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Feedback to ECHA

On the PFAS Restriction Proposal

In January 2023, the national authorities from Denmark, Germany, the Netherlands, Norway and Sweden submitted a restriction proposal on the manufacture, placing on the market and use of PFAS. The European Chemicals Agency (ECHA) opened a six-month consultation at the end of March 2023, ending on 25 September.

Euroheat & Power (EHP) is the international network representing the district energy sector to promote sustainable heating and cooling in Europe and beyond, with the **objective of full decarbonisation before 2050**. District heating and cooling systems (DHC) are networks that efficiently distribute centrally produced hot and cold water via insulated pipes to buildings. The reliability of these networks crucially hinges on the robustness and durability of their components, in service for decades under extreme conditions.

DHC networks are an infrastructure multi-energy by essence, leveraging the use of local sustainable resources and reducing the reliance on fossil fuels. They enable different countries, districts, and cities to choose from various renewable and low-carbon options, the most suited way of harvesting, recovering or generating heat. They are increasingly incorporating large heat pumps that use excess renewable power, enabling system integration and flexibility or recovering waste heat from industrial processes or tertiary activities. District cooling is also a growing solution that has important efficiency gains, as well as environmental, climate and comfort benefits. Large-scale heat pumps (heating) and chillers (cooling) rely on refrigerants, either F-gases (HFCs or HFOs) classified as PFASs, as well as naturally occurring gases like CO_2 or ammonia. These different refrigerants meet different temperature, safety, and efficiency requirements to match the characteristics of specific networks.

Other types of PFAS such as fluoropolymers are used in diverse manufacturing processes and products along the DHC value chain. For instance, PFAS substances are also used in coatings of machinery and tools used to produce pipes, in insulation foam for pre-insulated pipe, and in many key equipment (and their components) for heat and cold networks such as heat exchangers, substations, compressors, valves, seals, bearings, gaskets, etc. **The need to maintain precise control over temperature, pressure and tightness to avoid leaks and losses in DHC networks is paramount.** PFAS substances are numerous and have a wide range of physical and chemical properties, but they have in common high chemical and thermal stability. In this context, PFAS have been indispensable to ensure the manufacturing of durable, efficient, and safe equipment and parts, as well as efficient and safe operation of DHC networks.

Euroheat & Power (EHP) strongly supports the overall aim of **chemical regulations to protect public health and the environment**. We acknowledge the **need for appropriate restriction of PFAS substances**, targeting substances with scientifically proven risks to human health and the environment.

However, a blanket ban as it is currently proposed in the restriction proposal would have a severe impact on European industrial production, products, markets, and competitiveness, as well as the energy transition.

EHP would like to share the following considerations and recommendations with regard to the general regulation of PFAS.

01.	Differentiate between the different PFAS substances
02.	Assess the capacity of the industry to provide alternatives
03.	Set an adequate transition period when an adequate alternative exists
04.	Assess derogation needs
05.	Align the PFAS regulation to the EU's decarbonisation objective

1. Differentiate between the different PFAS substances

The Organization for Economic Cooperation and Development definition of PFAS used in the restriction proposal is broad and non-specific to a chemical's potential for harm to humans or the environment. It covers a broad range of substances[1] with different properties and applications.[2]

However, it is essential to **distinguish industrial applications**, namely district heating, that have been **in use for decades, in closed loop and controlled environments, under strict monitoring**.

Therefore, we believe that substances must be assessed individually around REACH processes and criteria of persistence, bioaccumulation, and toxicity, coupled with use scenarios.

2. Assess the capacity of the industry to provide alternatives

REACH, as stipulated in Article 68, emphasizes the necessity of considering the socio-economic impacts of any new restriction. A blanket PFAS ban would impede the EU's energy transition just when its acceleration is crucial, towards the 2050 objective of climate neutrality. In the short to medium term, the large-scale availability of technically and safety-compliant alternatives to many PFAS substances remains uncertain.

Therefore, we recommend **thoroughly investigating the availability of alternatives when imposing new restrictions**. Furthermore, the evaluation process should encompass not only the technical functionality of each PFAS compound but also the **technical and economic viability of potential alternative substances within a realistic timeframe**.

[1] OECD (2021), Reconciling Terminology of the Universe of Per- and Polyfluoroalkyl Substances: Recommendations and Practical Guidance, OECD Series on Risk Management, No. 61, OECD Publishing, Paris.
[2] OECD Website (2023). "What are PFASS and what are they used for?"

3. Set an adequate transition period for PFAS when an adequate alternative exists

Where equivalent alternatives to PFAS exist and are available on the market at scale, they should be used after **a reasonable transition period**. However, 18 months is not a feasible transition period due to the long-term nature of the investments made in the DHC infrastructure. Many of these projects have an expected lifespan of more than 30 years.

4. Assess derogation needs

Where there is sufficient evidence that there is a lack of technically or economically viable alternatives, derogation should be considered. We recommend a derogation period for the remaining lifetime of existing installations, as long as operators can prove to have strict PFAS leakage monitoring systems in place.

Furthermore, **we recommend exploring the possibility of granting time-unlimited derogations for the utilization of low GWP HFO F-gases for new installations where there are no existing technically and economically feasible alternatives** to PFAS-classified refrigerants. These HFOs are already subject to rigorous regulation under the F-gas regulation.

We support the proposed time-unlimited derogation for heating, ventilation, air conditioning, and refrigeration (HVACR) equipment installed in buildings where national building codes or safety regulations prohibit the use of alternatives. It is important to note that this unlimited time derogation should not only be valid for HVACR equipment in buildings, but also for district heating and cooling centrals placed in urban and industrial complexes. If not, there is a risk that HFO chillers/heat pumps, in for example, office buildings can continue to use PFAS-classified refrigerants, but the larger units placed at, or operated by, the utilities that are classified as industrial applications are forbidden to use the same refrigerant. This will create an uneven playing field in the heating and cooling market, favorizing stand-alone solutions over more societal beneficial solutions such as district heating and cooling.

5. Align the PFAS regulation to the EU's decarbonisation objective

50% of all energy consumed in the EU is used for heating and cooling purposes, with over 75% based on fossil fuels, 43% of this demand is supplied by natural gas. In the residential sector alone, around 80% of final energy consumption is dedicated to space and water heating.

To set the continent on track towards 2050, the Fit for 55 Package establishes a **framework to decarbonise key sectors of the economy and largely deploy renewables and waste heat in heating and cooling**. An immediate and universal ban on the usage of PFAS-classified F-gases in existing installations could lead to a switch away from heat pumps in district heating and cooling networks towards less efficient decentralised solutions, as well as making it harder to use excess heat in opposition to the goals set in European Green Deal, REPowerEU and Green Deal Industrial Plan, as well as the upcoming Heat Pump Action Plan.

It is therefore crucial that the potential PFAS ban, does not create uncertainty for companies that want to contribute to this endeavour by investing in large-scale industrial heat pumps, but who require long horizons to make a return on the investment.

DHC key facts and figures

Currently, there are 17,000 DHC networks in the EU, covering 12% of the heating and cooling market. **70 million EU citizens are supplied by DHC networks,** while 140 million citizens live in cities equipped with DHC. Based on national objectives and estimates from the sector to reach national energy and climate goals of selected countries, **over 5 million additional households are expected to be connected to District Heating by 2030, while this number is expected to grow towards 2040 and 2050**.[3]

DHC has a significantly higher proportion of renewable energy and low-carbon heat sources (43%) compared to the broader European heating and cooling sector (23%)[4]. This mix, currently largely relying on sustainable bioenergy, will further diversify to harness various concrete heat sources, such as geothermal, solar thermal, biogas, waste heat, waste-to-energy, excess electricity from variable sources such as wind and solar used in power-to-heat solutions, small nuclear reactors, or green hydrogen.

Diversification of clean heat supply: the role of large heat pumps on DHC markets

Heat pumps have a significant role in achieving the EU's climate and energy goals: either through individual systems located in buildings or through larger units connected to district heating and cooling networks. They have many advantages and will play an important role in the decarbonisation of heating and cooling towards 2050.

The European Commission recognises that "the use of efficient heat pumps in buildings, industry & local heat networks is key for cutting greenhouse gases and achieving the Green Deal & REPowerEU targets. Heat pumps are key to enabling the clean energy transition and achieving the EU's carbon neutrality goal by 2050." The Green Deal Industrial Plan, in line with the European Green Deal and the REPowerEU plan, sets the **objective to install at least 10 million additional heat pumps by 2027 and a total additional 30 million or more heat pumps by 2030**. To facilitate this, the Commission will introduce a Heat Pump Action Plan in the last quarter of 2023, aimed at expediting heat pump deployment and markets within the EU.

Large heat pumps are instrumental to energy diversification, enabling harvesting of a wide range of clean and local heat sources distributed via DHC systems: geothermal and ambient energy, waste heat from industrial processes, urban excess heat (e.g. from service/residential sectors – supermarkets, underground metro, data centres etc.) or sewage water treatment facilities. They can lift or lower the temperature from an existing low-temperature heat source such as renewable heat (solar thermal and geothermal) or excess heat from industrial processes and tertiary sources, with a minimum amount of electricity.

Waste heat recovery is a vast and untapped source of clean energy, with the potential to provide significant benefits to the EU's energy landscape. With a potential of 2,860 TWh per year, waste heat recovery could almost completely satisfy the EU's total energy demand for heat and hot water in the residential and tertiary sectors[5]. This potential extends beyond

[3] Euroheat & Power, Market Outlook (2023).
[4] DHC energy mix of European countries analysed in Euroheat & Power's 2023 Market Outlook.
[5] Connolly, D., et al. (2013). Heat Roadmap Europe 2: Second Pre-Study for the EU27. Department of Development and Planning, Aalborg University.

industrial processes and could be harnessed from a range of sources, including data centres, metro lines, and supermarkets. Wastewater treatment plants are another key source of waste heat, with a potential of 318 TWh of accessible waste heat annually across the EU.[6] Waste heat from wastewater treatment could via DHC networks supply heating for nearly 30 million EU households annually, on average.

Large heat pumps are **extremely efficient**, they have high COP (coefficient of performance), they enable economies of scale, centrally generating heat that is efficiently distributed to buildings; combined with large thermal storage, e-boilers, and CHP, they can help **reduce the overall electricity demand for heating and cooling** by integrating non-electric heat sources into the mix.

Whenever there is production of renewable power while demand is low, large-scale heat pumps can consume this surplus electricity to provide hot water either for immediate consumption of buildings via the heat grid or for thermal storage for later use (seasonally or as a short-term buffer for peak demand). This **avoids curtailment** of low or negatively priced electricity, supporting instead the decarbonisation of thermal grids and **enabling system integration**.

Large heat pumps are already used within DHC networks and their share in the mix is set to increase across Europe.[7] EHP anticipates a rising **contribution**, in the perspective of a growing and changing sector, namely in relation to harvesting renewable and waste heat. Large heat pumps already represent an important share of the DHC network mixes in Sweden, Finland, Denmark and France and are expected to grow in other countries such as Austria, and Germany. Italy, Czechia, Norway and Estonia also have installed capacity. Based on the investment plans of some of the largest DHC systems in Europe, **this capacity is expected to increase by at least 80% by 2030**.[8]

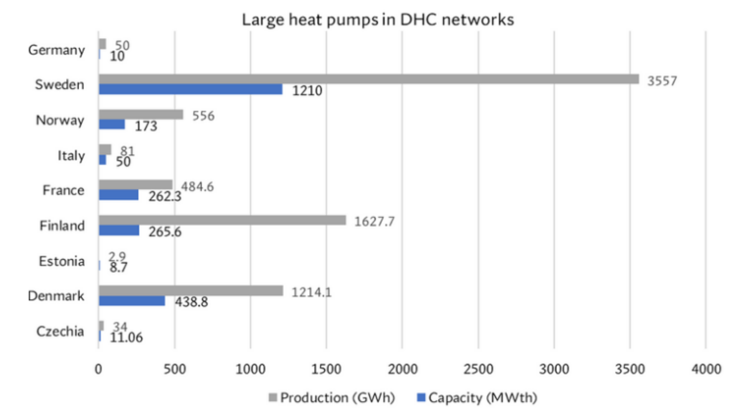

Figure 11: Production and capacity of large heat pumps in DHC systems (2021)

Impact of PFAS blanket ban on large scale heat pumps developments in DHC

F-gases (HFC refrigerants and low global warming potential HFO alternatives) used in e.g. heating, ventilation, air-conditioning and refrigeration, are part of the PFAS restriction proposal as many of these gases fall within the PFAS scope definition.

However, **there are a range of PFAS substances that are not persistent, bioaccumulative and toxic (PBT) or very persistent (vP)**. This includes HFOs which are registered under

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[6] Danfoss (2023): The World's largest untapped energy source: Excess heat.
[7] Euroheat & Power, Market Outlook (2023).
[8] Euroheat and Power (2022): Technology Report on large heat-pumps in District Heating and Cooling systems

REACH and are not considered as PBTs nor equivalent to PBTs. The proposed restriction would ban these products as well as HFCs with lower global warming potential (GWP), hydrofluoroolefins (HFOs), and HFC-HFO blends. It is important to remember that a range of refrigerants is needed for the energy transition.

The remaining options, in particular, natural refrigerants such as ammonia and CO2 are not suitable for all applications. For instance, natural refrigerants are less adequate for higher temperature levels (> 90°C) and do not all work in practice. Many DHC grids, in particular in colder climates (e.g. Nordic and Baltic countries) operate at temperatures above 90°C. Additionally, replacing existing equipment would lead to substantial extra costs to change systems to be able to use other refrigerants, potentially endangering the profitability of district heating companies that operate on low margins and long-term investment decisions.

A recent study published by Agora Energiewende[9] illustrates the lack of alternatives, including the supply of market-ready heat pumps (measured by technology readiness level) that meet both, the existing temperature requirements of the heating networks and the necessary thermal capacity. The study conducted an extensive market analysis of available heat pumps from different suppliers. Almost half of the researched heat pumps achieving a technology readiness level of 9 ("full commercial application") use refrigerants that would be affected by the PFAS ban. **Of the remaining ones, which would not be affected by the PFAS ban, only half are available in the capacity range above 1 MW.** However, not only natural refrigerants are used in these systems. Refrigerant R32, for example, as one of the few synthetic refrigerants that is not affected by PFAS, is used, but has a high GWP value of 675.

Installations could also become less energy and cost-efficient with alternatives that are not fully suited: additional boilers would have to be included to boost the heat temperature supply (e.g. in winter or peaks). It may also result in a shift towards less efficient technologies (e.g electric boilers), slow down the deployment of district cooling and the recovery of waste heat. It could also create market distortion in favour of less beneficial and decentralised heating and cooling solutions. This could jeopardize the progress made over the last decades.

An immediate ban as early as 2025 (with only an 18-month transition period for alternatives) would pose obstacles to the emerging use of district cooling and the rollout of large-scale heat pumps in district heating, negatively affecting the decarbonisation of heating and cooling in the EU. These repercussions stand in contrast to the recent EU goals and objectives set in the Green Deal and subsequent initiatives such as the Fit for 55 Package. The REPowerEU Plan emphasizes frontloading investments in renewables and energy efficiency to decrease fossil fuel imports and aims to double the current deployment rates of heat pumps in buildings and an accelerated deployment of large district heating and cooling network heat pumps.

Another important consideration is that HFC/HFO fluorinated gases (F-Gases) as refrigerants are fully contained and function in closed loop systems. Their emissions are subject to rigorous obligatory containment (on leaks controls, end-of-life collection, and disposal, etc.), under the EU F-Gas legislation. According to Article 1 of the F-Gas Regulation, its key objective is the same as that aimed by the Proposal - reduction of emissions, i.e.: "The

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[9] Agora Energiewende, Fraunhofer IEG (2023): Roll-out von Großwärmepumpen in Deutschland. Strategien für den Markthochlauf in Wärmenetzen und Industrie (Eng: Roll-out of large-scale heat pumps in Germany. Strategies for the market ramp-up in heat grids and industry).

objective of this Regulation is to protect the environment by reducing emissions of fluorinated greenhouse gases". Therefore, uses of HFC/HFO substances are already adequately controlled from the perspective of the main goal of the REACH restriction Proposal therefore a proposed restriction under REACH would be a case of double regulation.

District cooling, principles and benefits

District cooling (DC) functions similarly to district heating. It centrally produces and distributes chilled water for indoor cooling purposes to industrial, commercial and residential buildings through a closed-loop pipe network. DC aggregates the cooling needs of a district or a group of buildings, enabling an economy of scale that drives efficiency, reduces and balances electric loads, and reduces fuel costs. **A district cooling system can reach an efficiency rate typically 5 or even 10 times higher than a traditional air-conditioning system.**

Aggregated cooling loads also enable harnessing free cooling from ocean, river or lakes, and thermal energy storage which reduce costs and environmental impact associated with air conditioning. DC also avoid the heat island effect created by air conditioning units in densely populated areas.

District cooling relies on various technologies, including chillers (absorption or compression), and thermo-frigo pumps (combining heating and cooling) combined with chilled water- or ice-storage. Refrigerants used can be water (free cooling from a river), ammonia, HFCs or blends of synthetic refrigerants. They address different situations, sizes, resources availability, etc.

The emergence of a European cooling market

Existing schemes across Europe are expected to grow to supply existing buildings and accompany new urban developments. Sales of district cooling amounted to 3 TWh with over 150 systems across Europe in 2021. District cooling supplies nearly exclusively buildings from the tertiary sector but offers the capacity to provide integrated solutions for other sectors such as storage sites requiring constant cold temperatures (e.g., food sector).

After a strong growth first in Sweden (early 2000s) followed by Finland (after 2010), district cooling is now growing swiftly in Denmark and Norway. Projects are also recorded in France, Germany and Austria.

New projects are materialising in southern Europe after a lost decade following the financial crisis when all projects were stopped. For instance, in Barcelona, the Ecoenergies network supplying the Zona Franca will start to use the residual cold waste from the regasification of liquid natural gas by Enagás. By November 2023 this new capacity (18 MW) will come in addition to the existing generation assets of the network. This system will be the first district cooling network at the global level to make use of surplus cold from an LNG terminal. This example shows the versatility of district cooling to adapt to local contexts and its ability to valorise energy streams that would be otherwise wasted- or in this case dumped into the sea.

In Sweden, district cooling is expected to reach a 25% market share by 2030 on the basis of investment forecasts by operators. In France, under the new concession contract, the network in Paris should double within the next 20 years. In Austria after strong growth over the last decades – since 2009 cooling sales were multiplied by 7 – developments will continue in many cities. Vienna alone intends to double the network by 2030.