INTERMOUNTAIN® GAS COMPANY

Energy Efficiency

Efficient & Affordable Natural Gas Heat Pumps

Disclaimer

This guide is intended to provide an overview of natural gas fired heat pumps, benefits associated with such systems, and market opportunities. The guide includes some background and provides an understanding of gas heat pump (GHP) technologies and applications.

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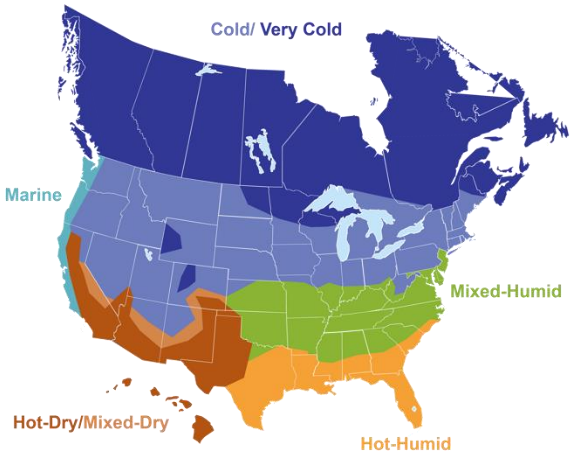
What is a heat pump? / How does it work?

Heat pumps are systems that transfer thermal energy from a heat source to a heat sink. Thermal energy is moved in the opposite direction of spontaneous heat flow. Heat pumps use energy to accomplish the desired transfer of thermal energy from heat source to heat sink. In short, a heat pump running in heating mode functions in the same way as a standard air conditioner running in reverse, so instead of rejecting heat to the outdoors when cooling, it is extracting heat from outdoor air or another source and transferring that heat to the indoor space.

Heat pumps come in a variety of configurations such as air source, water source, and ground source. In this guide we will discuss natural gas fired heat pumps along with their economic, environmental, and resiliency advantages & benefits.

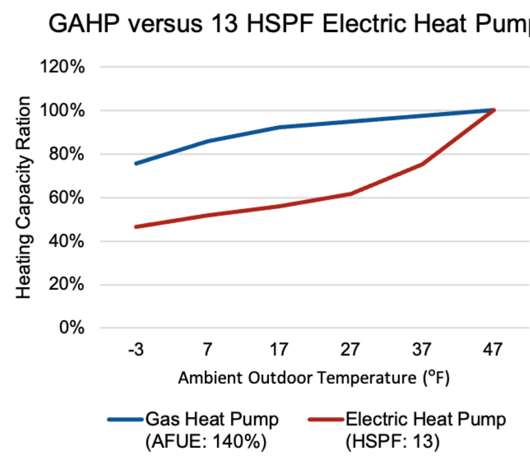
Introduction to Gas Heat Pumps



Sources:
https://www.energy.gov/sites/default/files/2014/01/f6/4_3a_ba_innov_buildingscienceclimatemaps_011713.pdf

https://www.energyvanguard.com/blog/do-you-know-your-building-science-climate-zone/

Natural Gas Heat Pumps (GHP) are heat pumps that utilize the combustion of natural gas to drive the heat pump system. All heat pumps require a source of heat which can be from the surrounding air, a water source or the ground. Gas fired heat pumps have an advantage as they can capture additional heat off the combustion process to improve overall efficiency and work much better in colder climates. The graph to the left shows how gas heat pumps maintain high heating effectiveness as the temperature drops. Electric Heat Pumps (EHP) require a back-up heating system to provide heat when no more heat can efficiently be extracted from the air or another source. GHPs maintain greater heating capacity across various source temperatures.



(Graph courtesy of Stone Mountain Technologies)

Why Gas Heat Pumps Are Important

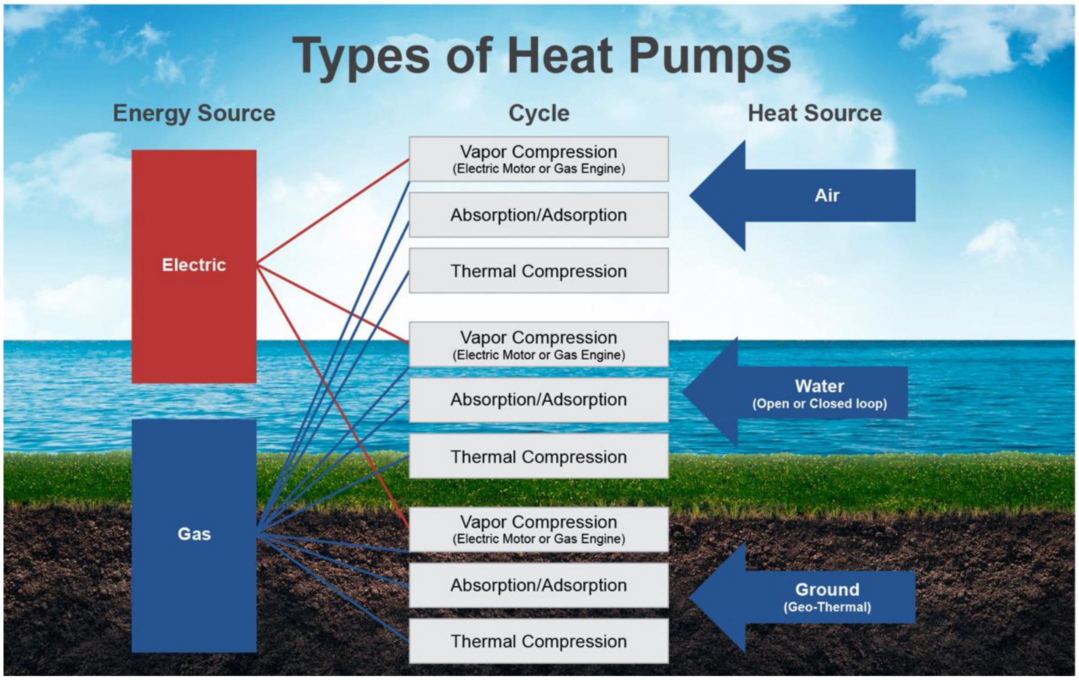
Natural gas heat pumps have system efficiencies that exceed the traditional 100% barrier and offer pathways to substantially reduce greenhouse gas emissions across various climates for both residential and commercial space and water heating sectors. With new North American Greenhouse Gas (GHG) reduction targets on the horizon, governments will demand more efficient HVAC technologies, to meet standards not currently met by traditional boilers and furnaces. Several gas heat pumps are commercially available today and more manufacturers will enter this market in the near future. Continued advancements in the development of gas heat pumps provides a viable and effective option for reaching aggressive climate action targets such as net-zero emissions by 2050. With the ability to operate on renewable natural gas today and hydrogen tomorrow, natural gas heat pumps will be an attractive solution to meet future emission reduction goals.

In addition, natural gas heat pumps offer the following advantages:

- Ability to operate on RNG and hydrogen to reduce emissions
- Ability for some models to operate without the use of harmful refrigerants (No Global Warming Potential)
- Ability to reduce electricity grid constraints by not having to upgrade electrical infrastructure
- Higher performance in cold climates because GHPs use gas combustion to deliver the majority of the system's heating load
- Technical feasibility to overcome retrofit barriers compared to alternatives
- Lower operating costs as compared to existing gas heating equipment or EHPs

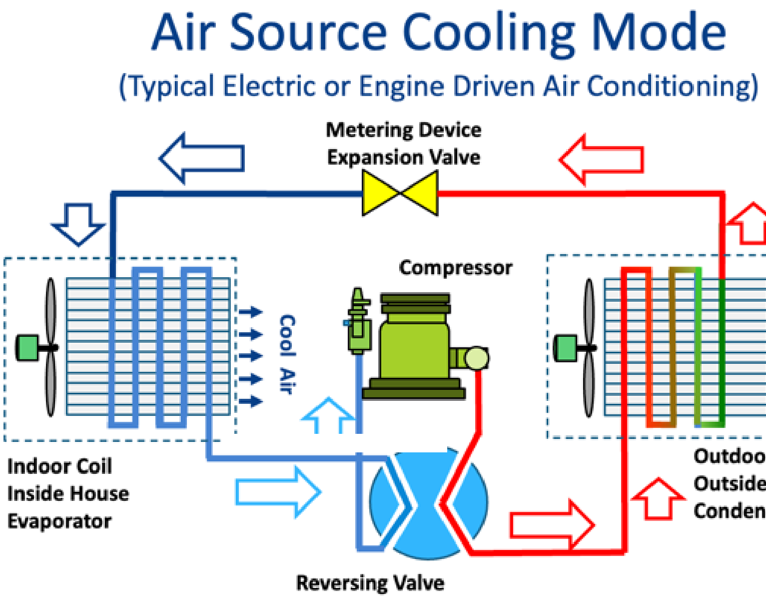
Heat Sources

Heat pumps extract heat from a heat source and deliver that heat to a heat sink. Air, water and the ground can all act as heat sources for heat pumps. Both gas and electric heat pumps can be configured to extract heat from an air source, water source or ground source and move that heat to a home or business to heat it.



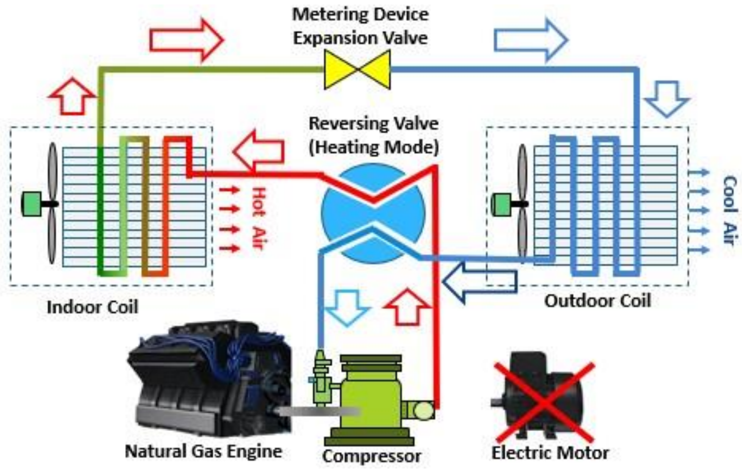
Types of Gas Heat Pumps

Heat pumps extract heat from outdoor air, a water source or a ground source and moves to the inside of a home or business. Before discussing how gas heat pumps work, it is helpful understand the basic principles of the vapor compression cycle used in typical air conditioners to provide cooling. In cooling mode, refrigerant is compressed and the hot gas is moved to the condenser (outside coil) where it is condensed into a high pressure, high temperature liquid. This liquid moves through an expansion devise device lowering the temperature and pressure before it enters the evaporator (inside coil) where air is circulated around this coil to cool the space. In heating mode, a reversing valve is added to the system to allow the system to run in reverse to provide heating.



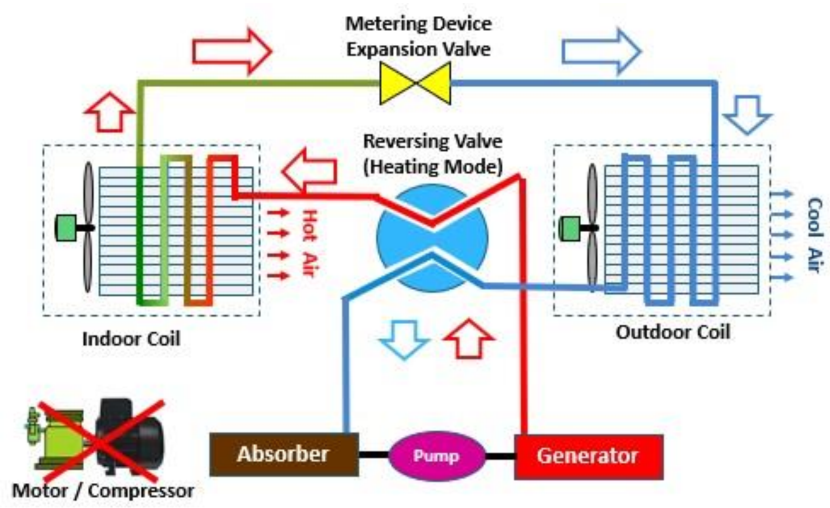
Engine Driven Heat Pumps

Engine-driven gas heat pump air conditioning systems utilize an efficient reciprocating engine running on natural gas to produce the shaft horsepower to turn a vapor compressor. Gas engine driven heat pumps use the same vapor compression cycle as electric heat pumps with the electric motor being replaced with an engine that runs on natural gas. The primary advantage of a natural gas engine-driven heat pump is the operating cost. This image shows the system in heat mode.



Commercially Available Engine Driven Heat Pumps:

Company	Website
Aisin World Corp. of America	www.aisinworld.com
Blue Mountain Energy	www.bluemountainenergy.com
Gridiron	https://www.gridironenergy.com/
Tecogen	https://www.tecogen.com/heat-pumps
Yanmar America	https://www.yanmarenergysystems.com/vrf/



Absorption Heat Pumps

Natural gas absorption heat pumps differ from traditional electrical heat pumps. Instead of consuming electric energy to operate a vapor compression cycle, absorption heat pumps consume gas to heat a solution of water and ammonia or Lithium Bromide in a completely sealed absorption circuit.

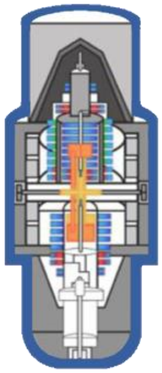
Absorption heat pumps are hydronic type systems, as they heat and/or cool water in order to heat and/or cool the air. The system is similar to a vapor compression cycle, but instead of a motor and compressor, absorption systems use a generator, pump and absorber. There are multiple absorption heat pump configurations available. This image shows an absorption-based heat pump in heating mode.

Commercially Available Absorption Heat Pumps:

Company	Website
Broad USA	https://broadusa.com/broad/
Energy Concepts	www.energy-concepts.com
Homy / Vicot	www.homybuild.ca
Robur	www.roburcorp.com

Thermal Compressors

Thermal Compression heat pumps represent a new emerging category of efficient heating, cooling, and hot water appliances. Thermal energy provided by the combustion of natural gas powers a unique thermodynamic cycle. Helium is heated, increasing its pressure, and this heat is removed and sent to a home or building for space heating or for hot water. As heat is removed, the pressure of the helium drops, causing a cooling effect that can be removed and used for cooling in a home or building. A pressure wave is established that “pumps” recovered heat from the cold end of the unit into the warm end, causing a “heat pump” effect that increases efficiency. This process does not employ phase change for heat transfer. The system offers a broad temperature range up to 165ºF and down below freezing. This type of system utilizes no ozone depleting refrigerants.



Courtesy of ThermoLift

Adsorption

Adsorption systems achieve their heat pumping effect by boiling a refrigerant and extracting heat from ambient air. The refrigerant is made to boil by letting a salt absorb the refrigerant vapor. The refrigerant absorption process delivers heat to the space. In the second step of this batch process, the saturated salt is dried, or desorbed, by supplying heat and increasing the temperature of the salt. The released ammonia vapor condenses and delivers additional heat to the space.

Efficiency

The efficiency of a heat pump (electric or gas) is defined by a term called the Coefficient of Performance (COP). The COP is a ratio of the energy produced and the energy consumed by a heat pump.

$$\text{COP (cooling)} = \frac{\text{Cooling Produced}}{\text{Work or Heat Input}}$$

$$\text{COP (heating)} = \frac{\text{Heating Produced}}{\text{Work or Heat Input}}$$

The COP can be calculated on an instantaneous, hourly, daily, or seasonal basis. Seasonal COP is calculated as follows:

$$\text{Seasonal COP (heating)} = \text{(Heat produced during a heating season)}/\text{(Heating gas energy consumed during the heating season)}$$

Another term called Gas Utilization Efficiency (GUE) is also used to define GHP performance:

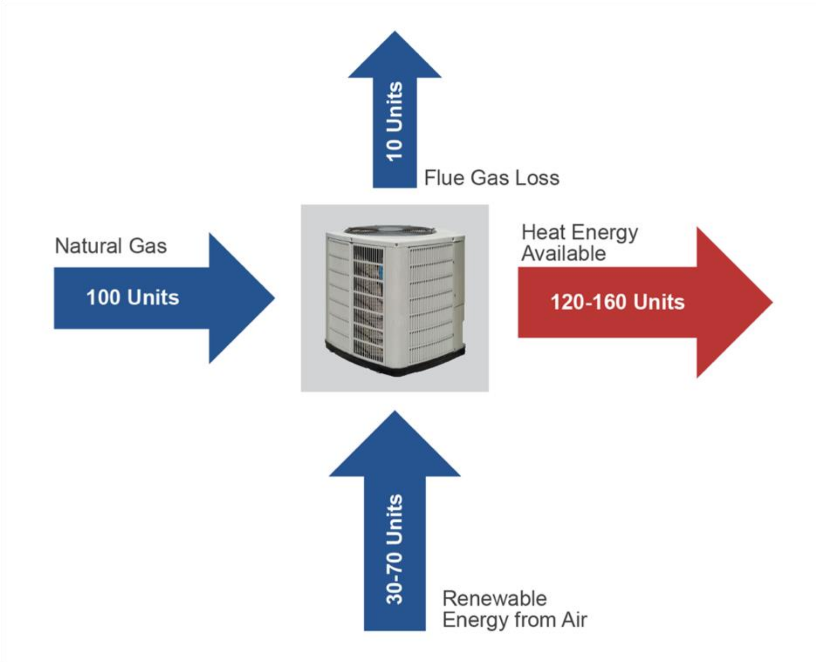
$$\text{GUE} = \frac{\text{Heat produced}}{\text{Heating gas energy consumed}}$$

Here are some average COP values for different types of GHPs:

Gas Heat Pump Type	Average Heating COP	Average Cooling COP
Absorption	1.3	0.7 – 1.4
Engine Driven	1.4	1.3
Thermal Compression	1.6	1.4

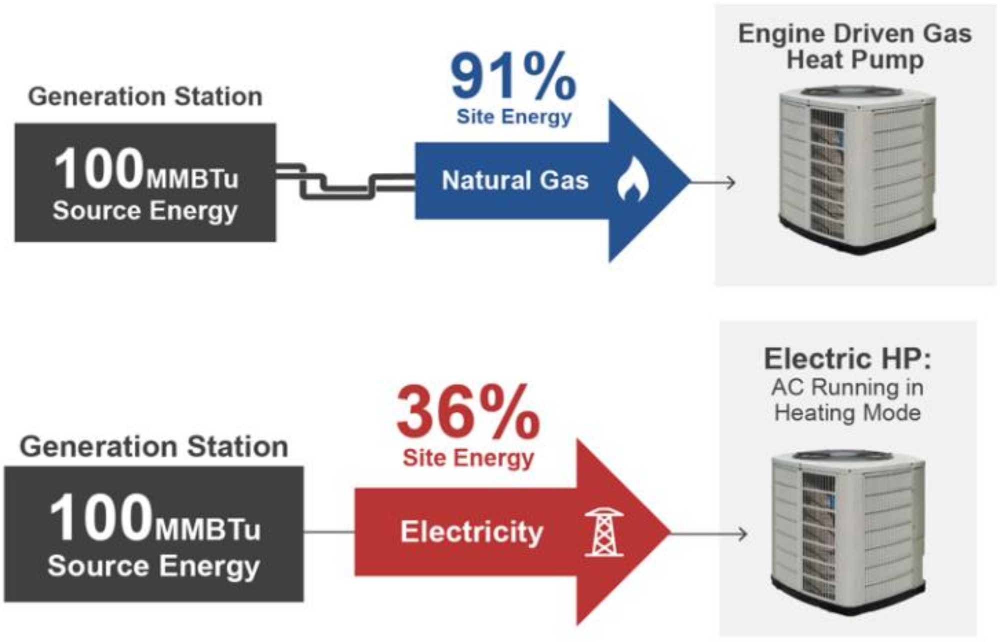
How GHPs Achieve Greater than 100% Efficiency

GHPs use natural gas as their primary source of energy. They also capture additional renewable energy from the air or other source and deliver it to the heating load. This diagram on the right shows how GHPs achieve greater than 100% efficiency by combining the two energy sources. To explain the concept, let us assume 100 units of energy are supplied by burning natural gas, with 5 to 10 units of this energy lost through the exhaust, just like in a furnace. Depending upon the type of GHP, 30 -70 units can be captured from the outside air, delivering about 120 - 160 units of energy to load, yielding a GHP efficiency of 120% -160%.

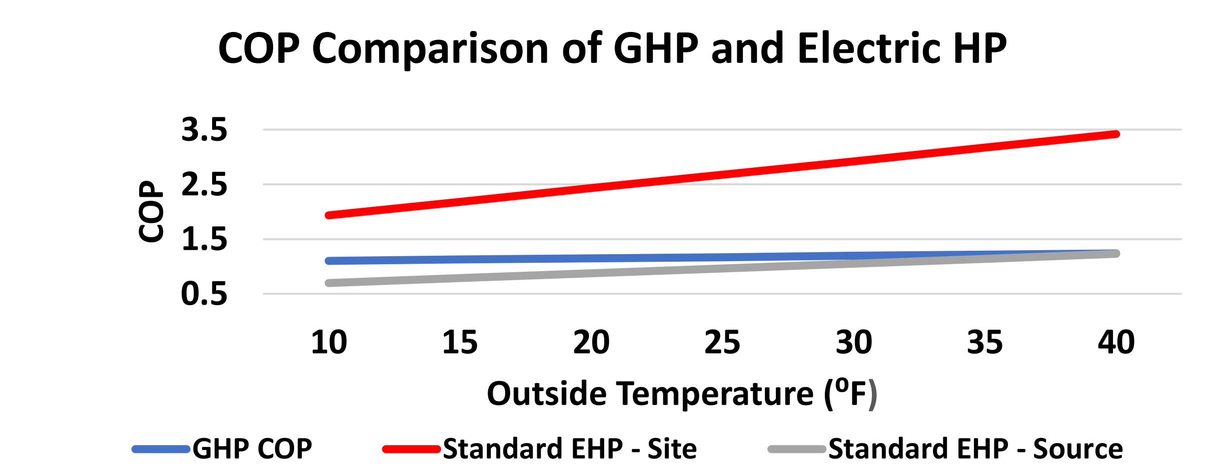


Comparing COP of Electric and Gas Heat Pumps

Published COPs for electric heat pumps (EHP) are higher than those for GHPs. The reason for this discrepancy is attributed to the fact that the COPs of EHPs are reported based only on the amount of electrical energy consumed on site, without considering the amount of energy consumed to produce electricity at the source of generation and transmission losses to supply electricity from the source to the site. (Source to site efficiency is covered further in the Environmental section of this guide.) For gas heat pumps, conversion efficiency is included in COP calculations. The diagram below helps to explain this concept.



The COP of an EHP (red line) changes when electricity generation efficiency is considered in COP calculations (gray line). This example assumes 36% electricity generation efficiency and 91% natural gas extraction and distribution efficiency.

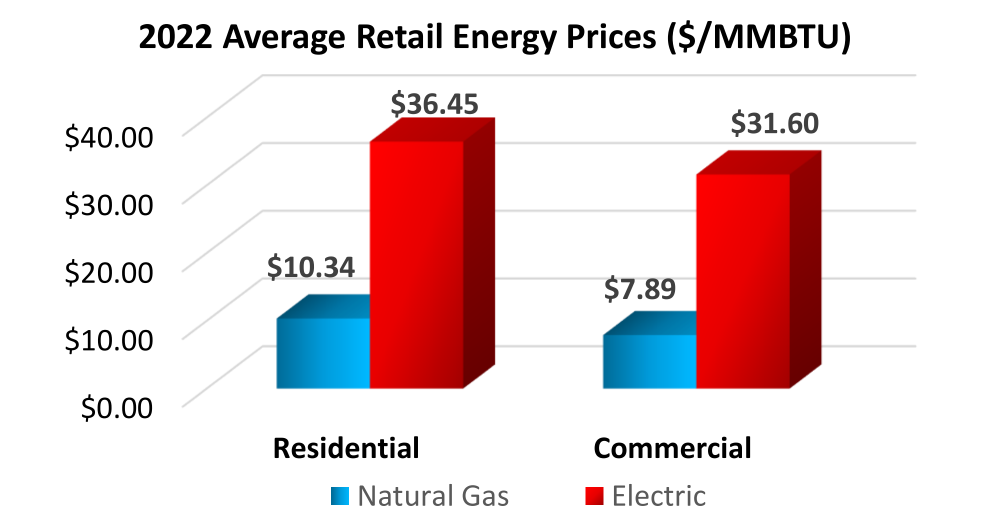


Courtesy of Enbridge Gas Distribution

Economics

The local cost of gas and electric is the largest factor that impacts the payback and/or life cycle cost of a GHP. On average, electric costs 3 or more times the cost of natural gas on an BTU for BTU basis, ranging from around 3 to as high as 7 Energy Price Ratio (EPR). This chart shows the average expected retail cost of gas and electric from the Energy Information Administration's Annual Energy Outlook 2021. The EPR will vary across different states and provinces and vary at the local level as well.

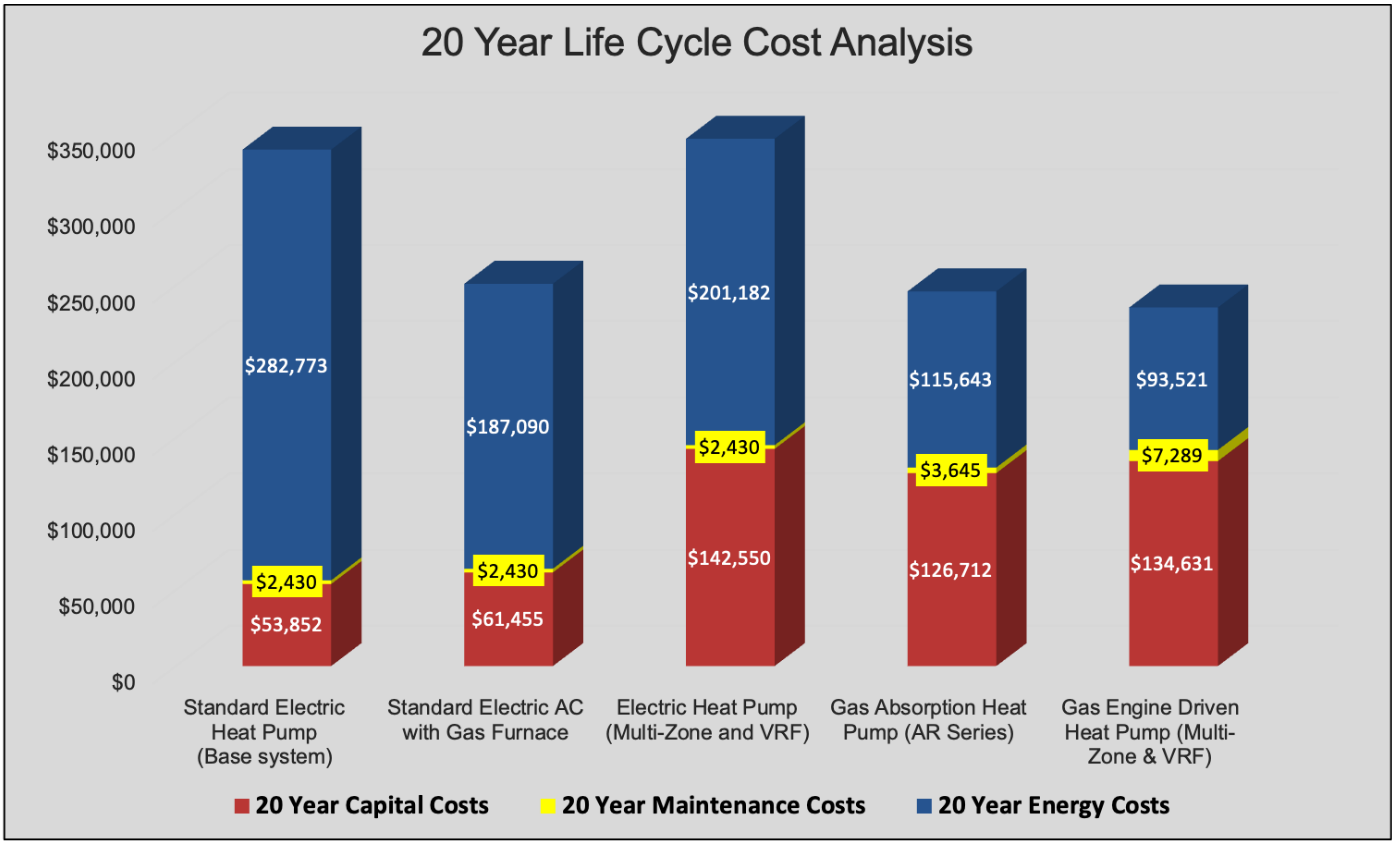
Note that electric rates are complex, and a detailed analysis should look at additional electric charges beyond the simple cost per kWh such as electric demand charges and time of use rates and as these tend to impact the true electric cost.



Source: Comparison of Operational Costs and Carbon Emissions for Gas and Electric Heat Pumps at Commercial Buildings, ICF, August 2021

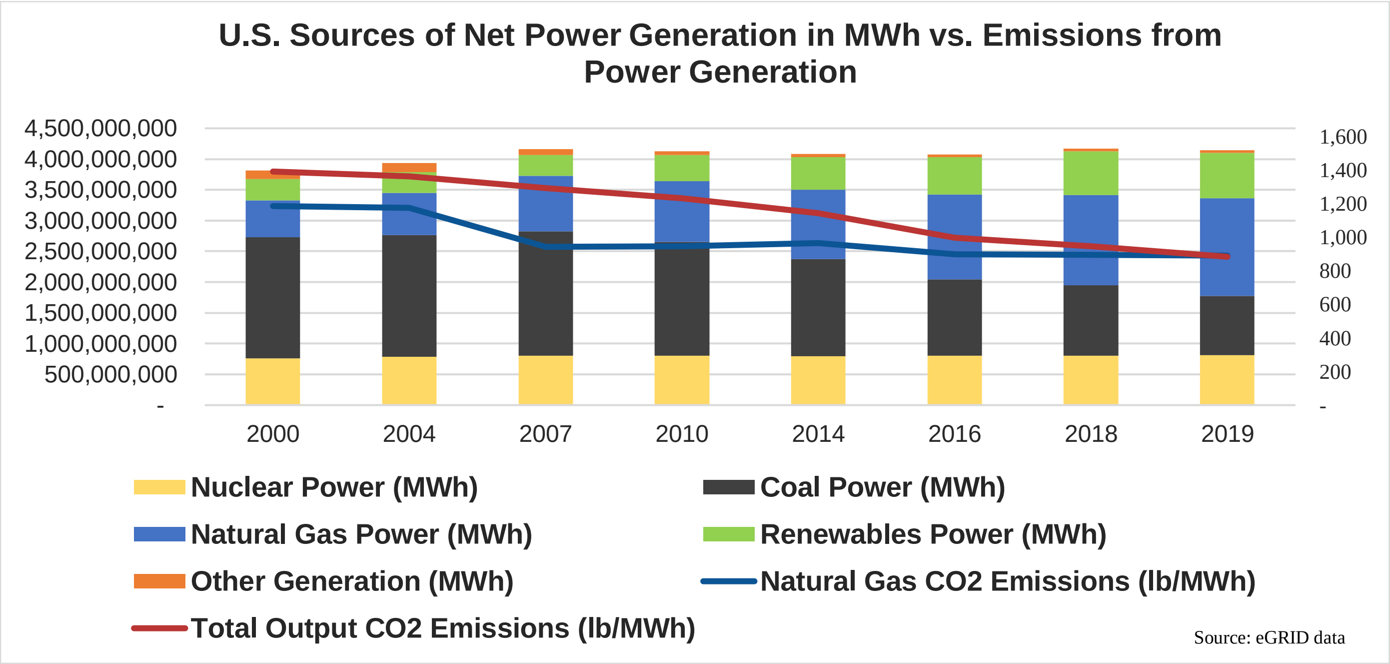
It is important to choose the right equipment to best meet the desired application. For heat and hot water only applications or in regions where heating is far more prevalent than cooling, absorption GHPs might provide the best economics. For applications requiring heating and cooling, an engine driven GHP might be the best solution. If heating and cooling are to be utilized simultaneously, overall system efficiency increases and can reach as high as 3.0 COP. This chart summarizes the average cost reduction for commercial buildings in four climate regions compared to traditional rooftop HVAC systems that has gas heating and electric cooling.

When comparing GHPs to conventional systems it is best to perform a Life Cycle Cost calculation that considers installed costs amortized over the life of the equipment, as well as energy and maintenance costs with appropriate inflation over time. The technology with the lowest life cycle cost should be selected. The following results are derived using an online tool at: https://gasairconditioning.com/general-resources/tools/. This calculation is for a 20-ton system amortized over 20 years at 5% interest with $.17/kWh, $10/kW, and $.65/Therm energy rates, with 2% energy & maintenance inflation rates.

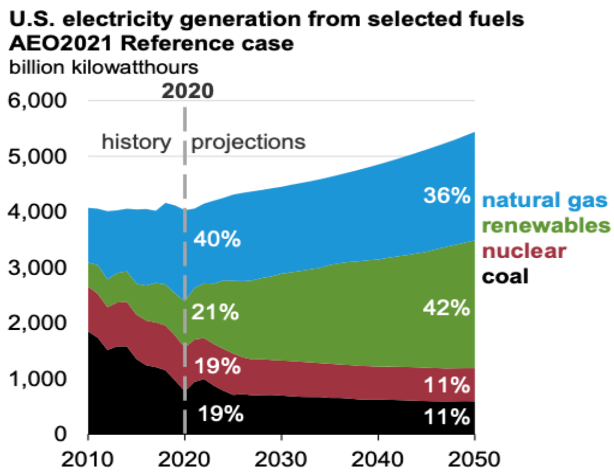


Environmental Benefits

Calculating greenhouse gas (GHG) emissions for a gas heat pump is straightforward. Simply multiply the amount of natural gas consumed by the GHG emission factor for natural gas. For an electric heat pump, however, calculating GHG emissions is somewhat complex, since it involves estimating associated marginal fuel of generation, called marginal emission factor (MEF). The generation mix for the electricity consumed by an EHP varies by region, time of day, and season. Therefore, it is important to apply MEFs on an hourly basis for better accuracy. For certain jurisdictions, MEFs may be constant because the majority of electricity is generated from fossil fuels. For example, the MEF will be about 0.493 ton/MWh if the marginal electricity is produced from combined cycle gas plants. However, for some other jurisdictions where the nonbase load generation is provided by a combination of emitting and non-emitting sources such as hydro, wind and combined cycle plants, the MEF could vary from 0 – 0.493 ton/MWh, depending on the hour of the day. Approximately 62% of electricity was generated with fossil fuels in 2019. There has been a clear shift away from coal to more renewable sources of electricity and more natural gas generation plants. New natural gas generators are combined cycle plants that are much more efficient that older gas plants. You can see below that the shift away from coal fired power has had a profound impact on overall CO2 emissions for power systems and that CO2 emissions from natural gas plants has improved over time as well.



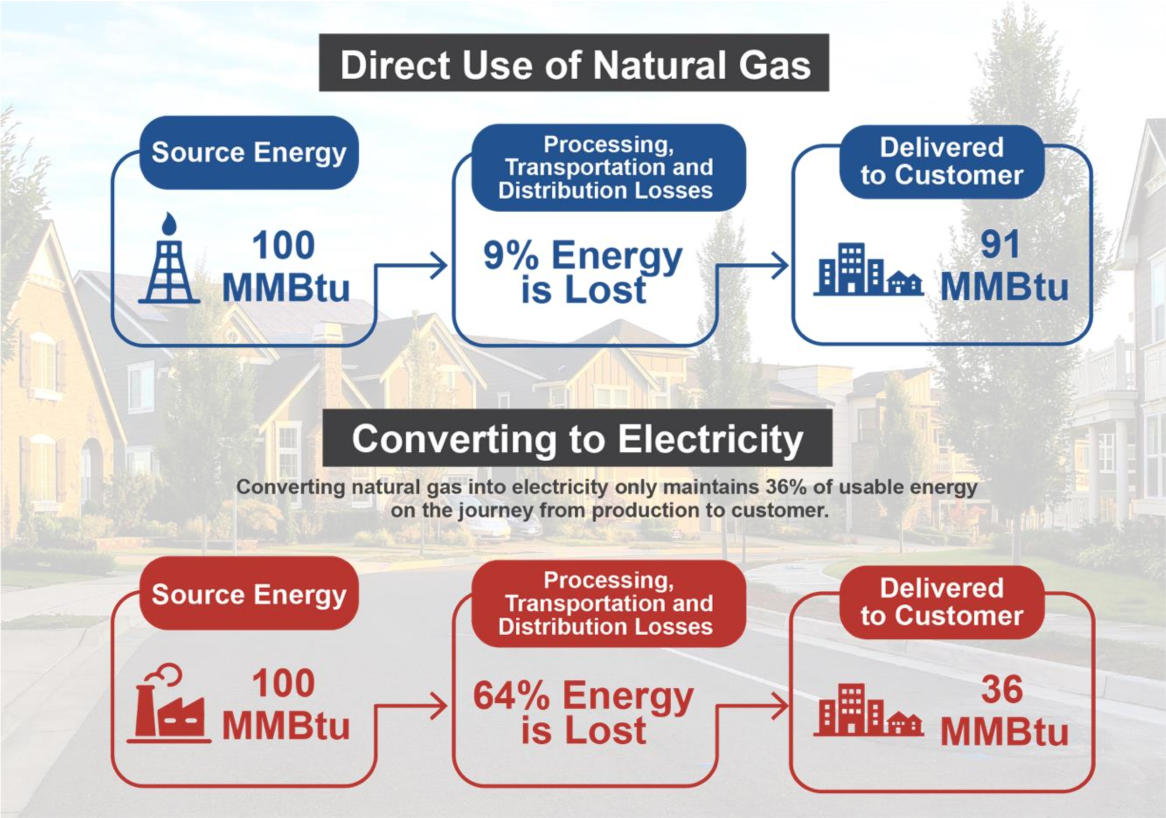
The Energy Information Administration (EIA) of the U.S. Department of Energy forecasts that coal will continue to be replaced into the future, but even with aggressive policies, it is projected that almost ½ our power will come from fossil fueled generators in 2050 (figure right).



Source: https://www.eia.gov/outlooks/aeo/pdf/04%20AEO2021%20Electricity.pdf

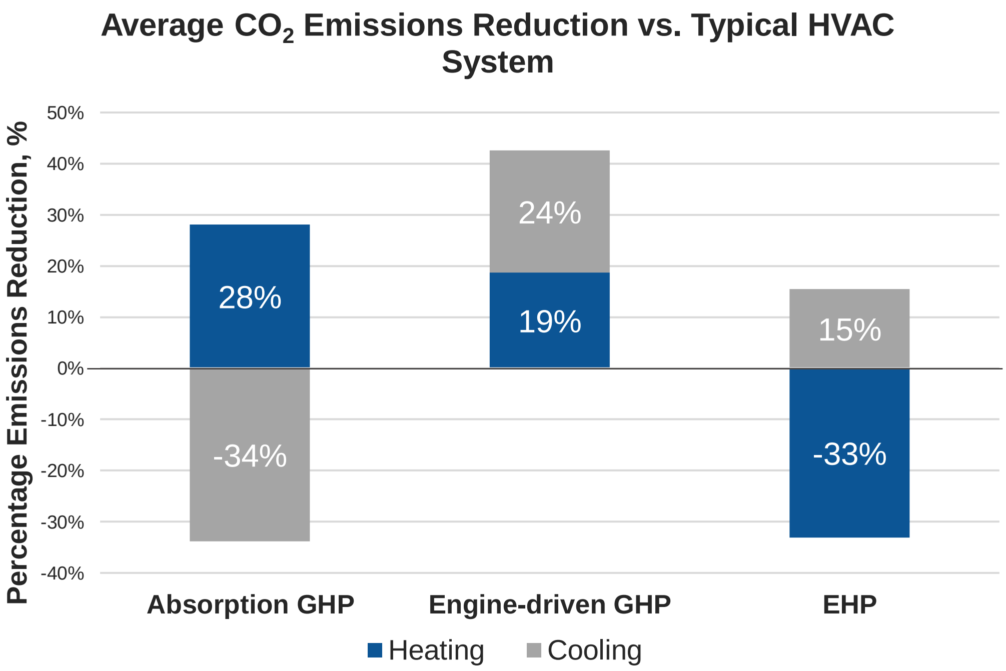
Electric generation and distribution is inherently energy inefficient. Only around 36% of the energy that goes into generating electricity makes it to end users.

The graphic below highlights energy losses from source to site for natural gas and electricity. When you take into account the emissions resulting from power production and distribution, the direct use of natural gas at homes and businesses is the clear choice for lowering greenhouse gas emissions.



Source: Natural Gas Our Clean Energy Future- 2020 AGA Playbook

A study by the ICF in August 2021 titled 'Comparison of Operational Costs and Lifetime Emissions for Gas and Electric Heat Pumps at Commercial Buildings' found that gas heat pumps provided lower emissions than standard HVAC equipment and electric heat pumps. The study looked at two commercial building types in four different climate zones and compared heat pumps to a standard RTU with gas heat. The lowest emissions for heating only applications came from a gas fired absorption heat pump. When it came to heating and cooling, the engine driven heat pump provided the lowest overall CO2 emissions.



Source: https://consortia.myescenter.com/GHP/ESC_GHP_Operating_Costs-Emissions-Study-ICF-August2021-Full.pdf

The following table shows CO_2 emissions for a standalone retail store in four climates. GHPs have lower heating CO_2 emissions than incumbent HVAC system and well as EHPs in all climate zones

(Tons of CO2)		Incumbent System	Absorption GHP	Engine-Driven GHP	EHP
Baltimore	Heating Emissions	834	562	665	834
	Cooling Emissions	769	994	567	631
	Total Emissions	1,603	1,556	1,232	1,465
Houston	Heating Emissions	283	186	212	240
	Cooling Emissions	1,459	2,060	1,183	1,198
	Total Emissions	1,742	2,245	1,395	1,438
Las Vegas	Heating Emissions	338	216	260	285
	Cooling Emissions	1,318	1,802	1,056	1,104
	Total Emissions	1,655	2,018	1,316	1,389
Minneapolis	Heating Emissions	1,775	1,365	1,506	2,975
	Cooling Emissions	481	489	271	394
	Total Emissions	2,255	1,854	1,777	3,369

All heat pumps use some sort of refrigerant. The primary refrigerant used for many years for vapor compression-based heat pumps was a Chlorofluorocarbon (CFC) known as R-12 or a Hydrochlorofluorocarbon (HFC) such as R-22. Both R-12 & R22 CFCs are known to damage our ozone layer and production has been phased out. Gas heat pumps use more environmentally friendly refrigerants that are non-ozone depleting and have lower Global Warming Potential (GWP). Engine driven GHPs use either HFCs such as R-134a or R-410a, or a Hydrofluoro-olefinan (HFO) such as R-513a, which has a low GWP. Absorption heat pumps use either R-717 Ammonia (NH_3) or Lithium bromide (LiBr) and water. Both of these are natural refrigerants with zero ozone depletion potential and zero GWP. Thermal compressors use R-704 Helium as the refrigerant which is non-toxic and has a GWP of 0.

Refrigerant	Global Warming Potential (GWP) Carbon dioxide equivalents, CO2e
R-134A	1430
R-410A	2088
R-513A	631
R-704 (Helium, He)	0
R-717 (Ammonia, NH3)	0
Liutium Bromide (LiBr)	0

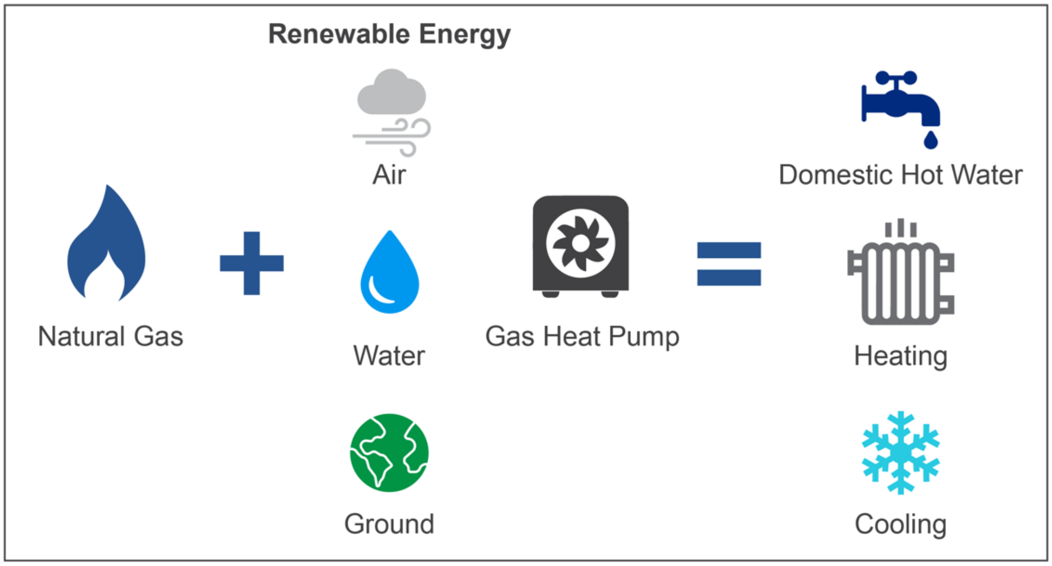
GWP source: https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

Comfort

A study titled ‘Technical, Economic, and Market Analysis of Gas Heating Equipment in Comparison to Electric Heat,’ by ERC at the University of Chicago found that electric heat pumps typically deliver 90-95ºF air temperature to a space while natural gas furnaces deliver hot air at approximately 120 ºF. GHPs typically deliver hot air at 100°F to 120°F. Delivered air temperatures for electric heat pumps tend to be lower compared to gas heating options. As a result, electric heat pumps need to circulate more air to warm a space, making the space feel cold and drafty compared to natural gas heating options. Ultimately, electric heat pumps work twice as hard to achieve the same heating level as a standard efficiency gas furnace. The air being moved is cooler, which tends to be noted by the occupants as lukewarm or even cold and drafty.

Applications

There is no need to reinvent the wheel. Gas heat pumps offer all the same capabilities as traditional equipment plus increased efficiency and added features. GHPs can be used in all market segments – residential, commercial, institutional and industrial.



Typical Applications:

- Space Heating Only
- Space Heating & Domestic Hot Water Heating
- Domestic Hot Water Heating Only
- Alternating Heating & Cooling

Special Applications:

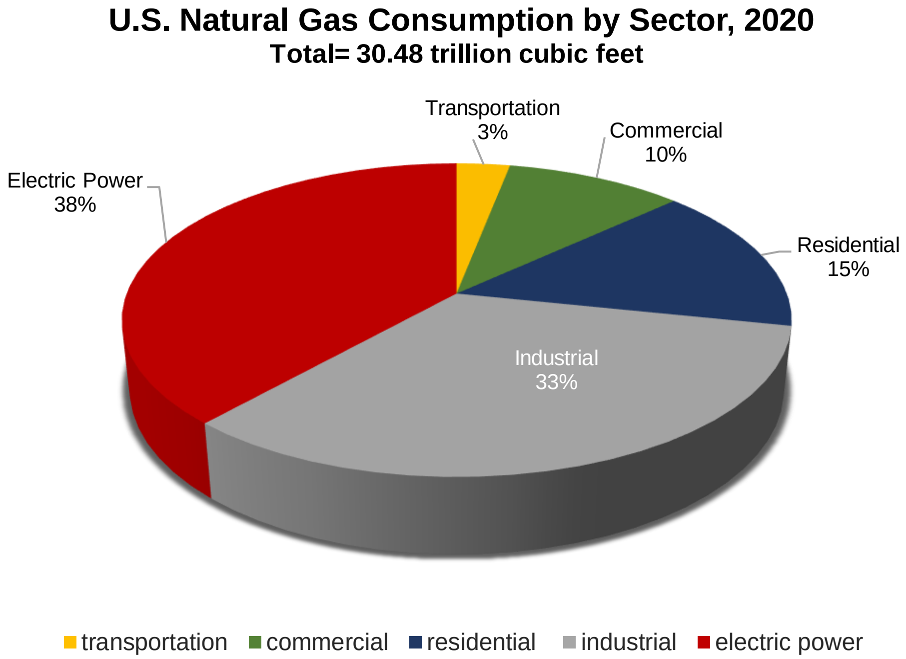
- Simultaneous Heating & Cooling
- Process Applications
- District Heating or Cooling

Installation flexibility and the ability to utilize multiple zones allows for a variety of terminal units:

- Air Handlers
- Fan Coils
- Ceiling Cassettes
- High Wall Units
- Radiant Floors & Panels
- Small Duct High Velocity Systems

GHP Markets

Although natural gas is widely utilized across the electric power sector for electricity generation and in the transportation sector as fuel for mobility and operating machinery, we will limit our market review to GHP applications in the residential, commercial and industrial sectors.
Traditionally, GHPs were limited to large scale industrial and commercial applications. Today, due to research, technical advancements, system level improvements and the increased popularity of Combined Heat & Power (CHP), smaller products have been brought to market, offering a more compact footprint and modular configuration. This has led to more market exposure extending to the residential and light-commercial markets.

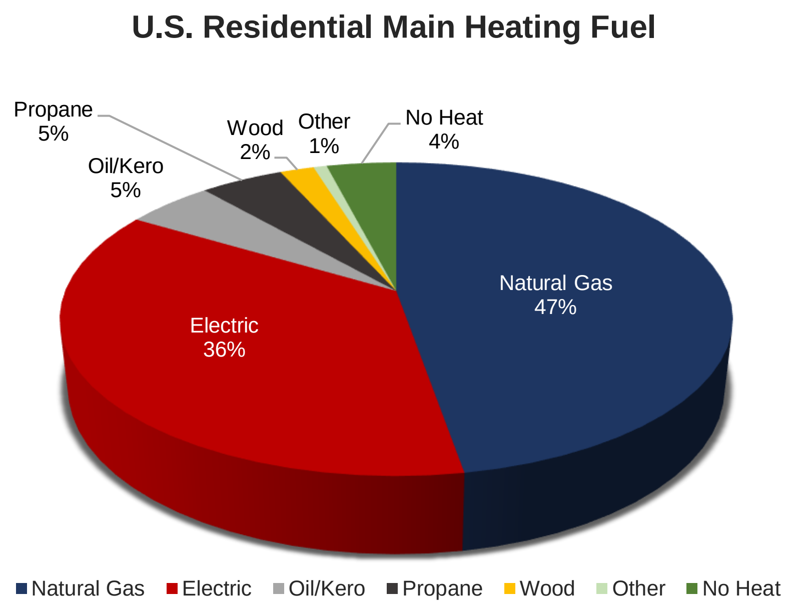


Source: https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php

With a need and urgency to capture waste heat, stakeholders can now make efficiency decisions at both the equipment level and overall system level to compare competing products.

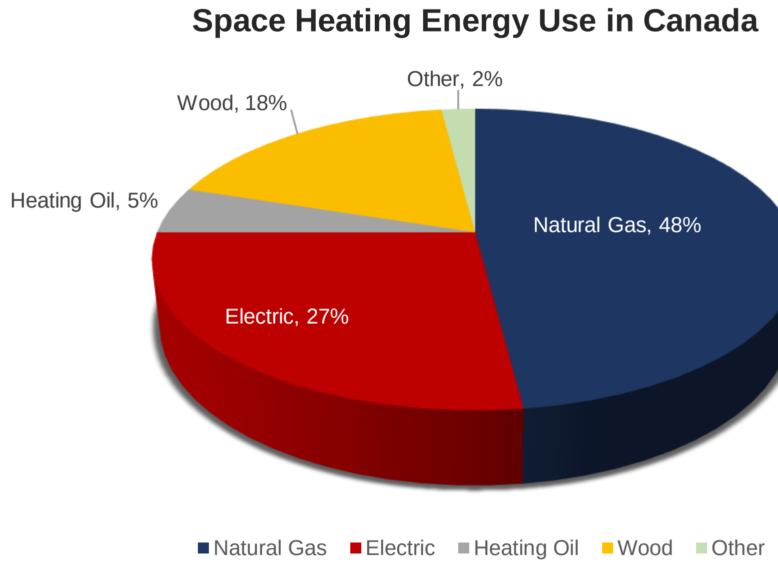
Residential:

About half the homes in the United States (and North America) use natural gas as the main energy source for space heating, domestic hot water, cooking and drying purposes. According to the U.S. Energy Information Administration (EIA), the residential sector in 2020 accounted for 15% of total natural gas consumption and 23% of total energy consumption.
Due to the reliability, availability and lower energy cost, gas heat pumps have the potential for promising applications in various single/multi-family homes, apartments and condominiums.



Source: 2015 Residential Energy Consumption Survey, released Feb 2017

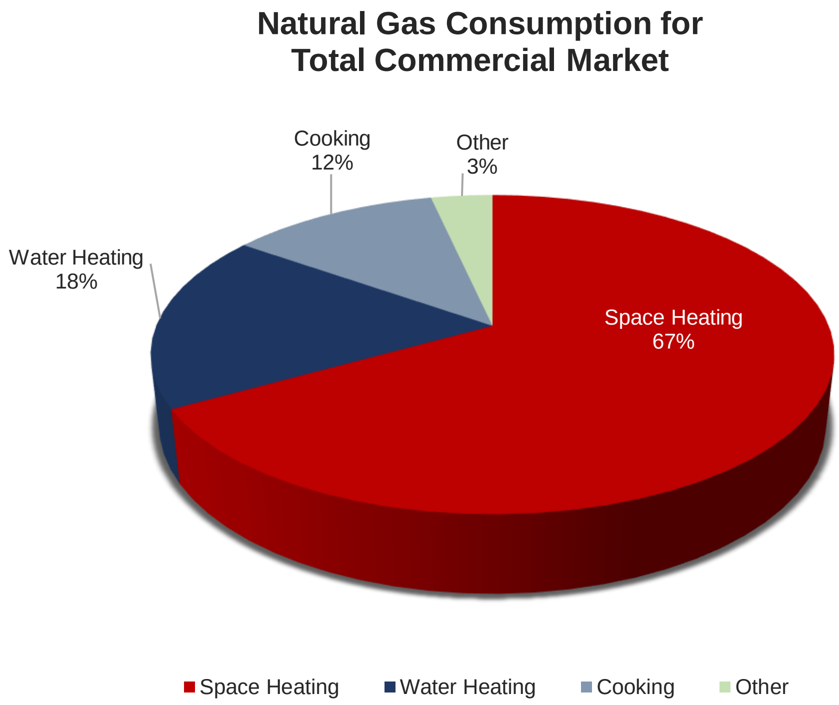
Residents with an existing natural gas connection have the highest incentive to add a GHP to meet their home energy needs. Absorption or thermal compression heat pumps are typically best for residential applications.



Source: Natural Resources Canada – Energy Fact Book 2020-2021

Commercial:

The commercial sector typically uses natural gas as its energy source for space heating and hot water heating. Commercial buildings seeking energy savings and reductions in electric demand have also been using natural gas air conditioning systems for many years.



Source: CBECS 2012 released 3/18/16, EIA CBECS

In order to provide a robust, reliable and efficient infrastructure, the past few decades have seen increased usage and popularity of combined cooling, heating and power systems (CCHP or CHP) as a single package unit. The commercial sector accounted for 10% of total natural gas consumption and 19% of total energy consumption. GHPs offer commercial buildings significant efficiency improvements for heating, water heating and cooling spaces, while reducing electric demand. Standard efficiency gas heating systems are approximately 80% efficient, while high efficiency furnaces, boilers or roof top units are 92%+ efficient. GHPs typically offer heating efficiencies of approximately 140%. Commercial buildings usually require both heating and cooling applications, which lend themselves more towards engine driven GHPs due to their higher cooling COPs.

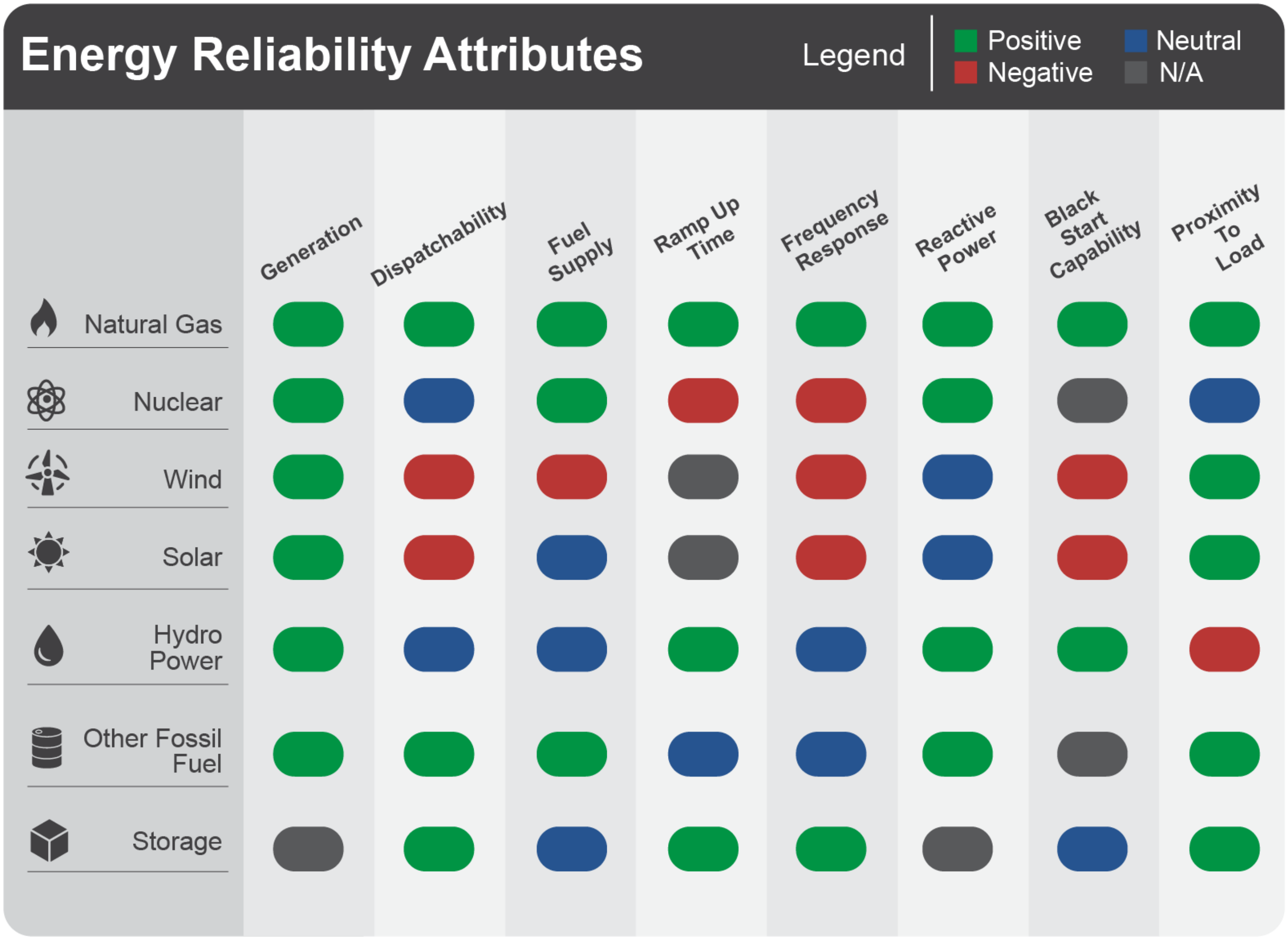
Industrial:

The industrial sector remains the highest consumer of natural gas which accounts for 33% of total natural gas consumption and 34% of total energy consumption. This sector typically uses natural gas for process applications that require heating, cooling or dehumidification. Gas heat pumps save industrial customers money on heating and cooling while reducing electric demand and reducing greenhouse gas emissions on a source basis.

Supporting Grid Reliability

The reliability of the electric grid that we benefit from depends on an array of factors. The figure below shows how various energy resources support the 8 key reliability attributes for grid system health. Natural gas comes to the forefront in these various energy resources.

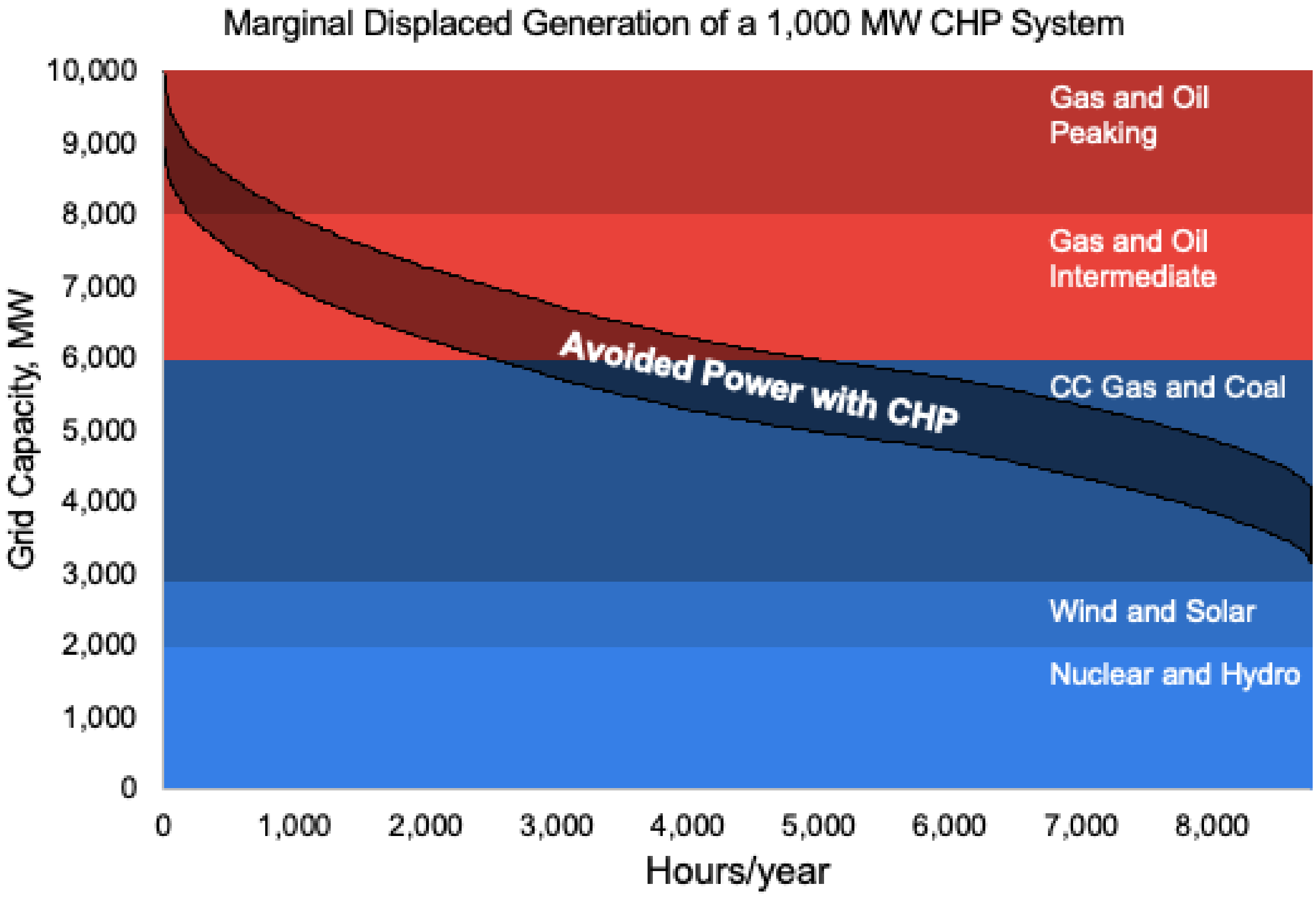
Reliability Attributes and Technology



GHPs reduce electric demand and therefore help improve grid reliability and resiliency. The negligible electricity consumption in this technology can help decrease overall demand at the national grid level for meeting the consumer's cooling and heating needs.

Electric demand varies greatly throughout the day across different climate zones. The grid is made up of a mix of baseload, intermediate power and peaking power plants. The following graph shows the electric grid dispatch order and load duration curve for a Combined Heat and Power (CHP) System running up to 8,760 hours per year. A gas heat pump will have similar characteristics to the CHP in helping to reduce peak and intermediate loads on the grid, thus helping to stabilize the grid while reducing congestion and constraints. This helps the grid maintain its reserve margins and become more reliable and resilient during critical hours.

GHPs are very efficient based on a source energy basis. GHPs help to limit power consumption during times of high electric demand (peak hours).



Source: Combined Heat and Power Potential for Carbon Emission Reductions, National Assessment, 2020-2050. ICF, July 2020

GHP Product Status

There are multiple gas heat pump systems in various stages of development that are available in a wide range of sizes for use in different applications. The following table summarizes the various products as of the writing of this guide. Please note that this is an evolving landscape that is subject to change.

Company	Type	Technology	Best Applications	Status	Heat Sizes	Cooling Sizes
Aisin		IC Engine		Commercially available	103,000 to 410,000 BTU/h	8, 15, and 30 Tons
Blue Mountain Energy		IC Engine		Commercially available, 5 & 11 Ton, field testing others	91,000 to 410,000 BTU/h	5, 8, 11, 15, and 30 Tons
boostHEAT		Thermal Compressor		Field test 2022	68,000 BTU/h	n/a
Broad USA		Absorption		Commercially available	962,000 BTU to 57,800,000 BTU/h	30 to 3,968 Tons
Energy Concepts		Absorption		Commercially available	396,000 to 40,000,000 BTU/h	20 Tons to 2,000 Tons, down to -50ºF
Gridiron		IC Engine		Commercially available	70,000 BTH/h	5 Tons
HeatAmp		Adsorption (Chemisorption)		Field test 2023	Up to 50,000 BTU/h	n/a
Robur		Absorption		Commercially available	120,000 BTU/h	5 Tons
Stone Mountain Technologies		Absorption		Commercially available 2022	10,000 to 140,000 BTU/h	Future cooling 1-4 tons
Tecogen		IC Engine		Commercially available	527,500 Btu/h	22 Tons
ThermoLift		Thermal Compressor		Field demos	55,000 to 75,000 BTU/h	3 Tons
Yanmar		IC Engine		Commercially available	108,000 to 198,000 BTU/h	8, 10, 12, and 14 tons
Vicot		Absorption		Commercially available. Resid. units: Field Trial	68,000 BTU to 290,000 BTU/h	n/a

Key: Residential Commercial Industrial Heating Cooling Water Heating

Note that many of these manufacturers offer modular design solutions that package more than one unit together to meet larger heating and cooling needs.

Contacts:

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GHP Codes and Standards

ANSI Z21.40.1- CGA 2.91 is the standard for safe operation, substantial and durable construction, and acceptable performance of gas fired, heat activated air conditioning and heat pump appliances. There is also a similar safety standard for work activated heat pumps (Internal Combustion) which is ANSI Z21.40.2. These standards cover two sections 1) the constructions, and 2) the performance.

The provisions in this standard are intended to help reduce injury risks to a person while retaining the normal operation of the appliance. This standard was initially published by the American National Standard (ANSI) and Canadian Gas Association Standard (CGA) in 1996 and reaffirmed in 2017. It is currently being updated by CSA.

Along with this standard, for performance testing there is ANSI Z21.40.4 – CGA 2.94 which proposes test methods to cover a wide range of unitary gas-fired technologies, including engine-driven, desiccant/adsorption-driven, and absorption-driven cycles. This ANSI test is comprised of a series of steady state rating points under static conditions, at full and partial loading, including considerations for defrost modes and cycling degradation. Data from these rating points will be used to generate performance curves and to calculate seasonal performance metrics, including seasonal efficiency (AFUE, Seasonal COP) and estimated electric power consumption.

GHP Resources

Visit gasheatpumps.com to learn more about GHPs. You can also find a variety of case studies, a video that provides an overview of GHPs and a magazine highlighting success stories. If you would like to perform a simple life cycle cost calculation for a GHP compared to conventional HVAC and EHPs, you can find a tool at gasairconditioning.com/general-resources/tools/.

Gas Heat Pumps – Extremely Energy Efficient – Even at Low Outside Temperatures

Natural gas heat pump options are available today that provide heating and cooling for residential, commercial & industrial customers. These systems utilize natural gas or renewable energy making them very reliable and energy efficient.

These innovative heat pumps can be configured as air source, water source, or ground source (geo-thermal) systems. Check out our video and Magazine:

Visit www.intgas.com/saveenergy for more information and updates on gas heat pump technology.

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