IEA HPT ANNEX 50

« HEAT PUMPS IN MULTI-FAMILY BUILDINGS »

STATUS IN PARTICIPATING COUNTRIES

Webinar 13th June 2023
In Europe, the residential HPs market increases steadily.

Different situations:
- New individual houses ➔ most spread solution
- Multi-family buildings ➔ very low and slow development

➔ Why? How to improve this situation
Contents

1. Heating and DHW production in residential buildings
2. The driver for HPs development: policy framework
3. The barriers to overcome in MFB
Heating and DHW production in residential buildings
1. Heating and DHW in residential buildings:

**Stock of HPs in Europe**

- **17 million HPs in Europe (end 2021):**
  - Scandinavia has the largest number of heat pumps per inhabitant in Europe.
  - In the south of Europe, there is also a large installed base (A/A HP mainly).
  - Between these two areas, the situation is very diverse, with two extremes:
    - France, with the largest gross installed capacity in Europe, and
    - the UK, with an installed capacity that is ten times less developed.
1. Heating and DHW in residential buildings

Energy for Heating in participating countries

In total building stock:
Main heating energy remains natural gas
Fossil fuel (gas + oil) have a majority share (except for Denmark)
HPs still represent a small part of heating systems in the global building stock: ≤ 10-12%

In MFB stock:
Global share of fossil fuels similar
More gas and less oil

Sources: EHPA 2019, Istat 2014 & Danish Energy Agency 2018
1. Heating and DHW in residential buildings

HP market in participating countries

In residential buildings:

- In all participating countries, residential heat pumps increase their annual sales.
- This overall dynamic can be viewed in terms of market penetration.

In MFB:

- Except for 3 countries, differences in the spreading of HPs depending on building types are not significant in the stocks.
- Differences in HPs market development in new buildings are much more important: HP share can reach 50% or more in new built individual houses and is comprise between few percents to 20% in new MFB.
- On retrofit market, the situation is also very different for SFH and MFB but data, in terms of shares, are difficult to collect.

Sources: www.stats.ehpa.org
1. Heating and DHW in residential buildings

Shares of HPs in new built individual houses and MFB

- Austria (2015-2018): MFB: 23%, SFH: 37%
- Germany (2017): MFB: 24%, SFH: 46%

Sources: BâtiEtude (France, 2022), Ivert/EE-Lab Database (Austria, 2017), Fraunhofer ISE (Germany, 2018)

- France (2015-2021):
  - MFB: 4 → 13%
  - SFH: 45 → 60% (55 → 70 for detached SFH)
The driver for HPs development: policy framework
2. Policy Framework: building regulations for new built

- Most of countries have set up buildings regulations based on maximal consumption expressed in primary energy (except for Austria which main regulation is based on heating demand).
- Almost all these regulations concern only new buildings but some of them include major refurbishments in their scope.
- 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 the energy needs. Other ones are so strict on the energy consumption requirement that it implies to make effort on both aspects.
- Some countries set up a mandatory building performance assessment to inform customers.
- In all countries, these regulations, which versions entered into force from 2013 to 2016, had and still have a visible impact on HP market.

- Only France has different rules for individual houses and multi-family buildings, with some consumption and renewables use tolerances.
- In France, the new building regulation includes a carbon performance, based on life cycle analysis of the building over 50 years, including construction, operating and dismantling phases.
- Several countries have planned or already implemented a ban of fossil fuel, including gas, in new buildings:
  - Denmark 2013
  - The Netherlands 2020
  - Austria 2019 if other solution(s)
  - France 2022 for individual houses, >2024 for MFB
  - UK announced for 2025
2. Policy framework: incentive program for retrofit

• Incentives schemes can have various logics depending on the countries:
  - Promotion of efficient technologies for all markets
  - Contribution of big energy consumers to energy efficiency actions (energy savings or energy efficiency certificates)
  - Incentive to existing building and equipments renovation with a wide scope of supported technologies
  - Specific programs to replace fossil fuel boilers in existing buildings
  - Etc.

• Heat pump installation always included in the scheme. In all countries, heat pumps are supported by grants, tax credit or reduction.

• Specific case of air-to-air HPs, excluded from incentive programs in a lot of countries

Some examples of incentive programs

2019, “Coup de pouce chauffage” in France, Incentive program for replacing the entire residential oil boilers stock by 2028 ➔ strong development of heat pumps in the individual renovation sector (+83% for air-to-water heat pumps in 2019).

2020, “Decreto Rilancio” in Italy. It includes the “Ecobonus 110%” (EB110) aiming to push renovation of existing building stocks. For some specific interventions including HP installation, its principle is to offer a subsidy of 110% of the total spending in the form of a tax credit, spread over 5 years.
2. Policy Framework: restrictions on fuel boilers in retrofit

Source: LCP Delta 2023
The barriers to overcome in MFB

Technical barriers
Economical barriers
3. Introduction: MFB stock characteristics

**Interesting common features**

- In almost all countries, most of multi-family buildings are composed with **less than 10 flats**, 6 to 8 in average.

- In all countries except Denmark, the multi-family buildings stock is almost equally distributed between owners and tenants. However, **in new built MFB, the share of owner-occupiers is more important**.

- In all participating countries, the residential building stock is quite old, with an average share of **52-60% of buildings built before 1970**, even 80% for Denmark.

- Then, the majority of MFB stock has been built before the first building regulations. For these multi-family buildings (<1970), the heating demand represent 120-150 kWh/m².an.

- **All these characteristics of MFB have consequences for the installation of heat pumps.**
3. Technical barriers to overcome

Supplied temperature, capacities and retrofit market

The multi-family buildings stock is quite old in all participating countries. Without any refurbishment, these MFB need high heating temperatures (> 60°C), not easily suitable for heat pump application.

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

The combination of several low-capacity products can be a valuable technical solution but can be difficult to implement in existing MFB.
3. Technical barriers to overcome

Access to the heat sources

Most of multi-family buildings are located in cities, with more or less high building density. Therefore, the access to the heat source, in particular geothermal one, is complicated.

For air-source heat pump, the collective heat source is often the only solution to avoid multiple and visible outdoor units, that can be difficult to integrate, even forbidden, in architectural terms.

In the collective case, the unique outdoor unit has to be installed on the roof, which supposes a terrace roof, or in a outside car park or garden near the technical room.
3. Economical barriers to overcome

**Capital costs**

In MFB, high capital costs affect the competitive position of heat pumps compared to fossil boilers or direct electric heating.

This criteria is particularly significant in new built operations, often (75% of total cases) managed by private promoters.

Indeed, for each new built operation, the promoter estimates a maximum selling price, corresponding to the type of flat, the location of the operation ... Among these criteria, a renewable heating system doesn’t appear yet.

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>Total capital cost (production, distribution, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement of a 240 kW boiler in a MFB built in 1970s</td>
<td>477 k€</td>
</tr>
<tr>
<td>Replacement of 36 kW electric heating in a MFB renovated in 2014</td>
<td>106 k€</td>
</tr>
</tbody>
</table>

**Source Suisse Énergie 2019**
3. Economical barriers to overcome

Energy prices

High influence of actual prices of oil and natural gas on the heat pump solution competitiveness

Fossil fuel energy prices at far lower levels than electricity ones ➔ significant barrier for the investment in new heating technologies using electricity

Electricity price varies a lot from one participating country to another but the ratio with gas price is almost always higher than 2

source EHPA www.stats.ehpa.org

DATA DON’T TAKE INTO ACCOUNT THE ENERGY CRISIS DUE TO THE WAR IN UKRAINE
In the 8 participating countries, HP is expanding rapidly in single family houses but far less in collective housing.

Main driver:
- policy framework: building regulations & incentive programs

Main barriers:
- Technical: access to the cold source, capacity of available products
- Economical: capital costs, energy prices

CONCLUSION

Essential point to be added
Lack of knowledge of the sector and of customers: HP is seen as a product for individual houses

Need for demonstration work to highlight the possibilities offered by HPs in MFB
Merci