

IMPULSE

Boosting the clean heat market

A policy for guiding the transition of the
EU heating industry

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Boosting the clean heat market. A policy for guiding the transition of the EU heating industry.

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Preface

Dear reader,

The heating transition is vital to Europe's energy transformation, offering benefits beyond emissions reduction – strengthening the European heating industry, enhancing energy security, and lowering household energy bills.

However, Europe's heating transition is off track. With heating systems lasting 15–20 years, the continued market dominance of fossil fuel boilers is locking Europe into fossil fuel dependency, making the buildings sector a major challenge to achieving EU energy and climate targets for 2030 and 2040.

To accelerate the transition, a new industrial strategy is essential. The current policy framework fails to scale clean heating supply and demand, risking

Europe's leadership in this critical sector and the long-term competitiveness of its heating industry.

Inspired by the UK's Clean Heat Market Mechanism and work done by the Regulatory Assistance Project on Clean Heat Standards, Agora Energiewende has explored the feasibility of an EU market-based instrument for heating appliances. Our findings suggest that an EU Clean Heat Market Instrument would enhance the effectiveness of other planned policies and could therefore help drive this transition post-2030.

But timely action is crucial. Political discussions must start now to enable legislation in this EU policy cycle. Let the debate begin!

Émeline Spire
Director Europe, Agora Energiewende

→ Key findings at a glance

- 1 **Europe's stagnating heating transition threatens to lock in fossil fuel dependency while undermining the competitiveness of its cleantech manufacturing sector.** After soaring heat pump deployment during the energy crisis, sales of clean heating appliances have returned to 2021 levels. Without a strong policy signal, fossil gas boilers are set to dominate well into the 2030s, with more than 50 million boilers estimated to be installed cumulatively by 2040. Innovative approaches are needed to enhance energy security and preserve Europe's competitive edge in cleantech.
- 2 **Based on incentives for manufacturers, an 'EU Clean Heat Market Instrument' could gradually expand the market for clean appliances.** One possible design would involve placing a charge on manufacturers based on the proportion of fossil fuel boilers in their sales. The revenue generated would then be reinvested into manufacturers who show progress in increasing their share of clean heating products. The charge level would be set by policymakers and could be gradually increased to maximise impact.
- 3 **Strengthening the existing policy mix, the instrument would help chart a clear transition pathway for the European heating industry.** The instrument would complement policies such as the upcoming carbon pricing scheme for buildings and transport ('ETS 2'). It would help meet the demand for clean heating appliances created by the ETS 2 by making those appliances more accessible and contribute to keeping the carbon price in check by reducing the installation of fossil fuel boilers.
- 4 **The upcoming Clean Industrial Deal and planned Electrification Action Plan are an opportunity to start a strategic dialogue on the future of the European heating industry.** These initiatives aim to boost the competitiveness of European cleantech manufacturing and support the integration of the growing energy system. With buildings accounting for 40 percent of the EU's energy consumption, accelerating the heating transition is crucial for meeting Europe's energy and climate targets, enhancing competitiveness, and strengthening strategic autonomy.

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Executive Summary

The European heating sector is at a critical juncture, grappling with significant challenges in transitioning to clean appliances. After a temporary surge during the energy crisis, sales of heat pumps sharply declined between 2023 and 2024, returning to pre-crisis levels. This volatility underscores the fragile state of the clean heating market, where falling gas prices, inflationary pressures, and persistent structural barriers – such as high upfront costs and a shortage of skilled installers – continue to impede progress.

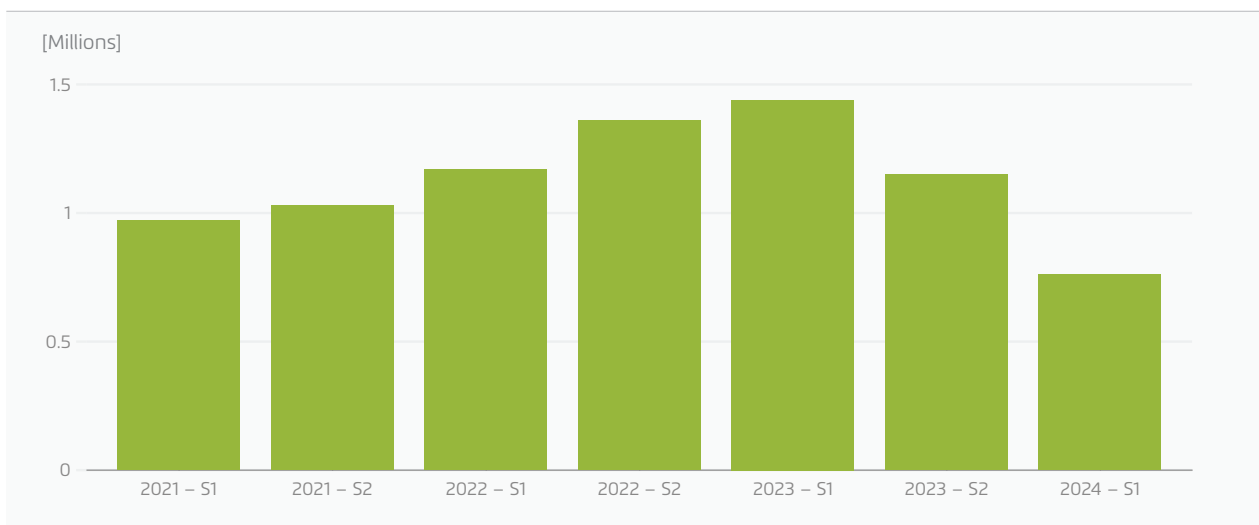
While demand-side policies and the forthcoming EU emissions trading system for heating and transport fuels (ETS 2) hold promise for improving the economic viability of clean heating, these initiatives face mounting obstacles. National subsidies and tax reforms are increasingly constrained by budgetary pressures and calls to weaken or delay the ETS 2 ahead of its 2027 launch are growing. Efforts to impose stricter restrictions on the installation of new fossil fuel boilers have also stalled following the political backlash that accompanied Germany's contentious heating law debate in 2023.

Under the current policy framework, clean heating technologies are projected to gain market share only incrementally, while fossil fuel boilers are expected to retain their dominance well into the 2030s. This slow transition has profound implications: households risk being locked into decades of fossil-based heating systems, undermining Europe's climate goals and energy security. Additionally, the European heating industry faces mounting risks, including underutilised manufacturing capacity, potential job losses, and slowed retraining programmes for installers.

European manufacturers pledged over 7 billion euros in heat pump investments during the energy crisis in anticipation of a clear policy direction, but the current slowdown threatens these investments, jeopardising the region's technology leadership in clean appliances. Imports from non-European manufacturers, particularly from China, have already increased, posing a direct challenge to Europe's competitive edge. Without swift policy intervention to accelerate the clean heating transition, the

Heat pump deployment by semester for key European heating markets

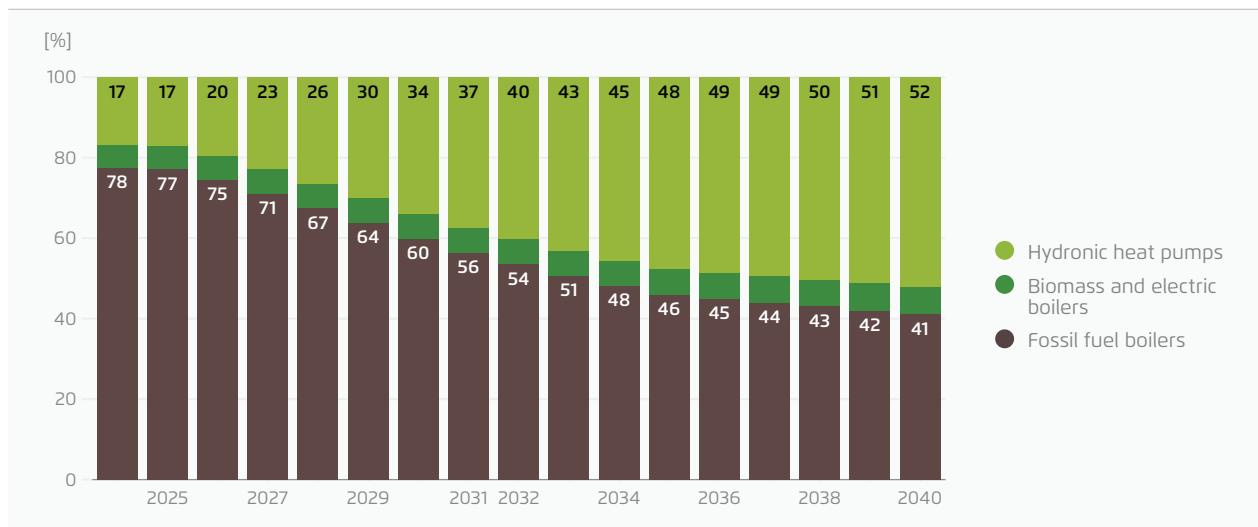
→ Fig. 1



Agora Energiewende (2025) based on EHPA (2024) and EHPA (2024a). Countries included: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland.

Projection of EU heating appliance sales by technology until 2040

→ Fig. 2



Agora Energiewende (2025) based on LCP Delta (2025). Note: Only covers hydronic central heating appliances.

heating industry risks following the trajectory of the car industry, where delayed action opened the door for non-European competitors to dominate in clean technologies.

Meanwhile, the UK will soon launch an innovative new policy for accelerating the heating transition known as the UK Clean Heat Market Mechanism (UK CHMM). The policy is designed to drive the heating industry's transition to low-carbon technologies by focusing on manufacturers' overall sales portfolios rather than imposing bans on fossil fuel boilers. Inspired by fleet standards for vehicles, the UK CHMM sets annually increasing targets for hydronic heat pump installations, gradually expanding the market for clean heating appliances without an immediate prohibition on fossil fuel systems.

Starting in April 2025, manufacturers must meet these targets or use flexible options such as credit banking, trading, or paying penalties. This market-based approach incentivises manufacturers to increase heat pump production and make them more attractive to consumers, encouraging broader adoption. Combined with complementary measures like grants, tax incentives, and workforce training, the UK CHMM not only supports decarbonisation but also promotes industrial innovation and a sustainable transition for the British heating industry.

Inspired by the UK example, this paper proposes a new EU policy instrument for the post-2030 period designed to incentivise heating appliance manufacturers to transition their sales portfolio to clean heating appliances by addressing both the supply and demand sides of the heating market.

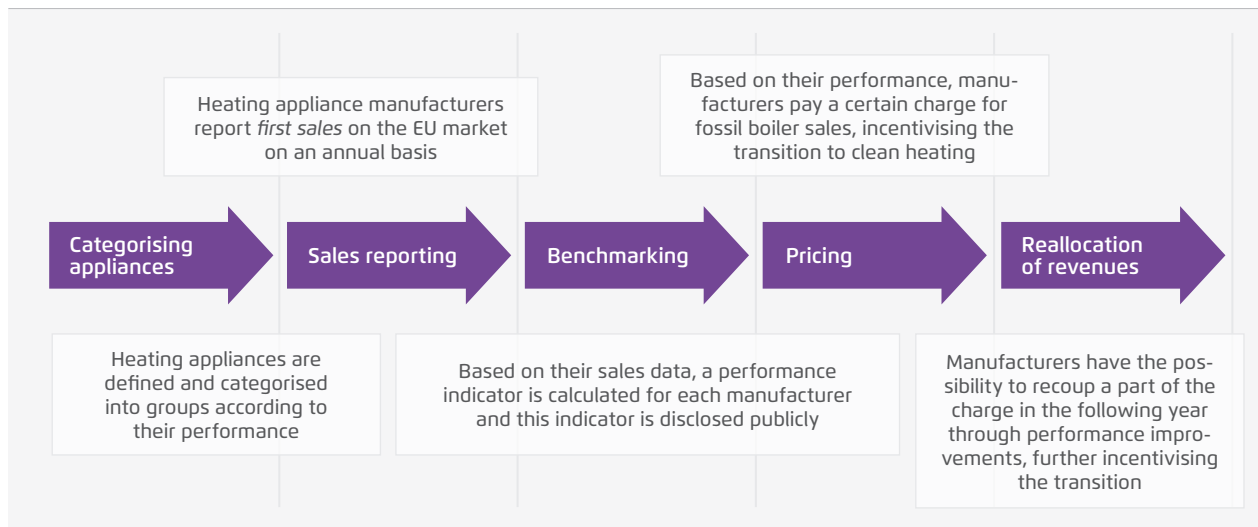
Such an *EU Clean Heat Market Instrument (EU CHMI)* would:

1. obligate heating appliance manufacturers to report their annual sales of heating appliances;
2. publicly benchmark and disclose the performance of individual manufacturers and
3. apply performance-based charges to heating appliance manufacturers for each fossil boiler sold, while allowing for a partial recovery of these charges in the following year based on performance improvements.

This performance-based scheme would encourage manufacturers to gradually shift their sales portfolios to clean heating appliances, making them more attractive to consumers through improved training, distribution channels, marketing, and financing options. The EU CHMI would create a clear policy signal for the heating sector's transformation, align with broader energy system integration, and level the playing field for EU manufacturers.

Overview of central elements of an EU Clean Heat Market Instrument

→ Fig. 3



Agora Energiewende (2025)

Furthermore, the CHMI would serve as a key commitment device for governments, signaling their dedication to clean heating goals. Governments adopting the EU CHMI would be compelled to address regulatory gaps and strengthen the policy framework, ensuring alignment with the EU's climate-neutrality target and creating the conditions for widespread adoption of clean heating technologies.

The CHMI could also play a critical role in the post-2030 policy framework, reinforcing carbon pricing under ETS 2. By facilitating the transition away from fossil fuel heating systems, the EU CHMI would reduce demand for fossil fuel boilers and lower emissions in the buildings sector. This would help mitigate the risk of excessive carbon price increases under ETS 2, keeping them politically acceptable, while contributing to the EU's 2040 climate targets.

Such a measure must be part of a broader, balanced policy mix that supports clean heating and ensures a fair transition. First, the EU CHMI is unlikely to be implemented before 2029 given the need for new legislation. Moreover, its design will require a phased introduction, with a focus on developing robust reporting and benchmarking systems and allowing manufacturers time to adjust. The primary impact of the EU CHMI would therefore be felt post-2030,

contributing to the EU's 2040 climate goal and signalling a long-term commitment to heating sector transformation.

Second, the EU CHMI also cannot resolve all structural barriers to clean heating, such as energy price disparities, on its own. It is therefore crucial that Member States enact necessary national policies such as timely carbon pricing under ETS 2, effective use of the Social Climate Fund, and VAT adjustments on electricity and appliances to send clear market signals and to prepare for a potential EU CHMI.

The current policy framework fails to create a compelling business case for scaling clean heating appliance supply, putting Europe's competitive edge at risk. A new industrial strategy for the heating sector is thus urgently needed to safeguard Europe's leadership in the clean technology race. The EU CHMI offers a critical opportunity to unlock private investment, simplify reporting, and incentivise manufacturers, ensuring that Europe's manufacturing and installer capacities align with growing demand. However, prompt political action is required to ensure such a legislation is introduced and adopted within this crucial policy cycle for Europe's climate and energy goals, and cleantech competitiveness.

1 Introduction

The EU heating market is facing significant challenges in transitioning to clean appliances. On the demand side, sales of heat pumps nearly halved between the first half of 2023 and the first half of 2024¹. This decline reflects two key factors: a changing market environment, with falling gas prices and inflation reducing household purchasing power, and persistent structural barriers such as high upfront costs and a shortage of skilled installers.

These challenges on the demand side are mirrored on the supply side by hesitations on the part of heating market actors and business case challenges. Though manufacturers have already invested approximately 7 billion euros² to expand heat pump production capacity, the current market conditions have resulted in underutilised facilities, job cuts and short-time work³. These setbacks risk creating a further ripple effect along the supply chain by slowing installer retraining in clean heating appliances, an area where manufacturers play a crucial role.

The implications of these trends are profound, jeopardising the economic competitiveness of the European heating industry and the EU's climate and energy goals. In the short run, a slowdown in the transition to clean heating will significantly weaken the competitive position of European manufacturers that have heavily invested in heat pump manufacturing. A slower transition will also see conventional fossil fuel boiler manufacturers switch less quickly to clean heating systems, potentially bolstering the competitiveness of non-European manufacturers in the medium to long term, as has been the case with other clean technologies. Meanwhile, a slower transition also implies a substantial lock-in of fossil fuels given the average lifetime of a fossil fuel boiler ranging between 15 and 20 years.

Addressing these challenges is essential, especially in the context of the EU's Clean Industrial Deal, which aims to enhance the competitiveness of European clean tech manufacturing, and the planned EU Electrification Action Plan, which will support growing energy system integration. With buildings accounting for 40 percent of the EU's energy consumption⁴, accelerating the heating market transition is also vital for achieving the EU's energy and climate targets and eliminating fossil-fuel dependencies.

Inspired by the UK's new Clean Heat Market Mechanism, this paper proposes a new EU policy instrument for the post-2030 period designed to incentivise heating appliance manufacturers to transition their sales portfolio to clean heating appliances by addressing both the supply and demand sides of the heating market. Such an *EU Clean Heat Market Instrument* would:

1. obligate heating appliance manufacturers to report their annual sales of heating appliances;
2. publicly benchmark and disclose the performance of individual manufacturers and
3. apply performance-based charges to heating appliance manufacturers for each fossil boiler sold, while allowing for a partial recovery of these charges in the following year based on performance improvements.

This performance-based incentive scheme would encourage manufacturers to gradually increase their sales of clean heating appliances and make clean heating appliances more attractive for consumers, e.g. by training installers, improving distribution channels or developing effective marketing tools, financing and service offerings to increase their uptake. Consequently, the proposed *EU Clean Heat Market Instrument* would foster the commitment of

1 European Heat Pump Association (2024).

2 Eunomia (2023).

3 European Commission et al. (2024).

4 European Commission (2020).

fossil fuel boiler manufacturers to transition their sales portfolio to clean heating appliances, setting a gradual but clear policy signal for clean industrial transformation and energy system integration, while levelling the playing field for EU heating market actors and improving the overall transparency of the heating market.

Conceived as an EU-wide policy, the instrument offers a harmonised and single-market-compatible approach to strengthening the cleantech competitiveness of the European heating industry that builds on and streamlines existing EU policies. In so doing,

this instrument has the potential to prepare the EU market for a sustainable future, while strengthening European market integration and complementing the existing policy mix.

Building on extensive stakeholder engagement and original analytical work by LCP Delta, this paper provides an in-depth assessment of the European heating market, examining market trends and policy landscapes. It also outlines key design considerations for the proposed Clean Heat Market Instrument and explores how it could interact with existing policies to accelerate the EU's clean heating transition.

→ Project background

In March 2024, Agora Energiewende launched a project in the context of growing industry concerns about declining heat pump sales and political pushback against regulatory policies, which were preventing the ambitious revision of the Ecodesign efficiency standards for central space heating appliances and of the Energy Performance of Buildings Directive (EPBD). The project aimed to assess the political and technical feasibility of introducing a market-based policy instrument for the EU heating sector.

The project was accompanied by extensive engagement of relevant stakeholders. Notably, a stakeholder sounding board met three times (April, June and October) and included representatives of the European Commission, responsible national ministries, individual heating appliance manufacturers, the main EU heating industry associations and civil society organisations active in the domain of EU heating policy.

The project was also accompanied by supporting research conducted by the specialist heating market consultancy LCP Delta. LCP Delta helped to develop the core design of the instrument and provided a detailed analysis of the state of the EU heating market and the potential impact of introducing an EU Clean Heat Market Instrument. The final reports from this research are publicly available on the website of Agora Energiewende:

Analysis of the EU Heating Market. Online available at: <https://www.agora-energiewende.org/publications/analysis-of-the-eu-heating-market>

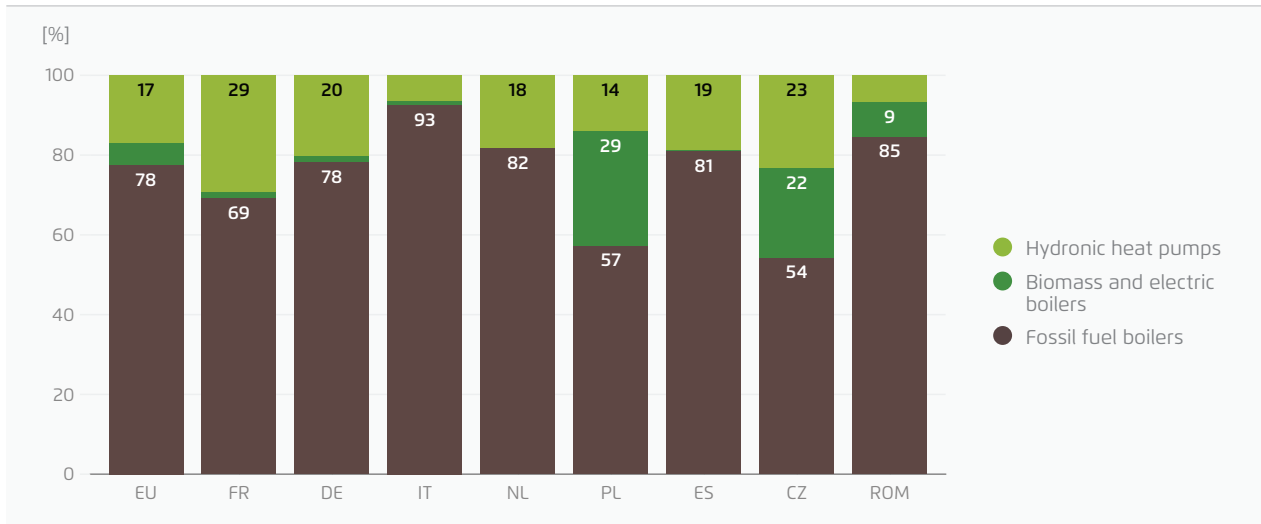
Designing a European Clean Heat Standard. Online available at: <https://www.agora-energiewende.org/publications/designing-a-european-clean-heat-standard>

Assessing the potential impact of a European Clean Heat Standard. Online available at: <https://www.agora-energiewende.org/publications/assessing-the-potential-impact-of-a-european-clean-heat-standard>

2 EU heating market and policy framework: state of play

Market share of heating appliance sales by technology in different member states

→ Fig. 4



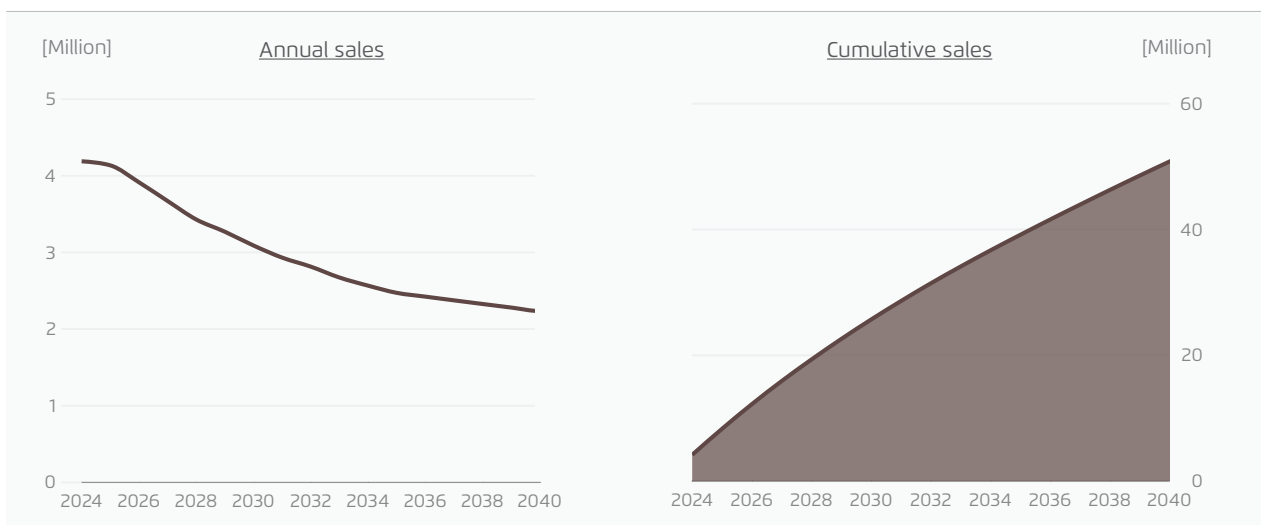
Agora Energiewende (2025) based on LCP Delta (2025). Note: Only covers hydronic central heating appliances.

Fossil fuel boilers remain the dominant technology in the EU heating market. While sales of efficient, low-carbon central heating appliances such as air-to-water heat pumps surged during the energy crisis, they have since returned to 2021 levels, representing

just 17 percent of the market in 2024 and ranging from 7 percent in Romania to 29 percent in France. In contrast, fossil fuel boilers still account for 78 percent of sales holding a majority share in all eight major national markets.

Projected sales of fossil fuel boilers

→ Fig. 5



Agora Energiewende (2025) based on LCP Delta (2025)

Given the current policy framework, boilers are projected to maintain their strong market position well into the 2030s. With more than 2 million annual sales, the projections imply that fossil fuel boilers would stay the leading technology for heating appliances on the EU market until 2034, according to a forecast by the specialist heating market consultant LCP Delta. This would lead to more than 50 million fossil fuel boilers being installed cumulatively until 2040.

Consequently, the projected uptake for clean appliances is not in line with the EU's climate and energy objectives. At this pace, the overall stock of heat pumps – i.e. the total number of heat pumps installed – is only expected to achieve moderate growth. Consequently, the EU is projected to fall far short of its *Fit for 55* 2030 target for the heat pump stock (Figure 6) and even to still see strong sales of fossil fuel heating appliances in 2040 despite the goal – laid down in the Energy Performance of Buildings Directive – of phasing out fossil fuel boilers by this date.

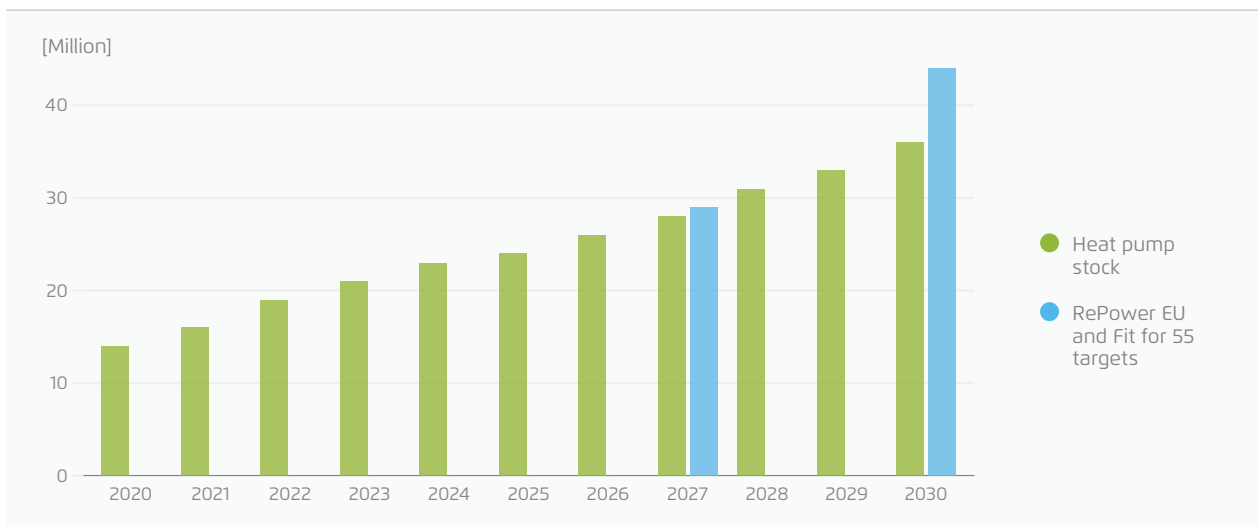
If this trend were to continue, heating in buildings could seriously jeopardise the EU's climate and energy targets and objectives. Given that a fossil

fuel boiler has an average lifetime of between 15 and 20 years, the continued strong market position of fossil fuel boilers would result in a major carbon lock-in in the buildings sector, clearly contradicting the EU's ambition to reach climate neutrality by mid-century. This carbon lock-in can already be seen if the Member States' own emissions projections for the buildings sector are compared with target scenarios from the European Commission's impact assessment for the 2040 climate target (see Figure 7). If unaddressed, this 'delivery gap' will either result in a failure to achieve the EU's climate targets or will require substantial additional action in other sectors to compensate for the continuous target exceedance by the buildings sector.

From an energy perspective, continuing to rely on fossil fuels for heating in buildings will perpetuate the EU's dependence on fossil fuel imports and limit the sector's ability to contribute to energy system integration. Notably, in the context of the EU's forthcoming Electrification Action Plan, an increase in renewable electricity generation will not be matched by a corresponding rise in electricity demand, which could undermine the economic viability of renewable energy projects and make the energy transition more expensive.

Projected stock of heat pumps* and EU targets

→ Fig. 6



Agora Energiewende (2025) based on EHPA (2021) and LCP Delta (2025). * refers to the total stock of heat pumps, including air-to-air heat pumps used for heating

➔ **Key assumptions from LCP Delta’s market forecast**

The forecast projects that progress will be driven mainly by planned policies. First, the introduction of the planned emissions trading system for heating and transport fuels will improve the economic case for clean appliances. Second planned restrictions on fossil fuel boiler installations will increase the uptake of clean heating. On the European level, the installation of fossil fuel boilers in new buildings will be restricted from 2030 onwards by the Zero Emission Buildings (ZEB) standard in the Energy Performance of Buildings Directive (EPBD). Moreover, some national regulations will drive the decarbonisation of heating sales in a number of Member States; the German Buildings Energy Law is a particularly prominent example, as it will significantly restrict the installation of fossil fuel boilers in existing buildings from 2026 or 2028*. This is an exceptional case, however, as most national frameworks and indeed the European framework provide limited regulatory signals for the uptake of clean heating in existing buildings.

*The date by which this provision will enter into force will depend on the finalisation of local heat planning, which needs to happen by June 2026 in municipalities with more than 100 000 inhabitants and by June 2028 in municipalities with fewer inhabitants.

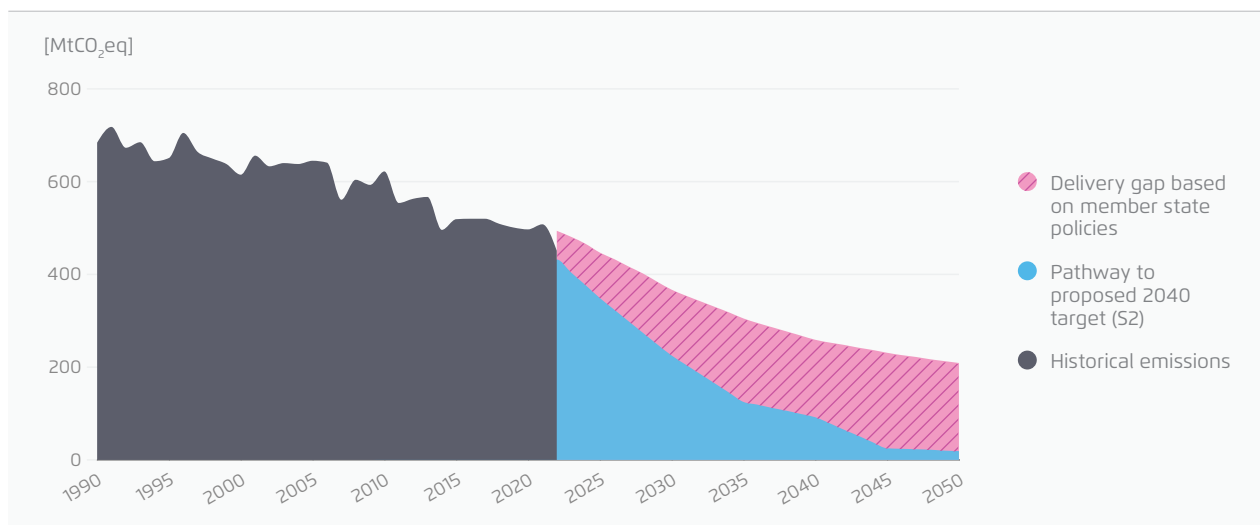
Currently, energy prices are one central reason why households are hesitant to invest in clean heating. With gas prices returning to 2021 levels, the incentive to switch to cleaner options has diminished. High electricity-to-gas price ratios remain a significant barrier, as they reduce the cost effectiveness of energy-efficient electric heat pumps compared to gas boilers by leading to long or even non-existent payback periods for heat pump investments. This disparity stems from all four components of energy

pricing – production, network tariffs, VAT and other taxes and levies – and varies significantly across Member States.

High upfront costs constitute another key barrier to the adoption of clean heating given that equipment and installation costs generally exceed those of fossil fuel boilers, thereby reducing the economic attractiveness of clean heating and restricting access

Historical and projected emissions for the EU buildings sector

➔ Fig. 7



Agora Energiewende (2025) based on European Commission (2024) and European Environmental Agency (2024)

for many low- and medium-income households⁵. This hurdle is frequently compounded by additional factors. Many European households must rely on personal savings, as access to credit and innovative financing options such as on-bill financing or leasing are scarce. Additionally, in areas with low property values, high renovation costs can represent a large share of or even exceed the property's worth.

So far, political efforts to promote clean heating have focused on demand-side measures to support consumers financially. Traditionally, grants have been the main means of supporting households with the upfront costs of heating appliances, with Member States spending 13.6 billion euros on such grants in 2022 alone⁶. Additional demand-side support policies include publicly backed low-interest loans and reduced VAT rates for clean heating appliances, which some governments have used to strengthen the economic case for clean heating. Increasingly, Member States are also considering reforms to

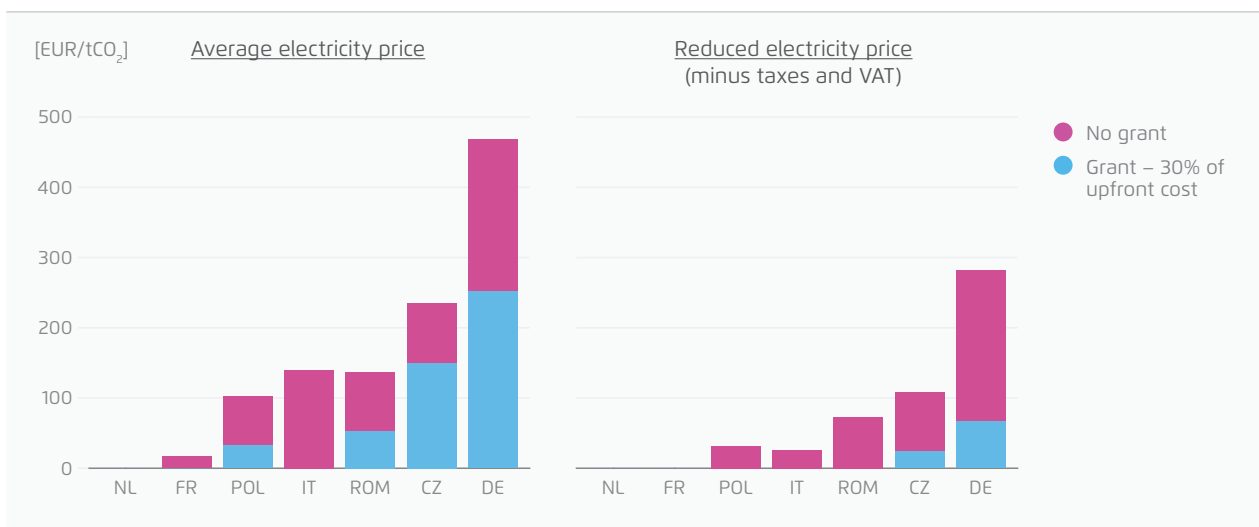
energy taxes, levies and surcharges to help rebalance energy prices in favour of electrification, in particular by reducing electricity price components.

Given the significant upfront cost gap between clean heating appliances and fossil fuel boilers, the financial resources for heating appliance subsidies and reduced electricity prices would need to be massively increased in order to significantly drive up the market share of clean appliances through fiscal measures alone. However, a subsidy-only policy comes with inefficiencies as it raises the risk of windfall profits for manufacturers and installers if subsidies are poorly designed. Notably, the shortage of skilled installers in many Member States (see box below) currently still limits the effectiveness of subsidies for clean heating systems as overall installation prices have been seen to increase in response to higher subsidy rates due to limited competition. Meanwhile, several key Member States are facing increasing budget constraints, which could make it politically and economically difficult for them to mobilise additional fiscal resources to support the deployment of clean heating appliances. This budgetary situation

⁵ LCP Delta (2025a).
⁶ Coolproducts (2023).

Additional carbon price needed for a heat pump investment to break even in ten years at December 2024 fossil gas prices

→ Fig. 8



Agora Energiewende (2025) based on LCP Delta (2025) and HEPI (2025). Note: The reduced electricity price is calculated as the average electricity price minus VAT and taxes. Necessary carbon price based on an assumed emissions factor of 0.2 kg/kwh for gas.

also risks the growing occurrence of detrimental stop-start dynamics for support schemes that promote boom-bust cycles in the heating market.

Another key policy for the promotion of clean heating is the planned introduction of an EU emissions trading system for heating and transport fuels (ETS 2) from 2027 onwards. The introduction of uniform carbon pricing for heating fuels across Europe has the potential to significantly improve the economic case for clean heating by increasing the price of fossil heating fuels, while also generating additional fiscal revenues that can be used by Member States to support the deployment of clean heating.

As Figure 8 shows, in some Member States like the Netherlands and France even relatively low carbon prices below 100 euros (EUR) per tonne of carbon dioxide (tCO₂) could already help to significantly improve the break-even point of a heat pump investment without subsidies. This demonstrates how carbon pricing could also play an important role in minimising the need for investment subsidies in the first place, allowing for a more market-driven approach to the deployment of clean heating.

However, in order to be more broadly effective and politically realistic, carbon pricing needs to be supplemented by other measures helping consumers to respond to it. The same calculations show that

→ The shortage of skilled installers and the need for innovative business models

Another key challenge for clean heating adoption is the shortage of skilled installers of clean heating appliances. Being the primary advisors to consumers, installers unfamiliar with heat pumps often recommend technologies they know, such as fossil fuel boilers. In many Member States, there are far fewer heat pump installers than gas boiler installers*, while a shortage of heating professionals in general further hampers the transition. This shortage raises installation costs and risks lowering quality when untrained installers take on the work. While certification programmes and reskilling incentives are emerging, the policy framework remains fragmented and inadequate to address these gaps effectively.

Against this background, the transition to more efficient yet also more complex appliances risks exacerbating the general installer shortage even further. Therefore, it remains questionable whether current business models will be successful in meeting the rising demand. Traditionally, small- to medium-sized installer companies have provided a tailored service to their customers on a very local level. While this decentral distribution model enjoys high trust among consumers, its effectiveness is rather low given the lack of potential for central coordination in these companies**. For example, a study in Germany has shown that larger organisations might be able to increase the productivity of a skilled installer by a factor of up to ten through the central administration, standardisation and digitalisation of processes and by ensuring the efficient division of labour between skilled installers and unskilled personnel***. Consequently, market actors are increasingly starting to harness these efficiency gains by streamlining the distribution of heat pumps. Moreover, larger organisations can bundle heat pump installations with other services, offering for example financing options or dynamic electricity tariffs or installing rooftop PV. While this is currently being done mainly by a handful of companies, such as Thermondo, Aira and Enpal, other manufacturers and energy suppliers are also starting to increasingly integrate and streamline their services. However, the business case for such innovative distribution models also depends on the market outlook for clean heating appliances.

* LCP Delta (2025a).

** Alternatively, some manufacturers supply installers directly; this is known as the two-tier distribution channel.

*** Sprind (2023).

significant additional demand-side policies – such as grants or energy price rebalancing measures – would be needed in many other countries to achieve similar break-even points for heat pump installations while keeping carbon prices at moderate levels. Moreover, with the early implementation of the ETS 2 already proving contentious due to the possible distributional impacts of high carbon prices and the fact that national Social Climate Plans have not yet been developed, the future of the instrument remains uncertain. Importantly, it remains to be seen whether policymakers will still choose to postpone or weaken the system to cushion larger price impacts and whether revenues will be prioritised to further support the heating transition.

In addition, various non-economic factors also limit the impact that carbon pricing has on scaling investments in clean heating, including distress purchases when the old system breaks down, first cost bias and a lack of knowledge and advice about the potential effects of the ETS 2 and life cycle costs⁷. In the case of rented buildings, a split incentive dilemma also arises as the building owner bears the upfront cost while fuel costs are shouldered by the tenants.

Given all these factors, carbon pricing under the ETS 2 is likely to play a highly important but insufficient role in influencing the investment decisions of

households and small businesses in the medium term, in particular given the likely political unacceptability of very high carbon prices.

Against this backdrop, stricter regulatory requirements have increasingly been introduced at the building level to prevent the lock-in of fossil fuel heating appliances and support the introduction of clean heating appliances. This is particularly evident in the case of new buildings, where numerous Member States (e.g. Austria, Germany, France) and regions (e.g. Brussels, Flanders) have introduced such restrictions, either in the form of explicit bans on the installation of new fossil heating appliances and new connections to the gas grid, or via strict requirements for renewables, CO₂ or energy efficiency that significantly favour the installation of clean heating. Notably, the newly revised Energy Performance of Buildings Directive also makes zero-emission buildings the new standard for new buildings. As a result, all new residential and non-residential buildings in the EU will be required to generate zero on-site emissions from fossil fuels from 1 January 2028 in the case of publicly-owned buildings and from 1 January 2030 in the case of all other new buildings, with the possibility of limited specific exemptions.

However, since new construction accounts for only about one percent of the building stock annually, the overall impact of these regulations is limited. Meanwhile, efforts to extend restrictions of or bans on fossil heating appliances to include existing

⁷ See, e.g. FES (2023).

Recent examples for legislative proposals and outcomes for installation requirements

→ Table 1

Geography	Proposal	Outcome
EU	Increasing minimum efficiency requirements for central space heating appliances under Ecodesign to 115% from 2029	None
Germany	Establishing a minimum renewables requirement of 65% for all installations from 2024 onwards	65% requirement for new buildings from 2024, for existing buildings from 2026/2028
France	Ban on gas boiler installations from 2026	None
Netherlands	Hybrid heat pump requirement from 2026	None
Austria	Mandatory replacement of all fossil fuel boilers by 2040, ban on installations in new buildings	Ban on installations in new buildings

Agora Energiewende (2025)

buildings have largely failed due to political backlash (see Table 1). While such measures would have sent a strong signal to accelerate the adoption of clean heating and spurred significant investment – evident in the nearly seven billion euros' worth of investment announced by heat pump manufacturers during the energy crisis following the REPowerEU proposal to ban stand-alone fossil fuel boilers from 2029 – they also raised concerns. Key issues included the market's readiness for a mass transition, the suitability of certain building types and electricity grids, and the potential social impacts of banning fossil fuel systems.

In short, the current policy framework fails not only to send a clear investment signal for consumers or manufacturers to invest in clean heating but also to address many of the non-financial barriers to clean heating deployment, putting the EU's climate and energy goals at risk. Crucially, the current weak market outlook for clean heating also has important implications for existing investments in heat pump manufacturing and the competitiveness of the European heating industry, which will be explored in the next section.

3 Growing competition on the heating market

After operating at close to maximum capacity during the energy crisis, European heat pump manufacturing is currently in a period of significant overcapacity due to the growing mismatch between supply and demand. As a result, the lack of demand for clean heating appliances coupled with continued installer shortages threatens the business case for the European heating industry’s transition to clean-tech. While manufacturers have already announced their intention of investing seven billion euros in expanding heat pump manufacturing until 2030⁸, the current decrease in demand has led to job cuts and short-time work schemes at numerous facilities as new capacities brought online in recent years remain underutilised.

This mismatch is projected to increase in the coming years in the wake of a policy framework which does not sufficiently ensure the uptake of clean appliances. Many of the announced investments were a

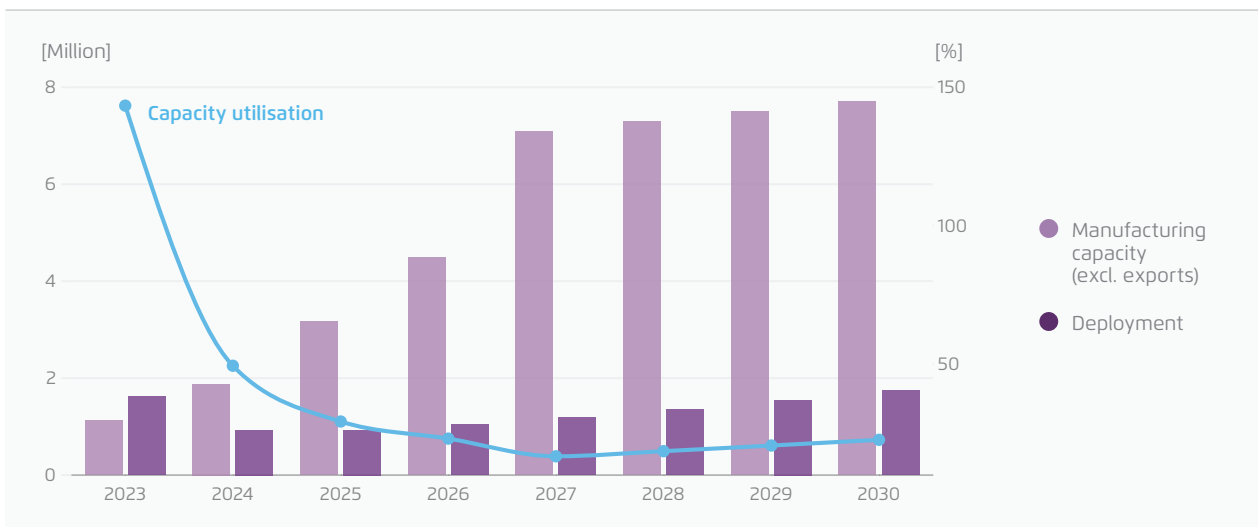
reaction to capacity constraints during the energy crisis and were based on the expectation that ambitious legislation would provide a solid business case for expanding heat pump manufacturing capacities – in particular an announced ban on the sale of stand-alone fossil fuel boilers. As these expectations have not materialised, the increasing discrepancy between manufacturing capacities and demand risks weakening manufacturers’ commitment to the heating transition. This would considerably slow down the European heating industry’s transition from fossil fuel boilers to clean heating appliances.

In this context, a new industrial strategy for the European heating industry is crucially needed to ensure its future competitiveness. A slower transition by manufacturers combined with increasing competition from non-European manufacturers raises doubts about the future of European technology leadership.

8 Eunomia (2023).

Projected manufacturing capacities and projected deployment for hydronic heat pumps

→ Fig. 9



Agora Energiewende (2025) based on Eunomia (2023) and LCP Delta (2025b)

Traditionally, the European market for heating appliances was fragmented, with local manufacturers dominating the respective national markets. In response to the increasing integration of the single market, mergers and acquisitions have turned these local manufacturers into large international groups that are generally still headquartered in Europe and use various traditional brands to operate in the different Member States. These international groups dominate the market for gas boilers in most of the Member States and have also expanded globally. Most of these manufacturers have also expanded their range of products by introducing clean heating appliances into their portfolio, typically focusing on hydronic heat pumps given their experience with hydronic heating systems.

However, this group of mixed-portfolio heating companies is increasingly facing new competitors that are putting their strong market position at risk. They

are confronted with specialised heat pump manufacturers, many of which have considerable experience with this technology, including manufacturers headquartered and producing in Asia. These firms are often well-versed in air-source heat pump technology due to the prevalence of air-air heat pumps in their domestic markets. Moreover, given the size of their domestic markets, the worldwide revenues of these groups far exceed those of their European counterparts in many cases, giving them greater potential for using economies of scale (see Table 2). These differences become even more pronounced in the context of projected overcapacities, as these large non-European manufacturers are more resilient to a stagnating market in Europe. Competitive pressures are thus already driving the ongoing internationalisation of the European heating industry, the recent acquisitions of Viessmann by Carrier and of the Heating and cooling segment of Johnson Controls by Bosch being good examples of this trend. If European

Heating manufacturer landscape *

→ Table 2

Name and company HQ	Manufacturer type	Revenue (world)**	Brands
Daikin (Japan)	Heat pump specialist	EUR 27.19 bn	Daikin
Carrier (US)	Heating generalist	EUR 24.4 bn	Carrier, Viessmann, Riello, Toshiba, Beretta
Midea (China)	Heat pump specialist	EUR 21.2 bn	Midea
LG (South Korea)	Heat pump specialist	EUR 20.52 bn	LG
Bosch (Germany)	Heating generalist	EUR 9.31 bn	Bosch, Buderus, Hitachi, IVT, Vulcano, Worcester
Mitsubishi (Japan)	Heat pump specialist	EUR 8.83 bn	Mitsubishi
Panasonic (Japan)	Heat pump specialist	EUR 5.06 bn	Panasonic
Vaillant (Germany)	Heating generalist	EUR 3.8 bn	Vaillant, Saunier Duval, Protherm, AWB, Bulex
Groupe Atlantic (France)	Heating generalist	EUR 3.2 bn	Atlantic, Ideal, Edesa
Ariston (Italy)	Heating generalist	EUR 3.09 bn	Ariston, ATAG, Chaffoteaux, Wolf
NIBE (Sweden)	Heat pump specialist	EUR 2.73 bn	NIBE
BDR Thermea (Netherlands)	Heating generalist	EUR 2.3 bn	BAXI, Remeha, Brötje, De Dietrich
Stiebel Eltron (Germany)	Heat pump specialist	EUR 1.25 bn	Stiebel Eltron

Agora Energiewende (2025)

* Manufacturers were selected on the basis of the market analyses provided by LCP Delta.

** Revenue for Heating and cooling sales only. Already accounting for the effects of recent acquisitions. Based on the latest annual report available for the respective company.

manufacturers were to slow down their transition to clean appliances in this context, they would massively jeopardise their competitiveness in this market segment, which in the long run will become the dominant market segment in view of the overall climate and energy targets.

Besides the competitiveness of European companies, the competitiveness of heat pump manufacturing in Europe is also challenged by lower production costs and the higher potential for economies of scale in China. Given their extensive experience with central heating systems in Europe, European companies currently still have technology leadership in the area of hydronic heat pumps, which account for a large share of domestic demand⁹. Even the main companies headquartered outside Europe manufacture a large part of their sales portfolio in Europe given the strong European manufacturing landscape and the buoyant domestic market for hydronic heating systems in Europe. However, China is catching up rapidly and recently overtook the EU in terms of both

new patents and new scientific articles on heat pump technology¹⁰. Furthermore, China can potentially benefit from lower production costs and larger production capacities for hydronic heat pumps, enabling the country's manufacturers to leverage economies of scale to a greater extent. This effect has already been seen in recent years, with Chinese exports in hydronic heat pumps increasing sixfold between 2018 and 2022, resulting in the EU becoming a net importer. While the overall market share of Chinese imports in the European market is still relatively small, competitive pressures are likely to increase in the future as Chinese capacities are expected to increase further in line with domestic climate targets (see Figure 11).

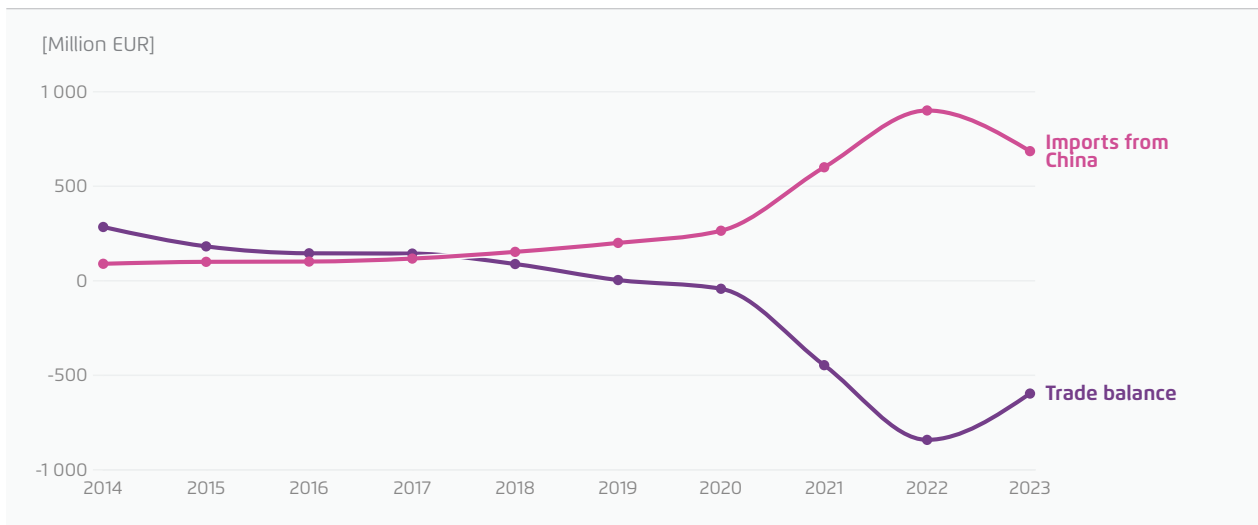
The picture is even more challenging for European manufacturers when the production of heat pump components is considered. In principle, component manufacturers stand to become the major beneficiaries of the transition from fossil fuel boilers to hydronic heat pumps, as the latter are generally a more complex and component-intensive product. Therefore, the transition of the European heating industry also drives growth in the market for

⁹ Official EU statistics do not distinguish between hydronic heat pumps and air-to-air heat pumps. Since the figures indicate a share of 60% in domestic heat pump manufacturing, the share accounted for by hydronic heat pumps is probably considerably higher.

¹⁰ European Commission (2024).

EU trade balance for hydronic heat pumps and imports from China

→ Fig. 10



Agora Energiewende (2025) based on UN Comtrade (2024)

suppliers of certain components, making the heating transition an opportunity for both large international manufacturers and SMEs.

However, unlike component assembly, which for the most part takes place in Europe, certain key components are increasingly being manufactured outside Europe. For example, some of the manufacturers headquartered in Asia are producing their compressors there, which enables them to use economies of scale. Consequently, European competitiveness is being eroded not only by heat pump assembly but also by component production.

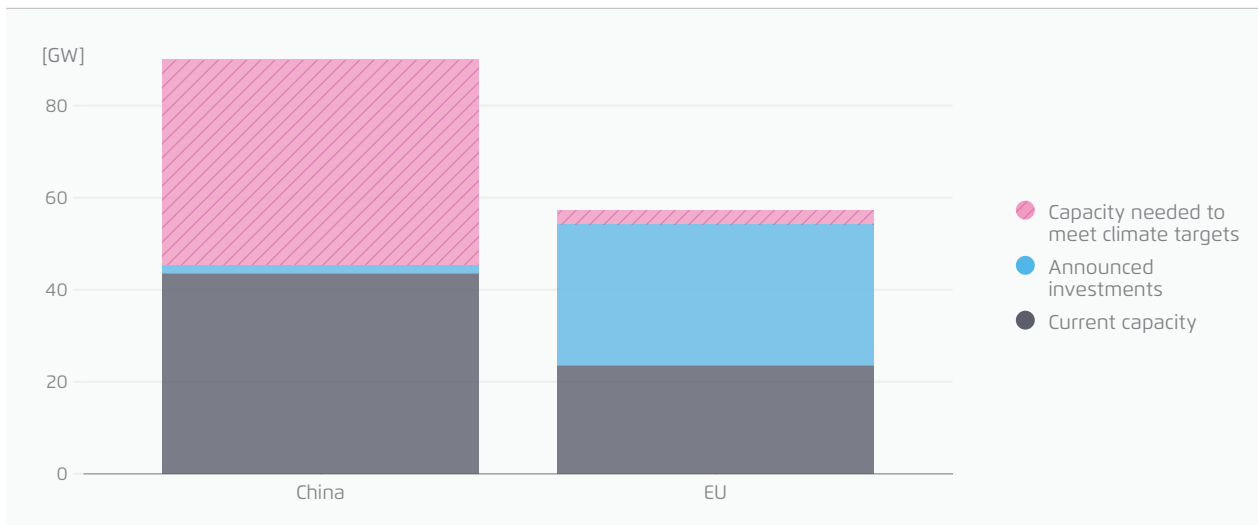
To date, the framework for European industrial policy has been limited to providing investment support to manufacturers. While the EU Net Zero Industrial Act focuses on technical support, such as accelerating approval processes, the French government is also providing financial support by covering 20–45 percent of the investment costs for new domestic heat pump manufacturing in France¹¹. In the current market situation, however, this approach is unlikely to be sufficient to boost the competitiveness of

European clean heating manufacturers given the lack of demand on Europe’s domestic market and growing competition from Asian manufacturers.

Despite being two fundamentally different industries, similarities to the car industry cannot be ignored in this regard. Currently, European car manufacturers are under substantial competitive pressure from their Chinese counterparts since the latter have a competitive edge when it comes to electric vehicles. This is because European industry long focused on combustion technology, which allowed Chinese manufacturers to strategically specialise in EVs. A similar trend could be seen with heat pumps if European manufacturers were to slow down the transition of their sales portfolio to clean heating. This could give Chinese manufacturers the opportunity to strengthen their market position for heat pumps, whereas European manufacturers would be strategically locked into fossil fuel boilers. Consequently, the long-term competitiveness of European manufacturers would be at risk as they would face strong non-European competition in a largely decarbonised market.

¹¹ French government (2024).

Current and projected manufacturing capacities for heat pumps in the EU and China → Fig. 11



Agora Energiewende (2025) based on IEA (2024)

4 The new UK Clean Heat Market Mechanism

→ The UK government vision for the Clean Heat Market Mechanism

“The Clean Heat Market Mechanism – introducing a rising market standard for heat pumps as a proportion of fossil fuel boiler sales – has been designed to provide the UK’s world-leading heating appliance industry with the policy certainty and confidence to invest in ways to make heat pumps an even more attractive and simpler choice for growing numbers of UK households, thereby supporting both heat pump deployment growth and the transition of the overall market from traditional high-carbon technologies to the low-carbon future.”

Department for Energy Security & Net Zero (2024): Consultation outcome – Clean heat market mechanism: proposal to change the scheme start date to 1 April 2025.

The UK government has recently confirmed the introduction of a new UK Clean Heat Market Mechanism, marking a significant policy development aimed at supporting the transition of both the heating industry and the market. Unlike traditional product policies that impose requirements on individual appliances or building codes that apply to individual buildings, this mechanism targets heating manufacturers’ overall sales portfolio.

This approach is more gradual than a ban on stand-alone fossil fuel boilers, as it builds the market for clean heating appliances over time rather than immediately mandating their use by restricting fossil fuel boiler installations. The mechanism is based on the concept of fleet standards, similar to the EU’s CO₂ standards for cars and trucks, which have been successfully implemented worldwide and proven effective in driving industrial transformation in the automotive sector.

The UK’s Clean Heat Market Mechanism is set to enter force in April 2025¹². It will require manufacturers to achieve annually increasing targets

for hydronic heat pump installations, based on their sales of fossil fuel boilers. To generate credits, installations must be conducted by installers certified under the MCS system and must take place in existing buildings.

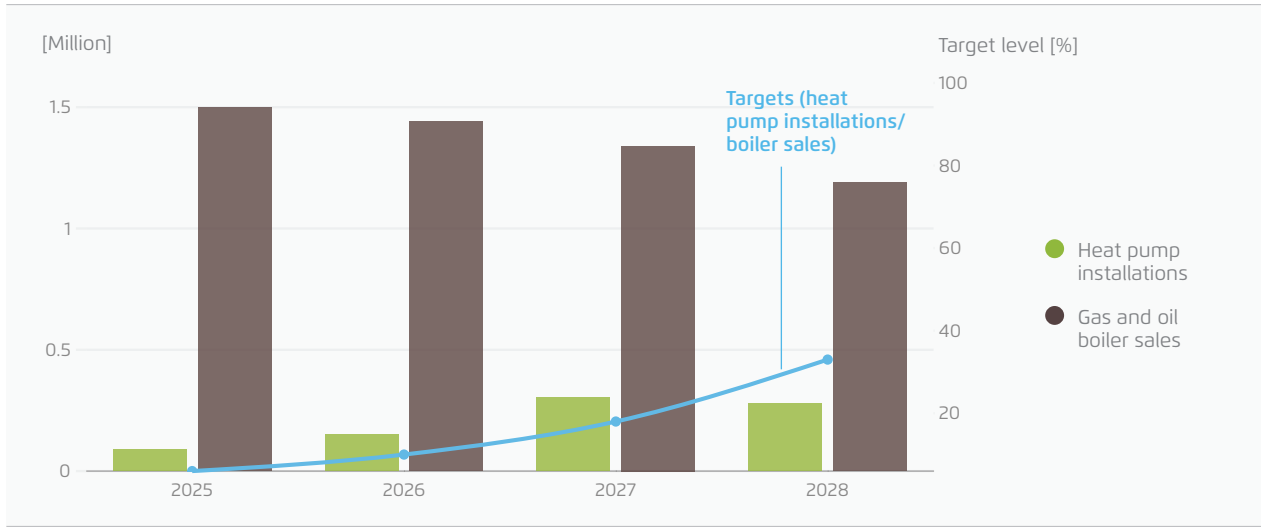
Manufacturers missing their targets will have several flexibility options, including the chance to bank credits for and to borrow credits from the following years between years and to participate in a credit trading system that will allow them to purchase credits from manufacturers that exceed their targets. Alternatively, manufacturers can opt to pay a fixed penalty for each missing credit, initially set at 500 pounds sterling¹³.

The instrument is designed to encourage manufacturers not only to expand production capacity but also to make heat pumps more appealing to consumers, ensuring sufficient demand to meet the targets. In response to the scheme, manufacturers have already started offering rebates for heat pumps and increasing their direct involvement in heat pump distribution.

¹² Originally, the plan was to introduce the scheme in April 2024, but then it was postponed by one year. In December 2024, the new UK government confirmed that the instrument would be implemented in April 2025.

¹³ In the initial proposal the penalty was set at 5 000 pounds and later reduced to 3 000 pounds. The new government further lowered it to 500 pounds.

Target level and corresponding appliance sales for UK Clean Heat Market Mechanism → Fig. 12



Agora Energiewende (2025) based on European Commission (2024) and European Environmental Agency (2024)

At the same time, the instrument is not seen as a stand-alone instrument. Instead, the introduction of the UK’s Clean Heat Market Mechanism is accompanied by a comprehensive set of complementary policies to create a robust policy mix supporting low-carbon heating adoption. These include generous financial incentives such as the enhanced 7 500 pound Boiler Upgrade Scheme grant and a 1.5 billion pound allocation to the scheme for 2025–2028, a VAT rate of 0% for heat pump installations, and additional funding through programmes such as the Energy Company Obligation and the Home Upgrade Grant. The Future Homes Standard, set to

take effect in 2025, will ensure that low-carbon heating technologies become the norm in new buildings, while initiatives such as the Heat Pump Investment Accelerator and the Heat Training Grant provide financial support to bolster manufacturing capacity and workforce skills in the heating sector.

Importantly, the UK’s Clean Heat Market Mechanism also provides a clear transition pathway for the British heating industry. Aligned with the goal of installing 600 000 heat pumps by 2028, the scheme has been explicitly framed as an industrial policy to promote the industry’s gradual transition.

5 Designing an EU Clean Heat Market Instrument

Against the backdrop of the political backlash against fossil fuel boiler bans, a struggling European heating industry and an insufficient political framework to support its transition, Agora Energiewende has conducted an extensive research and stakeholder consultation project over the last year exploring the **potential role of market-based policies to support the EU heating market's transition to clean heating**. This has resulted in a proposal for a new policy instrument, the Clean Heat Market Instrument, which we explain below.

Following the example of the UK's Clean Heat Market Mechanism, this new policy instrument would take the form of an obligation or performance-based

incentive for manufacturers of fossil fuel-based heating appliances to gradually transition to clean heating. In contrast to previous approaches to regulating the heating sector, the instrument would target the entire sales portfolio of manufacturers rather than the performance of every individual appliance or building.

Unlike traditional heating policies that address the supply and demand sides separately, the Clean Heat Market Instrument would tackle both aspects simultaneously (see Figure 13). By incentivising manufacturers to gradually scale up supply, the instrument encourages them to make clean heating appliances more accessible to consumers through existing or

→ An EU Clean Heat Market Instrument – in a nutshell

What is an EU Clean Heat Market Instrument?

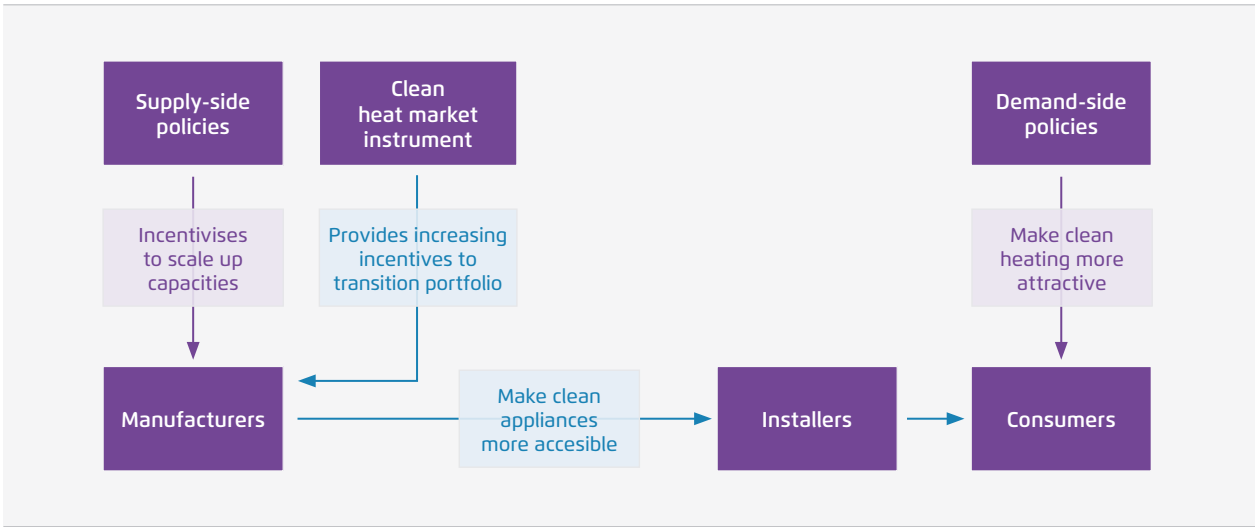
A Clean Heat Market Instrument is a financial incentive for heating appliance manufacturers that is based on their ratio of clean heat appliances to non-clean appliances sold ("clean heat sales ratio") or weighted climate performance in grams (g) of carbon dioxide equivalent (CO₂e) per kilowatt hour (kWh) of heat. This performance-based scheme would incentivise manufacturers to increase their sales of clean heating appliances, e.g. by investing in manufacturing capacities for clean heat appliances or by developing effective marketing tools and distribution channels to increase their uptake.

How would an EU Clean Heat Market Instrument work?

- **Step 1 – Categorisation of appliances:** Clean heating is defined and appliances are categorised (non-compliant, compliant, neutral) or weighted according to their climate performance (e.g. carbon intensity (gCO₂e/kWh heat).
- **Step 2 – Sales reporting:** All heating appliance manufacturers that sell heating appliances on the European market report the sales of all appliances that fall within the scope of the scheme to the EU Commission annually.
- **Step 3 – Performance benchmarking:** Based on the reported sales, the EU Commission calculates a performance indicator – e.g. a clean heat sales ratio (CHSR) – for every manufacturer.
- **Step 4 – Disclosure:** Manufacturers disclose this performance indicator prominently on their website so that consumers / installers / investors etc. can see how each company performs.
- **Step 5 – Pricing:** Each manufacturer is charged based on its performance. Charge levels are higher for manufacturers in poorer performance bands.
- **Step 6 – Reallocation of revenues:** Manufacturers have the possibility to recoup a part of the charge through performance improvements, further incentivising the transition to clean heating.

Clean Heat Market Instrument and traditional policy measures

→ Fig. 13



Agora Energiewende (2025)

How could a Clean Heat Market Instrument be designed?

→ Table 3

Key design elements	Core initial design	Alternative options considered
Obligated parties	Heating appliance manufacturers	Energy retailers, installers
Metric counted	Heating appliances sold	Heating appliances installed, CO ₂ saved, clean heat supplied
Specific reporting metric	"First" sales from the factory	Final sales, accredited installations, tCO ₂ saved, clean kWh supplied
Customer groups	All types and segments (residential, non-residential, new-build, retrofit)	Only existing buildings
Monitoring, reporting and verification system	Mandatory annual reporting of sales with third-party verification	Monitoring of individual installations
Performance indicator	Clean heat sales ratio (CHSR)	Specific emission targets based on weighted climate performance (gCO ₂ e/kWh heat)
Pricing mechanism	Fixed price incentive in the form of a charge for each non-compliant appliance sold	Credit trading with other manufacturers; cap on overall sale of non-compliant appliances with auctioning of sales allowances
Use of revenues	Covering administrative costs; partial or full recovery of charges based on performance improvements	Allocation to general EU budget; earmarking of funds to support clean heating (e.g. via the EIB or Innovation Fund) or address distribution questions (e.g. via the Social Climate Fund).
Geographical scope	EU-27	EEA, individual Member States

Reflections by Agora Energiewende based on work by LCP Delta

→ European vs. national policy instruments

While a Clean Heat Market Instrument could in theory also be designed as a national policy instrument, an EU-wide approach seems preferable due to single market considerations. For one thing, setting up a CHMI at the national level would only be possible for large Member States given the administrative complexity, whereas a European system could be aligned with existing EU legislation such as classifications of heating systems and product reporting requirements. Setting up the instrument at the European level would also reduce complexity for manufacturers, as national systems would entail differing requirements. Lastly, a European approach also appears preferable in order to support the competitiveness of European industry given the size of the EU single market and its weight in the world market.

innovative distribution models. This, in turn, boosts consumer demand. As a result, the instrument increases the effectiveness of the overall policy mix by ensuring that both the supply and demand sides of the heating market grow in tandem.

In short, an EU Clean Heat Market Instrument potentially represents an innovative new approach to steering the heating transition in Europe, providing a more gradual and flexible pathway for the industry and consumers than a direct ban on certain products, while at the same time still providing greater policy certainty for market actors.

Building on a comprehensive analysis of the current market situation and the policy context for clean heating appliances, this project has identified several possible design options for such an EU instrument and the potential impacts this instrument could have on industry and consumers. Throughout the whole project, this research was accompanied by intensive consultation of key stakeholders, including industry, government representatives and civil society, and supported by the extensive heating market expertise of the specialist consultancy LCP Delta. This in-depth analysis and stakeholder dialogue helped to identify both the significant opportunities offered by and limitations of such an instrument.

Based on this work, we present a concrete proposal for the following instrument (see Table 3) and a timeline for its introduction by 2030 (see Figure 14), as

well as a menu of options for policymakers to adapt the policy instrument to different levels of ambition and policy priorities.

In the following sections, some of the more detailed considerations for designing such an instrument are discussed, focusing on each of the instrument's five key building blocks: 1) definitions, 2) reporting, 3) benchmarking and disclosure 4) pricing and 5) reallocation of revenues. Naturally, each of these steps allows for a range of more detailed design choices that can fundamentally change the scope, impact and complexity of the instrument.

5.1 Establishing the scope of the instrument and defining clean appliances

Developing the instrument requires choices to be made about (1) the range of heating appliances in scope, and about (2) the categorisation of appliances based on whether they are considered "clean" and therefore an eligible technology. Both decisions can be aligned with existing EU legislation.

1. With regard to the **scope** of heating appliances to be covered, existing product groupings under the Ecodesign Regulation and the Energy Labelling Regulation could be used (see Table 4).
 - A. In the broadest definition, this could comprise all six product groups under these regulations, taking into account a wide range of appliances from

Classification of heating appliances under Ecodesign

→ Table 4

Ecodesign product group*	Scope	Technologies
Space and combination heaters (Lot 1)	Central heating appliances providing space and water heating except solid fuel boilers	Fossil fuel boilers (except coal), hydronic heat pumps, electric boilers
Water heaters (Lot 2)	Appliances only providing water heating	Fossil water heaters, hot water heat pumps, packages of solar thermal with other water heater
Air conditioners (Lot 10)	Air conditioners with a rated capacity below 12 kw	Air-to-air heat pumps
Solid fuel boilers (Lot 15)	Solid fuel boilers providing space and water heating	
Local space heaters (Lot 20)	Non-central heating appliances providing space heating to a single room	Gas and wood stoves, fireplaces, electric heaters
Air heating and cooling products (Lot 21)	Air conditioners with a rated capacity above 12 kw	Air-to-air heat pumps, air heaters, chillers

European Commission (2025)

hydronic heat pumps and boilers to air-to-air heat pumps and other appliances solely designed for space or water heating. This option would allow the instrument to include certain technologies such as air-to-air heat pumps, which could potentially become an important technology for the heating transition in certain Member States.

- B. In a narrower definition, the scope could be restricted to Lot 1 and Lot 15 to cover only hydronic heating appliances. This definition of the scope would ensure that the appliances in scope are in fact interchangeable, allowing a “non-clean”

appliance to be replaced with a “clean” appliance without major changes to a heating system and ensuring that competition between heating appliance manufacturers is on a level playing field. In the short term, it seems preferable, at least initially, to restrict the scope of the instrument to appliances which can provide both space and water heating. However, the potential inclusion of air-to-air heat pumps could be subject to a later review (e.g. in 2032) in order to gather more evidence on their role in the heating transition.

→ Air-to-air heat pumps

Crucially, one consequence of limiting the scope of the instrument to central space and water heating is that air-to-air heat pumps (Lot 10, Lot 21) would be excluded. On the one hand, air-to-air heat pumps have the potential to play a key role in the heating transition in some Member States given their ability to provide cooling and their strong market position in some Member States. Moreover, they are generally more affordable than hydronic heat pumps and would therefore lower investment costs for households. On the other hand, however, it is difficult to compare air-to-air heat pumps with hydronic heat pumps based on current use cases. Many of these appliances are still used primarily for cooling, and when they are used for heating, they often serve as an auxiliary heating system given that they can only provide space heating. This provides a rationale for excluding them from the (1) scope of the instrument as they do not currently appear to serve the same market segments as hydronic appliances. Consequently, their potential inclusion in the (2) definition of “clean appliances” would risk undermining the system’s credibility, as air-to-air heat pumps do not currently contribute significantly to the replacement of fossil fuel boilers.

2. Either efficiency or carbon emissions could be used as the criteria for categorising **clean appliances**, based on existing EU legislation.
 - A. Choosing efficiency would be in line with several pieces of existing legislation, as subsidies, reduced VAT and public procurement already require appliances to be in the two highest classes of the EU Energy Label. Moreover, the efficiency of each model for heating appliances is already disclosed publicly through its entry in the EPREL product database under Ecodesign legislation.
 - B. Choosing carbon emissions as the criterion would be in line with the long-term objective of phasing out fossil fuel boilers by 2040, as laid down in the Energy Performance of Buildings Directive (EPBD) and upcoming sustainability reporting requirements for manufacturers. Moreover, they have been a requirement for subsidies as well since 1 January 2025 following the revision of the EPBD. Therefore, the guidance issued by the Commission for implementing this provision¹⁴ could be used to define both compliant and non-compliant technologies. While product-specific emissions factors do not have to be disclosed by manufacturers as things currently stand, this might change in future under the Ecodesign for Sustainable Products Regulation (ESPR)¹⁵.

Table 5 illustrates how technologies would be classified according to the two criteria. Both criteria potentially allow for a broad definition of compliant appliances, reflecting the heterogeneity of heating appliances between different Member States. Therefore, both criteria provide a solid basis for defining clean appliances in the context of introducing the instrument.

To further increase the instrument’s precision, additional factors could be considered to refine the categorisation of appliances. First, a category for neutral appliances could be created to cover those technologies which would be compliant according to the criteria mentioned above yet whose categorisation as compliant would conflict with other policy objectives. Second, appliances could be weighted according to their size and performance. Weighting appliances in this way would be a better way to reflect the total heat generated by an appliance than simply counting the number of appliances. Using the respective performance indicator – energy efficiency or a product-specific carbon emissions factor – to weight appliances would align the instrument more precisely with the respective indicator and allow for a less “black and white” categorisation of eligible versus non-eligible technologies. This approach would for example incentivise manufacturers to focus on certain technologies such as hybrid heat pumps which contribute partially but not fully to these objectives.

¹⁴ European Commission (2024a)

¹⁵ The new Ecodesign criteria might oblige manufacturers to report the life-cycle emissions of heating appliances, which would include emissions during the use phase. Moreover, the criteria might also include a specific data point on the emissions generated during the use phase. For more information see European Commission (2024b).

Eligible and non-eligible technologies defined according to different criteria → Table 5

Eligibility criteria	Eligible technologies	Non-eligible technologies
Efficiency	Hydronic heat pumps, hybrid heat pumps, micro-CHP, highly efficient biomass boilers	Fossil fuel boilers, electric boilers, pure hydrogen boilers, renewable liquid fuel boilers, inefficient biomass boilers
Carbon emissions	Hydronic heat pumps, hybrid heat pumps, pure hydrogen boilers, renewable liquid fuel boilers, conversion kits for renewable fuel, electric boilers, biomass boilers	Fossil fuel boilers, micro-CHP

Elaboration by Agora Energiewende based on work by LCP Delta

5.2 Sales reporting

Setting up an EU Clean Heat Market Instrument requires data on the sales and/or installation of heating appliances at the company or corporate group level.

Currently, in spite of the increasing integration of the EU market for heating appliances, publicly available data is fragmented and incomplete. While manufacturers are obliged to report all of their models to the EPREL database, this obligation does not include the reporting of sales data. Therefore, data on the heating market is only publicly available in some Member States thanks to voluntary and non-harmonised data collection by national associations. Moreover, while data in the market reports of the leading EU heating industry associations provides highly aggregated sales figures across several key markets, these figures are released slowly, fail to cover large parts of the EU heating market and are generally not appropriate for monitoring the progress of the EU heating market as a whole, let alone progress at the company or product

level¹⁶. Trade data only refers to trade volumes and does not allow the overall share of appliances manufactured outside the EU to be tracked in the EU market.

Besides making it difficult to track the state of the EU heating market, this poor data availability poses practical challenges to EU policymaking. For example, the lack of market data makes it hard to interpret the Energy Labelling Regulation, which affects rules for public subsidies, as these rules relate to the “highest two significantly populated classes of energy efficiency”. Moreover, the current data is not linked to the origin of products, making it difficult to track the competitiveness of EU manufacturers versus foreign competitors. As such, besides being a necessary condition for the introduction of an EU Clean Heat Market Instrument, company sales reporting would also significantly improve transparency and the ability of policymakers to monitor the general state of the EU heating market in terms of sustainability and competitiveness.

¹⁶ The Association of the European Heating Industry (EHI) has produced a publicly available heating market report in several of the past years, but the report only covers ten Member States and does not include up-to-date sales figures. Moreover, while the European Heat Pump Association covers a greater number of countries (18 of the 27 EU Member States) and provides more up-to-date sales figures, it focuses entirely on heat pumps and fails to cover fossil boilers or alternative clean heating technologies.

Existing and upcoming reporting requirements for heating manufacturers

→ Table 6

Legislation	Scope	Start date	Content
Waste Framework Directive	All manufacturers	2021	Quantity of hazardous substances (refrigerants) placed on the market
Taxonomy	All publicly listed manufacturers	2023	Reporting of share of taxonomy alignment* in business activities
CBAM	All manufacturers	2023	Quantity of imported materials covered by CBAM
CSRD	Turnover > EUR 50 m, > 250 employees, profit > EUR 25 m (2 out of 3), also non-EU companies	2025–2029 (depending on company size)	Taxonomy alignment, reporting on various environmental indicators (incl. scope 3 emissions)
Due Diligence Directive	Turnover > EUR 450 m, > 1 000 employees	July 2027–July 2029 (depending on company size)	Transition plan for reducing all emissions (incl. scope 3) from 2030, due diligence for upstream social and environmental risks

European Commission (2024d), European Commission (2020), European Commission (2023), European Commission (2022), European Commission (2024e). *Heating appliances are in line with the criteria of the EU taxonomy provided they are grouped into one of the two highest efficiency classes.

At the same time, manufacturers will already be confronted with tougher corporate sustainability reporting criteria in the coming years (see Table 6). At the company level, only manufacturers listed on European stock markets are currently obliged to conduct sustainability reporting under the EU taxonomy. Until 2029, however, these requirements will be gradually expanded in terms of both scope and content with the implementation of the Corporate Sustainability Reporting Directive (CSRD) and the Due Diligence Directive. Most importantly, these directives will require manufacturers to report their scope 3 emissions, which means they will have to track the emissions of their sold products. Manufacturers will therefore need to develop methodologies to assess these emissions, including assumptions about the emissions factors and average lifetimes of their appliances. These requirements will create a level playing field between manufacturers given that some manufacturers are already reporting their scope 3 emissions on a voluntary basis. However, they also entail the risk of a lack of comparability, as there will be no common methodology for assessing scope 3 emissions.

The EU Clean Heat Market Instrument proposed in this paper would comprise a reporting mechanism which could help manufacturers to meet these tightening reporting requirements and policymakers to obtain a better overview of the EU heating market.

In terms of technology, the mechanism would cover all appliances defined as heating appliances under this instrument. Two different options exist for designing this mechanism:

- A. Sales-based reporting: This reporting mechanism would require manufacturers to report their sales of heating appliances on an annual basis. Therefore, the mechanism would apply to first sales of heating appliances by manufacturers or importers to wholesalers or installers.
- B. Installation-based reporting: In this scenario, manufacturers would need to report installations conducted by a verified installer. This is similar to the UK's CHMM, which requires manufacturers to report installations by a certified installer accredited by the UK's MCS certification body.

While the latter (B) is generally preferable as it allows for greater influence on the quality of an installation and better targeting of the instrument (e.g. focusing on heat pump installations in existing buildings), setting up such a system on the EU level would be significantly more complex given that equivalent certification systems are currently not available in all 27 Member States and would likely take significantly more time to establish. Therefore, sales-based reporting seems to be the preferable option, at least when the instrument is initially introduced.

→ Verifying appliance sales and installations

To ensure the accountability of sales reporting, a system for verifying appliance sales would be needed. Such a system could be inspired both by the UK's CHMM and by existing EU legislation. Under the UK system, fossil fuel boiler sales will need to be submitted on a quarterly basis. Additionally, manufacturers will need to provide an annual report with sales data reviewed by an independent third party. This approach is similar to the way that companies' emissions are verified under the EU Emissions Trading System (EU ETS), which requires obligated parties to submit annual emissions reports verified by a third party by the end of March of the following year. These reports need to be based on a plan, which must be approved by the regulator, for monitoring and verifying emissions. Alternatively, appliance sales could also be verified through national registries similar to those for cars, which are used to check manufacturers' compliance with CO₂ standards. While this system could also be used to verify installations in the long term, the UK-inspired solution would be more suitable than the latter to ensure speedy implementation in the short term.

When developing the reporting system, policy-makers should take into account existing legislation, reporting requirements and reporting infrastructure in order to minimise or even reduce the regulatory burden. In order to simplify reporting, reporting requirements under the mechanism could be linked to the EPREL database, which would ensure that they cover all products placed on the EU market, including imports. This would also ensure that the necessary performance indicators for classifying appliances would be part of the reported data points.

To align this mechanism with other reporting requirements for manufacturers, additional information about the products, such as the content of imported materials covered by CBAM and the manufacturing locations of the final product and key components, could be included in the reporting obligations. This would allow manufacturers to aggregate these data points in order to fulfil their individual corporate-level reporting requirements (Waste Framework Directive, Taxonomy, CBAM, CSRD, Due Diligence Directive). While some of these data points could be made public, other data points could be kept confidential to protect sensitive manufacturing data. Introducing the reporting mechanism by 2029 would ensure that manufacturers could also use this simplification method in line with the introduction of the new corporate reporting requirements (see Table 6).

To integrate the reporting of these different data points without creating an additional reporting mechanism for manufacturers, the delegated act on hydronic heating systems under the newly adopted Ecodesign for Sustainable Product Regulation (ESPR) could also be used. Replacing the existing Ecodesign minimum energy efficiency criteria for heating appliances, this delegated act will lay down requirements for minimum performance and for the disclosure of information on a broad range of indicators, potentially including the carbon emissions of all appliances placed on the market. It could cover numerous data points at the product level which the manufacturer would have to report at the company level. Most notably, the ESPR explicitly states that information requirements for manufacturers can also include reporting the sales figures relating to

the respective products¹⁷. Additionally, the creation of a digital product passport for heating appliances, including unique facility identifiers for identifying manufacturing locations, could be part of this delegated act, as could the requirement to track the value chains of new heating appliances. As all of this data will be stored in a central registry, this registry could be combined with the EPREL database to facilitate reporting for manufacturers and increase the value of this database for policymakers.

In short, policymakers have numerous opportunities to minimise and, in some cases, even reduce the regulatory burden that introducing a sales-based reporting mechanism imposes on manufacturers, namely by building on existing laws, requirements and reporting infrastructure in order to streamline reporting requirements at the product level (EPREL, ESPR) and at the company level (Taxonomy, CBAM, CSRD, Due Diligence Directive). Meanwhile, introducing such a reporting mechanism would enable policymakers to better track progress on transitioning to clean appliances and strengthening the competitiveness of EU manufacturing.

5.3 Benchmarking and disclosure

Based on the definition of clean heating (Step 1) and the reporting scheme (Step 2) outlined above, the instrument would include a performance indicator for manufacturers that would benchmark manufacturers' progress on transitioning their sales portfolio. This transparency would be particularly helpful for financial institutions and business partners as it would allow them to assess how well individual manufacturers have prepared for the transition in light of their own sustainability requirements. Currently, this transparency does not exist given that most

¹⁷ Ecodesign for Sustainable Product Regulation, Article 4 (6): "The delegated acts adopted pursuant to paragraph 1 may, as appropriate in view of the specificities of the product group, include any of the following additional requirements: (...) b) that manufacturers, their authorised representatives or importers make available to the Commission information on the quantities of a product covered by the delegated acts referred to in paragraph 1 of this Article placed on the market or put into service, in accordance with Article 37(1)."

→ Carbon-based performance metric and CO₂ standards for cars

One option for designing the kind of manufacturers' performance indicator described above would be to base it on the average carbon emissions factor of the appliances sold by the manufacturer. As explained earlier, this metric would be in line both with upcoming requirements for manufacturers to report their scope 3 emissions and potential new reporting requirements on the product level under ESPR. Moreover, this would make the instrument very similar to the CO₂ standards for cars laid down in existing EU policy. The CO₂ standards for cars require car manufacturers to meet an individual target expressed as the average fleet emissions (grams of carbon dioxide per kilometre, gCO₂/km). As these targets will be lowered over time, car manufacturers will need to increase the share of electric vehicles in their fleet. If they miss their targets, manufacturers are required to pay a fixed charge (EUR 95/gCO₂/car). Alternatively, manufacturers can choose to cooperate with other manufacturers which far exceed their targets ("pooling"). This has led to substantial financial transfers from traditional car manufacturers to manufacturers which only produce electric vehicles.

manufacturers are not required to disclose their sales data because they are not listed on the stock market. As already mentioned in the previous chapter, upcoming sustainability reporting requirements will not be sufficient to provide this transparency either, as methodologies for certain indicators may well differ between manufacturers. Consequently, the lack of a transparent tool for financial institutions will potentially increase the financing costs for manufacturers at a time when they are facing significant financing needs to invest in transitioning their manufacturing capacities and reskilling installers.

The instrument addresses this problem by introducing a performance indicator for manufacturers based on their sales of clean and fossil fuel heating appliances reported under the scheme described in the previous chapter. Therefore, the system would establish a performance indicator for each manufacturer, describing their progress on transitioning their sales portfolio. This indicator could take one of two forms:

- A. In a simple version, this benchmark could be a "Clean Heat Sales Ratio" calculated as the ratio of non-eligible and eligible appliance sales according to the definition of clean appliances (Step 1).
- B. In a more sophisticated version, this ratio could be weighted by both the size of appliances and

their performance on the relevant indicator for defining clean appliances. This would lead to an average value for either efficiency (%/kw) or carbon emissions (CO₂/kwh) for the sales portfolio of manufacturers.

Choosing one of the options depends on the level of granularity applied when defining clean appliances.

Additionally, this benchmarking system could create a label for manufacturers by assigning them to different bands based on their performance. By benchmarking and highlighting the progress of heating appliance manufacturers relative to their competitors, financial institutions, investors and business partners would be able to integrate the label into their risk-management systems and better differentiate between companies based on the performance indicator. As a result, this label should help to improve financing conditions for manufacturers with a strong rating by signalling to investors and financial institutions that a manufacturer is well prepared for the future market. Therefore, the system would also increase competition between manufacturers as their ratings would always be seen in comparison to the ratings of other manufacturers. This can already be seen as an indirect incentive for manufacturers to transition their sales portfolio.

5.4 Pricing

As a fourth element, an EU Clean Heat Market Instrument would include a pricing mechanism as an explicit financial incentive for manufacturers to scale up their supply chains and develop end-consumer markets for clean heating appliances. This mechanism can be seen as the central element of an EU CHMI, building on each of the previous elements.

While different options for designing such a mechanism exist, one thing that all these design options have in common is that they incentivise manufacturers to increase sales of eligible appliances and disincentivise additional sales of non-eligible appliances. The mechanism could function in three different ways:

1. As a fixed incentive, applying a performance-based charge to boiler manufacturers for all non-eligible appliances sold. In other words, a manufacturer with a good performance rating would pay a lower charge per appliance than a manufacturer with a poor performance rating. This would provide an additional incentive to improve their performance, and the level of the incentive would increase over time.
2. As a credit trading system such as the UK's CHMM, setting an explicit target for manufacturers to increase the share of clean heating appliances in their sales portfolio. This target would require manufacturers to reach a certain number of credits through sales of clean appliances according to the number of fossil fuel boilers sold. This target would

be raised over time. As in the UK, the system could allow manufacturers to buy credits from another manufacturer instead. To avoid a formalised credit trading system, pooling between manufacturers – in much the same way that happens with the CO₂ standards for cars – could be introduced as an alternative.

3. As a cap-and-trade system, requiring boiler manufacturers to purchase certificates for every boiler sold. As is the case with the EU ETS, the overall number of certificates would decrease over time, thereby progressively shrinking the market for fossil fuel boilers and building up a market for clean appliances. At first, manufacturers would have the possibility to buy certificates at an initial auction every year. Later, certificates could be traded between manufacturers on a secondary market.

Table 7 highlights the main differences between the different options with respect to the key design considerations.

→ Manufacturers involved: In a fixed incentive (model 1) or cap-and-trade system (model 3), only manufacturers selling fossil fuel boilers would be involved in the pricing mechanism, as these models only address fossil fuel boilers sold. By contrast, a credit trading system (model 2) would also allow specialist manufacturers of clean heating appliances to sell their credits to manufacturers of fossil fuel boilers, as is foreseen under the UK's CHMM. Though this would allow European specialist manufacturers to benefit from the system, thereby

Key design considerations for different pricing mechanisms

→ Table 7

Consideration	Fixed incentive	Credit trading	Cap-and-trade
Manufacturers involved	Manufacturers producing fossil fuel boilers	All manufacturers	Manufacturers producing fossil fuel boilers
Level of the incentive	Fixed	Determined by market	Determined by market
Market outcome	Uncertain	Certain	Certain
Administrative burden	Low	High	High

Elaboration by Agora Energiewende based on work by LCP Delta

→ Potential manufacturer responses to the CHMI

Depending on the time horizon, manufacturers will have different options for responding to the instrument. In the short term, cross-subsidising sales of clean appliances by increasing the prices of fossil fuel boilers appears to be the most intuitive reaction, as this would send a price signal to both installers and consumers. However, this strategy's long-term potential is limited by the profit margin of manufacturers, i.e. by the extent to which manufacturers can sustainably decrease prices for clean appliances. Cooperating with external manufacturers of clean appliances could be an alternative short-term response in the event that a manufacturer does not yet have a competitive supply of clean appliances. Such cooperation could take the form of a formal merger or more informal cooperation, whereby one manufacturer would sell an appliance produced by another manufacturer ("white labelling"). In the long term, however, building up a larger supply of clean appliances by fostering their uptake by consumers seems to be the most viable strategy for manufacturers. On the supply side, this strategy would require manufacturing capacities to be expanded and an attractive portfolio of clean appliances to be established. To develop the demand side, it would require a combination of price signals (cost-competitive base price, rebates, bonuses etc.) and non-financial measures (installer training, marketing, improving accessibility by streamlining the distribution channels of clean appliances). Streamlining distribution channels could also involve bundling the installation of clean appliances with other services, such as dynamic electricity tariffs or financing rooftop PV or insulation. Manufacturers could either offer such services directly or cooperate with large installer companies.

Source: LCP Delta (2025b)

strengthening their market position, non-European specialists would benefit from the system too, potentially weakening European competitiveness in the long term¹⁸.

→ Level of the incentive: While the incentive would be fixed in a system with fixed incentives, it would be determined by the market in a credit trading or cap-and-trade system. The price level in these latter systems would therefore correspond to the incentive required to produce a certain market outcome. In other words, such a system implicitly assumes that manufacturers are capable of achieving a given target within a given policy mix and that they are in a position to make clean heating appliances more attractive for consumers in order

to achieve the target. Therefore, these systems could place a considerable burden on highly ambitious manufacturers, leaving them no choice but to drastically adjust consumer prices. This assumption would be relaxed in a system with a fixed incentive that reflects the assumption that heating appliance manufacturers have limited agency¹⁹.

→ Market outcome: However, a fixed incentive would also imply that the instrument is unable to guarantee a certain market outcome. Consequently, the system would not be able to align the heating market with any specific climate- or energy-related targets. Regarding potential manufacturer responses (see text box below), this would limit the incentive for manufacturers to build up a more accessible supply of clean appliances in the long term.

¹⁸ This dimension of potential transfers between different groups of manufacturers was also one of the key concerns of the UK heating industry with regard to the UK's CHMM. Consequently, some mixed-portfolio manufacturers have indicated that they would prefer to pay an exit payment or to cross-subsidise their own heat pump sales out of their boiler revenues than to indirectly subsidise their competitors.

¹⁹ For example, a fixed incentive could be directly linked to the financial capabilities of manufacturers by corresponding to the average profit margin of a gas boiler, which is estimated to be around 100 euros.

→ Pricing under the EU CO₂ standards for cars

A pricing mechanism – the so-called “excess emissions premium” – is also an essential feature of the EU CO₂ standards for cars which has proven to be an effective driver the transition while balancing the impacts on manufacturers. Set at 95 euros per gram of CO₂ per vehicle exceeding the target, the premium was carefully calibrated to discourage non-compliance by making investment in cleaner technologies more cost-effective than paying fines. While it was wildly speculated that carmakers would receive significant fines during the last major target increase in 2020/2021, they were in the end largely able to avoid such fines. While the European Commission has not publicly disclosed detailed information on the fines imposed for 2020/2021, public reports indicate that the total fines were significantly lower in 2021 than in 2020. In 2020, automakers paid approximately 510 million euros in fines for missing CO₂ emission targets. By 2021, this amount decreased substantially, with reports suggesting that total fines amounted to around 10 million euros. This reduction is attributed to automakers' increased efforts to meet emission standards, including the adoption of electric vehicles and strategic pooling arrangements*.

*Electrek (2024).

→ Administrative burden: Setting up a formal trading system between manufacturers requires additional administrative resources. Both a credit trading and a cap-and-trade system would require the exchange of credits/certificates between manufacturers to be organised and monitored by the scheme administrator.

Given these key considerations, a fixed incentive seems preferable when the instrument is introduced as it would prevent any disproportional impact on manufacturers while gradually increasing the incentive for them to transition their sales portfolio. In the long term, however, a market-based mechanism might be needed to ensure market outcomes and motivate manufacturers to interact more directly with consumers.

5.5 Reallocation of revenues

One implication of choosing a system with fixed incentive would be that limited but substantial revenues would be generated by the instrument, depending on the level of the incentive. Reallocating these revenues back to manufacturers is crucial in order to reduce the financial burden imposed by the charges. At the same time, this can be used to provide them with additional incentives. Based on

these considerations, two options for reallocating the scheme revenues back to manufacturers have been identified:

- A. Part of such revenues could be reallocated to manufacturers based on the degree to which they improved their performance benchmark in the previous year. This would not only provide manufacturers with a further incentive to decarbonise their sales portfolio but would also reduce the financial burden of the charges by allowing them to reclaim a portion of these charges.
- B. Revenues could also be used to increase the scheme's impact on the competitiveness of European manufacturers of clean heating appliances. For example, the Commission could organise auctions at which manufacturers could bid for the revenues by offering to implement certain measures to improve the accessibility of clean heating, such as reskilling installers in markets with a low share of clean heating appliances. This would further increase the instrument's impact on the accessibility of clean appliances for consumers.

Linking such revenue reallocation to performance benchmark improvement appears to be the more straightforward option as it would be directly based on other elements of the scheme. However, any

excess revenues²⁰ could still be used to directly support manufacturers' efforts to make clean heating more accessible and could potentially even be complemented by other EU funds.

5.6 Possible timeline for the introduction of an EU Clean Heat Market Instrument

It seems unlikely that an EU Clean Heat Market Instrument could be introduced before 2029, as setting up such a system would clearly require new legislation. Therefore, its formal introduction would probably follow a lengthy timeline that would include a substantial period of impact assessment in order to develop the concrete legislative proposal in consultation with stakeholders and Member States, followed by a legislative process for the formal proposal, negotiation, adoption and implementation of the new law. Consequently, it is highly unlikely that such a legislative procedure could be concluded before

2028, meaning that the system could be launched in 2029 at the earliest. In other words, the instrument would serve as a long-term lever for heating decarbonisation as distinct from the potential short-term levers associated with the implementation of the Fit for 55 package and the strengthening of the existing policy framework.

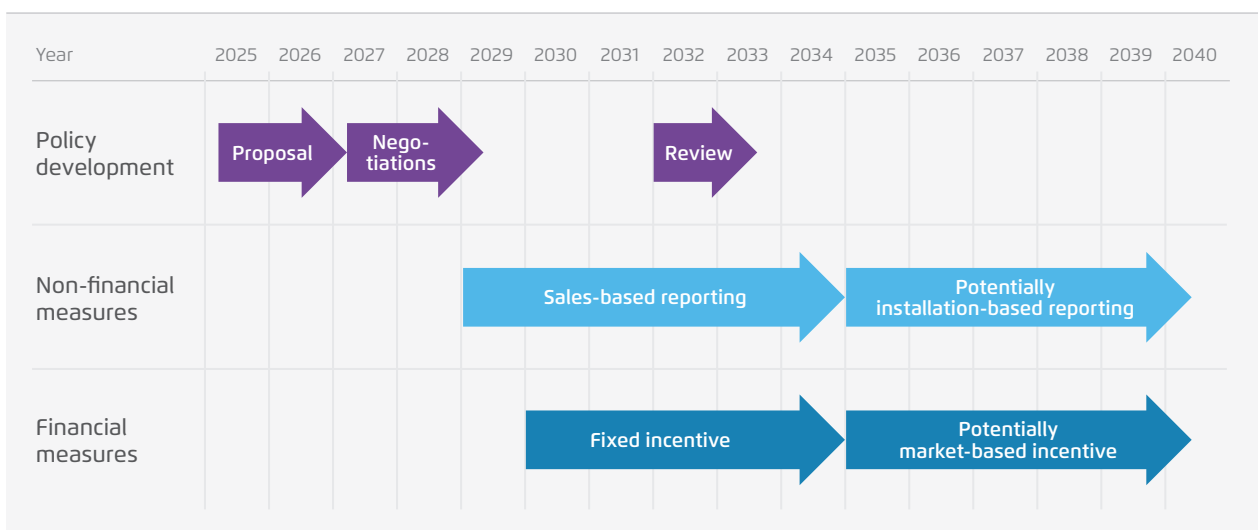
Despite the urgency required by the current state of the EU heating market, the aforementioned design considerations suggest that a sequential and gradual introduction of an EU CHMI would be necessary and preferable for at least two key reasons.

1. First, as the different elements of the system build upon each other, a sequential introduction would ensure that there is sufficient time to put in place and test the necessary reporting and benchmarking/disclosure infrastructure in order to ensure their robustness before the system's more consequential pricing element is introduced.
2. Second, a gradual introduction of the pricing element could help manufacturers manage this change by giving them more time to familiarise themselves with the system.

²⁰ A reallocation proportional to the improvement of the performance indicator would never lead to a full reimbursement of the charge as this would imply that a manufacturer would have completely decarbonised its sales portfolio.

Potential timeline for progressively strengthening an EU Clean Heat Market Instrument

→ Fig. 14



Agora Energiewende (2025)

As already indicated above, reviewing the instrument a few years after its introduction could therefore be used to significantly strengthen it. The review could be based both on experience gained during the first years and on the UK's experience. In terms of reporting, the review could also assess the feasibility of complementing the sales reporting system with an installation-based verification system such as that in the UK. This would allow the instrument to more directly ensure the quality of clean appliance

installations following the introduction of a harmonised installer certification system across the EU, building wherever possible on existing certification systems. In terms of the pricing mechanism, the review could allow a market-based system to be introduced in order to ensure the instrument's desired market outcomes. This could potentially align the pricing mechanism with specific climate and energy targets for 2040.

6 Balancing policies for a just and competitive transition

6.1 An EU CHMI cannot drive progress on its own

The EU Clean Heat Market Instrument should not be viewed as a stand-alone policy instrument to deliver the EU’s climate and policy objectives, but rather as a new policy instrument to complement and strengthen the existing policy mix.

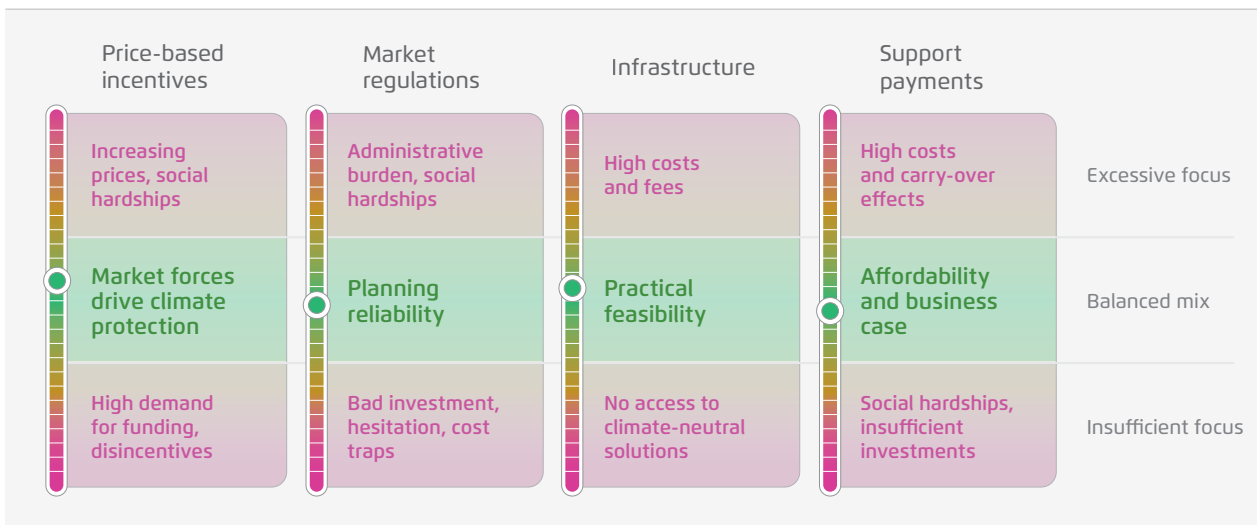
Firstly, given that the EU Clean Heat Market Instrument would only realistically enter into force at the end of the decade, the policy would clearly not close the pre-2030 delivery gap in the buildings sector or deliver the EU’s REPowerEU 2030 heat pump target by itself. Instead, its direct policy impact would largely be felt in the post-2030 policy environment, helping to contribute to the EU’s 2040 climate and energy goals and provide a clear policy signal for the long-term transformation of the heating sector. Importantly, this also implies that additional policies and measures will be needed at Member State level ahead of its introduction if the EU is to get the clean heating transition on track in the coming years.

Secondly, while the EU Clean Heat Market Instrument represents a significant policy innovation by addressing both the demand and supply sides of the heating market, it is insufficient on its own to address all major barriers to the deployment of clean heating. This applies particularly to running costs, which in the case of energy prices are largely impacted by factors beyond the direct control of heating appliance manufacturers, such as developments on wholesale energy markets and in terms of taxes, levies, surcharges and carbon pricing. This highlights the importance of continued policy action on energy price rebalancing, both through the introduction of the ETS 2 and through national energy price reforms.

Thirdly, an excessive focus on price-based incentives or market regulations can lead to significant negative impacts that should either be avoided or addressed by additional policies (see Figure 15).

Illustrative policy mix for a balanced climate policy

→ Fig. 15



Agora Think Tanks (2024): Klimaneutrales Deutschland. Von der Zielsetzung zur Umsetzung.

Put simply, the EU Clean Heat Market Instrument is no silver bullet. To be effective it must work in tandem with other complementary policies and wider government action in support of clean heating.

6.2 A socially just heating transition requires a balanced policy mix

For the EU Clean Heat Market Instrument to be equitable, it must also be embedded in a broader, well-coordinated policy framework. This framework should address existing market barriers and social impacts while providing sufficient lead time for manufacturers and governments to prepare for it.

Crucially, the instrument’s effectiveness and impact will depend significantly on the strength of the existing market and policy framework, which varies widely across Member States. Thus, policymakers must take this wider market and policy framework into account when designing such a policy instrument. In countries with robust frameworks, the CHMI would require limited additional incentives, as clean appliances are already competitive there. Conversely, in countries with weaker frameworks, substantial efforts and incentives will be needed,

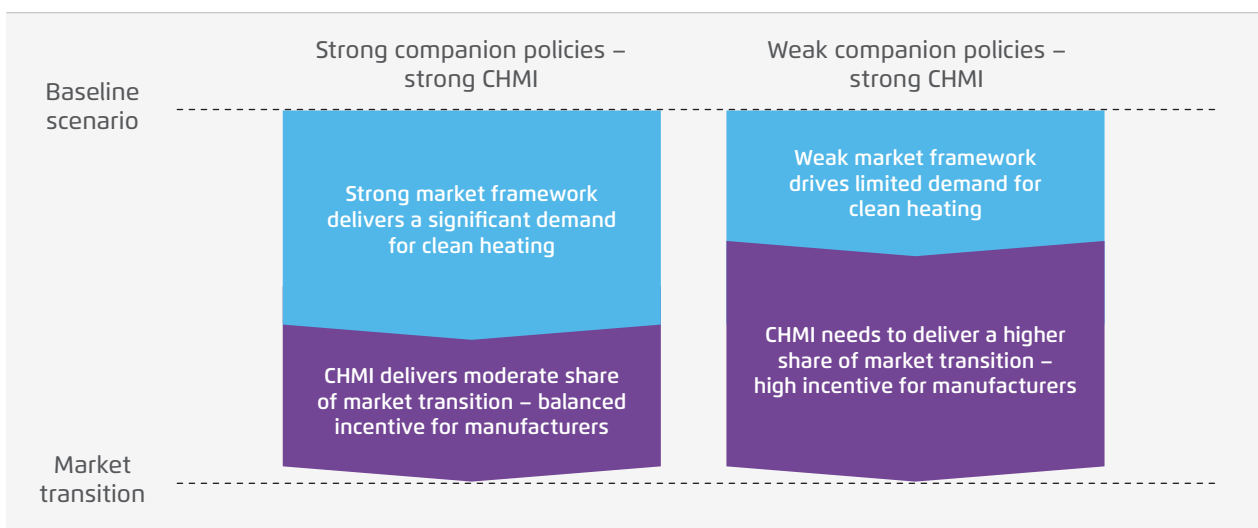
potentially leading to cross-subsidisation and higher appliance prices. To mitigate disparities across Member States, national governments must act early to address key barriers outside manufacturers’ control, such as high energy prices and limited access to subsidies and ensure the CHMI does not place disproportionate burdens on manufacturers. A gradual introduction of the CHMI is also crucial to give manufacturers time to adapt and scale up the supply of clean heating appliances.

Addressing social inequalities is equally important. Vulnerable households with limited financial capacity to respond to price signals risk bearing the brunt of higher heating costs under the CHMI unless proper safeguards are in place. It will thus be essential to expand existing measures, such as higher subsidies for low-income households, in order to ensure fairness and accessibility.

In both cases, European policies, including the ETS 2 and the Social Climate Fund, can play a pivotal role in ensuring a balanced policy mix. For instance, the ETS 2 can improve electricity-to-gas price ratios, while revenues from the Social Climate Fund can support targeted subsidies and market development programmes.

How the broader market framework influences the relative impact of a Clean Heat Market Instrument (CHMI)

→ Fig. 16



Agora Energiewende (2025)

→ Insulation policies and the CHMI

Insulation policies also contribute to the market framework for heat pumps as the latter's efficiency depends on the thermal envelope of a building. Therefore, the effectiveness an EU CHMI could be limited by the EU building stock's thermal envelope quality given that the instrument would be insufficient to make clean heating attractive in worst-performing buildings. Consequently, the long-term success of an EU CHMI would require strong support for insulation. Such support will also be needed to address the inequalities mentioned above, as the average efficiency of the building stock varies between Member States and low-income households tend to live in more poorly insulated dwellings. On a political level, this will necessitate the proper implementation of National Building Renovation Plans under the EPBD, which need to be completed by the end of 2026. These plans need to significantly drive forward the rate of renovation in the Member States.

Next to strengthening the market framework for clean appliances through complementary policies, the level of ambition for the instrument will be the second lever for achieving a balanced policy mix. Already starting with a high ambition level would complicate attempts to balance the CHMI with other policies as it would directly confront manufacturers with a high incentive to transition their sales portfolio. Compared to a more moderate ambition level, this would increase the risk of unintended consequences. On the contrary, gradually increasing the incentive would allow for policy learning as policymakers would be able to adapt the system and therefore reduce the risk of unintended consequences.

6.3 Early action is needed to pave the way for the EU CHMI

Timing is also critical. Policies to strengthen market frameworks should be implemented well before the CHMI's launch, as these typically involve national legislation that can be enacted more quickly than European measures.

Achieving this goal will require the proper implementation of European legislation. One of the most important tasks for national governments – especially in Member States with no existing carbon price for heating fuels – will be to implement an effective yet socially acceptable carbon price when the ETS 2 is launched in 2027. Member States will

need to ensure that this carbon price is transposed into national law as quickly as possible. Urgent action is also needed regarding the Social Climate Fund, as Member States will need to submit their Social Climate Plans with their spending priorities by June this year. These plans must ensure that funds are used effectively to make clean heating appliances accessible and affordable for vulnerable households. Lastly, Member States need to ensure that their policies are in line with European legislation in terms of financial support for heating appliances and public procurement rules. While Member States are theoretically already obliged to consider energy efficiency and climate criteria in these policies, some have not yet aligned their national policies with the European framework.

Member States also have numerous additional short-term levers at their disposal to improve the market framework for clean appliances. Concerning energy prices, Member States have the option to decrease energy taxes or VAT on electricity, which plays a key role in the electricity-to-gas price ratio in some Member States. The same is true of VAT on clean appliances, with many Member States not taking advantage of the possibility offered by the VAT directive to reduce VAT²¹. By differentiating VAT rates between clean appliances and fossil fuel boilers,

²¹ EHPA (2024b).

Member States could also prepare for the introduction of an CHMI by already sending a clear price signal to market actors.

6.4 An EU CHMI would help complement and strengthen existing policies

While the inherent limitations of the EU Clean Heat Market Instrument and the need for a wider policy mix have to be given consideration, the CHMI can play an important role in complementing and strengthening the existing policy framework for clean heating.

Firstly, the CHMI could serve as a vital commitment device for both manufacturers and governments. In the case of the former, it would underscore the EU's climate objectives, providing manufacturers with a clear, predictable signal to accelerate the transition to clean heating technologies. For governments, introducing the CHMI would signify their strong policy commitment to clean heating, requiring parallel efforts to strengthen the broader policy framework. This dual role of the CHMI – guiding industry while compelling governments to address regulatory and market gaps – could help to enhance alignment with the EU's climate neutrality targets.

Notably, balancing policies has also been a key consideration alongside the introduction of the UK's CHMM. For example, the UK government capped

penalties at 500 pounds sterling per missing heat pump credit in the scheme's first year. It also nearly doubled the Boiler Upgrade Scheme budget for heat pump grants and launched the Heat Pump Accelerator Competition to fund production capacity expansion.

Secondly, the CHMI could play an important role in the post-2030 policy framework. Besides sending a clear long-term signal to the heating industry to invest in clean heating, its direct impact after 2030 could contribute considerably to minimising the lock-in of fossil fuel heating appliances in the decade to 2040. Thus, its introduction could make a significant contribution towards reducing the currently projected delivery gap with respect to the expected 2040 climate target.

In much the same way that CO₂ standards do for cars, vans and trucks in the transport sector, the policy could also play an important role as a companion policy to carbon pricing under the ETS 2. By reducing the installation of fossil fuel boilers and subsequent emissions from fossil heating in the buildings sector, it would help keep ETS 2 prices in check, thereby helping to secure the political acceptability of emissions trading for heating and transport fuels.

In short, while the CHMI must be integrated into a cohesive policy framework, it can also be expected to make a significant contribution to driving a fair and effective heating transition across Europe, balancing the needs of industry and consumers while aligning with the EU's climate and energy goals.

7 Outlook

A new industrial strategy for the heating sector will be essential in the upcoming EU policy cycle to accelerate the heating transition. The current policy framework fails to provide a compelling business case for scaling up the supply of clean heating appliances, putting the competitiveness of European industry at risk. This stagnation in the heating transition is jeopardising Europe's leadership in another crucial cleantech sector.

An EU Clean Heat Market Instrument (CHMI) could play a pivotal role in this new strategy. By streamlining reporting requirements, improving access to private capital and providing financial incentives to manufacturers, the CHMI would significantly boost the competitiveness of clean heating technologies in Europe. It would also create a long-term growth perspective for the sector, aligning with the broader transition to more efficient appliances. Importantly,

the CHMI would help to ensure that Europe's recently added manufacturing capacities are matched with sufficient demand, making it an effective and forward-looking industrial policy.

Introducing an EU CHMI is in line with the priorities of the new European Commission. It would safeguard the future competitiveness of a key European industry under the Clean Industrial Deal and support the integration of the European energy system, as envisioned in the Electrification Action Plan.

However, timely action is critical. To enable the necessary legislative proposal to be drawn up and the interinstitutional negotiations to be conducted within this policy cycle, political discussions on the CHMI need to begin immediately. This would allow the required legislation to be adopted before the end of the current policy period.

8 Annex

Stakeholder Sounding Board

As mentioned previously, the project was accompanied by extensive engagement of relevant stakeholders. Notably, a stakeholder sounding board met three times (April, June and October) and included representatives of the European Commission, responsible national ministries, individual heating appliance manufacturers, the main EU heating industry associations and civil society organisations active in the domain of EU heating policy.

During these meetings, key aspects of the project have been discussed corresponding to the different stages of the project at which they took place. While the first meeting was focused on the general outline of the project, initial results for the work packages were discussed in the second meeting and nearly-final results have been discussed during the third meeting.

Participants in the Stakeholder Sounding Board

Representatives of the following organisations participated in some or all of the dialogue group meetings. Agora Energiewende would like to thank all of them for their time and valuable contribution to the discussion.

Basis for the participation

Participants discussed and reviewed inputs prepared by Agora Energiewende and LCP Delta that served as the basis of this report. This report has not been endorsed or approved by the participants or their organisations.

Participating organisations

European Commission, DG Energy

German government, Ministry for Economy and Climate Protection (BMWK)

French government, General-Directorate for Climate and Energy

Dutch government, Ministry of Housing and Spatial Planning

International Energy Agency (IEA)

European Climate Foundation (ECF)

European Environmental Bureau (EEB)

Environmental Coalition on Standards (ECOS)

The European Consumer Organisation (BEUC)

Regulatory Assistance Project (RAP)

European Heating Industry (EHI)

European Heat Pump Association (EHPA)

Ariston Group

Stiebel Eltron

Viessmann

Groupe Atlantic

NIBE

GCP Europe

Agora Energiewende project team and consultants present throughout the dialogue process:

Name	Organisation
Andreas Graf	Agora Energiewende
Steffen Verheyen	Agora Energiewende
Steven Ashurst	LCP Delta
Jonny Buzzing	LCP Delta

Estimating impacts

Like any impactful policy instrument, introducing an EU Clean Heat Market Instrument would have considerable effects (positive and negative) on different groups of stakeholders. These effects result from the changing sales mix for heating appliances which implies a higher number of clean appliances sold while the number of fossil fuel boilers sold would decrease. Therefore, LCP Delta has provided an analysis of these potential impacts.

The following main impacts were identified²²:

Consumers are expected to benefit from a decrease in energy costs as clean appliances are more efficient than fossil fuel boilers. This size of this effect is estimated to vary significantly between different Member States due to differences in electricity-to-gas price ratios. However, consumers are also confronted with higher capital costs as clean appliances are generally more costly compared to fossil fuel boilers although this cost gap is expected to decrease over time. The analysis did not take into account potential reactions of the manufacturers to the pricing mechanism which could further decrease the cost gap as manufacturers could react by decreasing heat pump prices while increasing boiler prices.

Manufacturers are expected to face additional costs as they are confronted with both administration costs and charges for their fossil fuel boiler sales. Here, again, the amount of the additional costs depends on manufacturers' reactions to the scheme and the question whether they are able to pass-on additional costs to consumers. Moreover, the additional costs through the charges might be mitigated partially or completely depending on the manufacturer's progress in transitioning its sales portfolio.

Furthermore, manufacturers also face additional revenues as a consequence of the switch to appliance with higher upfront costs. While this would increase the overall revenue of the heating industry, individual companies might not benefit from this transition depending on their market share in the market for clean appliances.

Society is facing benefits due to decreases in both emissions and air pollution. These benefits are expected to accumulate over time with more of the additional clean appliances sold coming into operation. Therefore, the instrument's initial impacts on these indicators might be rather small compared to the impacts after several years.

Due to different market environments for clean appliances, the size of these different effects and their overall result is expected to differ strongly between Member States. While LCP Delta's estimations for the Social Net Present Value (SNPV) are positive for Member States with an advanced framework for clean appliances as well as for the EU in total, they are negative for Member States where the current framework for clean appliances is less advanced. This underlines the important role of the proper implementation of planned European policies such as the ETS II and the Social Climate Fund as these policies are expected to significantly improve the market framework for clean appliances in these Member States.

LCP Delta has also analyzed the impact of several sensitivities on the estimations for the Social Net Present Value. These estimations show that the SNPV reacts strongly to changes on the assumptions for both upfront costs and running costs. These findings highlight, again, the case for complementary policies to decrease upfront and running costs for clean appliances.

²² For a detailed analysis as well as quantitative estimations see LCP Delta (2025b).

References

Agora Energiewende (2024): *EU policies for climate neutrality in the decisive decade*. Online available at: <https://www.agora-energiewende.org/publications/eu-policies-for-climate-neutrality-in-the-decisive-decade>

Agora Energiewende (2024): *Klimaneutralität Deutschland*. Online available at: <https://www.agora-energiewende.de/publikationen/klimaneutrales-deutschland-studie>

Coolproducts (2023): *Subsidies for fossil heating appliances in the EU and the UK*. Online available at: <https://www.coolproducts.eu/wp-content/uploads/2023/07/mission-possible-full-report.pdf>

Elektrek (2024): *Volkswagen, Land Rover among those paying millions in fines for missing CO₂ targets*. Online available at: <https://electrek.co/2024/04/12/volkswagen-land-rover-among-those-paying-millions-in-fines-for-missing-co2-targets/>

European Environmental Agency (2024): *Trends and projections in Europe 2024*. Online available at: <https://www.eea.europa.eu/en/analysis/publications/trends-and-projections-in-europe-2024>

European Heat Pump Association (2023): *EHPA Market report for 2022 – sample version*. Online available at: <https://www.ehpa.org/news-and-resources/publications/heat-pump-sales-in-europe-2021-ehpas-2022-market-report/>

European Heat Pump Association (2024): *Europe avoiding 5.5 cubic meters of gas with heat pumps*. Online available at: <https://www.ehpa.org/news-and-resources/news/europe-avoiding-5-5-billion-cubic-metres-of-gas-with-heat-pumps/>

European Heat Pump Association (2024a): *Pump it down: Why heat pump sales dropped in 2023*. Online available at: <https://www.ehpa.org/news-and-resources/press-releases/pump-it-down-why-heat-pump-sales-dropped-in-2023/>

European Heat Pump Association (2024b): *European countries failing to make heat pumps affordable*. Online available at: <https://www.ehpa.org/news-and-resources/news/heat-pumps-versus-boilers-taxes-and-running-costs/>

Eunomia (2023): *EU Hydronic Heat Pump Manufacturing Market Assessment*. Online available at: <https://eunomia.eco/reports/eu-hydronic-heat-pump-manufacturing-market-assessment/>

European Commission (2020): *EU Taxonomy Regulation*. Online available at: <https://eur-lex.europa.eu/eli/reg/2020/852/oj/eng>

European Commission (2022): *Corporate Sustainability Reporting Directive*. Online available at: <https://eur-lex.europa.eu/eli/dir/2022/2464/oj/eng>

European Commission (2023): *Regulation on establishing a Carbon Border Adjustment Mechanism*. Online available at: <https://eur-lex.europa.eu/eli/reg/2023/956/oj/eng>

European Commission (2024): *Impact Assessment on a 2040 climate target*. Online available at: https://climate.ec.europa.eu/document/download/768bc81f-5f48-48e3-b4d4-e02ba09faca1_en

European Commission (2024a): *Commission notice on phasing out financial incentives for stand-alone boilers powered by fossil fuels under the recast of the Energy Performance of Buildings Directive*. Online available at: https://energy.ec.europa.eu/document/download/a9780433-4343-4808-b1d4-94528f1c0a31_en

European Commission (2024b): *Ecodesign for Sustainable Products Regulation*. Online available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781&qid=1719580391746>

European Commission (2024c): *Waste Framework Directive*. Online available at: <https://eur-lex.europa.eu/eli/dir/2008/98/oj/eng>

European Commission (2024d): *Due Dilligence Directive*. Online available at: <https://eur-lex.europa.eu/eli/dir/2024/1760/oj/eng>

European Commission et al. (2024): *Heat Pumps in the European Union – 2024 Status Report on Technology Development, Trends, Value Chains and Market*.

French government (2024): *Produire 1 million pompes à chaleur en France pour décarboner les bâtiments et l'industrie*. Online available at: <https://www.entreprises.gouv.fr/la-dge/actualites/produire-1-million-de-pompes-chaleur-en-france-pour-decarboner-les-batiments-et>

French government (2024): *Produire 1 million pompes à chaleur en France pour décarboner les bâtiments et l'industrie*. Online available at: <https://www.entreprises.gouv.fr/la-dge/actualites/produire-1-million-de-pompes-chaleur-en-france-pour-decarboner-les-batiments-et>

FES Just Climate (2023): *Removing social and economic barriers to decarbonising heating*. Online available at: <https://justclimate.fes.de/e/removing-social-and-economic-barriers-to-decarbonising-heating.html>

Household Energy Price Index (2024): *Energy prices for December 2024*. Online available at: <https://www.energypriceindex.com/price-data>

International Energy Agency (2024): *Advancing clean technology manufacturing*. Online available at: <https://iea.blob.core.windows.net/assets/7e7f4b17-1bb2-48e4-8a92-fb9355b1d1bd/CleanTechnologyManufacturingRoadmap.pdf>

LCP Delta (2023): *Are heat pumps at the inflexion point on a hockey stick-shaped growth curve?*

LCP Delta (2025): *Analysis of the EU Heating Market*. Online available at: <https://www.agora-energiewende.org/publications/analysis-of-the-eu-heating-market>

LCP Delta (2025a): *Designing a European Clean Heat Standard*. Online available at: <https://www.agora-energiewende.org/publications/designing-a-european-clean-heat-standard>

LCP Delta (2025b): *Assessing the potential impact of a European Clean Heat Standard*. Online available at: <https://www.agora-energiewende.org/publications/assessing-the-potential-impact-of-a-european-clean-heat-standard>

Regulatory Assistance Project (2023): *Clean heat standards: New tools for the fossil heat phase-out in Europe*. Online available at: <https://www.raponline.org/knowledge-center/clean-heat-standards-new-tools-for-fossil-fuel-phaseout-in-europe/>

Regulatory Assistance Project (2024): *Clean heat standards handbook*. Online available at: <https://www.raponline.org/knowledge-center/clean-heat-standards-handbook/>

Sprind (2023): *Produktivität von Handwerker:innen bei Wärmepumpeneinbau verzehnfachen*. Online available at: <https://www.sprind.org/magazin/gutachten-thermondo>

UK Government (2024): *Clean Heat Market Mechanism*. Online available at: <https://www.gov.uk/government/consultations/clean-heat-market-mechanism-adjustment-to-scheme-introduction-date>

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Agora Energiewende develops scientifically sound, politically feasible ways to ensure the success of the energy transition – in Germany, Europe and the rest of the world. The organisation works independently of economic and partisan interests. Its only commitment is to climate action.

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