

TEON

High Temperature Heat Pumps (HTHPs):
Perspectives and Challenges for Zero-Emission Heat Generation

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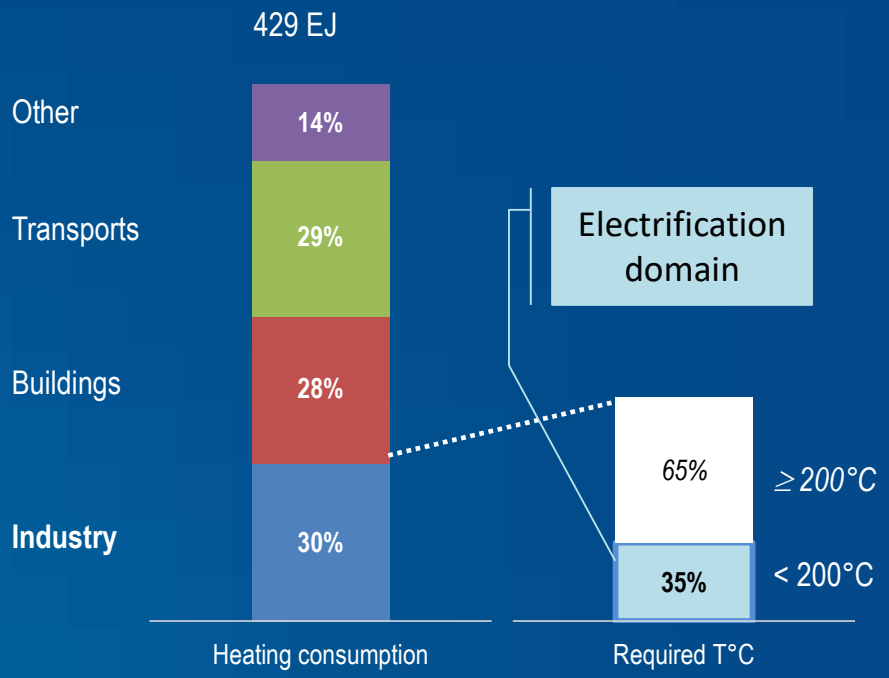
WATER® BLAZE TECHNOLOGY

Who we are

- TEON is an Italian company that develops, manufactures and markets HTHPs (water up / down to 110°C/-20°C) for industrial processes and commercial / residential buildings (particularly equipped with traditional heating terminals)
- TEON solutions:
  - can be both single- and double stage, air/brine/water-water
  - introduce pushed subcooling phases for the recovery and regeneration of heat in the thermodynamic cycle, thus maximizing efficiency at high temperatures
  - adopt (only) natural refrigerants with (i) GWP close to 0, (ii) no PFAS, (iii) limited pressure in the refrigeration circuit, (iv) lower refrigerant charge and (v) higher enthalpy of condensation
  - advanced digital technology for intelligent remote management and performance optimization

Market Perspectives



- **Industry and buildings are key priorities:** Together, they account for 58% of heating consumption, making them major targets for decarbonization.
- **Electrification has significant potential:** A substantial share of heating demand could be met through electrification with high-temperature heat pumps, contributing to more sustainable heating and reducing dependence on fossil primary energy resources.

Source: Renewable for Industry, IEA 2025
Heat Roadmap Europe

Applications of HTHPs in production processes

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Applications

1. Simultaneous production of heat and cold
2. Production of heat and cold not at the same time
3. Recovery of thermal waste
4. Production of cold all year round and heat in winter
5. Production of cold throughout the year and heat in winter with the use of cold storage

Not exhausative

	Automotive Industry	Food/Beverage Industry	Chemical & Pharmaceutical Industry	Mechanical Industry	Hotels, Hospitals & Large Complexes
HEATING NEEDS	**Paint curing** • Hot ail from the heat pump for coating pre-treatment and drying metal or plastic parts.	**Pasteurization**: Heating to 100°C is necessary to heat products (milk, cheese, fruit juice).	**Chemical reaction processes**: Some chemical reactions require high temperature for the tull completion.	**Metal heat treatments**: nest tempering, hardening often need high temperatures.	**Centralized heating for sanitary hot water**: in hotels, hospitals central heating for sanitary hot water is essential and fundamentaito produce large volumes of water.
	Plastic injection molding: • Hot war injection main-tains the T°C optimal for the polymer in plastic injection molding.	**Sterilization**: necessary for various food products (beer, milk, cans, etc.).	**Sterilization**: necessary for various food products (beer, milk, cans, etc.).	**Metal cleaning**: Hot water is needed to wash grease or the oil from metal workpieces.	**Swimming pools and spas**: Water heating to heat the pools and spas, in larg hotels, heating large volu
	Welding and gluing • Many assembly pro-cesses require high temperature to make plastic and metallic.	**Cleaning and sanitizing lines:** Equipment and lines require high temperature water to avoid contamination.	**Distillation & evaporation** Distillation processes require heat as well as evaporation, common for chemical and pharmaceutical applications.	**Distillation & evaporation** Distillation processes requir the heat as well as evaporation, common for chemical and pharmaceutical applications.	
COOLING NEEDS	**Stones on stems**: • **Compressor stations**: require refrigeration for internal heat abs, orption and thermal	**Cooling NEEDS** **Controlled fermentation**deer, • femenation temperature from 1°C to +12°C to maintain the ideaps conditions for correcta fermentatıéton.	**Process fluid cooling**: For solvents or other imust be kept at stable temperatures.	**Machine tools** (lathes, CNC **cutters, etc.)**: Cooling to 8-12'C to increase the efficiency of lubrication, grinding, etc.	**Water circues** **Producing**: domestic hot water.
	Station of compress: • Require refrigeration for internal heat absorption and thermal exchange.	**Fermentation** (beee wine, yogurts): Necessary fermentation temperature from -1°C to +12°C to maintain the ideal conditions for the process.	**Process fluid cooling**: For solvents or other fluiid must be kepi at stable temperatures.	**Machine tools** (lathes, CNC **cutters, etc.)**: Cooling to 8-12'C to increase the efficiency of lubrication,	**Water circuit cooling**: Produce domestic hot water.



Challenges: HP OEM Value Chain

- **Knowledge transfer and technology diffusion:** Ensuring continuous updates and effective dissemination of knowledge on new heat pump technologies across the entire value chain, including OEMs, installers, plant design engineers, technicians and refrigeration specialists.

- **Continuous training on new refrigerants:** Developing technical skills and providing ongoing training on new refrigerants, including their properties, safety requirements, handling procedures and implications for system design and installation.

- **Expanding technological applicability and developing specialized technical competencies:** Training and supporting professionals in the application of advanced heat pump technologies in buildings and industrial settings where gas boilers have traditionally been the only viable solution, overcoming technical and design barriers.



Challenges: Technology and Grid Readiness

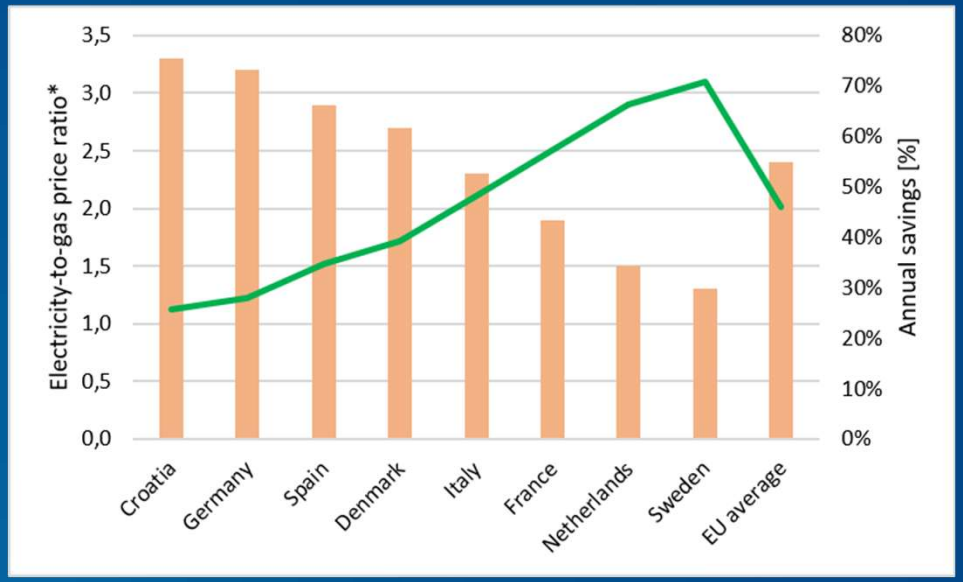
- **Uncertainty in electricity supply and grid capacity:** Increasing uncertainty regarding the availability of sufficient electrical power and the capacity of local distribution networks represents a major barrier to heat pump deployment, particularly for large-scale and centralized heating systems, that sometimes require the installation of dedicated MV/LV transformers to support centralized heat pump systems.

- **Legacy industrial equipment and process constraints:** In some industrial sectors, production equipment has been specifically designed to use steam as a heat transfer medium, even when the actual process does not require high temperatures. This reflects legacy plant configurations and outdated infrastructure that can limit the straightforward integration of heat pumps.

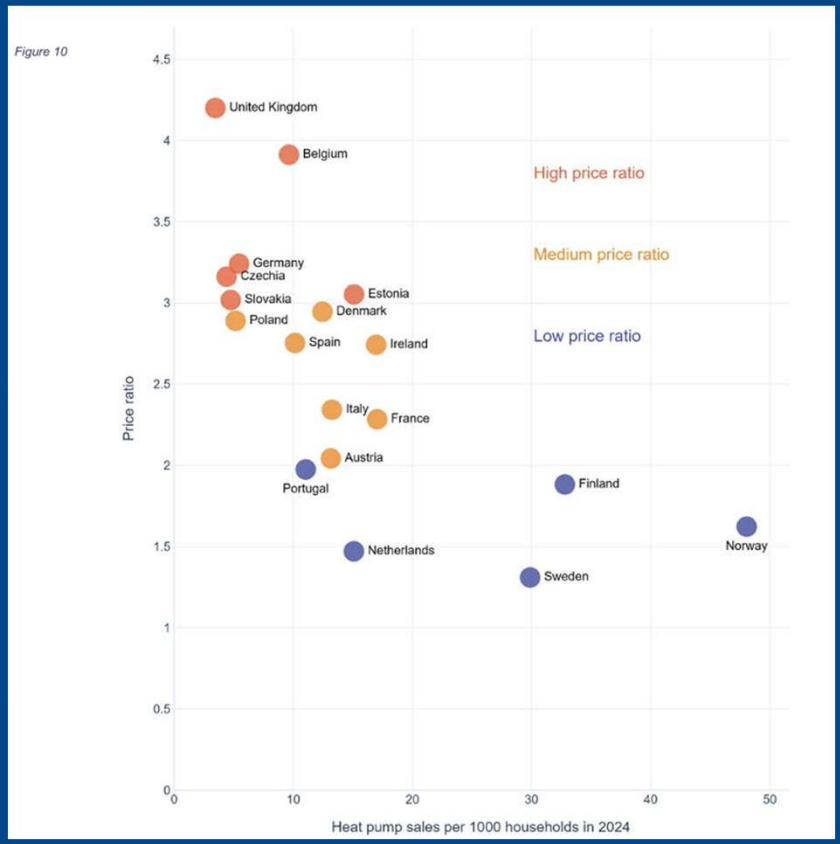
- **Need for plant adaptation and system redesign:** Overcoming these barriers may require substantial modifications to existing industrial equipment, heat distribution systems and electrical infrastructure. The associated technical complexity and investment requirements can slow down heat pump adoption, even where the required heat demand is compatible with available technologies.

Challenges: Feasibility in different sites

- Electricity-to-gas price ratios determine **the feasibility of the gas boiler replacements** with the same technology**.**
- Lower electricity-to-gas price ratios **lead to more heat pump sales per household.**



Source: Eurostat household electricity dataset NRG_PC_204 and gas dataset NRG_PC_202. 2025 data.
***Calculations with SCOP=4 and the gas boiler efficiency of 90%.*



Source: Source: European Heat Pump Association (EHPA). (2025). EHPA Market Report 2025, Figure 10, "Lower electricity-to-gas price ratios lead to more heat pump sales per household," p. 11. .

Challenges: Legislation

- **Regulatory focus on electricity rather than thermal energy:** Most energy policy initiatives, regulatory frameworks and incentive mechanisms have historically focused on electricity generation, energy efficiency and power-sector decarbonization. Thermal energy, despite representing a significant share of final energy consumption, receives comparatively less attention, particularly in terms of dedicated policies supporting the electrification of heating and cooling.

- **Limited recognition of thermal energy as a source of system flexibility:** Regulatory frameworks increasingly recognize the role of electricity storage and demand-side flexibility in balancing the grid. However, the potential of heat pumps combined with thermal energy storage to provide similar flexibility services remains insufficiently valorized. This limits opportunities for heat pump operators to participate in flexibility markets and generate additional revenue streams.



Thank you for the attention

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