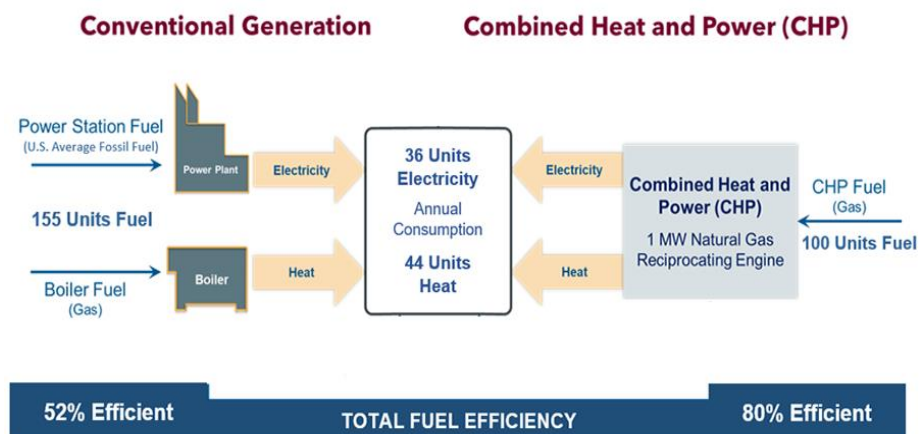


# Energy Efficient Technologies for Gas-Powered Equipment

**Energy Efficient technologies can play a pivotal role in a low-carbon future. Gas-powered technologies can offer efficient and cost-effective methods to reduce energy requirements and fuel consumption, often with reduced greenhouse gas emissions compared to other energy options.**

## Combined Heat and Power Systems

Combined heat and power (CHP) systems are onsite generators that provide both power and thermal energy from a single fuel source.<sup>1</sup> Unlike conventional generators, where heat and electricity are produced separately, CHP, also referred to as cogeneration, captures heat that would otherwise be wasted and applies it to various end-uses, such as space heating/cooling, hot/chilled water, and process heat. Most CHP systems today run on natural gas, but they can run on various fuel sources including biogas and hydrogen. Overall, CHP increases energy efficiency, reduces electricity costs, improves resiliency, and reduces emissions when compared to separate heat and power systems.



Source: [U.S. EPA CHP Partnership](#)

**CHP uses 32% less fuel and has 50% less CO<sub>2</sub> emissions, compared to traditional generators<sup>2</sup>**

## Gas Heat Pumps

Gas heat pumps are a substitute technology for furnaces and air conditioners. Instead of generating heat, they transfer heat from one place to another depending on conditions with the building. For example, in warmer months they move heat out of the building, while in cooler months they work by pumping warm air or hot water into the building. They work by using thermal energy such as natural gas and an outdoor heat source to achieve the desired indoor heating effect. Gas heat pumps have proven to be a highly-efficient use of natural gas. In many circumstances, gas heat pumps use less fuel and produce fewer greenhouse gas emissions than electric heat pumps.<sup>3</sup>

<sup>1</sup> U.S. DOE, [Combined Heat and Power Deployment Program, 2021](#)

<sup>2</sup> CHP Alliance, [CHP is a Low-Carbon Reliable Alternative to New Central Gas Plant, 2020](#)

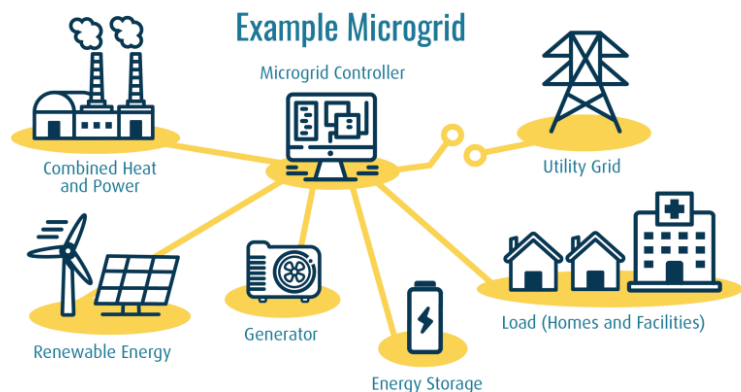
<sup>3</sup> ICF, [Comparison of Operational Costs and Carbon Emissions for Gas and Electric Heat Pumps at Commercial Buildings, 2021](#)

## Fuel Cells

Unlike reciprocating engines that combust fuel, fuel cells work by using an electrochemical process to produce electricity and heat. Fuel cells can be used in a wide variety of sectors and applications including transportation, power, industrial, residential, and commercial settings. Depending on the fuel sources, fuel cells can produce little to no greenhouse gas emissions. Additionally, fuel cells operate at higher efficiencies than conventional combustion-based technologies, with efficiencies capable of exceeding 60%.<sup>4</sup>

## Microgrids

Microgrids are decentralized networks of electricity users, transmission infrastructure, and local distributed energy resources. These systems are capable of incorporating a variety of generation technologies, including natural gas generators, solar arrays, wind farms, and energy storage systems. While still connected to the utility grid, microgrids are capable of operating autonomously in the event of a grid outage, which increases local energy resilience. Since microgrids generate electricity locally, they are also able improve efficiency by reducing energy lost during the transmission and distribution of electricity.



Source: [NASEO](#)

## High Efficiency Residential HVAC

With heating and cooling accounting for half of a typical home's energy use, high-efficiency HVAC systems can play a critical role in reducing energy costs and emissions for homeowners.<sup>5</sup> HVAC system efficiencies can be improved by upgrading equipment, duct repair and sealing, and adding an air-source heat pump. Benefits of efficient HVAC systems include reducing household energy consumption, decreasing operating and maintenance costs, and improving air quality for homeowners.<sup>6</sup>

## Integrated Energy-Hybrid Heating Systems

Integrated energy systems combine energy efficient heat pump technology with high-performing boilers or furnaces. While heat pumps are typically highly efficient, they operate best in temperate climates and may not perform as well in very cold environments. Adding a natural gas-fired boiler or furnace can improve the cost and environmental benefits of heat pumps.

## High-Efficiency Gas Water Heaters

High-efficiency gas water heaters include condensing tank-style, tankless, and gas heat pump water heaters. These systems offer efficiency increases between 20% and 75% compared to standard tank water heaters.

<sup>4</sup> [U.S. DOE, Fuel Cells](#)

<sup>5</sup> [U.S. DOE, Heating, Ventilation and Air Conditioning](#),

<sup>6</sup> [Pipelife, What is an Integrated Heating System?](#)