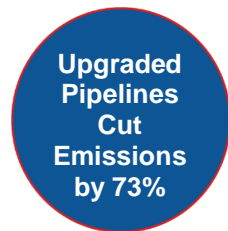


Natural Gas is Key to a Low Carbon Energy Future

Emitting significantly lower CO₂ than all other fossil fuels¹, natural gas is a major part of the solution as we work toward a low carbon future.

Developments in wind and solar power are reducing the carbon footprint of the electric grid. Intermittent by nature, these low-carbon energy sources require additional electric storage to offset the irregular power generated by solar or wind turbines. Natural gas offers reliability and stability to the energy system as additional renewable power is added to the grid, especially in peak energy demand periods. Far less expensive than other forms of energy storage, natural gas is the perfect solution to allow renewable research and advancements to continue and thrive.²

The Natural Gas Industry Invests in Utility System Modernization and Innovation



Better system management, diligent preventative maintenance, and enhanced leak detection and repair have led to declining emissions over three decades despite expansions of the natural gas pipeline. Upgrading distribution system infrastructure to cutting edge protected steel and plastic materials reduces pipeline emissions by more than 95% compared to older cast iron and bare steel pipes.³ According to the U.S. Environmental Protection Agency, from 1990 to 2018, upgraded pipelines have cut methane emissions from the gas transmission and distribution system by 73% and as little as 0.1% of delivered natural gas leaves the system.⁴

Hybrid Heating Offers the Best of both Worlds in Homes

Electric heat pumps adequately work in climates when the temperature is 35°F or higher, but around the freezing point or below, energy efficiency declines quickly. A dual-fuel system is a great solution, using a heat pump at 35°F and up, and switching automatically to a gas furnace when it gets colder.⁵

Gas Heat Pumps Are Reliable

Natural gas-powered heat pumps function on the same principles as electric heat pumps for efficiency and savings in moderate climates, with added performance and comfort during very cold weather all while reducing CO₂ emissions over conventional systems. In addition, gas heat pumps partner well with solar systems and can extract heat from air, ground, or water sources.

Direct Consumption of Natural Gas Maximizes Efficiency and Lowers Emissions

Direct use of natural gas for heating, cooling, water heating, cooking, and clothes drying cuts carbon emissions by almost 50%. Direct use is more efficient than consuming gas-fired electricity from the grid.⁶

Direct Consumption is 92% Efficient⁶

Households with natural gas appliances produce 22% fewer greenhouse gasses compared to electric-only homes.⁷



Biogas Refining Converts Methane into Carbon-Neutral Renewable Energy

The production of Renewable Natural Gas (RNG) supports decarbonization in two ways and is considered to be carbon neutral. First, the capture of biomethane at wastewater treatment plants, agricultural waste, waste processing

¹ <https://www.eia.gov/tools/faqs/faq.php?id=73&t=11>

² <https://www.washingtonpost.com/brand-studio/api-can-natural-gas-be-the-key-to-lowering-emissions/>

³ <https://www.aga.org/sites/default/files/legacy-assets/our-issues/Rewriting-Our-Energy-Future/Documents/Rewriting%20Our%20Energy%20Future%20WEB%20FINAL.pdf>

⁴ <https://www.aga.org/news/news-releases/gas-utilities-support-methane-reduction-innovations/>

⁵ <https://www.aga.org/sites/default/files/legacy-assets/SiteCollectionDocuments/KnowledgeCenter/OpsEng/CodesStandards/0804AHPFNLRPT.PDF>

⁶ <https://playbook.aga.org/reliable>

⁷ <https://playbook.aga.org/environment/>

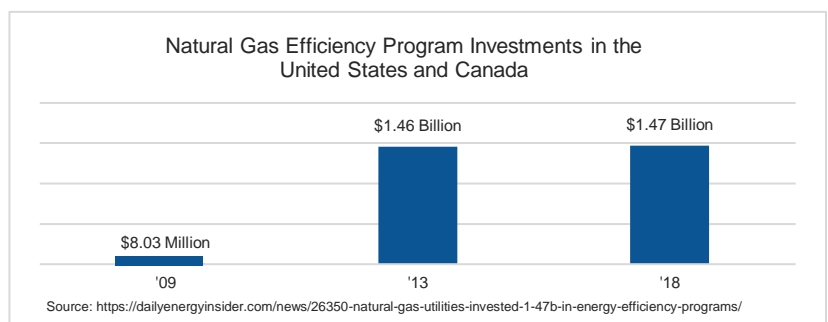
facilities (i.e., anaerobic digestors) and landfills, prevents methane from being released into the environment. Second, displacing carbon emitting gas (i.e., conventional natural gas) with carbon neutral gas significantly lowers total greenhouse gas emissions.⁸

Hydrogen Produced from Reforming Natural Gas Powers Fuel Cells

Fuel cell electric vehicles (FCEVs) powered by hydrogen lowers emissions by producing only water vapor from the tailpipe. Even including the hydrogen production process, delivery and storage, FCEVs reduce total greenhouse emissions by 50% compared to gasoline vehicles. In the United States, 95% of hydrogen is produced by natural gas reforming in large central plants.⁹

Carbon Offset Credits & Energy Efficiency Programs

In 2018, American and Canadian utilities funded more than 130 gas efficiency programs to help customers reduce their carbon footprint for a total of \$1.47B USD and 2.25 million metric tons of avoided CO₂. That is equivalent to almost 490,000 passenger vehicles taken off the road or over 270,00 homes' energy use for one year.¹⁰ Programs included carbon offset credits (i.e., renewable energy projects, carbon sequestration, energy-efficiency improvements) and weatherization incentive campaigns for insulation and energy-efficient appliances.¹¹ Energy efficiency gains improve each year as these programs continue.



ZNE Homes are More Feasible Using a Dual-Fuel Design

An American Council for an Energy-Efficient Economy study found that Zero Net Energy (ZNE) homes with dual-fuel systems outperformed electric-only homes:¹²

- 5-15% lower Time Dependent Valuation (TDV) energy consumption. TDV is a metric used to measure the societal and environmental impacts into true energy costs at any given hour during the year.
- Allows for smaller solar photovoltaic systems and smaller HVAC systems for lower upfront costs.
- Better performance and lower costs for heating during cold weather.

Carbon Capture and Carbon Sequestration Remove CO₂ from the Atmosphere

Carbon capture technology for natural gas fired power plants already exists. Department of Energy models show that technology improvements will lead to significant adoption by 2040.¹³ As more natural gas is consumed, greater resources become available for carbon capture R&D for industrial and residential sectors.

Carbon sequestration is possible by piping CO₂ fertilizer into greenhouses for storing carbon in plants or injecting carbon dioxide deep below the Earth's surface to trap the carbon permanently below the impermeable seal.

⁸ https://gasfoundation.org/wp-content/uploads/2019/12/AGA_3894-RNG-2-Pager_V-11.pdf

⁹ <https://www.energy.gov/eere/fuelcells/hydrogen-production-natural-gas-reforming>

¹⁰ <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

¹¹ [https://www.aga.org/news/news-releases/natural-gas-utilities-invest-\\$3.8-million-per-day-helping-customers-save-money-and-reduce-their-carbon-footprint/](https://www.aga.org/news/news-releases/natural-gas-utilities-invest-$3.8-million-per-day-helping-customers-save-money-and-reduce-their-carbon-footprint/)

¹² https://www.aceee.org/files/proceedings/2016/data/papers/10_1100.pdf

¹³ https://www.energy.gov/sites/prod/files/2017/01/f34/Carbon%20Capture%20Opportunities%20for%20Natural%20Gas%20Fired%20Power%20Systems_0.pdf