#HPinsights

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Heat pump potential in Luxembourg

Clean energy in action

This brief analyzes the current technologies used in Luxembourg's domestic heating sector and explores the future potential of heat pumps as a sustainable alternative.

Key market indicators

- Population (2024): **672 050** [1]
- Number of residential dwellings (2025): **263 671** [2]
- Sales of heat pumps (2023): **502** [3] = 303 air/water + 199 geothermal
- Stock of heat pumps (2023): **5 193** [3] units
- Heat pump density (2023): **7.7** heat pumps per 1000 residents or **19.7** heat pumps per 1000 residential dwellings
- Approx. number of operating boilers (2023): **143 279** units = 88 642 (natural gas) + 54 637 (fuel oil)
- Electricity-gas price ratio (2024): ~ **2.35**
- Electricity-fuel oil price ratio (2024): ~ **1.87**
- 2023: Legal ban on the installation of fossil fuel boilers in new buildings
- 2040 (indicative, non-binding): Target year for the complete phase-out of fossil fuel boilers in all buildings
- Heat pump target stock (after 2040): ≥ **120 000** units (new buildings not included)
- Heat pump target density (after 2040): ~ **178** heat pumps per 1000 residents (2023 population)

Current market

The domestic heating sector in Luxembourg is dominated by fossil-fuel boilers, which are used in approximately 86% of heating installations. Table 1 shows an estimated count of the number of installations by fuel type and building type. In the calculations leading to this table, it was considered that apartment buildings have an average of six dwellings per building and use a central heating system.

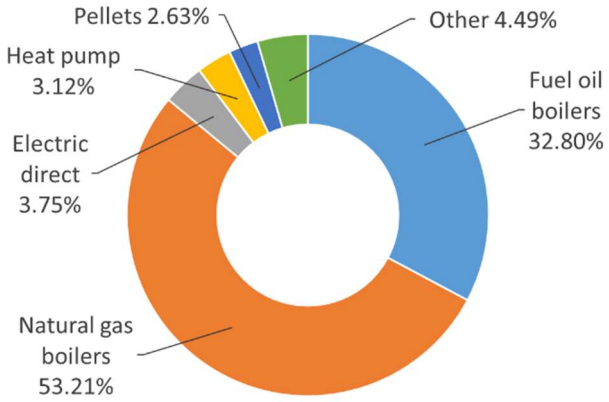

Figure 1. Current domestic heating technologies

❶**Natural gas** is the primary heating fuel in Luxembourg, used in 53% of installations, mainly in the capital and towns with access to the gas grid. It has long been favored for its convenience and the country's well-developed distribution network.

❷**Heating oil** is the second most common heating source, used in about 33% of installations, particularly in single-family homes in rural areas. Just a few years ago, nearly 70% of rural households depended on heating oil due to its ease of transport and storage.

❸ **Direct electric** systems (resistive radiators, convectors, and underfloor heating) are used by around 3.75% of households. While they offer convenience, these systems are less energy-efficient compared to other heating options.

❹ **Heat pumps** still have a relatively low adoption rate in Luxembourg. According to HeatEurObserv'ER [3], there were 5,193 heat pumps in operation in 2023, with 65.4% being aerothermal and 34.6% geothermal. Assuming these systems are primarily used for heating, this corresponds to an estimated 3.12% of households relying on heat pumps. The market is growing steadily, as heat pumps have become the corresponding "reference technology" for new buildings following the 2023 ban on fossil-

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fuel boilers. In existing homes, a voluntary replacement scheme supports the transition from older oil and gas boilers to heat pumps or pellet systems.

Table 1. Estimation of the number of installations by technology and housing type, based on [4]

Technology	Single-family houses		Apartment buildings		Total	
	Units	Percentage	Units	Percentage	Units	Percentage
Natural gas boilers	73855	51.07%	14787	67.24%	88642	53.21%
Fuel oil boilers	49961	34.55%	4676	21.26%	54637	32.80%
Electric - direct	4655	3.22%	1601	7.28%	6256	3.75%
Electric - heat pump	4898	3.39%	295	1.34%	5193	3.12%
Wood and pellets	4344	3.00%	42	0.19%	4387	2.63%
Other	6894	4.77%	589	2.68%	7484	4.49%
Total	**144607**	**100.00%**	**21991**	**100.00%**	**166599**	**100.00%**

❺**Wood and biomass** (pellets, etc.) heating play a minor role in Luxembourg, with only about 2.63% of households using wood-burning stoves or pellet boilers as their primary heat source. This includes some farmhouses and eco-conscious new homes with biomass boilers. While Luxembourg has forests and a tradition of fireplace use, wood is now more commonly used as a supplemental or cozy heating option rather than a widespread primary source.

❻**District heating** is very limited in Luxembourg, with only a few thousand households currently connected. There are a few local district heating networks, for example in parts of Luxembourg City and in new housing developments or areas using industrial waste heat, but district heating remains uncommon. The government's climate plan envisions growing these networks in certain areas, but communal heating is a very small part of the overall heating sector.

Future market

Luxembourg is proactively shifting its heating stock toward low-carbon technologies, with heat pumps emerging as the leading solution. In 2023, the government banned the installation of fossil-fuel boilers in new buildings. Aligned with the EU targets, it aims to decarbonize the heating sector by 2040. There are, however, no mandatory or specific national targets for 2040. Yet, based on the figures in Table 1, we can foresee the likely shape of the domestic heating sector once the decarbonization process is completed at 2040 or beyond.

There are around **143,000 fossil fuel boilers to be replaced** by heat pumps and biomass boilers. Determining the split between these two technologies is uncertain due to the requirements of different building types, regional infrastructure, user preferences, and incentive schemes that may influence technology adoption.

Heat pumps are ideal for well-insulated dwellings in areas with access to electricity, but they require a significant upfront investment and may be less effective in poorly insulated buildings. Pellet boilers, on the other hand, are better suited for rural areas, offer renewable heating using locally sourced biomass, and can integrate with existing radiator systems, but they require more space for fuel storage and regular maintenance.

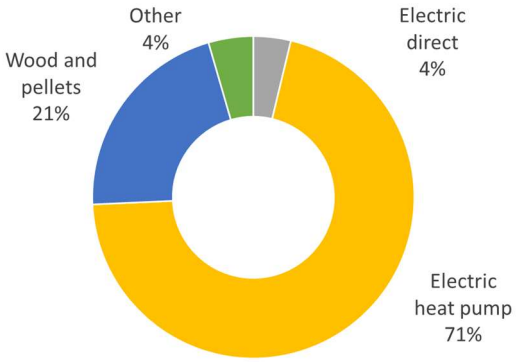

Figure 2. Future domestic heating technologies

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In our estimations we assume the following:

- 75% of single-family houses and all apartment buildings opt for heat pumps. Based on the figures of Table 1, long-term stock would be calculated as: 5193 + 0.75*(73855+49961) + (14787 + 4676) = **117,518 heat pumps (71%)**
- 25% de single-family houses opt for biomass boilers, mainly in rural areas, resulting in a final stock of 0.25*(73855+49961) + 4387 = **35,341 biomass boilers (21%)**

These assumptions lead to the structure represented in Figure 2. The calculations do not account for population growth, which is expected to be significant in the coming decades in Luxembourg and will likely increase demand, primarily for heat pumps.

Luxembourg is an affluent country with a very high dependence on imported fossil fuels for heating: a textbook case for implementing ambitious decarbonization targets. With proper government support, the transition of the domestic heating sector to low-carbon technologies can be achieved within approximately two to three decades. However, potential bottlenecks, such as the shortage of trained heat pump professionals and the impact on the electrical system, must be carefully assessed.

References

[1] EUROSTAT, data set *TPS00001*, year 2024
[2] LUSTAT, data set "*Dwellings by type of building, construction period and occupancy status*", time period 2021
[3] EUROBSERV'ER, "Heat pumps barometer – october2024"
[4] RP 1er résultats 2021 N°13 "*Panorama du logement en 2021: du changement dans la continuité*" [En ligne], 2024, mis en ligne le 27/06/2024, consulté le 09/04/2025. URL : https://statistiques.public.lu/fr/recensement.html

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