Greenhouse Gas Emissions Reduction

Biennial report to the Minnesota Legislature
January 2015

Minnesota Pollution Control Agency

Minnesota Department of Commerce

Legislative Charge

Minn. Statutes § 216H.07 Emissions-Reduction Attainment; Subd. 3.Biennial report.

(a) By January 15 of each odd-numbered year, the commissioners of Commerce and the Pollution Control Agency shall jointly report to the chairs and ranking minority members of the legislative committees with primary policy jurisdiction over energy and environmental issues the most recent and best available evidence identifying the level of reductions already achieved and the level necessary to achieve the reductions timetable in section 216H.02.

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Progress toward Next Generation Energy Act greenhouse gas emission reduction goals

Greenhouse gases (GHGs) are gases that, upon release to the atmosphere, warm the atmosphere and surface of the planet, leading to alterations in the earth's climate.

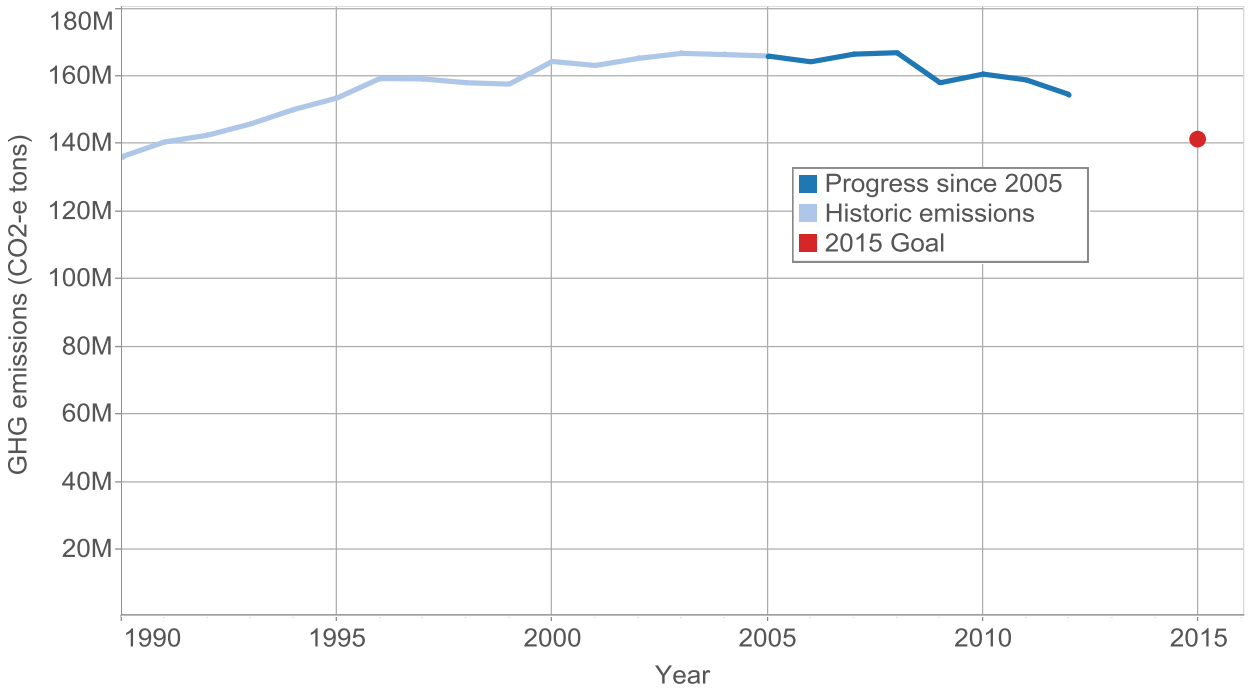
GHG emissions have declined 7% since 2005.

The Minnesota Pollution Control Agency (MPCA) and Minnesota Department of Commerce Division of Energy Resources (Commerce) are required to report on statewide progress toward the greenhouse gas reduction goals established in the Next Generation Energy Act of 2007 (Minn. Stat. § 216H.02). This act established a 2015 reduction goal 15 percent below 2005 emissions. The longer term goals of the Next Generation Energy Act are to reduce emissions 30% below 2005 emissions by 2025, and 80% below 2005 emissions by 2050.

To track progress toward the Next Generation Energy Act reduction goals, the MPCA estimates and reports emissions of carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), and two classes of compounds known as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

GHG emissions in 2012 totaled 154 million CO_2-equivalent tons[1] (CO_2-e). Between 2005 and 2012[2], GHG emissions from Minnesota declined by 11 million tons CO_2-e, or about 7 percent, though some reductions may not persist, such as the decreased emissions resulting from the outage of a coal-fired unit at Xcel Energy's Sherburne County electricity generation facility.

Tracking progress on reducing Minnesota greenhouse gas emissions



[1] *A CO_2-equivalent (CO_2-e) ton is a term used to compare emissions of different greenhouse gases by standardizing their warming effects.*

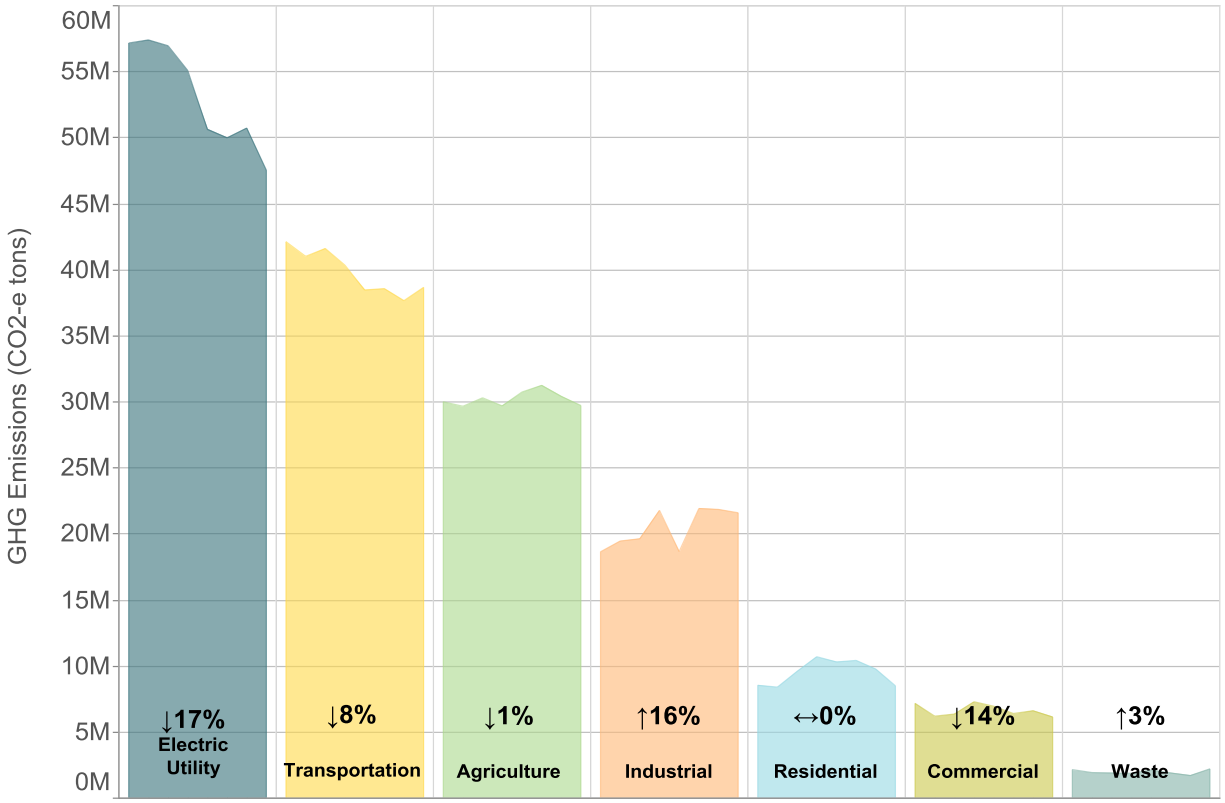
[2] *Current data reporting and analysis procedures result in about a two year lag in tabulation of calendar year emissions.*

Sources of greenhouse gas emissions in Minnesota

The MPCA's GHG Emission Inventory groups GHG emissions in the agricultural, commercial, electric generation, industrial, residential, transportation, and waste sectors.

The electric power sector and transportation sector together account for 56 percent of 2012 emissions. Most of the reductions in state-level GHG emissions also occurred in the electric power and transportation sectors. It is important to note that emissions from using electricity are counted in the electric utility sector rather than distributed to the consumers in the other sectors.

Greenhouse gas emission changes by economic sectors: 2005-2012



Economic sector	Percent of 2012 total	Sector description
Electric utility	31%	Combustion of fuel for generation of electricity, all emissions from electricity consumption in Minnesota, including electricity imported from other states
Transportation	25%	Fuel combustion, air conditioning leakage, natural gas pipelines
Agriculture	19%	Ruminant digestion, animal feedlots and manure management, fertilizer use, crop cultivation, fuel combustion
Industrial	14%	Fuel combustion, taconite processing, petroleum refining, magnesium casting, lead recycling, and manufacturing steel, glass, insulating foam, and semiconductors
Residential	6%	Fuel combustion (space and water heating, dryers), fertilizer and product use, housing material carbon sequestration, air conditioner and refrigerator leakage
Commercial	4%	Fuel combustion, solvent use, medical N_2O, includes institutional sources
Waste	1%	Waste processing and incineration, methane from landfill gas and wastewater, carbon sequestered in demolition landfills

Causes of changes in GHG emissions

Most greenhouse gas emissions are the result of fossil fuel combustion. The large reductions in emissions from electric utilities and transportation are due to reduced use of fossil fuels. This was accomplished by switching from coal to lower-impact natural gas at some utilities, using renewable sources to generate electricity, using electricity more efficiently, and driving more fuel efficient vehicles. The temporary outage at Xcel Energy's Sherburne County coal-fired electricity generation facility significantly contributed to the reduction in GHG emissions estimated for 2012. Fossil fuel combustion also declined in the residential and commercial sectors.

Some GHGs are emitted from activities other than burning fuels. Raising agricultural crops and livestock result in GHG emissions. Agricultural process emissions decreased overall, but some aspects of agriculture had increasing emissions, such as from feedlots, manure management, ruminant digestion, fertilizer use, and crop residues. Industrial manufacturing processes also emit GHGs. Some industrial activities showed decreasing emissions, such as magnesium casting and semiconductor manufacturing. Taconite processing and oil refinery GHG emissions increased, contributing to the overall increase in GHG emissions from industrial processes.

In all sectors, emissions from more detailed sources within a category may show increasing or decreasing trends that are not visible in broad sector trends. The relative contributions of the different sectors to the overall total vary in magnitude, so a large percentage change within a sector can correspond with a smaller change in total GHG emissions.

Emissions from using electricity are not estimated by where the electricity is used; rather, all emissions from electricity are included in the emissions from electric utilities. Efforts to improve the efficiency of residential electricity use and reduce emissions are reflected in the emissions from electric utilities, not in residential emissions.

Emission Change by Sector (million CO_2-e tons)

	2005	2012	Net Change[3]	Percent Change	Significant sources of changing emissions
Electric Utility	57.2	47.6	-9.6	-17%	Less coal use, switching from coal to less GHG-intense natural gas, more renewable energy sources
Transportation	42.1	38.7	-3.5	-8%	Higher vehicle fuel efficiency
Agriculture	30.0	29.7	-0.3	-1%	Lower emissions from cultivation on peat land
Industrial	18.7	21.6	3.0	16%	Increased taconite processing, more natural gas use
Residential	8.5	8.5	-0.0	-0%	Less fuel combustion for heating, more air conditioners using HFCs, less construction of new housing creating long-term carbon sequestration
Commercial	7.2	6.1	-1.0	-14%	Less fuel combustion, more air conditioners using HFCs
Waste	2.2	2.2	0.1	3%	Less storage of carbon in demolition landfills, more landfill gas flaring to destroy methane
Total	**165.9**	**154.5**	**-11.4**	**-7%**	Less fossil fuel used

[3] *Numbers may not add due to rounding.*

Indicators of greenhouse gas emission intensity

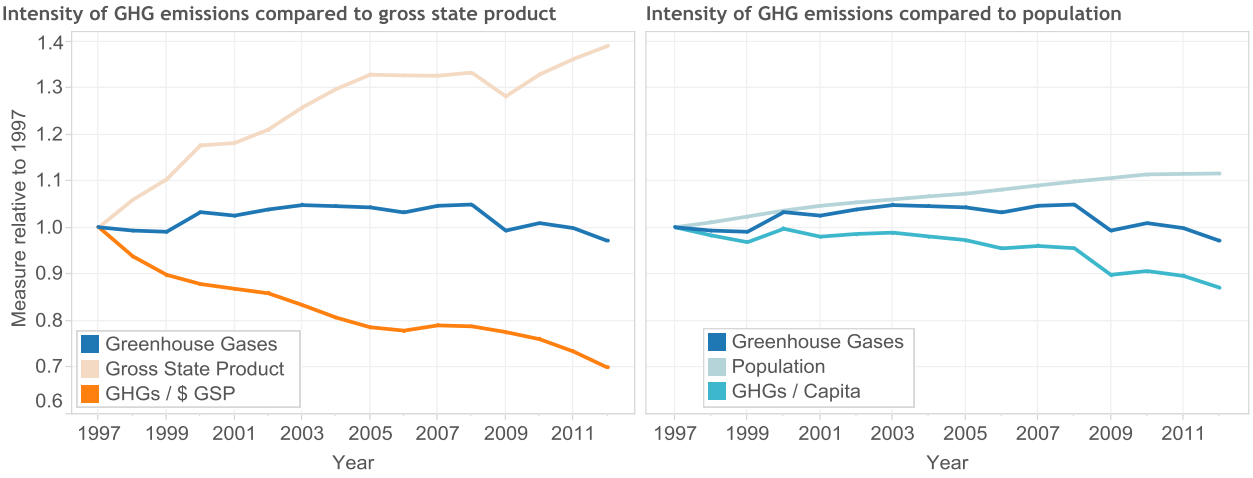
Measures of GHG emission intensity are useful in understanding how GHG emissions change in relation to other Minnesota trends. Some indicators related to GHG emissions include population, economic outputs and energy consumption. The changes in these indicators are shown as the relative change since 1997[4].

GHG emissions have generally declined, indicating a shift toward a less greenhouse gas intense economy. Our population also continues to grow while emissions decline.

The recession can be seen in the emissions and economic activity in 2009. Industrial output and overall energy consumption declined, reducing greenhouse gas emissions. With economic recovery, the gross state product (GSP, chained 2009$) increased.

Minnesota's economy has grown while emitting lower emissions per dollar of gross state product.

In late 2011, the state's largest coal-fired unit at Xcel Energy's Sherburne County generation station suffered a disabling explosion and did not resume operation until late 2013.



Forecasted emissions

As part of the Environmental Quality Board's (EQB) Climate Strategies and Economic Opportunities (CSEO) project during 2014, a forecast was developed estimating the state GHG emissions if Minnesota carried on with business as usual, implementing planned policies. The forecasted emissions show an overall slight decline from 2012 to 2030. Most of the emissions reductions are predicted in the electric utility and transportation sectors.

The forecasted emissions, without additional reduction efforts, fall short of the 2030 reduction goal. The CSEO project is evaluating various policies for their ability to reduce Minnesota's GHG emissions with consideration given to the cost of the reduction in emissions and opportunities for economic development and job creation in the state.

Further information: http://www.environmental-initiative.org/projects/cseo-stakeholder-engagement

[4] 1997 chosen as initial year for consistency with US Bureau of Economic Analysis data.

Greenhouse gas emission inventory methodology

A technical support document published in 2012 provides a more detailed discussion on the calculation methodology and is available at http://www.pca.state.mn.us/tchy611.

Only emissions that occur within the geographical borders of the state are estimated, with two exceptions – net imports of electricity into the state to meet Minnesota demand and emissions from the combustion of aviation fuel purchased in Minnesota, but not necessarily combusted within Minnesota air space.

The Next Generation Energy Act requires that evaluation of state-level GHG emissions take into account photosynthetically-removed CO_2 sequestered in biomass in forests, soils, landfills and structures. Removal of CO_2 from the atmosphere and long-term sequestration in residential structures and demolition and construction landfills are included in statewide GHG emission totals. However, it has proven difficult or impossible to express some observed sequestration of CO_2 from the atmosphere in standard CO_2-equivalent terms because the permanency of the stored carbon is more uncertain. This carbon sequestration, mostly involving forestry carbon, is tracked separately.

Emissions are estimated for all years from 1970 to 2012. With a few exceptions, the methods used to develop these estimates are derived from the following sources:

- **US Environmental Protection Agency** (2014) *Inventory of US greenhouse gas emissions and sinks: 1990-2012.*
- **California Air Resources Board, California Climate Action Registry, ICLEI, Local Governments for Sustainability, and The Climate Registry** (2010) *Local government operations protocol for the quantification and reporting of greenhouse gas emissions inventories, version 1.1*.
- **Intergovernmental Panel on Climate Change** (2006) *IPCC guidelines for national greenhouse gas inventories*. Vol. 1-4.
- **Radian Corporation** (1996) *Methane emissions from the natural gas industry*. Volumes 1-15. Prepared for the US Environmental Protection Agency and the Gas Research Institute.
- **The Climate Registry** (2008) *General reporting protocol, version 1.1*.
- **Minnesota Pollution Control Agency** (January, 2012) Greenhouse gas emissions in Minnesota: 1970 – 2008.

Changes in methodology and data sources

The methods used to develop the emission estimates are largely unchanged from previous reports. The methodological changes made since the last report were made to improve estimation of total emissions. To assure consistency, these changes were applied to all prior inventory years, when possible, including the baseline year of 2005. Data collection changes to accommodate consistency with federal reporting necessitated a methodological change for 2012 data, resulting in a break in continuity for a few sources, though this had a negligible effect on the total estimated emissions.

Additional sources of emissions were added to capture the use of high global warming potential greenhouse gases.

Revised data used as inputs for estimation were updated when available.