

Energy Working Group



Northfield Carbon Calculations

A graphical display of City and community energy use and carbon emissions in Northfield, MN

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Summary

In order to get a sense of the scale and distribution of local energy consumption and carbon emissions, the Northfield Energy Working Group (NEWG)¹ developed the following graphical representations of community energy data provided by Xcel Energy for the Northfield substation and City of Northfield energy data provided by City staff.

Community data show a steep increase in community energy use (21%) and carbon emissions (11%) over the available data range from 2012 – 2014. It is worth examining the causes of this notable upward trend, and seeking to obtain more recent Xcel Energy data to confirm whether the trends have continued. For comparison, the NEWG also recommends comparing current electricity consumption to the amount of emissions-free electricity produced annually by current and future local renewable energy resources including the Carleton and St. Olaf wind turbines, community solar gardens and privately owned rooftop solar arrays. Some of these resources are “behind the meter”² so their power contributions are not fully accounted for in the Xcel Energy Northfield substation data. But to provide a sense of scale to the impact of these developments, we believe that - should all currently planned local renewable energy projects come to fruition - their combined total annual electricity production could approach 25% of the community’s current electricity consumption at the Northfield substation. The transition to carbon-free electricity is already well underway in Northfield!

City of Northfield data was compiled for calendar year 2015 and 2016 using information provided by City staff. Over 2,000 pages of data were analyzed in order to create a baseline carbon emissions inventory for the City of Northfield, resulting in 50-60 hours of work by a Carleton College student. Data included electricity and natural gas bills for every City account, vehicle fuel purchases and monthly waste bills. Electricity is the primary source of emissions, and therefore represents the greatest opportunity for carbon emissions reductions. The NEWG represents further investigation into the sources of that electricity use, targeting large consumers (such as the Ice Arena) for potential energy conservation projects. It would be useful to continue tracking City carbon emissions trends over time, but a better system of collecting and manipulating data would greatly enhance the efficiency of this task.

¹ The Northfield Energy Working Group was created in September 2016 to advise the Northfield Environmental Quality Commission on how to advance a subset of four specific “quick start” actions from the 2008 Northfield Energy Task Force report.

² “Behind the meter” means that a power generation source serves the owners’ premises before delivering any excess power to the public grid. Public energy data at the substation would therefore not account for 100% of this electricity production or consumption.

Figure 1: Northfield Substation Energy Consumption

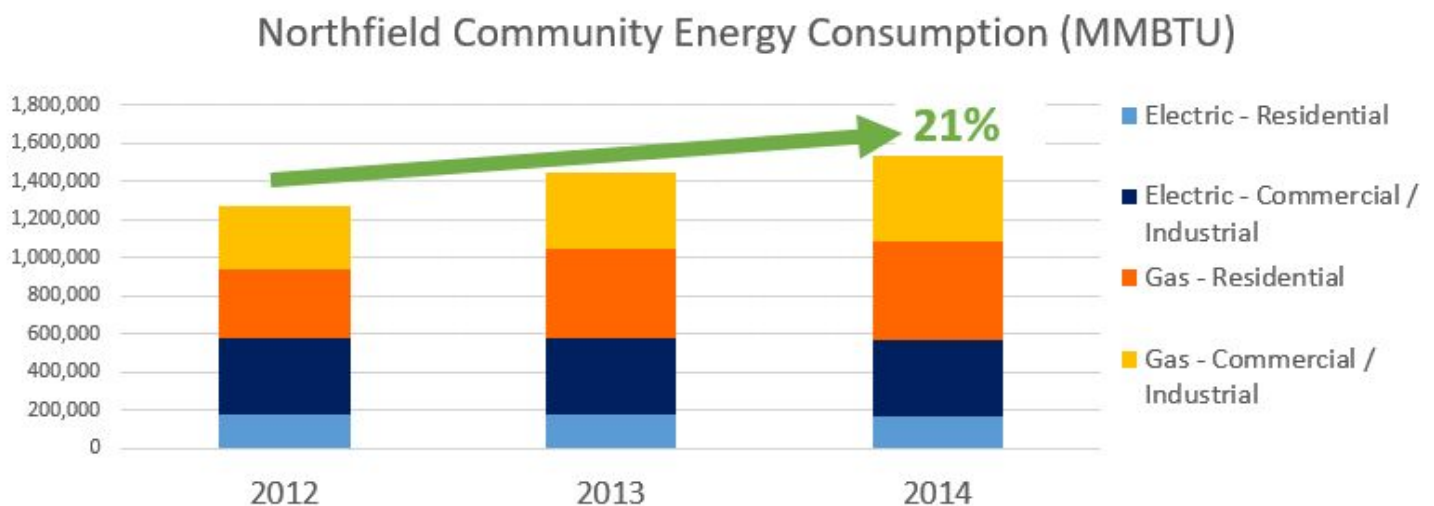


Figure 1 represents all natural gas and electricity provided by the Xcel Energy Northfield substation to Northfield businesses and residences. The data show a notable rate of increase in just three short years, although weather does have a strong influence and there were far more heating degree days in 2014 than 2012. Although gas usage is split fairly evenly between commercial/industrial and residential customers, electricity usage is strongly dominated by the commercial/industrial sectors. This graph normalizes gas and electricity usage into energy units of MMBTUs (million British Thermal Units) but the carbon emissions factor of electricity is roughly three times greater than gas.

Figure #2: Northfield Substation Carbon Emissions

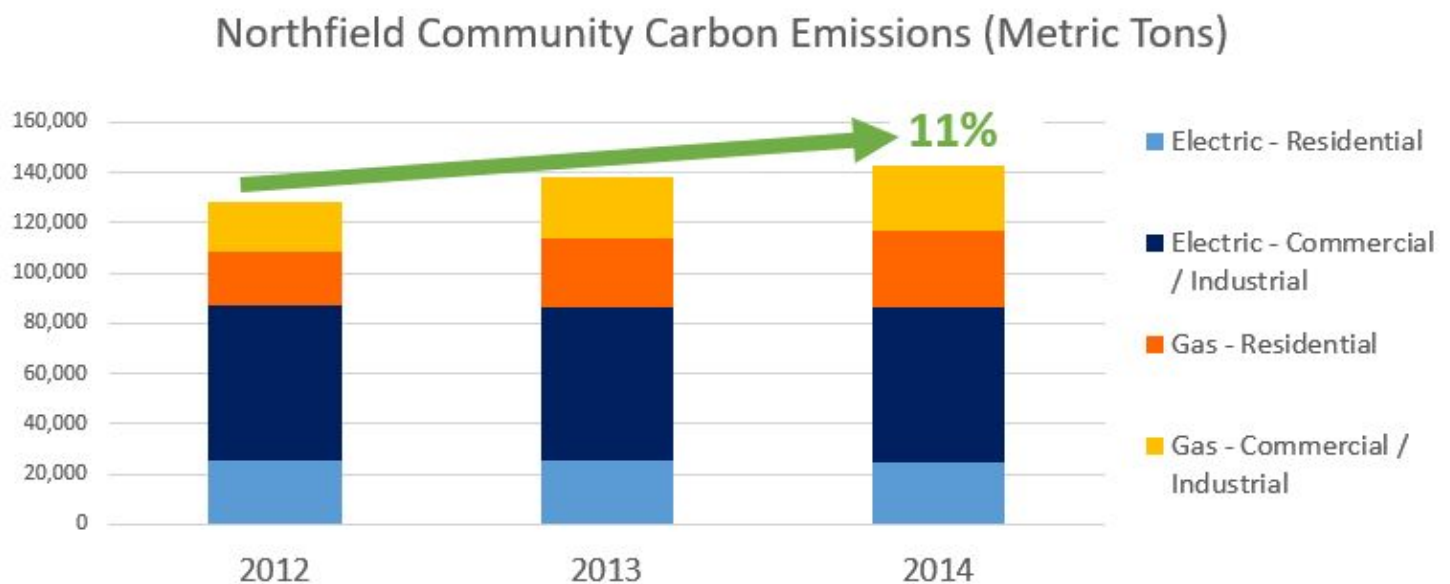


Figure 2 converts the data from Figure 1 into metric tons of carbon emissions using the fixed conversion factor for natural gas and the annual carbon emissions factors for electricity which changes depending on Xcel Energy's current fuel mix. Although Northfield's energy footprint is higher for gas, it has a much higher carbon footprint for electricity. The carbon emissions factor of electricity is roughly three times greater than that of natural gas. But as the public grid gets "greener", Northfield's electricity will have a smaller carbon footprint per kWh of consumption.

Figure 3: City of Northfield Carbon Emissions

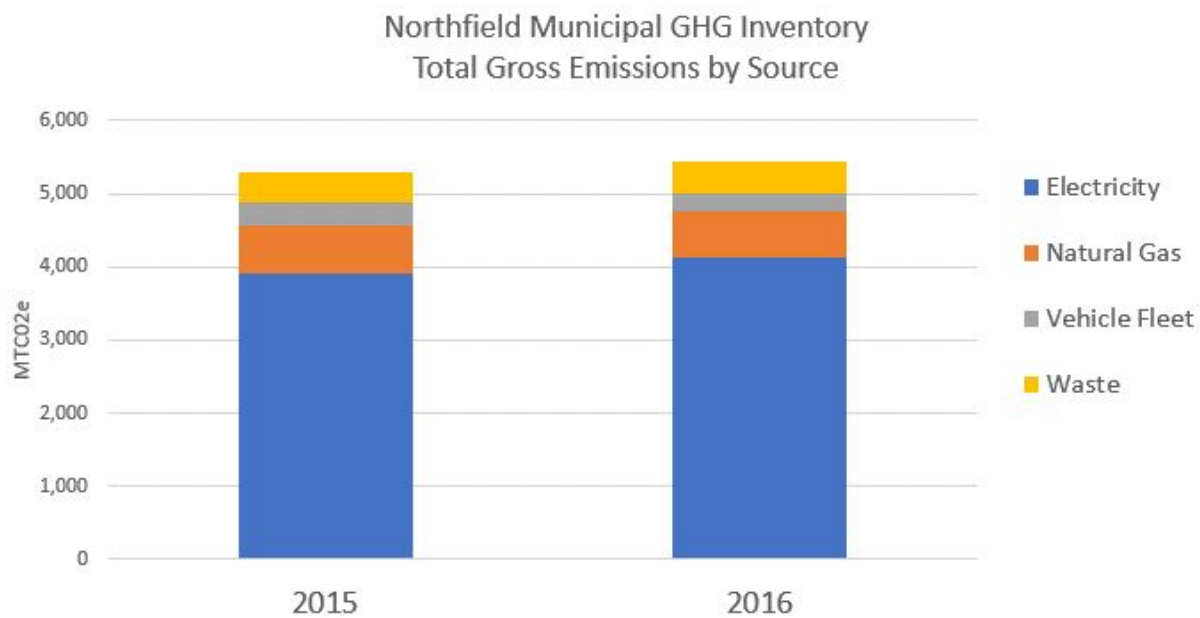


Figure 3 represents carbon emissions generated by City of Northfield operations. This is not a fully comprehensive accounting of carbon emissions, but captures the main categories including utility consumption in City buildings, fuel use in City fleet vehicles and municipal waste generated in City facilities.