

*Are heat pumps at the inflexion point on a hockey stick-shaped growth curve?*

An LCP Delta whitepaper  
Heat Research Team

July 2023

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Date of issue: 18 July 2023

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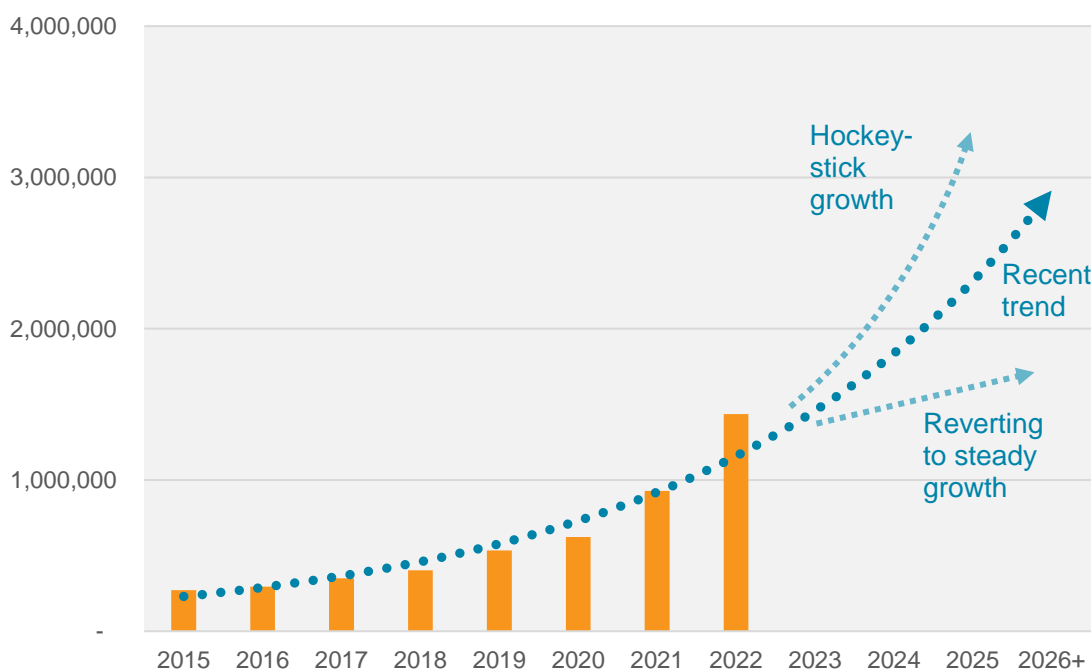
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# Are heat pumps at the inflexion point on a hockey stick-shaped growth curve?

## Three key challenges to overcome for heat pump growth to turn into a hockey stick-shaped curve.

Sales of residential hydronic heat pumps (HPs) grew by 52% per year over the last two years across Europe's top 10 markets – far greater than the 18% growth rate over previous years. These figures include all key 'flavours' of the technology: electric vapour compression, hybrid, and thermally-driven – but of course are dominated by the most mature, fully-electric products.

Policy and regulations across many countries are becoming increasingly supportive of the HP market, which provides an attractive backdrop for sustained growth, but will it be enough to meet the transformative targets many have set for future HP deployment?



**Figure 1: Trend of hydronic HP sales in Europe's top 10 markets (based on 2022 figures<sup>1</sup>), 2015-2022**

Source: *Electrification of Heat Service research, LCP Delta*

<sup>1</sup> Top 10 markets: France, Italy, Germany, Poland, Netherlands, Spain, Czechia, UK, Austria, and Sweden. Data as reported by national heat pump organisations / associations.

In this whitepaper we draw on our research to ask ‘**will the sector be able to capitalise on this recent success, and follow an exponential, hockey stick-shaped growth curve in the next years**’? We discuss three key challenges for the sector to rise up to for this to happen.<sup>2</sup>

Our analysis leads us to the view that the **strong sales momentum** generated by growing heat pump sales in recent years **will continue overall through to 2030**. But only if the industry delivers on the three major challenges it faces currently will it be in with a shot of seeing truly exponential growth from the 2015 base year.

- **Challenge #1: Expanding market segments:** continued success in the retrofit, off-gas market – coupled with building in the tougher retrofit, on-gas market. Over a third of the heat pump sales in recent years have been to the easier-to-access new-build market. This market segment will continue to grow – but can only take the industry so far, and will only make a small impact on the challenge to decarbonise Europe’s homes.
- **Challenge #2: Entrepreneurialism:** in heat pump propositions, channels and market creation. In many countries heat pumps have followed traditional heating routes to market, through distribution and installers. Our research finds that a new wave of innovation in propositions and business models is emerging – from energy retailers, new entrants, multi-energy solution providers, installers, and more. This entrepreneurialism will unlock new customer segments and power further growth.
- **Challenge #3: Supply chain capacity:** The industry needs to – and largely is – responding to three main supply chain challenges: (a) developing more (European) manufacturing capacity; (b) managing the supply chain challenges of changes to new refrigerants, which are at the heart of how heat pumps work; and (c) the biggest challenge (in some markets) of training sufficient numbers of installers and guaranteeing quality for end-users.

### Hydronic heat pumps sales have been booming

Sales more than doubled between 2020 and 2022, driven by a potent combination of incentives and regulations. The current energy price crisis has been an additional spur as spark spreads narrowed in many countries. Impressive though this growth is, heating heat pumps have only penetrated about 5-6% of the total market for hydronic (water-based) heating across Europe. The untapped market is enormous.

The first half of 2023 has seen mixed fortunes for HP sales growth across Europe as key policies have changed / ended / become uncertain, and as broader macroeconomic forces heap further pressures on consumer spending.

Governments are typically pulling a number of levers to drive these markets forward. These are taking a number of different forms:

- **Grants and tax breaks** towards the upfront cost of installing a heat pump.
- **Regulations setting minimum performance standards** for buildings and heating systems – today mostly in new-builds rather than existing homes.

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<sup>2</sup> Note that electrically-driven hydronic heat pumps are not a silver bullet to decarbonising heat. Other high-efficiency solutions include thermally-driven heat pumps and air-to-air heat pumps (for example in highly efficient new build homes). In some markets, boilers using decarbonised gases like biomethane and hydrogen, and even renewable liquid fuels, are already playing a role and will provide alternatives to heat decarbonisation via electricity. Also note that this paper does not cover all of the growth challenges for hydronic heat pumps.

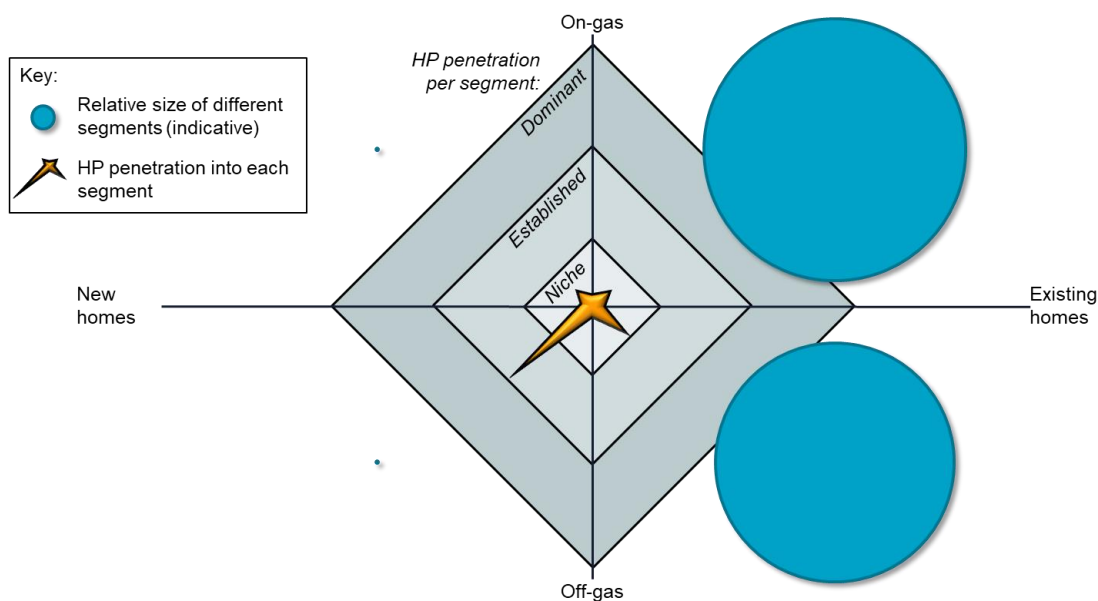
- **Shifting energy taxes**, for example from electricity to natural gas, to improve HP running costs.
- **Supporting upskilling** of heating installers and the supply chain.

Our *European Heating Markets Regulations and Incentives Database* shows steady growth in the number, type and strength of these levers across Europe's major heating markets.

Looking forwards, the current focus of policy discussion is to increase the 'minimum performance standards' for heating retrofits. This would see a legal restriction on the installation of replacement heaters in existing buildings which have a seasonal heating efficiency of less than 100%. It is early days, with much detail still to be considered, but proposals of this kind are currently being explored by the European Commission, and in countries including the Netherlands, France and the UK. Germany is moving forward with a similar policy, although with a different focus on a minimum renewable energy share rather than efficiency.

### Challenge #1: Will heat pumps be able to expand into new segments?

Homes across Europe are hugely diverse. Heat pumps sales have, so far, focussed on some particular subsets of these homes – primarily the new build and off-gas single-family home retrofit segments. The graphic below shows how heat pumps initially focussed on specific, smaller parts of the market – but have moved, and are now moving, into the high volume segments. Our research and analysis demonstrates that this journey should successfully continue – driven by product innovation and incentives and regulations.



**Figure 2: Mapping heat pump penetration across the key markets and housing segments.** There are ~116M homes heated with a natural gas boiler, versus ~106M homes with heating which is not piped natural gas<sup>3</sup>. Compared to both these segments, the number of new build homes constructed every year is very small, at around 2M completed units annually.

<sup>3</sup> On-gas includes individual and collective central heating boilers, and hybrids, fuelled by natural gas. Off-gas segment is composed of: fully-electric heating (room heaters and HPs), other fossil fuel boilers, and wood/biomass boilers. Neither of these groups includes homes connected to a heat network, or homes mainly heated with stoves.

Source: LCP Delta European 'E-Heat Map' Database

New homes (the left hand side of the chart) comprised around one third of heat pump sales in 2022. Building regulations in an ever-increasing number of countries (such as France, Italy, and Poland) make them the technology of choice for this sector. EU-wide, the ratio of new homes built without heat pumps to those built with heat pumps installed is ~5:1. Two thirds of sales are thus going to existing homes, so heat pumps are already breaking into this enormous market (with an installed base of 7.5 million heating HPs already), but with the equivalent ratio of existing homes without / with HP installations sitting at a massive ~213:1, the heat pump industry sector is only scratching the surface of this sector.

The on-gas segment of existing homes is enormous; around 116 million (M) European homes are heated by gas boilers. To date, heat pumps have not gained much traction in this part of the market as they have struggled to compete with the upfront and running cost of boilers, and installation challenges can add complexity and cost. That is starting to change in some countries, driven mainly by financial incentives and the re-distribution of energy taxes between electricity and gas prices. New regulations for minimum heating appliances could catapult heat pumps further into this sector (in particular hybrid heat pumps), although this has shown to be a highly contentious issue like in the recent case of Germany. The industry is also driving product innovation to better fit heat pumps to this sector – such as smaller appliance footprints, higher output products, as well as more aesthetically pleasing casings.

There is still plenty of room for growth in off-gas homes too (the bottom right part of the above chart). This sector has >42M homes being heated by central heating boilers (fossil fuels and biomass), and still >50M homes using resistive electric heating. Heat pumps have demonstrated they can successfully displace these oil, LPG and electric boilers in many countries, and will continue to do so – driven by incentives such as the MaPrimeRénov programme in France, ISDE in the Netherlands, and Poland's Clean Air Programme.

Mult-family homes (which cover all the segments on the chart) make up almost 40% of European homes. Installation of heat pumps in this sector can be more complex but the industry has stepped up in recent years with specific products and packages designed for this sector, with a resultant increase in sales.

## **Challenge #2: Is there sufficient entrepreneurialism to drive innovative propositions and business models to reach new parts of the market?**

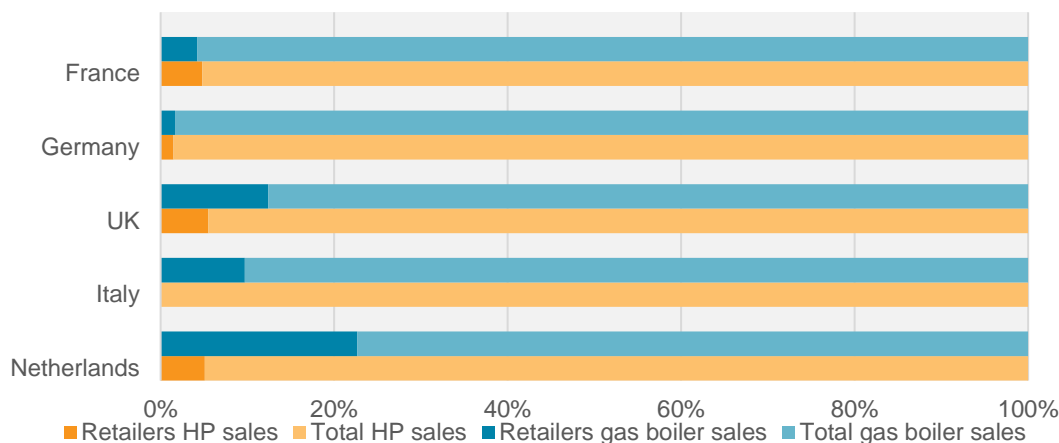
Heat pumps have largely been sold through installers and specifiers – with these channels accounting for over 90% of sales in most markets. To fully capture the opportunity in new parts of the market our opinion is that the industry (manufacturers, energy retailers, service providers) will need to continue to push forward new propositions and business models that engage customers in new, innovative ways and enable smooth journeys and great experiences for customers to decarbonise their heating and their homes.

There is plenty of evidence that this is already emerging in many markets, via:

- **Channels** – increasing engagement from energy retailers (from a low base)
- **Propositions** – such as bundling low carbon energy solutions, non-CAPEX offers
- **Finance** – not all customers will be able to afford the upfront cost
- **Flexibility** – creating additional value from providing flexibility to the energy system

Energy retailers in particular are broadening their scope of services, with many investing heavily in recent times to grow business lines offering HVAC solutions and even comprehensive home energy solutions to their customers. Some are swiftly acquiring necessary capabilities, such as

a network of installers, and establishing partnerships with finance providers and HVAC manufacturers. Some are even buying heat pump manufacturers outright or closely collaborating with them to design models for specific applications. In our view these end-to-end solutions will help heat pumps access new customer groups. But energy retailers are – largely – still at the very beginning of their heat pump sales journey, as shown below.

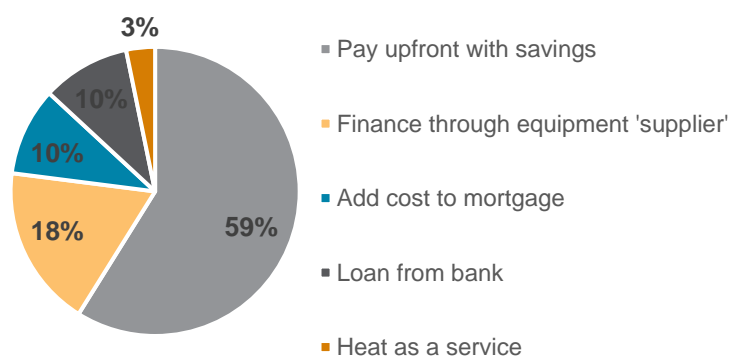


**Figure 3: Heating appliance sales from energy retailers in select EU markets, 2022.**

*Source: Heating Business Service research, LCP Delta*

A key step to increasing market shares will be developing a range of attractive customer propositions, which will enable providers to reach a range of customer groups including those who are unable, or unwilling, to pay the higher upfront cost of a heat pump installation. From basic consumer finance, to rentals, to full 'as-a-service' solutions, all will be needed. In Germany alone we have seen 3 propositions emerge from key players in the market, and in 2022 heat pump rentals accounted for 4% of total heat pump sales there.

We are also seeing growing interest from banks and infrastructure funds to provide finance – ranging from cashback for mortgage customers that fit a heat pump or PV panels, to fully-financed service-based offerings. Our research shows that there are sizeable customer segments interested in financed heat pump solutions, as illustrated by the graphic below. It is likely these segments will grow, as more financed propositions come to market and market awareness of these offerings in turn grows.



**Figure 4: Homeowners preferences for funding a new heat pump installation.**

Results from European householders 'considering buying a heat pump as their next heating appliance'

Source: Heating Business Service research, LCP Delta

### Challenge #3: Is there sufficient capacity in the supply chain?

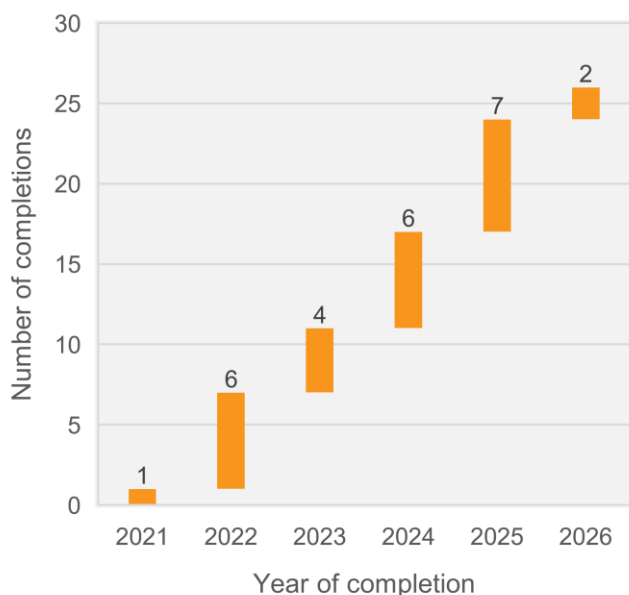
There are three presiding supply chain challenges the industry must overcome.

- Adding new **manufacturing capacity**
- Training the new generation of heating **installers**
- Managing the change from high- to **low-GWP refrigerants**

Through the energy crisis the combination of these factors has resulted in some long waiting times for homeowners from initial interest to installation – up to a year in some of the fastest growing markets (such as Germany and the Netherlands) and at least 3-4 months elsewhere.

Building capacity in supply chains is hard to achieve quickly. Some of the challenges will be relatively short lived – for example manufacturing capacity challenges should be overcome in the next 2-3 years. The hardest challenge will be the availability of adequately certified installers – which in some markets will likely be a constraint on future growth. The impact of the change to low-GWP refrigerants is also unclear with discussions between the European Commission and industry ongoing.

**New manufacturing capacity:** Heat pump manufacturers (and their supply chains) are a mix of European and global companies. The pandemic and associated supply-chain crunches that affected many industries also affected the heating sector, including heat pumps. The outcome has been an acceleration of the production of heat pumps and their key components within the European territory.



The sector overall has announced investments in new capacity totalling more than €2.3 billion in the last two years, with more to come. Most new production should be commissioned through 2024-26.

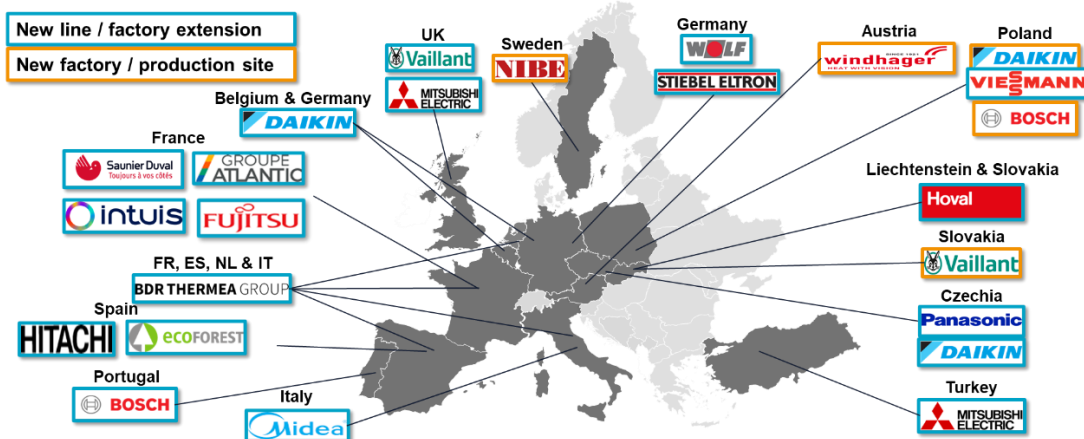
This is driven by internal company strategies as well as European and national drives to enhance their own manufacturing bases – for example the UK government is running an 'accelerator' competition with £30M (€35M) to support manufacturers in making more heat pumps and key components in Britain.

Figure 5: Count and timeline of heat pump factory project completions 2021-26

Source: Electrification of Heat Service research, LCP Delta



Looking at these projects on the map, we see that so far the expansion of HP production capacity has been announced for 14 countries in the European region.



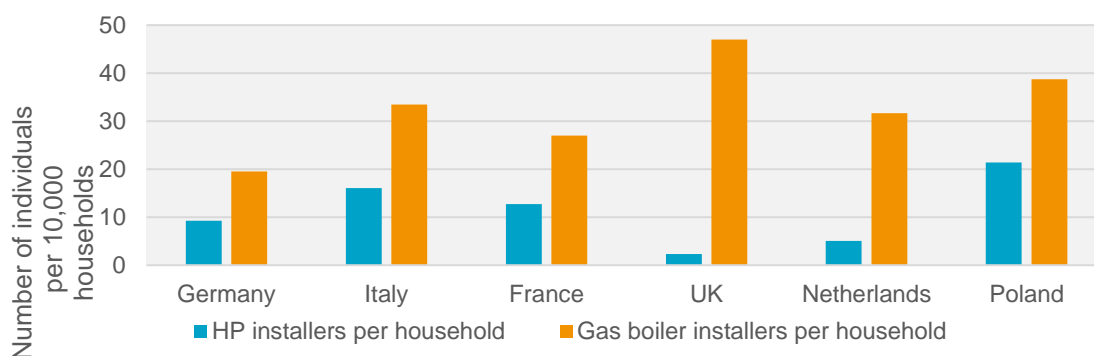
**Figure 6: Mapping recently announced HP production additions / expansions across Europe, by brand**

Source: *Electrification of Heat Service research, LCP Delta*

**Installers:** the challenge of installer capacity varies significantly across different countries. In Germany, for example, the number of installers needs to double to meet the Government-set target of 500,000 new heat pump installations in 2024. Similarly, the UK needs to increase its installer workforce sevenfold to meet a target of 600,000 installs by 2028. While countries like Spain, Italy and Poland do not currently face a shortage of installers with heat pump qualifications, the situation could change as heat pump sales accelerate. All the while, maintaining a consistent quality of installations will be an ongoing challenge.

Installer shortages are not easy to overcome: an aging current base of heating installers, lack of training and complex certification schemes, uncertainty about future refrigerants usage, and the multidisciplinary nature of heat pump installations are all contributing to this shortage.

As with any complex problem, solutions from all fronts are needed. Industry and governments need to, and in many countries are working hard together to address the challenge. Some is specific to heat pumps, but the wider energy sector needs to transform how it provides personalised advice, insights and recommendations to households. And innovations, for example creating marketplaces that seamlessly connect manufacturers, installers, and customers are emerging in several countries.



**Figure 7: Number of qualified heating installers per 10,000 households across selected countries through Europe**

*Source: Heating Business Service research, LCP Delta*

**Heat pump refrigerants:** At the same time as scaling up appliance production, the industry is also working on the introduction of new refrigerants (the fluid at the heart of the heat pump cycle) as it accelerates its transition towards lower-GWP (global warming potential) and less polluting refrigerants.

The awaited revision of the pivotal F-gas regulation will likely enforce further reductions in HFC quotas and bans for equipment using high-GWP refrigerants. This will make natural refrigerants the preferred choice, especially with potential restrictions on PFAS under REACH regulations<sup>4</sup>. While some European manufacturers are established in using natural refrigerants like propane (R290), other European and Asian players are at an earlier stage of their development. Propane's low GWP makes it a future-proof option, although its flammability poses installation challenges (classified A3 for “low toxicity” and “high flammability”), leaving opportunities for other / new low-GWP refrigerants or heat pumps technologies operating without refrigerant. We are closely following the development of thermoacoustic heat pumps and photovoltaic-thermal products too.

Players already experienced with different refrigerants have a competitive advantage, but there are concerns about the industry's ability to rapidly develop and commercialise suitable technologies to meet heat pump installation ambitions set by the European Union.

### **Conclusion – strong growth trend to continue; hockey stick shaped growth possible**

Either way, we are at an inflexion point in European heat pump growth. In our opinion, it will take further sustained effort for the sector, coupled with supportive policy developments, to truly capitalise on the vast remaining market potential by the end of this decade. Based on progress to date, we expect heat pumps to follow the ‘recent trend’ of strong growth. But we think that ‘hockey-stick growth’ is eminently possible should the industry and policy makers step right up to the three challenges laid out in this White Paper.

LCP Delta's ongoing research into the European heating and heat pump markets demonstrates that the industry, governments, and the wider energy sector are indeed stepping up to these challenges. But as it often is, the devil is in the detail and in the implementation and action. There is plenty of detail to get right in decarbonising heating markets – from propositions to regulations, product innovation to customer preferences, and finance to commercial strategies.

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<sup>4</sup> The details of the proposed restriction of per- and polyfluoroalkyl substances (PFASs) or ‘Forever Chemicals’ under the European Registration, Evaluation, Authorisation and Restriction of Chemicals regulation (REACH - Regulation (EC) No 1907/2006) are available since early 2023.

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