POSITION PAPER

Brussels, 4 March 2025

# Industrial heat pumps to decarbonise Europe's industry

**More than 60% of the energy used by European industry is for the provision of heat. Industrial heat pumps can help decarbonise low to medium temperature heat supply within industries by reusing waste heat and generating renewable energy thus replacing oil and gas. Industrial heat pumps are part of a European clean tech sector, ready and deployable today and able to reach temperatures of up to 180-200°C. Industrial heat pumps use waste heat from processes, exhaust air from buildings and infrastructure or generate renewable energy from ambient sources such as air, water, sewage and ground. They are key to Europe's energy security, resilience, sovereignty and competitiveness as they displace oil and gas and use local clean electricity instead. They are already being used in industries like paper and pulp, wood, dairy, fruits, vegetables, paint, food, textiles.**

*Industrial heat pumps: low hanging fruit in the new mandate*

The European Commission's **Clean Industrial Deal** will focus on creating lead markets for clean tech and putting in place conditions for companies to grow and compete. The **Industrial Decarbonisation Accelerator Act** will focus on accelerating clean tech for energy intensive sectors. Industrial heat pumps are a clean technology manufactured in Europe that enables European industries to become cleaner, more efficient and decarbonised. This not only boosts their competitiveness, but also supports the EU's decarbonisation goals. They should therefore be at the centre of the Clean Industrial Deal and the Industrial Decarbonisation Accelerator Act. The **Energy Affordability Action Plan** plays an important role as well to reduce the electricity bill needed to level the playing field for industrial heat pumps.

Heat pumps are the main technology to electrify heating in the residential, commercial and industrial sector, therefore the European Commission's **Electrification Action Plan** and the **Heating and Cooling strategy** should also strongly focus on unlocking their potential.

In the following chapters, we provide a more detailed overview of:

- Industrial heat pumps: the low hanging fruit to decarbonise Europe's industry
- Policy recommendations to accelerate the roll-out of industrial heat pumps

Top recommendations to accelerate industrial heat pump uptake:

1) Improve the electricity to gas price ratio by ensuring fair tax policies and designing levies so they increase electrification
2) Financial support for industrial decarbonisation should focus on electrification and energy efficiency
3) Simplification of state aid provisions to deliver industrial heat pumps
4) Guarantee timely grid access for electrified industrial processes
5) Regulate the re-use of waste heat

**European Heat Pump Association (EHPA)**
Avenue de Cortenbergh 120, 1000 Brussels – Belgium
info@ehpa.org
www.ehpa.org

## A. Industrial heat pumps: the low hanging fruit to decarbonise Europe's industry

### 1. Industrial heat in Europe: focusing on the easy-to-electrify segments

According to the latest data from Eurostat, around 60% of industrial energy needs are currently procured with fossil fuels, versus just one third with electricity. Heating is, by far, the largest source of energy consumption in the EU industrial sector. According to Agora Industry[1], it represents about 47% of the industrial energy demand and it predominantly produces with fossil fuels (more than 80%). The same study concludes that 62% of the heat currently utilized in the industrial sector can be electrified with existing technologies.

Different industries have different heating needs, and technological alternatives for direct electrification. Therefore, it is important that the Clean Industrial Deal considers all different segments of the industry and does not leave behind those sectors that can easily electrify their processes. On the contrary, it should present measures that are adjusted to all different heating and industrial needs. In this context, industrial heat pumps can play a major role.

### 2. Industrial heat pumps increase cost competitiveness of European industry

Capable of reaching temperatures of up to 200°C, heat pumps are suitable for process heat supply, often replacing natural gas, and can be two to four times more efficient than traditional heating methods. Energy intensive industries, such as dairy, paper, beverages, and food, as well as nearly any drying process, can retrofit industrial heat pumps to increase energy efficiency and reduce primary energy consumption. According to the European Commission's Joint Research Centre (JRC) **massive implementation of industrial heat pumps in the European market will significantly strengthen European process industry. Production sites will become more efficient, valorising local waste heat, leading to lower production costs and increased competitiveness**, while reducing greenhouse gas emissions substantially. Electrification by heat pumps will enhance the independence of European countries from fossil fuel imports and energy imports in general.

### 3. Industrial heat pumps have a strong European local value chain

60-73% of heat pumps installed in Europe are currently manufactured in Europe. There are around 300 heat pump and component manufacturing sites in Europe – providing around 170,000 direct jobs. Europe benefits from a strong heat pump value chain, especially in industrial heat pumps with key suppliers providing all relevant components as confirmed by the JRC. To remain competitive in a rapidly evolving global market, the sector requires significant investment to scale production capacity. The heat pump sector has the potential to become one of Europe's next industrial success stories, provided we ensure the right conditions for its continued development and competitiveness.

[1] Fraunhofer ISI (2024): Direct electrification of industrial process heat. An assessment of technologies, potentials and future prospects for the EU. Study on behalf of Agora Industry

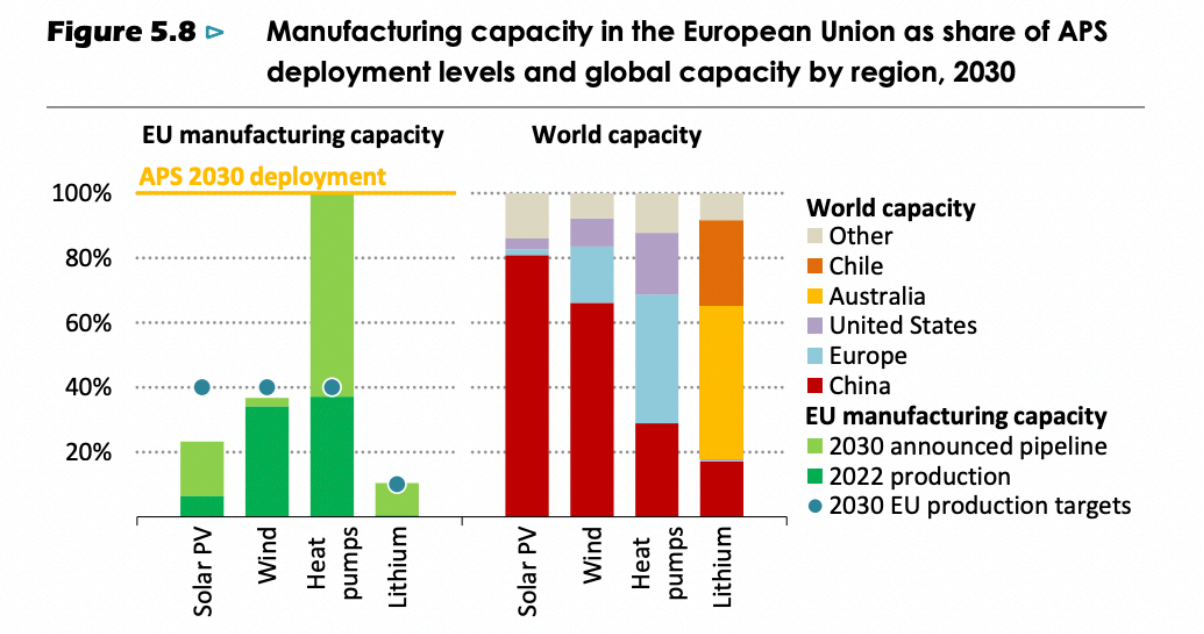



*Figure 1: IEA energy outlook 2023. APS means "announced pledges scenario"*

**4. Electrification: Unlocking Efficiency, Energy Security, and Competitiveness for a Sustainable Future**

"Three quarters of industrial CO2 emissions result from burning fossil fuels that provide process heat for the production of industrial goods, such as chemicals, steel, paper, food and beverages. Process heat constitutes the single most significant energy use by industry"[2]. More than 60% of industry's energy use goes on heat. Electrifying these processes with industrial heat pumps therefore significantly reduces our dependency on fossil fuels, increasing our energy sovereignty.

Unlike other heat appliances, industrial heat pumps can reuse waste heat, which is abundantly available in industrial processes. This waste heat can be repurposed by the heat pump, either by integrating it into district heating networks or by utilizing it within the company itself. Reusing waste heat will lower costs for industries by decreasing the demand for primary energy sources and reducing the need for additional heating systems, as it is cheaper to just reuse energy than it is to buy or produce it. Waste heat can replace fossil energy otherwise used to produce heat. Additionally, this approach would help improve the ESG performance of the company and reduce the embedded carbon emissions of the manufactured products.

[2] Fraunhofer ISI (2024): Direct electrification of industrial process heat. An assessment of technologies, potentials and future prospects for the EU. Study on behalf of Agora Industry.

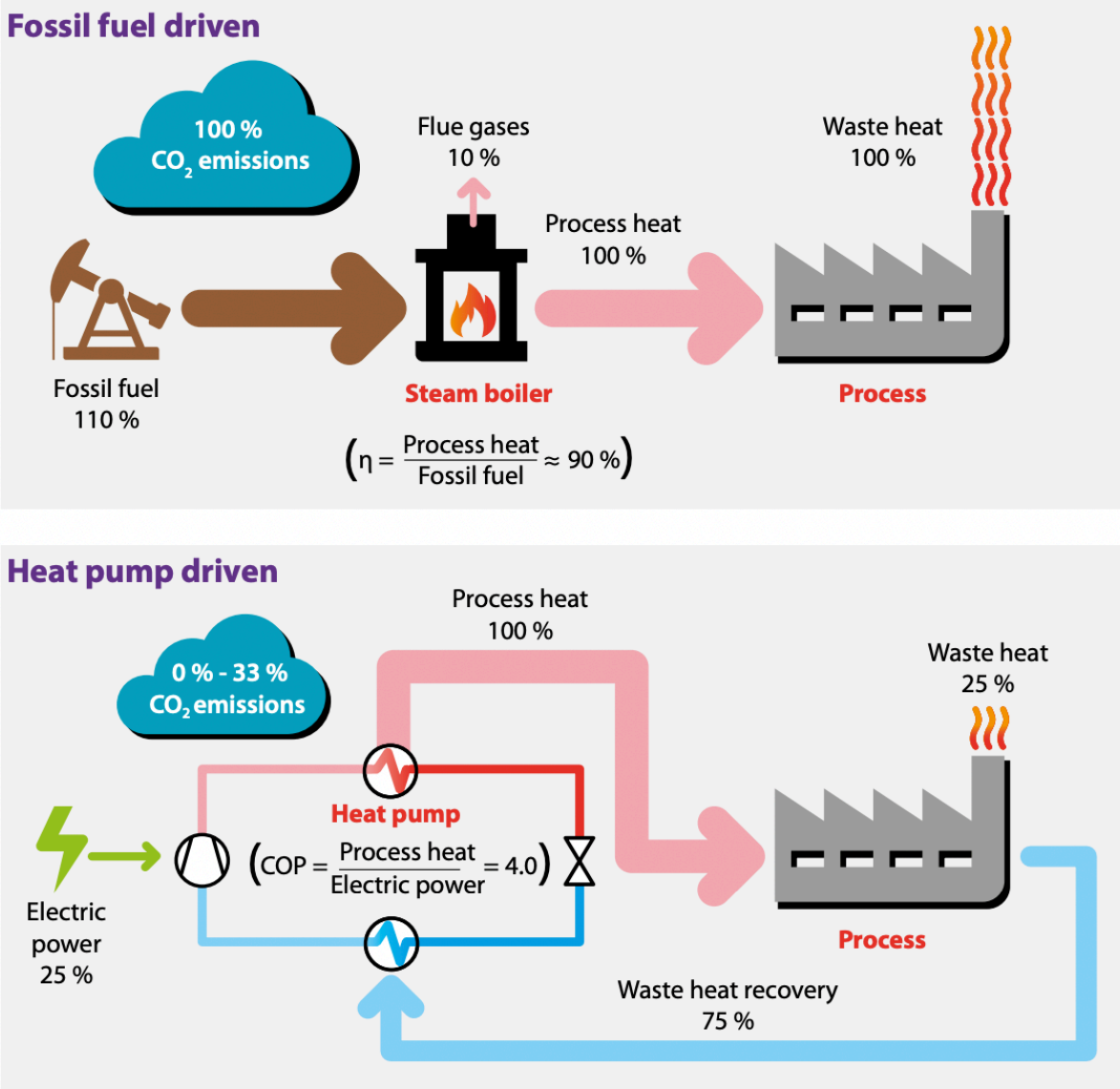
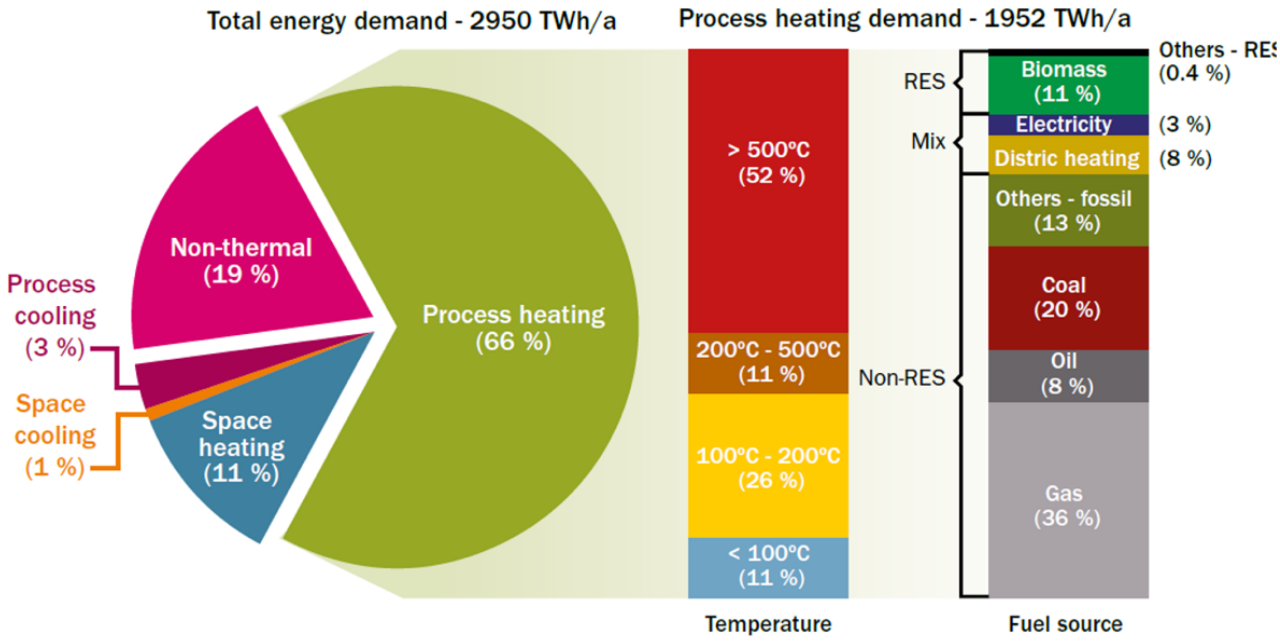



*Figure 2: Comparison of fossil fuel driven and heat pump driven industrial process schemes* ***source: De Boer et al: Strengthening Industrial Heat Pump Innovation – Decarbonizing Industrial Heat***

### 5. Industrial heat pumps are a real, readily deployable technology available today.

Industrial heat pumps are technically mature, available and used in industries like paper and pulp, wood, dairy, fruits, vegetables, paint, food, textiles. Examples can be found in EHPA's heat pump stories and EHPA and paper and pulp trade body CEPI's publication on heat pumps in the paper and pulp industry. Today, industrial heat pumps provide temperatures of up to 200°C and further R&D is ongoing, with supply temperatures of up to 300°C by 2035 expected.

The potential to implement this mature technology is large: 37% of the final energy demand for process heating in Europe is below 200°C and can thus be retrofitted with industrial heat pumps. This amounts to 722 TWh. For 722 TWh, a heat pump capacity of around 108 GW (432 TWh @4000 hrs and 756@7000 hrs) is needed. In 2022, based on Eurostat data, the estimated installed stock of industrial heat pumps was in the range of 7 TWh in Final Energy Consumption (FEC) across EU27. This means that **the potential is enormous** and we can increase from 7 to 722 TWh, so hundred times the current installed capacity.




**Source: De Boer et al: Strengthening Industrial Heat Pump Innovation** Decarbonizing Industrial Heat

6. **Delivery is dependent on affordable and abundant electricity for European industries.**

In its study looking at the future of heat pumps, the International Energy Agency clearly points out that similar to the buildings sector, costs remain a major barrier to the adoption of industrial heat pumps. The cost of equipment, installation and related process changes are often high but less critical in industry than operating costs. In addition, current electricity market designs and tax structures often favour natural gas over electricity use in industry in many jurisdictions. However, the required efficiency (COP) for heat pumps to be economically viable is declining, approaching 2.0, as tangible and intangible levies, pledges, and legislation can now only be met by heat pumps.

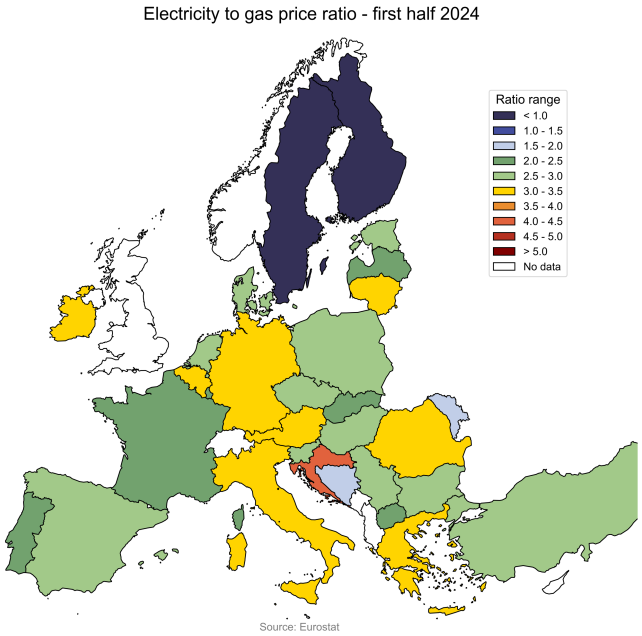



*Figure 4: Comparison of current electricity to gas price ratio in European Countries for small scale industrial end-users (2GWh/a to 20 GWh/a electricity, 3 GWh/a to 28 GWh/a gas)*

## A. Policy recommendations to accelerate the roll-out of industrial heat pumps

The new European Commission mandate focuses on sustainable prosperity and competitiveness of European industry and reinforcing economic security by reducing dependencies. Industrial heat pumps address all of these points as explained above. To support the accelerated rollout to the benefit of European industry, we list a number of recommendations for European policy makers below. These can be addressed in the upcoming Clean Industrial Deal, Electrification Action Plan and Heating and Cooling Strategy.

Top recommendations to accelerate industrial heat pump uptake:

1) Improve the electricity to gas price ratio by ensuring fair tax policies and designing levies so they increase electrification
2) Financial support for industrial decarbonisation should focus on electrification and energy efficiency
3) Simplification of state aid provisions to deliver industrial heat pumps
4) Guarantee timely grid access for electrified industrial processes
5) Regulate the re-use of waste heat

1. **Improve the business case**

a. Opex – Improve the electricity to gas price ratio

i. **Ensure fair tax policies to enhance industrial competitiveness and accelerate electrification in the EU and at national level**: a clear and strategic approach to taxation is urgently needed, both for electricity and non-electricity related taxes, to reduce the overall electricity costs for industries looking to electrify, making them more competitive in the global market. This should be done at EU level via the Energy Taxation Directive and with Member-State specific guidance.

ii. **Ensure the balance of electricity costs, levies, charges and grid investment are all designed to increase electrification**: this needs to happen at both national and European level to ensure that regulated, anticipatory and other costs do not discourage electrification before it takes hold. European guidance on best practices regarding levies and on which buget to put them (general buget, electricity bill, other) should help Member States in their national analysis to balance the electricity bill.

b. Capex

i. **Encourage Member States to put in place financial support at national level for industries that decarbonise their production systems:** provide financial support in the form of tax rebates, deductions and/or subsidies for companies that achieve energy savings via industrial heat pumps. One way of doing this could be through targeted and temporary grants for industries that use a significant portion of energy for heating and cooling applications, which can be effectively addressed with today's heat pump technologies. This approach could focus on strategic sectors for the EU, such as food and beverage, machinery and transport, and pulp and paper. This could also be achieved through a mechanism where the energy savings resulting from the installation of an industrial heat pump can be converted into credits which can then be sold on a related credit stock market. In some countries, such as Italy or Denmark, the revenue from the sale of these credits can cover up to 20% of the initial investment cost of the heat pump.

ii. **Low-interest loans:** huge annual savings from industrial heat pumps can be made – and can even become revenue. Nevertheless, upfront costs for fully electric systems remain high and put off customers. Access to financing should be made easier by establishing low -interest loan programs and guarantees, so that companies can face high upfront costs for capital-intensive industrial heat pump projects.

iii. **Encourage Power Purchase Agreements (PPAs):** a power purchase agreement is a long-term contract between an electricity generator and a buyer to purchase electricity at a predetermined price and for a fixed period. They are often used to finance renewable energy projects. Removing barriers to PPAs is essential to ensure market-based deployment of renewable energy, and thus industrial heat pumps and waste heat recovery.

iv. **Ensure that industrial subsidies support and encourage industrial heat pumps and the recovery of waste heat** and do not result in growth of inefficient and fossil-based technologies. Similarly to what has been done in the Energy Performance of Buildings Directive for residential heating (EPBD art. 17, 15), the EU should set a clear date by which Member States should discontinue financial incentives for industrial heating powered by fossil fuels for temperature levels where mature alternatives are readily available.

2. **Regulation**

- **Create an improved framework for the accelerated deployment of heat pumps: develop the necessary policy and financing frameworks** to help the sector reach the REPowerEU target of 60 million additional heat pumps installed in Europe by 2030. Expressed in energy, this comes to almost 1,500 TWh of Final Energy Consumption (FEC) supplied by heat pumps in 2030. In our document "Heat Pump Accelerator", we offer an overview of the solutions to the challenges identified by industry stakeholders, governments and NGOs to the deployment of heat pumps in Europe. Reinforced EU-wide governance should safeguard, support, and monitor the implementation of targeted heat pump initiatives and incentive campaigns at the national level to ensure these objectives are followed through.

- **Clear target for direct electrification for industrial processes:** set an EU based target for industrial electrification and require Member States to set national targets for direct electrification for industry, especially for the clean electrification of heating processes. This would help ensure planning certainty for technology providers and industrial offtakers through clarifying emissions reduction pathways to meet 2030 and 2040 EU climate targets.

- **Clear target for renewables in industry:** the current renewable energy directive only encourages Member States to increase renewables in industry by indicative minimum percentage points (RED art. 22a). This should be strengthened by requiring this from Member States instead of only encouraging.

- **Extend the Temporary Crisis and Transition Framework (TCTF) to support industrial electrification:** a very effective way to improve competitiveness in the short term could be through a temporary ad-hoc State aid framework for the electrification of low-temperature heating processes, similar to the TCTF approach. It is important to note that the current TCTF already includes a chapter dedicated to aiding the decarbonisation of industrial production processes through electrification, among other methods. However, this aid is limited to supporting investment costs (CAPEX), making it ineffective given the low tolerance for failure among companies. The new ad-hoc framework should define the conditions a support scheme must comply with while allowing flexibility to adapt to specific national conditions, enabling fast-

track approval. This new framework would also facilitate a more harmonised design of support measures across the EU, with the flexibilities it permits.

- **Simplification of the state aid provisions:** The current state aid framework makes the support for industrial heat pump technologies difficult to deliver in practice. Adapting article 38 (3) of the General block exemptions (GBER) to allow standard funding provision without the need to calculate net present value (NPV) or forecast future investment in alternative technologies would improve that. Also modifying article 38b to allow investment aid for energy performance contracting, heat as a service and other new innovative financed models is important. Otherwise the financed models would be 30-50% more costly than the non- financed versions. In addition, governments should be able to use operational aid to provide insurances against high electricity prices, without needing state aid clearance. This can be done by modifying article 43 2 (iii) by extending the provision of operational aid from 1MW to 30MW for the provision of renewable heat, and specifically referencing heat pumps in this clause.
- **Make heat pumps default for industrial heat up to 200°C:** the current Renewable Energy Directive includes that Member States "shall endeavour to"increase the share of renewable sources in industry among others with "renewable based electrification" of industrial processes below 200°C. This wording should be strengthened and be the default option by including it as a requirement in permitting and licensing of all new and renovated industrial facilities.
- **Stronger industrial efficiency targets:** require from industries to implement the energy efficiency first principle in their industrial process heat.
- **Recognise industrial heat pumps and waste heat recovery in climate plan assessment - National Energy and Climate Plans (NECPs):** Member States and relevant local authorities should incorporate strategies related to industrial heat pumps and waste heat in their upcoming National Energy and Climate Plans (NECPs) as well as in their heating and cooling assessments and local plans. With regards to the specific measures for the integration of renewable energy technologies, countries support the deployment of heat pumps, mostly in individual households as an instrument for replacing fossil-fuel individual heating appliances. Nevertheless, the EC guidance and the NECPs should explicitly point out the deployment of industrial heat pumps and waste heat recovery as well.

3. **Energy system integration**

- **Guarantee timely grid access for electrified industrial processes**: this can be achieved through a combination of robust energy system planning, and strict implementation of Market Design grid provisions on grid connection procedures and timelines. It will be necessary to implement a dynamic and efficient management of grid connection queues and requests, prioritising mature projects, and offering adequate flexible connection agreements.
- **Address barriers to unlocking flexibility in the industry:** different types of demand participation should be acknowledged to cater for the specific features of different industry sectors. Demand-side response should be incentivised through remuneration while not penalising industrial players with limited flexibility potential. For this to happen, developing appropriate market price signals and offering de-risking instruments such as guarantees and low interest loans to incentivise investments in flexibility is crucial.
- **Invest in a net zero grid**: network companies should plan for the net-zero grid and put in place anticipatory investments. The accelerated strengthening of the electricity grid should allow for industrial facilities to decarbonise and connect quickly.

- **Take into account flexibility when planning the net-zero grid:** flexibility potential of heat pumps can reduce costs for the energy system and for consumers. Grid operators need to be aware of this flexibility potential and take this into account when planning for the net-zero grid.

4. **Knowledge, information** and skills

- **European industrial heat pump and waste heat recovery guidelines:** develop comprehensive EU-wide guidelines for the implementation of industrial heat pumps and waste heat recovery, ensuring consistency, sharing of best practices across the continent and across al levels of the value chain.
- **Funding for audits:** Ensure specific funding for industries to do an audit of their industrial process to identify the potential for implementing industrial heat pumps and waste heat recovery.
- **Increase awareness about industrial heat pump applications** by putting them as a key area to develop in the different announced legislative initiatives by the European Commission: Clean Industrial Deal, Industrial Decarbonisation Accelerator Act, Electrification Action Plan and Heating and Cooling Strategy.
- Develop and deliver EU-wide recognised **certifications and training programs for engineers, technicians in industrial sectors** on industrial heat pump adoption.
- **The Commission should consider a manufacturing plan** to ramp up industrial electrification technologies, starting with mature low- to medium-temperature options such as industrial-scale heat pumps, then forecasting rapid adoption along an S-curve in the near future. The plan must include a skills strategy, planning for training and ensuring that jobs in manufacturing, installation and maintenance will attract enough workers.[3]
- **A coherent strategic research, innovation and investment agenda at EU level** is needed to make industrial heat pumps an integral part of standard process equipment for heat up to 200°C. This includes continued funding for research, development and innovation via EU and national programs to achieve cost reductions, increasing temperatures and standardisation.
- **The Commission should explore calls for dedicated proposals under the Innovation Fund on direct industrial electrification** (e.g. of low-to-mediumtemperature industrial heat) with special emphasis on SMEs, tackling sectoral technology integration challenges. It could take the form of an Electrification Bank, building on the Hydrogen Bank's experience.[4]
- **The Commission could explore creating an Important Project of Common European Interest (IPCEI) for direct electrification technologies for industrial process heat**. The aim would be to boost EU innovation and technology capacity while supporting the creation of European value chains.[5]

[3] https://www.e3g.org/wp-content/uploads/E3G-Briefing-An-Electrification-Action-Plan-to-secure-EU-industrys-future-2.pdf
[4] https://www.e3g.org/wp-content/uploads/E3G-Briefing-An-Electrification-Action-Plan-to-secure-EU-industrys-future-2.pdf
[5] https://www.e3g.org/wp-content/uploads/E3G-Briefing-An-Electrification-Action-Plan-to-secure-EU-industrys-future-2.pdf

5. **Unlock waste heat recovery with heat pumps**

- **Regulate the re-use of waste heat:** the current EED (art. 26.6) requires Member States to ensure that data centres with a total rated energy input exceeding 1MW use waste heat or waste heat recovery applications. This should be replicated in other sectors and it should be **mandatory for entities such as smaller data centres, air-conditioned** buildings or industries using cooling as a process to draft a plan for exploiting waste heat.
- **Regulate the use of industrial heat pumps** by making it mandatory for industries to link the required waste heating and cooling in their process design planning. For new industrial sites, it should be mandatory to design heating and cooling systems by combining processes instead of using standalone chillers and boilers/heat pumps. Additionally, mandate the replacement of chillers with heat pumps equipped for heat recovery during equipment upgrades, enabling industries to optimize energy efficiency with minimal extra CAPEX while retaining heating capabilities.
- **Comprehensive definition of waste heat recovery:** the waste heat definition must cover all relevant and feasible waste heat applications, **including on-site waste heat recovery, for example from the cooling of buildings**. EU legislation provides a narrow definition limited to the waste heat which can only be used in district heating and cooling applications in the current Renewable Energy Directive. Further references to "waste heat" in other legislation indicate either the broader use of waste heat (e.g. Energy Efficiency Directive, Article 23, Annex IX) or exclusively to its use in district heating and cooling (e.g. Energy Efficiency Directive, Article 24, EU Taxonomy).
- **Expand the role of waste heat** beyond district heating and cooling by, for example, setting sectoral targets for suitable industrial sectors and large commercial buildings (e.g. hospitals, airports, hotels, data centres, commercial kitchens etc.). Highlight that the maximisation of waste heat collection requires district heating and cooling networks to operate at the lowest possible temperature level, ideally at ambient temperature. Ensure that the distribution of thermal energy across the boundaries of individual lots is legally feasible. Encourage cities to consider (ambient temperature) district heating and cooling networks as part of infrastructure, next to electricity, data, water, and waste water.
- **Inclusion of waste heat to power in the EU Taxonomy for sustainable investments:** the EU Taxonomy is a classification system designed to help investors, businesses, and policymakers identify environmentally sustainable economic activities. It should help steer investments towards sustainable activities. While waste heat recovery is already recognised as a climate mitigation and green investment measure under the Taxonomy, "the production of power using waste heat" is currently missing, despite being a carbon-neutral solution. For this reason, we would recommend adding waste heat to power (utilisation of waste heat from industrial and tertiary sources to produce electricity for internal or external usage) to the list of energy measures that should be considered under the EU Taxonomy regulation.
- **Inclusion of waste heat recovery in the EU Emissions Trading System (ETS) for free allocation:** the EU ETS aims at reducing greenhouse gas emissions by setting a cap on the total emissions allowed from certain industries, requiring industries to purchase or receive allowances for their emissions and allowing trading of allowances between participants. Some industries are given free allowances (free allocation) to prevent these industries from relocating and to support specific sectors. Notwithstanding the considerable benefits for sustainability and climate, waste heat recovery from industrial processes should be eligible for free allocation within the ETS. By doing this, it will be more financially

attractive for industries to adopt waste heat recovery and the EU ensures that industries investing in sustainable practices remain competitive.

**Author:**
Jozefien Vanbecelaere
Jozefien.vanbecelaere@ehpa.org
+32 498 455 292

**European Heat Pump Association (EHPA)**
Avenue de Cortenbergh 120
1000 Brussels – Belgium

info@ehpa.org
www.ehpa.org