



ENERGY-INTENSIVE INDUSTRIES ECOSYSTEM: HEAT PUMPS

DEFINITION

Heat pumps are crucial devices for the clean energy transition, aiming for carbon neutrality by 2050. These systems are highly efficient, using less energy than traditional boilers by extracting and upgrading ambient energy from the air, ground, or water. This energy can be used for heating, cooling, and hot water in buildings. Heat pumps operate primarily on the vapour compression cycle, which uses electrical energy, but some use sorption cycles powered by heat.

The EU promotes the adoption of heat pumps as part of its broader strategies like the REPowerEU plan and the European Green Deal.

SME SIGNIFICANCE



NUMBER OF SMEs IN THE EU27 VALUE CHAIN

ca. **150** (in production) with many more in the installation and maintenance.

SHARE OF SMEs OVER TOTAL

85%

ADDED VALUE OF SMEs OVER TOTAL

50%

HEAT PUMPS EU VALUE CHAIN

PHASE 1

INPUTS AND RAW MATERIALS



- Copper and aluminium are essential for making heat exchangers and other heat pump components.
- Rare earth elements and other minerals are used in the manufacturing of compressors and electronic controls that are, in turn, integral to heat pump functions.
- The EU is dependent on foreign suppliers when it comes to metals and very dependent, especially on China, for the relevant rare earth elements.

PHASE 2

INTERMEDIATE PRODUCTS



- Compressors and Electronic Components, as well as refrigerants, are the main intermediate products used to fabricate heat pumps. The picture is mixed with the EU having some production capabilities but not sufficient to be self-reliant. Compressors are mainly imported from China.
- Semi-conductors represent another intermediate input (for some systems), which is typically imported from Asian countries.

PHASE 3

FINISHED PRODUCTS



- A distinction can be made between small-scale installations and larger ones (i.e. more than 2MW).
- The former is more standardised, with a larger role for large firms and more competition from foreign countries. China's export trade value in heat pumps to the EU27 rose by 400% between 2017 and 2021, marking it as the most important foreign actor by far.
- The latter is more bespoke, tailored to the needs of the client, with the EU having a stronger position globally and where SMEs dominate.

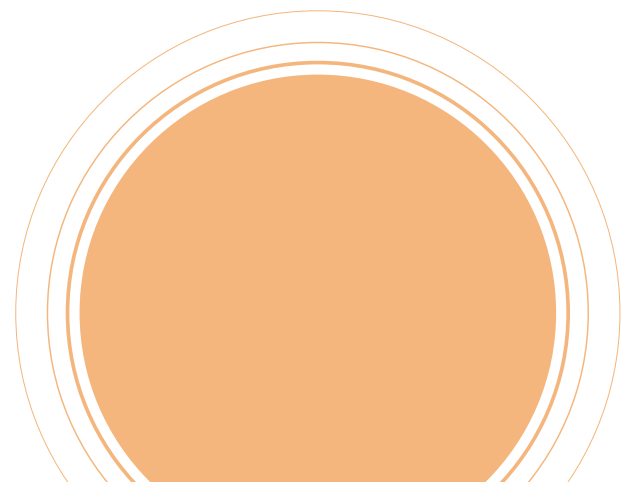
STRENGTHS AND VULNERABILITIES

EU STRENGTHS

- The EU, in particular the border region between Poland, the Czech Republic and Slovakia, has been successful in **attracting Foreign Direct Investment**.
- The market is in **full expansion** and expected to remain buoyant for the near future, in large part thanks to financial support schemes and regulatory measures, creating a bigger market.
- The EU hosts a **considerable number of innovating companies**, with a mix of start-ups and established corporates contributing to innovation. The Netherlands, in particular, stands out for having a high number of start-ups. In terms of scientific publications, Italy emerges as a leader in all types of heat pumps within the EU.
- **Financial support from the EU** has been instrumental in developing heat-pump-related materials, technologies, and building applications. EU support has significantly contributed to the region's leading position in global cutting-edge R&D.

EU VULNERABILITIES

- **Skills shortages** are pronounced. This manifests itself especially concerning the installation of (advanced) heat pumps, which requires specialised expertise that many heating installers do not possess.
- **China is emerging as a formidable competitor**, both in the EU and on the global stage, especially for smaller installations where price competition is more important.
- The **reliance on imports** for components hurts the competitiveness of the EU producers.





EXAMPLES OF POLICY MEASURES INTRODUCED TO ENHANCE OPEN STRATEGIC AUTONOMY


EU


- The **REPowerEU plan** sets ambitious targets for the deployment of heat pumps, aiming for 30 million new units by 2030. This initiative includes doubling annual sales of heat pumps and promoting their use in residential and industrial settings. The plan also emphasises ramping up production capacities and facilitating access to financing, in line with achieving the EU's climate-neutrality goals.
- There are relevant projects originating from the **European Research Council** (including the Energy Efficiency in Buildings partnership and the SME instrument) and the **Marie Skłodowska-Curie Actions**. Over the 2014-2022 period, more than 80 projects dedicated to heat pumps have been set up as part of Horizon 2020.
- A forthcoming **EU Heat Pump Action Plan** aims to accelerate the deployment of heat pumps. This includes legislative support, investment in skills and training, and facilitation of access to EU funding programs for heat pump rollout at both individual and regional levels. The plan also seeks to update legislative frameworks to encourage the use of heat pumps over traditional fossil fuel-based heating systems.

MEMBERS STATES

- **Financial support schemes** are common and typically deemed necessary to stimulate the market (at least until it reaches more maturity). Grants and subsidies are, therefore, widely employed across the EU and beyond, especially for renovation projects.
- **Regulatory measures** are also common, with many EU countries setting targets that have a favourable effect on the market. For instance, a forthcoming legal regulation in Germany, set to take effect next year, will mandate that at least 65% of newly installed heating systems must utilise renewable energy sources.

EXTRA-EU

- **United States:** The US Department of Energy (DOE) has launched various programmes to support the manufacturing of clean energy technologies, including heat pumps. For instance, the Advanced Manufacturing Office within the DOE promotes innovations in manufacturing processes that could lower costs and improve the efficiency of heat pump production. The Inflation Reduction Act also includes measures aimed at boosting domestic manufacturing of clean energy technologies, providing incentives for companies that produce heat pump components in the United States.
 - **China,** as part of its 14th Five-Year Plan, has emphasised the importance of green and low-carbon technologies. The government offers support for manufacturers of heat pumps through subsidies and incentives, particularly focusing on innovations that improve energy efficiency and reduce costs.
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POLICY RECOMMENDATIONS TO MAXIMISE SME OPPORTUNITIES AND REDUCE RISKS IN OPEN STRATEGIC AUTONOMY

Policy predictability and consistency over time are key. This is especially important because upfront investments can be high, and investors will be more keen to incur these costs if the returns on investment are predictable. Also, manufacturers will only make substantial investments if they are convinced of the long-term demand.

The adoption and implementation of the **EU action plan** would be instrumental in this manner.

In order to continue playing a leading role in cutting-edge R&D, the EU should **continue fostering collaboration** between industry stakeholders, research institutions, and government bodies in its programmes.

Another solution is to provide **best-practice examples** of installations. This seems especially pertinent for installations for energy-intensive industries and could partially address the problem of skill shortages among installers.

The **regulatory process** is slow and cumbersome. It is necessary to streamline the permitting process for various heat pump installations and technologies. Pre-approved guidelines for heat pump facility locations, as well as support for the repurposing of existing facilities, would be welcome in this respect.

Quality standards for components can be developed and enforced to lead to more secure and sustainable production within the EU. Such standards could be very effective in preventing large-scale imports from third countries that compete mainly on price but do not offer the same quality assurances.

Data sources:

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