Rolling out heat pumps in Germany and Europe

Insights & policy recommendations

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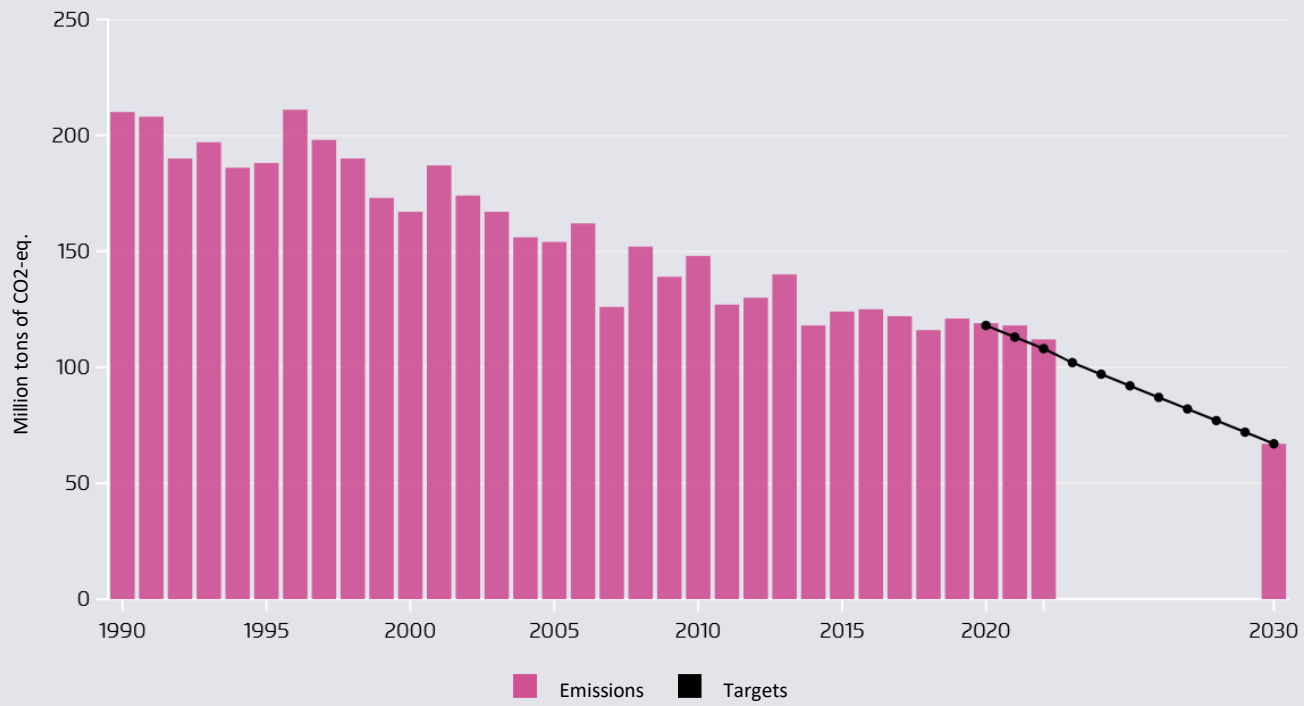
BERLIN, 06 JULY 2023

The status quo

Emissions in the buildings sector have fallen since 1990. Over the past years, however, progress has been too slow.

GHG emissions in the buildings sector 1990-2022 and annual reduction targets

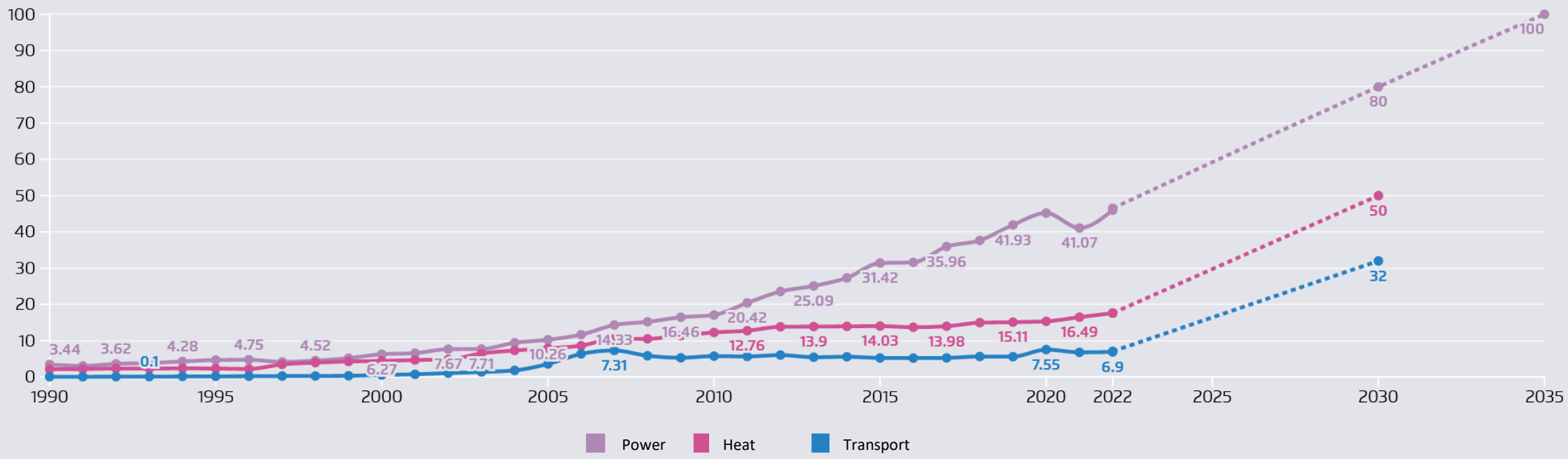


Agora Energiewende (2023)

- Germany aims to reach **climate neutrality by 2045**.
- GHG emissions in the buildings sector have fallen by over **45% since 1990**.
- However, annual emissions have remained rather stable over the past decade.
- As a result, Germany failed to meet ist annual GHG reduction target for the buildings sector for three consecutive years.
- In order to meet the mid- to medium climate targets, **emissions must be reduced substantially and immediately**.
- Current policies are a first step, but overall insufficient.

Compared to the power sector, the heat and transport sector are laggig behind in terms of utilizing renewables.

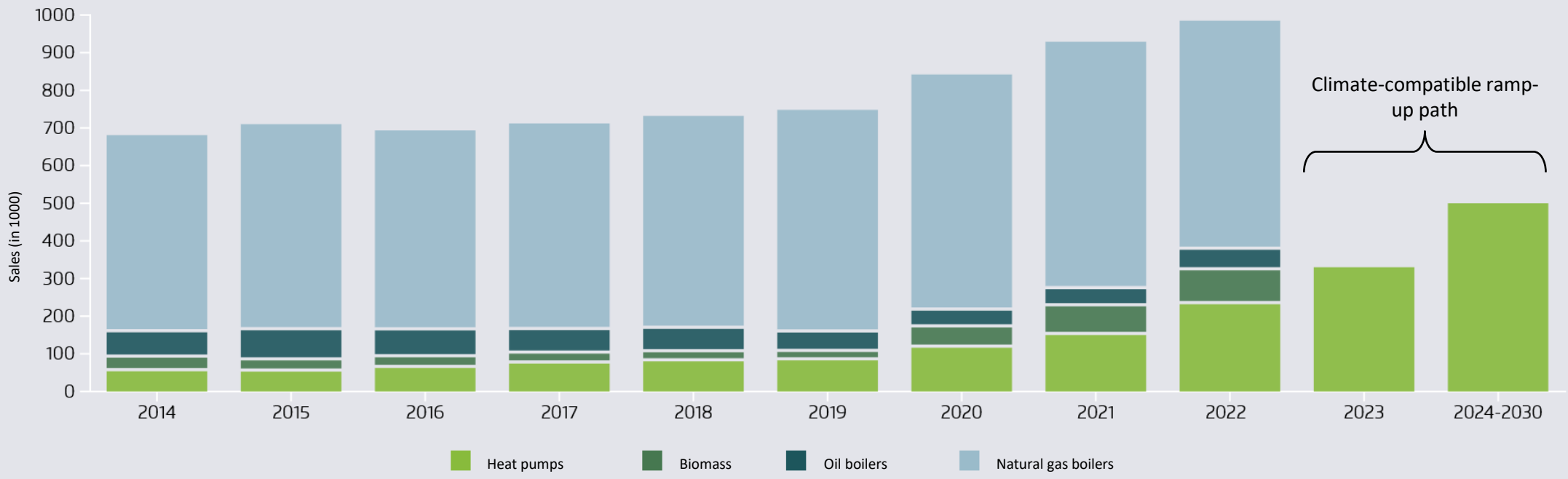
Share of renewables in final energy consumption since 1990 and sectoral targets for 2030 and 2035



Agora Energiewende (2023), based on AGEB (2022a/b), AGEE Stat (2022); 2022: estimated values

Oil and gas boilers still dominate the market for heating technologies and make phase-out regulations necessary.

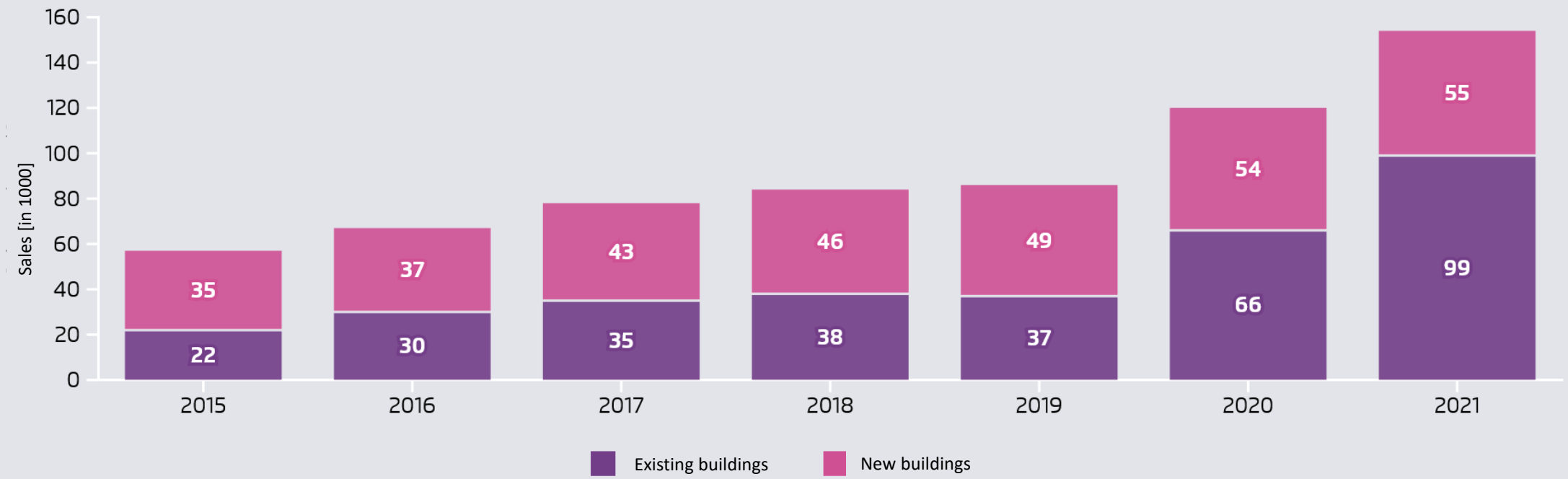
Sales of decentralized heating technologies in Germany since 2014



Agora Energiewende (2023), based on BWP (2022, 2023) und BDH (2022)

Accelerating heat pump adoption in existing buildings is key: the trend has reversed over the past few years.

Market sales of heat pumps in new and existing buildings in Germany



Agora Energiewende (2022) based on BWP and Destatis (2022)

Overview of policies in Germany & Europe

A phase-out regulation for fossil fuel-based boilers in Germany: Agreed upon, but significantly weakened.

When the social-democratic (SPD), green (Die Grünen) and liberal (FDP) party agreed to form a coalition in 2021, they pledged to implement a regulation that would successively phase out fossil fuel-based boilers and thus make a significant contribution towards climate mitigation.

Initial proposal: All new heating systems have to be based on at least 65% renewables (= de facto ban of new stand-alone oil and gas boilers).

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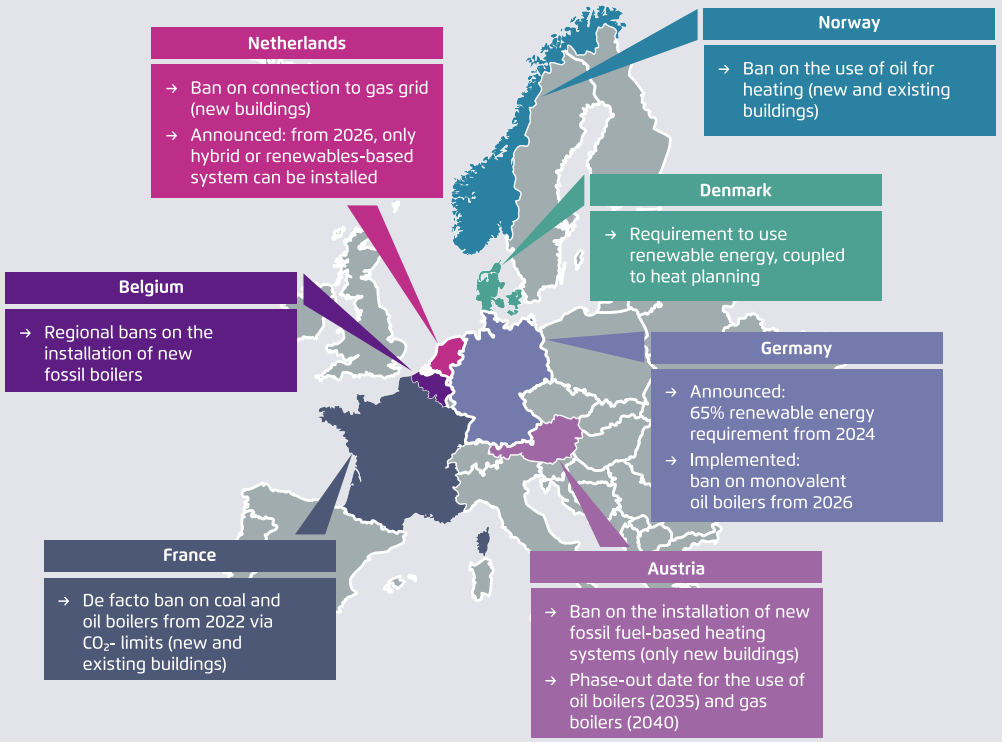
Revised proposal: Only new heating systems in new buildings (in certain areas) have to be based on at least 65% renewables. This 65% rule will apply to existing buildings only once a municipal heat plan is in place. Notable exceptions for hydrogen and biomass are in place. Uncertainties remain.

The revised 65%-rule cannot safeguard that homeowners make sensible investment decisions. Further, market actors do not receive the reliable framework conditions they need to make necessary investments.

In order to provide regulatory certainty and ensure that the climate targets are met, a revision of the regulation is required.

Several European countries have announced or implemented phase-out regulations.

Overview of phase-out regulations in other countries



Agora Energiewende based on Öko-Institut (2021)*

- Many neighbouring countries have already planned or implemented similar regulations restricting the use of fossil fuels for heating.
- Countries have chosen varying policy designs.

Examples:

- bans on the installation or use of fossil fuel-based boilers,
- asset-related CO_2 limits,
- obligations for renewable heat.

* Öko-Institut 2021: Phase-out regulations for fossil fuel boilers at EU and national level

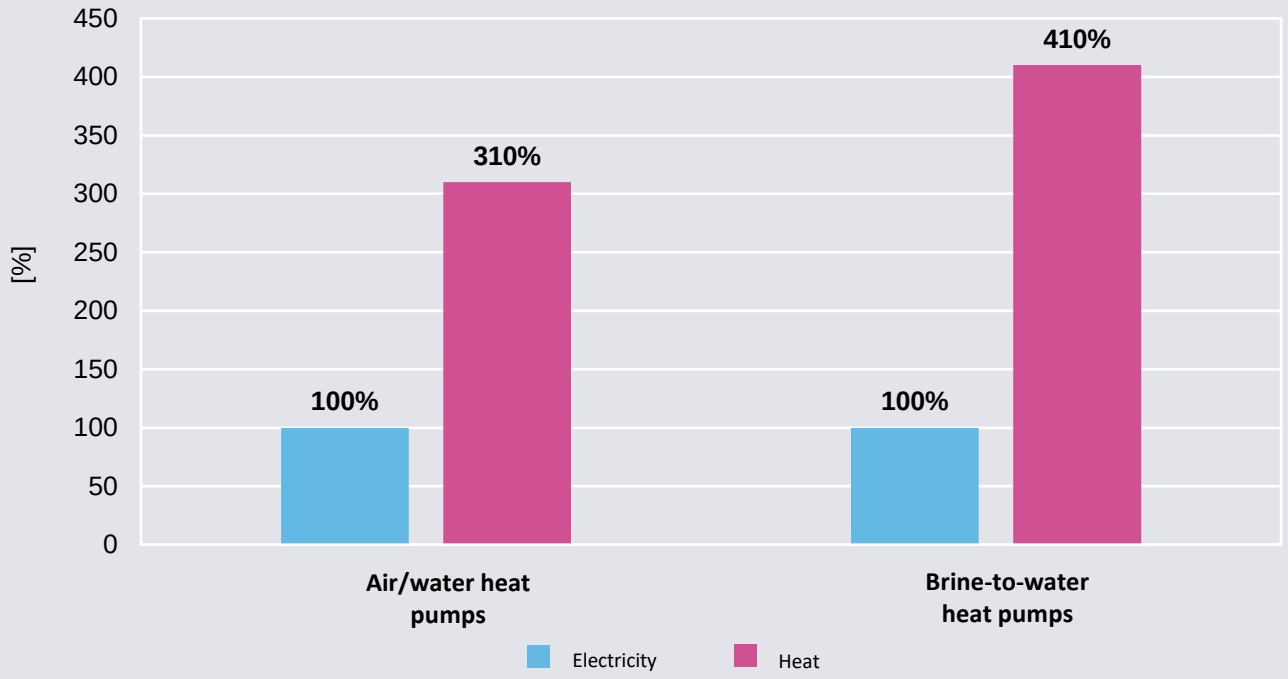
Besides phase-out regulations, several supporting policies are in place. Examples from Germany and Sweden:

Germany:	Sweden:
→ Subsidy: up to 40% of investment costs of heat pumps (depends on age and type of old heating systems) → In 2022, the levy on electricity („EEG Umlage“) was abolished, which reduced electricity prices for consumer → „Heat pump summit“: policymakers and market actors agree on ambitious targets (6 million heat pumps by 2030)	→ Three rounds of tenders between 1989 and 1995 (led to cost reductions, efficiency increases and high market share today, i.e. 90%) → Information campaigns, capacity raising in relevant authorities, training & certification programs → Research programmes, testing, funding of research & development → High CO_2 prices → Other favourable conditions: limited natural gas grid

Behind the scenes: Technologies and costs

Heat pumps achieve good efficiency results in the existing buildings stock. About 50-80% of buildings are (already) suitable.

Average efficiency of heat pump systems in old buildings



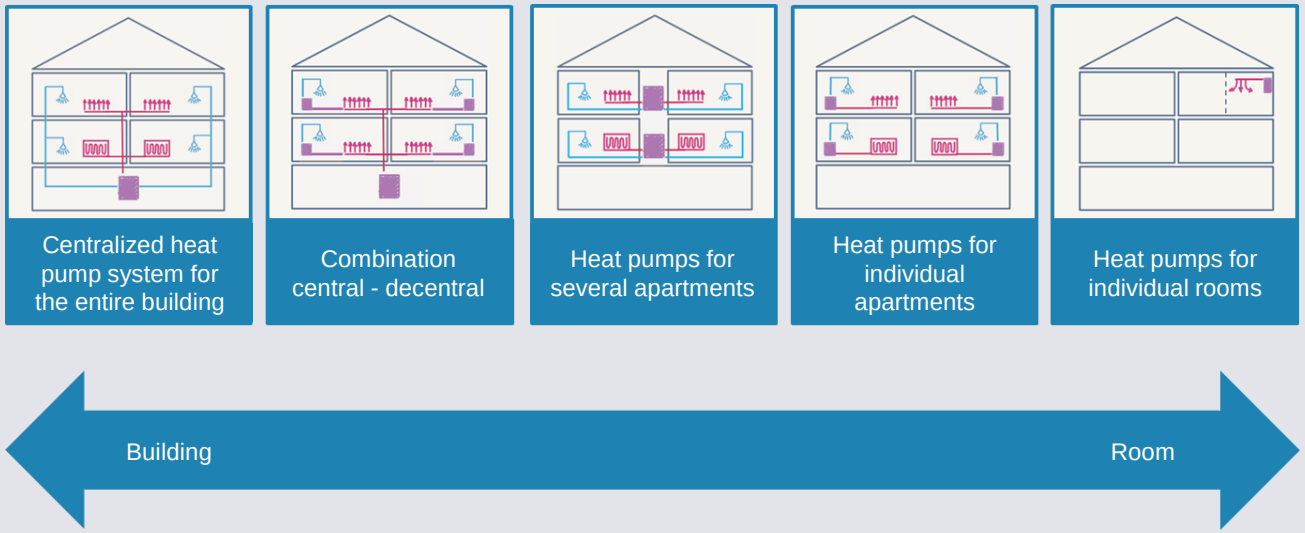
Agora Energiewende, based on Fraunhofer ISE (2022)*

- Results from field tests show: Heat pumps also achieve good efficiency values in existing buildings.
- In most cases, heat pumps can work successfully and efficiently, even with "normal" radiators.
- They are able to provide the necessary heat even in very cold winters.
- The average annual efficiency of air-to-water heat pumps from the latest monitoring project of Fraunhofer ISE is 3.1. For brine-to-water (ground source) heat pumps it is 4.1.

* Fraunhofer ISE 2022: "WPsmart im Bestand"

In the future, heat pumps will have to be installed in new building segments. Luckily, there are many options.

Classification of options for apartment buildings



Agora Energiewende, based on Fraunhofer ISE (2022)*

- The use of heat pumps in apartment buildings is possible and has already been demonstrated in various projects in Germany and Europe.
- The diversity of apartment buildings and their characteristics make it possible to apply different technical solutions concerning the installation of heat pumps.
- In the future, it is important to achieve more standardisation.

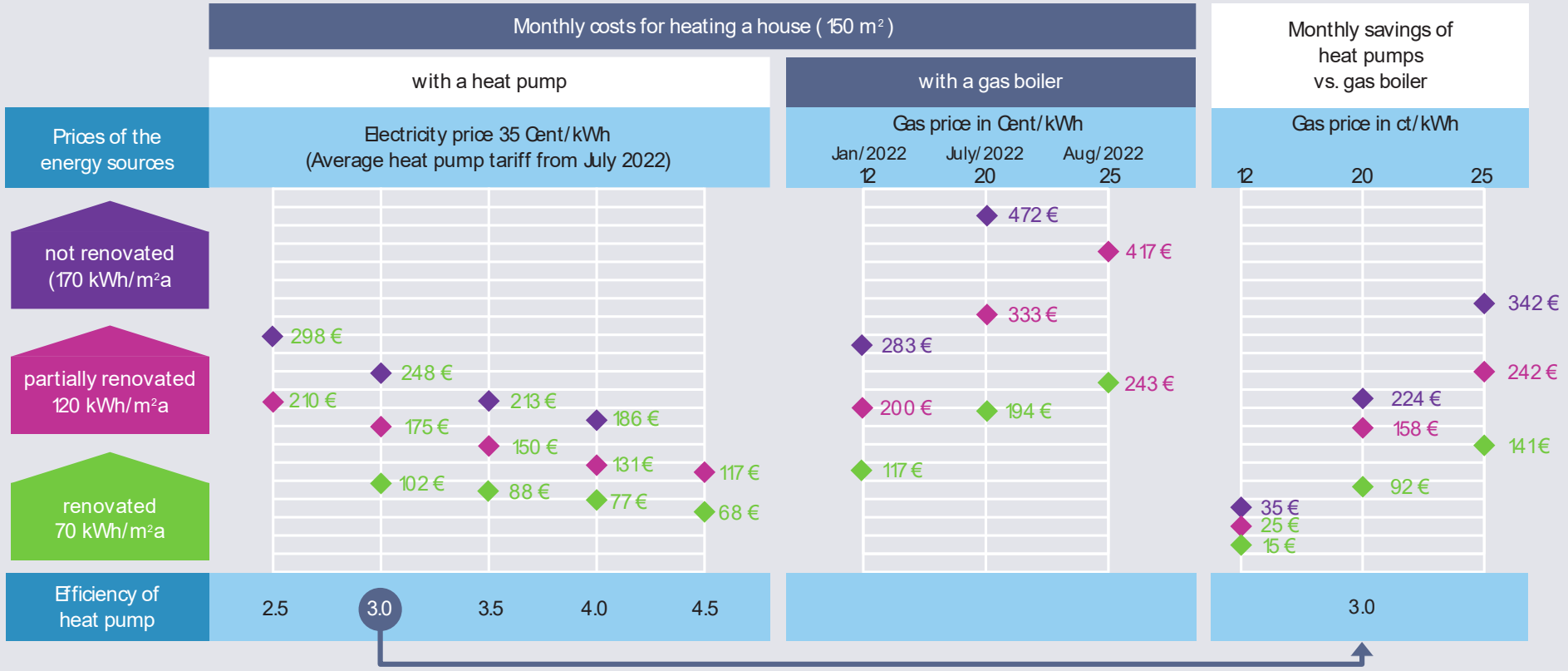
* Fraunhofer ISE 2022: "Annex 50" (https://heatpumpingtechnologies.org/annex50)

The investment costs for heat pumps are high, but there is potential for cost reductions in production and installation.

The investment cost of a heat pump (excluding subsidies) is currently two to three times higher than that of a gas boiler. These high costs are caused by two main factors: production and installation costs.

- **Installation costs** have risen significantly due to a shortage of tradespeople.
- Potential for cost reduction: mainly by shortening installation times. According to statements from manufacturers, halving current installation time (about 3 days with 2 installers) is possible. The way to achieve this: higher component integration and more pre-assembly as well as supporting digital methods.
- Examples from other countries (e.g. novel training models of the British company Octopus) show: new business models can enable significant cost reductions
- **Production costs:** Representatives of the heat pump industry see a realistic cost reduction potential of 40% by 2030.
- Strongly increasing unit numbers enable new production processes as well as economies of scale through increasing modularisation, integration and automation.

The monthly operating costs for heat pumps are lower than those for gas boilers.

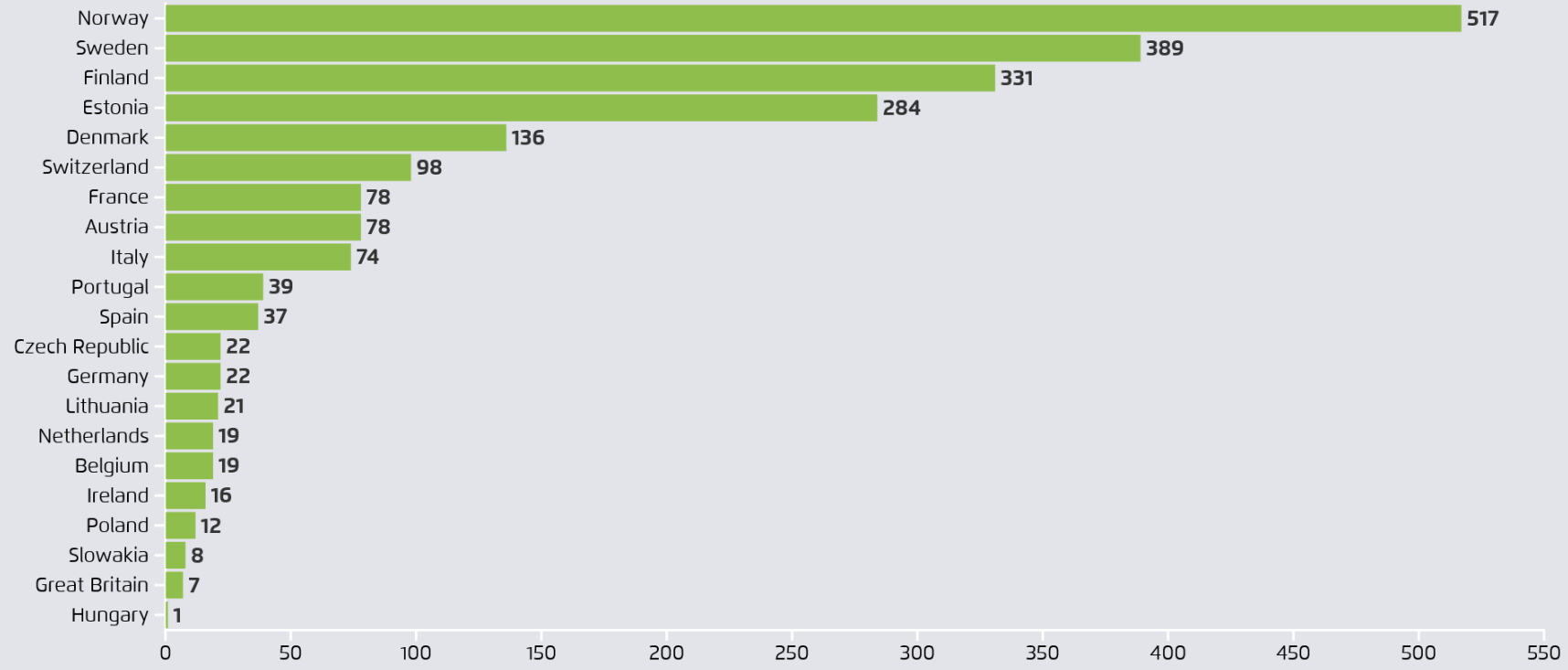


Fraunhofer ISE (2022)

Looking ahead

Several countries show: High penetration of heat pumps is possible – even in cold climates.

Number of installed heat pumps per 1000 households (2021)



Agora Energiewende, based on Orsted und stats.ehpa.org (2021)

Reliable framework conditions are the key for the market ramp-up of heat pumps; supporting measures are necessary.

- → Providing a clear regulatory framework
- → Including a strong regulatory impulse, e.g., phase-out provision
- → Supporting low-income households, e.g., via a higher subsidy
- → Lowering the electricity price, e.g. via heat pump tariffs, lowering tax
- → Strengthening training programs to address bottlenecks in installation
- → Dismantling current regulatory barriers

The transformation of the heating market requires fundamental adjustments from all actors involved.

Manufacturing

- Expand production capacities for heat pumps & convert existing production lines.
- Increase the degree of industrialisation of production
- Develop robust heat pump standard solutions (plug-and-play) that are easy to install and tolerant of installation or design errors
- Faster market diffusion of niche solutions (e.g. for floor heating)

Installation

- Trades: Aligning the product portfolio with the sale, installation and maintenance of heat pumps.
- Training of employees for the design/ planning, installation and maintenance of heat pumps; development of new qualification concepts.
- Potentially, involve new actors (e.g. energy suppliers) in the sale and installation of heat pumps
- Development of new products, services and markets

Energy utilities and housing companies

- Adaptation of the electricity distribution networks to the additional loads.
- Upgrading the electricity grids so that the flexibility of the heat pumps can be used for the electricity system.
- Establishing heat pumps as a standard solution in the housing stock of large housing companies

Thank you!

Questions?

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