

# Heat pumps in multi-family buildings, drivers and barriers

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In Europe, the residential heat pump market has been steadily increasing for several years in most countries. However, the figures vary depending of the type of building. Whereas heat pumps are the most widespread solution in new individual houses, the market for them in multi-family buildings (MFBs) remains low, both in new buildings and in existing ones.

The HPT TCP Annex 50, dedicated to heat pumps in MFBs, aims to gather and analyze data from the eight participating countries<sup>1</sup> in order to identify both individual and common characteristics of buildings, technical aspects and regulatory schemes that can explain the state of heat pump use in MFBs and can determine individual and common barriers that must be overcome in order to develop heat pumps in MFBs.

## Place of heat pumps in European buildings

In all participating countries, annual sales of residential heat pumps have been increasing over the last decade, particularly since 2014. The increased sales can be viewed in terms of residential market penetration (see Figure 1, page 16). We can thus observe more or less pronounced dynamics, with sometimes still modest heat pump penetration rates despite booming sales, but a clear and increasingly rapid progression.

However, specific figures differ depending on the type of residential building. Indeed, heat pumps still represent a small portion of heating systems in the global building stock in all participating countries, from a few percent up to 10%. Except for some countries, such as Austria, Switzerland or France where there are significant differences between heat pump shares in MFBs (1–7%) and individual houses (10–15%), differences in heat pump adoption that depend on the building type are not very significant when considering stocks.

However, differences in the market development of heat pumps between individual houses and MFBs are more obvious in new buildings. In some countries, such as Austria, France and Germany, heat pumps are the heating system of choice in newly built individual houses, at around 50% or more. But this percentage increases more or less rapidly in newly built MFBs in all countries.

Thus, if we consider the three countries mentioned, heat pumps represent only 4–5% of heating systems in new collective housing in France but more than 20% in Germany and Austria.

## The driver: policy framework

All participants represent European countries. Except for Switzerland, the countries share the same policy landscape, with the main relevant directives concerning the energy performance of buildings, energy efficiency and performance requirements of energy-related products. Moreover, these countries are affected by the 2020 and 2030 targets in terms of CO<sub>2</sub> emission reductions, energy efficiency and use of renewables.

To meet these targets, each participating country has developed a specific regulatory scheme to encourage renewables and reduce energy consumption in the building sector. Among all the regulations in force in each country, two rules are key drivers for the heating system market: buildings regulations for new buildings and incentive programs for existing ones.

Most of the countries have established building regulations based on maximal consumption. The maximal consumption value and the uses included in the accounting vary from one country to another. Some regulations add a performance requirement on the building structure to minimize energy needs. This encourages shared efforts between building structure and system efficiency to reduce energy consumption. Other regulations are stricter concerning energy consumption requirement that it implies to make effort on both aspects even if no requirement on building structure efficiency is imposed. It should be noted that France is the only country where the requirements are different, and less strict, in collective housing than in individual houses.

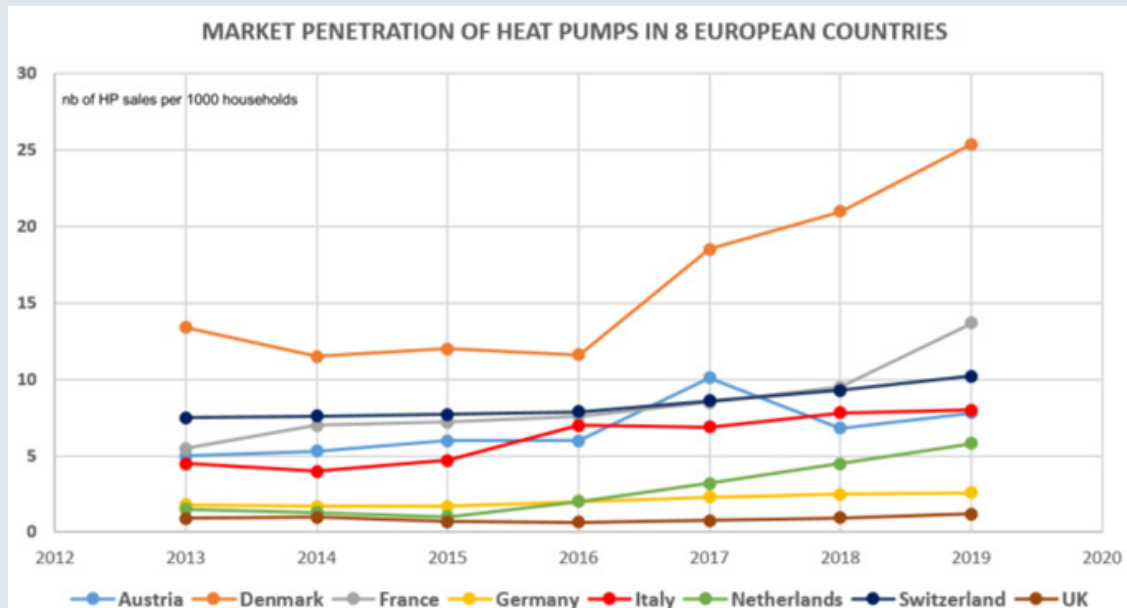


Fig. 1: Residential market penetration in the 8 participating countries (source EHPA [www.stats.ehpa.org](http://www.stats.ehpa.org))

In addition, several countries have implemented or are planning to implement a ban on fossil fuels, including natural gas, in newly constructed buildings (Denmark in 2013, Netherlands in 2018, France in 2021 and UK announced for 2025). Without being so radical in their stated desire to eliminate fossil fuels, the regulations of other countries are, however, sufficiently restrictive in terms of energy consumption for heating and domestic hot water use to promote the development of efficient systems like heat pumps.

Incentives schemes take on different forms depending on the country: promotion of efficient technologies for all markets, contribution of big energy consumers to energy efficiency actions (energy savings or energy-efficiency certificates), incentives for existing building and equipment renovations with a wide scope of supported technologies, specific programs to replace fossil fuel boilers in existing buildings, etc. Whatever the reason for the incentive, heat pump installation is included in the scheme and even becomes the central part of it. In all countries, heat pumps are supported by grants, tax credits or tax reductions.

In conclusion, although policies are being tightened, they are becoming more favorable to the development of heat pumps in buildings. The few differences noted in the regulations do not fully explain the weak development of heat pumps in collective housing compared to single-family homes. Thus, besides regulatory barriers, other barriers have to be overcome to obtain a sustainable development of heat pumps in MFBs.

## Barriers to overcome

### Technical barriers

#### Heating capacity and supplied temperature

The multi-family building stock is quite old in all participating countries, with 52–60% of buildings on average being built before 1970. The majority of MFB stock was built before the first building regulations. For these MFBs (earlier than 1970), the heating demand represents 120–150 kWh/m<sup>2</sup>/an. Without any refurbishment, these MFBs need high heating temperatures (above 60°C), which do not easily suit heat pump applications.

Moreover, in most countries, state-of-the-art heat pumps provide heating capacities below 50 kW. These types of products are only adapted for efficient buildings, not for collective heating production in old ones.

#### Access to heat sources

Most multi-family buildings are located in cities, with rather high building density. Therefore, access to the heat source, in particular geothermal sources, is complicated. For air-source heat pumps, a collective heat source is often the only solution to avoid multiple visible outdoor units. These can be difficult to integrate, even forbidden, from an architectural perspective. In the collective case, the unique outdoor unit has to be installed on the roof, which presupposes a terrace roof, or in an outdoor car park or garden near the technical room.

## Economic barriers

### Capital costs

In MFBs, high capital costs affect the competitive position of heat pumps compared to fossil-fuel boilers or direct electric heating. This criteria is particularly significant in new builds, often (75% of total cases) managed by private developers. The main concern of private market players is the cost of flats, and consequently their selling price. Indeed, for each new build, the developer estimates a maximum selling price, corresponding to the type of flat, its location, etc. Among these criteria, a renewable heating system is not at top of mind. As developers are rarely able to value heating by heat pumps in their buildings, this quite expensive heating system directly affects the cost price without any effect on the selling price. For the moment, clients and developers are not convinced.

### Energy prices

Current prices for oil, natural gas and biomass greatly impact the heat pump market.

Because the prices for crude oil and other fossil-fuel energy sources have been falling in recent years and kept stable at low levels, there is a significant barrier for investing in new heating technologies that use electricity. The price of electricity varies substantially from one participating country to another but is always high compared to gas prices. The electricity/gas price ratio is 1.7 to 4. If an average seasonal performance factor (SPF) around 3 is considered, in a few countries (Denmark, Germany,

UK), this SPF does not compensate the energy price ratio. This means that even operating costs can be higher for a heat pump installation than for a gas boiler one.

## Conclusion

In the seven European countries participating in Annex 50, heat pumps are expanding rapidly in single-family homes but are still struggling to gain market share in collective housing, despite regulations that are increasingly favorable to their installation in all countries. Common barriers have been identified. They can be technical (access to the cold source, capacity of available products) or economic (investment cost, energy prices).

An essential point common to all countries should be added: the lack of knowledge on the part of the building sector and customers. Heat pumps are still too often considered as a product for individual houses. Significant demonstration efforts are needed to highlight the potential offered by heat pumps in collective housing.

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