International Energy Agency

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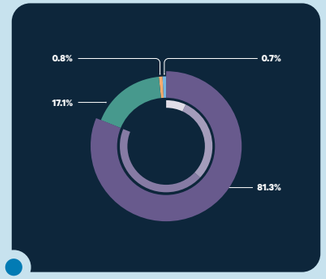
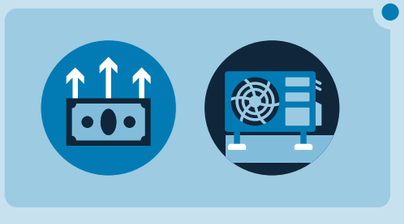
# Home Heating Technology *Guide*

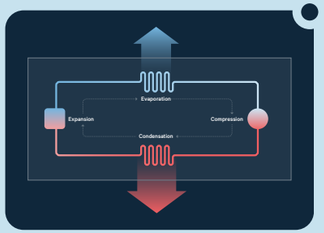
A comprehensive overview of home heating technology solutions

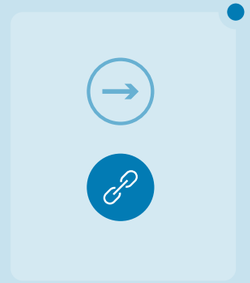
Azerbaijan

# Content







**40%**

The buildings sector accounted for over 40% of Azerbaijan's total energy consumption in 2021

Certain heat pumps models can both heat homes and cool them

# Introduction

A significant portion of Azerbaijan's total energy consumption currently comes from buildings – the vast majority of which are individually heated using boilers that run on the country's ample supply of natural gas.

The gas boilers often fall short in terms of energy efficiency and sustainability compared with other options available on the market. More efficient and sustainable alternatives – such as heat pumps powered by low-emissions electricity – therefore deserve a closer look.

This guide offers a comparison of home heating options, supporting consumers in Azerbaijan as they make decisions based on their personal energy needs and circumstances. Contractors can offer more customised advice and cost estimates.

FIGURE 1

**Share of energy sources in residential sector,** 2021 *(TJ)*

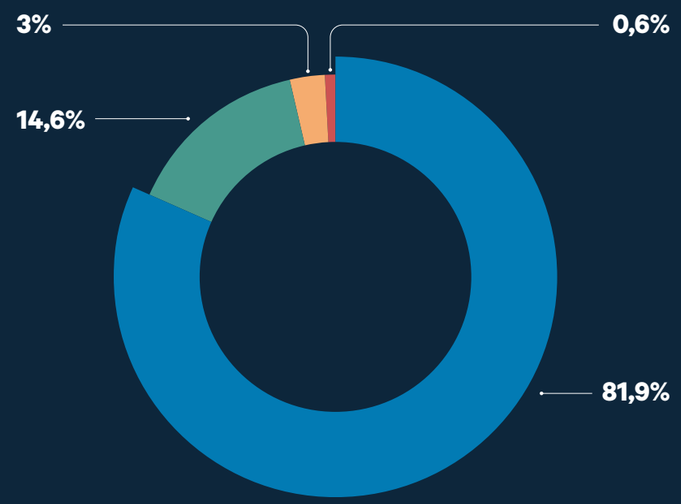
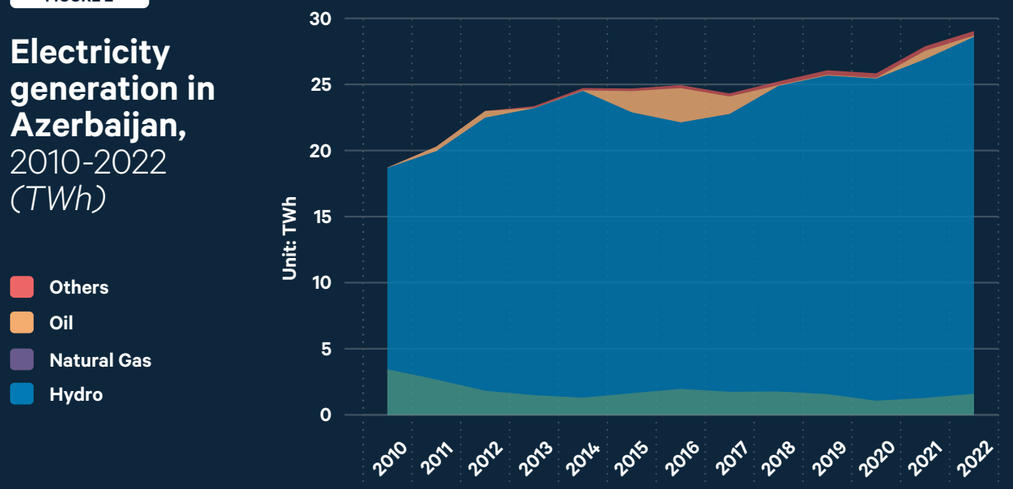



FIGURE 2

**Electricity generation in Azerbaijan,** 2010-2022 *(TWh)*




Sources: IEA World Energy Statistics and Balances (database), 2022.



# Key context for Azerbaijan

Currently, natural gas dominates the country's heating sector, with approximately 82% of households relying on it for warmth, according to the State Statistical Committee of Azerbaijan.

Electricity serves as an alternative heating source, particularly in urban centres, though it remains far less present than natural gas. Only a few Azerbaijani households, mostly in urban areas, are currently connected to a district heating system (less than 3%). Traditional fuels such as wood and coal are utilised in some rural regions where access to modern heating infrastructure is limited, although their usage has been declining.

The energy consumption of existing buildings in Azerbaijan is high, as the majority are older and do not match the most up-to-date energy efficiency standards, according to the IEA's review of Azerbaijan's energy policies conducted in 2021.

**Natural gas**

**82%** of households consumption

**Firewood / Agricultural waste**

are still utilized in some rural regions

**Electricity**

serves as an alternative heating source, particularly in urban centers

# What is a heat pump?

A heat pump uses technology similar to what is found in a refrigerator or an air conditioner, but it works in reverse. It extracts heat from a source – the surrounding air, geothermal energy stored in the ground, or even waste heat from a nearby factory. It then amplifies and transfers the heat to where it is needed.

## What are the benefits?

In Azerbaijan, where the climate is characterised by cold winters and hot summers, adopting efficient and versatile heating technologies is essential. Heat pumps are particularly well-suited to meet energy needs in the country, since certain models can provide both heating and cooling.

Because most heat is transferred rather than generated, heat pumps are far more efficient than conventional heating technologies. In fact, current models are 3-5 times more energy efficient than gas boilers. They can also be cheaper to run.

There are wider advantages to installing more heat pumps as well. The International Energy Agency estimates that they have the potential to reduce carbon dioxide ($CO_2$) emissions by at least 500 million tonnes globally in 2030 – making it a key technology as countries work to meet their energy and climate goals.

Notably, heat pumps can be combined with other heating systems, such as those using gas, in hybrid configurations.


**1 Absorbing heat from outside**

A heat pump collects warmth from the outside, which it uses to turn refrigerant, in its pipes, into vapour.

**2 Bringing heat inside**

The gathered vapour is compressed to heat it further, and transported into your home, releasing heat.

**3 Releasing heat indoors**

The super-hot gas passes its heat to the heat transfer medium, warming up the area. During this step, the vapour transforms back into a liquid.

**4 Cooling down liquid**

This liquid passes through a special valve, rapidly cooling it down to prepare for absorbing the outside heat.

**5 Optional cooling**

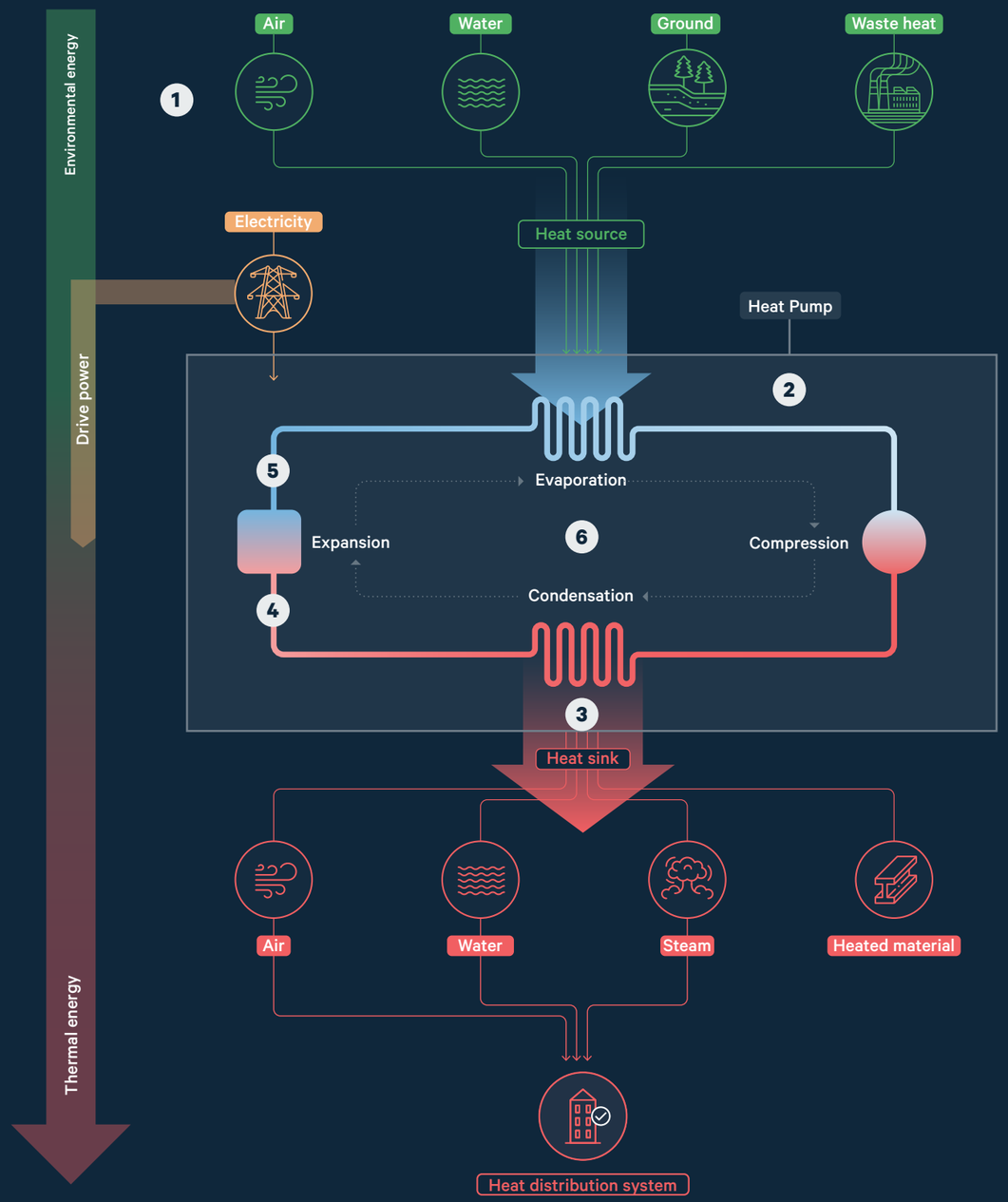
Alternatively, the heat pump can reverse the process. It takes warmth from the inside and releases it outside, similar to opening a window to let out warm air.

**6 Continuous cycle**

The heat pump maintains a repeating cycle, either bringing warmth in to heat your home or moving warmth out to cool it down.



# How does a heat pump work?



# What heating options currently exist?

When it comes to home heating, consumers have a diverse array of options, from traditional systems that run on fossil fuels to cutting-edge sustainable solutions. This overview of technologies available globally allows for a closer examination of their individual characteristics and their potential role in achieving secure, sustainable heating for households in Azerbaijan.



## Air-to-Water Heat Pumps

These heat pumps use heat from the air outside to heat water for your radiators or underfloor heating. Since they move heat in and out of buildings instead of generating it, they are 304 times more energy efficient than fuel-based or electric heaters.

Air-to-water heat pumps are usually connected to a tank that provides hot water for heat distribution systems, bathrooms and kitchens. Some models also provide space cooling. They run on electricity, and when installed in well-insulated homes they can achieve significant energy bill savings.

**Capacity**
Heating, hot water and cooling

**Average lifespan**
15-18 years

**Powered by**
Electricity

**Heats through**
Radiators, underfloor heating

**Energy bills**
Up to 50% lower than for gas boilers. Saving are approximate and may vary.

## Air-to-Air Heat Pumps

Air-to-air heat pumps use heat from the air outside to heat your home through in-room blowers or vents. As with air-to-water heat pumps, they are also 3-4 times more energy-efficient than fuel-based or electric heating systems.

Air-to-air heat pumps are ideal for homes without radiators or underfloor heating. They can also provide space cooling. Some models can be combined with water tanks to provide hot water for bathrooms and kitchens.

**Capacity**
Cooling, heating

**Average lifespan**
12-15 years

**Powered by**
Electricity

**Heats through**
Blowers

**Energy bills**
Up to 50% lower than for gas boilers. Saving are approximate and may vary.

## Ground source Heat Pumps

Ground source heat pumps use heat from the ground outside to heat water for your radiators or underfloor heating. They are 4-5 times more energy efficient than fuel-based or electric heating systems.

Ground source heat pumps – as well as water source heat pumps that absorb heat from a nearby river, lake or pond, or from groundwater – are also more energy efficient than air-source heat pumps, as ground and water temperatures stay relatively stable compared with outdoor air temperatures.

**Capacity**
Heating, hot water

**Average lifespan**
20-25 years

**Powered by**
Electricity

**Heats through**
Radiators, underfloor heating

**Energy bills**
Up to 50% lower than for gas boilers. Saving are approximate and may vary.

## Solar Thermal Heaters

Solar thermal heaters use solar collectors on the roof to produce hot water. While this hot water is mainly used in bathrooms and kitchens, it can also contribute to meeting your space heating needs if combined with other heating systems such as heat pumps.

When utilised in this way, solar thermal heaters can lower the energy costs of the system with which they are combined. They have lifespans of 15-20 years.

**Capacity**
Heating, hot water

**Average lifespan**
15-20 years

**Powered by**
Electricity

**Heats through**
Radiators, underfloor heating

**Energy bills**
Solar energy can lower the energy costs of the system it's combined with.

## District Heating

Heat networks, available in some areas, are centralised systems that distribute heat to your home through underground pipes. District energy networks transfer heat to radiators or underfloor systems and might also provide hot water for bathrooms and kitchens. Some systems can also cool connected homes.

They run on various energy sources, such as combined heat and power plants or large-scale heat pumps, depending on the network.

**Capacity**
Heating, hot water and cooling

**Average lifespan**
20-25 years

**Powered by**
Various sources

**Heats through**
Radiators, underfloor heating

**Energy bills**
Up to 50% lower than for gas boilers. Saving are approximate and may vary.



## Biomass Boilers

Biomass boilers burn wood pellets, chips or logs to heat water. This water then provides heat to radiators or underfloor systems. Other biomass heating systems, such as stoves, can heat a single room and can be combined with a boiler for hot water for bathrooms and kitchens.

Biomass heating systems can also be used in combination with solar thermal heaters or heat pumps. When installed in well-insulated homes, they can achieve significant energy bill savings.

**Capacity**
Heating, hot water

**Average lifespan**
20-25 years

**Powered by**
Biomass

**Heats through**
Radiators, underfloor heating

**Energy bills**
Up to 50% lower than for gas boilers. Saving are approximate and may vary.

## Electric Radiators

Electric radiators are stand-alone units that generate heat by passing an electric current through a resistor. Households using electric radiators for space heating also need a hot water system such as a heat pump or electric water heater.

Energy bills are typically higher than for other technologies, and their lifespans are shorter, at about 10-12 years.

**Capacity**
Heating

**Average lifespan**
10-12 years

**Powered by**
Electricity

**Heats through**
Radiators

**Energy bills**
Higher than for other technologies.

## Gas Boilers and Furnaces

Gas boilers and furnaces utilise natural gas to heat water for radiators or underfloor systems while distributing warmth via forced-air systems. These systems also cater to daily hot water needs in homes. Notably, nine European countries have initiated or announced bans on exclusive natural gas boiler installations, with similar measures in certain regions of North America and China.

Compared with low-emissions options like heat pumps, gas boilers and furnaces consume more energy. They typically have a lifespan of 15-17 years.

**Capacity**
Heating, hot water

**Average lifespan**
15-17 years

**Powered by**
Gas

**Heats through**
Radiators, underfloor heating

**Energy bills**
Higher than for low-emitting systems such as heat pumps.



2024

National Energy Efficiency Fund

could ultimately support the adoption of energy-saving heating technologies such as heat pumps

# Azerbaijan's home heating transition

Not all of these heating technologies are used widely or available in Azerbaijan right now.

However, Azerbaijan is currently taking steps to tackle challenges in its energy sector. It is exploring initiatives and incentives to transition to a more secure and sustainable energy system, such as the National Energy Efficiency Fund.

The Fund, launched in March 2024, could ultimately support the adoption of energy-saving, more sustainable heating technologies such as heat pumps. For example, preferential loans could support the implementation of new technologies and cover efforts to improve insulation in buildings. Well-insulated spaces are ideal settings for heat pumps, since they have more stable, controlled indoor environments that make it easier for the technology to regulate.

For this reason, further efforts to strengthen energy efficiency standards for both newly-built and renovated homes could support the implementation of clean heating technologies in Azerbaijan, reducing energy bills and lowering carbon emissions.

Other initiatives – such as those focused directly on supporting heat pump uptake – could also boost usage in Azerbaijan. To succeed, these measures should be well-tailored to the country's needs, be sufficiently funded, and involve consistent engagement with all stakeholders.

# Sources

International Energy Agency (2022), World Energy Statistics and Balances Database

https://shrtm.nu/ZaEf61Z

Ministry of Energy of the Republic of Azerbaijan (2024), Enerji effektivliyi fondunun vəsaitlərinin formalaşdırılması və istifadə QAYDASI

https://shrtm.nu/esqP0w1

International Energy Agency (2021b), Azerbaijan Energy Policy Review

https://shrtm.nu/e8T4lu6

International Energy Agency (2021), Are renewable heating options cost-competitive with fossil fuels in the residential sector

https://shrtm.nu/IPVsYDu

International Energy Agency (2022b), The Future of Heat Pumps

https://shrtm.nu/MBLzXbV

Ministry of Energy of the Republic of Azerbaijan (2021), Laws

https://shrtm.nu/2esXRKo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Azerbaijan

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