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A Heated Debate in a Heating World: Heat Pumps amid Energy Crisis

Alice Moscovici,
Research fellow, energy and industrial policy

Phuc-Vinh Nguyen,
Head of the Jacques Delors Energy Centre,
Senior Research fellow, French and EU energy policy

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Executive Summary

Russia's second invasion of Ukraine settled the economic and political cost of Europe's dependence on imported fossil fuels. **Four years later, the war in Iran has confirmed that this vulnerability is not episodic but structural.** Europe cannot insulate itself through emergency packages alone. What is required is a sustained programme to remove imported fossil fuels from final energy use, with low-carbon electrification as the central pathway. Yet current spending still points in the wrong direction. Our latest estimate that of the €16 billion mobilised in emergency measures, only about €2 billion has supported electrification. In parallel, price caps tax relief and on fuels and gas have prolonged the very dependence Europe is trying to reduce. **The European Commission's forthcoming Electrification Action Plan, due in mid July 2026, is therefore the opportunity to make that pivot - to treat each geopolitical shock not as a problem to be cushioned, but as the core reason to accelerate the transition.**

Residential heat pumps sit at the centre of this argument, being able to simultaneously reduce household exposure to gas prices and cut emissions in the buildings sector. But the European heat pump market remains fragile. In fact, although the EU has met its *REPowerEU* milestone, the installed base still falls short of the trajectory implied by the *Fit for 55*, and annual sales continue to move with gas prices rather than resting on stable, policy-driven demand.

The report shows that two conditions are decisive if this market is to become durable. The first is the electricity-to-gas price ratio. Heat pumps do not require electricity to be cheaper than gas in absolute terms, but they do require electricity to remain reasonably attractive relative to gas. Where the ratio is unfavourable (more than 2:1 times), public support must compensate for weak market incentives, creating a fiscal trap in which governments spend more simply to offset distorted price signals. **The second condition is policy credibility**. Heat pumps are long-term investments, and households, installers and manufacturers need stable rules, predictable subsidies and a clear regulatory direction. Stop-and-go policy design, abrupt changes in grants or repeated reversals of mandates undermine confidence and slow market transformation.

The four countries analysed show that there is no single model for success. Ireland demonstrates the limits of relying mainly on carbon pricing: the tax is politically established, but it has not delivered large-scale heat pump deployment because electricity remains structurally disadvantaged and crisis measures have weakened the relative price signal. **The Netherlands** offers the clearest example of direct fiscal rebalancing, having shifted taxation away from electricity and onto gas in a way that improved the economics of heat pumps. Yet its experience also shows that price signals are only effective when backed by stable regulation: the cancellation of the planned hybrid heat pump mandate weakened long-term credibility. **Germany** illustrates the opposite risk, with ambitious regulation introduced in a context where electricity remained relatively expensive and policy design became politically contested. **France** starts from a more favourable electricity mix and a better baseline ratio, but repeated changes to grant schemes and fiscal constraints have weakened the credibility of support. **The common lesson is that electrification succeeds only when relative prices, regulation and support instruments altogether are aligned over time.**

Importantly, the optimal policy sequence differs depending on a country's starting point. Where the ratio is already favourable, the priority shifts to policy delivery: subsidies that are stable and well designed, light administrative burdens, and an end to the stop-and-go support that has repeatedly shaken confidence. Germany and the Netherlands show the costs of reversals; France shows the limits of instability even when fundamentals are stronger. Where the electricity-to-gas ratio is still unfavourable, fixing that ratio must come first as regulation alone cannot overcome a price signal pointing in the wrong direction.

To do so, the current energy crisis should be treated as a political window to rebalance relative prices in favour of electricity. Governments should not seek to suppress energy prices uniformly as seen in France in 2022. Instead, crisis support should be designed to protect households while preserving incentives for electrification. That means cushioning electricity more than gas, as Ireland and Germany did in 2022, and using more differentiated support rather than broad, untargeted price caps. Stronger relief on electricity, targeted transfers for gas-dependent households, and temporary reductions in taxes and levies can all be deployed through existing billing systems. This is not only fiscally more efficient; it is also better aligned with electrification because it protects vulnerable households without erasing the price signals needed to drive heat pump investment.

The medium-term challenge is to unlock the scale of investment needed for ambitious and durable electrification policies. The war in Iran has raised oil and gas prices in a way that resembles, though with a different magnitude and volatility, the price signal that the new carbon market for buildings and road transport is expected to create from 2028. The difference is that today's geopolitical shock generates no public revenue for Member States to reinvest in decarbonisation. ETS2, by contrast, can turn a carbon price into a financing tool. **Frontloading future ETS2 revenues through the European Investment Bank would give Member States the fiscal capacity to move beyond short-term emergency relief and support large-scale, predictable and socially credible transition policies.** Under such a mechanism, the EIB would provide loans to Member States, backed by future ETS2 revenues. This would allow governments to finance heat pumps, electricity-tax reductions, building upgrades and targeted household support before ETS2 becomes politically contested. In this framework, ETS2 would cease to be seen primarily as a political liability and would become a financing engine for Europe's electrification. The logic is straightforward: preserve the relative price signal now, and use future ETS2 revenues to build the investment architecture that makes the transition durable.

Ultimately, electrification should not be treated as a narrow climate policy instrument, but as a core energy security strategy. The strategic question is therefore not whether to intervene, but how to use intervention to turn emergency response into durable transition: **in the short term, by preserving the electricity-to-gas price ratio; in the medium term, by mobilising ETS2 revenues to finance ambitious, scalable, and socially credible electrification policies.**

Finally, Member States and the European Commission should prepare contingency plans based on three possible scenarios for the Strait of Hormuz: a rapid reopening in July, a disruption lasting until the beginning of the winter heating season, and a prolonged conflict. These plans should predefine the demand-reduction measures that would apply under each scenario, drawing on existing examples such as Portugal's rules-based crisis triggers and the Netherlands' multi-stage oil crisis framework. They should also clarify under what conditions additional exceptional measures could be justified, including temporary flexibility under European fiscal rules. Such flexibility should remain tightly conditioned: it must be temporary, targeted, proportional to the scale of the shock, and oriented towards electrification and demand reduction rather than blanket fossil-fuel subsidies.

Introduction

Russia's invasion of Ukraine in 2022 laid bare the political and economic costs of our dependence on imported fossil fuels - particularly gas - inflicting an estimated €930 billion in additional import costs over the course of the crisis[1]. Four years later, renewed geopolitical tensions involving Iran have once again revealed the structural fragility of the European energy system and the inadequacy of many of the policy responses adopted in the aftermath of the first shock. Despite the scale of disruption and the apparent political consensus it generates, the European Union (**EU**) remains highly vulnerable to the very fossil fuel markets it sought to escape. **What is required today is not another crisis-exit plan, but a coherent and economically grounded political agenda capable of structurally phasing out fossil fuels through the electrification of end uses - an agenda that was already urgent in 2022 and has since become indispensable.** In this respect, the European Commission's forthcoming "Electrification Action Plan", scheduled for 15 July 2026, should mark a decisive inflection point - transforming recurring geopolitical energy shocks into a durable electrification shock.

To date, however, the EU's electrification strategy has resembled alternating current more than a continuous one. Policy effort has been concentrated overwhelmingly on the supply side - namely, the decarbonisation of electricity generation - and has undeniably delivered results. The EU power mix has shifted from being predominantly fossil-based in 2005 (53%) to one in which they represent just 29% in 2025[2]. Yet progress on the demand side has advanced timidly. Over the same period, the EU's electrification rate increased only marginally, from 19.2% to just 23%, lagging behind economies such as China, where electrification rose from 15.6% to 28%.[3] This gap cannot be attributed to a lack of strategic intent. The European Green Deal, the *Fitfor55* package[4], and, more recently, the Clean Industrial Deal, all implicitly point towards a substantially more electrified economy, with an indicative electrification target of 32% by 2030. Rather, it reflects a growing disconnect between long-term strategic objectives and the policy environment required to achieve them. The dilution of the 2035 ban on new internal combustion engine vehicles[5], the one-year postponement of the second carbon market[6] (**ETS2**), and proposals to prolong free allowances for energy-intensive industries under the existing ETS[7] all reflect **a growing tendency to subordinate long-term electrification objectives to short-term competitiveness concerns - and, with them, to prolong reliance on fossil solutions**.

This disconnect is particularly striking given the scale and immediacy of the electrification opportunity. Transport alone is expected to

1 Dr.Rosslowe, Chris. "Shockproof: how electrification can strengthen EU energy security". Ember. October 2025.

2 Ember. "Electricity Data Explorer"

3 Enerdata. "Share of Electricity in Total Final Energy Consumption." Enerdata Yearbook, 2026 edition.

4 Defard, C. & Nguyen, P.-V. "En route vers l'objectif de neutralité climatique: quelles transformations pour 2030?", Institut Jacques Delors, February 2024.

5 European Commission. "Commission takes action for clean and competitive automotive sector". Press Release. December 2026

6 Pacheco, Marta. "Carbon tax on buildings and transport delayed to 2028 under EU climate deal". Euronews, December 2025.

7 Krukowska,Ewa. "EU to Allocate More Free Carbon Permits to Industry". Bloomberg. May 2026

account for nearly 40% of electrification growth between 2025 and 2030. Electric vehicles displaced an estimated 1.5% of EU net oil imports in 2024, providing a tangible - if still modest - indication of their potential contribution to energy sovereignty.[8] In the buildings sector, **heat pumps represent a smaller share of electrification growth in absolute terms (7%), yet their impact on fossil fuel demand is disproportionately large**. In 2024, the existing stock of residential heat pumps avoided approximately 5.5 billion cubic metres of gas consumption, equivalent to around 2% of total EU gas imports. Despite this demonstrated potential, deployment patterns remain inconsistent with what would be expected from a technology consolidating its position as the default heating solution.

While the EU formally met the REPowerEU target of 20 million installed heat pumps by 2026, this milestone should not be interpreted as evidence of self-sustaining market momentum. By the end of 2025, 29.3 million residential units were operational across the biggest European markets - well below the 60 million required to remain on track with the *Fitfor55* trajectory by 2030[9]. Achieving this objective would require annual sales exceeding 6 million units, more than double the historical peak of 3.2 million reached in 2022 - and, crucially, sustained over time. To date, however, deployment has remained closely tied to oscillations in the gas price cycle rather than anchored in stable, policy-driven demand. Sales surged to 3.2 million units in 2022 amid peak gas prices[10], before declining to 3 million in 2023 and 2.4 million in 2024 as prices eased. Early data from 2026 suggest a renewed increase of 17% year-on-year[11], partly linked to renewed geopolitical tensions. Such patterns do not reflect structural market maturation, but rather continued exposure to the very volatility electrification is intended to mitigate.

Whether the current rebound evolves into a durable trend will depend on governments' ability to move beyond reactive crisis management and establish long-term policy frameworks capable of sustaining demand independently of fossil fuel price cycles. So far, the evidence remains unconvincing. Of more than 210 emergency measures adopted at an announced cost of 16 billion euros[12], only 30 measures totalling around 2 billion have been directed towards electrification. Despite their fiscal cost and limited structural impact, governments continue to rely on VAT reductions, tax suspensions, and broad-based price relief mechanisms targeting oil and its derivatives. Should the conflict prove protracted, there is a significant risk that such interventions will be extended progressively to gas markets, particularly as rising prices begin to feed into household bills. The lesson of 2022 - that targeted support for vulnerable households and robust price signals for the broader economy are complements, not alternatives - has yet to be fully internalised.

By contrast, evidence from periods of relative price stability suggests that electrification demand can respond rapidly to credible and well-designed policy frameworks. One central constraint to large-scale deployment remains economic. Upfront installation costs - typically ranging from €10,000 to €15,000, remains markedly higher than the €3,000 to €7,000 generally associated with the replacement of a gas boiler[13], creating a substantial barrier for lower- and middle-income households who are both more exposed to energy poverty and more

8 ibid.

9 Achieving the Fit for 55 target implies 40 million additional units by 2030, lifting the total stock to around 60 million.

10 European Heat Pump Association. "Market intelligence - interactive platform". Countries included: France, Germany, Italy, Spain, Sweden, Finland, Belgium, Poland, Netherlands, Denmark, Austria, Portugal, Czechia, Estonia, Lithuania, Ireland, Slovakia, Hungary

11 European Heat Pump Association. "Energy crisis sees rise in heat pump sales". May 2026. Include only 11 countries.

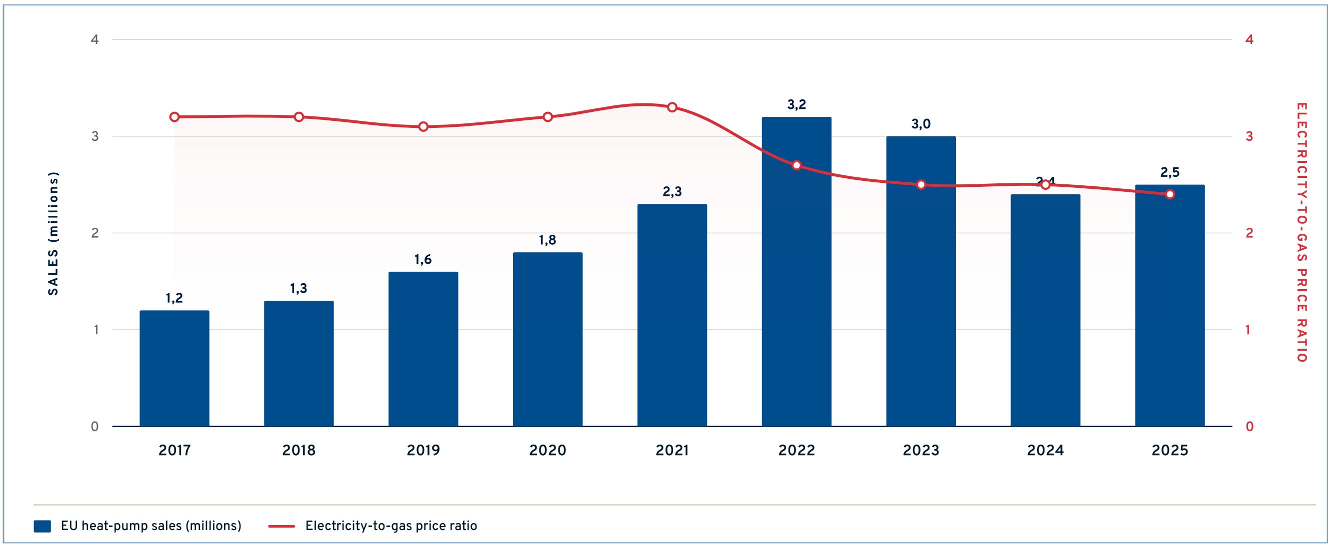
12 Moscovici, Alice et Nguyen, Phuc-Vinh. "Energy shock: Immediate Responses And National context". Interactive tracker. June 4 2026.

13 Varying by country, system type (air- or ground-source), home size, existing infrastructure, efficiency rating, labor and manufacturing capacities

likely to live in poorly insulated buildings[14]. While capital subsidies can partly address this gap, they cannot compensate for weak operating cost incentives. **In this context, the electricity-to-gas price ratio emerges as one critical determinant of household decision-making - that is, the relative price households pay for one unit of electricity compared with one unit of gas.** Given that heat pumps are typically about three times more efficient than gas boilers, their economic attractiveness depends fundamentally on relative energy prices. The electricity-to-gas price ratio directly shapes both operating cost savings and the level of upfront support required to ensure acceptable payback periods. When electricity prices are sufficiently low relative to gas, households can achieve substantial lifetime savings - in the range of 20% to over 60%[15] - and require limited capital support. By contrast, higher ratios compress operational savings and increase the need for subsidies to offset upfront investment costs.

While estimates vary, a ratio at or below 2:1 is generally considered necessary to ensure a clear economic case[16]. Yet several Member States significantly exceed this threshold, including Belgium (3.8), Romania and Hungary (3.6), and Germany (3.2) as of late 2025, materially weakening the financial attractiveness of adoption. Conversely, others demonstrate that more favourable conditions are achievable, such as the Netherlands (1.4), Bulgaria (1.8), and Portugal (1.9). Evidence supports this relationship: at the EU level, heat pump sales increased markedly when the ratio narrowed during the 2022 crisis and declined as it widened thereafter (Figure 1). At the national level, Member States with persistently high ratios also tend to exhibit lower levels of deployment.

FIGURE 1. Heat Pump sales and the electricity-to-gas price ratio in the EU



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with EHPA and Eurostat Data.
▲ Note: Sales cover the largest EU markets only – France, Germany, Italy, Spain, Sweden, Finland, Belgium, Poland, Netherlands, Denmark, Austria, Portugal, Czechia, Estonia, Lithuania, Ireland, Slovakia and Hungary.

This distortion has multiple origins. One important factor lies in wholesale electricity price formation, which continues to reinforce the linkage between electricity and gas prices. Despite their relatively limited share in total generation in some Member States, gas-fired power plants frequently remain price-setting in EU electricity markets. As a result, gas

14 European Parliament's Committee on Industry, Research and Energy (ITRE). "Energy Efficiency for low-income& households". 2016

15 European Commission. "5 things you should know about heat pumps". Directorate-General for Energy. December 2025

16 European Heat Pump Association."2024 Annual Report". April 2025.

prices continue to shape electricity prices for a significant share of hours, meaning that even increasingly decarbonised power systems remain partially coupled to fossil fuel costs.

Fiscal policy, however, plays an important – and more immediately addressable – role. In most Member States, **electricity is taxed at nearly twice the rate applied to gas, (excluding VAT),** a disparity that exceeds a factor of three in countries such as Germany, Czechia, and Belgium. **These asymmetries reflect legacy fiscal frameworks designed when electricity was a commodity to be taxed rather than a vector of decarbonisation to be incentivised.** The Energy Taxation Directive (**ETD**), first adopted in 1992 and last revised in 2003, continues to set minimum tax rates based on energy content rather than carbon intensity, thereby embedding a structural bias against electrification. The 2021 reform proposal sought to address this misalignment but has stalled due to unanimity requirements in the Council. **Against this backdrop, the European Commission is exploring alternative avenues to rebalance price signals, including a principle that electricity should not be taxed more heavily than gas**[17]. By anchoring such a provision in the Electricity Regulation under Article 194, this approach could bypass unanimity and rely on qualified majority voting. While Member States would retain discretion over tax levels, they would no longer be able to tax electricity more heavily than natural gas. In the absence of EU-level reform, Member States already retain substantial room for manoeuvre: reducing electricity taxation to ETD minimum levels[18], applying reduced VAT rates (down to 5%), removing non-energy levies from electricity bills, or shifting policy-driven costs onto fossil fuels or into general government budgets. Explicit carbon pricing on gas - already operational in nine Member States and set to expand under ETS2 from 2028 - offers a further avenue for rebalancing relative prices. Progress on these measures, however, remains deeply uneven.

However, price signals alone are insufficient. Investment in electrification is highly sensitive to expectations about future policy conditions. Regulatory uncertainty, frequently revised subsidy schemes with shifting eligibility criteria, abrupt funding interruptions, and administrative complexity have together produced the stop-start deployment dynamics observed to date, undermining both household confidence and supply-chain development. **A stable and incentivising policy framework is therefore essential.** This requires not only the presence of stable regulations such as long-term targets, but also the credibility, consistency, and predictability of the policy instruments designed to achieve them, including subsidy schemes.

At EU level, the revised **Energy Performance of Buildings Directive** (**EPBD**) and the **Renewable Energy Directive (RED)** establish a credible long-term legislative architecture - mandating zero-emission standards for new buildings by 2030, fossil fuel phase-out pathways by 2040, and a 49% renewable energy share in buildings by 2030 - but legislative ambition does not, on its own, guarantee implementation. **Coordination deficits at EU level have materially compounded this institutional deficit.** The abandonment of the Heat Pump Action Plan[19] and the decision to subsume the Heating and Cooling Strategy within the broader Electrification Action Plan have contributed to a loss of policy visibility at a critical juncture. While this consolidation may ultimately enhance strategic coherence, it has, in the short term, deprived the sector of a dedicated coordination framework. Whether the forthcoming Electrification Action Plan will resolve these shortcomings or further dilute sector-specific ambition remains uncertain.

If the EU is to turn today's geopolitical shocks into lasting structural change rather than transient demand spikes, electrification must be decoupled from fossil fuel volatility and anchored in a coherent policy framework. **This**

17 Abnett, Kate. "EU plans tax changes to reduce electricity bills, draft shows". Reuters. June 2026

18 Electricity duty at minimum rates of EUR 0.5 per MWh for business use and EUR 1 for non-business use - Excise Duties on Electricity in Europe, 2024

19 European Heat Pump Association."20 organisations urge EU Commission: publish Heat Pump Action Plan for a net-zero Europe". January 2024

requires, above all, aligning relative price signals with a stable policy framework and long-term regulatory signals.

Against this backdrop, this paper focuses on two core enabling conditions for electrification: a favourable electricity-to-gas price ratio, as the primary determinant of operating cost competitiveness, and a stable, credible policy framework, encompassing both regulation and subsidy design, as the key driver of investment certainty. **This focus reflects the demand-side emphasis that should underpin the forthcoming Electrification Action Plan,** even though supply-side constraints encompassing manufacturing capacity or workforce shortages, and behavioural barriers also matter. Without credible and economically consistent demand signals, however, progress on these other fronts is unlikely to translate into sustained deployment. Through four case studies, this paper assesses the extent to which current policy configurations deliver on these demand-side conditions.

Choice of Case Studies

This paper analyses four national case studies - Ireland, the Netherlands, Germany and France - selected to capture distinct combinations of price signals, policy design, and market outcomes across the heat pump transition. Each country illustrates a specific configuration of fiscal and regulatory conditions, allowing for a comparison of the mechanisms through which heat pump deployment has advanced, or has been constrained.

- **Ireland** offers a distinctive perspective by foregrounding carbon pricing as the principal policy lever. Its relatively explicit reliance on carbon taxation makes it a useful case for assessing whether price-based instruments, when combined with a strong regulatory framework, can drive household electrification, or whether their effectiveness depends substantially on complementary measures.

- **The Netherlands** provides the clearest example of deliberate fiscal rebalancing. Having recognised that its energy taxation structure was discouraging electrification, Dutch policy sought to correct the electricity-to-gas price differential. It therefore constitutes the most direct test case for examining whether fiscal rebalancing translates into stronger adoption incentives.

- **Germany** presents the sharpest tension between regulatory ambition and adverse market conditions. Despite early and explicit legislative support for heat pumps, deployment has remained constrained by one of the least favourable electricity-to-gas price ratios in Europe, compounded by recent political reversals that have weakened policy momentum. Germany thus serves as a stress test for the limits of regulatory intervention in the absence of supportive price signals.

- **France** represents the most favourable baseline. As the largest heat pump market in Europe, it benefits from a structurally low electricity-to-gas price ratio rooted in its nuclear-dominated generation mix. The French case thus provides a reference point for what deployment can look like when price signals and policy support are broadly aligned

Taken together, these four cases provide a structured basis for identifying which combinations of fiscal and regulatory conditions are most conducive to heat pump deployment, and for drawing transferable lessons for policymakers navigating residential decarbonisation.

1. Ireland

Ireland presents a striking paradox in the electrification of residential heating: **the conditions for rapid heat pump deployment appear unusually favourable, yet deployment outcomes remain weak.** Residential heat sits at the centre of the country's energy system. Space heating alone accounts for nearly 35% of total final energy demand, with households responsible for almost half of this consumption[20]. Within households, heating dominates energy use, representing more than half of total demand, and contributes approximately 12% of national greenhouse-gas emissions. Decarbonising residential heat is therefore not a marginal efficiency challenge, but a core structural test of Ireland's energy transition.

The case is particularly revealing because slow progress cannot be easily explained by a lack of technical potential. Ireland's housing stock offers substantial scope for electrification: close to four-fifths of dwellings could accommodate heat-pump systems without requiring major building fabric upgrades[21]. At the same time, the wider energy system is moving in a direction that should strengthen the case for electrified heating. Ireland's electricity mix is decarbonising rapidly, driven by the expansion of renewable generation, particularly wind[22], thereby increasing the emissions advantage of heat pumps relative to fossil-fuel heating. In principle, these conditions should create a strong foundation for a rapid shift away from combustion-based residential heat.

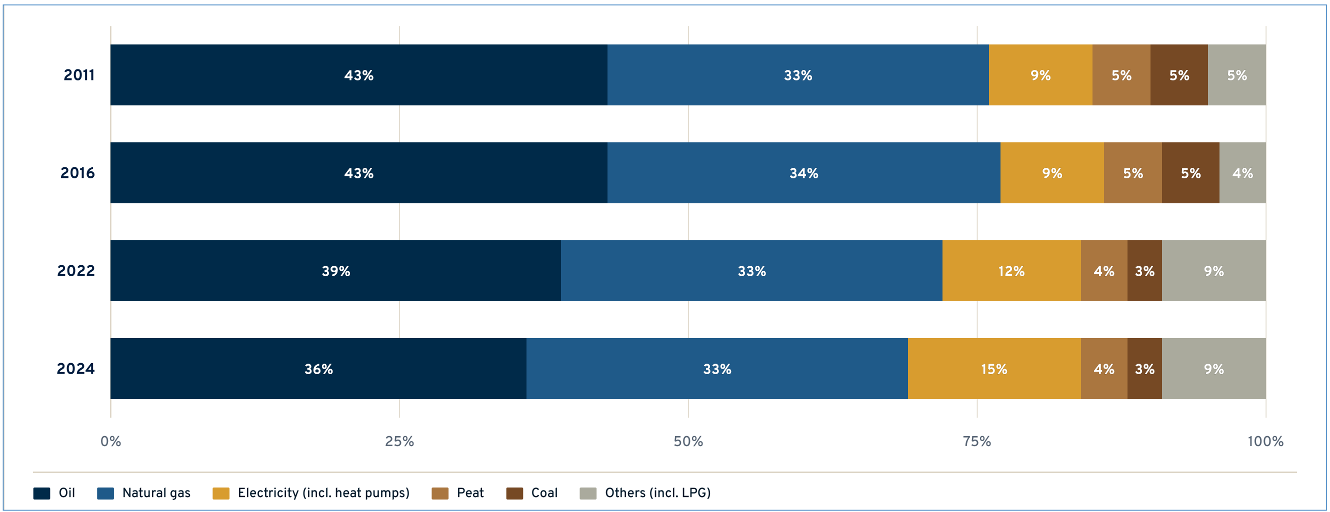
Yet the outcomes remain far below what this favourable context would suggest. Natural gas, heating oil and solid fuels continue to supply more than three-quarters of residential heat demand. Electrification has advanced only gradually, with electricity's share of residential heat rising from 9% in 2011 to 15% in 2024 (Figure 2). This represents progress, but not at a pace consistent with Ireland's climate objectives or with the scale of the technical opportunity available. The result is a widening gap between the structural conditions that should enable electrification and the policy and market outcomes actually observed.

20 Sustainable Energy Authority of Ireland (SEIA). "Energy in Ireland, 2025 Report". December 2025

21 Sustainable Energy Authority of Ireland (SEIA). "National Heat Study: Low Carbon Heating and Cooling Technologies". February 2022

22 International Energy Agency. "Countries & Regions, Ireland".

FIGURE 2. Energy Mix for residential heating in Ireland, 2011-2024



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with CSO data.

This gap points to a deeper problem of policy alignment. Price signals, regulatory frameworks and support mechanisms do not consistently incentivise households to switch from fossil-fuel heating to heat pumps. Instead, they generate mixed signals that weaken both the economic and behavioural drivers of electrification. Ireland therefore provides a useful lens through which to examine why favourable technical and system conditions do not automatically translate into rapid heat-pump deployment, and how carbon pricing, energy affordability and policy design interact to shape residential heating outcomes.

BOX. History of a carbon tax

Ireland's carbon tax trajectory encapsulates a central dilemma of climate policy: the difficulty of reconciling economic efficiency with political feasibility. An initial attempt under the 2000 National Climate Change Strategy (2000) failed to take root, undone by competitiveness concerns and low institutional trust[23]. **Carbon pricing, at that stage, remained confined to a narrow environmental rationale, lacking both fiscal legitimacy and broad societal consent.**

The policy that eventually emerged did so under markedly different conditions. In the aftermath of the 2007 general election, a Fianna Fáil (Renew) - Green Party coalition assumed office as Ireland entered a severe sovereign debt crisis, with public debt rising from 27% of GDP in 2007 to 130% by 2012[24]. **This fiscal context reframed carbon taxation as a revenue-generating instrument, providing political cover that environmental arguments alone had failed to secure**. Introduced in 2009 at €15/tCO_2 and raised to €20/ tCO_2 in 2010, the tax initially covered sectors accounting for 40% of national emissions[25], with solid fuels added in 2013. **Yet the rate was set - and held - at levels too low to significantly alter energy choices**. Between 2009 and 2017, relative energy prices continued to favour fossil fuels - the electricity-to-gas price ratio hovering around 3.5:1[26] - limiting incentives for fuel switching. Consequently, national emissions were projected to decline by just 1% by 2020, and modelling suggested that even a doubling of the rate to €40/tCO_2 would yield less than

23 J.Clinch, Peter. Dunne, Louise. "Environmental tax reform: an assessment of social responses in Ireland." ScienceDirect. May 2006.

24 Federal Reserve Bank of St. Louis. "Central government debt, total (% of GDP) for Ireland".

25 Residential heat, transport, commercial buildings and small industry

26 Calculated from Eurostat Data

5% abatement[27] - well short of Ireland's EU obligation to reduce ETS2 and solid fossil fuels emissions by 30% relative to 2005 levels.

A substantive inflection point emerged only in 2018, with the intervention of the Citizens' Assembly. **By conditioning its support for higher carbon taxation on gradual increases, revenue earmarking, and targeted compensation for lower-income households[28], the Assembly reframed the terms of political acceptability.** Distributional fairness was no longer peripheral but constitutive of the instrument's legitimacy, a finding consistent with the broader empirical literature on carbon price acceptability[29]. These principles, subsequently relayed through parliamentary deliberation, underpinned the adoption of a phased trajectory towards €80/tCO_2 by 2030[30]. The trajectory was quickly tested, however. Following an increase to €26/tCO_2 in 2019[31], the pandemic-era collapse in fossil fuel prices eroded the price signal, widening the ratio to 4.1:1 by early 2021[32] and diluting electrification incentives. The Climate Change Advisory Council warned that such volatility was undermining the credibility of the carbon price trajectory, calling for a faster move toward €100/tCO_2[33]. The broader political context was nevertheless shifting: heightened climate salience in 2019 - driven by youth mobilisation and the "Greta effect" - translated into electoral pressure, contributing to the formation of an unprecedented Fianna Fáil - Fine Gael (EPP) – Green Party coalition after the 2020 general election. That alignment enabled the Climate Action and Low Carbon Development Act 2021, committing Ireland to a 51% reduction in emissions by 2030[34], **with the Finance Bill 2021 operationalising annual €7,50 carbon tax increases to reach €100/tCO_2 by 2030**[35].

Ireland's experience thus suggests that carbon pricing does not diffuse as a purely technocratic instrument. **Its consolidation depends on a cumulative political process in which fiscal context, institutional trust, and mechanisms of citizen deliberation interact to confer legitimacy on a policy that, in its initial formulation, proved politically untenable.**

27 de Bruin, Kelly C., and Aykut Mert Yakut. "The Economic and Environmental Impacts of Increasing the Irish Carbon Tax." Research Series no. 79, Economic and Social Research Institute, October 2018.

28 An Tionol Saoranach. "Third Report and Recommendations of the Citizens' Assembly". April 2018.

29 Anderson, B., Böhmelt, T., & Ward, H.. Public opinion and environmental policy output: A cross-national analysis of energy policies in Europe. Environmental Research Letters, 2017.
Clinch, J. P., Dunne, L., & Dresner, S.. Environmental and wider implications of political impediments to environmental tax reform. Energy Policy, 34, 960–970. 2006

30 Houses of the Oireachtas, Joint Committee on Climate Action. "Climate Change: A Cross-Party Consensus for Action." Report, Houses of the Oireachtas, March 2019.

31 Donohoe, Paschal. "Budget 2020 Statement of the Minister for Finance and Public Expenditure and Reform, Paschal Donohoe TD." Speech, Department of Finance, Government of Ireland, October 2019.

32 Calculated from Eurostat data

33 Climate Change Advisory Council. "Annual Review 2020." Annual Review, Climate Change Advisory Council, September 2020.

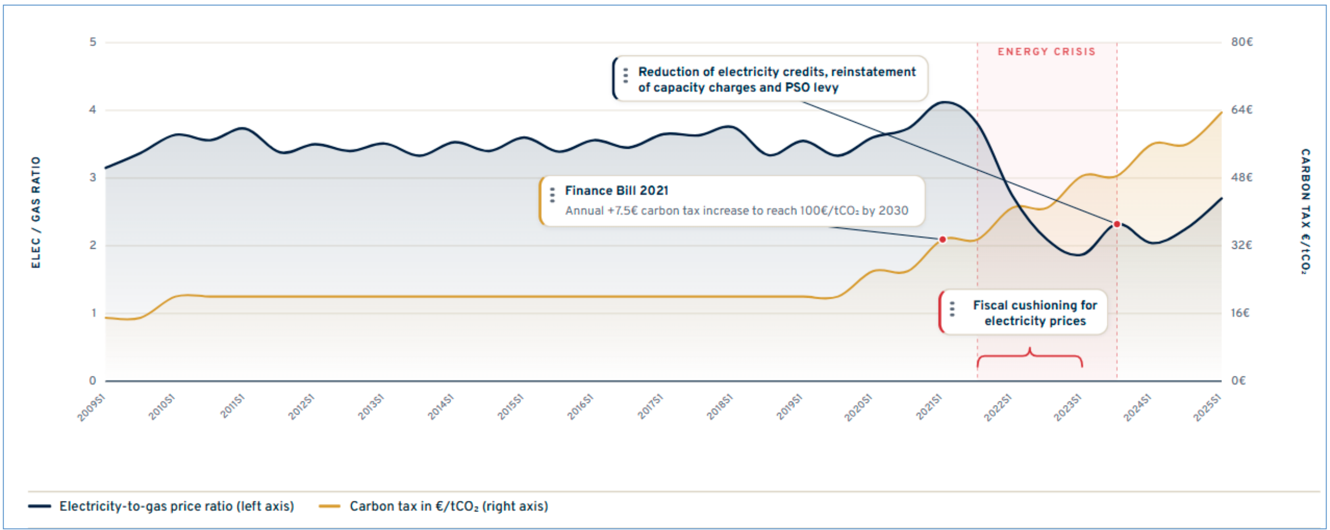
34 Go!!vernment of Ireland. "Climate Action and Low Carbon Development (Amendment) Act 2021." Act No. 32 of 2021, Irish Statute Book, 23 July 2021.

35 Government of Ireland. "Finance Act 2021." Act No. 45 of 2021, Irish Statute Book, 21 December 2021.

1 . The electricity-to-gas price ratio

After years of stagnation, the electricity-to-gas price ratio fell sharply from 4.1:1 in 2021 to 1.9:1 by 2023[36] (see Figure 3). While this compression coincided with the accelerated carbon tax trajectory legislated in 2021 - suggesting rising carbon prices may have started to rebalance the relative fuel costs - **the timing and magnitude of the shift point instead to crisis-driven fiscal intervention designated to insulate electricity bills as a form of social protection, while allowing gas prices to adjust more fully.**

FIGURE 3. Evolution of Ireland's electricity-to-gas price ratio, set against the carbon tax trajectory



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with Eurostat data.

Between 2021 and 2023, retail gas prices rose by approximately 130%, yet scheduled carbon tax adjustments accounted for only a marginal share of that rise - around 2.5 percentage points (Figure 4). The dominant transmission channel was instead wholesale market exposure. The energy and supply component of retail gas bills rose by nearly 220% during the shock, accounting for roughly four-fifths of the overall retail increase. Electricity prices were subject to comparable upstream pressures, with energy supply costs rising by over 200%, but followed a markedly different trajectory at the retail level. Extensive fiscal interventions - combining VAT reductions for both electricity and gas from 23 to 9%, cuts to network charges, capacity costs and the Public Service Obligation (PSO) levy[37], alongside Universal Electricity Credits approaching €1,000 per household by end-2023[38] - significantly dampened pass-through. The resulting compression in the electricity-to-gas price ratio did not reflect a strengthening of carbon price signals, but rather an asymmetry in how the crisis was mediated through public policy. In effect, **electricity prices were politically contained by targeted fiscal cushioning, while gas prices remained more directly exposed to wholesale fluctuations.**

36 Calculation from Eurostat data

37 Which funds renewable electricity support schemes

38 Four times €200 (April 2022, November 2022, January 2023, March 2023) and €150 in December 2023. Department of Climate, Energy and the Environment. "Minister Ryan welcomes publication of the Electricity Costs (Emergency Measures) Domestic Accounts Bill 2023." Press release, Government of Ireland, 24 October 2023

FIGURE 4. Household electricity and gas price increases during the energy crisis, 2021-2023

Contribution of each price component, in c/kWh

▲ Note: Although the energy and supply component rose far more sharply for electricity than for gas (+€26/MWh vs +€7.5/MWh), net retail increases were lower for electricity (+€4.5/MWh) than for gas (+€9.1/MWh). VAT cutsapplied equally to both fuels and cannot explain the divergence, which stems instead from extensive fiscal offsets on electricity — reduced capacity charges, network costs and renewable levies, plus the Universal Electricity Credit — with no equivalent cushioning on gas.

▲ Source:Alice Moscovici, Phuc-Vinh Nguyen. Made with Eurostat data.

This distinction has broader policy relevance. Carbon taxes and emissions trading systems have long been portrayed as primary drivers of energy price increases - a recurring but misleading claim. During the 2022 crisis, Polish state-owned utilities claimed that EU climate policies drove 60% of electricity costs[39], a figure later corrected by the European Commission, which showed ETS costs were closer to 20%. Yet similar arguments continue to resurface, including in Italy during the Iran crisis[40]. By conflating carbon pricing with crisis-driven price spikes, these arguments construct a politically convenient but analytically weak explanation. **In doing so, they erode the legitimacy of carbon pricing by associating it with forms of instability it does not generate while obscuring its actual source: fossil fuel dependence.** The ETS, by contrast, constitutes a stable and predictable cost component, explicitly designed to guide the transition away from fossil fuels rather than generate instability.

By 2024, easing wholesale pressures brought the electricity-to-gas price ratio back toward around 2:1. While both electricity and gas prices declined, the reduction was more pronounced for gas, allowing the ratio to widen again. This divergence was not only driven by upstream dynamics, but also by the gradual withdrawal of crisis-era fiscal support, which had disproportionately shielded electricity prices. The phasing-out of electricity credits[41], alongside the reinstatement of capacity charges and the Public Service Obligation (PSO) levy, re-exposed system costs that had been temporarily suppressed. **In this sense, the post-crisis adjustment revealed rather than resolved an underlying asymmetry: electricity prices embed substantial system costs that are not equivalently borne by gas.** Even prior to the crisis, network costs for electricity were four times higher than for gas. While electricity taxation remains comparatively low in European terms (12% of the bill versus 23% across the

39 Kość, Wojciech. “High Energy Prices Spark Yet Another Fight between Warsaw and Brussels.” POLITICO, 15 February 2022.

40 Brini, Valentina. “L’Italia affila le armi contro l’Ets, ma è in minoranza.” ANSA, 17 March 2026.

41 Two times 150€ (January 2024, March 2024). Two times €125 (November 2024, January 2025).

EU[42]), network and supply components are 1.5 times higher than the EU average in absolute terms[43], **implying that the cost disadvantage stems instead from elevated network charges and retail supply margins.**

This structural imbalance is likely to intensify under current policy trajectories. The extension of reduced VAT rates on both electricity and gas until 2030[44] preserves fiscal neutrality between energy carriers, at the expense of any differentiated signal in favour of electrification. At the same time, rising network tariffs - linked to a €20 billion five-year grid investment programme[45] - increase the cost base of electricity by around €2.40 per month[46] - with expansion needs driven in significant part by data centre demand - accounting for around 20% of Ireland's electricity consumption in 2023[47] and projected to reach one-third in the coming years[48]. While central to Ireland's foreign direct investment strategy[49], the growing share of electricity consumption attributable to data centres raises unresolved questions regarding cost allocation and social acceptability. In parallel, the reduction in the PSO levy - from €2.01 to €1.46 per month[50] - offers minimal relief, far outweighed by 10–15% tariff increases in late 2025 (around €200 per year per household [51]) and the removal of Universal Electricity Credits. **Collectively, this policy mix fails to tilt incentives sufficiently toward electrification.** It relies heavily on carbon pricing to steer behaviour, while leaving the structural cost disadvantage of electricity largely unaddressed. **Yet as long as electricity remains structurally more expensive, carbon pricing alone will not trigger a decisive shift toward heat pumps.**

Recent geopolitical developments further expose the fragility of this approach. Renewed disruptions to global energy markets - linked to instability in the Middle East - have translated rapidly into domestic price pressures, reflecting Ireland's persistent reliance on imported fossil fuels - notably heating oil, used by approximately 35% of households, and gas, which accounts for over 30% of residential heating and nearly half of electricity generation. The government initially resisted intervention, appropriately prioritising the credibility of the carbon pricing trajectory[52]. As pressures intensified, however, this position proved difficult to sustain. The €250 million relief package introduced between March and May marked a first adjustment[53]. While relatively limited in scope, measures such as fuel excise reductions introduced distortions in transport price signals, even as targeted income support in the heating sector remained more consistent with distributional objectives. The subsequent escalation of public opposition - culminating in large-scale protests in April[54] -

42 Eurostat data

43 Network costs accounted for around 35% of Irish electricity bills compared with 27% EU-wide, while supply costs represented about 45% versus 35% at EU level.

44 Caragher, Jacinta. "Ireland Extends to 31 Dec 2030 Energy Temporary VAT Cut to 9%." VAT Calc, October 2025.

45 O'Halloran, Barry. "Consumers to Face Higher Electricity Costs amid Networks Investment." The Irish Times, July 2025

46 Commission for Regulation of Utilities. "CRU Approves Annual Electricity Network Charges." News release, August 2025

47 Mason Hayes & Curran. "Data Centres in Ireland – Energy Concerns." Insight, January 2025.

48 Walsh, Kate. "The Future of Data Centres in Ireland." Research Matters: Key Insights for the 34th Dáil and 27th Seanad", Houses of the Oireachtas Library & Research Service, March 2025.

49 Department of the Taoiseach. "Programme for Government 2025: Securing Ireland's Future." Government of Ireland, January 2025.

50 Commission for Regulation of Utilities. "Adjustment to the Public Service Obligation Levy 2025/26." Decision Paper CRU2025164, October 2025

51 Gleeson, Colin. "Wholesale Electricity Prices Down 16% but Consumers Still Facing High Bills." The Irish Times, December 2025

52 Higgins, Adam. "Fresh €250 Energy Credits Blow for Irish as 'Highly Unlikely' Short-Term Payments Brought in amid Iran War Price Hikes." The Irish Sun, March 2026.

53 Fletcher, Olivia. "Ireland Issues Fuel Support Package to Ease Iran War Impact." Bloomberg, March 2026.

54 Greene, Tommy. "Why Are Fuel Price Protests Sweeping the Republic of Ireland?" Al Jazeera, April 2026.

precipitated a more substantive policy reversal. The €505 million supplementary package[55], combining extended fuel tax cuts with the deferral of the scheduled carbon tax increase to October 2026, constitutes a critical inflection point. **Although formally temporary, this postponement weakens the credibility of what has become the state's central instrument for correcting relative price signals between electricity and fossil fuels, revealing the limits of a strategy overly dependent on a single policy lever.** Critically, with gas prices expected to rise again by October, the political feasibility of implementing the increase remains low, making further postponement a credible scenario.

This dynamic is further reflected in the composition of crisis spending. **Of the €755 million deployed, no measure has been directed toward reducing structural dependence on fossil fuels or accelerating electrification.** As in 2022, policy has focused on mitigating immediate price impacts rather than addressing underlying system exposure. The current response, however, introduces an additional inconsistency: whereas earlier interventions disproportionately shielded electricity consumers, recent measures have have instead lowered the cost of fossil fuels,[56], weakening incentives for substitution. **By both softening carbon price signals and reducing the relative cost of gas, the policy mix has, so far, blunted the price differential needed to drive electrification.** Without parallel action to address the structural cost disadvantage of electricity and preserve a clear price gap with fossil fuels, these signals remain insufficient to shift demand in a sustained way. The result is a recurring pattern in which external shocks prompt temporary adjustments but fail to deliver lasting change, leaving Ireland structurally exposed to future episodes of fossil fuel volatility.

2 . The Policy Framework

Since 2019, Ireland's Climate Action Plans have articulated parallel decarbonisation pathways for new construction and the existing housing stock, yielding markedly different outcomes. **In new dwellings, regulatory intervention at the European level has proven decisive.** The 2010 recast of the EPBD Directive - transposed into Irish law in 2011 - introduced the Nearly Zero Energy Building (NZEB) standard, mandating minimum performance thresholds by 2020 that effectively excluded fossil-based heating systems[57]. This framework was further reinforced by subsequent revisions under the Clean Energy for All Europeans package in 2018. The impact on technology choices has been structural. Fossil-based systems, such as oil boilers, have been largely phased out of new installations, with their share falling from around 35% in the early 2000s to just 4% by 2020[58]. **In parallel, heat pumps have become the dominant technology in dwellings built since 2020, accounting for around 85% of systems**[59]. This trajectory illustrates how clear, binding regulation can durably reshape market behaviour within a single decade.

The dynamics governing the existing housing stock present a stark contrast. While national targets are formally ambitious - envisaging 680,000 heat pump installations by 2030, of which 400,000 in existing dwellings[60] - the pace and distribution of deployment reveal a persistent implementation gap. **By end-2025,**

55 Connaught Telegraph. "Government Announces New €500m. Package of Fuel Supports amid Crisis." Connaught Telegraph, April 2026.

56 Suspension of NORA (National Oil Reserves Agency) levy, reduction of excise duties on diesel (−32 c/L), gasoline (−26 c/L), and agricultural gas oil (−7.4 c/L)

57 Ireland's energy performance label, rating homes from A (most efficient) to G (least efficient) provides the metric for enforcement

58 International Energy Agency. "Ireland." Countries & Regions, IEA, 24 January 2025.

59 Central Statistics Office. "Domestic Building Energy Ratings Quarter 4 2025." Statistical release, 22 January 2026.

60 Department of the Taoiseach. "Climate Action: Energy Efficiency in Buildings." Government of Ireland, 26 June 2020, last updated 15 November 2021.

heat pumps were present in just over 180,000 BER-rated dwellings, equivalent to under 15% of the rated housing stock[61]. More significantly, uptake remains heavily concentrated in newer segments of the housing stock: among dwellings constructed prior to 2014, penetration rates remain marginal (6%). On current trajectories, **even optimistic projections do not foresee 50% progress toward the 400,000-unit heat pump target, implying full completion may slip into the early 2040s - a delay of more than a decade against the stated objective.**[62]**.**

Delivery is first constrained by a fundamental regulatory asymmetry. While public support for fossil-fuel boiler installations was discontinued in 2025 - effectively making heat pumps the only subsidised heating technology - no equivalent prohibition governs their continued installation in existing dwellings. Although the Climate Action Plan 2021 committed to the elimination of fossil fuels in buildings by 2050, subsequent iterations have yet to translate this objective into an operational timeline. The transition in the existing stock thus remains largely voluntary, shaped by private cost considerations rather than enforceable policy constraints.

This reliance on voluntary investment has proven insufficient to deliver at scale. Structural explanations alone offer only a partial account. While split incentives in the rental sector constrain decision-making in a minority of cases, the predominance of owner-occupiers (70%[63]) who retain direct control over investment choices — suggests that barriers lie elsewhere. Financial constraints, frequently invoked in policy discourse, have also been significantly mitigated. Grant levels for heat pump installations have increased substantially over time - tripling from up to €3,500 in 2018 to up to €12,500 in February 2026[64] - now covering 80% of median installation costs. Additional schemes such as Warmer Homes and the National Home Energy Upgrade Scheme also extend assistance to low-income and deep-retrofits. **Yet uptake remains limited, pointing to a deeper misalignment between the design of support mechanisms and the conditions required for widespread adoption.**

Heat pump grant eligibility rules reflect a structural tension between optimising system performance and scaling deployment across the existing housing stock. While close to 80 percent of residential dwellings could technically accommodate a heat pump without additional energy-efficiency improvements[65]- using a deliberately optimistic suitability threshold - access to public support remains restricted by design. Under the Better Energy Homes Scheme - the principal public support mechanism for residential heat pump installation grant access is conditional on meeting a Heat Loss Indicator (HLI) threshold, which in practice requires homeowners to undertake insulation upgrades prior to installation. While this condition serves a legitimate technical purpose - ensuring that installed systems operate perfectly - **it effectively subordinates deployment scale to performance optimisation, with significant consequences for the pace and distributional reach of the transition.**

This design is particularly misaligned with the characteristics of Ireland's housing stock. Almost half of occupied homes were built before 1980[66], predating modern insulation standards and typically requiring substantial fabric upgrades before meeting programme eligibility thresholds. Housing typology compounds the challenge: around 90 % of dwellings are

61 ibid.

62 Essien-Thompson, E., Mulville, M., Keane, G., and Ahern, C. "Forecasting Ireland's Retrofit Trajectory: Overcoming Policy Gaps to Meet Climate Action Goals." Energy Policy 212 (2026): Article 115135.

63 European Commission: Eurostat. "Housing in Europe – 2025 Edition." Interactive publication, European Union, 2025.

64 Sustainable Energy Authority of Ireland (SEAI). "Heat Pump Systems." Home Energy Grants.

65 SEAI's National Heat Study. However, this estimate reflects a broad technical-suitability assessment rather than the narrower eligibility criteria applied under public support schemes.

66 Central Statistics Office. "Occupied Dwellings." In Census of Population 2022 Profile 2 – Housing in Ireland. CSO statistical publication, July 2023.

detached or semi-detached - the highest share in the EU, where the average stands at around 50%[67]. These dwelling types are almost universally heated by fossil-fuel systems and, owing to their larger exposed surface areas and higher heat-loss ratios, face disproportionately high insulation costs before qualifying for support. In effect, the households most central to decarbonisation face the highest financial and technical barriers to accessing support. The distributional dimension reinforces this concern. Homes in this category are disproportionately located in rural areas - where awareness of retrofit programmes is comparatively lower - and more frequently occupied by older residents, whose shorter planning horizons and greater aversion to disruptive, long-payback renovations further reduce the probability of uptake[68]. **The current framework thus concentrates grant support among technically straightforward installations in well-insulated dwellings, at the expense of accelerating the transition in higher-emitting segments of the stock where the decarbonisation imperative is greatest.** The government has taken incremental steps to address this constraint. The HLI eligibility threshold was raised in 2024, and homes built from 2007 onwards now automatically qualify for a heat pump grant without requiring prior insulation works. These adjustments coincided with a measurable increase in SEAI-supported heat pump installations, which rose by approximately 20% in a single year, from 3,600 in 2024 to 4,200 in 2025.[69] While this pattern is consistent with the view that easing eligibility constraints can support additional uptake at the margin, it should not be read as evidence of a direct causal effect. In any case, the trajectory remains an order of magnitude below the annual installation rate required to meet the 2030 retrofit target, and the adjustments fall short of the structural recalibration needed to align programme design with the scale of deployment required.

This misallocation is rendered more acute by the parallel architecture of the scheme landscape. The Warmer Homes Scheme - which provides fully funded energy upgrades to low-income households - specifically targets the oldest and least-efficient dwellings: the segment with the highest emissions-reduction potential and the most acute affordability constraints. Yet in 2025, it received fewer applications than the Better Energy Homes Scheme (10,300 against 16,700[70]) and delivered almost half as many property upgrades, despite serving the homes most in need of intervention. The comparatively low uptake may itself reflect a structural feature of the programme's own design: eligible households must apply on their own initiative, yet the type of retrofit measures to be implemented are determined by SEAI rather than by the homeowner - an arrangement that removes agency from the very individuals whose sustained engagement the transition requires. **Irrespective of its causes, public expenditure is structurally tilted toward households requiring comparatively less support, while funding for the highest-impact renovations remains constrained,** raising substantive questions about both the efficiency and the equity of current resource allocation.

67 ibid.

68 Ameli, Nadia, and Nicola Brandt. "Determinants of Households' Investment in Energy Efficiency and Renewables: Evidence from the OECD Survey on Household Environmental Behaviour and Attitudes." Environmental Research Letters 10, no. 4 (2015): 044015.

69 Sustainable Energy Authority of Ireland. "Statistics for National Home Retrofit Programmes." SEAI.

70 Sustainable Energy Authority of Ireland. "Statistics for National Home Retrofit Programmes." SEAI.

2.
The Netherlands

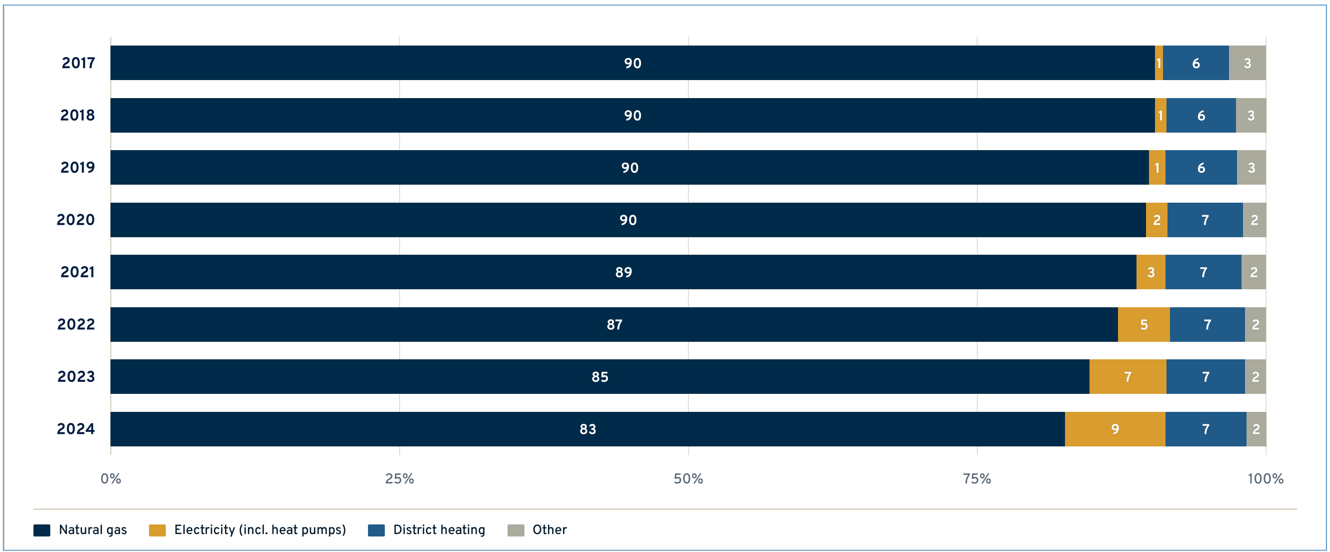
The Netherlands offers a historically grounded case study in the structural dynamics of energy transition. Prior to the 1960s, Dutch households relied predominantly on coal. The discovery of the Groningen gas field catalysed a rapid, state-coordinated shift to natural gas, promoted as a local, cleaner, safer, and more affordable alternative. Within two decades, a comprehensive national distribution network was in place, coal's share of total energy consumption had collapsed from 85% before the Second World War to just 4% by 1975[71], and gas had become the organising principle of the built environment, industrial processes, and market structures. **It is precisely this success that now constitutes the central obstacle to the next transition.**

Nowhere is the depth of this lock-in more apparent than in residential heating. Approximately 90% of homes remain gas-dependent[72] - the highest share in the EU - and where progress towards alternatives has been limited: the proportion of homes heated without gas increased from around 5% in 2017 to roughly 11% in 2024 (see Figure 5). This inertia reflects not merely technological path dependence but a co-evolution of infrastructure, pricing frameworks, appliance markets, and consumer expectations that systematically disadvantages competing solutions.

71 Gales, Ben, and Rick Hölsgens. "Coal Transition in the Netherlands: An Historical Case Study for the Project 'Coal Transitions: Research and Dialogue on the Future of Coal.'" IDDRI and Climate Strategies, 2017.

72 Statistics Netherlands (CBS)

FIGURE 5. Energy Mix for residential heating in the Netherlands, 2017-2024



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with CBS (Central Agency for Statistics) data.

More revealing still is that supply-side contraction has produced no commensurate reduction in demand. Earthquake risks associated with Groningen extraction have driven a near-90% decline in domestic production since over the past decade - from levels equivalent to around 180% of annual consumption to just 30% - culminating in the field's formal closure in 2024. Yet consumption has fallen by less than 25%[73]. The resulting gap has been absorbed primarily through import substitution rather than structural demand reduction, with LNG - whose share rose from 32% to 45% of gas imports between 2020 and 2024 - filling the shortfall.[74]. **This reconfiguration ensured short-term security in the context of the Russian gas phase-out, but at the cost of reinforcing the economic and institutional logic of continued gas system reliance, thereby deepening rather than loosening carbon lock-in.**

The supply strategy assembled to manage that reconfiguration is now itself a source of renewed vulnerability. The post-Groningen model traded dependence on Russian pipeline gas for dependence on US LNG, which accounted close to 70% of LNG imports in 2024[75]. While this substitution appeared robust under normal market conditions, it has proven fragile under geopolitical stress. As the Iran conflict disrupts Middle Eastern supply routes and amplifies Asian demand, widening Pacific price premiums are diverting US cargoes towards higher-value markets, compressing both availability and affordability in Europe. As a consequence, Dutch gas storage stood at just 11% in May 2026[76] - the lowest in the EU after Sweden - **illustrating how a model designed as a mechanism of resilience has, under pressure, become a vector of structural instability.**

In the power sector, the trajectory is more differentiated. The coal phase-out of the late 2010s reduced generation emissions but largely substituted gas, which accounted for around 60% of generation by 2020.[77]. More recent develop-

73 International Energy Agency. "Natural Gas – The Netherlands." Countries & Regions, IEA. Accessed 26 June 2026.
74 Statistics Netherlands (CBS). "Gas Consumption in the Netherlands Declines Again." CBS, February 2024.
75 Statistics Netherlands (CBS). "No Change in Natural Gas Consumption in 2024." CBS, February 2025.
76 Gas Infrastructure Europe. "AGSI Storage Inventory." AGSI, Gas Infrastructure Europe. Accessed 26 June 2026.
77 International Energy Agency. "Natural Gas – The Netherlands." Countries & Regions, IEA. Accessed 26 June 2026.

ments indicate a structural shift: wind and solar expanded from 8% of generation in 2015 to 45% in 2024, exceeding the fossil share for the first time. Wind capacity specifically increased by around 18% annually between 2020 and 2024, three times the EU average (6%). However, translating this into economy-wide decarbonisation - particularly through heat pump deployment - requires structural changes: district heating expansion in high-density areas, substantial grid reinforcement to accommodate increased electricity demand, and significant improvements in building efficiency to reduce overall heat loads. **Without these complementary measures, electrification risks being constrained by the very system conditions that have historically favoured gas.** Taken together, these dynamics define the analytical and policy challenge examined in this paper: how to unwind a deeply embedded, cross-sectorally reinforced system of gas dependence in a context where prior adaptation responses have, in several respects, consolidated rather than reduced it.

BOX. Political Context

The 2017 Dutch general election unfolded within an increasingly fragmented political landscape, constraining the formation of stable governing coalitions. Mark Rutte (VVD, Renew) secured a third term, but the previous two-party coalition was replaced by a four-party centre-right alliance—VVD, CDA (EPP), D66 (Renew), and the Christian Union (ECR)—commanding only a narrow parliamentary majority. Within this constrained configuration, climate policy nonetheless emerged as a central priority, reflecting a shift in the broader political equilibrium[78]**. This shift was decisively shaped by the Urgenda litigation, which introduced a novel form of judicial constraint on climate policymaking.**

In 2015, nearly 1,000 Dutch citizens argued before the Hague District Court that the Dutch state bore a legal duty to protect its citizens from the risks posed by climate change. The court ruled that the government had to reduce GHG emissions by at least 25% by 2020 compared with 1990 levels, a decision ultimately confirmed by the Supreme Court[79] (2019). **By grounding climate obligations in human rights law, the decision effectively reconfigured the parameters of policy discretion, imposing a binding external constraint on coalition bargaining.**

It was within this altered institutional context that the government advanced a draft National Climate Law in December 2018, formalising long-term targets of 49% emissions reduction by 2030 and 95% by 2050[80]. Yet this trajectory was quickly called into question. An assessment by the Netherlands Environmental Assessment Agency (PBL), published shortly before provincial elections determining the composition of the Senate, projected that existing measures would fall short, achieving only 43% emissions reduction by 2030[81]. The timing of this assessment proved politically consequential. Faced with mounting pressure from civil society[82] - echoing popular demand dynamics seen in Ireland - and growing concerns that the climate dossier could be weaponised during the campaign, the government moved to close the gap through a set of supplementary measures, including the introduction of an industrial carbon tax and **adjustments to household energy taxation aimed at addressing distributional concerns.** These measures succeeded in consolidating support on the centre-left, but simultaneously triggered a counter-mobilisation from climate-sceptical right-wing actors. The resulting electoral dynamics deprived the governing coalition of its Senate majority, complicating the legislative pathway for key fiscal components of the climate package. While the National Climate Law itself

78 Government of the Netherlands. "Coalition Agreement 'Confidence in the Future.'" Publication, October 2017.

79 Urgenda Foundation. "The Urgenda Climate Case against the Dutch Government." Urgenda.

80 The national climate law has since been amended. The objective for 2030: -55%. The objective for 2050: climate neutrality.

81 Hofhuis, Paul. "Are the Dutch Really Going Green? Climate Politics in the Low Lands (Part Two)." Policy Brief, Clingendael Netherlands Institute of International Relations, September 2019.

82 TIME. "Amsterdam's First National Climate Change March Draws 40,000 People." TIME, March 2019.

was adopted with broad parliamentary support in June 2019, the implementation of associated taxation measures required subsequent negotiations with opposition parties, ultimately secured later in November 2019[83].

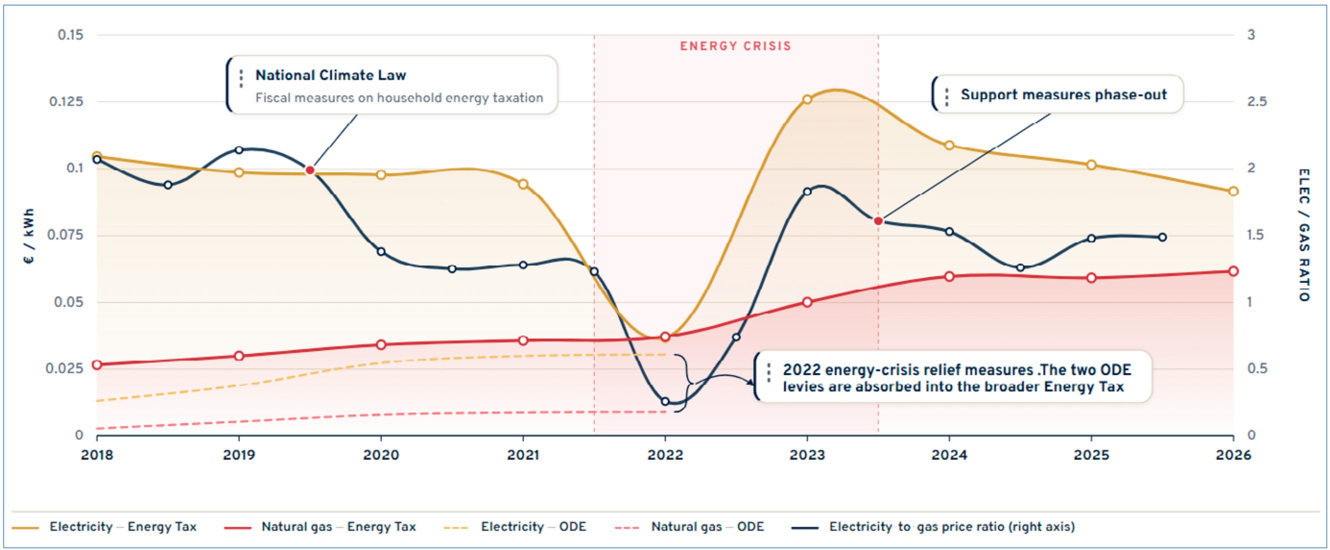
The Dutch case thus illustrates the dual effect of judicial and societal pressures in climate governance. While capable of elevating policy ambition beyond what coalition arithmetic alone would permit, such pressures also intensify distributional conflicts, exposing the political fragility of implementation in fragmented parliamentary systems.

1 . The electricity-to-gas price ratio

Prior to 2019, despite representing a smaller share of the final household bill, electricity was taxed at rates nearly four times higher per unit of energy than gas. As a result, the electricity-to-gas price ratio remained close to 2:1 between 2016 and 2019. **The 2019 reform, introduced as part of the National Climate Agreement, marked deliberate recalibration of these price signals.** Rather than increasing the overall tax burden on households, the government shifted taxation away from electricity and towards fossil fuels, with higher levies on natural gas offsetting reductions in electricity taxation. In parallel, the reform expanded a fixed tax credit applied to all grid-connected households, rising from €250 in 2019 to €520 by 2026. Because the rebate is independent of energy consumption and available regardless of the household's heating system - including gas and district heating - **it allows households switching away from gas to reduce their exposure to rising fossil fuel taxation while retaining the full benefit of the credit.** However, its visibility and influence on behavioural change remain limited compared to marginal price signals. The measure therefore functions primarily as a form of income support that helps maintain the social acceptability of the reform rather than as a direct driver of fuel switching. Finally, the reform rebalanced the Sustainable Energy Surcharge (ODE), originally split evenly between households and industry - raising the industry contribution to two-thirds of total revenues, thereby redistributing transition costs toward actors better positioned to absorb them.

83 Eerste Kamer der Staten-Generaal. "Overzicht wetsvoorstellen pakket Belastingplan 2020 (incl. behandelschema Eerste Kamer)." Eerste Kamer der Staten-Generaal.

FIGURE 6. Evolution of household energy taxes on electricity and natural gas



- Note: ODE (Opslag Duurzame Energie) was merged into the main Energy Tax from 2023 onwards, which is why the dashed lines 2022. The 2022 dip in the electricity Energy Tax reflects a temporary energy-crisis relief measure. The electricity-to-gas price ratio does not include the electricity tax credit.
- Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with Eurostat and Netherlands' Tax and Customs Administration data.

This rebalancing was temporarily interrupted by the 2022 energy crisis, forcing **a shift from structural alignment to immediate affordability.** A series of emergency measures - including VAT reductions across both electricity and gas (from 21% to 9%, July–December 2022), increases in the household tax credit (from €460 in 2021 to €680 in 2022) and targeted reductions in electricity taxation for the first consumption bracket (-8.4 c/kWh, including VAT) saved households around €150 per year on average[84]. **While primarily designed as social protection measures, they also had the unintended effect of further compressing the price ratio to a low of 0.3, temporarily accelerating the incentive shift away from gas.** However, the effect proved short-lived: the withdrawal of support measures in 2023, combined with the integration of the ODE levy into general taxation, restored upward pressure on electricity prices. **Despite this interruption, the cumulative effect of the post-2019 reforms has been a substantive reorientation of relative price signals.** By 2024, the electricity-to-gas price ratio had declined to 1.4 - the second lowest in the EU after Sweden. Adoption patterns appear broadly consistent with this shift. The share of electrified dwellings increased steadily from below 2% in 2019 to nearly 9% by 2024, suggesting that sustained adjustments to fiscal incentives can translate into measurable changes in end-use behaviour over time.

Looking ahead, the 2026 outlook largely consolidates this fiscal trajectory. Electricity taxation is set to decline further (-10%), while levies on natural gas continue to increase (+4%)[85]., reinforcing the relative advantage of electric technologies established since 2019. Yet as fiscal barriers to electrification have been progressively reduced, a different challenge has emerged: **the cost of expanding and operating the electricity network.**

Electricity network charges are expected to rise modestly in 2026 (+2%), but more significantly over the medium term as operators finance substantial grid expansion - estimated at €200

84 Eurofound. "Tax Reduction on Energy Bill and Reduction of Tax Rate on Electricity." EU PolicyWatch, measure NL-2022-1/2221, updated 24 April 2025.

85 Belastingdienst. "Energiebelasting." Belastingdienst. Accessed 29 June 2026.

billion by 2040[86] - to meet rising demand and alleviate congestion. Under the current capacity-based tariff structure, households pay a largely fixed annual network charge regardless of usage. As investment needs increase, average charges are projected to rise from roughly €350 today to around €560 by 2030 (+60%[87]). In response, regulators and network operators are exploring a transition towards volume- and time-dependent network tariffs, with implementation currently envisaged in 2029[88]. Unlike the fiscal reforms introduced since 2019, this initiative is not primarily intended to encourage electrification. Rather, it seeks to improve cost reflectivity, reduce congestion and reward flexibility, with around 70% of households expected to pay less under the proposed structure than under the projected 2030 baseline. For households adopting heat pumps, the picture is more nuanced. Annual network charges could increase to around €570 for hybrid systems and up to €690 for all-electric systems, falling to around €550 with smart control and to roughly €370 when accounting for savings from gas grid disconnection.

By contrast, gas network tariffs reflect a contraction dynamic. As consumption declines[89], fixed infrastructure costs are spread across a shrinking user base, raising per-household charges (around +9% in 2026[90]) and strengthening incentives to disconnect. Regulatory changes adopted in 2023 reinforce this trend by enabling operators to anticipate declining demand through accelerated infrastructure cost recovery. At the same time, the downsizing of the gas network has become institutionalised. Network operators are compensated for dismantling infrastructure and, since February 2024, disconnection costs have been socialised across all users rather than borne by individual households. Taken together, these developments point to a gradual but increasingly coherent realignment of incentives. **Lower electricity taxation and rising gas costs continue to improve the relative attractiveness of electrification, while network tariff reform seeks to ensure that electrification proceeds in a manner compatible with system constraints**. While the financial attractiveness of electric technologies may not improve uniformly - particularly for low-income households or those unable to shift consumption - the overall direction of travel remains consistent: reducing dependence on fossil fuels while encouraging more efficient use of an increasingly electrified energy system.

Recent geopolitical developments have reinforced the relevance of this strategy. Amid the Iran crisis, global gas market dynamics have again translated into higher consumer prices, despite the Netherlands' limited direct exposure to Qatari LNG. Around half of households - those on variable or dynamic contracts - will experience a 13% increase in both electricity and gas prices[91]. While fixed contracts provide temporary insulation, their availability is declining, and new contracts are being signed at significantly higher levels. As these contracts roll over through 2026–2027, exposure to price volatility is expected to broaden. Notably, the policy response has differed markedly from that observed in 2022. Rather than weakening price signals through broad-based subsidies, the government's €1.1 billion support package has focused primarily on structural measures, including expanded financing through the National Heat Fund, enhanced insulation and heat pump subsidies, targeted assistance through the Energy Emergency Fund, and household advisory services. **In doing so, the Netherlands has largely**

86 PricewaterhouseCoopers Advisory N.V. "Financiële Impact Energietransitie voor Netbeheerders ('FIEN+')." Eindrapport, prepared for Netbeheer Nederland, 16 December 2024.

87 Berenschot. "Verkenning alternatief nettarief kleinverbruik." Report prepared for Netbeheer Nederland, October 2024

88 Autoriteit Consument & Markt. "Voorstel codewijziging volume- en tijdsafhankelijke transporttarieven voor kleinverbruikers." Zienswijze en consultatie, 13 May 2026.

89 Statistics Netherlands (CBS). "Average Energy Bill Slightly Lower This Year." CBS, 26 February 2026.

90 Statistics Netherlands (CBS). "Average Energy Bill Slightly Lower This Year." CBS, 26 February 2026.

91 NL Times. "Energy Supplier Essent to Raise Variable Tariffs, Increasing Monthly Costs for Consumers." NL Times, 23 May 2026

preserved the relative price advantage of electricity over gas, maintaining the integrity of the post-2019 reform framework even under renewed external pressure. Early evidence points to renewed momentum in electrification investments and to an increasing perception of heat pumps as crucial instruments of household energy security and autonomy.

2 . The policy framework

The Dutch National Climate Plan (2019) assigned the building sector - responsible for 12% of national emissions in 2019[92] and the third-largest emitting sector[93] - a targeted reduction of 3.4 $MtCO_2$ by 2030, of which 2.2 $MtCO_2$ (65%) attributable to residential buildings alone[94]. Current projections indicate the Netherlands will fall short by approximately 1 $MtCO_2$, with only a 10% probability of meeting the original target.[95] **More analytically significant than the magnitude of this gap is its nature: much of the emissions reduction achieved to date reflects exogenous factors** - notably higher gas prices and a series of mild winters - rather than sustained, policy-driven structural change in heating systems.

This fragility is reflected in the uneven effectiveness of policy across building segments. In new construction, regulatory intervention has been decisive. The 2018 amendment to the Gas Act[96] - effectively prohibiting new gas connections - has yielded near-complete compliance, with 90% of buildings completed after 2020 being gas-free. By contrast, progress in the existing building stock - the core of the decarbonisation challenge -has lagged across all three pillars of the 2019 strategy: district heating, insulation, and heat pumps. **District heating** has fallen furthest behind. By the end of 2023, only 65,000 additional connections had been realised, against a 2030 target of 500,000[97], constrained by regulatory uncertainty, planning complexity, and high capital costs. Insulation efforts have advanced more steadily but remain insufficient in scale: between 2021 and 2024, only 650,000 of the targeted 2.5 million homes were upgraded[98] - a quarter of the target.

Heat pump deployment presents a more ambiguous picture. Projections suggest up to 1.5 million units could be installed by 2030, covering close to 20% of the housing stock[99]. However, of the approximately 820,000 units installed by the end of 2025[100], around 80% are concentrated in new construction, where electrification is already mandated. Penetration in the existing stock, where emissions reductions are most needed, remains comparatively limited. **Policy has attempted to address this gap through the promotion of hybrid heat pumps,** which combine an electric unit with a gas boiler. This approach reflects the technical and economic constraints of the existing housing stock. While fully electric systems paired with insulation is the most cost-effective option in smaller dwellings[101], their economics deteriorate for larger homes, which require more

92 Statistics Netherlands (CBS). "Which Sectors Emit Greenhouse Gases?" Greenhouse Gas Emissions Dossier, CBS. Accessed 29 June 2026

93 Statistics Netherlands (CBS). "Which Sectors Emit Greenhouse Gases?" Greenhouse Gas Emissions Dossier, CBS. Accessed 29 June 2026

94 Ministry of Economic Affairs and Climate Policy. "Integrated National Energy and Climate Plan 2021–2030." The Netherlands, November 2019

95 Climate and Energy Outlook 2025

96 PBL Netherlands Environmental Assessment Agency. "Climate and Energy Outlook of the Netherlands 2025." English summary of the Dutch report Klimaat- en Energieverkenning 2025 (KEV), 1 October 2025.

97 Netherlands Court of Audit. "Government Heat Network Policy at Odds with Domestic Heat Pump Grants." News item, 4 February 2025.

98 Langen, Mike. "Housing Market Monitor – Energy Transition." ABN AMRO, 14 August 2025.

99 Dutch New Energy Research. "Nationaal Warmtepomp Trendrapport 2026." Dutch New Energy, 2026.

100 Dutch New Energy Research. "Nationaal Warmtepomp Trendrapport 2026." Dutch New Energy, 2026.

101 Schippers, Vincent, Esther Mot, Nghia Phan, Casper Tigchelaar, Kim Fernández Gómez, Peter Mulder, and Steven van Polen. "Inkomenseffecten van woningverduurzaming." CPB/TNO/PBL publication, June 2025

extensive and costly upgrades. With larger dwellings accounting for nearly 40% of the stock, hybrid systems offer a pragmatic intermediate solution: they can reduce gas consumption by up to 60%, maintain compatibility with existing infrastructure, and limit pressure on electricity networks. However, this pathway entails a clear trade-off. **With lifetimes of 15–20 years, hybrid systems risk locking in residual gas use and delaying full electrification, effectively prioritising short-term feasibility over long-term transformation.**

Even this second-best pathway has struggled to scale. Despite relatively strong uptake by European standards - hybrids accounted for around 10% of heating appliance sales in 2023, compared to just 1% in Germany and France - fewer than 200,000 units had been installed by the end of 2025. **Current projections suggest a ceiling of approximately 500,000 units by 2030[102], well below the one million hybrid system target set by the government[103]**. This underperformance points to constraints that go beyond technological suitability or headline policy ambition.

Contrary to common assumptions, financial capacity does not appear to be the primary barrier. Around 95% of homeowners are estimated to be able to finance decarbonisation investments - through savings or borrowing - while retaining a financial buffer of at least €10,000[104]. However, capacity should not be conflated with willingness. Households may rationally defer or avoid investment due to competing priorities, perceived risks, or uncertainty about future policy developments and returns. This uncertainty is closely linked to the evolution of the policy framework itself. **Rather than following a stable transition pathway, the policy framework has oscillated between stronger and weaker support for electrification, creating uncertainty for households and manufacturers alike.** Until 2023, the Netherlands has developed a relatively coherent policy mix combining regulatory direction with financial support. The announcement that hybrid heat pumps would become the default replacement for gas boilers from 2026 provided a clear long-term signal, while the simplification of eligibility criteria and the expansion of the "Investment Subsidy for Sustainable Energy and Energy Saving" (**ISDE**) - whose coverage increased from 20% to 30% of average investment costs[105] - lowered both financial and administrative barriers. The share of installations receiving ISDE support rose from 40% in 2022 to over 70% in 2024[106], reflecting the extent to which market growth depended on predictable public support. Together, these measures supported a rapid scale-up, with annual hybrid heat pump sales increasing more than sixfold between 2021 and 2023, from fewer than 10,000 units to almost 60,000.

This policy credibility was weakened in May 2024, when the incoming coalition cancelled the planned hybrid heat pump mandate, removing the main source of long-term regulatory certainty. At the same time, subsidies for smaller systems were adjusted downward to reflect declining technology costs and return support rates closer to the intended 30% level, after some systems had received subsidies covering 40–50% of investment costs. While this adjustment can be justified on efficiency grounds, its timing proved critical. Coming immediately after the cancellation of the mandate and in a context of normalising gas prices, it reinforced the perception of a weakening policy environment. Market developments suggest that this shift in perception had tangible effects. Hybrid heat pump sales fell by 22% between 2023 and 2024, with the decline amplified by lower gas prices. The apparent rebound in early 2025 appears largely driven by households bringing forward purchases to benefit from earlier

102 Dutch New Energy Research. "Nationaal Warmtepomp Trendrapport 2026." Dutch New Energy, 2026.

103 Hanegraaf, Randall. "Dutch Hybrid Heat Pump Action Plan." Presentation, Dutch Enterprise Agency, CA-RES, Madrid, 29 September 2023

104 ibid.

105 DHPS. "ISDE subsidie voor warmtepompen fors verhoogd in 2022." DHPS. Accessed 29 June 2026.

106 Dutch New Energy Research. "Nationaal Warmtepomp Trendrapport 2026." Dutch New Energy, 2026.

subsidy conditions, rather than by a sustained recovery in underlying demand. The subsequent 15% decline in early 2026 compared to the previous year indicates continued fragility[107].

The January 2026 coalition agreement marks yet another shift in direction. It places greater emphasis on district heating as a means of managing electricity network constraints, while also announcing that **hybrid smart heat pumps will be promoted and become mandatory from 2029 in areas not suitable for district heating.** However, the central issue is no longer the presence of pro-electrification measures, but the credibility of the policy signals themselves. Repeated reversals have made it increasingly difficult for households and investors to distinguish between durable commitments and temporary political compromises, weakening the investment certainty required for large-scale transition.

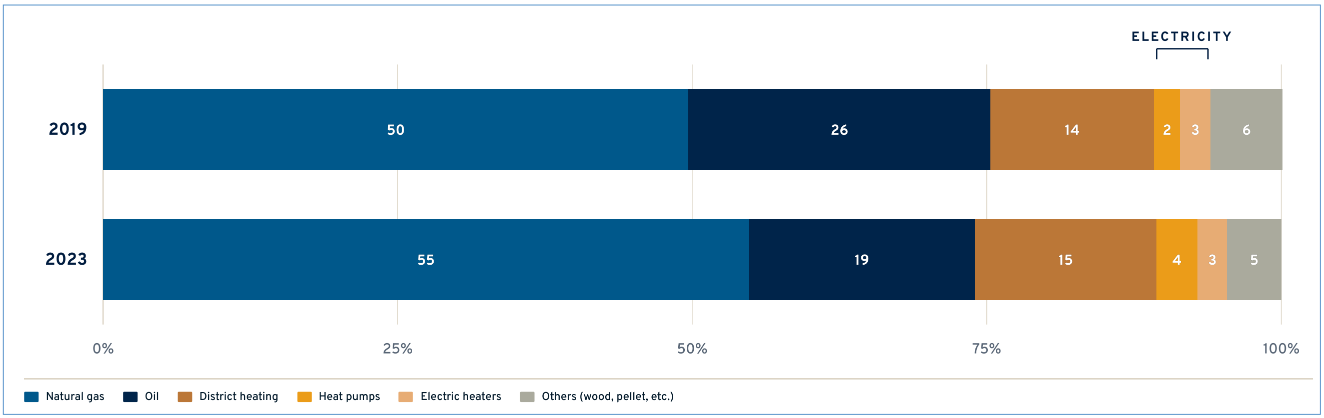
At the same time, regulatory pressure remains unevenly distributed across tenure types. It is concentrated in the rental sector through minimum energy performance standards requiring dwellings rated E, F, or G to reach at least D by 2030—an appropriate response to landlord-tenant split incentives, particularly in cities such as Amsterdam where rental housing accounts for around 70% of the stock. However, this regulatory approach is not matched by equivalent obligations in the owner-occupied sector, which represents approximately 60% of the housing stock. This asymmetry further limits the overall effectiveness of the policy framework.

107 European Heat Pump Association. "Energy Crisis Sees Rise in Heat Pump Sales." Press release, 4 May 2026.

3. Germany

Germany's heating transition departs from a position of deep structural dependence on fossil gas. Of roughly 20 million residential buildings, more than 70% continue to rely on gas or oil (see Figure 7), reflecting decades of infrastructure development, appliance standardisation, and pricing structures that have collectively anchored gas as the dominant heating source. This structural reliance is central to the country's climate challenge: decarbonising heat requires not only technological substitution, but the unwinding of an entire system organised around fossil supply.

FIGURE 7. Energy Mix for Residential Heating in Germany, 2019-2023



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with Beim Heizen genutzte Energieträger (BDEW) data.

Since 2022, that challenge has been compounded rather than alleviated by the imperative of supply security. The abrupt loss of Russian pipeline gas, which previously accounted for over half of Germany's imports, triggered a rapid diversification of supply. Norwegian gas now dominates imports, while LNG has expanded from 7% of supply in 2021 to roughly 10% in 2025. Yet this shift has altered the geography of supply rather than its scale: aggregate import volumes have remained broadly stable since 2018. **The associated expansion of import infrastructure -** supported by public commitments rising from €3 billion in

2022 to almost €10 billion through 2038[108] **- is therefore calibrated to levels of gas demand that decarbonisation pathways explicitly project to decline, raising the prospect of stranded assets and sustained public cost exposure.**

It is against this supply-side backdrop that demand-side developments acquire their full significance. Household gas consumption fell by 23% between 2021 and 2024, driven by behavioural adjustments to price signals, efficiency improvements, and the accelerated deployment of alternative heating technologies[109]. Installations between 2023 and 2025 alone are estimated to have reduced LNG import requirements by approximately €1.3 billion - a figure that positions electrification not merely as a climate instrument but as a structural lever for reducing the import exposure that 2022 rendered so acutely visible. **That this dynamic has not more fundamentally reshaped supply-side investment logic points to a core tension within the transition.**

Developments in the power sector further reinforce this tension. Renewables now account for around 57% of electricity generation in 2025, placing Germany on a plausible path towards its 2030 target of 80%. Yet at the same time, gas-fired generation has increased its share of the mix, rising from 10% in 2014 to nearly 18% in 2024, reflecting its role as the primary balancing source following nuclear phase-out and coal reduction.[110] The implication is that decarbonising heat and electricity are not parallel processes but structurally interdependent ones, linked through shared infrastructure and overlapping demand for gas.

Germany's heating transition must therefore be understood as a system-level transformation shaped by the enduring centrality of gas within both supply and demand configurations. The tension between security of supply and decarbonisation is not merely political but embedded in the physical and economic architecture of the energy system itself, and it is within this configuration that the trajectory of the transition must be assessed.

BOX. Political Context

Germany's grand coalition government, formed in March 2018 between Angela Merkel's CDU/CSU (EPP) and the Social Democratic Party (S&D), initially treated carbon pricing in non-ETS sectors as politically too risky, wary of electoral backlash and concerns over industrial competitiveness[111]. **This reluctance rapidly eroded amid intensifying** Fridays for Future **mobilisations**[112]**, further amplified by the severe 2018 drought**[113]**, which - as in Ireland and the Netherlands - propelled popular demands for credible, enforceable emission reductions onto the political agenda.** Yet, while public pressure for stronger climate action mounted, the risk of social backlash remained salient, particularly in light of the Yellow Vest protests in France[114]. To navigate this tension, the government commissioned the German Council of Economic Experts to identify cost-effective policy options. Its July 2019 Special Report[115] endorsed carbon pricing as the most efficient instrument for emissions reduction, lending the measure technocratic legitimacy and a degree of political cover - albeit conditional on careful policy design - for a measure that remained electorally sensitive.

The September 2019 "Climate Action Programme 2030" introduced the Fuel Emissions Trading Act (BEHG),

108 Wettengel, Julian. "Germany, EU Remain Heavily Dependent on Imported Fossil Fuels." Clean Energy Wire, 13 April 2026

109 Bruegel, Jonathan, Ana Maria Jaller-Makarewicz, Kevin Leung, and Andrew Reid. "Germany's Gas Dependence: An Energy Security Risk." Institute for Energy Economics and Financial Analysis, March 2026.

110 International Energy Agency. "Natural Gas – Germany." Countries & Regions, IEA. Accessed 29 June 2026.

111 Wettengel, Julian. "Germany's Carbon Pricing System for Transport and Buildings." Clean Energy Wire, 26 March 2024

112 Deutsche Welle. "Protesters Call for Germany to Lead on Climate." DW, 1 December 2018.

113 Hockenos, Paul. "The Great Drought of 2018: Germany's Endless Summer." EnergyTransition.org, 26 December 2018

114 Rubin, Alissa J., and Somini Sengupta. "'Yellow Vest' Protests Shake France. Here's the Lesson for Climate Change." The New York Times, 6 December 2018.

115 German Council of Economic Experts. "Setting Out for a New Climate Policy." Special Report 2019, 12 July 2019.

a national emissions trading system (nETS) for transport and heating fuels covering almost 40% of national emissions in 2022[116] - bearing clear hallmarks of risk-averse incrementalism. Starting with a fixed-price phase (€10/tCO_2 in 2021, rising to €35/tCO_2 by 2025), it functioned initially as a carbon tax before transitioning to auctioning within a €55–65/tCO_2 corridor from 2026[117]. Originally set to shift toward market-based pricing from 2027 alongside ETS2's initial rollout, this trajectory has been altered by ETS2's postponement to 2028, prompting an extension of the 2026 price corridor through 2027[118]. Framed as a "socially fair" entry point to limit distributional shocks, this low starting trajectory drew sharp criticism from climate economists, including those of the Mercator Research Institute on Global Commons and Climate Change, for lacking behavioural steering effect and risking emissions lock-in[119]. **Sustained societal and political pressure soon forced a recalibration:** the October 2020 revision raised the entry price to €25/tCO_2 with a steeper trajectory[120]. A second adjustment during the December 2023 budget crisis further accelerated increases - to €45/tCO_2 in 2024 (from €40) and €55/tCO_2 in 2025 (from €45) - **blurring the line between environmental pricing and fiscal revenue-raising,** much as Ireland's 2009 carbon tax introduction amid fiscal constraints had already revealed the tensions inherent in hybrid instruments serving multiple policy objectives.

To maintain public acceptance - again, echoing Ireland's approach - the government ringfenced nETS revenues to the Climate and Transformation Fund (KTF), projected at €40 billion over 2021–2024. These funds supported, among other things, building renovations and boiler replacements, renewable electricity expansion, electric mobility infrastructure, and relief measures for citizens and industry. Germany's experience thus exemplifies "incrementalism under pressure": a politically cautious entry into carbon pricing, followed by stepwise acceleration driven by societal demands and fiscal imperatives.

1 . The electricity-to-gas price ratio

The EEG surcharge - introduced under the 2000 Renewable Energy Sources Act (EEG) to finance renewable expansion - illustrates how a well-intentioned climate instrument can become structurally counterproductive. The levy did play central role in scaling up clean electricity, helping to double the share of renewables in power generation between 2010 and 2017[121]. Yet as renewable capacity expanded, the cost of support rose accordingly, driving the surcharge to more than triple from 2.05 to 6.88 ct/kWh over the same period. By 2020, the levy accounted for over one-fifth of household electricity bills, while taxes and levies exceeded half of the final price[122] - significantly above the EU average (40%)[123]. This created a structural contradiction: **a policy intended to decarbonise the power sector simultaneously also contributed to relatively high electricity prices, thereby weakening incentives for electrification at the precise moment they were most needed.**

In response, Germany pursued the same objective as Ireland and the Netherlands - realigning energy price signals to accelerate decarbonisation - but through a hybrid approach. **Like**

116 International Carbon Action Partnership. "German National Emissions Trading System." ICAP ETS Map Factsheet. Accessed 29 June 2026

117 Federal Government of Germany. "CO_2 Pricing." Federal Government, 20 September 2019.

118 EnergyMarketPrice. "Germany Will Halt Its National CO_2 Price in 2027 Due to the EU Postponing Emissions Trading." EnergyMarketPrice, 12 November 2025.

119 Edenhofer, Ottmar, Christian Flachsland, Matthias Kalkuhl, Brigitte Knopf, and Michael Pahle. "Assessment of the German Climate Package and Next Steps: Carbon Pricing, Social Balance, Europe, Monitoring." Mercator Research Institute on Global Commons and Climate Change and Potsdam Institute for Climate Impact Research, 22 October 2019

120 30€ in 2022 and 2023, 40€ in 2024, 45€ in 2025. From 2026, auctions with a price corridor (55- 65€)

121 from 17% in 2010 to 35% by 2017. International Energy Agency. "Electricity – Germany." Countries & Regions, IEA. Accessed 29 June 2026.

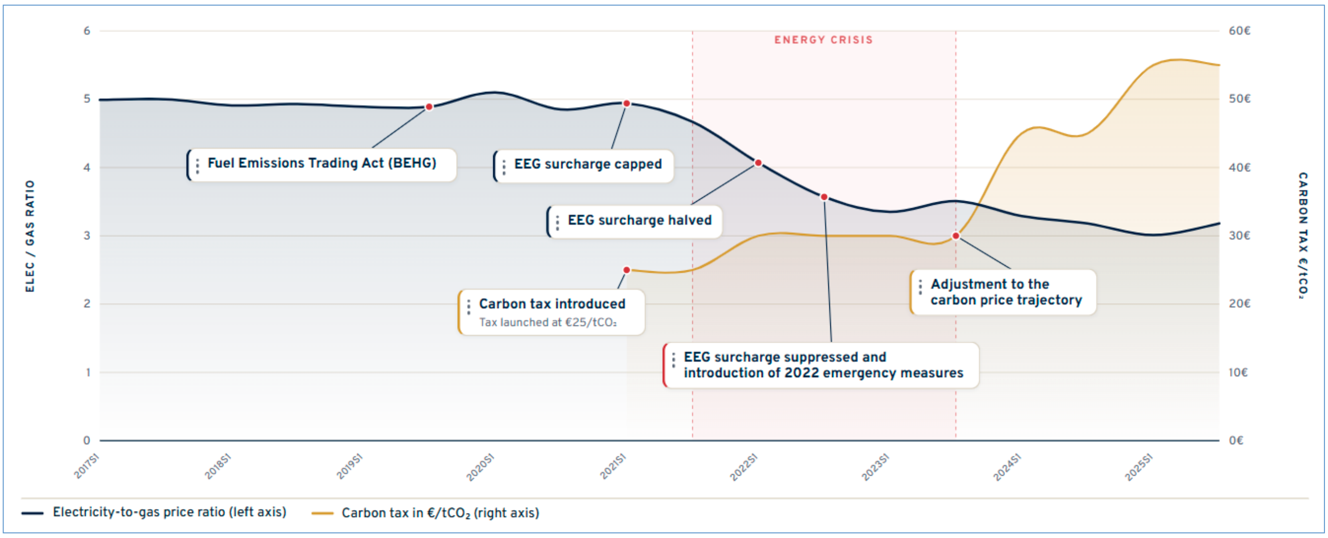
122 Bundesverband der Energie- und Wasserwirtschaft. "BDEW-Strompreisanalyse April 2026." BDEW, 15 April 2026.

123 European Commission: Eurostat. "Electricity Prices Components for Household Consumers – Annual Data (from 2007 onwards) [nrg_pc_204_c]." Eurostat Data Browser. Accessed 29 June 2026.

Ireland, it introduced a national carbon price (nETS), generating new revenues from fossil fuel use. At the same time, rather than directly adjusting existing energy taxes as in the Netherlands, Germany used these revenues to shift EEG costs from electricity bills to the federal budget. In effect, all three countries pursued variants of fiscal rebalancing - moving the burden of climate policy away from electricity and onto carbon-intensive energy - albeit through different institutional routes reflecting their starting points.

The gradual phase-out of the EEG surcharge marked a turning point. While carbon pricing had already begun to improve relative price signals - narrowing the ratio from 5.1 in early 2020 to 4.7 by end-2021 - its impact was constrained by persistently high electricity levies. More decisive progress followed: the EEG 2021 cap[124] introduced under the post-pandemic stimulus package, its partial reduction in early 2022 amid rising energy price, and its full phase-out in July 2022[125] brought forward in response to the 2022 energy crisis. This shift, financed via carbon revenues channelled through the KTF, reduced the electricity-to-gas price ratio further to 3.4 by early 2023.

FIGURE 8. Evolution of Germany's electricity-to-gas price ratio, set against the carbon tax trajectory



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with Eurostat and BMWK data.

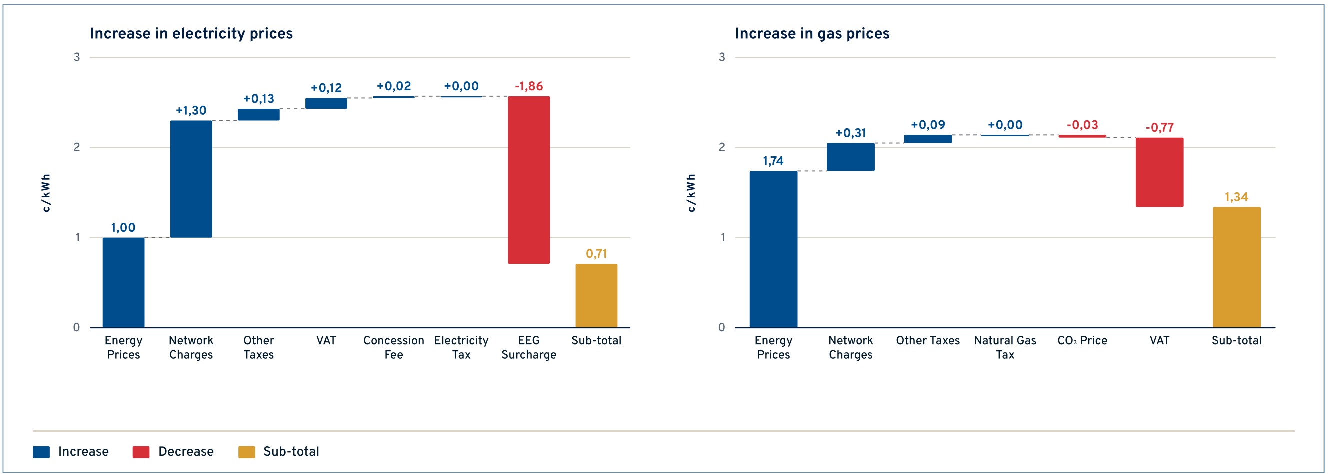
Importantly, this fiscal architecture proved relatively resilient even under crisis conditions. The structural reduction in electricity costs helped offset part of the surge in wholesale prices and locked in a sustained improvement in electricity's relative attractiveness. At the same time, crisis interventions on the gas side - namely the VAT cut from 19% to 7%, the CO_2 price increase postponement, and price brakes applied to *both* electricity and gas - partly diluted these incentives by shielding consumers from the full carbon and market signals. **Yet, these measures did not fully neutralise relative price dynamics.** Between early 2022 and the end of 2023, gas prices rose by over 10% while electricity prices remained broadly stable (+1.5%), allowing the electricity-to-gas price ratio to continue narrowing from 4.8 before the crisis to

124 Enerdata. "Germany Will Spend €11bn to Lower EEG Renewable Surcharge in 2021–2022." Daily Energy & Climate News, 8 June 2020

125 Appunn, Kerstine. "Germany Stops Landmark Mechanism That Funded Renewables Expansion via Power Bills." Clean Energy Wire, 30 June 2022.

3.4 in 2023, albeit at a slower pace. **This suggests that well-designed fiscal rebalancing can retain some steering effect even when layered with crisis measures, provided that these remain temporary and do not symmetrically suppress price signals.** Germany's experience during this period carries a direct lesson for the current Iran-related energy shock: broad-based heating fuel subsidies tend to freeze relative price signals and erode electricity's cost advantage, while more targeted interventions can preserve directional incentives even under affordability pressure.

FIGURE 9. Decomposition of household electricity and gas price increases during the energy crisis, 2022-2023



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with SDES (French Sustainable Development Statistics) data.

This relative improvement, however, did not translate into absolute cost competitiveness. Despite substantial reforms, electricity prices in 2025 remained around 20% above their pre-crisis level - significantly higher than gas prices in absolute terms. In response, the coalition government formed under Chancellor Merz in May 2025 (CDU/CSU–SPD) committed to reducing electricity prices by at least 5 ct/kWh by recycling carbon pricing revenues to lower the electricity tax to the European minimum. Fiscal pressures, however, led to a partial reversal by July 2025, with relief largely confined to industrial users and broader household measures postponed[126].

The 2026 outlook points to a gradual reorientation of policy, away from targeted fiscal rebalancing and toward a more horizontal affordability approach. While the transition to a carbon price corridor of €55–65/tCO_2 under the nETS is expected to increase revenues accruing to the KTF, these additional resources are no longer systematically channeled toward strengthening electrification incentives. **Instead, policy has taken a more distributionally neutral approach aimed at reducing overall energy costs.** This shift is reflected in parallel price reductions across energy carriers. Electricity prices are projected to decline by around 5%, mainly driven by a 15% reduction in grid fees financed through a €6.5 billion KTF subsidy to transmission system operators[127]. In parallel, gas prices are reduced by around 7% through

126 Wehrmann, Benjamin. "What German Households Pay for Electricity." Clean Energy Wire, 4 December 2025

127 Eversheds Sutherland. "Germany: Bill on Subsidy for Reducing Network Access Fees in 2026." Insight, 15 September 2025

a €3.4 billion allocation to abolish the gas storage levy[128]. Although these measures deliver tangible relief (€160 per household), they compress the price differential between electricity and gas, weakening the relative cost advantage of electrification. **More fundamentally, using carbon revenues to subsidise fossil gas undermines the internal consistency of the policy framework by offsetting the very price signal carbon pricing is meant to create.** This not only dilutes its effectiveness as a driver of structural change, but may also create tensions in terms of public acceptability[129], as households are simultaneously exposed to carbon costs while seeing revenues used to cushion fossil fuel use.

Against this backdrop, more targeted corrective measures have begun to emerge. Since January 2024, households with controllable devices - including heat pumps - can benefit from reduced network tariffs in exchange for demand flexibility, with reductions of up to 60% in unit network tariffs[130]. In parallel, a 2026 amendment to the Energy Financing Act exempts electricity used for heat pumps from the CHP levy and the offshore network levy (1.1 ct/kWh in 2025). Combined, these measures can reduce electricity costs for heat pump users by 6 to 8 ct/kWh (roughly 15–20%). Beyond their immediate savings, these interventions mark a shift in policy logic. **By targeting specific end-uses rather than applying broad-based price reductions, they attempt to correct relative price signals while maintaining affordability - preserving, rather than diluting, incentives to electrify.**

However, this more coherent design comes at the cost of limited reach. Access depends on meeting specific technical requirements, notably the installation of a separate meter, which introduces upfront (€100–200) and recurring (€25/year) costs[131]. The investment typically becomes worthwhile only above around 3,000 kWh of annual heat pump electricity use - and less so for households with significant self-consumption from rooftop solar. As a result, these measures function more as targeted optimisations than systemic corrections: they improve the economics of electrification at the margin, but do not fundamentally alter the broader price structure.

2 . The policy framework

Germany's building decarbonisation strategy rests on two interdependent delivery channels: **the scale-up and decarbonisation of district heating, and mass electrification through heat pumps.** On the latter, meeting the 2030 target of 6 million installed units require sustained annual installations of at least 500,000 units from 2024 onwards[132] - a pace that recent deployments (230,000 in 2024, 300,000 in 2025) fall significantly short of, leaving an installed stock of around 2.6 million at end-2025, roughly 40% of the target. This shortfall reflects structural constraints embedded in the policy and market framework itself, not merely cyclical fluctuations.

The post-2021 architecture initially provided strong directional signals, coupling strengthened financial incentives with reinforced regulatory clarity. The revised Building Energy Act (GEG), adopted in 2023, mandated that newly installed heating systems operate on at least 65% renewable energy from 2024 onwards - effectively phasing out new standalone fossil fuel boilers. **Yet the enacted text reflected a coalition compromise that significantly diluted the original ambition.** While the government aimed for a broad de-facto ban on new fossil-fuel systems, the ban only applies narrowly to new construction from January 2024, while existing buildings retain flexibility until municipalities complete climate-neutral

128 Argus Media. "German Coalition to Abolish Gas Storage Levy 'for All.'" Latest Market News, 26 March 2025

129 Eisl, Andreas, and Phuc-Vinh Nguyen. "How to Make the ETS2 Socially Acceptable." Policy Paper No. 314, Jacques Delors Institute, November 2025.

130 Bundesnetzagentur. "Bundesnetzagentur Sets Rules for the Integration of Controllable Consumer Devices." Press release, 27 November 2023.

131 Energie-Experten. "Stromzähler für Wärmepumpen: Wann lohnt sich welcher Zähler?" Last updated 19 February 2026. Koch, Johanna. "Brauchst du einen Stromzähler für deine Wärmepumpe?" 1KOMMA5°, updated 16 September 2025

132 Agora Energiewende. "Heat Pumps Are the Key to Climate Neutrality in Buildings: Insights from Germany." Agora Energiewende, July 2023.

heating plans, extended to 2026-2028. Crucially, the revised GEG permits continued installation of "hydrogen-ready" gas heaters - a concession to gas industry lobbying[133] that, given hydrogen's continued dependence on natural gas and uncertain conversion economics, risks preserving a fossil pathway under the guise of future-proofing. The gap between statutory ambition and enacted policy is therefore significant from the outset.

Against this regulatory backdrop, deployment trends point to genuine but unevenly distributed progress. Installations rose from 170,000 units in 2021 to 440,000 in 2023 across the existing and new sector, and **a structural milestone was reached in the first half of 2025: heat pump sales exceeded gas boiler sales for the first time**. By 2025, nearly 70% of newly constructed homes were equipped with heat pumps, up from around 20% in 2015, with the share expected to rise further to 80% based on current building permits. P**rogress in the existing building stock is more encouraging than in other European countries, but remains limited in absolute terms:** while heat pumps' share in renovation projects increased from about 5% in 2019 to 25% in 2023, fossil-based systems still account for more than half of installations - despite half of existing buildings already being technically suitable without renovation and up to 80% with only minor upgrades. The gap between technical potential and realised deployment points to a set of structural barriers that regulatory ambition alone has not resolved.

The most binding of these is cost. Average installation costs in Germany reached approximately €35,000 - double those in France and the Netherlands (€15,000–16,000)[134]. This premium reflects a compounding set of market characteristics: dominance of high-specification domestic manufacturers with limited penetration from lower-cost producers, a technological culture that prioritises performance over standardisation - which in turn, increases complexity, extend installation time, and amplify dependence on certified specialist labour, installer labour rates averaging €60–70 per hour against €35–45 elsewhere - explaining roughly 20% of the cost differential independently of equipment pricing - and a VAT rate of 19% against 5.5–10% in France and 9% in Ireland. Each of these factors is individually significant and in combination, they constitute a structural cost floor that policy has so far failed to address.

The subsidy framework, while nominally generous, compounds rather than corrects this problem. The reformed BEG scheme, in force since 2024, operates as a proportional reimbursement model - a base rate of 30%, supplemented by bonuses for natural refrigerants (+5%), fossil systems replacement (+20%), and low-income households (+30%), with total support potentially reaching 70% of eligible costs up to a €30,000 ceiling - corresponding to a maximum grant of €21,000[135]. **Because subsidy levels scale with total project costs, suppliers face limited pressure to minimise prices, instead anchoring pricing strategies around subsidy ceilings and sustaining a high-cost equilibrium rather than driving standardisation or competition.** The mechanism intended to make heat pumps affordable has become a structural prop for the cost levels that make them unaffordable without it. **The distributional consequences follow directly from this design logic**. While payback periods fall from around 14 years without support to approximately 7 years at the base rate[136], even at the 70% ceiling a €30,000 installation still requires roughly €9,000 in residual expenditure - a threshold compounded by €1,500–2,700 in administrative transaction costs that falls disproportiona-

133 Bundesverband der Energie- und Wasserwirtschaft, Deutscher Verein des Gas- und Wasserfaches, and Zukunft Gas. "Transformationspfad für die neuen Gase." BDEW, May 2023.
Deckwirth, Christina. "How the German Gas Lobby Gutted a New Heating Bill." Climate State, 8 July 2023. Federal Association of Energy and Water Industries (BDEW), German Technical and Scientific Association for Gas and Water (DVGW), gas lobby association Zukunft Gas

134 Miara, Marek. "Heat Pump Installation Costs: Germany vs. Europe." Heat Pumps Watch, 10 February 2026

135 heimWatt. "Neue BEG-Förderung für Wärmepumpen seit 01. Januar 2024." heimWatt Ratgeber, 26 January 2024

136 Allianz Research. "The Heat Is On: Unlocking Germany's Heat-Pump Potential." Allianz Research, 20 January 2026 tely on liquidity-constrained households. That only 30% of the approximately 150,000 grants awarded in 2024 included the low-income bonus reflects a scheme that, by design, rewards those with the financial capacity to pre-finance investments and absorb residual risk. Subsidy volume, in this respect, is not a proxy for equity. Economics Minister Reiche has acknowledged this dynamic explicitly, signalling a reorientation toward targeted, income-focused support on the grounds that subsidy scale has itself driven up installation costs[137].

Crucially, the deeper problem is one of sequencing. The 2023 heating reform imposed regulatory obligations before the issues were resolved and the structural conditions for an affordable transition had been established - and was perceived accordingly. The policy's credibility was further eroded by subsidy instability: the suspension of support programmes at end-2023, followed by the simultaneous announcement of more generous 2024 schemes, created perverse incentives for deferral precisely when investment momentum was most needed. Full reinstatement not achieved until August 2024 and prospect of subsidy reductions end-2025 have already triggered a pull-forward surge in early 2026 installations - a pattern that, as the Netherlands case illustrates, tends to be followed by contraction rather than sustained growth. **The result was a stop-and-go environment that converted a credible long-term framework into a source of uncertainty, ultimately leading to the erosion of public support.**

In 2026, the new coalition replaced the 65% renewable mandate with a technology-neutral framework and a gradually escalating "bio-staircase". **This recalibration of the Building Modernisation Act can be read as the political aftershock of a climate policy that was framed too abruptly and too confrontationally.** During the 2023 heating law debate, heat pumps became the centre of a highly polarised cultural conflict, fuelled by conservative actors, tabloid media and the gas lobby, which turned the reform into an exceptionally emotional controversy. Quantitative content analysis confirms that the media overwhelmingly judged the law negatively, especially on communication, acceptance and its perceived adverse economic and climate effects[138]. The main lesson is that ambitious climate policy measures must be designed and communicated with acceptance in mind from the outset: early, clear messaging, active debunking of misinformation, and stronger social cushioning before obligations are imposed are all essential. Seen in this light, **the 2026 reform is not only a technical correction to a policy that moved faster than the market, but also a political correction to a reform whose framing helped make it unsustainable.** Yet if the new framework lowers coercion without improving the structural conditions for adoption, it risks remaining politically easier but economically too weak to deliver the market transformation it seeks.

The landlord-tenant dimension illustrates both the ambition and the limits of the current framework. Since 2023, Germany's carbon cost-sharing mechanism has allocated emissions-related charges between tenants and landlords on a sliding scale from 0 to 95%, depending on the building's emissions per square metre and year. In practice, this means well-insulated buildings with gas boilers face relatively low carbon-cost burdens, while inefficient buildings shift a much larger share of the charge onto landlords, thereby strengthening the incentive to invest in retrofits. The newly negotiated 2026 tenant-protection rule extends this logic for new gas boilers: regardless of a dwelling's actual emissions, landlords installing a new gas boiler after September 2026 will have to bear 50% of CO_2 costs from 2028 and 50% of biogas blend costs from 2029. **Taken together, these measures are intended to correct the principal-agent problem by linking the cost of emissions more directly to the actor who controls the investment decision**. Yet their behavioural effects remain limited. Current cost levels are still modest - around €250 per year

137 Osna.FM. "Germany to Scale Back Heating System Subsidies." Osna.FM, 12 December 2025.

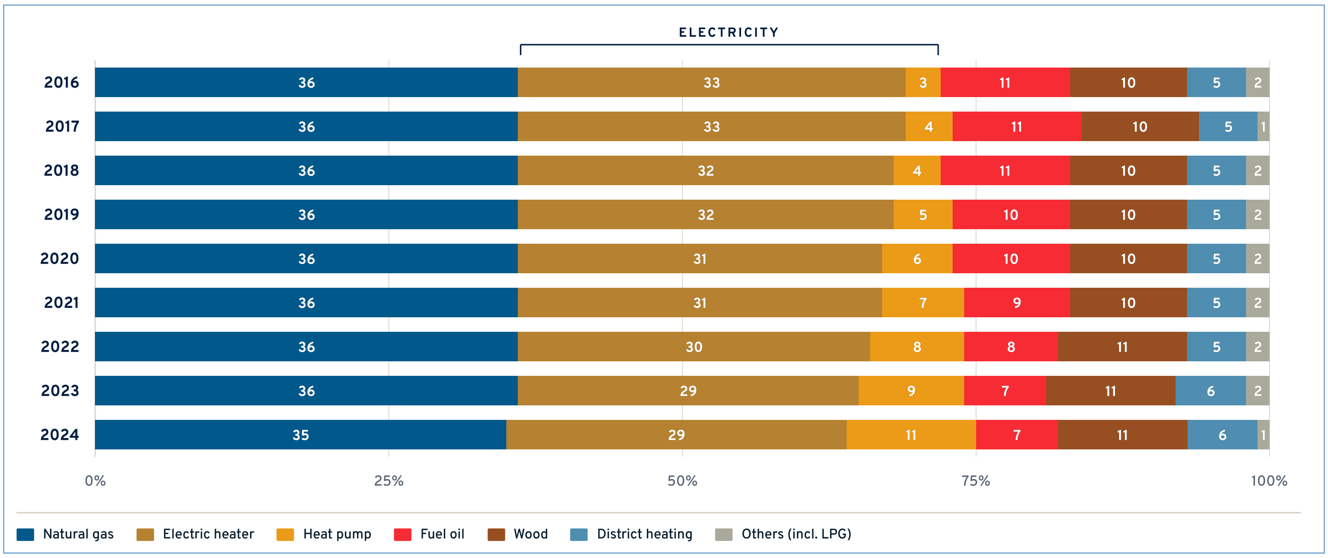
138 Jost, Pablo, Matthias Mack, and Johannes Hillje. "Aufgeheizte Debatte? Eine Analyse der Berichterstattung über das Heizungsgesetz – und was wir politisch daraus lernen können." Das Progressive Zentrum, April 2024.

for a typical apartment - and remain too low to offset the attractiveness of new gas systems over a 20-year horizon, especially if landlords do not believe carbon costs will rise steadily over time. The framework is therefore coherent in principle, but its impact still depends on policy credibility and on whether future cost escalation is seen as politically durable.

4. France

In the residential building sector, heating accounts for two-thirds (66%)[139] of total energy consumption. Electricity is the primary heating source in France, serving 40% of households in 2024, ahead of gas (35%), wood (11%), and oil (7%)[140] (see Figure 10). This level of heating electrification is significantly more advanced than in the other countries studied and is largely a legacy of France's structural response to the 1973 oil shock.

FIGURE 10. Energy mix for residential heating in France, 2016-2024



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with SDES (French Sustainable Development Statistics) data.

139 ADEME. "Consommation surfacique des bâtiments résidentiels par usage." BâtiZoom: Observatoire de la Transition Écologique du Bâtiment, updated 13 April 2026.

140 Service des données et études statistiques. "Bilan énergétique de la France pour 2024." Données et études statistiques, 4 March 2026

The predominence of electricity stems directly from the 1974 "Messmer Plan," which commissioned 58 nuclear reactors to replace oil-based electricity - then 40% of France's power mix.[141] The resulting fleet was intentionally oversized to ensure energy independence, creating a surplus that enabled the mass rollout of electric resistance heating. Targeted policies[142] - repayable advances for new housing, special tariff structures, and communication campaigns[143] - accelerated this transition. However, by prioritising electric heaters over building fabrics, the policy diverted investment away from thermal insulation and drastically increased winter electricity peak demand.

This strategy rapidly expanded electric heating's share from 14% of dwellings in 1970 to 57% in 1990[144], first in individual houses (70% in 1982) and later to multi-family dwellings (45% in 1990[145]). Today, the share stands at 38%, shaped by two opposing trends. First, falling fossil fuel prices in the 1990s and the 2012 thermal regulation (RT 2012) - which set consumption cap for new buildings expressed in primary energy rather than final energy, structurally disadvantaging electricity - boosted condensing gas boilers and reduced direct electric heating to 29%. Second, heat pump use rose markedly (9%), driven by higher fossil fuel prices in the 2000s and accompanying tax incentives[146]. **Compared to the other countries studied, France's heating electrification is significantly more advanced, largely as a legacy of these structural responses to the oil shock.**

Today, France has the largest heat pump stock in Europe (6.6 million units in 2024[147]) and ranks sixth in installations per 1,000 households (200 units). Two factors explain this: an abundant, low-carbon electricity supply[148] and a relatively stable, favourable electricity-to-gas price ratio (around 2.4 over the past decade). With a significant electricity surplus (over 90 TWh exported in 2025, or 17% of total production[149]), **France holds a comparative advantage that remains partially underutilised.** Indeed, gas boilers in the building sector have stagnated at 36% since 2016, while oil-based systems have only gradually declined (from 11% to 7% between 2016 and 2023).

France's building decarbonisation strategy therefore depends on its ability to rapidly stimulate heat pump demand, especially as fossil fuel replacements. Although a robust action plan is now in place, its short-term implementation may be constrained by limited budgetary capacity and an unstable political majority.

141 International Energy Agency. "France 2021: Energy Policy Review." IEA, 30 November 2021.

142 Archives historiques du Ministère de la Transition écologique et solidaire et du Ministère de la Cohésion des territoires. "Répertoire d'archives détaillé : Administration centrale : tarification de l'électricité, politique énergétique … 1965–1999." Published 9 May 2014, updated 2 April 2019.

143 Fontaine, Antoine. "Le choix du nucléaire, une question de chaleur. Politiques et régimes concurrents pour chauffer la France au cours des années 1970." In Le défi thermique. Normes, territoires et politiques de la chaleur et du chauffage, edited by Antoine Fontaine and Laurence Rocher, 115–137. Paris: Presses des Mines, 2025

144 Bouton, François. "Les énergies de chauffage des ménages en France métropolitaine." Données et études statistiques, Service des données et études statistiques, 28 October 2024.

145 Fontaine, Antoine, and Laurence Rocher. "Les enjeux thermiques de la transition énergétique." In Le défi thermique. Normes, territoires et politiques de la chaleur et du chauffage, edited by Antoine Fontaine and Laurence Rocher, 9–25. Paris: Presses des Mines, 2025

146 Clerc, Marie-Émilie, Amélie Mauroux, and Vincent Marcus. "Le recours au crédit d'impôt en faveur du développement durable : Une résidence principale sur sept rénovée entre 2005 et 2008." Insee Première, no. 1316, INSEE, 14 October 2010

147 EHPA. "Heat Pump Market Intelligence – Interactive Platform." EHPA. Accessed 29 June 2026

148 RTE. "Bilan électrique 2025 – Principaux résultats." RTE, 25 February 2026

149 RTE. "Bilans électriques nationaux et régionaux." RTE. Accessed 29 June 2026

BOX. Political Context

In France, the ambition to introduce a carbon tax dates back to the early 2000s, driven both by climate objectives and by the intention to finance a reform of working time150. However, the draft law was struck down by the Constitutional Council on the grounds that it breached the principle of equality before taxation. During the 2007 presidential election, the main candidates committed to introducing a carbon tax by signing an "Ecological Pact,"151 supported by more than 700,000 French citizens and championed by Nicolas Hulot (Greens), a prominent environmental figure in France. In line with this commitment, President Nicolas Sarkozy (EPP) secured parliamentary approval in 2010 for a carbon tax set at €17/tCO_2. However, it was once again invalidated by the Constitutional Council due to an excessive number of exemptions and partial rebates[152].

In 2014, his successor François Hollande (S&D) introduced a carbon component - often referred to as a "carbon tax" - in accordance with a political agreement concluded with the Green party ahead of the election. Applied to fossil energy consumption (oil, gas, and coal), it covered around 40% of France's greenhouse gas emissions (broadly corresponding to the future scope of ETS2), including the building sector. Initially set at €7/tCO_2, the carbon price followed a non-linear trajectory[153], with a planned increase to €56/tCO_2 in 2020 and €100/tCO_2 by 2030 - comparable to the level adopted by Ireland for that horizon. Subsequently, the 2018 Finance Bill proposed accelerating this trajectory[154], implying a carbon price exceeding €100/tCO_2 as early as 2024. **However, the tax was frozen in 2018 at €44.6/tCO_2 following the Yellow Vests movement** triggered by the sharp increase in the carbon price from €30.5/tCO_2 to €44.6/tCO_2, combined with rising global oil prices and an excise tax adjustment aimed at aligning diesel and petrol taxation, resulting in pump price increases of approximately €0.21/litre for diesel[155] and €0.08/litre for petrol[156]. **This politically traumatic episode continues to explain the reluctance of French policymakers to advance proposals related to energy taxation.** It also sheds light on France's hesitation to implement ETS2[157], amid concerns that excessive volatility in future carbon prices could significantly increase households' energy bills. Finally, this episode provides empirical support for the need to earmark all revenues from carbon taxation for the energy transition in order to enhance social acceptability[158], in line with findings from the academic literature and later experiences in Ireland and Germany.

150 Rogissart, Lucile, Sébastien Postic, and Julia Grimault. "La composante carbone en France : fonctionnement, revenus et exonérations." Point climat no. 56, I4CE, October 2018.

151 Vie-publique.fr. "De l'écotaxe à la taxe carbone, la difficile mise en œuvre du principe pollueur-payeur." Vie-publique.fr, 15 November 2021.

152 Vaudano, Maxime, and Jonathan Parienté. "La taxe carbone et le Conseil constitutionnel : une histoire de désamour." Le Monde, 23 August 2013, updated 7 October 2013.

153 €14.5/tCO_2 in 2015, €22/tCO_2 in 2016, €30.5/tCO_2 in 2017, €39/tCO_2 in 2018, and €47.5/tCO_2 in 2019

154 Annual increases targeting €55/tCO_2 in 2019, €65.4/tCO_2 in 2020, €75.8/tCO_2 in 2021, and €86.2/tCO_2 in 2022

155 INSEE. "Prix moyens mensuels de vente au détail en métropole – Gazole (1 litre)." Série chronologique, identifiant 000442588. Accessed 29 June 2026

156 INSEE. "Prix moyens mensuels de vente au détail en métropole – Supercarburant sans plomb, indice d'octane 95 (1 litre)." Série chronologique, identifiant 000849411. Accessed 29 June 2026.

157 Nguyen, Phuc-Vinh. "ETS2 : clé de voûte du Pacte vert européen ou premier des dominos ?" Policy Paper, Institut Jacques Delors, November 2025.

158 Eisl, Andreas, and Phuc-Vinh Nguyen. "How to Make the ETS2 Socially Acceptable." Policy Paper No. 314, Jacques Delors Institute, November 2025.

1 . The electricity-to-gas price ratio

In energy-transition policy, Emmanuel Macron's second term (beginning in 2022) began with a campaign pledge made to launch an **ecological planning agenda designed to deliver a "concrete, collective and credible" roadmap for France's ecological transition - including housing as one of six pillars.** In practice, however, the ambition of this agenda has been sharply constrained by structural fiscal and political constraints. With a public deficit of 5.2% of GDP in 2025[159] and the absence of a stable parliamentary majority following the dissolution of the National Assembly after the 2024 European elections, the government has been reduced to building an energy policy on the lowest common denominator: **pushing electrification at constant budget, relying on extra-budgetary mechanisms and avoiding new fiscal commitments.** This situation is unlikely to change before the next presidential election in April 2027.

In parallel, the price structure of electricity and gas bills reveals an important opportunity for policy action. In France, the composition of electricity and gas bills is relatively similar: taxes account for 33% of electricity bills and 31% of gas bills, network costs for 39% and 37%, and supply costs for 28% and 32%, respectively[160]. As such, one of the most effective ways to incentivise electrification of end uses lies in strengthening the carbon price signal. Yet despite the introduction of a carbon tax in 2014, the electricity-to-gas price ratio paradoxically followed an upward trend until 2021, averaging 2.5 (see Figure 11). This deterioration was driven by the freeze of the carbon tax in 2018 following the *Yellow Vest* movement, simultaneous increases in electricity taxation[161] (the tax and levy component rose by roughly 50% between 2012 and 2020[162]), rising costs of production, procurement and supply, as well as regulatory charges such as energy savings certificates (**CEE**) passed through to consumer bills. The French case, similar to Ireland, illustrates a core lesson: carbon pricing in isolation is insufficient to steer household behaviour; it must be embedded in a wider policy mix that actively improves the relative economics of electricity.

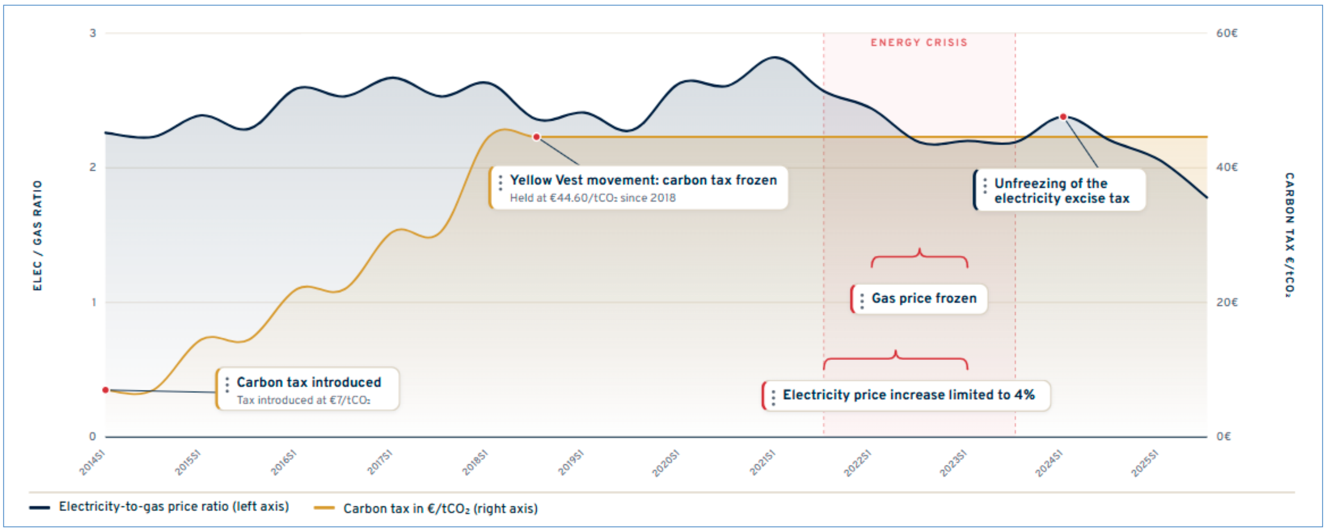
159 INSEE. "Finances publiques." Tableau de bord de l'économie française. Accessed 29 June 2026.

160 Energie-Info. "Prix de l'électricité et du gaz : que payons-nous ?" Médiateur national de l'énergie. Accessed 29 June 2026

161 Connaissance des Énergies. "Prix de l'électricité : de combien a-t-il augmenté en France ces dernières années ?" Connaissance des Énergies, updated 17 September 2024.
Florian. "Bouclier tarifaire contre la hausse des prix de l'énergie." Selectra, updated 15 April 2026.

162 Sfen. "Fin du bouclier tarifaire : l'électricité plus taxée que le gaz." RGN, 22 January 2024.

FIGURE 11. Evolution of France's electricity-to-gas price ratio, set against the carbon tax trajectory



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with Eurostat and Ministère de la Transition écologique data.

The downward trend observed since 2022 is more encouraging, but it reflects short-term crisis management rather than a structural shift in favour of electrification. In 2022, France experienced specific disruptions in its electricity production: stress corrosion issues led to the shutdown of roughly half of the nuclear fleet, with availability falling to 54% compared to an average of 73% between 2015 and 2019[163], while 2022 was also the second driest year on record, reducing hydro output by 20% compared to the 2014–2019 average. The resulting drop in generation from nuclear and hydro - France's two main sources, accounting for 70% and 12% respectively in 2021[164] - forced the system to rely more heavily on gas-fired electricity, both through imports from neighbouring countries and through increased domestic gas-fired generation[165]. In this context, the Banque de France estimated the cost of nuclear unavailability at €16 billion for 2022[166].

Caught between rising European gas prices and higher domestic electricity costs, the state responded with a two tariff shield. For gas, regulated gas tariffs for households were frozen on 1 November 2021 at their October 2021 level, preventing an estimated price increase of 180% (including taxes) by 1 October 2022[167]. Subsequently, from 1 January to 1 July 2023, price increases were capped at 15%, avoiding a further estimated rise of around 120%[168]. For the State, which implemented full and direct compensation, the cost of the gas tariff shield amounted to €4.8 billion in total[169].

For electricity, the approach was initially more cautious. Between 1 February 2022 and 31

163 RTE. "Bilan électrique 2022." Analyses et données de l'électricité, RTE, data updated February 2023.

164 RTE. "Bilan électrique 2021 – Une production d'électricité assurée à plus de 92 % par des sources n'émettant pas de gaz à effet de serre." RTE, 25 February 2022

165 RTE. "Bilan électrique 2022 – Un système électrique français résilient face à la crise énergétique." RTE, 14 February 2023

166 Gaulier, Guillaume, and Charles Serfaty. "Solde énergétique en 2022 : la crise de la production électronucléaire survenue au pire moment." Bloc-notes Éco no. 329, Banque de France, 24 November 2023, updated 25 July 2024.

167 Energie-Info. "Le 1er octobre 2022, les tarifs réglementés de vente d'électricité et de gaz naturel n'évoluent pas." Médiateur national de l'énergie, 30 September 2022.

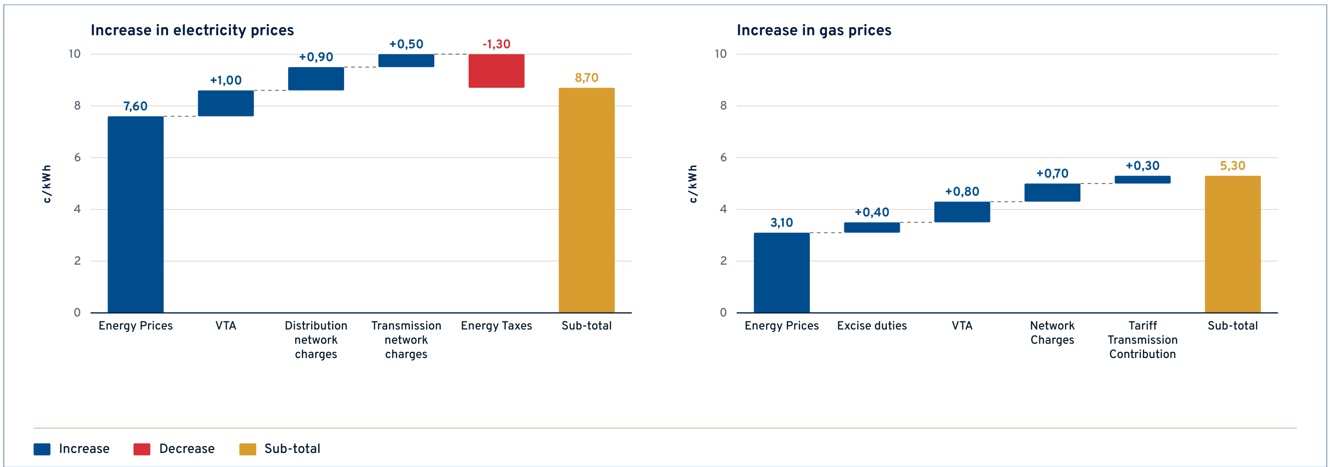
168 Khadira, Oumaima, and Christophe Meilhac. "Prix du gaz naturel en France et dans l'Union européenne en 2022." Datalab Essentiel, Service des données et études statistiques, August 2023.

169 Commission de régulation de l'énergie. "Dispositifs de soutien aux consommateurs." CRE, page updated 24 July 2024.

January 2023, price increases were limited to 4%, preventing a 35% rise for households relative to February 2021. This relied on a cash-advance mechanism via suppliers in 2022, intended to be recovered in 2023, and on a sharp reduction in electricity taxation: the excise tax was lowered to €1/MWh, the minimum allowed under EU law - contributing to the decline in the electricity-to-gas price ratio (see Figure 11). From 1 February 2023, the State moved to direct and final compensation, again capping price increases at around 15% (including taxes) instead of the 100% that would have occurred without the shield. From 1 August 2023, the cap was tightened to 10%, avoiding a theoretical increase of 75%. The shield was extended for an additional year from 1 February 2024 to allow a gradual phase-out, aligned with the decline in wholesale electricity prices. For the State, the cost of the electricity tariff shield for households amounted €20 billion for households[170] - four times more than for gas over the same period.

The progressive unfreezing of the electricity excise tax, which rose from €1/MWh to €21/MWh in 2024 (compared to €32/MWh pre-crisis), explains the rebound in the electricity-to-gas price ratio in the first half of 2024 (see Figure 12). Nonetheless, the overall trend has remained downward, driven among other factors by the doubling of the gas excise tax in 2024[171]. The French case therefore illustrates how crisis-driven price relief and targeted tax adjustments can temporarily improve relative price signals, but also how fragile such improvements are if they remain tied to short-term measures rather than a durable reform of the tax structure.

FIGURE 12. Decomposition of household electricity and gas price increases during the energy crisis, 2022-2023



▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute). Made with Eurostat and CRE data.

In parallel, additional measures were adopted, including a strengthening of the "energy cheque" targeted at lower-income households. In 2023, the energy cheque benefited 5.6 million households, with amounts ranging from approximately €50 to almost €280 depending on taxable income and household composition. At the end of 2022, this support was exceptionally supplemented by three additional payments: one ranging from €100 to €200 for income-eligible households, one for heating oil users, and another for wood users. According to the Banque de France, the tariff shield as a whole contributed to limiting inflation (by 2.2%) while supporting economic growth (by 0.3%). However, it came at a very high fiscal cost -

170 Commission de régulation de l'énergie. "Dispositifs de soutien aux consommateurs." CRE, page updated 24 July 2024

171 Jezioro, Étienne. "Prix du gaz et de l'électricité au premier semestre 2025." Données et études statistiques, Service des données et études statistiques, 20 November 2025.

between €60 and €72 billion over the period 2021–2024[172] - due to insufficient targeting, which partly explains France's current public deficit level of 5.2%.

Now unable to replicate such a level of budgetary effort, France has opted for a crisis response to the situation in Iran that combines better targeting of support measures with an acceleration of the electrification agenda. While this approach is primarily driven by economic and political pragmatism, it also constitutes a best practice that could be replicated across the EU. Nevertheless, caution is warranted in the French case. Despite two successive gas price increases of 15.4% (just over €6 including taxes) and 4.8% in May and June[173], respectively, the impact on households has so far remained limited due to the end of the heating season. However, in the event of a prolonged disruption of the Strait of Hormuz, the government could be forced to introduce additional support measures, potentially undermining efforts to ensure price convergence between electricity and gas. Preventing such an outcome is essential to preserve the dual incentive provided by both the price signal and the implementation of the electrification agenda.

2 • The policy framework

The ecological planning agenda for France's building sector sets various 2030 objectives, including a 58% reduction in direct greenhouse gas emissions (compared to 2019) and a 10% decrease in energy consumption. In concrete terms, this entails phasing out at least 75% of oil-fired heating systems and reducing the number of gas boilers by around 20% (approximately 3 million units) by 2030.

Within this framework, the third National Low-Carbon Strategy (SNBC 3), due to be published in July 2026, aims to scale up renovation efforts to 700,000 dwellings per year by 2030, including 250,000 deep renovations defined as achieving at least a two-class improvement in energy performance (from A to G). This target appears particularly ambitious in light of France's persistent difficulty in delivering deep renovations over the past 15 years. Recent experience illustrates this gap between ambition and implementation. As early as February 2024, the government effectively abandoned its January 2024 target of 200,000 deep renovations, shortly after announcing a €1 billion cut to the MaPrimeRénov' budget - the main renovation subsidy scheme - reducing it to €3 billion (down from €3.4 billion initially planned, though still above the €2.4 billion allocated in 2023). As a result, by 2025, only 120,000 subsidised deep renovations had been completed, alongside 190,000 single-measure interventions.

Beyond budgetary constraints, policy design has been marked by instability. The reintroduction of single-measure renovations into MaPrimeRénov' in 2024 - after their exclusion in 2023 - illustrates a broader lack of strategic consistency. This instability is further underscored by the recent decision of the French government[174] to once again sharply reduce the scheme's scope by excluding single-measure renovations, with the aim of achieving €300 million in savings. This constant stop and go adjustment reflects an unresolved tension between proponents of comprehensive retrofits[175] - who see heat pumps as a way to maximise emissions reductions[176] through fuel switching - and advocates of single-measure upgrades, which often include heat pump installations regardless of insulation level. This debate is

172 Cour des comptes. "Les mesures exceptionnelles de lutte contre la hausse des prix de l'énergie." Rapport public thématique, 15 March 2024

173 Service Public. "Le prix repère de vente de gaz baisse de 4,8 % à partir du 1er juin." Direction de l'information légale et administrative, 13 May 2026.

174 Benezet, Erwan, and Vincent Vérier. "« Nous assumons un choix de responsabilité » : nouveau tour de vis pour MaPrimeRénov'." Le Parisien, 26 June 2026.

175 Rüdinger, Andreas. « Maintenir l'ambition sur la rénovation énergétique, enjeu essentiel pour la planification écologique. » IDDRI – Institut du développement durable et des relations internationales, 14 mars 2024.

176 Gouvernement français. « Rénovation énergétique des bâtiments publics de l'État et de l'enseignement supérieur. » Info.gouv.fr, dossier de presse, 14 décembre 2020.

not unique to France and mirrors similar policy trade-offs observed across EU Member States. Recent empirical findings are likely to further intensify this discussion. ADEME[177] has indicated that heat pump performance is not strictly contingent on high levels of prior insulation, challenging a key assumption underpinning the sequencing logic of deep renovations. At the same time, INSEE's analysis of residential energy consumption suggests that realised energy savings from insulation works often fall short of modelled expectations[178]. Taken together, these insights call into question the systematic prioritisation of deep renovations as the cornerstone of decarbonisation strategies, and lend support to more flexible, technology-driven approaches.

From a just transition perspective, the current policy reorientation also reflects distributional constraints. As highlighted by the High Council for the Climate (HCC)[179], access to low-carbon heating alternatives entails proportionally higher effort for lower-income households. According to I4CE[180], even after accounting for substantial public support - amounting to roughly €40,000 - a lower-middle-income household would still face a residual cost of around €40,000 for a deep renovation in 2026, making such investments largely inaccessible. By contrast, the economics of heat pump adoption are considerably more favourable. With subsidies reaching up to €12,000 in early 2026, the remaining cost is estimated at approximately €5,500. This differential is likely to further widen in a context of rising gas prices and the anticipated rebalancing of electricity and gas taxation, reinforcing the short- to medium-term attractiveness of electrification pathways. This shift in policy emphasis is consistent with observed investment trends. Since 2016[181], growth in building renovation spending has been driven primarily by heat pump deployment, with investment increasing fivefold to reach approximately €4.7 billion in 2024. In this context, the prioritisation of heat pumps appears less as a deviation from initial strategy than as an adaptation to economic realities, technological performance, and social acceptability constraints. The key challenge going forward will be to reconcile this pragmatic shift with long-term efficiency objectives, ensuring that short-term gains in deployment do not come at the expense of structural reductions in energy demand.

In this context, the electrification plan presented in response to the war in Iran at the end of April 2026 reiterates several prior commitments, including increasing the electrification rate to 38% by 2035 (from 27% currently) and reduce the share of fossil fuels in the energy mix from 60% in 2023 to 40% by 2030 and below 30% by 2035. **For buildings, the government has banned gas boilers in new buildings from 2027 and sets a new target of one million heat pump installations per year by 2030**. To operationalise these objectives, the plan introduces stronger conditionality and new support mechanisms. From 1 September 2026, access to subsidies for deep renovations will be contingent on the removal of fossil fuel boilers, thereby explicitly favouring electrification through heat pumps. Deployment is to be further supported by the introduction of a three-year leasing scheme, modelled on existing electric vehicle programmes: from autumn 2026, low-income households will be able to acquire a heat pump through monthly payments over three years, with total payments capped at or below their previous energy bills.

177 Agence de la transition écologique (ADEME). « Les pompes à chaleur : une solution à fort potentiel. » ADEME, communiqué de presse, 7 octobre 2025.

178 Institut national de la statistique et des études économiques (Insee). « Effets de l'isolation thermique des logements sur la consommation réelle d'énergie résidentielle. » Insee, juillet 2025.

179 Haut Conseil pour le climat. Relancer l'action climatique face à l'aggravation des impacts et à l'affaiblissement du pilotage. Rapport annuel 2025. Haut Conseil pour le climat, 3 juillet 2025.

180 Vailles, Charlotte, et Sirine Ousaci. « Crise énergétique, évolution des aides : les ménages peuvent-ils passer à l'électrique et rénover leur logement ? » I4CE – Institut de l'économie pour le climat, 20 octobre 2023.

181 Agence de la transition écologique (ADEME). « Investissements dans la rénovation énergétique des logements par catégorie de gestes de rénovation. » Batizoom – ADEME, mise à jour du 30 septembre 2025.

Beyond its energy pricing rationale, the one-million-unit target also reflects a clear industrial policy dimension. France's domestic heat pump industry, which currently produces around 500,000 units annually, has committed - within the framework of the electrification plan - to doubling its output by 2030[182]. Aligning this expansion with a European preference clause, consistent with the government's broader "Made in Europe" positioning, would enable France to link decarbonisation objectives with competitiveness and industrial sovereignty. In this sense, heat pump deployment is framed not only as a climate instrument, but as part of a broader strategy to reduce external dependencies and support reindustrialisation. This systemic approach is further underscored by the projected macroeconomic and social impacts of electrification. The decarbonisation of residential heating is expected to reduce French gas imports by 20% by 2030. Looking further ahead, it could enable the phase-out of gas in two million social housing units by 2050, out of a current stock of just over ten million gas-heated homes. **These objectives position heat pumps as a central lever not only for emissions reduction, but also for energy independence and the decarbonisation of lower-income housing segments**.

Finally, the plan introduces "electrification territories," allowing local authorities - at municipal and inter-municipal level -to apply for the implementation of territorially differentiated electrification strategies with quantified targets. These may include, for example, supporting a defined number of households in phasing out oil heating or developing local roadmaps for reducing reliance on gas. Similar to the approach adopted in the Netherlands, where municipalities have played a key role in tailoring implementation, this initiative reflects a growing emphasis on place-based delivery and the operationalisation of national objectives at the local level.

To support this ambition, €10 billion per year will be mobilised until 2030, compared to the €5.5 billion initially planned. However, the additional €4.5 billion does not stem from new budgetary resources, but largely from an expanded use of Energy Savings Certificates (**CEE**). This extra-budgetary mechanism obliges energy suppliers to finance energy efficiency measures for end-users, including households, businesses, and local authorities. While it underpins key schemes such as MaPrimeRénov' and social leasing, it is not neutral for consumers, as costs are ultimately passed through energy prices - estimated by the Court of Auditors[183] at around €0.70c/kWh for gas and €0.69c/kWh for electricity. The scale of this reliance is significant: CEE obligations represented nearly €6 billion in 2022 and have financed approximately 700,000 heat pumps between 2015 and 2023. In the absence of additional fiscal space, France is therefore increasingly shifting the burden of financing onto regulated obligations.

An alternative would be to rebalance energy taxation by aligning taxes on gas and oil with those applied to electricity. Yet, despite recommendations from the Council on Mandatory Levies, the government did not use the phase-out of tariff shields to correct the existing tax differential. According to IDDRI, such a reform could generate around €4 billion in additional revenue. In practice, however, energy taxation remains politically sensitive. Taxes already account for a substantial share of electricity bills (33%)[184] and recent attempts at reform have proven fragile. In late 2024, a proposal to increase electricity excise duties above pre-crisis levels, aimed at raising more than €3 billion, was quickly abandoned following political opposition. As a result, electricity remains taxed at roughly twice the level of gas (and similarly for oil), reinforcing an unfavourable price signal for electrification.

More broadly, as highlighted by the Court of

182 Le Parisien. « On peut doubler la production sans difficulté" : la filière s'engage à produire un million de pompes à chaleur d'ici 2030. » Le Parisien, 24 mai 2026

183 Cour des comptes. Les certificats d'économies d'énergie. Cour des comptes, 17 septembre 2024.

184 Médiateur national de l'énergie. « Prix de l'électricité et du gaz : que payons-nous ? » Énergie-info, fiche pratique.

Auditors[185], energy taxation in France continues to function primarily as a revenue-generating instrument rather than a lever of climate policy, having generated close to €60 billion in 2021. This structural constraint is compounded by the state of public finances which limits the scope for reform. While the Senate has supported a revenue-neutral convergence of electricity and gas taxation - combining lower taxes on electricity with higher taxes on gas - this proposal was rejected by the National Assembly. More recently, the government has signalled openness to reducing electricity taxation, but such a move raises questions regarding fiscal cost (for example, an estimated €2.5 billion for a €6/MWh reduction in excise duty) and targeting.

These budgetary constraints are already affecting the implementation of building decarbonisation policies. MaPrimeRénov', faced a suspension of disbursements for deep renovations in 2025 due to funding limitations, and was again suspended at the start of 2026[186] in the absence of an adopted budget. Such disruptions weaken policy credibility and investment visibility across the sector. Given the current fiscal context - and persistent geopolitical uncertainty affecting energy markets - these constraints are unlikely to ease in the short term, raising broader questions about the financial sustainability of France's electrification strategy.

185 Cour des comptes. « La place de la fiscalité de l'énergie dans la politique énergétique et climatique française. » Cour des comptes, 6 septembre 2024.

186 Franceinfo. « Budget 2026 : le dispositif MaPrimeRénov' suspendu le 1er janvier. » Franceinfo, 22 décembre 2025

5. Social barriers

Price signals and regulatory reforms are necessary to accelerate heat pump deployment, but they are not sufficient on their own. Adoption remains constrained by persistent social and behavioural frictions. One persistent constraint is **replacement bias.** Households rarely replace functioning heating systems before failure, and when they do, they frequently default to familiar fossil-fuel technologies, reinforcing technological path dependency. With gas boilers typically lasting between ten and fifteen years, each missed replacement cycle represents a decade or more of locked-in fossil fuel consumption - and a correspondingly delayed entry point for heat pump adoption. This inertia is reinforced by a **limited sense of urgency**. In this context, adoption depends not only on price signals but also on the credibility of future policy constraints. Therefore, periods of energy price stress can become politically significant moments, temporarily increasing public attention and weakening behavioural inertia. Whether this window translates into durable behavioural change, however, also depends on the surrounding information and support environment.

Low consumer awareness constitutes a second structural barrier, particularly in less mature markets. According to the EHPA, 30% of surveyed homeowners across Europe cited lack of knowledge as a barrier in 2022[187], with even higher levels of unfamiliarity in less mature markets. In Ireland, for instance, three in five households in 2024 reported never having heard of heat pumps or being unfamiliar with the technology[188]. Such findings suggest that market immaturity is not merely a question of cost competitiveness, but also of informational diffusion and social familiarity.

The information environment can further exacerbate these barriers. In several European countries, heat pumps have been the subject of organised misinformation campaigns focusing on cost, reliability and performance. The German debate around the 2023 Building Energy Act illustrated how rapidly such narratives can distort public perceptions and generate political backlash against electrification policies[189]. Similar dynamics have since emerged in France, where coordinated online campaigns circulated misleading claims regarding installation failures and exaggerated operating costs[190].

187 Market Data Forecast. "Europe Heat Pump Market Report." Market Data Forecast, last updated May 2026

188 Julienne, Hannah. "Heating Behaviour in Ireland: Analysis of 2023 Data from the Behavioural Energy and Travel Tracker." Sustainable Energy Authority of Ireland, February 2025.

189 Haas, Tobias, Hendrik Sander, Anna Fünfgeld, and Franziska Mey. "Germany's Contested Heat Transition and the Campaign Against the Building Energy Act." Research Institute for Sustainability, 25 June 2025.

190 Marchand, Cécile. "French PR Executive Behind Facebook Network Spreading Heat Pump Hate." DeSmog, 23 April 2026.

These developments reflect a broader pattern of climate policy contestation. **Decarbonisation measures are often framed as technocratically imposed, socially regressive and economically irrational by far-right political parties**[191], with issues of fairness, property rights and cost of living placed at the centre of opposition narratives. As a result, resistance to heat pumps cannot be understood purely as a question of technology acceptance; it also reflects deeper concerns around trust, distributional effects and state intervention. This has direct implications for policy design. Communication strategies are necessary but insufficient if limited to generic awareness campaigns. More effective approaches engage directly with households' concrete concerns - upfront costs, reliability, installation complexity and expected savings - and rely on embedded, trusted forms of support. Ireland's campaigns, for instance, have shown some success by focusing on comfort and practical benefits, while Germany's Stromspar-Check programme offers a more integrated model, combining free home visits with tailored advice for low-income households. Its expansion to cover a majority of the territory highlights the potential of personalised and institutionalised support mechanisms to overcome behavioural and informational barriers.

191 Haas, Tobias, Hendrik Sander, Anna Fünfgeld, and Franziska Mey. "Climate Obstruction at Work: Right-Wing Populism and the German Heating Law." Energy Research & Social Science 123 (May 2025): 104034

6. Recommendations

1 . Scenario framework for the Strait of Hormuz

The Iranian crisis has transmitted rapidly into European energy markets, but in a uneven manner across commodities - creating a divergence that is central to both the timing and design of policy intervention. **Oil markets have reacted with exceptional speed and magnitude.** According to the French Observatory of Economic Conjunctures (OFCE), Brent crude prices rose by more than 60% during the first thirty days of the conflict, compared to a 35% increase over the same timeframe during the First Gulf War in the 1970s[192]. **This surge has translated almost mechanically into higher retail fuel prices** across Member States,with increases reaching around 32% for diesel in early April and 15% for petrol by late May.[193] This rapid pass-through reflects the structural characteristics of oil markets: high storability, global liquidity, and forward-looking pricing ensure that supply risks are quickly capitalised and transmitted to consumers. As a result, price signals are immediate and highly visible, prompting swift policy responses. To date, most emergency measures have indeed focused on fuel affordability and transport-related compensation. **By contrast, gas and electricity markets exhibit slower and more fragmented transmission mechanisms.** Although TTF prices surged by more than 100% in less than twenty days, the impact on household bills has so far remained comparatively contained. Between February and April 2026, residential end-user gas prices increased on average by approximately 7% on average across European capitals[194] - albeit with significant cross-country variation - while electricity prices remained broadly stable in several markets[195].

This apparent decoupling is explained by two temporary buffering mechanisms. First, the widespread use of fixed-price retail contracts has delayed the pass-through of wholesale price increases, shielding a large share of households, although those on variable contracts are already exposed. Second, the timing of the shock - at the end of the heating season - has dampened its immediate impact as declining demand has offset rising unit costs. **Neither of these factors provides durable protection.** As contracts expire and heating demand resumes in autumn, wholesale price increases are likely to transmit more fully across the European household base. **The current period should therefore**

192 Timbeau, Xavier. "Pétrole et gaz en temps de guerre." L'ÉcoGraphe no. 10, OFCE, Sciences Po, 10 March 2026

193 European Commission: Directorate-General for Energy. "Price Developments 2005 Onwards." Weekly Oil Bulletin dataset, 25 June 2026.

194 Yanatma, Servet. "Europe's Household Energy Prices Surge after Iran War: Which Capitals Were Hit Hardest?" Euronews, 14 May 2026.

195 ibid.

be understood as a narrowing window for anticipatory policy action. The central policy question is not whether to intervene, but how to calibrate intervention over time. **Decisions taken now -** between targeted and untargeted support - between structural investment and short-term price mitigation, and between measures that reinforce or undermine electrification **- will shape both household exposure during winter 2026–27 and the fiscal cost of public intervention.**

Against this backdrop, the recommendations developed in this report are structured around three scenarios reflecting possible evolutions of the conflict and the status of the Strait of Hormuz:

- **HM5**, assuming full reopening by the end of July 2026;
- **HM8**, assuming closure extending through October 2026, with wholesale prices feeding directly into winter heating costs;
- **HM12**, assuming prolonged disruption, leading to a structural reconfiguration of global LNG markets.

Each scenario carries distinct implications for the urgency, calibration and targeting of policy intervention.

SCENARIO 1 (HM5) - THE SPRAIN - A MANAGEABLE SHOCK WITH LINGERING EFFECTS

The most optimistic scenario (HM5), in which the Strait of Hormuz fully reopens by the end of July 2026, does not imply a return to price stability in European energy markets, especially as renewed bombardments have cast doubt on the durability of the announced ceasefire[196]**.** The shock leaves temporary but non-negligible marks on macroeconomic conditions. The European Commission's Spring 2026 forecast[197] already reflects part of this impact: assuming oil and gas prices peak in the current quarter before stabilising at around 20% above pre-war levels by end-2027, EU GDP growth is projected at 1.1% in 2026 (down from 1.4% previously) while inflation reaches 3.1%, one percentage point higher than earlier expectations.

This persistence reflects the nature of the shock. While reopening the Strait restores transit routes, it does not fully restore supply[198]. Liquefaction activity is expected to resume only gradually, implying a temporary supply shortfall of around 10% relative to 2025 levels.[199] **More importantly, the conflict has inflicted durable damage to global LNG supply.** Strikes on Ras Laffan - Qatar's primary LNG hub - have destroyed two liquefaction trains, removing approximately 17% of national export capacity and 3% of global LNG supply[200]. Repair timelines of three to five years, alongside declared force majeure on several contracts (including deliveries to Italy and Belgium), point to lasting disruption. In parallel, expansion projects such as North Field East are likely to be delayed by more than a year. Taken together, these disruptions imply a cumulative loss of around 120 bcm of LNG supply over 2026–2030 - roughly 15% of projected global incremental supply[201]. **In other words, even under HM5, short-term stabilisation does not eliminate underlying structural tightness in global gas markets.**

For the EU, this tightening coincides with increased systemic exposure. Despite limited

196 Bronner, Luc, and Hélène Sallon. "Lebanon Ceasefire between Israel and Hezbollah Remains Fragile under US-Iran Pressure." Le Monde, 20 June 2026.

197 European Commission: Directorate-General for Economic and Financial Affairs. "European Economic Forecast. Spring 2026." Institutional Paper 341, European Commission, 21 May 2026

198 Stapczynski, Stephen. "Pakistan Urgently Seeks LNG as Hormuz Flare-Up Chokes Supply." Bloomberg, 29 June 2026.

199 International Energy Agency. "Gas Market Report, Q2-2026." IEA, April 2026.

200 QatarEnergy. "The Missile Attacks Reduced Qatar's LNG Export Capacity by 17% and Caused an Estimated Loss of $20 Billion in Annual Revenue." X, 19 March 2026.

201 International Energy Agency. "Gas Market Report, Q2-2026." IEA, April 2026.

reliance on Gulf LNG (less than 4% supply[202]), the shift away from Russian pipeline gas has raised the share of LNG imports from around 20% to 45% by 2025. Unlike Russian pipeline gas, largely secured through long-term contracts, a share of LNG procurement are indexed to global spot markets[203], where cargoes are allocated through competitive bidding, amplifying price volatility. European buyers are therefore exposed to global price dynamics regardless of supply origin. This exposure is compounded by weak storage fundamentals: at the outset of the 2026 refill season, EU storage levels stand at around 47% on July 1st, well below historical averages, just as Asian demand begins to rise with the onset of the summer cooling season[204]. **The EU thus enters its most critical storage replenishment phase - now based on a reduced 80% target - in a tight and highly competitive global market, where price, rather than physical scarcity alone, determines access to supply. Recent modelling suggests that, under current conditions, EU gas storage could reach only around 76% ahead of winter - the lowest level observed in the past 15 years[205]. Bridging the gap to the 90% target would require an additional €10–15 billion in procurement costs[206], highlighting the growing financial burden of securing supply in a constrained market environment.**

Under the HM5 scenario, European LNG import prices are projected to stabilise at 14.0 $/MMBtu (42€/MWh), compared with roughly 12.5 $/MMBtu in 2024 (38€/MWh), implying a relatively contained increase in household heating bills in the near term (on the order of 0–15%, around a hundred euro[207]).

This apparent stability is, however, contingent. **As supply constraints bind, adjustment shifts to the demand side.** Maintaining price increases within this range implicitly required a measurable reduction in European energy consumption - unlikely to materialise at sufficient scale and speed without policy intervention. **Historical precedent demonstrates that rapid demand reduction is feasible, but politically contingent.** The oil shocks of the 1970s led France to adopt far-reaching sufficiency measures, including limits on heating, motorway speed restrictions and constraints on commercial energy use.[208]. More recently, the 2022–2023 energy crisis triggered a coordinated European response: a voluntary 15% gas demand reduction target, coupled with a Union alert mechanism that could make reductions mandatory[209]. National measures ranged from France's *Plan Sobriété* (targeting a 10% energy reduction target) to binding efficiency obligations in Germany and large-scale public campaigns such as Ireland's 'Reduce Your Use'. EU gas demand fell by nearly 18% between August 2022 and March 2023[210], although part of this decline reflected demand destruction rather than structural efficiency gains. Crucially, this outcome relied on a strong crisis narrative, credible coordination and high public salience of energy costs - conditions that are no longer fully in place today.

In contrast to 2022, the current crisis is not primarily driven by an immediate risk of physical

202 European Union Agency for the Cooperation of Energy Regulators. "Analysis of the European LNG Market Developments: 2026 Monitoring Report." ACER, 13 May 2026.

203 Fixed-price indexation only represent 16% of EU spot LNG trades

204 The forecast of an unusually hot summer, reinforced by El Niño conditions, further increased expectations of higher electricity demand for cooling and added upward pressure on energy prices.

205 Financial Times. "Europe Risks Starting Winter with Gas Stocks at 15-Year Low." Financial Times, 29 June 2026

206 European Union Agency for the Cooperation of Energy Regulators. "An Overview of ACER's LNG Monitoring Report." Presentation to the Council Working Party on Energy, RAT WK 9180/26, 22 June 2026

207 Using 700€ spent on gas as a baseline hypothesis, as reported by ACER. European Union Agency for the Cooperation of Energy Regulators. "Gas Factsheet." ACER. Accessed 30 June 2026

208 Nguyen, P.-V. & Breucker, F. « Sobriété énergétique, l'année d'après », Institut Jacques Delors, Décryptage, Septembre 2024

209 Council of the European Union. "Council Adopts Regulation on Reducing Gas Demand by 15% This Winter." Press release, 5 August 2022. The framework was extended through March 2024 and later maintained as a Council Recommendation through March 2025.

210 European Commission: Eurostat. "EU Gas Consumption Decreased by 17.7%." Eurostat News, 19 April 2023

shortage, but by price dynamics. This distinction is critical. In 2022, the prospect of scarcity created both urgency and political legitimacy for intervention. **Today, demand reduction is framed less as a necessity to avoid shortages than as a tool to contain wholesale prices - often before these increases are fully visible to households.** This significantly complicates its political acceptability. Evidence from the 2022–2023 winter highlights this dynamic: although up to 90% of French households reported reducing energy consumption, between 65% and 80% identified financial pressure as the primary motivation[211]. Behavioral adjustment was therefore largely reactive and price-driven, rather than anchored in a sustained policy shift toward sufficiency. **In the current context, where retail gas and electricity prices have yet to fully reflect wholesale increases, the political space for anticipatory demand reduction remains limited -** particularly in Member States approaching electoral cycles, where such measures can be readily framed as coercive or welfare-reducing. **This asymmetry is reflected in diverging international responses.** Several Asian economies, facing more immediate supply constraints, have adopted explicit demand-management strategies, including restrictions on cooling, reduced working hours, and mobility-related measures[212]. European governments, by contrast, have prioritised price shielding through fiscal measures and subsidies (20 Member States[213]), **dampening the demand response that would otherwise contribute to easing wholesale price pressures.**

At EU level, policy signals increasingly acknowledge the need for demand moderation but fall short of operationalisation. The European Commission has called for reduced consumption, proposing a lowering of storage targets from 90% to 80% and issuing non-binding guidance on sufficiency measures under the AccelerateEU Energy Union communication. However, implementation remains limited and voluntary. Only eight Member States have formally encouraged reduced consumption, while binding measures remain the exception[214]. **The prevailing approach is therefore reactive rather than anticipatory, creating a critical sequencing problem.** Market-driven demand adjustment will occur, but it will do so only once retail prices rise materially ahead of the winter heating season. By then, however, the window to rebuild storage buffers at manageable cost will have largely closed. In addition, policies developed under conditions of urgency can be less thoroughly designed, potentially overlooking secondary effects or cross-border implications. **The issue is not whether demand will adjust, but whether it will do so early enough to influence the summer refill cycle and, ultimately, the level and volatility of winter energy bills.**

Only two member states have begun to address this challenge through anticipatory policy design. Portugal's March 2026 framework introduced a dedicated emergency framework under which predefined intervention mechanisms are automatically triggered once retail electricity prices increase by more than 70% or rise to 2.5 times the average of the previous five years (above €180/MWh)[215]. This approach avoids the immediate costs of mandatory restrictions while pre-positioning the policy response in case of deterioration. Once activated, it enables the declaration of an energy crisis and the implementation of both price and demand-side measures, including price caps and mandatory consumption reductions (to 80% of prior-year levels for households and 70% for businesses). **By relying on transparent, pre-established thresholds, it reduces uncertainty, limits delays, and mitigates political resistance.** The Netherlands has

211 Direction interministérielle de la transformation publique. "Sobriété énergétique des ménages : l'éclairage des sciences comportementales." Note d'idées, December 2023.

212 International Energy Agency. "2026 Energy Crisis Policy Response Tracker." Data tool, last updated 12 June 2026

213 Moscovici, Alice and Nguyen, Phuc-Vinh. " Energy shock: Immediate Responses and National Context" Interactive tracker. Accessed 30 June 2026.

214 Denmark, France, Luxembourg, Belgium, Portugal, Slovakia, Slovenia, Sweden

215 Reuters. "Le Portugal approuve le plafonnement des prix de l'électricité en cas de crise énergétique." Translated by Zonebourse, 19 March 2026

similarly activated the first stage of its four-level oil crisis framework, currently focused on enhanced market monitoring. However, the system provides a clear escalation pathway: voluntary demand reduction and awareness measures in the second phase, binding restrictions in the third, and rationing under conditions of physical shortage in the fourth[216]. **Despite institutional differences, both approaches share a common logic: rules-based escalation anchored in objective indicators rather than discretionary decision-making, reducing both response time and political friction.**

This logic should underpin the policy response under HM5. While immediate mandatory demand reduction may be economically efficient, current conditions do not yet support its political feasibility. **The priority should therefore be institutional preparedness. Member States should operationalise national crisis frameworks by defining clear trigger conditions for graduated demand-reduction measures and communicating them transparently to households and firms.** Given the systemic nature of the shock, coordination at EU level is essential. The European Commission should **require Member States to define and notify these escalation mechanisms by the end of July 2026**, ensuring consistency in trigger design, transparency, and timing, and aligning them with the Electrification Action Plan. This would strengthen credibility, reduce fragmentation, and limit uncoordinated responses that could amplify price volatility. Crucially, such frameworks should embed a clear hierarchy of demand curtailment reflecting both social priorities and technical constraints. For households, essential uses - particularly heating - should be protected, with reductions targeting discretionary consumption first. For industry, sequencing is critical, as sectors with continuous processes face high restart costs and cannot be curtailed abruptly without significant economic loss. **Defining these priorities ex ante is key to avoiding inefficient, across-the-board demand destruction and ensuring that adjustment occurs where it is least costly.**

SCENARIO 2 (HM8): THE FRACTURE – A SEVERE WINTER SHOCK WITH SYSTEMIC CONSEQUENCES

The second scenario assumes a sustained closure of the Strait of Hormuz until October 2026. Under these conditions, EU GDP growth is projected to fall to around 0.5% in 2026 - roughly half the baseline - reflecting the combined effects of sustained energy price inflation, reduced household purchasing power, and heightened investment uncertainty across Member States. What distinguishes this scenario is not only the scale of the shock, but its timing: it materialises precisely as the European heating season is about to begin, when wholesale price pressures transmit most directly into household energy expenditures. As a result, **average household energy expenditures are projected to increase by 40 to 60% compared to pre-crisis levels,** driven by both prolonged market tightness and the seasonal surge in demand.

At the wholesale level, the adjustment mechanism is both straightforward and severe. In the absence of Qatari LNG exports - and with limited short-term scope for rerouting sufficient alternative supply - the European market must clear at prices high enough to attract marginal cargoes from a globally constrained pool. This implies a sharp escalation in prices across energy carriers. Oil prices are projected to reach around $120 per barrel, up from approximately $70 prior to the conflict (+70%). In gas markets, European LNG import prices could rise to around $28/MMBtu (€60/MWh)[217], nearly double the levels observed under less severe scenarios. Translated into retail terms, this corresponds to an increase of at least 25% of the gas bill for an average household.

However, the impact of the shock does not remain confined to gas markets; it propagates across the entire energy system, most critically through electricity prices. This transmission is driven by the structure of European power

216 Rijksoverheid. "Landelijk crisisplan olie 2026." Bijlage 7a bij Kamerbrief over het maatregelenpakket Acties Weerbaarheid Energieschok, 20 April 2026

217 Jones, Matthew, Andreas Schröder, and Lewis Unstead. "What to Expect from European Energy Markets in H2 2026: 10 Key Questions." ICIS, 2026.

markets. Under marginal pricing governing the day-ahead electricity market, wholesale electricity prices are set by the last unit needed to meet demand - often a gas-fired plant during periods of high demand or low renewable output, conditions that frequently coincide in winter. Gas prices therefore directly determine electricity prices at precisely the moments when demand, and overall system costs, are highest. While the frequency of this linkage has declined at EU level - with fossil fuels setting the marginal price in roughly 50% of hours in 2025, down from around 70% in 2020[218] - exposure remains substantial and uneven across Member States. In more gas-dependent systems, this share remains significantly higher - gas setting the marginal price in close to 90% of hours in Greece, Belgium and the Netherlands in 2021. Yet these differences offer only limited protection. The high level of market integration means that price signals propagate across borders, including those with more low-carbon electricity mixes that import electricity for their needs. As a result, the shock becomes systemic: no national market can fully decouple from gas-driven price dynamics. This system-wide propagation is what ultimately determines the impact on households. Once transmitted through wholesale electricity markets, the shock reaches consumers through retail pricing structures. While contract structures determine the speed of pass-through, the composition of retail tariffs determines its magnitude. Taxes, levies, and network charges - often substantial components of final bills - do not adjust downward in response to market conditions and therefore amplify the overall price increase. **Retail tariff design thus becomes a critical transmission channel, and, by extension, a key policy lever**.

However, the scope for using this lever is constrained by fiscal realities. Member States enter this scenario with significantly reduced budgetary space, following the extensive support deployed during the 2022 crisis and subsequent affordability measures deployed in the early phases of the current one (**16 billion euros in early June**[219]). This limits the feasibility of broad, untargeted interventions such as price caps applied across energy carriers. Beyond their fiscal cost, they weaken the relative price signals needed to steer consumption and investment towards electrification by compressing price differentials between gas and electricity.

The experience of the 2022 crisis shows that this trade-off is not unavoidable. Well-designed support measures can provide relief while preserving - or even strengthening - relative price signals. In Germany, support reduced overall price levels without fully eliminating the differential between gas and electricity, meaning that incentives to shift away from gas-based heating were weakened but not erased. Ireland illustrates a more deliberate calibration: although measures were primarily designed for social protection, electricity was relatively more protected than gas, compressing the electricity-to-gas price ratio in a direction that favoured electrification. These cases demonstrate that crisis interventions can be structured not only to shield households, but also to support underlying transition objectives. Taken together, they point to a more strategic approach. **Rather than suppressing prices uniformly, governments should actively structure them.** This implies intervening across both gas and electricity to ensure social acceptability, while calibrating support asymmetrically. In practice, this means **prioritising deeper and more sustained reductions in electricity bills - through cuts to taxes and levies or the temporary socialisation of network costs - while limiting gas support to targeted instruments such as income-based transfers.** Such differentiation serves a dual purpose: it contains fiscal costs and, more importantly, preserves a favourable electricity-to-gas price ratio, maintaining incentives for electrification even in a high-price environment. For example, reducing electricity-related charges by 30–40% while restricting gas support to targeted measures

218 European Commission: Directorate-General for Economic and Financial Affairs. "EU Energy Markets: Evolving Gas-Electricity Price Linkages in a More Volatile System." In European Economic Forecast, Spring 2026, 21 May 2026

219 ibid.

would significantly shift relative operating costs without removing protection for vulnerable gas-dependent households.

The effectiveness of this approach, however, depends on its persistence. Temporary price adjustments have limited influence on behaviour and investment, whereas sustained differentials shape expectations and support structural change. This is also where the current crisis creates a policy window. Rebalancing energy taxation in favour of electricity has long been recognised as necessary but politically difficult. Periods of acute price stress alter this constraint. As governments are already intervening at scale to shield households, the political and fiscal frameworks for reform are temporarily more flexible. **This creates a window in which crisis-response measures can be designed not merely as temporary relief, but as vehicles for structural adjustment. Embedding asymmetric reductions in electricity charges within emergency packages - and maintaining part of these adjustments beyond the immediate crisis - allows policymakers to durably reshape relative price signals.** Depending on the national context, these measures can act either as a catalyst in settings where no clear decarbonisation trajectory had previously been established, effectively substituting for absent structural policy, or as a reinforcing mechanism in settings where transition frameworks already exist, accelerating momentum.

Operationalising this approach requires anticipation and coordination. Measures should be designed and announced ahead of the winter season to shape expectations and smooth the adjustment as fixed-price contracts expire. Priority should be given to instruments that can be deployed rapidly through existing billing frameworks, notably adjustments to taxes, levies, and network charges. Where fiscal constraints are binding, targeting should be achieved through complementary income-based transfers, rather than through further compression of price signals.

SCENARIO 3 (HM12): THE CHRONIC INJURY: A PROLONGED CONFLICT AND STRUCTURAL ENERGY STRESS

The third scenario assumes a prolonged and indeterminate closure of the Strait of Hormuz, extending past the mid-term elections in the EU and at least through the end of 2026 amid sustained geopolitical conflict. Under such conditions, global energy markets would face an acute and persistent supply shock, with particularly severe implications for the EU. Oil prices could rise to USD 150 per barrel - over 110% above pre-conflict levels - while gas markets would experience an unprecedented disruption. According to ACER, up to 112 bcm of LNG export capacity could be removed from the global market, a shock that no plausible short-term supply response could offset. Even under optimistic assumptions, incremental LNG supply from the United States, Australia, and emerging exporters would materialise too slowly and at insufficient scale. The situation would deteriorate further in the event of a disruption to US LNG exports, particularly given the EU's growing reliance on US supply in recent months (with imports increasing by around 5% between mid-May and the end of June)[220]. Such a shock could push European LNG import prices to around USD 55/MMBtu (€170/MWh). At this level, the issue shifts from price volatility to systemic affordability, with household energy bills rising by more than 50% - equivalent to an increase of around €350 for the average household.

In this context, the graduated escalation frameworks envisaged under lower-intensity scenarios become insufficient. Policy cannot proceed incrementally but must move directly to full-scale crisis deployment. **The 2022 EU emergency demand-reduction framework provides the closest institutional reference point, but one whose parameters require careful qualification before they can be responsibly applied to the present scenario.** That framework introduced a voluntary 15% gas demand-reduc-

220 The share of EU LNG imports supplied by the United States has risen from 58% to 63%. European Union Agency for the Cooperation of Energy Regulators. "An Overview of ACER's LNG Monitoring Report." Presentation to the Council Working Party on Energy, RAT WK 9180/26, 22 June 2026.

tion target in response to the loss of roughly 80 bcm of Russian pipeline supply[221] - a disruption that unfolded gradually and could be partially offset through demand substitution, accelerated LNG procurement, and coordinated storage drawdowns. Transposing that framework onto a shock of categorically greater scale would be structurally inadequate. Model estimates indicate that a 10% reduction in European LNG demand would lower global prices by only around 12%, underscoring the limits of unilateral European demand management. A more appropriate response would be to reactivate the EU framework in strengthened form: converting it into a binding mechanism and raising the target to at least 20% demand reduction across both gas and electricity, given the role of gas in power generation. This effort should be more differentiated than in 2022, combining an EU-wide target with national burden-sharing that reflects differences in exposure, substitution capacity, and prior mitigation efforts. Such a framework should be discussed during the revision of the Energy Security Regulation on July 22nd.

Beyond the European level, coordinated demand reduction across major LNG-importing regions would substantially enhance effectiveness. Simultaneous efforts could reduce global LNG prices to approximately 37.2 USD/MMBtu (110€/MWh), corresponding to a reduction of around 32%. This underscores the strategic importance of international coordination, particularly with key Asian importers, to avoid demand competition and dampen price escalation in a constrained supply environment.

That said, even coordinated demand reduction would leave prices at historically elevated levels and household energy bills under severe pressure. Household bills could increase by more than 80% with particularly acute distributional consequences for low-income households, energy-intensive industries, and sectors with limited ability to substitute away from gas. **The policy response must therefore extend to fiscal and regulatory measures aimed at preventing a broader economic and social crisis.** Here, fiscal capacity becomes a binding constraint. After successive crises since 2020, many Member States lack the budgetary space to respond at the required scale. **A temporary relaxation of European fiscal rules would therefore be warranted, but only as a tightly conditioned exceptional measure.** Its purpose should not be to enable broad, untargeted subsidies, which would be expensive, regressive, and inflationary, but to preserve the capacity for **timely, targeted, temporary, and tailored support** to vulnerable households, strategically exposed firms, and critical public services - criteria that the Commission itself has established as the benchmark for legitimate crisis expenditure. In parallel, the European Commission would need to play a stronger coordination and oversight role than in previous crises, both to safeguard fiscal sustainability and to limit fragmentation and distortions within the internal market.

2 • ETS2 and electrification: turning future carbon revenues into investment capacity

The current rise in energy prices resembles, in part, the price signal expected from the extension of the EU Emissions Trading System to buildings and road transport (**ETS2**)[222]. While differing in both timing and magnitude - with expected increases of around +10-11% for transport fuels and +11-13% for gas in France according to the *Court of Auditors*[223] - ETS2 is nonetheless projected to exert a measurable inflationary effect, estimated by the ECB at around 0.2 percentage

221 International Energy Agency. "Anatomy of a Natural Gas Crisis." In Gas Market Lessons from the 2022–2023 Energy Crisis. IEA, 2025

222 Nguyen, Phuc-Vinh. "ETS2: Fuel for the Yellow Vests or Driver of the Green Transition?" Infographic, Jacques Delors Institute, October 2025.

223 Cour des comptes. "La place de la fiscalité de l'énergie dans la politique énergétique et climatique française." Observations définitives, Cour des comptes, 6 September 2024.

points by 2028[224]. A critical distinction, however, lies in the fiscal dimension of these increases. Today's price surge, driven by geopolitical tensions in the Middle East, is a negative terms-of-trade shock for the EU, generating additional costs without corresponding public revenues[225]. By contrast, the price signal induced by ETS2 will be revenue-generating, with Member States capturing the full proceeds of carbon pricing. In this context, the frontloading of ETS2 revenues offers a means to bridge the gap between short-term price shocks and long-term investment needs. **By making up to €50 billion in future carbon revenues available earlier, governments could turn an otherwise unproductive price shock into a lever for structural transformation.**

The rationale is straightforward. The current price shock is not accompanied by recyclable revenues; instead, it generates additional costs, estimated at €62 billion, including €16 in fossil fuel support measures and €42 in higher import costs. While these increases may ease over time, carbon prices are structurally expected to rise. This creates a window of opportunity to pre-allocate future carbon revenues to immediate investment needs, notably **electrification and energy efficiency investments.** Anticipated revenues could also help manage the risk of downward fossil fuel price volatility. If global prices fall after a geopolitical de-escalation, full pass-through to consumers could weaken incentives for fuel switching and delay investment. A temporary fiscal adjustment mechanism, akin to the Belgian "price ratchet," could mitigate this risk by partially offsetting market price declines through higher fossil fuel taxation before ETS2 enters into force. These adjustments would then be phased out once ETS2 becomes operational. Such an approach would smooth price fluctuations over time, avoiding both a sharp post-crisis price drop and a later ETS2-induced spike. By maintaining a relatively high and predictable fossil fuel price trajectory while supporting electrification, Member States could combine a strong price signal with a productive use of future carbon revenues.

The frontloading of carbon revenues is a mechanism through which the European Investment Bank (**EIB**)[226] provides loans to Member States that have transposed ETS2, with repayment secured against future carbon market revenues. However, the envelope currently envisaged remains too limited: €3 billion for investment purposes, potentially rising to €6 billion if demand is strong. Given the administrative and reporting requirements attached to participation, this scale is unlikely to generate significant uptake - as illustrated by the fact that only one Member State has so far expressed interest.

We therefore recommend increasing the frontloaded envelope to up to €50 billion, a conservative lending assumption we have put forward since November 2025[227]. This would make future ETS2 revenues available at a scale more commensurate with current investment needs and **would help reframe ETS2 not as a political liability, but as a driver of electrification and crisis response. The political economy rationale is clear: without such a mechanism, the upcoming revision of the ETS Directive, taking place amid rising energy prices, risks weakening or even dismantling ETS2 during negotiations.** The proposed scale is consistent with existing estimates. EPICO[228] suggests that up to €50 billion could be mobilised, equivalent to around 50% of ETS2 revenues for

224 European Central Bank. "ECB Staff Macroeconomic Projections for the Euro Area, March 2026." ECB, March 2026.

225 Timbeau, Xavier. "Non, l'État ne profite pas de la hausse du pétrole." OFCE Blog, Sciences Po, 31 March 2026

226 European Investment Bank. "ETS2 Frontloading Facility." Project summary, EIB, 29 October 2025, approved 4 February 2026

227 Nguyen, Phuc-Vinh. "ETS2 : clé de voûte du Pacte vert européen ou premier des dominos ?" Policy Paper no. 317, Institut Jacques Delors, November 2025.

228 Janssen, Matthias, Christoph Nodop, Patrick Peichert, Maximiliane Reger, Bernd Weber, Parul Kumar, Simon Munkler, and Ayana Trüper. "Strengthening the EU ETS 2 through Revenue Frontloading." Policy Report, EPICO KlimaInnovation and Frontier Economics, Berlin, May 2025

2033–2035 at a carbon price of €65/tCO_2. Agora Energiewende[229] estimated a potential €36.2 billion for 2025–2027, based on a carbon price of €40/tCO_2 and roughly 30% of expected revenues between 2030 and 2035. BloombergNEF[230] also finds that **allocating 50% of ETS2 revenues to electrification or to rebalancing the electricity-to-gas price ratio could accelerate behavioural change while reducing the average ETS2 carbon price by 2030**. This interaction is crucial. If Member States use the current geopolitical shock to rebalance energy taxation, downward pressure on ETS2 prices could help limit social backlash. The objective should be to move away from current spending patterns, in which substantial public resources are used to subsidise fossil fuel consumption. Instead, these financial flows should be redirected toward electrification technologies such as heat pumps and electric vehicles. **Access to the €50 billion frontloaded envelope should therefore be conditional on compliance with clearly defined investment and reform criteria.**

First, frontloaded carbon revenues must be exclusively earmarked for electrification investments. Member States with sufficient fiscal space may still protect households from price shocks, but such support should remain consistent with the Commission's AccelerateEU criteria: timely, temporary and targeted. To ensure this, access to frontloaded funds should be conditional on fiscal rebalancing. Public support delivered through non-targeted measures or fossil fuel subsidies should remain at least 1.5 times lower than the amount made available through the EIB loan facility. In practice, spending on broad-based price caps or fossil fuel tax cuts should be significantly below the frontloaded carbon envelope. This would prevent the advance on future ETS2 revenues from being offset by measures that weaken fossil fuel price signals. Eligibility should therefore depend on Member States prioritising support for electricity and electrification over fossil fuels.

Second, access to frontloaded funds must be subject to additional institutional and policy conditions. Member States should have transposed ETS2 into national law and adopted a national crisis framework, inspired by the Portuguese and Dutch examples. Such a framework should define a clear hierarchy of demand-reduction triggers and prioritise curtailment measures according to social objectives and technical constraints (Scenario 1).

The Iran conflict has already created a fossil fuel price signal that favours fuel switching. **National responses should reinforce, rather than neutralise, this dynamic.** This means rebalancing the electricity-to-gas price ratio through protection measures that prioritise electricity over gas, while using frontloaded carbon revenues to finance or co-finance the upfront costs of electrification. The momentum observed in France, where private companies have committed close to €3 billion to support the government's electrification plan[231], could serve as a model for the EU. The Commission could build on the recent initiative bringing together more than 60 companies[232], industry associations and civil society organisations in support of ETS2 and its implementation through a dedicated Alliance. Together, these recommendations could be integrated into the European Commission's forthcoming Electrification Plan, expected in July.

229 Baccianti, Claudio, Matthias Buck, Oliver Sartor, and Christopher Schröder. "Investing in the Green Deal: How to Increase the Impact and Ensure Continuity of EU Climate Funding." Agora Energiewende, 16 September 2024, revised 9 December 2024.

230 BloombergNEF. "EU ETS II Pricing Scenarios: Balancing Cuts and Costs." Climate Policy Factbook, 17 September 2025.

231 Élysée. "Réunion de l'équipe de France de l'électrification." Présidence de la République, 26 May 2026.

232 Transport & Environment. "European Industry and Civil Society Unite to Accelerate Climate Action." Letter, 12 May 2026.

MANAGEABLE → SEVERE → SYSTEMIC

HM5 – A Manageable Shock

Short, absorbable disruption – prices elevated but contained.

SHOCK & CONTEXT

- The Strait of Hormuz fully reopens by the end of July 2026
- Prices remain elevated but manageable
- Storage refill and household bills under pressure (+0–15%)

IMMEDIATE RESPONSE

- Activate national crisis frameworks early
- Use targeted support and rules-based triggers for demand moderation
- Preserve incentives for electrification and align support with the Electrification Action Plan

HM8 – A Severe Shock at Winter Onset

Disruption coincides with peak heating demand – affordability at risk.

SHOCK & CONTEXT

- The Strait of Hormuz remains closed up until October 2026
- The shock hits as winter demand begins
- Household bills rise sharply and affordability becomes the main risk

RECOMMENDATION

- Move from preparation to active intervention
- Use differentiated price relief and demand management
- Coordinate measures across Member States and supply globally

HM12 – A Prolonged Systemic Shock

Structural, sustained disruption – high prices and mounting fiscal stress.

SHOCK & CONTEXT

- The Strait of Hormuz remains closed up until February 2027
- The shock becomes prolonged and structural
- Prices remain at historically high levels and fiscal stress intensifies

RECOMMENDATIONS

- Introduce binding demand reduction
- Protect vulnerable households and critical users
- Apply tightly conditioned fiscal relaxation

COMMON TO ALL SCENARIOS

Fostering electrification

SHORT TERM

- Preserve or improve the electricity-to-gas price ratio
- Use crisis support to protect households without flattening price signals

MEDIUM TERM

- Frontload future ETS2 revenues through the EIB
- Turn ETS2 from a political liability into a financing engine for electrification

▲ Reading note: Scenarios HM5, HM8 and HM12 describe escalating gas-supply shocks, from a short, absorbable disruption to a prolonged systemic crisis. Policy intensity rises with severity, while the electrification timeline at the bottom applies across all three.
▲ Source: Alice Moscovici, Phuc-Vinh Nguyen (Jacques Delors Institute).

Annexes

Indicator	Ireland	The Netherlands	Germany	France
Heat pump target by 2030	**680,000 heat pumps installed by 2030, including 400,000 in existing dwellings**	**1 million hybrid systems**	**6 million units heat pumps; requires around 500,000 installations per year from 2024**	**1 million heat pumps installed per year by 2030**
Current strajectory (2024–2025)	180,000 BER-rated dwellings with heat pumps by end-2025 (15% of the rated housing stock) → 26% of the target achieved"	820,000 heat pumps insatlled by end-2025	Around 2.6 million heat pumps by end-2025. Annual installations remain below required pace: 230,000 in 2024 and 345,000 in 2025	Annual installations remain below required pace: 550,000 in 2024 and 530,000 in 2025
Regulatory framework	NZEB standards effectively excluded fossil heating in new buildings; no equivalent fossil boiler ban in existing buildings	Gas Act amendment prohibits new gas connections in new buildings; planned 2026 hybrid heat pump mandate cancelled in 2024; new 2026 coalition proposes mandatory hybrid smart heat pumps from 2029 in areas not suited to district heating	Revised Building Energy Act requires new heating systems to run on at least 65% renewable energy from 2024; effective fossil boiler restrictions are strongest in new buildings, while existing buildings retain flexibility until municipal heating plans are completed	Regulation increasingly oriented toward building renovation and fossil-fuel phase-out, but implementation remains tied to unstable renovation policy and shifting MaPrimeRénov' rules
Electricity-to-gas price ratio 2025	From 3.5:1 in 2017 to 2.9:1 in 2025	From 1.9:1 in 2017 to 1.5:1 in 2025	From 5:1 in 2017 to 3.2 in 2025	From 2.6:1 in 2017 to 1.9 in 2025
Main lever used to reduce gas/ electricity price ratio	Carbon tax trajectory toward €100/tCO_2 by 2030, but recent crisis measures amid the Iran war delayed the price increase	Direct fiscal rebalancing: higher gas taxation, with revenues recycled to lower electricity taxation	National carbon price plus removal of the EEG surcharge from electricity bills and transfer to the federal budget	Carbon tax frozen since the Yellow Vest crisis; electricity price support and tax reductions used during the energy crisis
Heat Pump Costs on average	Around €9,500–12,500	Around €15,000–16,000	Around €30-35,000	Around €15,000–16,000
Subsidy Design	Better Energy Homes Scheme subsidy design: Fixed-amount, measure-based grant rather than income-indexed support. Bundled grant of up to €12,500: up to €6,500 for the heat pump system, up to €2,000 for central-heating upgrades where required, and a €4,000 Renewable Heat Bonus when replacing an existing oil, gas, solid-fuel or electric-storage heating system. Warmer Homes Scheme for low-income households	ISDE scheme; flat subsidy, intended to cover around 30% of investment costs ISDE subsidy design: Flat, technology-based subsidy rather than income-indexed support. Provides a fixed contribution per eligible heat pump system, with support calibrated to cover around 30% of average investment costs. Coverage was increased from around 20% to 30%, while eligibility criteria were simplified, lowering both financial and administrative barriers.	BEG subsidy design: Proportional reimbursement model rather than flat grant. Provides a base subsidy covering 30% of eligible investment costs, supplemented by bonuses: +5% for heat pumps using natural refrigerants, +20% for replacing fossil heating systems, and +30% for low-income households. Total support can reach 70% of eligible costs, capped at €30,000, corresponding to a maximum grant of €21,000.	MaPrimeRénov' subsidy design: Income-indexed and renovation-pathway based. Differentiates support by household income category and by type of intervention, distinguishing between comprehensive deep renovation pathways and single-measure renovations such as heat pump installation.

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Institut Jacques Delors
Penser l'Europe • Thinking Europe • Europa Denken
17 rue d'Antin, 75002 Paris, France
www.delorsinstitute.eu • info@delorsinstitute.eu