Power2People Follow Up Report: Heat Pumps

A Eurelectric report

November 2022

Eurelectric represents the interests of the electricity industry in Europe. Our work covers all major issues affecting our sector. Our members represent the electricity industry in over 30 European countries.

We cover the entire industry from electricity generation and markets to distribution networks and customer issues. We also have affiliates active on several other continents and business associates from a wide variety of sectors with a direct interest in the electricity industry.

We stand for

The vision of the European power sector is to enable and sustain:
- A vibrant competitive European economy, reliably powered by clean, carbon-neutral energy
- A smart, energy efficient and truly sustainable society for all citizens of Europe

We are committed to lead a cost-effective energy transition by:

investing in clean power generation and transition-enabling solutions, to reduce emissions and actively pursue efforts to become carbon-neutral well before mid-century, taking into account different starting points and commercial availability of key transition technologies;

transforming the energy system to make it more responsive, resilient and efficient. This includes increased use of renewable energy, digitalisation, demand side response and reinforcement of grids so they can function as platforms and enablers for customers, cities and communities;

accelerating the energy transition in other economic sectors by offering competitive electricity as a transformation tool for transport, heating and industry;

embedding sustainability in all parts of our value chain and take measures to support the transformation of existing assets towards a zero carbon society;

innovating to discover the cutting-edge business models and develop the breakthrough technologies that are indispensable to allow our industry to lead this transition.

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WG Customers & New Services

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KEY MESSAGES

- Electric heat pumps serve as a critical vehicle for empowering end-consumers to participate in the energy transition.
- On average, European households save 39% on their bills when switching from fossil fuel-powered heating systems to electric heat pumps.
- Electric heat pumps provide an up to 400% efficiency gain over comparable gas boilers when installed in properly insulated homes.
- The flexibility of heat pump technology allows for their use in a variety of household settings, including in multifamily homes, or as part of district heating and cooling systems
- A major barrier to the rapid uptake of heat pumps across the Union is a combination of high up-front cost and lack of available subsidies at the national level. These subsidies are often exhausted early into the fiscal year due to high demand, leaving many consumers unable to take advantage of them and likely to replace old boilers with less expensive fossil fuel-driven models.
- Other key barriers slowing down the adoption of heat pumps include a lack of awareness and familiarity with the technology or the available programs to help offset the upfront cost, a lack of properly skilled installers, and a misunderstanding about the home infrastructure needed to support heat pumps.
- In order to correct the incentive structure and align it with the EU's climate ambitions, subsidy schemes in Member States for fossil fuel-powered heating systems should be converted into support schemes for heat pumps, either through direct financing, tax reductions, or state-funded upskilling programs.

Heat Pump Facts

Despite the name, heat pumps are devices which can provide heating, cooling, and hot water for residential, commercial, and industrial customers. There are three specific technologies on the market: air source pumps, water source pumps, and ground source pumps. The widespread application of heat pumps would have a significant impact on the decarbonisation of both residential buildings and industry (both in commercial and industrial spaces) – heating and cooling currently account for 51% of final energy consumption and 27% of CO_2 emissions in Europe.

Heat pumps are also significantly more energy efficient than gas boilers (300% more[1]), so beyond being powered by cleaner sources, they also require significantly less energy to provide the same level of comfort. This efficiency over gas boilers also applies to green Hydrogen boilers. The below Sankey diagram from the Hydrogen Science Coalition[2] shows that when heated directly with electricity, heat pumps retain this efficiency.

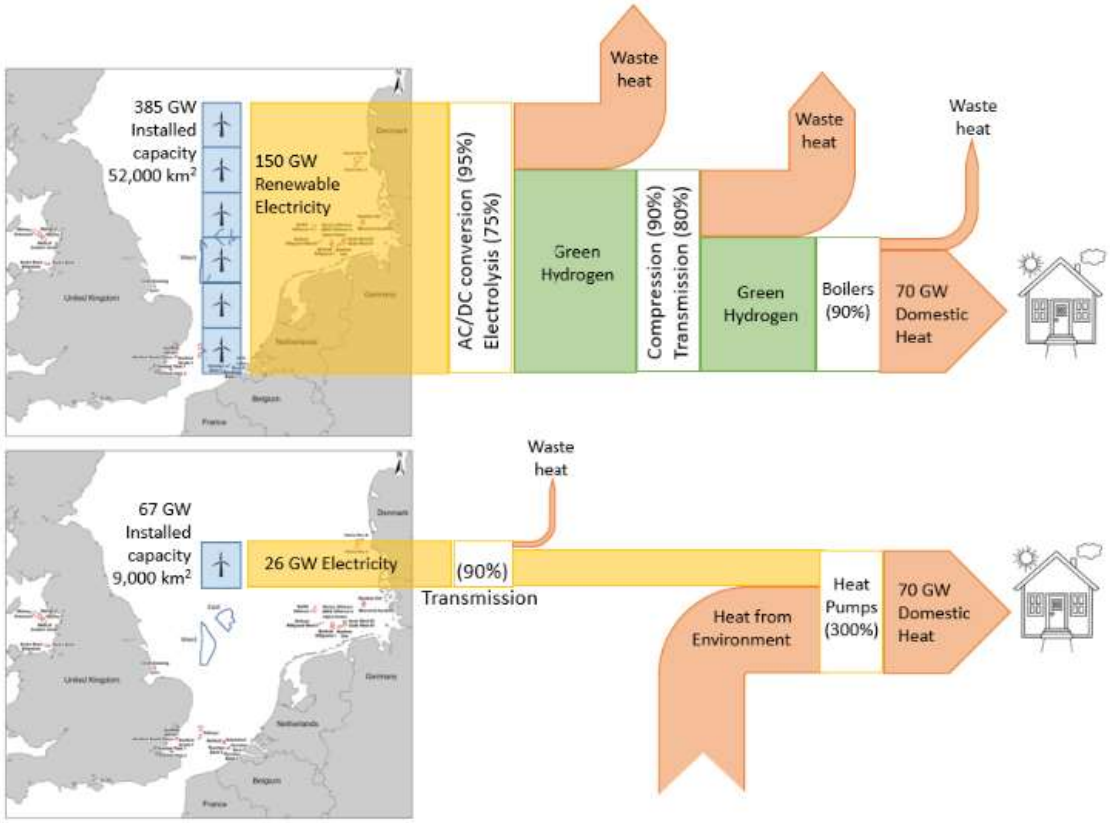

Fig. 1 Providing domestic heating in the UK using either Green Hydrogen or Heat Pumps. The colours of the arrows indicate the type of energy: electricity, green hydrogen or heat. The widths of the arrows are proportional to the power flows (in units of GW). The blue boxes show scaled areas of wind turbine farms on the maps. Red polygons on the maps are existing offshore wind turbine installations, which currently total approx. 10 GW.

Heat pumps are an adaptable technology and work in a variety of climates. In Europe, the Nordic countries have some of the highest heat pump deployment per 1,000 households (24.44 for Sweden, 27.54 for Denmark, 39.01 for Finland, and 41.79 for Norway[3]), busting the myth that heat pumps do not function well in cold climates. In fact, tests show that heat pumps efficacy continues

[1] https://www.theecoexperts.co.uk/heat-pumps/air-source-heat-pump-efficiency
[2] https://h2sciencecoalition.com/wp-content/uploads/2022/09/Energy-Bill-briefing-by-H2SC-2022-08-28-2.pdf
[3] https://www.energymonitor.ai/sectors/heating-cooling/weekly-data-france-is-the-biggest-market-for-heat-pumps-in-europe

at temperatures as low as -16, much lower than the average winter temperatures in the coldest regions of Europe.

While we know that a well-insulated home is an energy-efficient home, the myth that suggests that one's home must be well-insulated before installing a heat pump is not the case. With proper installation and a system which is well-fitted to your home, a heat pump can effectively provide temperature comfort in homes in a variety of conditions. While it is possible to achieve some efficiency gains in a variety of building types, the best outcomes are produced in well-insulated homes. Due to these energy efficiency gains, these systems also effectively manage temperatures in both new and existing buildings while using significantly less energy than their fossil-fuel based counterparts.

Beyond these energy efficiency gains, there are additional benefits electric heat pumps bring to consumers. The first is that heat pumps can heat both space and water, thus eliminating the need for a gas boiler completely. As a result, a consumer can completely eliminate their gas bill (if they have electrified any remaining appliances such as their oven). According to ACER, the average European consumer spent €700 per year on their gas bill[4] (and this was before the recent gas price spike). Though some of the operating cost of the heat source will be transferred to the electricity bill, the average 17% in network costs and 25% in taxes and levies specific to the gas bill will not. Because heat pumps are powered by electricity, they can be paired with home generation through solar PV panels or be supplied by electricity generated in a Citizen Energy Community and compound the savings.

Electric heat pumps are already seen as the way forward to further decarbonise heating across the European Union. Right now, approximately 40% of gas consumption in Europe is from the residential sector, the majority being for heating purposes[5]. The European Commission has highlighted the role electric heat pumps will play in weaning Europe off fossil fuel-based heating in the requirements set out in the recast Energy Performance of Buildings Directive, Energy Efficiency Directive, and the recent REPowerEU plan. There are currently around 17 million heat pumps installed across the Union[6], and the Commission's ambition is to install another 60 million by 2030.[7]

Sales of heat pumps are growing exponentially in some European countries. For example, in Portugal the heat pump market doubled its size in the first half of 2022 in comparison to the same period in 2021. This is mainly explained by the existence of the *Environmental Fund* initiatives, which financed up to 85% of the cost. The market has been witnessing a similar trend during the second half of 2022, mainly due to increasing gas prices across Europe. Therefore, a well-designed strategy that involves the public sector, private companies, and local communities, may represent a timely window of opportunity for the large-scale installation of heat pumps.

Value Added

The results of our Power2People survey of over 2000 European consumers found that the cost of electric heat pumps was the second-most cited reason for why they had not switched from their gas boiler (second only to satisfaction with their current heating system with a 1% difference).[8]

[4] https://www.acer.europa.eu/gas-factsheet
[5] Goldman Sachs Research – Electrify Now, 30/3/22
[6] https://www.euractiv.com/section/energy-environment/news/europes-booming-demand-for-heat-pumps-exposes-bottlenecks/
[7] https://www.ehpa.org/about/news/article/repowereu-heat-pump-strategy-required-to-help-sector-deliver/
[8] https://cdn.eurelectric.org/media/5613/eurelectric_consumer_survey_report_pledge_to_the_people-2021-030-0567-01-e-h-1DC2B671.pdf

While the up-front cost for electric heat pumps is higher, most households save significantly on their annual heating or cooling bill.

Country[9]	Average Annual Operating Cost for a Gas Boiler	Average Annual Operating Cost for an Electric Heat Pump	Savings
Austria	€ 1480	€ 1280	14%
Czech Republic[10]	€ 1500	€ 500	67%
Denmark	€ 1950	€ 1660	15%
France	€ 930	€ 640	31%
Italy	€ 940	€ 640	31%
Netherlands	€ 1320	€ 450	66%
Spain	€ 470	€ 350	26%
Sweden	€ 4660	€ 1830	61%

Barriers to Adoption

In our Power2People report, three key barriers were most cited by consumers as holding them back from switching to electric heating solutions : satisfaction with their current heating system, perceived expense of installing and operating heat pumps, and an inability to switch from their current system. Of the consumers surveyed, only 18% had switched to an electric heating solution, with the majority having either a gas-fired system, a heating element connected to a district heating system (which may be supplied by electricity or gas), or a pellet- or wood-fired heating system.

Another barrier identified in the report was an awareness gap limiting consumers' active participation in the energy transition. 80% of consumers are not actively engaged in the energy transition, with 26% of those surveyed not being aware of any of the products and services their supplier offers for saving energy or access to financing. Targeted information campaigns coordinated between governments, national regulatory authorities, and private entities like suppliers are an easy and affordable solution to increasing awareness and utilisation of these solutions by consumers.

Beyond those barriers identified in the report, there are several other hurdles that need to be addressed to fully realise the potential of this technology and further decarbonise Europe's heating systems. First and foremost is the cost and perceived complexity of the increase of

[9] We used Odyssee-Mure (link) as a starting point for current consumption in space and water heating. We calculated the energy requirement underlying the consumption and we used an efficiency of 90% for gas boiler and a COP of 3.5 for heat pump to get the new final consumption. Then we applied Eurostat prices, using the average between S1 and S2 2021 values.

[10] Based on the average household consumption of 14 MWh/year for heating

contracted power. Installing a heat pump will increase a household's usage, usually involving moving from a 3-kW to a 5- or 6-kW hook-up, which could increase consumers' expenditure. Moreover, consumers may perceive the switch to heat pumps as a time-consuming, complicated decision. In general heat pumps occupy more space (volume of 110 litres on average with more needed for equipment) and the installation itself often implies some home refurbishments.

As with many decarbonisation initiatives in Europe, there is also a shortage of qualified installers to properly fit and connect heat pumps across the Union. For example, in the Czech Republic the current wait time to get a heat pump installed is 4 months. Fortunately, however, most certified heating installers are qualified to install heat pumps, and what they need to learn in addition to their traditional training can be delivered in just one week.[11] Within the buildings sector, it is also important for technicians and small businesses to understand all of the benefits of heat pumps. They usually serve as the sole point of contact for end users when it comes to developing a renovation or new build plan, and they have the potential to be a key advocate for the technology to become more mainstream in Europe.

Policy Recommendations

1. **Direct financing programs** – governments should allocate public funding to consumers through one-time grants to offset the up-front cost of purchasing and installing an electric heat pump. This can be by providing favourable interest rates to these consumers, de-risking investments through public guarantees, and through co-investment programmes. For instance, Portugal employs part of their *National Recovery and Resilience Plan* funds to finance these types of solutions.
2. **Tax reductions** – to incentivise the purchase of heat pumps, governments should provide a tax incentive, either through income tax rebates or through VAT reductions on heat pumps produced in the EU. Another way governments can incentivise uptake is by reducing taxes and levies placed on electricity. This reduction in taxes would significantly reduce the price of electricity, thus reducing the overall operating cost of electric solutions.
3. Another key barrier to the uptake of heat pumps in the coming years is **access to a skilled workforce** able to properly install them. Governments can mitigate this barrier by providing public funding for apprenticeship programmes and upskilling programmes for professionals currently certified to install gas-based heating systems.
4. **Correcting Incentive Schemes** – governments should evaluate the current subsidy structures for heating to ensure that decarbonised heating is incentivised and fossil fuel-based heating curtailed. An example of where these incentives could be improved is the Ecobonus currently available in Italy. The current scheme is available for all heating and cooling systems, including gas condensing boilers. Given the efficiency gains of electric heat pumps over gas boilers, shifting the incentive scheme to cover only electric heat pumps increase electrification and facilitate households' contribution to energy savings targets.

Eurelectric Members' Solutions

Enel is working on three flagship projects which allow for the most efficient integration of electric solutions for space and water heating in all customer segments. The three areas of scope are Sardinia (IT), Zaragoza (ES), and Santiago (CL), and heat pumps are at the centre of these flagships given their ability to unlock the full electrification of heating in the residential, commercial, and public sectors. Heat pumps have also proven to be a competitive solution for the electrification of industrial processes which use low-temperature hot water.

[11] https://www.euractiv.com/section/energy-environment/news/europes-booming-demand-for-heat-pumps-exposes-bottlenecks/

Eurelectric pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

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