



# Myth-buster: Heating decarbonisation

## Why stalling on the transition to clean heating in the EU will only help fossil fuel companies

Brussels, February 2024

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## **MYTH: “The electricity grid will be incapable of accommodating a massive rollout of heat pumps”**

**FACT: Capacity of the existing power system is already capable of integrating 50 million heat pumps – and more could be unlocked by making electricity demand flexible**



The electricity grid is central to the energy transition. Shifting to electric vehicles and appliances, like heat pumps, means that we will use more electricity than before. Measures to make our energy use more efficient are essential, alongside energy flexibility and energy storage technologies.

The biggest EU [energy companies and trade associations](#) have said that “integrating 50 million heat pumps into the existing power system is possible with existing capacity” without jeopardising grid stability. This is backed up by a recent [study](#) from the Joint Research Council (JRC), which shows that “most national power systems could cope with higher heat-electrification rates”. 12 EU Member States are even prepared already for full electrification scenarios.

Only three countries in the EU have a power system that would be stressed if 60% of all fossil-fuelled technologies were substituted. However, even this challenge is not unsurmountable. Making electricity demand flexible would enable larger shares of heat electrification. According to another [JRC analysis](#), the load shifting potential of heat pumps can be released by activating their smartness, “unlocking the possibility to shift up to 4 to 14 GWh hourly”.

## MYTH: “Technology neutrality should be preserved; we cannot rely only on one technology”

**FACT: There are numerous renewable heating technologies on the market, so consumers would continue to have a lot of choice without boilers that run only on fossil fuels**

Technology neutrality can be applied to renewable heating options, of which there are many. There is no need to consider polluting fossil fuel technologies when there are plenty [different mature and established options](#) – this is illogical and goes against the [Energy Efficiency First principle](#).

The EU could decarbonise the entire building stock using ecodesign regulations, which would allow many different solutions to flourish, such as:

- Geothermal heat pumps
- Hydronic heat pumps
- Air-to-air heat pumps
- Solar thermal
- District heating

And also:

- Thermally driven heat pumps
- Cogeneration units
- Solid fuel heaters
- Hybrid heaters
- All local applications, including gas, oil, and solid fuel-based appliances

Under ecodesign rules, the European Commission does not intend to ban either the installation or the use of fossil fuels. Instead, they are focusing on the installation of new boilers that exclusively run on fossil fuels (100% gas boilers, 100% oil boilers, and 100% coal boilers), in line with the [analyses](#) from the IEA (International Energy Agency) and [JRC recommendations](#), which are calling for an even earlier date.



## MYTH: “Heat pumps only perform well in renovated buildings”

**FACT: Very few households need to be retrofitted in order to install a heat pump –only 15% of properties in the EU need to be upgraded**



Multiple studies have checked the readiness of heat pumps in existing residential households – and only very few households need energy efficiency upgrades for them to function appropriately.

One project, '[Electrification of Heat](#)', highlighted that “energy-efficiency upgrades are not always necessary to install a heat pump. For instance, energy efficiency **upgrades were only made for 15% of properties** where a heat pump was installed – in most cases this was loft insulation”.

A DeltaEE [study](#) showed that for houses in rural areas, “based on average peak winter day temperatures, **around 84% of homes can be electrified at their current level of insulation**. This increases to around 93% if all suitable homes have loft and wall insulation installed”.

The European consumer association, BEUC, has also assessed how much [insulation retrofit](#) existing households need to install a heat pump. Results showed that “depending on the climate zone and the building type, a medium range retrofit may be sufficient to allow the reference heat pump to completely cover heating demand and reduce temperature drops sufficiently to keep buildings comfortable enough”.

In addition to this, an assessment of [existing heating transfer systems](#) (the circuit going from the central heater to the radiators) was undertaken by Fraunhofer ISE. They found that “in many older houses, the heat transfer systems are oversized. As a result, when the heating system is replaced, it is usually possible to lower the flow temperature set in the system and operate the heat pump more efficiently. [...] In many other cases, small renovation steps have already been taken, such as replacing the windows. **This is often sufficient to use a heat pump efficiently**”.

## MYTH: “Heat pumps are bulky and need a lot of space”

**FACT: There are already many small heat pumps on the market – and manufacturers continue to innovate**

Heat pump manufacturers are working to minimise the space occupied by heat pumps – but innovation, which is already picking up, must continue to play a role to take this even further.

Viessmann offers a [compact all-in-one system](#) that is **about the size of a wall cabinet**: only 28cm away from the wall. This serves the purpose of heating, ventilating, and providing sanitary hot water.



Olimpia Splendid has released a heat pump that works as a stand-alone fan coil with [no external unit](#), minimising the unit size in the outer wall of a building.

Another **no external unit appliance** was released by Innova that is [only 16 centimetres](#) in depth and customisable according to the user’s needs.



Olimpia Splendid heat pump that works as a stand-alone fan coil with no external unit

Bosch has also developed an [all-in-one design](#) that can be installed in one go as a chimney-shaped roof-mounted heat pump, powered by natural refrigerants. There is a wide array of rooftop variations being developed – such as the angle, roof covering, accessibility, and height – to help simplify the process of installation and maintenance.

HydroTopWorks (a UK manufacturer), together with Bosch, has launched a roof-mounted heat pump with the outdoor unit that is [only 15cm](#) above the roof, integrated seamlessly into the roof of the house.

## MYTH: “Heat pumps cannot be installed in historical buildings”

FACT: Heat pumps that do not need to be drilled into internal or external walls exist so negative impacts on historical buildings can be avoided



White heating units that require walls to be drilled would pose challenges for many historical buildings for aesthetic reasons, the European Heat Pump Association (EHPA) has made clear that “some heat pump types can be installed [without drilling](#) holes into your walls or floors. They can even be placed on your home’s exterior or garden and be connected to the existing ductwork”.

In 2023, Historic England assessed the installation of [air-sourced heat pumps in historical buildings](#). The outcome was that “the overwhelming impression from the occupant interviews was that **the visual appearance was not an issue**. Given all the case studies were historic buildings, it was assumed that a variety of mitigation measures would have been used to lessen the visual impact of external units. However, only one participant had taken measures to hide the unit behind a fence”.

Additionally the ‘[Electrification of Heat](#)’ project outcomes also mention that “from Victorian mid-terraces to pre-WWII semis and a 1960s block of flats – the project has proven that heat pumps can be successfully installed in homes from every style and era”. **The age of the building does not affect the performance of the heat pump**. Even in pre-1919 buildings, heat pumps are performing quite well, with a performance range that is average to high (Coefficient of Performance between 2.7 and 3.3).

## MYTH: “Heat pumps work well only at low flow temperature or only if you change piping systems”

**FACT: Most pipes are already large enough to facilitate heat pumps – in many instances only the least efficient radiators would need to be changed. High temperature heat pumps, which are suitable for many applications, are also available on the market.**

The efficiency of heat pumps is often associated with flow temperature, but the maximum heat output that can be transported through pipes depends on both the diameter of the pipes and the flow and return temperatures. In many cases, heating pipes inside buildings and district heating pipes in streets are oversized.



As found in the study “Towards low flow temperatures”, by Ifeu-RAP, the diameters of a significant percentage of district heating pipes are larger than necessary. This means that heat pumps can work efficiently at higher flow temperatures if the piping system is appropriately designed and optimised.

It is not always necessary to change piping systems to fit a heat pump. In many instances, **replacing only the radiators**, especially the least efficient ones, **can be an effective strategy to achieve lower flow temperatures**. This method allows homeowners to embrace heat pump technology without incurring the cost and disruption of a complete piping system replacement.

The notion that heat pumps are limited to low flow temperatures is also challenged by the existence of **high-temperature heat pumps**. These advanced systems can operate at temperatures between 60-80°C, which is in the same range as fossil fuel boilers. This flexibility makes heat pumps suitable for a wide range of heating applications.

Finally, as the European Heat Pump Association (EHPA) has stated: “heat pumps can work with various heating systems, including underfloor heating, radiators, and convectors of all sizes”. This versatility means that homeowners have the option to integrate heat pumps into their existing heating systems without the need for major modifications or system changes.



## MYTH: “Gas will be decarbonised by hydrogen and renewable fuels”

**FACT: More than 99% of hydrogen is produced using fossil fuels. It is also more explosive and can only be blended up to 20% for use in existing gas boilers, locking in up to 80% fossil gas.**

Low-carbon gas may pose a significant climate risk, according to the [International Council on Clean Transportation \(ICCT\)](#). Hydrogen produced using fossil gas combined with carbon capture and storage (CCS) can have a greenhouse gas (GHG) intensity as high as fossil gas itself. Only a tiny fraction of hydrogen, approximately **0.04%**, is currently produced using clean electricity. The vast majority **is still generated using fossil fuels.**



Shifting to hydrogen combustion in homes can also pose significant safety and technical challenges. This includes risks related to NO<sub>x</sub> and CO emissions, material vulnerabilities, and a higher potential for explosions. [Physicians' groups](#) have raised concerns about the use of hydrogen and natural gas blends in heating, citing a heightened risk of deadly explosions and exacerbation of health hazards like asthma and dementia.

Hydrogen also cannot be blended with fossil gas to more than a 20% share - commonly agreed as the maximum blend for safe and technically feasible use in most existing gas boilers. So, blending hydrogen into the gas network could **potentially lock consumers into using at least 80% fossil gas**, which will not help with decarbonisation.

According to the [International Renewable Energy Agency \(IRENA\)](#), **hydrogen has the lowest priority in residential heating** due to the availability of other mature electrification solutions, such as heat pumps. The [Agora Energiewende report \(figure 20\)](#) also shows that converting electricity into hydrogen via electrolysis and then burning it in a boiler is **one of the least energy efficient ways to heat a house.**

As well as being neither feasible nor safe, hydrogen is also not the cheapest option. The [European Consumer Organization \(BEUC\)](#) has highlighted that hydrogen boilers and hybrid heat pumps (hydrogen/electric) are among the most expensive options for consumers, with hydrogen expected to be significantly more costly than natural gas.

Finally, a [report](#) from the European Commission's Joint Research Centre (JRC) indicates that by 2030, there will be no significant uptake of hydrogen in the buildings sector.

## MYTH: “Heat pumps perform badly in cold climates”

**FACT: Heat pumps are very efficient in even the coldest weather – many of the coldest countries in the EU contain a high share of households with heat pumps**

Countries with some of the coldest winters in Europe, such as Norway, Sweden, Finland, and Estonia, have a **significant share** of households using heat pumps. Heat pumps **can perform very efficiently in even the most severe weather**. In fact, at  $-7^{\circ}\text{C}$ , they have more than double the efficiency of a gas boiler.

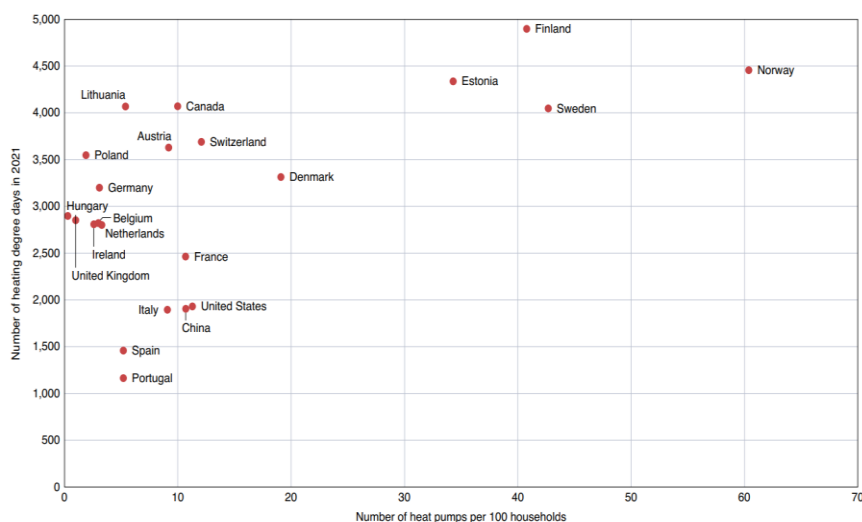


Real-life user experience attests to the effectiveness of heat pumps in cold climates. The [Boston Globe](#) reported that homes stayed comfortably warm with an heat pump, even as temperatures outside dropped to  $-8^{\circ}\text{F}$  (approx.  $-22^{\circ}\text{C}$ ). A survey they conducted on social media about the performance of heat pumps also found that the majority of heat pump users had warm living spaces during extremely cold conditions.

Heat pumps are designed to function at a range of temperatures. According to [The New York Times](#), many **heat pump models can operate close to normal in temperatures down to  $-24^{\circ}\text{C}$  ( $-11.2^{\circ}\text{F}$ )**.

The [Energy Saving Trust](#) notes that air-sourced heat pumps typically work within a temperature range of  $-5^{\circ}\text{C}$  to  $25^{\circ}\text{C}$  for most of the year. Even on the coldest days, which are relatively rare, supplementary systems or **better insulation can be used to maintain heating efficiency**.

**Ground-source heat pumps (GSHPs)** are particularly efficient (Coefficient of Performance exceeding 3 and, in some cases, nearly reaching 4) – even in outdoor temperatures as low as  $-20^{\circ}\text{C}$ . This makes them a reliable option in extreme cold.



Heat pump systems are designed to adjust their performance based on individual needs and conditions. This adaptability makes them efficient in varying climates. In regions with extremely low temperatures, such as areas where temperatures can plummet to  $-40^{\circ}\text{F}$ , geothermal heat pumps **demonstrate exceptional performance**. These

systems can achieve a high Coefficient of Performance 4.29, ensuring comfort even in the harshest cold.

## MYTH: “Heat pumps are noisy”

**FACT: EU rules on heat pumps also focus on noise pollution, so new products installed today are considerably quieter than in the past**



In the evolving landscape of EU environmental regulations, ecodesign is taking centre stage. These rules also cover noise measurement with a clear goal: to reduce noise emissions from products, including heat pumps. As a result, the products that find their way into our homes are now **considerably quieter** than they were in the past.

Thanks to feedback from people who have incorporated heat pumps into their daily lives, it's also evident that noise might not be the thorny issue we imagined it to be. **Around 75% of heat pump users express satisfaction with the noise levels**, with a **peak of 91%**, suggesting that for a significant portion of users, noise is not a pressing concern.

The Guardian surveyed more than 2,500 heat pump users, with a similar outcome: , **more than 80%** express their contentment with the noise generated during operations. This is a reassuring statistic highlighting that for the vast majority, noise is far from being a disruptive factor.

Modern heat pumps come equipped with outdoor units that typically carry a sound rating of approx. 60 dB. To put that in perspective, it's akin to the sound of a moderate rainfall or a normal conversation. The indoor components of these systems, where we often spend most of our time, **maintain a considerably quieter operation**, with sound levels ranging **from 18 to 30 dB** – roughly the equivalent of a hushed whisper.

The EU is pushing for quieter products using ecodesign rules, but the heart of the matter lies in the perspective of the users – which data proves is encouraging. Most heat pump users are content with noise levels, with ongoing initiatives to make these systems even more user-friendly.

## MYTH: “Heat pumps cannot be massively rolled out with natural refrigerants”

**FACT: Heat pumps that use natural refrigerants instead of climate-damaging gases have already arrived and are being rolled out now – including by some of the largest companies**

The limitations of current refrigerants (such as fluorinated gases) on the market and their global warming potential is [well known](#). As stated by sustainability consultant [ATMOsphere](#): “Small and medium companies are leapfrogging to natural refrigerants in heat pumps to avoid continuous refrigerant changes, and market leaders are converting their sales



portfolio to fully natural by 2027. Companies specialised in other heating applications are also crowding into the heat pump space, seeing the market opportunity in providing systems with natural refrigerants.”

**The shift to natural refrigerants is already in motion.** The industry is actively installing heating systems in European homes that utilise lower-GWP refrigerants, such as R-290, HFC-32, and HFO-513. These refrigerants, designed to have a reduced environmental impact, are gaining traction in the market.



One significant development is the adoption of [R-290 in heat pumps](#). Since 2017, European manufacturers like Alpha Innotec, Glen Dimplex, Heliotherm, NIBE, and others have introduced heat pumps using this refrigerant.

This industry-wide shift toward natural refrigerants is further evidenced by **over 50 European companies** that have included heat pumps with natural refrigerants in their portfolios. Even giants like [Panasonic](#) have entered the arena, unveiling a range of propane heat pumps. These innovative products are expected to open new opportunities for low-carbon, commercial-scale heating and cooling solutions. This indicates a promising future for sustainable and environmentally friendly heating technologies.

Addressing concerns about cost-effectiveness, a comparative analysis by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) dispels the [myth of increased costs associated with natural refrigerants](#) in heat pumps. The study found that the cost difference between using HFC-410A and natural refrigerants like R-290 or R-1270 in domestic heat pumps is negligible - **a matter of only a few euros**. For heat pumps located outdoors, there is no discernible cost difference.

## MYTH: “Heat pump installation in multistorey buildings is hard or unfeasible if the secondary circuit is lengthy”

**FACT: Technology is meeting this challenge, with many innovative and proven solutions now on the market**



The prospect of installing heat pumps in multistorey buildings is subject to scepticism due to concerns about the complexity of lengthy secondary circuits. However, innovative solutions and real-world examples are dispelling these misconceptions and paving the way for more sustainable heating systems in urban environments.

One solution is the [implementation of a thermonet](#). In this approach, cold brine is transported instead of hot water, mitigating heat losses in the distribution system. This concept has its roots in district heating systems, where efficiency is paramount. The [COOLGEOHEAT project](#) has been instrumental in showcasing the viability of thermonets, proving that heat losses are not insurmountable.

**Hydronic balance is another practice that helps to maintain an optimal flow distribution** within the secondary circuit. The flexibility of this method allows for various configurations that are [tailored to the specific requirements](#) of the heating system. Often, it is not a significant issue for the secondary circuit.

In densely populated urban areas, **district heating systems are emerging** as a feasible way to decarbonise heating systems. The [city of Prague](#) is a prime example, where district heating is playing a significant role in reducing carbon emissions from heating.

[E.ON's ectogrid™](#) solution has the potential to achieve zero emissions for heating and cooling on a large scale by using a low-temperature grid to maximise the use of excess energy via heat pumps.

The success of heat pump installations in multistorey buildings is not just theoretical, it is tangible: [Kensa Contracting](#) is actively involved in a project that involves installing ground source heat pumps in 183 flats across three high-rise tower blocks in Blackburn, UK. This initiative aims to reduce carbon emissions and household heating costs while demonstrating the space-saving potential of medium-

depth systems. In recognition of its achievements, the project was awarded the title of 'District Heating Project of the Year' in 2022.

The [IEA](#) has found that heat pump systems are not only possible but already actively employed in apartment buildings across various countries. **These systems have real-world success stories**, demonstrating their effectiveness in diverse building types.

The European Heat Pump Association (EHPA) [stresses](#): "In terms of apartment buildings specifically, it is crucial to improve awareness that heat pumps work for all application and building types, including high rises". They give many compelling examples, including:

- Decarbonising residential areas in France
- Revitalising a mixed-use complex in Italy without outdoor units via water-source heat pumps
- Renovating poorly conditioned buildings with air-to-water heat pumps
- 186 flats with 3 high-rise blocks decarbonised with ground source heat pumps and renovation
- 118 apartments with hybrids units installed (90% heat pumps, 10% gas)

Finally, the [Sunamp/Kensa](#) partnership in the UK has achieved a remarkable feat by eliminating the need for gas supply in an occupied high-rise building for the first time, all with minimal disruption. This innovative solution not only reduces carbon emissions but also sets an exciting precedent for sustainable heating in multistorey buildings.

## MYTH: “Heat pumps are expensive”

**FACT: Heat pumps are one of the most affordable options for consumers in the long-term, and with huge investments announced, upfront costs will continue to fall**



The perception that heat pumps are too expensive is prevalent across the EU. However, closer examination reveals a different story – one in which heat pumps are actually one of [the most affordable options for consumers](#).

The long-term financial benefits of heating electrification are compelling. Shifting to electric heating can lead to more affordable energy bills for consumers, with potential [savings of up to 860€ per dwelling annually](#).

The total cost of owning and operating heat pumps compared to traditional gas boilers is significantly lower, with [reductions ranging from 31% to 35%](#). The payback time for heat pumps is expected to decrease by 60-70% between 2022 and 2050, making the transition to heat pumps a sound investment. However, it's not just policy and investments that support affordability. Projections also indicate a drop in electricity prices from 0.25€/kWh to 0.17€/kWh (a 32% reduction) by 2026, with stability expected until 2030.

The upfront costs of heat pumps are [forecasted to decline by 40%](#) over a ten-year period, largely driven by increased market competition. With the right political support, heat pumps could be even less expensive. [Taxes and levies for heating bills](#) are currently heavily misaligned with climate goals, leading to fossil fuels being undertaxed and electricity overtaxed for running costs of appliances.

European manufacturers are responding to the evolving policy landscape and increasing demand from end-users by investing heavily in manufacturing capacity and logistics. [Investment announced for the next three years](#) amounts to nearly 5 billion euros. This is **expected to create an economy of scale for heat pumps**, reducing upfront costs for consumers, which remain the main obstacle.

There is a significant opportunity to make heat pumps even more financially attractive **by redirecting existing fossil subsidies to heat pumps**. These subsidies do not comply with the EU's energy labelling framework ([article 7\(2\), EU2017/1369](#)) and are potentially subject to legal challenges.

In the EU and the UK, if all fossil fuel subsidies were reallocated, it would be possible to make heat pumps financially appealing [to an additional 600,000 households](#). This redirection of funds could help to offset the investment costs associated with heat pumps.

If we factor in costs associated with medical treatment for conditions caused by indoor air pollution from fossil fuel boilers, a **significant health dimension also comes into play**. The European Public Health Alliance (EPHA) stated: “European citizens are spending 90% of their time indoors and fossil fuel heating [systems] are heavily polluting the indoor air in our homes. Together with cooking appliances, having indoor fossil fuel combustion is leading to €29 billion health costs in EU and UK, if we consider only gas, it is around 3,5 billion €. Nitrogen Dioxide and Particulate Matters (PM) exposures contribute to mortality, asthma, and diseases. 300,000 premature deaths in the EU were attributed to chronic exposure to PM2.5 only”.

Reliance on electricity generated by fossil gas has led to health costs [amounting to](#) up to 8.7 billion euros in 2019 in the EU and the UK, with Italy, Germany, the UK, France, the Netherlands, and Spain facing the most significant health burdens.

[Another analysis](#) by Regulatory Assistance Project (RAP) conducted in 2022 shows that households can save up to 27% on their heating bills by using efficient heat pumps compared to gas boilers. With an efficient heat pump, the cost can be reduced to as low as 830€ per year, resulting in substantial annual savings.

Lastly, the concept of 'Heat as a Service' business models, in which end-users don't pay for the installation of a heat pump, can significantly mitigate barriers related to heat pump retrofitting, including the upfront cost. Such models reduce end-user risk and enable smoother adoption of heat pumps, [examples](#) are already emerging in the EU. Another measure currently under evaluation are **ad-hoc heat pump tariffs**, which are especially beneficial in countries where electricity is overpriced compared to gas, leading to a [reduction in running costs by 50%](#).



## MYTH: “There are currently skills gaps in the sector”

**FACT: While there are some skills gaps in the deployment of renewable technologies, we are well set-up for maintenance – heat pumps require less maintaining than gas boilers**

While this is partly true, it is not the whole story. On-site workers are currently lacking to deploy renewable technologies at the pace needed to meet energy and climate targets. However, **maintenance of heat pumps is less time-consuming than that of gas boilers**. Gas boilers require an annual service to operate safely and efficiently, while heat pumps only require approx. [one single service every three to five years](#). Reskilling current installers from boilers to heat pumps will be the way forward, as well as vocational trainings for new green workforce.



Efforts are being made by the EU to close the skills gap in a dedicated [Heat Pump Action Plan](#), in cooperation with experts, operators trade organisations, and other stakeholders. This is due in 2024.

## MYTH: “There are raw material disruptions in the supply chain”

**FACT: Heat pumps require copper and nickel to be produced, which is far less than what is required to produce other renewable technologies**



The European Commission is working on [Critical Raw Materials](#) by “*upping its game in terms of extracting, refining, recycling and diversifying to ensure secure and sustainable access to critical raw materials*”. Only the critical raw materials **copper and nickel are needed to produce heat pumps**. This is less of a challenge than other clean technologies, such as low-emission hydrogen, as the [IEA](#) has made clear. Nonetheless, advocates for clean heating

are [calling for](#) EU ecodesign and energy labelling rules that also focus on material efficiency and circularity.

The European Commission’s Joint Research Centre highlights some considerations regarding [materials availability](#): “Heat pumps do not have specific materials exposures but are vulnerable to volatility in metals prices, the global shortage of semiconductors and the import dependency on permanent magnets”.



### **Environmental Coalition on Standards**

c/o WeWork  
Rue du Commerce 31  
1000 Brussels, Belgium  
+32 2 89 97 680  
[ecostandard.org](http://ecostandard.org)



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