



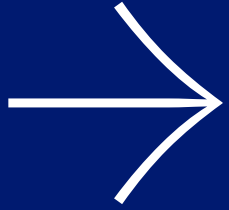
IEA HPT ANNEX 50

« 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

INTRODUCTION



Contents

1. Heating and
DHW production
in residential
buildings

2. The driver for
HPs
development:
policy framework

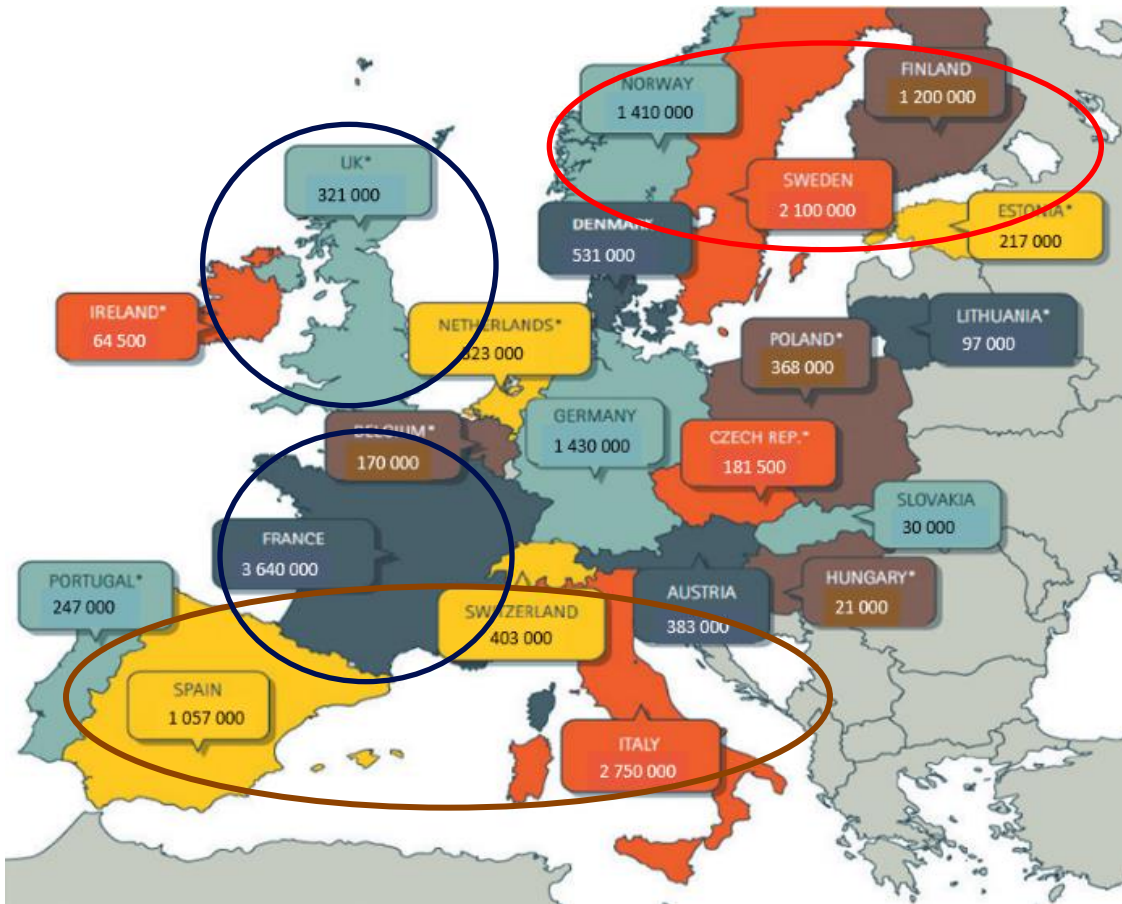
3. The barriers
to overcome in
MFB

1

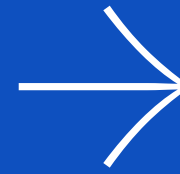
Heating and DHW production in residential buildings

1. Heating and DHW in residential buildings:

Stock of HPs in Europe



Stock 2021 of HPs for heating and DHW in Europe (source EHPA 2022)

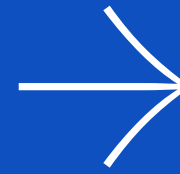
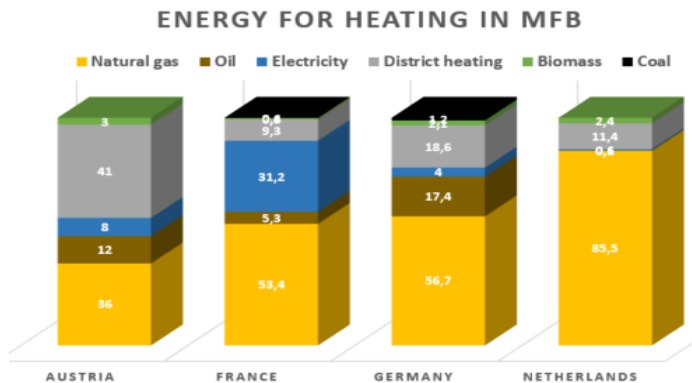
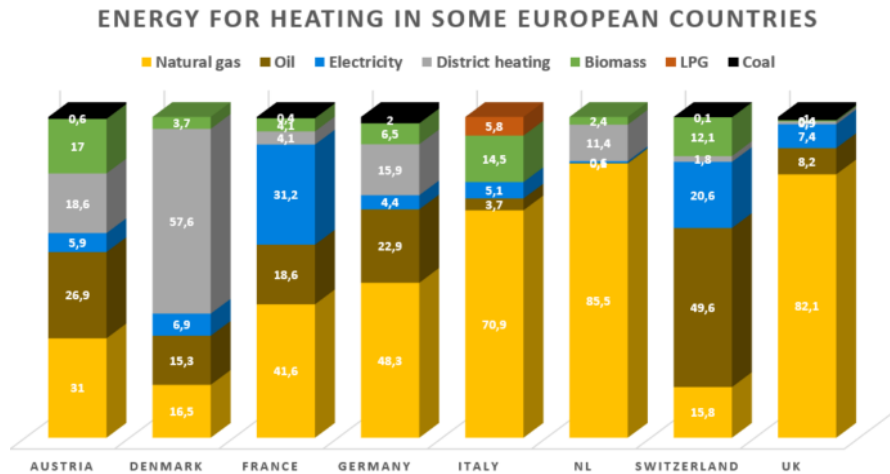


17 million HPs in Europe (end 2021):

- 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 : $\leq 10-12\%$

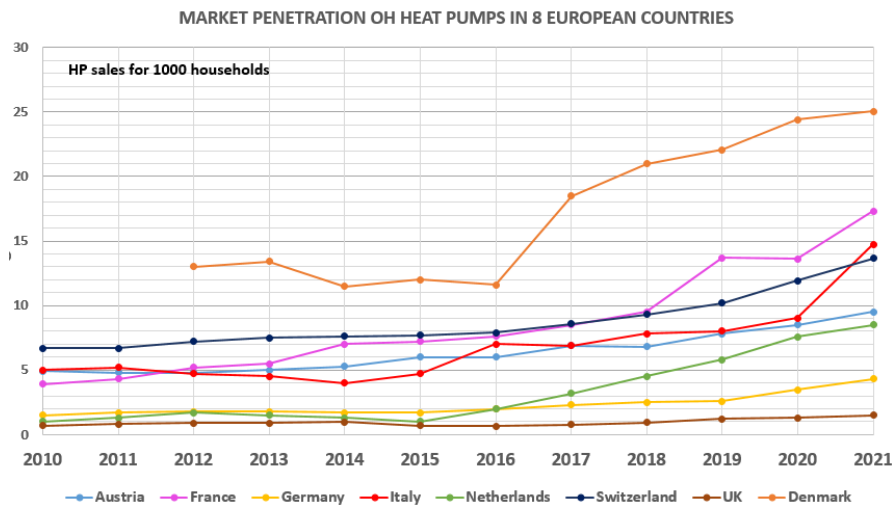
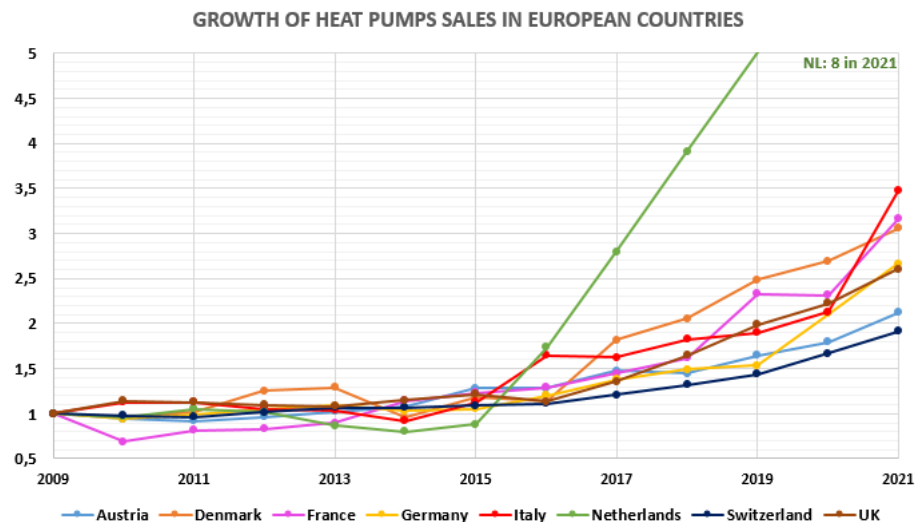
In MFB stock :

Global share of fossil fuels similar

More gas and less oil

1. Heating and DHW in residential buildings

HP market in participating countries



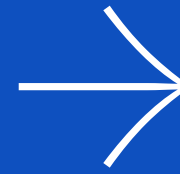
In residential buildings :

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

In MFB :

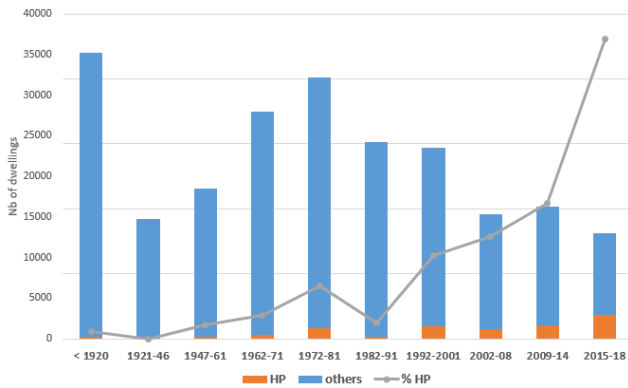
- Except for 3 countries, differences in the spreading of HPs depending on building types are not significant in the stocks
- Differences in HPs market development in new buildings are much more important : HP share can reach 50% or more in new built individual houses and is comprise between few percents 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

1. Heating and DHW in residential buildings

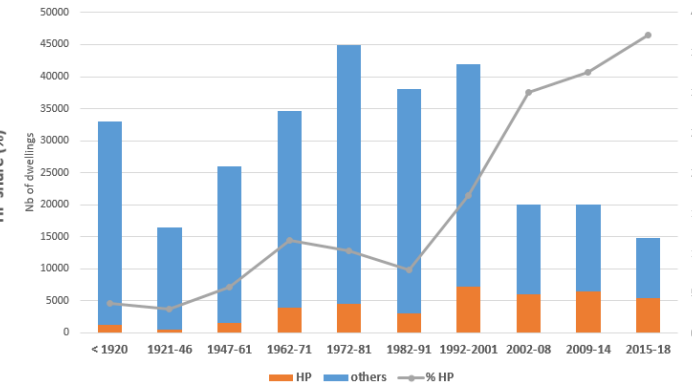


Shares of HPs in new built individual houses and MFB

Austria, MFH: share of HPs, function of construction date

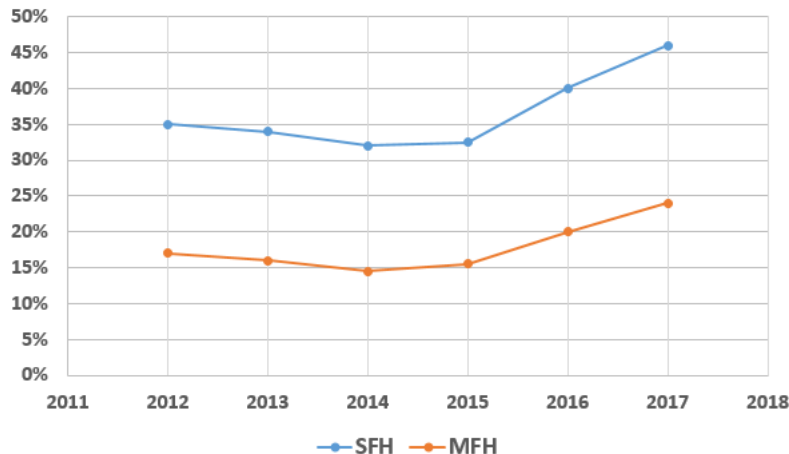


Austria, SFH: share of HPs, function of construction date



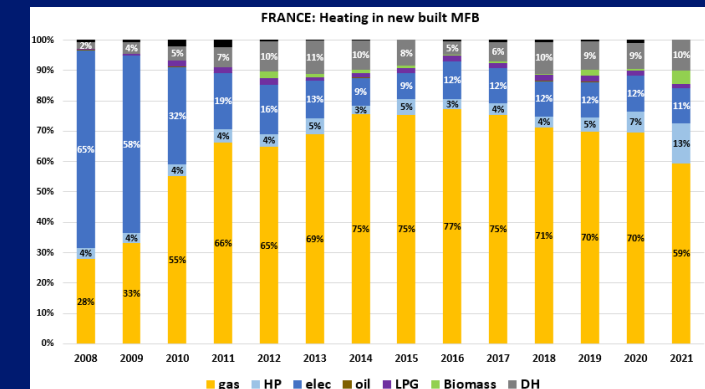
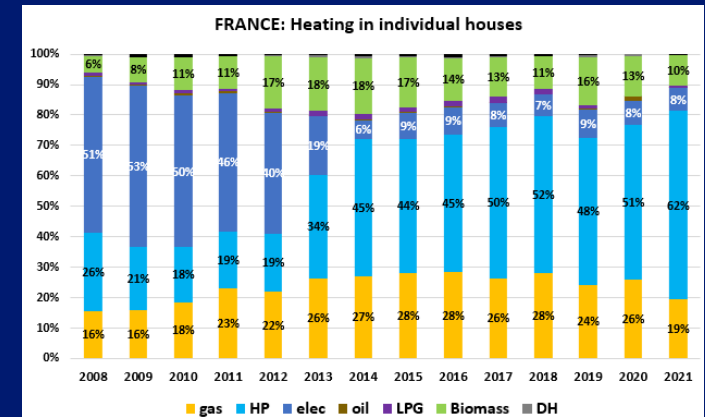
- Austria (2015-2018): MFH: 23%, SFH: 37%

Germany: HPs shares in SFH and MFH



- Germany (2017):
 - MFH: 24%
 - SFH: 46%

- France (2015-2021): :
 - MFH: 4 → 13%
 - SFH: 45 → 60% (55 → 70 for detached SFH)



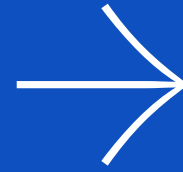
Sources *BâtiEtude (France, 2022), Ivert/EE-Lab Database (Austria, 2017), Fraunhofer ISE (Germany, 2018)*

2

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



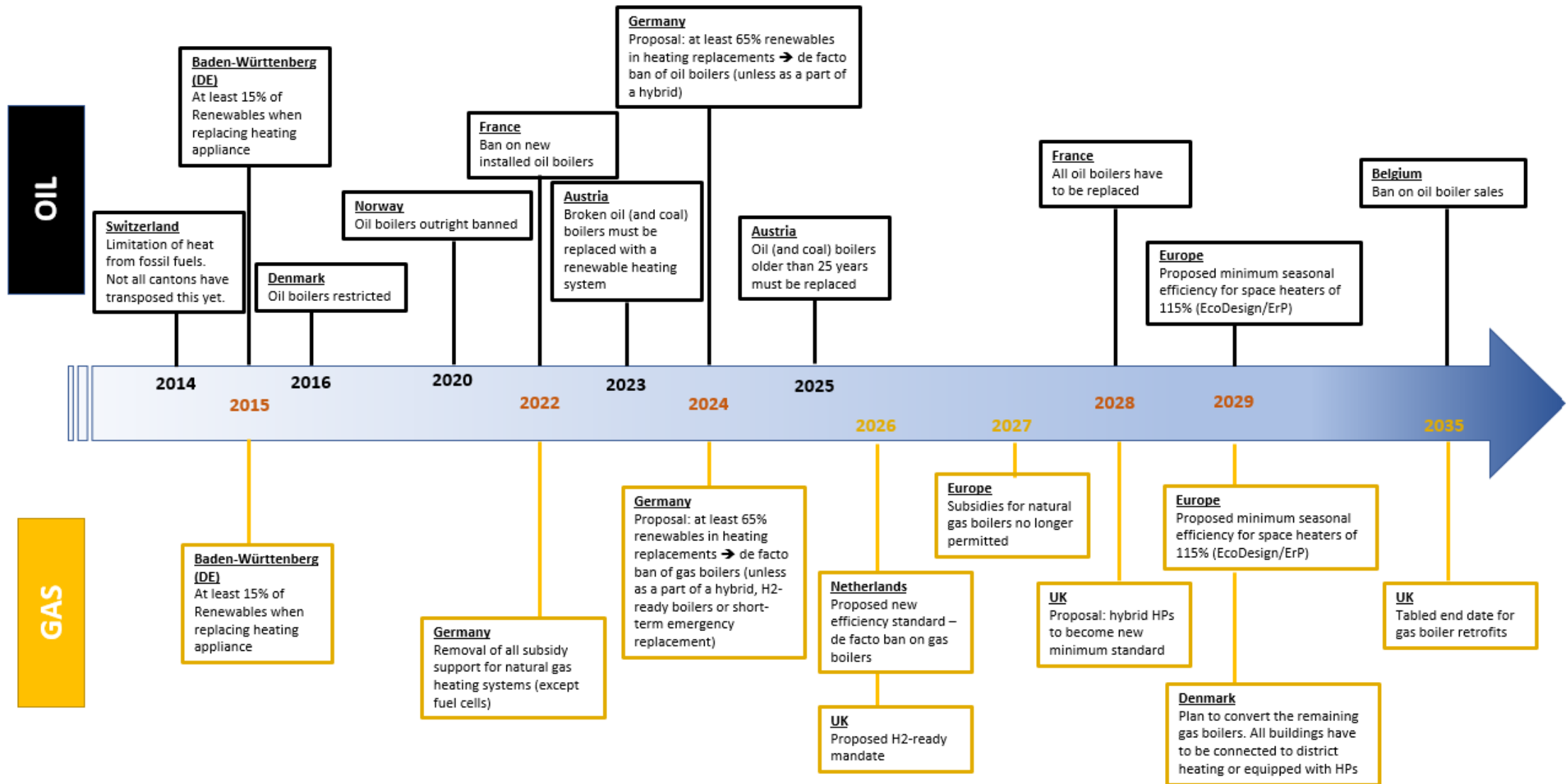
Some examples of incentive programs

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 in the form of a tax credit, spread over 5 years.

2. Policy Framework: restrictions on fuel boilers in retrofit



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The barriers to overcome in MFB

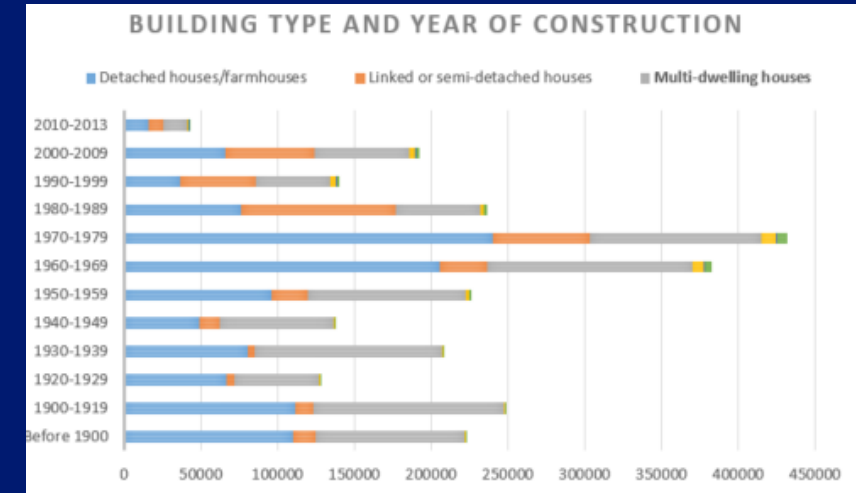
Technical barriers

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.



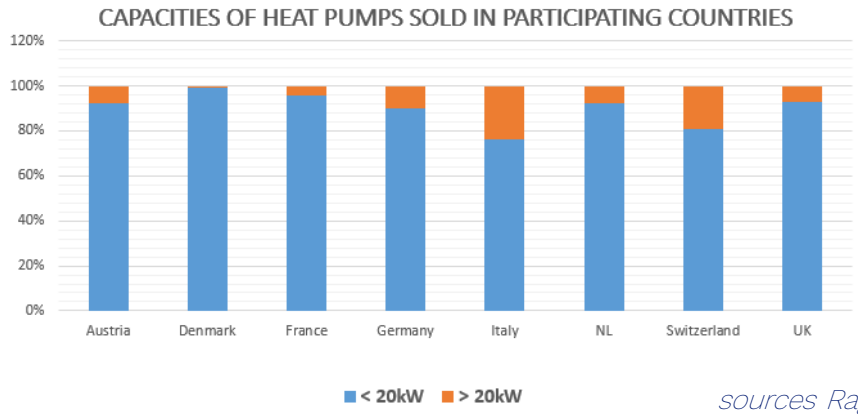
Year of construction. Example of Denmark.
Source Statistics Denmark

Building use	Electricity consumption kWh/m ² year	Heat consumption kWh/m ² year
Residential (single family)	38	142
Residential (multi-family)	35	125
School	20	130
Office	95	170
Hotels	110	150

Average energy consumption. Example of Italy.
Source ENEA - STRPIN

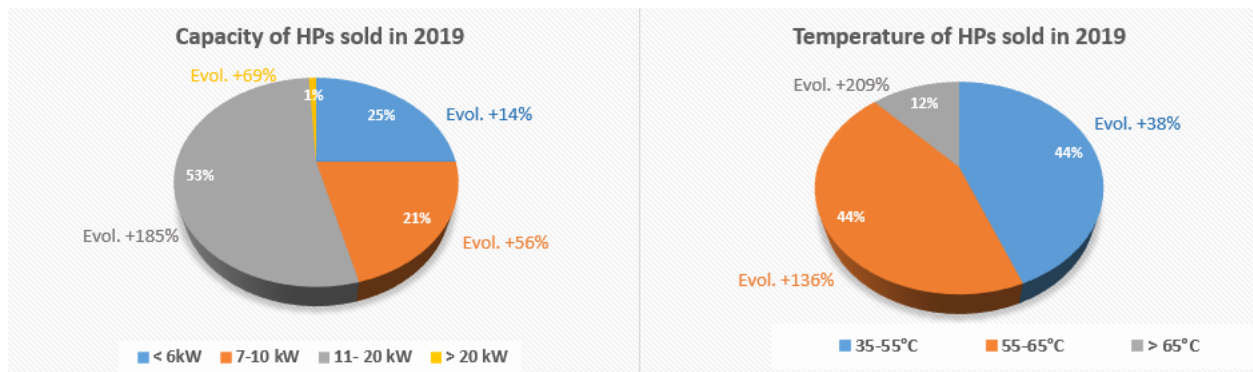
3. Technical barriers to overcome

Supplied temperature, capacities and retrofit market



sources Ragwitz 2016, EHPA2021

Example of France :



Less than 10 products > 20 kW dedicated to MFB
Few of them with Twater > 55°C



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



source Suisse Energie



source Giordano Industries



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.

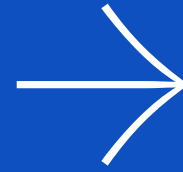
3. Economical barriers to overcome

Capital costs

In MFB, high capital costs affect the competitive position of heat pumps compared to fossile 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.



Two examples in Switzerland :

Type of operation	Total capital cost (production, distribution, etc.)	
	HP solution	Reference solution (boiler)
Replacement of a 240 kW boiler in a MFB built in 1970s	477 k€	156 k€
Replacement of 36 kW electric heating in a MFB renovated in 2014	106 k€	54k€

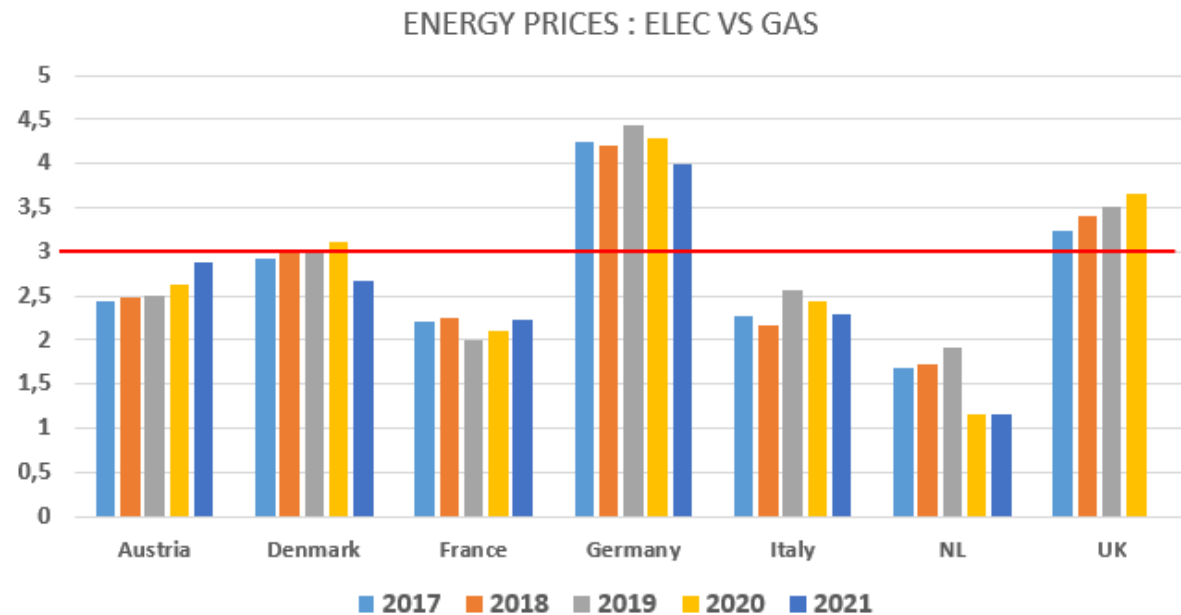
Subsidies included

Source Suisse Energie 2019

3. Economical barriers to overcome



Energy prices

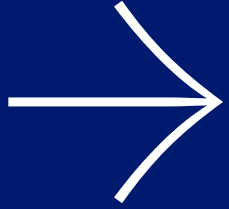


source EHPA www.stats.ehpa.org

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



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 : acces 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

