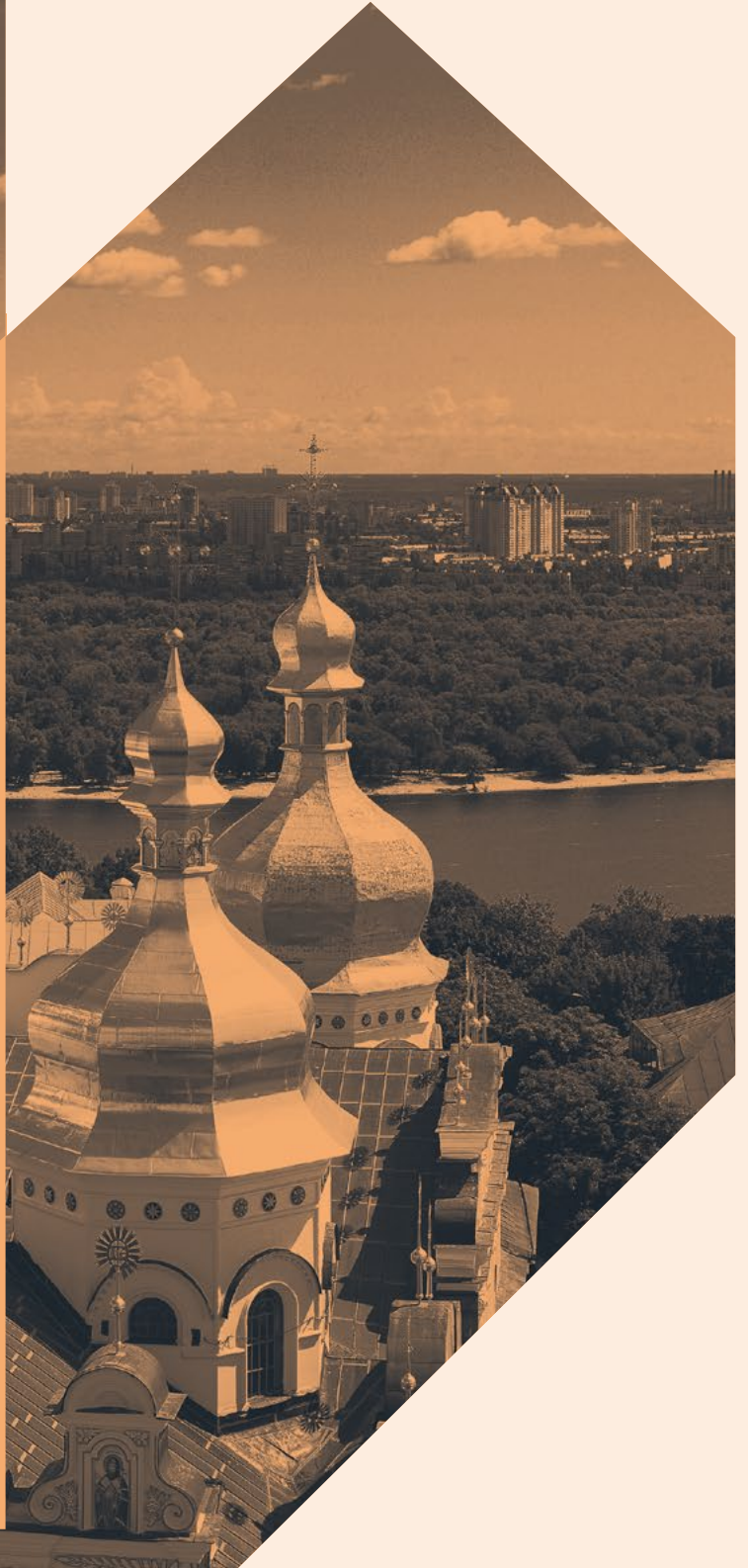




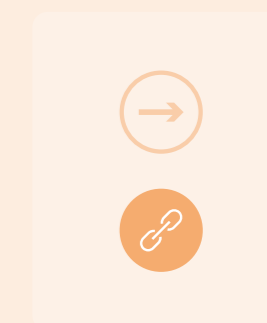
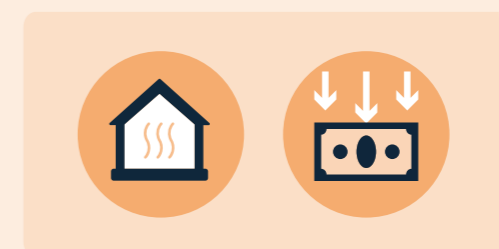
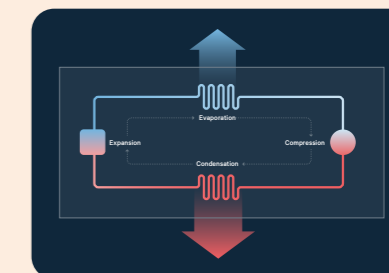
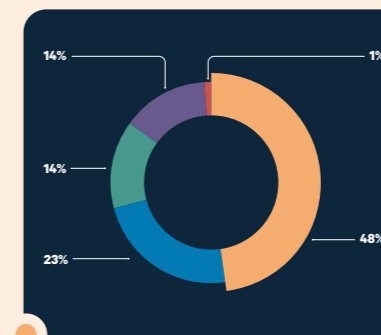
Home Heating Technology *Guide*

A comprehensive
overview of home heating
technology solutions



Ukraine

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Introduction

Amid the full-scale war in Ukraine, energy security remains a top priority. This includes ensuring that households have reliable and affordable access to home heating, which constitutes 43% of the country's energy consumption.

The largest share of demand comes from residential buildings. Nearly half of Ukrainian households in 2021 relied on district heating, typically fuelled by natural gas, followed by individual heating solutions such as stoves and furnaces fuelled by gas or coal.

Despite their widespread usage, these heating solutions often fall short in terms of energy efficiency and sustainability compared with other options available on the market. More efficient and sustainable alternatives which also enhance energy security – 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 Ukraine as they make decisions based on their personal energy needs and circumstances. Contractors can offer more customised advice and cost estimates.



43%

The buildings sector accounts for 43% of Ukraine's total energy consumption



47%

of households relied on district heating in 2021

Key context for Ukraine

District heating, largely installed during the Soviet era, still fulfils over half of demand for heat energy in Ukraine – though a transition to other options is underway. Since the 2000s, more and more households have been switching to alternative heating technologies due to poor service quality, rising prices and low efficiency.

creating a more stable and controlled indoor environment, while limiting energy bills. Improved insulation also reduces cooling needs in summer.

Wider adoption of low-emissions and efficient technologies such as heat pumps could deliver many benefits, including helping Ukrainians conserve energy, improving Ukraine's energy security by reducing fossil fuel imports, and fulfilling the government's plans to build a more sustainable energy system for the future.

Currently, most consumers in Ukraine cannot regulate the temperature of rooms in their homes except by opening windows. With only 10% of Kyiv's residential buildings equipped with individual heat substations, according to USAID, many consumers have installed standalone electric heaters or gas boilers for heat and/or hot water – though neither is the most energy efficient nor sustainable option on the market.

The energy consumption of existing buildings in Ukraine is high, as the majority are older and do not match the most up-to-date energy efficiency standards. Proper insulation reduces heat loss from buildings,

Ukraine has numerous advantages it could tap to expand clean electricity supply and support this transition. The country has substantial potential to generate more energy from wind and solar – especially through the installation of greater distributed energy resources. It also already generates low-emissions electricity from nuclear, which account for about a quarter of Ukraine's total energy supply.



most consumers in Ukraine cannot regulate the temperature of rooms in their homes except by opening windows



10%

only 10% of Kyiv's residential buildings are equipped with individual heat substations

FIGURE 1

Share of energy sources in residential energy consumption 2020

- Natural gas
- Electricity
- Heat
- Solid biofuels
- Coal and oil

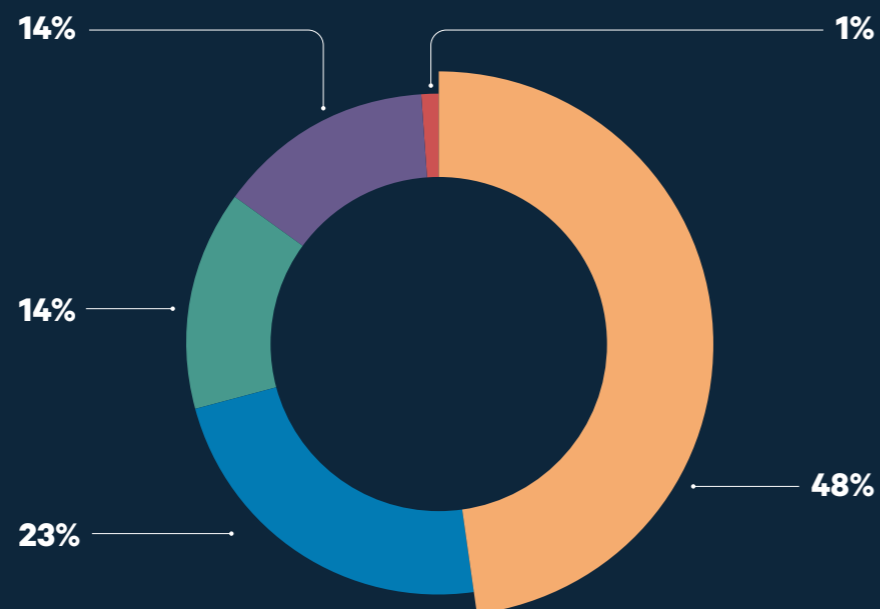
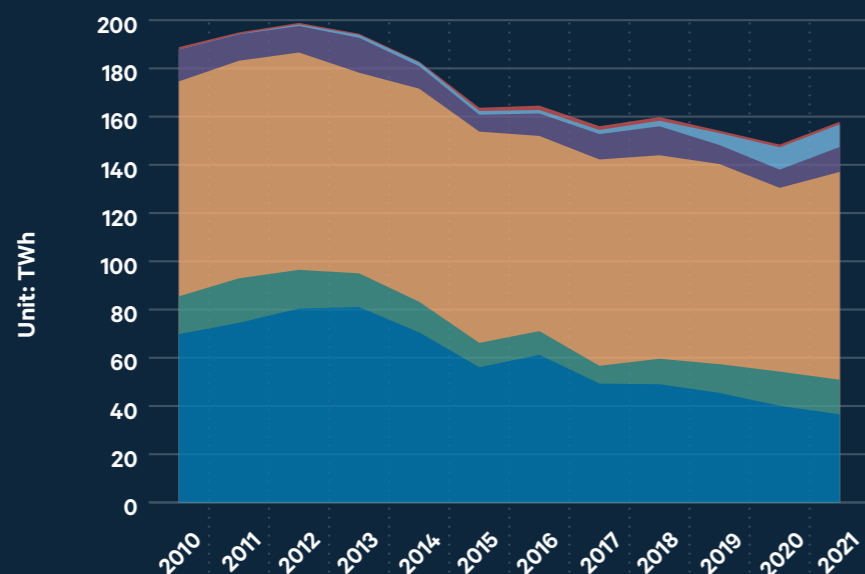


FIGURE 2

Electricity generation in Ukraine 2010-2021 (TWh)

- Nuclear
- Coal
- Coal and oil
- Hydro
- Solar and wind
- Others



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

NOTE Excluding temporarily occupied territories of Crimea, Sebastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.

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 Ukraine, 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. can also be cheaper to run – helping to ensure more affordable energy prices over the longer term and

supporting Ukraine's shift away from fossil fuel imports.

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 (CO₂) emissions by at least 500 million tonnes globally in 2030 – making it a key technology as countries work to make their energy systems more sustainable.

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



Heat pumps could help reduce CO₂ emission by at least 500 million tonnes in 2030 globally



Equal to the annual emissions of all cars in Europe today

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

4 Cooling down liquid

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

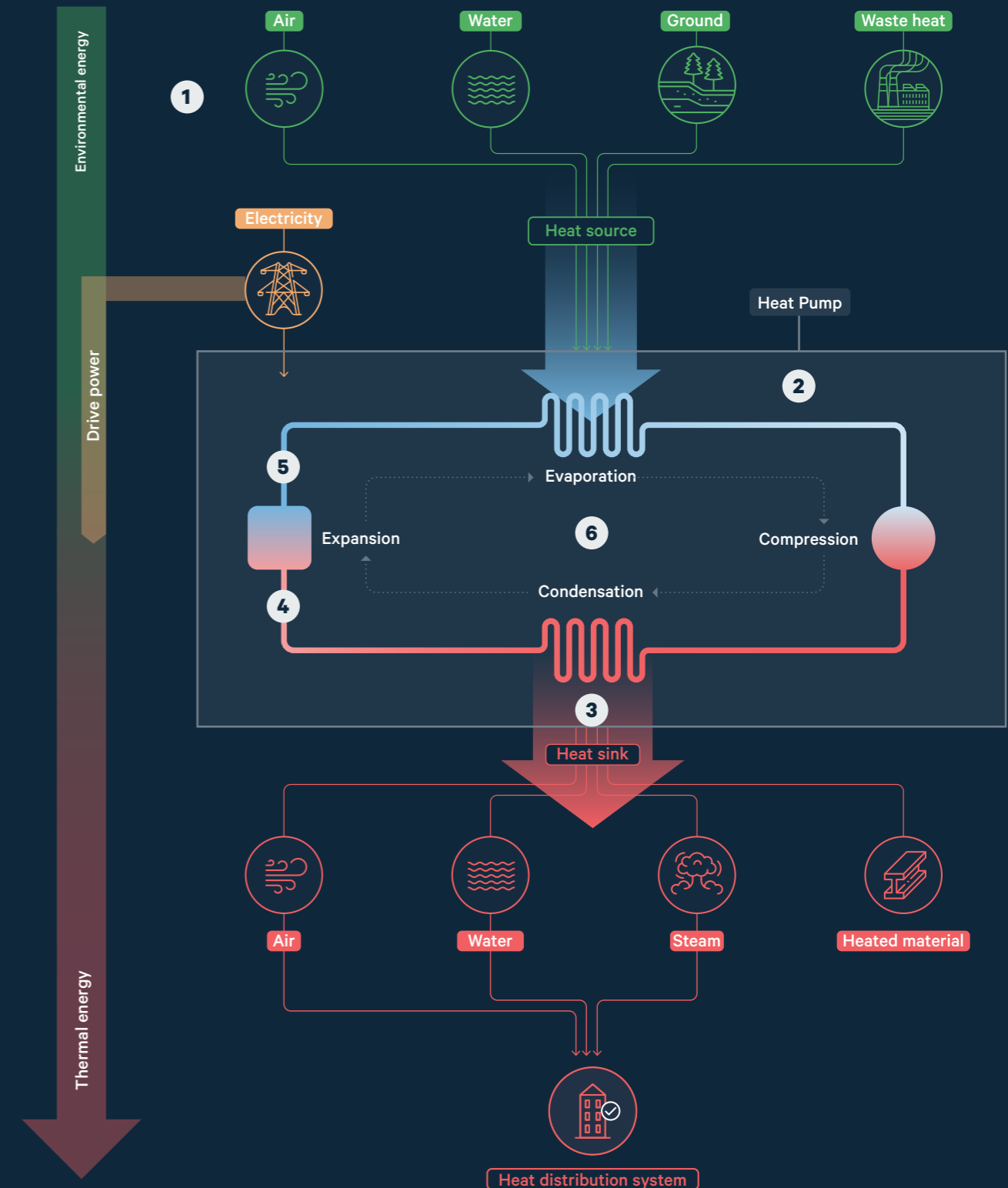
5 Optional cooling

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 Ukraine.



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. Savings 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. Savings 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. Savings 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. Savings 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. Savings 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

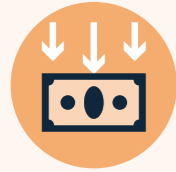
Average lifespan
15-17 years

Powered by
Gas

Heats through
Radiators, underfloor heating

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

Ukraine's home heating transition



Warm Loans Programme

289 M€

864 000 households received more than UAH 8.9 billion (EUR 289 million) for energy efficiency measures



Energodim Financial Support Programme supported 470 projects covering 64 000 households

94 M€

with a total budget of UAH 3.8 billion (EUR 94 million)

3 GWh

energy savings of 3 gigawatt-hours (GWh) per year

Not all of these home technologies are widely used or available in Ukraine right now. However, the country is taking steps to tackle challenges in its energy sector, exploring initiatives and incentives to transition to a more secure and sustainable energy system.

For instance, through the government's Warm Loans Programme, which ran from 2014 to 2021, 864 000 households received more than UAH 8.9 billion (EUR 289 million) for energy efficiency measures. This funding mostly went towards insulating individual houses and apartments, but also supported the purchase of solid fuel boilers to replace gas boilers. These measures were aimed at preparing households for the phase-out of gas subsidies and possible risks to gas supply.

The State Agency on Energy Efficiency and Energy Saving for Ukraine (SAEE) estimated that the programme saved the equivalent of around 490 million cubic meters of natural gas per year in 2021. Programme participants saw both their energy bills decline and their living comfort increase.

The country's Energy Efficiency Fund also aims to support energy efficiency projects for buildings. In September 2019, the Fund launched the Energodim Financial Support Programme for energy efficiency measures in apartment buildings. By July 2021, it supported the launch of more than 470 projects covering 64 000 households, with a total budget of UAH 3.8 billion (EUR 94 million) and expected energy savings of 3 gigawatt-hours (GWh) per year.

Before Russia's full-scale invasion of Ukraine, the Fund planned to secure the participation of around 426 000 households in 4 900 blocks of apartments by the end of 2025, shaving 20% off their utility bills and avoiding an estimated half a million tonnes of emissions. An expansion of the Fund's scope to cover improving energy efficiency in individual houses is currently in the works.

Other initiatives – including those focused directly on supporting the adoption of heat pumps – could boost sustainable home heating in Ukraine if they are well designed and targeted and sufficiently funded.

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Ukraine



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