020001	Accept EPA estimate	EPA
Livestock	Cattle and Calves Waste Emissions, Beef Cows	2805020002	Accept EPA estimate	EPA
Livestock	Cattle and Calves Waste Emissions, Heifers and Heifer Calves	2805020003	Accept EPA estimate	EPA
Livestock	Cattle and Calves Waste Emissions, Steers, Steer Calves, Bulls, and Bull Calves	2805020004	Accept EPA estimate	EPA
Livestock	Swine production composite, Not Elsewhere Classified	2805025000	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Pullet Chicks and Pullets less than 13 weeks old	2805030001	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Pullets 13 weeks old and older but less than 20 weeks old	2805030002	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Layers	2805030003	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Broilers	2805030004	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Ducks	2805030007	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Geese	2805030008	Accept EPA estimate	EPA
Livestock	Poultry Waste Emissions, Turkeys	2805030009	Accept EPA estimate	EPA
Livestock	Horses and Ponies Waste Emissions, Not Elsewhere Classified	2805035000	Accept EPA estimate	EPA
Livestock	Sheep and Lambs Waste Emissions, Total	2805040000	Accept EPA estimate	EPA
Livestock	Goats Waste Emissions, Angora Goats	2805045002	Accept EPA estimate	EPA
Livestock	Goats Waste Emissions, Milk Goats	2805045003	Accept EPA estimate	EPA

Category Name	Sub-Category Name	SCC	Emission Estimation Method	Activity Data Information Source
Domestic Animals Waste Emissions	Cats	2806010000	Accept EPA estimate	EPA
Domestic Animals Waste Emissions	Dogs	2806015000	Accept EPA estimate	EPA
Wild Animals Waste Emissions	Bears	2807020001	Accept EPA estimate	EPA
Wild Animals Waste Emissions	Elk	2807025000	Accept EPA estimate	EPA
Wild Animals Waste Emissions	Deer	2807030000	Accept EPA estimate	EPA
Forest Wildfires	Forest Wildfires	2810001000	Accept EPA estimate	EPA
Human Perspiration and Respiratio	Total	2810010000	Accept EPA estimate	EPA
Prescribed Burning	Forest Management	2810015000	Accept EPA estimate	EPA
Prescribed Burning	Rangeland	2810020000	Accept EPA estimate	EPA
Structure Fires	Residential Structure Fires	2810030000	Use emission factors recommended by the EIIP document based on tons of material burned. Assume the average total material burned in each fire is 1.15 ton.	Minnesota Department of Public Safety
Human Cremation	Human Cremation	2810060100	Apply emission factors to estimated weight of cremated individuals	Minnesota Department of Health
Animal Cremation	Livestock & Pets	2810060200	Apply emission factors to estimated weight of cremated animals	Census of Agriculture and survey of pet crematoria.