

IT ALL ADDS UP: EMISSIONS FROM MINNESOTA'S NATURAL GAS CONSUMPTION

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About this Analysis

Since its founding, CEE has focused on energy use in the building sector. Increasingly, we have recognized the important role that the building sector emissions play in our collective efforts to meet greenhouse gas reduction goals as well as how addressing those emissions can benefit our economy and communities. As reflected in our recently published 2040 vision, [equitable decarbonization of the building sector and industry is necessary to meet the urgent climate challenge](#).

In 2007, Minnesota set ambitious goals to reduce Minnesota's greenhouse gas emissions by 15% by 2015, 30% by 2025, and 80% by 2050 over 2005 levels. Since that time, scientists at the Intergovernmental Panel on Climate Change (IPCC) have determined that even more aggressive action is necessary to avoid the worst impacts of climate change. The latest IPCC report calls for essentially zero global greenhouse gas emissions by 2050.

Since 2007, Minnesota has made great progress in reducing greenhouse gas emissions from the electricity supply. Building on those successes, we see the likelihood of almost eliminating electric sector emissions by 2040. Unfortunately, we have made little progress in other sectors and have actually seen increased emissions in the building and industrial sectors.

Natural gas is the primary source of space and water heating in Minnesota's buildings and the fuel of choice for many of Minnesota's large businesses. Natural gas is also the primary driver of increased emissions in Minnesota's buildings and industry.

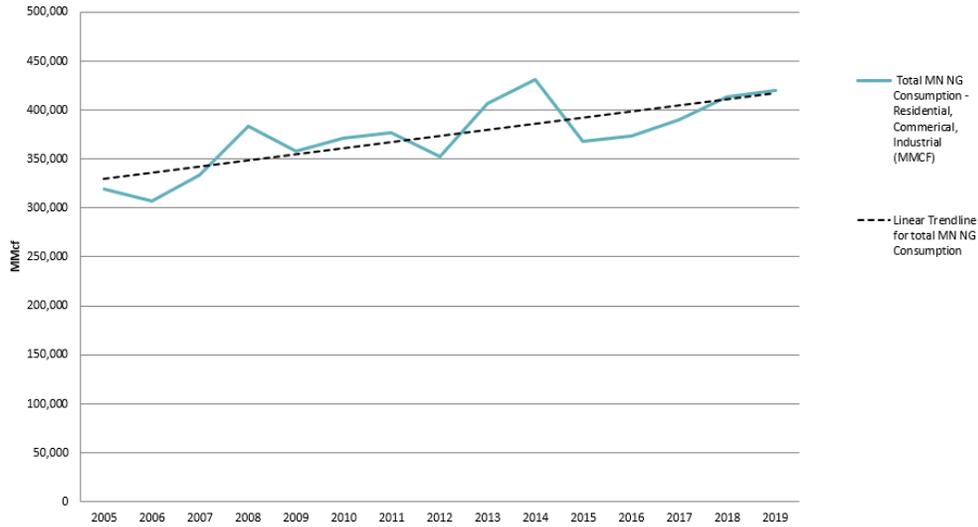
CEE conducted an analysis of lifecycle emissions resulting from natural gas consumption in Minnesota's residential, commercial, and industrial sectors.¹ The results of this analysis demonstrate that Minnesota cannot meet its greenhouse gas reduction goals without working to reduce greenhouse gas emissions from natural gas consumption in these sectors in the near future.

Natural Gas Consumption in Minnesota's Residential, Commercial, and Industrial Sectors

Natural gas consumption in the residential, commercial, industrial sectors has increased significantly over the last 15 years — it is up by 32% overall since 2005.

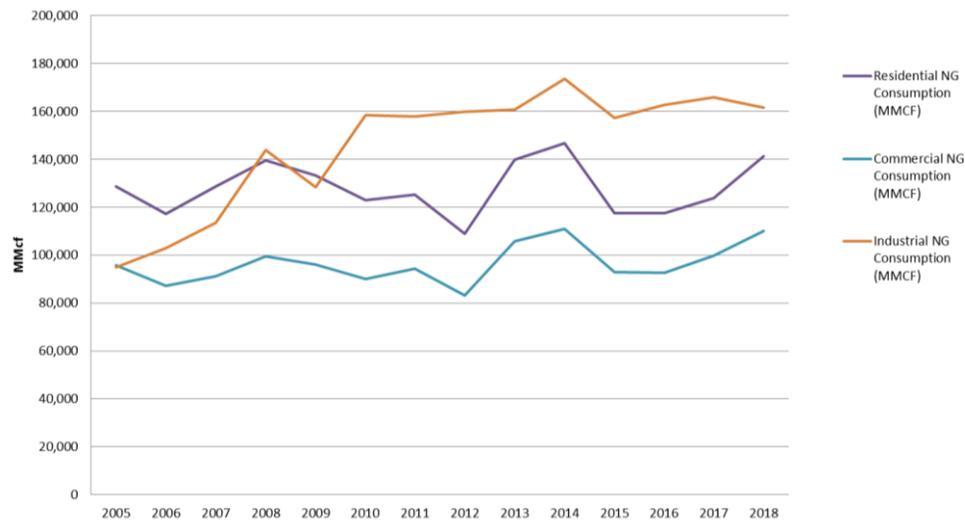
¹ Here, "lifecycle" means emissions resulting from methane leakage at the site of production, through transmission and distribution as well as combustion emissions that occur at the end use. This analysis does not account for natural gas consumption — or the resulting emissions — from natural gas used in electric generation. This analysis focuses on natural gas used in the building sector and in industrial processes. Key assumptions are listed on page 5.

Figure 1: Natural gas consumption in Minnesota buildings and industry



In that time period, the residential sector increased consumption by 12%, the commercial sector by 18%, and the industrial sector by 71%.

Figure 2: Minnesota’s natural gas consumption by sector



Additional research is needed to understand the factors driving the increase of natural gas consumption in each of these sectors. Some of those factors may include the following:

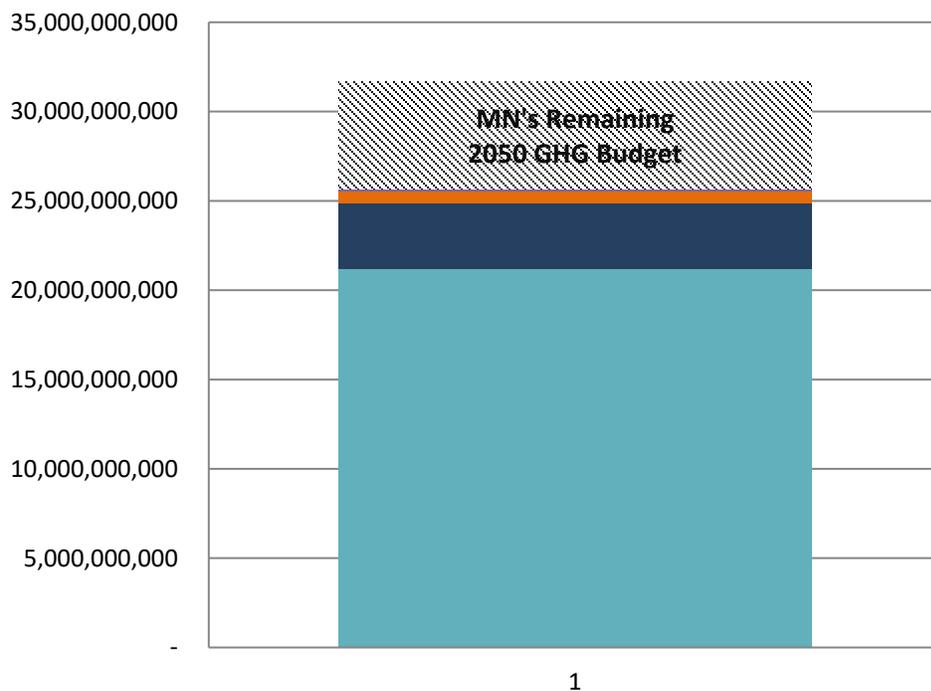
- New homes are larger than existing, older homes.
- The economy and population have grown.
- Natural gas service has expanded to more communities in Minnesota.
- Commercial and industrial customers are shifting from other fuels to natural gas due to its low cost.

Emissions from Minnesota's Natural Gas Consumption

As noted above, while Minnesota has reduced greenhouse gas emissions from electric generation by over 29% since 2005, this is not the case for the building or industrial sectors. In fact, Minnesota's building and industrial sectors have higher emissions now than they did in 2005, primarily due to those sectors' increased consumption of natural gas.²

Even if Minnesota were to cap natural gas consumption at current levels, natural gas emissions will make it extremely difficult for Minnesota to meet its greenhouse gas reduction goals. Lifecycle emissions resulting from Minnesota's 2019 natural gas consumption in the residential, commercial, and industrial sectors would make up the equivalent of 86% of Minnesota's 2050 economy-wide annual greenhouse gas budget, leaving just 14% for all other sectors of our economy.³

Figure 3: Minnesota's 2019 natural gas emissions as a share of 2050 greenhouse gas budget



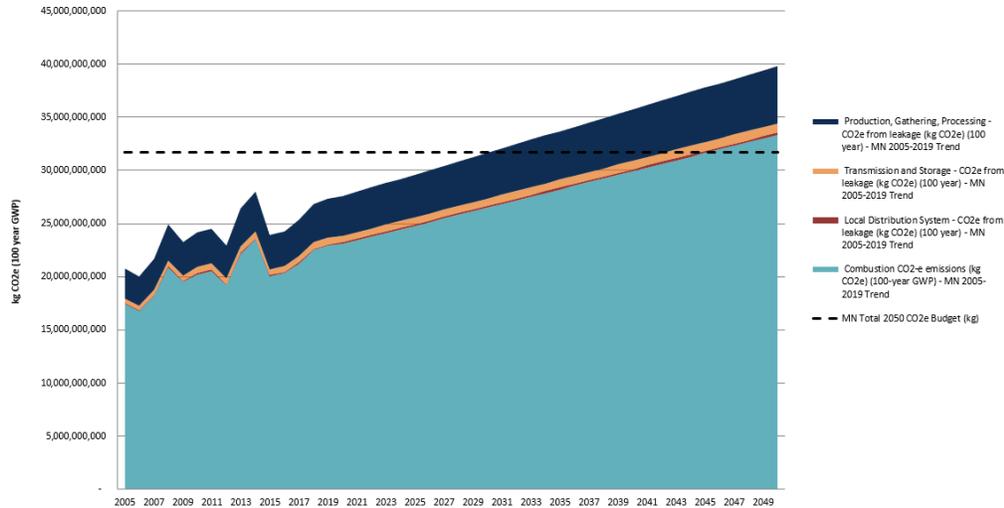
If the state continues along its current trajectory of growth in natural gas consumption, it will exceed the 2050 greenhouse gas budget with natural gas emissions alone. As shown in Figure 4, emissions associated with Minnesota's natural gas combustion in buildings and industry will surpass the state's

² Minnesota Pollution Control Agency, "[Greenhouse gas emissions data](#)." Accessed on December 3, 2020.

³ Minnesota's 2050 annual, economy-wide greenhouse gas budget is based on the 2007 Next Generation Energy Act goal of reducing Minnesota's greenhouse gas emissions by 80% by 2050 compared to 2005 emissions levels. The Minnesota Pollution Control Agency (MPCA) quantified Minnesota's total 2005 greenhouse gas emissions. The 2050 greenhouse gas budget referenced throughout this document reflects 20% of the total 2005 greenhouse gas emissions quantified by the MPCA.

annual economy-wide 2050 greenhouse gas budget by 2046. If both combustion and leakage emissions are considered, the state will exceed the economy-wide 2050 greenhouse gas budget by the year 2030.

Figure 4: Minnesota’s lifecycle natural gas emissions by source



Conclusion

Our analysis shows that natural gas consumption and emissions associated with that consumption are on the rise in Minnesota’s buildings and industry. Minnesota cannot meet its 2050 greenhouse gas reduction goals without first addressing emissions from natural gas used in the residential, commercial, and industrial sectors. Natural gas currently plays an important role in Minnesota — it is the primary source of heat in our extreme winters and a relatively inexpensive, energy dense fuel used in many large businesses. Decarbonizing these end uses, while maintaining affordability and reliability, will be challenging, but it must be done.

Electricity provides a feasible, low-carbon alternative for some current natural gas end uses in Minnesota, but may not be a practical solution for others. Decarbonizing the range of Minnesota’s natural gas end uses will require a portfolio approach with a variety of technological solutions.

Additionally, efforts to decarbonize natural gas end uses in Minnesota must also consider implications for equity. If not well managed with purposeful policy and implementation strategies, decarbonizing Minnesota’s natural gas end uses could worsen existing inequities in our state or create new ones. For example, without equitable policies and implementation, decarbonization technologies, which will have up-front costs, would likely be adopted by those with the money and capital access to do so, leaving lower-income Minnesotans behind. This could put an even greater energy cost burden on Minnesotans who are least able to bear it, while also limiting which Minnesotans get to share in the environmental and public health benefits of decarbonization technologies, and even which communities receive the economic benefits of decarbonization.

Increased attention, collaboration, research, policy, and hard work will be necessary to develop an equitable, comprehensive strategy to address emissions from natural gas end uses in the residential, commercial, and industrial sectors in Minnesota. As a part of that work, CEE has worked in partnership with the Great Plains Institute to convene a [stakeholder process](#) to explore pathways and develop potential solutions for reducing or eliminating emissions from natural gas end uses in Minnesota. This process includes a broad set of Minnesota stakeholders, including clean energy organizations, state agencies, labor representatives, large natural gas customers, and cities, as well as some of the state's natural gas utilities. Recommendations of this stakeholder group will be finalized in Spring of 2021.

Tackling emissions from natural gas presents many challenges and will require collaboration across many organizations and individuals, but it also presents many opportunities for utility customers, workers, and the utility itself to build a cleaner energy future.

Assumptions

- Minnesota's natural gas consumption (2005–2019): U.S. Energy Information Administration, Natural Gas Consumption by End Use.
https://www.eia.gov/dnav/ng/NG_CONS_SUM_DCU_SMN_A.htm
- Lifecycle methane emissions: Alvarez A. et. al, "Assessment of methane emissions from the U.S. oil and gas supply chain," Science, July 2018.
<https://science.sciencemag.org/content/361/6398/186>
- Global warming potential of methane: 100-year Global Warming Potential for methane from the Intergovernmental Panel on Climate Change, Fifth Assessment Report.
<https://www.ipcc.ch/assessment-report/ar5/>
- Minnesota's growth forecast (2020–2050): Calculated by applying the slope intercept of the linear trend line for actual natural gas consumption between 2005–2019 for each of the three sectors in Minnesota.