# American Gas Association Energy Analysis
# Modeling the Economic Impacts of a Local Gas Moratorium in the Chicago Metropolitan Area

(Updated with 2023 Datasets)

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**Impacts on Residential and Commercial Energy Bills**

- In the Chicago MSA, between 2024 and 2043, a gas moratorium would affect approximately 1.5 million homes and 117,000 commercial facilities. Additionally, AGA modeled the average cost of installing high-voltage service paneling in around 662,000 older homes built before the early 1960s, which would need these upgrades to electrify.
- According to AGA, the 20-year cost of owning the average home with high-efficiency natural gas equipment would be $27,809. The 20-year cost of owning an average home with electric equipment would be between $57,553 and $61,073, depending on whether the structure would require upgraded service paneling. Therefore, natural gas represents a savings of between 51% and 54% versus electricity for the average residential customer.
- Commerical costs were based on operating costs only, in part due to the diverse requirements of different businesses. On average the use of natural gas would cost businesses $9,802 per year while electrification would increase these costs to $19,275 per year.
- When equipment costs, installation costs, maintenance costs, and energy costs are annualized, the average home with natural gas would cost its customers an average of $1,390 per year while the average electrified home would cost between $2,878 and $3,054 per year. Hence, natural gas customers would save between $1,487 to $1,663 per year.
- This analysis includes the lower electric space heating rate as well as the free-carbon generation cost of 4 cents per kWh that will start in 2027. More savings are possible with the 2.2 cents per kWh cheaper electric heating rate from the use of all other electric end uses. However, this cost savings is small compared to the increased electric heating consumption. A reduction of 2 cents for every MWh of electricity usage would save customers $22 per year per MWh.
- This analysis presumes electrification would proceed gradually as more homes and commercial structures come online and existing appliances and equipment reach the end of their service lives. In 2043, electrification would increase net costs for residential customers by $3.2 billion and for commercial customers by $1.2 billion. From 2024 through 2043, residential customers' cumulative costs would increase by $26.6 billion and commercial customers' cumulative costs would increase by $11 billion for a regional total of $37.6 billion.
- Based on the model, the average residential gas customer uses 800 therms per year for space heating (670 with a 95% AFUE furnace) and 233 therms for all other end uses (the majority of which is typically for water heating). If electrified, the average heating energy consumption for a 300% efficient heat pump would be 9,378 kWh or 320 therms per year. If electrical resistance is used, space heating annual energy consumption would rise to 19,050 kWh or 650 therms per year. The average annual energy consumption of all other electrified end uses would be 2,872 kWh or 98 therms.

**Natural Gas vs. Electricity Energy Cost Comparison in Chicago, IL**

**For People's Gas Customers**

- Fixed costs are $25.78 per month, or $14.75 per month if space heating is not used.
- Variable charges include service/storage and gas supply charges per therm.
    - Service/storage costs are $0.5490 per therm or $0.9992 without gas space heating.
    - The average gas supply charge in 2023 was $0.3800 per therm.
- Average monthly gas usage for households in IL is 89 therms, resulting in an average cost of $12.19 per MMBtu and a variable cost of $9.3 per MMBtu for households that use gas for heating (93% of homes with natural gas do use it for space heating).
- As a high-end cost estimate, by using a high-priced single month and not an average for the cost of gas purchased, use the most expensive monthly fixed gas cost, as well as the higher cost of service, this would incorrectly result in a cost closer to $16.5 per MMBtu for 2023 or nearly 35% higher than the actual average.

**For ComEd Electricity Customers (single family only)**

- Monthly fixed costs for single-family homes in 2023 were $15.23 (electric heating) or $13.89 (gas or other sources of space heating). This would result in a monthly increase in fixed costs for electrifying homes in 2023 by $1.44 or $17.28 a year.
- Variable costs include distribution and supply/transmission charges per kWh.
    - Distribution costs are $0.02012 per kWh (electric heating) or $0.04189 per kWh (gas or other sources of heating).
    - Supply costs in late 2023 were $0.09665 per kWh. This combines the cost of making the energy or $0.08333 per kWh and $0.0132 per kWh for transmission.
- Combined variable cost of energy for electric heating is $0.11677 per kWh or $34.22 per MMBtu; for gas or other sources of heating, it's $0.13854 per kWh or $40.60 per MMBtu.
- Incorrectly adding up these variable costs will result in different outcomes for estimating costs. Using distribution and transmission but not the larger of the supply costs would result in a cost of $0.0332 per kWh or $9.8 per MMBtu in 2023.

**Comparison of Average Gas Rate and Variable Electric Rate (single family only)**

- Electrifying results in a cost increase of 2.8 to 3.3 times compared to natural gas.
- Additional costs from the "carbon-free energy resource adjustment" in 2027 raise the cost further by about 4 cents or $11 per MMBtu
- Total costs can be 3.8 to 4.3 times higher than natural gas in 2027 and beyond.
  *Note: Similar calculations can apply to multifamily homes.*

Sources of Data

https://www.citizensutilityboard.org/blog/2024/01/11/new-electric-rates-for-comed-and-ameren-customers-in-2024/
https://www.comed.com/SiteCollectionDocuments/MyAccount/MyBillUsage/TypicalChargesSummaryResidential.pdf
https://www.peoplesgasdelivery.com/payment-bill/gas-rates

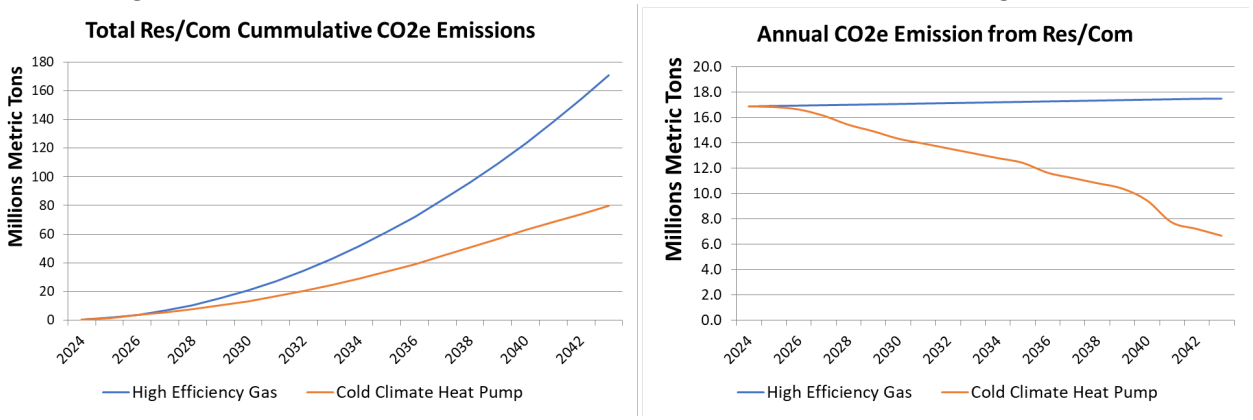
**"What if" Retrospective on Extreme Winter Weather Events (January 2014 and 2019)**

- Both in January 2014 and 2019, The greater Chicago area experiences sub-freezing arctic temperatures for more than 48 hours. This can have dramatic effects on personal health, greatly disrupt household activity, and of course, impact heating bills.
- For the average residential customer, an 80% efficiency gas furnace costs between $116 and $120 for just space heating in January (2019 vs 2014). For a 300% efficient heat pump relying on backup for some of the required heating, the range would be $343 and $480. The average household using only a resistance furnace would see a monthly heating bill of $535 to $663.
- For the average commercial customer, an 80% efficiency gas furnace costs between $1,208 and $1,483 for just space heating in January (2019 vs 2014). For a 300% efficient heat pump relying on backup for some of the required heating, the range would be $2,251 and $3,393. The average household using only a resistance furnace would see a monthly heating bill of $3,933 to $4,831.

**Impact Policy Will Have on Net Emission Reductions**

- A primary driver for costs to consumers is the likelihood of extreme winter weather. Based on the last 10 years of local weather data (2010-2019), Chicago experiences hourly temperatures at or below 35 degrees F 25.8% of the time, or the equivalent of over 94 full days yearly. This is a significant amount of time for customers to experience freezing temperatures outside.
- The mandated electrification would decrease CO2 emissions attributable to the Chicago region by a cumulative 90.9 million metric tons between 2024 and 2043. This result reflects reduced direct use of natural gas and an increase in emissions from power generation, which would need to respond to additional load from electrification.
- Between 2024 and 2043, the continued use of natural gas while converting units to high-efficiency gas appliances would emit a total of 170.6 million metric tons of CO2e compared to an all-electric pathway which would emit 79.7 million metric tons of CO2e for a total savings of 53% over 20 years.
- AGA evaluated CO2e emissions using NREL's ReEDS model's long-term marginal rate and used the "Low Renewable Cost Scenario" to account for the accelerated use of renewable energy (2022 Cambium Database for the state of Illinois, located in the PJM Region). NREL's model assumes that any state policies will meet their goals of net neutrality or 100% zero carbon by the date determined based on the original policy. If reality takes longer to achieve these goals then emissions will be higher.
- Natural gas emissions were assumed to equal 134 lbs. CO2e/MMBTU with no new decarbonization strategies throughout the 20 years. Incorporating gas decarbonization strategies, such as integrating low-carbon fuels like renewable natural gas, would affect these results.
- Accounting for the emissions saved, the average cost per ton of CO2e saved would be $413 per metric ton of CO2e. With the inclusion of some RNG, natural gas can contribute to some of the same emissions reductions based on NREL's forecast at a lower cost.

Figure 1 – Total emissions from modeled households and businesses through 2043

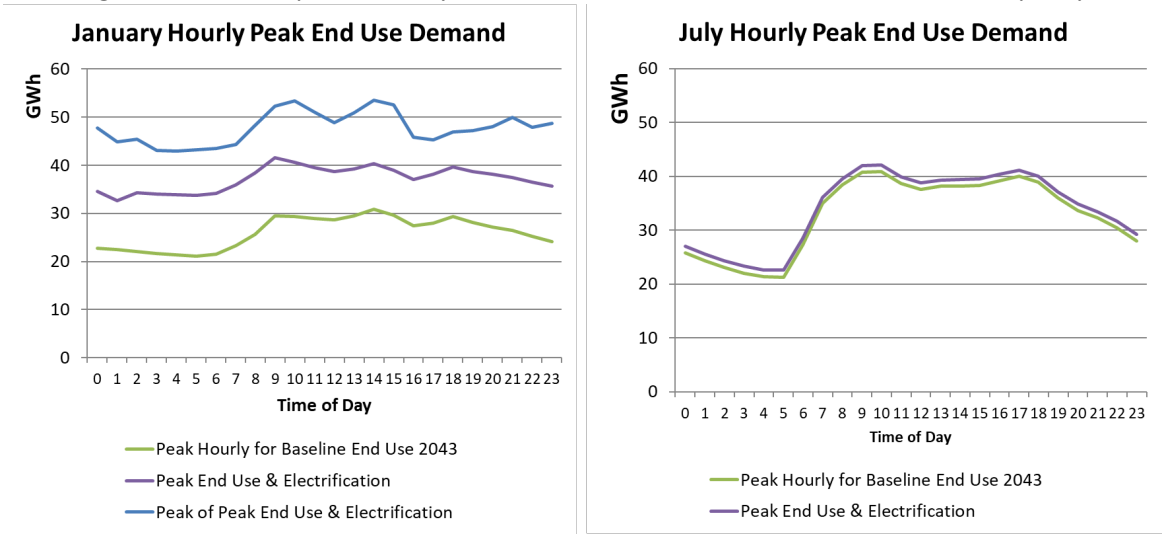



Source: AGA Modeling

**Policy Impact on Summer and Winter Demand in 2043**

- Figure 2 compares peak end-use demand in Illinois in the summer and the winter under the baseline and policy-mandated electrification scenarios in 2043. Both scenarios were built on the NREL's cambium database forecast for 2043 electricity demand which only relies on 2012 weather data. Peak electricity demand increases more severely under a 10-year "peak of peak" event. The implications of this type of strain on energy systems may have an impact on overall energy system resilience. Nonetheless, additional margins, lower appliance efficiencies, and a 30-year horizon for weather events can be factored in to account for a broader range of possibilities.

Figure 2 – Peak of peak January demand for Illinois in 2043 after electrification policy




Source: AGA Modeling

This analysis is limited to the net costs and emissions impacts of mandated electrification for the Chicago region. It does not attempt to determine the total costs of the electrification policy for all regions. Additional costs would include: (1.) the electric generation, transmission, and distribution costs associated with increased load on the whole of the PJM Interconnection; (2.) the potential for gas utilities to raise rates on customers once the size of the customer base decreases; and (3.) and risks associated with changes in the reliability of the electrical grid and the overall resiliency of the Midwest and Mid-Atlantic energy system.