

Minnesota – EPA Power Sector Regulations Project
Straw Base Case Modeling Assumptions
September 28, 2011

| Model Input | Base Case Assumptions | Links & Notes |
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| Electric demand growth | EPA Base Case v4.10 (calibrated to AEO 2010, which does not explicitly include MN (or other state) EERS. EPA's previous base case run predicted that the average annual growth rate from 2012 to 2030 would be 0.83% for energy demand and 0.87% for peak energy. | Projections can be found in the worksheet titled "MRO Demand" from spreadsheet titled "IPM Information for MN to EPA 09-10-11 v3" The group should examine these projections and determine what additional adjustment is needed to accommodate the EERS. |
| Natural gas prices | EPA Base Case v4.10 (calibrated to AEO 2010 reference case) EPA's previous base case run predicted that prices would be 41% greater in 2030 than they are in 2012. | When updating to AEO 2011, will need to decide what fracking scenario to choose. See worksheet titled "Fuel report" from spreadsheet titled "TR_Base_Case_Final" |
| Coal prices | EPA Base Case v4.10 (calibrated to AEO 2010). EPA's previous base case run predicted that prices would be 13% greater in 2030 than they are in 2012. | See worksheet titled "Fuel report" from spreadsheet titled "TR_Base_Case_Final" |
| Other fuel prices | EPA Base Case v4.10 (calibrated to AEO 2010). EPA's previous base case run predicted that nuclear increases 18%, biomass 11%, pet. coke 0%, waste coal 1%, oil 51% | See worksheet titled "Fuel report" from spreadsheet titled "TR_Base_Case_Final" |
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| Planned Fleet Changes | | |
| Firm capacity additions and retirements | EPA Base Case v4.10 with additional input from MN stakeholders | See worksheet titled "MN NEEDS Units" from spreadsheet titled "IPM Information for MN to EPA 09-10-11 v3" |
| Base costs of new generating capacity | AEO 2010 (should mirror EPA Base Case v4.10) | See slide 24 of ICF's presentation. |
| Renewable generation | EPA Base Case 4.10. Relies on AEO 2010, where States generally meet their RPS (reflects RPS as of Sept. 2009) | A full list of RPS assumptions by region is in Appendix 3-6 of EPA's Base Case v4.10 http://www.epa.gov/airmarkets/progsregs/epa-ipm/docs/v410/Chapter3.pdf |
| Nuclear generation | EPA Base Case v4.10 | Assumes nuclear units forced to retire after 60 years of operation. See slides 26 & 27 of ICF's presentation for additional details on constraints for new nuclear builds. |
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| Pollution Control | | |
| Costs of controls for NO _x , SO ₂ , and toxics | EPA Base Case v4.10 | See slides 28-34 of ICF's presentation. |
| Cost of controls for GHGs | EPA Base Case v4.10 with additional marginal abatement cost curves for efficiency improvements at existing | See slides 35 & 36 for details on fuel switching and CCS. Resources for the Future has developed cost curves for |

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| | facilities. | efficiency improvements at existing facilities. |
| Firmly planned controls | Stakeholder input needed. | Does this feed into MN NEEDS Units??? |
| Existing SO ₂ and NO _x regulations | None in MN. Includes existing SO ₂ and NO _x regulations in place in other states. | For a full list of other state regulations, see Appendix 3-2 of EPA's Base Case v4.10 http://www.epa.gov/airmarkets/progsregs/epa-ipm/docs/v410/Chapter3.pdf |
| Existing mercury regulations | Minnesota Mercury Reduction Act + MERP http://www.pca.state.mn.us/publications/p-p2s4-08.pdf Three largest plants (6 units) reduce Hg emissions 90% by 2015. Remaining facilities emitting >5 lb/year reduce 70-90% by 2025. | Note that the EPA Base Case v4.10 assumes 90% removal of Hg content of fuel annually for all MN coal units >250 MW |
| Existing CO ₂ regulations (MN) | MN PUC shadow carbon price for new investment (\$9-\$34/ton CO ₂). EPA's Base Case v4.10 includes a shadow price for carbon when determining what new facilities to build in all states (equivalent to \$15/ton). This is consistent with AEO 2010. RGGI cap & trade is included. CA's AB32 is not. | For MN, need to determine what number in the range should be modeled, and how that price should compare to the shadow price modeled for rest of region. For other state CO ₂ policies, see Appendix 3-9.3 |
| Grid Assumptions | | |
| Transmission capability and planned expansion | EPA Base Case v4.10 plus new lines identified as "very likely" by MISO. | For MRO specific information, see slides 11 & 12 of the ICF presentation, or see worksheet titled "MRO Transmission" from spreadsheet titled "IPM Information for MN to EPA 09-10-11 v3". For other regions, see section 3.3 of EPA's Base Case v4.10 http://www.epa.gov/airmarkets/progsregs/epa-ipm/docs/v410/Chapter3.pdf |
| Unplanned transmission expansion (to accommodate new units) | New fossil and renewable unit costs include some transmission. Renewable unit costs were estimated on a regional basis by NREL. | ICF is looking into whether can get breakdown of regional renewable generation costs from NREL. |
| Regional breakdown | MISO is working with EPA and ICF to address limitations with EPA's Base Case v4.10. | EPA's Base Case assumptions can be found on slide 7 of ICF's presentation. |
| Reserve margin requirements | 15% | See Section 3.6 of EPA's Base Case v4.10 http://www.epa.gov/airmarkets/progsregs/epa-ipm/docs/v410/Chapter3.pdf |