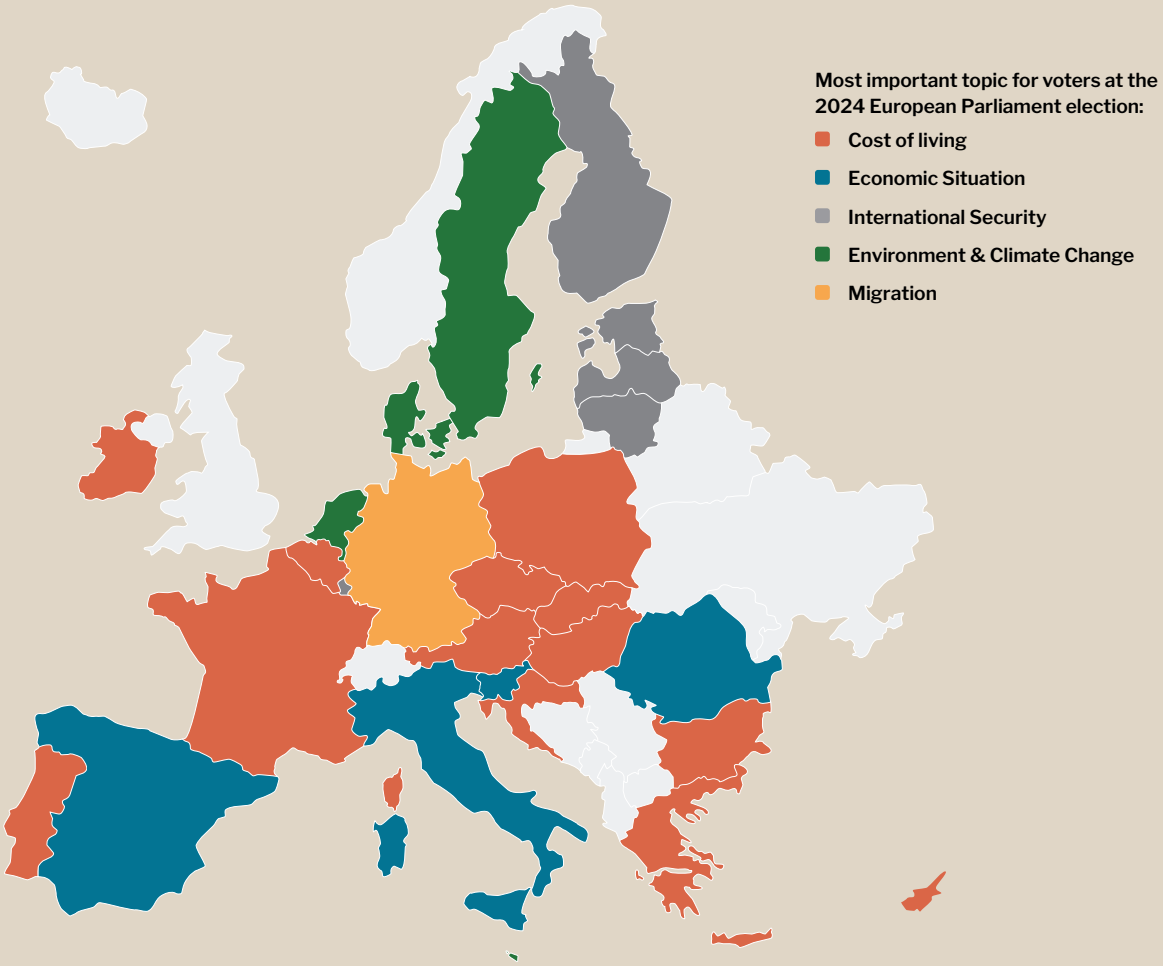
EUROPEAN ELECTRIFICATION

FOR A MORE SECURE, COMPETITIVE, FAIR AND SUSTAINABLE UNION



CONCITO

European Electrification for a more Secure, Competitive, Fair and Sustainable Union

By Nicolai Bech Kofoed

CONCITO

Abstract

The political and economic prosperity of the European Union has been based on privileged access to cheap American security, cheap Russian energy and cheap Chinese goods, as well as a rules-based global order with little or no barriers to international trade.

All these virtues are diminishing, while climate change is accelerating, the EU's competitiveness is struggling, and cost-of-living is one of the most important issues for voters. The Clean Industrial Deal and the framing of the European Commission's 2040 climate target proposal confirm that these trends permeate President von der Leyen's second mandate.

To this end, this paper provides concrete policy recommendations and ideas for the Commission's upcoming Electrification Action Plan and wider policy framework for 2040.

The EU should prioritize electrification of heating, transport and industry to:

1. **Accelerate climate action** by cutting emissions fast and effectively, keeping in mind that the EU's electricity supply is 74 percent non-fossil,
2. **Enhance European independence and security** by reducing reliance on imported fossil fuel, and
3. **Improve competitiveness and social cohesion** by reducing energy costs for industry and households.

European electrification is a no-regret decision as **the cost of action is lower than the cost of inaction:** The **EU imports more than 90 percent of its oil and gas**, and since 2008 the EU has spent an average **317 bn EUR annually** on fossil fuel imports, and citizens have faced high and volatile prices.

By focusing on electrification, renewable energy, and energy efficiency, the EU can cut this import in half by 2040. Notably, **annual savings from reduced fossil fuel imports amount to 160 bn. EUR by 2040, whereas additional investments in renewable energy and grids amount to approximately 100 bn. EUR annually, according to the European Commission.**

The savings will increase even further if the EU manages to integrate its electricity market and improve system flexibility through investments in and integration of large-scale batteries. As a result, the overall energy system costs as a share of GDP will fall significantly towards 2040, driven by European electrification, according to the European Commission.

Politically, electrification can bridge the divide between Member States that prefer either nuclear or renewable energy, and it can contribute to a just transition by adding millions of local, skilled labor jobs across the continent.

Reaching the 2040 climate target requires fast, deep and structural electrification. To foster this historic change, the European Commission should propose and promote policies that accelerate electrification across the most important sectors, while decarbonizing the EU's electricity supply.

Policy recommendations

	Short-Term: Implement and enforce	**Long-Term:** Prepare and propose
National	» Implement EU climate and energy legislation* properly. » Adjust state aid and taxes/levies for households and industries to incentivize electrification.	» Invest in grids, energy storage, energy efficiency and renewable energy. » Invest in education and reskilling of workforce.
European	» Enforce and safeguard EU climate and energy legislation and initiate infringement procedures on gross lack of implementation e.g. on Electricity Market Regulation. » Maintain environmental integrity of ETS2. » Focus EIB de-risking on grids, storage and industrial electrification. » Focus Innovation Fund even more on electrification. » Focus Social Climate Fund on vulnerable households' transition away from fossil heating and transport.	» Prepare a 2040 climate and energy policy framework that accelerates clean electrification. » Focus next MFF and CEF on grid investments, including EV charging. » Incentivize cost-sharing of cross-border renewable energy projects. » Adjust permitting to allow for faster deployment of renewable energy and easier grid access with due respect for environmental protection. » Accelerate phaseout of fossil heating via performance standards for boilers. » Allow individual Member States to accelerate phaseout of combustion engine cars and fossil boilers.

* Electricity Market Regulation, Renewable Energy Directive, Energy Efficiency Directive, Energy Performance of Buildings Directive, Ecodesign, CO_2-emission standards for road transport.

Introduction

The unprovoked Russian invasion of Ukraine in February 2022 marked a shift in international politics, especially in the bilateral relationship between Russia and the EU. Many Member States increased defense spending significantly and this trend will continue, as NATO members recently committed to 5 percent military spending. To further improve their security and limit the strength of their Russian adversary, EU Member States passed 18 rounds of sanctions and the EU sought to reduce and even ban imports of Russian fossil fuel. However, due to a consistently high consumption of oil and gas, Member States unintentionally funded Moscow's war efforts[1] by at least 210 bn. EUR since the invasion.[2]

This is only the tip of the iceberg: Since 2008, Member States combined spent an average of approximately 100 bn. EUR *annually* importing Russian energy[3], corresponding to approximately 1 percent of GDP, comparable to their contribution to the EU budget, or their national military spending.

The Commission's Clean Industrial Deal confirms its intention to invest in clean, domestic energy production and infrastructure. However, the Commission also maintains its commitment to enter into agreements with new suppliers[4] of fossil fuel[5], even though that could lock in a high European oil and gas consumption[6] and thus extend the indirect import from (and thus the unintended support for) Russia.[7]

Against this geopolitical backdrop, the EU's competitiveness is also struggling. High energy prices constitute a serious challenge for several important sectors and industries and thus the EU needs energy reforms and investments to regain competitiveness and increase global relevance.

While energy prices are also formed by nationally determined taxes and tariffs[8], the EU as such needs to increase its energy investments to enable a transition away from the expensive imported fossil fuel through comprehensive electrification, according Mario Draghi and the European Commission.[9]

Draghi aligns with Enrico Letta, who also calls for full integration of the European electricity market to improve security of supply and bring down energy prices through higher efficiencies and increased competition. If Member States are to reduce their dependence on Russia, they need to work closer together.

According to Enrico Letta, European competitiveness requires free flow of electricity, so that businesses and citizens in one Member State can access affordable electricity produced in another, while balancing power supply and demand across regions.[10]

The free movement of goods remains one of the cornerstones of the European Union, but this virtue does not fully apply to electricity. Though the EU's electricity market is more advanced than other regions, including North America, congestion and insufficient bilateral and regional cooperation still limit cross-border flows.[11]

This problem damages European competitiveness and hurts households[12] by increasing consumer prices as well as the costs of renewable energy curtailment and of the ensuing redispatch.[13] The economic case for electrification is positive, if Europe manages to integrate electricity markets and thereby reduce prices and increase security of supply.

The EU's push to limit reliance on fossil fuel is and should also be driven by climate concerns. As the fastest-warming continent[14] and with the devastating floodings[15], heat waves[16] and wildfires[17] in mind, the EU has a narrow self-interest in limiting climate change to improve the safety and wellbeing of its citizens, including fiscal stability, as extreme weather could cause a 5 percent drop in Eurozone GDP by 2030.[18]

The case for climate action also extends to challenges such as migration: extreme weather will be increasingly recurrent and droughts and floodings will work as a risk multiplier that increases both political instability and the flow of refugees and migrants globally. And while most migration will remain regional, migration towards Europe will also increase.[19]

On top of this, the EU also has a clear moral and international obligation to reduce its emissions, as the EU accounts for a disproportionate share of the historical emissions.[20] If one also includes the consumption-based carbon footprint, the EU's obligation is not only historic, but very current[21], as EU citizens, especially from affluent Member States[22], per capita emit approximately twice as much as the average citizens globally.[23]

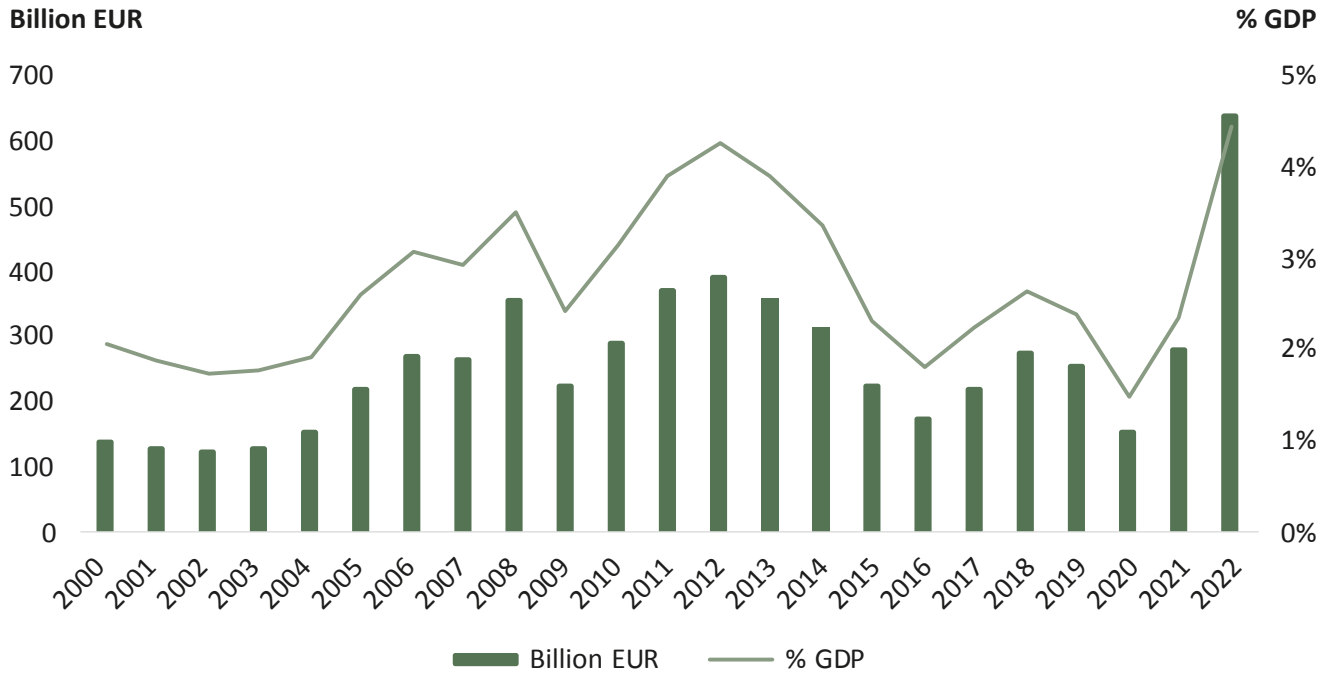
While facing a challenging geopolitical outlook, declining competitiveness and escalating climate change, President von der Leyen has committed to and maintained a 90 percent greenhouse gas reduction target for the EU by 2040.[24] For context, the European Scientific Advisory Board on Climate Change (ESABCC) recommended a 90-95 percent 2040-taget.[25]

However, the ESABCC's recommendation was for a *domestic* target, which determines reductions within the EU rather than outsourcing climate efforts to countries outside the EU through international credits that could risk undermining our climate policies.

This analysis takes the Commission's 2040 Impact Assessment as its point of departure, as the 2040 climate target negotiations are unfinished, and the share and effect of international credits thus remain unknown.

In its Impact Assessment for the 2040 climate target, **the Commission highlights electrification as an important tool to reduce emissions quickly and cost-effectively**, using competitive and European technology such as wind and heat pumps. As such, the Commission's Clean Industrial Deal emphasizes electrification as crucial to the EU's security, competitiveness and climate action, estimating the need to increase the EU's electrification rate from 23 percent in 2024 to 32 percent by 2030 and to 51 percent by 2040. This is in stark contrast to the EU's electrification rate, which has stagnated around 20 percent[26] since the turn of the century.[27]

Figure 1: EU's net fossil fuel imports 2000-2022 Source: European Commission 2040 Impact Assessment



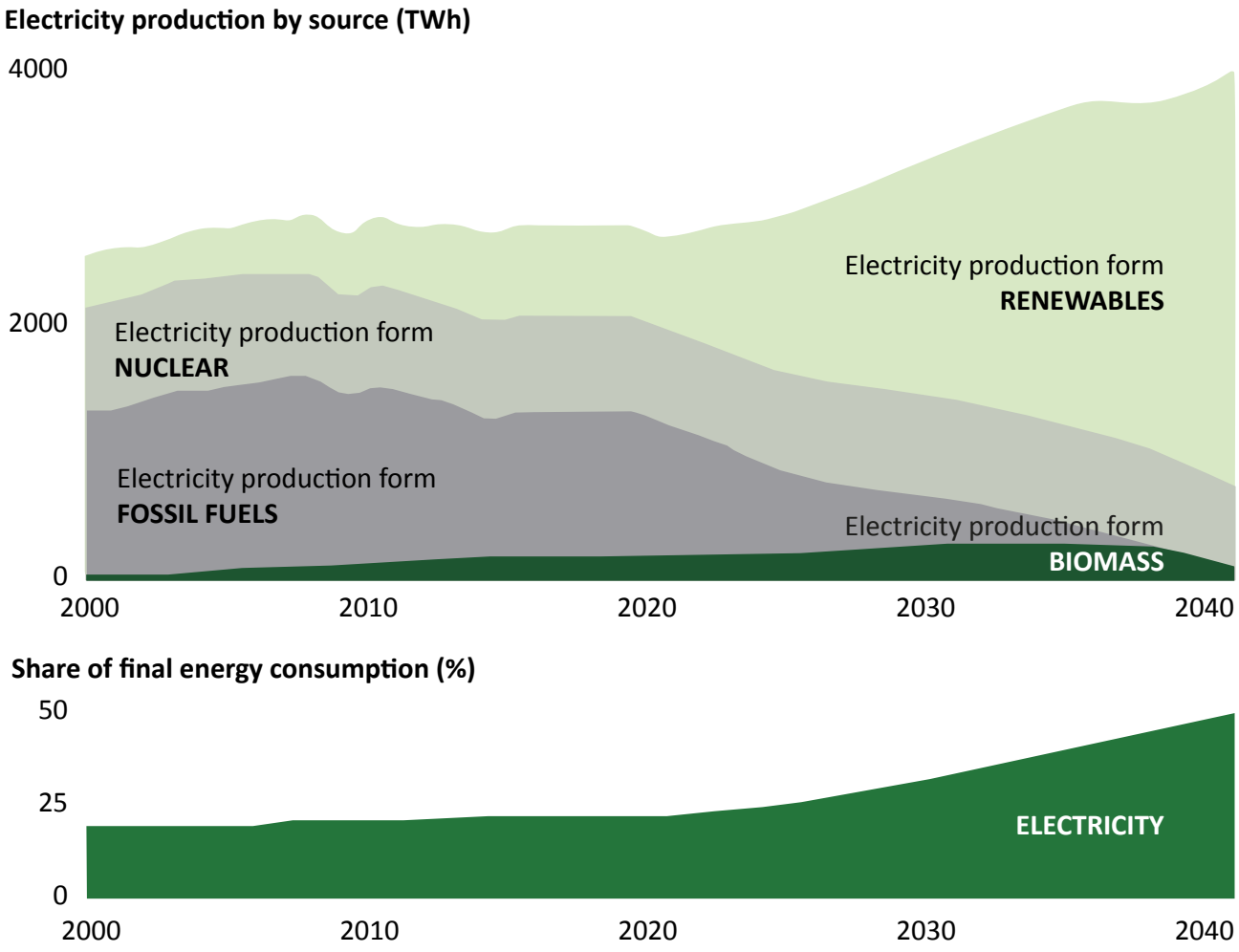
In other words, the EU needs to make more progress in the next five years than it has done in the past 25 years. At the same time, the EU needs to decarbonize its electricity supply by phasing out coal and reducing gas-based electricity to a minimum. Reforms and investments are needed, if the EU is to accelerate electrification and deliver on the promise to reduce energy imports, energy costs and energy emissions.

The first order of business is to maintain the environmental integrity of the strong policy frameworks of ETS and ETS2 that price in the emissions in energy, industry, heating and road transport, where electrification is necessary and feasible, and where market actors need investor certainty.

Coupled with increased grid investments, enforcement of the Electricity Market Regulation and targeted support for households and industry's electrification, the EU will be on track.

The EU's impetus for electrification is strong, benefiting its climate action as well as its security, competitiveness, and citizens. While the path to electrification requires investments and reforms, **the cost of action is lower than the cost of inaction**. The EU imports more than 90 percent of its oil and gas, spending more on importing fossil fuel than on defense.[28] By doing nothing, the EU will be stuck with dangerously low energy security, struggling competitiveness, hurting households and escalating climate change.

Figure 2: Projection of the EU's electrification and decarbonization of electricity supply



Source: Strategic Perspectives

The fossil diversification pitfalls

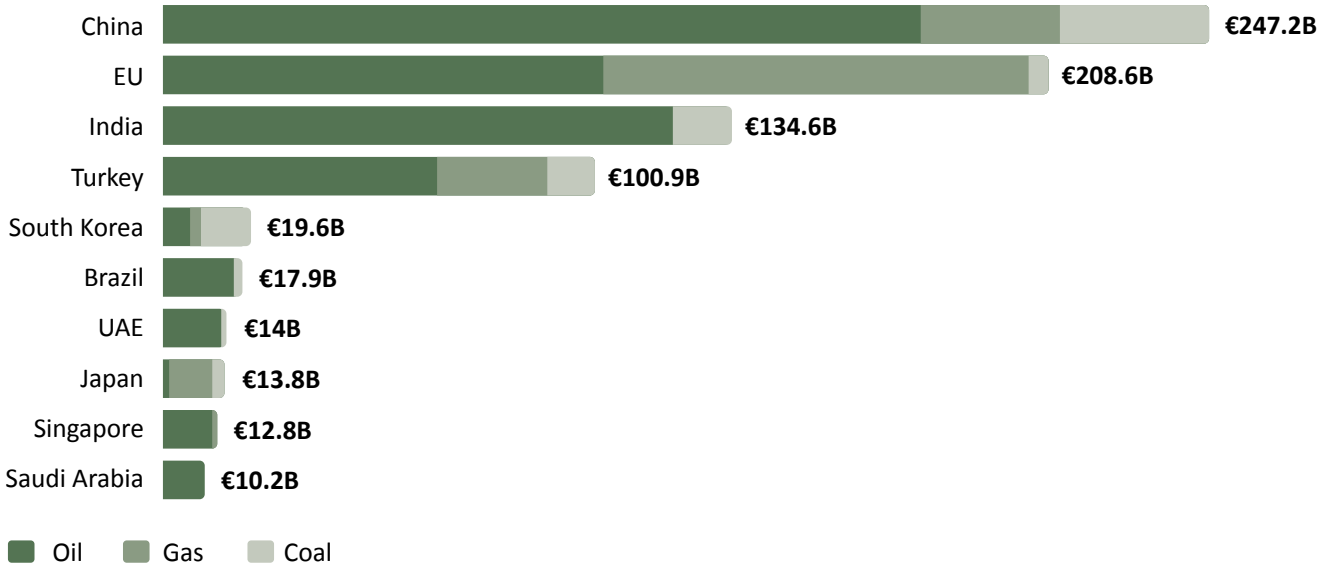
This paper focuses on the virtues of European electrification. Before diving into the specifics, including concrete policy recommendations and challenges, it is worth exploring the obvious alternative: diversifying the EU's supply of fossil fuel. This chapter argues that while this approach had some merit in the immediate aftermath of the invasion of Ukraine, serious pitfalls persist for European climate, security, competitiveness and cost-of-living.

Since the invasion of Ukraine and the energy crisis that followed, the European Commission has promoted diversification of oil and gas supply as a key part of the solution to European energy security.[29] To this end, Member States and the Commission have signed agreements with inter alia Algeria, Azerbaijan, India, Libya, the US and Qatar. With the Clean Industrial Deal, the Commission plans to bet on imported Liquified Natural Gas (LNG) to improve European energy security.

While this approach was politically understandable in the weeks and months following the invasion, including the energy crisis that peaked in the third quarter of 2022, the medium-to-long term ramifications are severe: **the fossil diversification approach structurally undermines the EU's security, competitiveness, cost-of-living and climate policy** by extending the EU's unsustainable, expensive and risky reliance on fossil fuel imports.

Already in the short term, the EU should complement and fence in the fossil diversification approach by drastically limiting European consumption of fossil fuel and by limiting investments in fossil infrastructure, while promoting electrification as a cost-effective, sustainable alternative in line with the Commission's 2040 Impact Assessment.

Figure 3: Top importers of Russian fossil fuel since the invasion of Ukraine



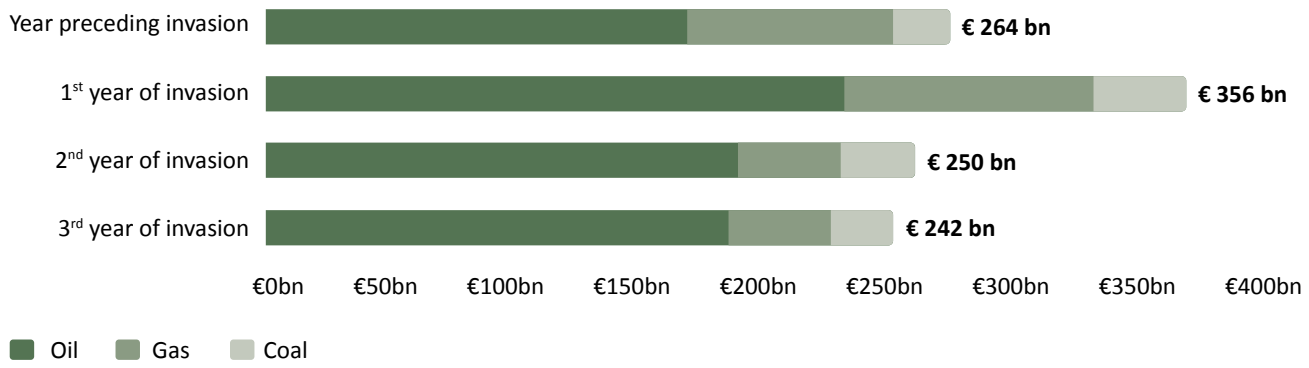
Source: Politico

Security

From a security perspective, the fossil diversification approach is harmful because it circumvents the EU's own sanctions[30] by purchasing Russian oil[31] and gas indirectly via third countries.[32] While the EU's *direct* imports decreased significantly in 2022[33], the indirect imports via inter alia India[34] and Turkey have sustained the EU's unintentional funding of its main geopolitical adversary in Moscow (cf. Figure 3).

In the first three years following the invasion, the EU spent more than 205 bn. EUR on Russian fossil fuel.[35] This equals more than 2400 F-35[36] fighter jets.[37] Russian fossil fuel export revenues have stabilized around 2021-levels even as prices normalized, the war escalated, and new rounds of EU sanctions were introduced[38] (cf. Figure 4). This indicates that Russian exports have not suffered significantly from the EU's sanctions or diversification of supply, as the EU's stable demand for fossil fuel is covered by indirect imports of Russian fossil fuel.

Figure 4: Russia's fossil fuel export revenue

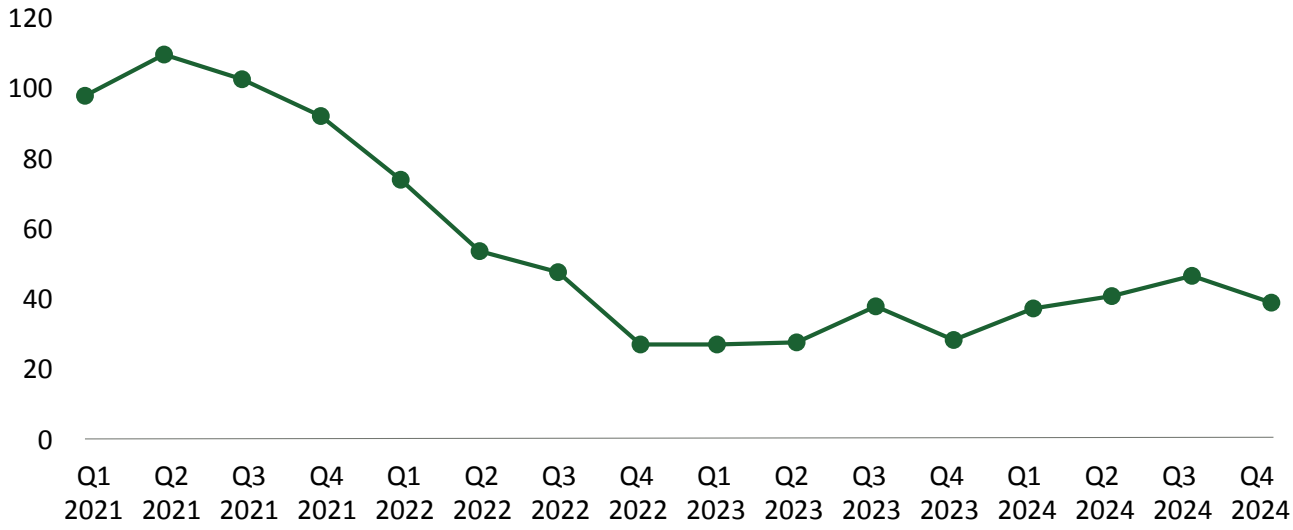


Source: CREA

The **EU's phaseout of gas has stagnated from Q4 2022 to Q4 2024[39]** (see Figure 5 and 6)**, and its oil import was even higher in 2024 than before the Russian invasion of Ukraine** (see Figure 7)**.**[40] Despite the pronounced ambition to phase out the import of Russian energy[41], the EU *increased* its direct import of Russian Liquified Natural Gas (LNG) after the invasion[42], contributing more than 7 bn EUR directly to the Russian economy in 2024 alone.[43]

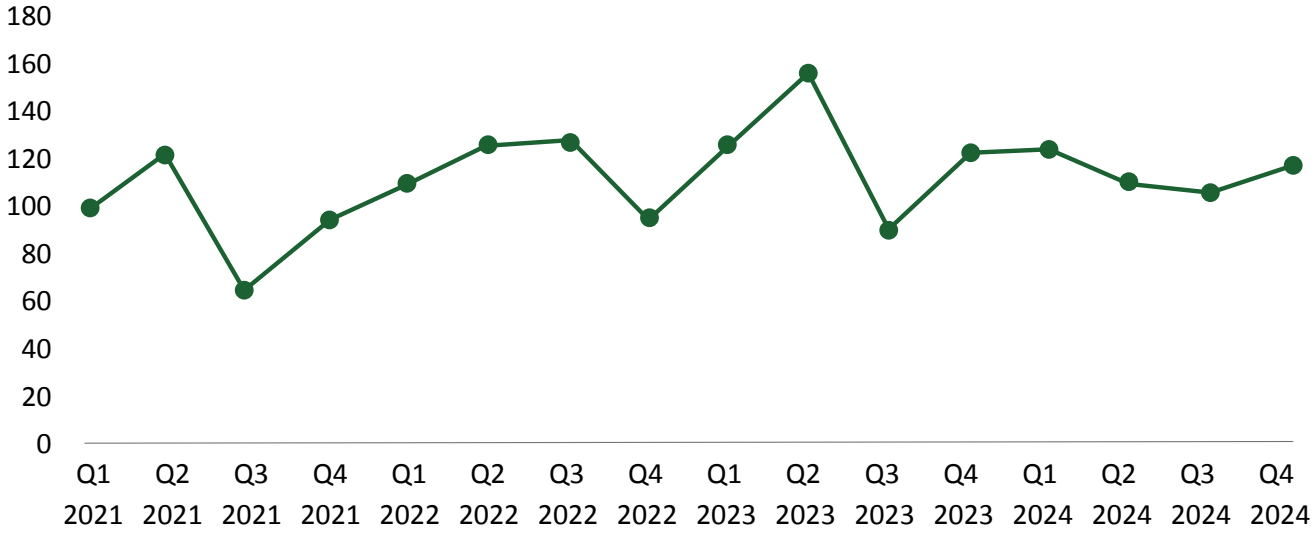
Notably **the aggregate direct gas imports from Russia, counting both natural gas and LNG, increased from Q4 2022 to Q4 2024, which confirms the point that the EU is not on track to phase out Russian gas**[44] (cf. Figure 5 and Figure 6). As noted, counting indirect imports amplifies this point even further.

Figure 5: EU imports of natural gas in gaseous state from Russia, Q1 2021 to Q4 2024



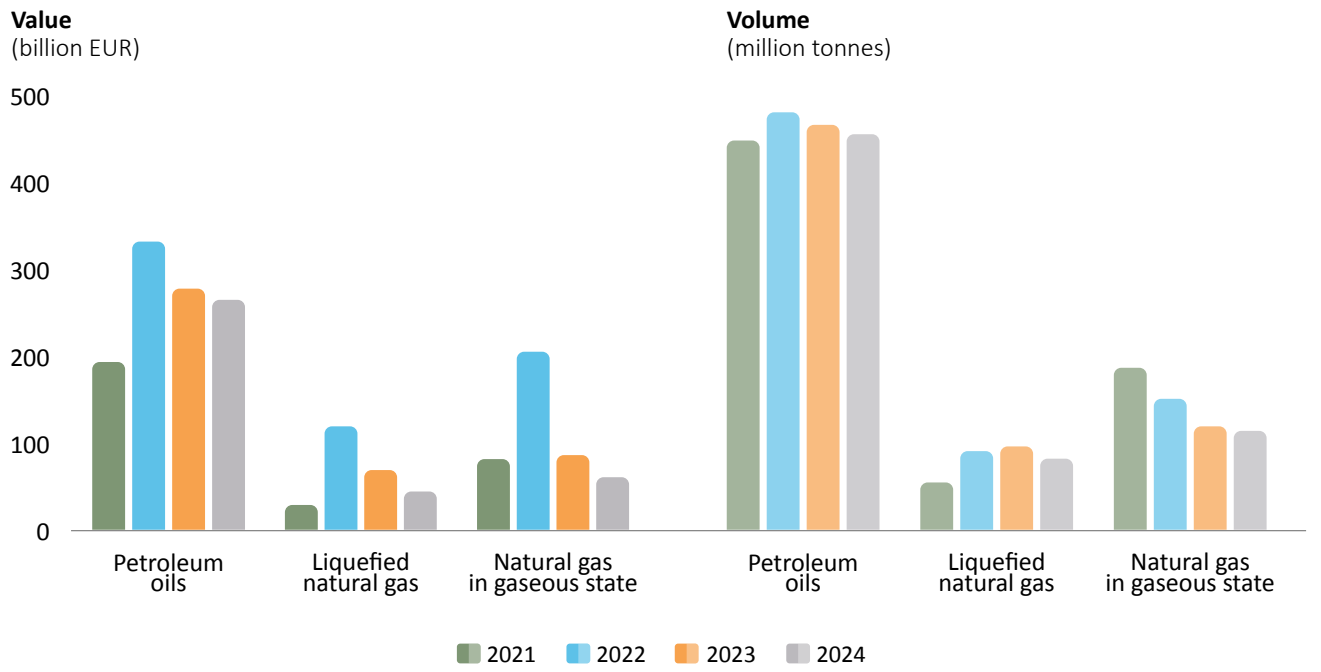
Source: Eurostat

Figure 6: EU imports of LNG from Russia, Q1 2021 to Q4 2024



Source: Eurostat

Figure 7: Extra-EU imports of natural gas and petroleum oils, 2021-2024



Source: Eurostat

Competitiveness and cost of living

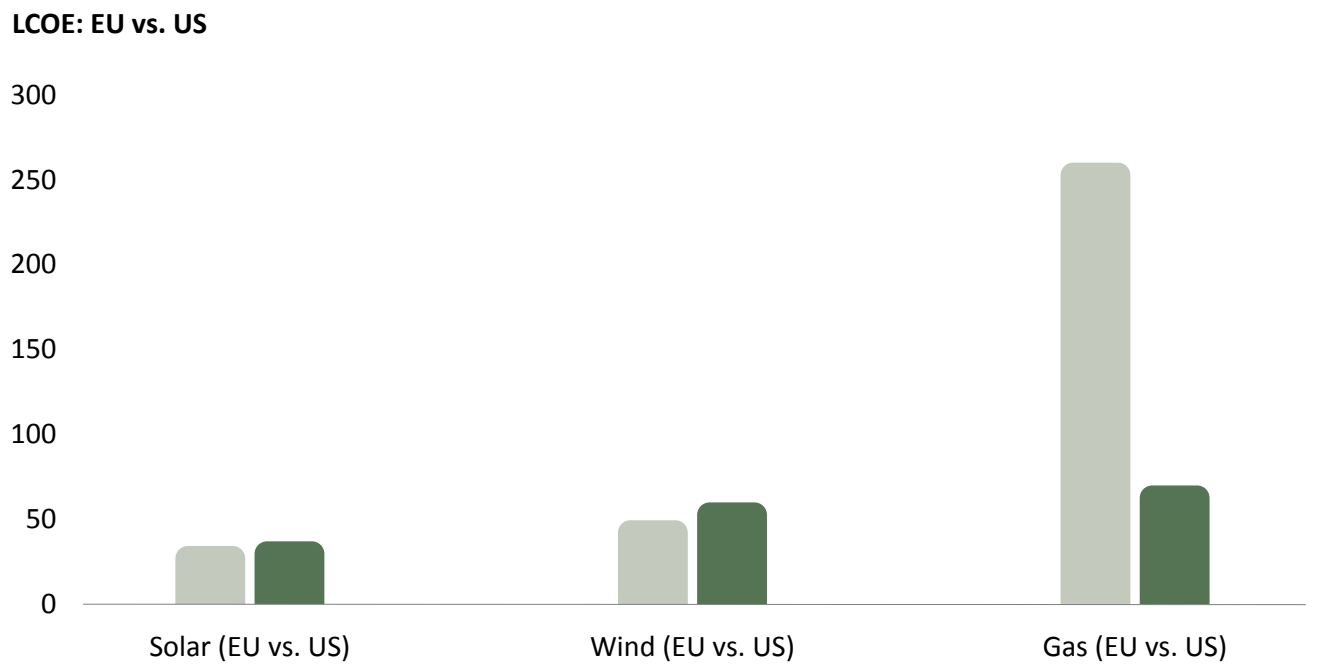
In terms of competitiveness, the fossil diversification approach also poses significant risks to Member States. First, by committing to LNG, Member States could suffer high and volatile energy prices determined by foreign (often unreliable) suppliers[45] and thus fail to make the EU more competitive and robust. Switching to American LNG will not address the EU's challenge with high gas prices, as the EU could, at best, hope for American prices plus a premium.[46]

According to the IEA (Figure 8), the EU will not be able to access gas that is even remotely competitive with either American gas or homegrown European energy based on wind and solar, even if the latter entails increased grid investments.

The switch to American LNG would not solve the problem of vulnerability either, as the EU's gas supply would be even more exposed to the risk of trade wars.

In terms of cost-of-living, the fossil diversification approach does not help vulnerable households that face high and volatile prices. Moreover, households depending on natural gas for heating could face rising tariffs, as fewer customers share the bill for the gas grid.[47]

Figure 8: Levelized cost of energy (USD/MWh)



Source: IEA's World Energy Outlook 2024.

Note: Solar is Solar PV, wind is an average of onshore and offshore wind and gas is CCGT. Numbers are USD/MWh.

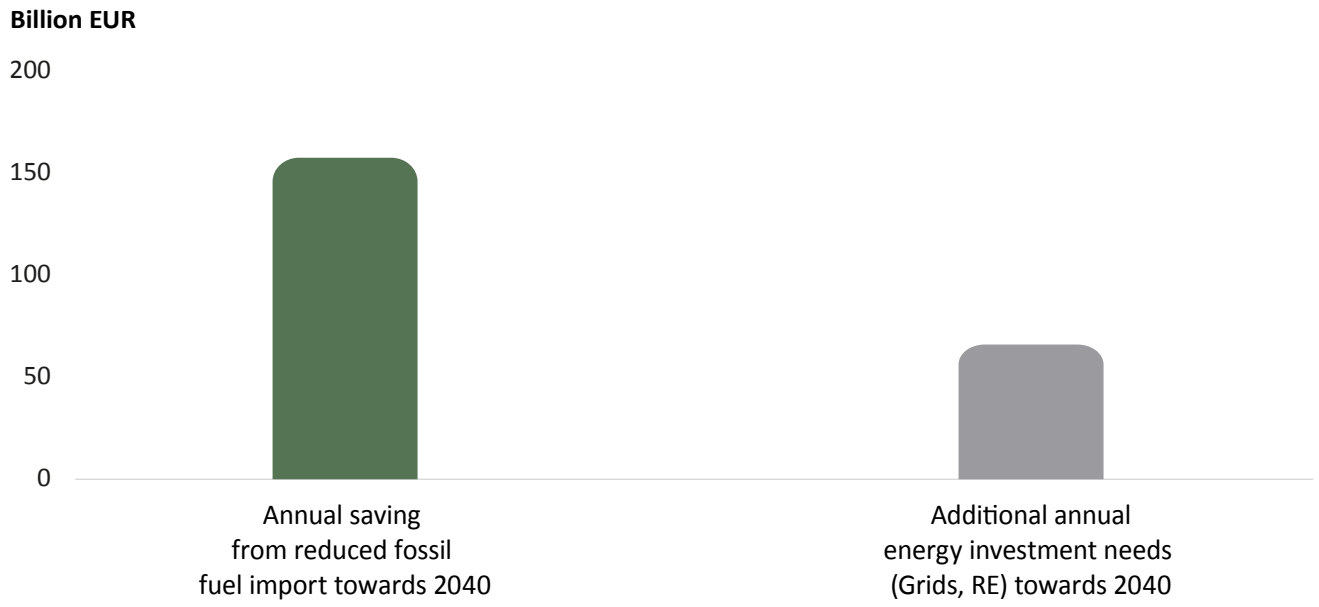
Second, Member States will own stranded assets such as LNG terminals[48] and could be committed to long-term contracts that extend for decades.[49] This runs counter to the EU's climate law, which entails drastic reductions of fossil fuel consumption by 2030.[50] In short, the EU will either have a serious overcapacity of LNG infrastructure, or an unsustainably high consumption of gas, already by 2030.[51]

Third, since 2008 the EU has annually spent an average of 317 bn. EUR, and 3 percent of its GDP, on fossil energy imports.[52] **The EU could cut energy import costs by 160 bn. EUR annually towards 2040, according to the Commission's Impact Assessment. The saving from limiting fossil fuel imports will increase further through electrification and market integration**, according to the Commission's Clean Industrial Deal.[53]

The Commission forecasts that the saving from the transition, which includes both reduced energy import costs and efficiency gains, will increase to 260 bn. EUR annually by 2040 as the EU increases electrification to 51 percent in line with the 2040 Communication Impact Assessment.[54]

This entails a reduction of gas-power to 3 percent, down from 16 percent of the EU's electricity, as well as full electrification of residential heating, which accounts for 40 percent of the total gas demand[55] (and much more in Member States such as Italy and The Netherlands[56]). Finally, it entails electrification of industrial processes below 200 degrees, which cover around 10 percent of the EU's total gas demand (and about 40 percent of industrial gas demand).[57] Thus, natural gas (and eventually hydrogen) will be preserved for high temperature processes, where electrification (for now) remains less feasible.

Figure 9: Annual energy savings and investments towards 2040



Source: European Commission 2040 Impact Assessment

To put this saving into perspective: towards 2040, the EU's grid investments will increase by approximately 40 bn. EUR (from 63 bn. EUR[58] to 100 bn. EUR annually[59]), while the EU's renewable energy investments will increase by approximately 30 bn. EUR (from 100 bn. EUR[60] to 130 bn. EUR[61]), according to Commission estimates, which also highlights 16 bn. EUR of additional investments in battery manufacturing. Compared to 260 bn. EUR in annual savings by 2040[62], the investments in grids, renewable energy and batteries are fiscally advantageous in the long term.

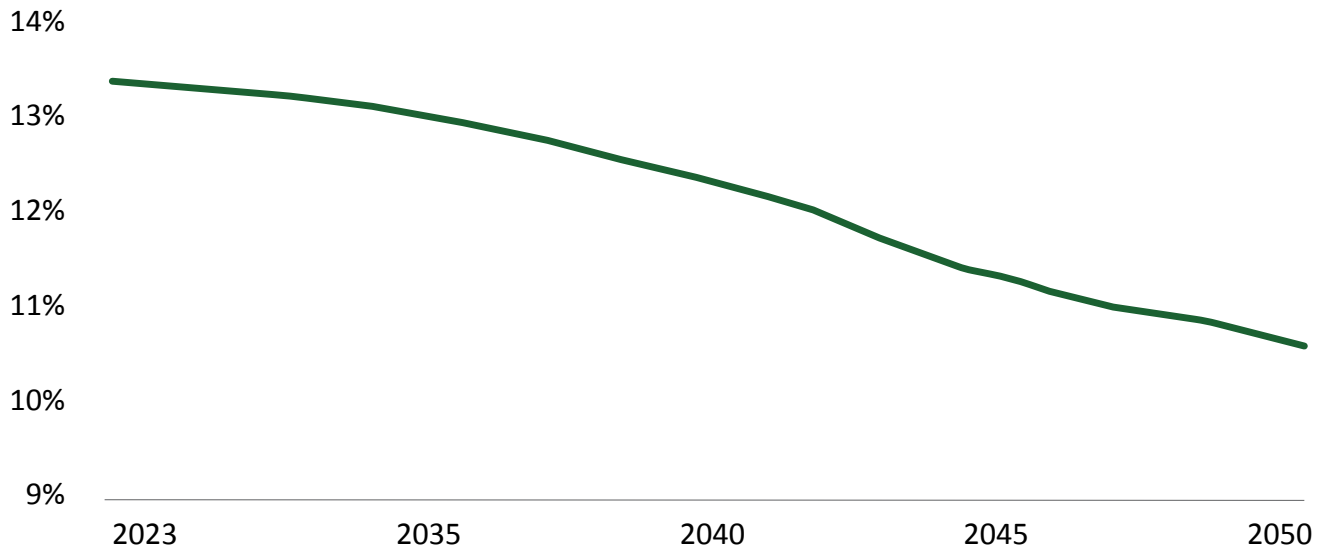
In addition, the negative effect of energy price shocks on GDP is cut in half, if the EU manages to reduce fossil fuel consumption in line with the Commission's 2040 target, according to its impact assessment.[63]

However, on the demand-side, consumers will face up-front costs for heat pumps, electric vehicles and roof top solar installations. While these investments will cut consumer costs in the long term, it is vital for the speed and legitimacy of the transition that these up-front costs are addressed, especially for low-income households.

For Finance Ministries, the loss of revenue from taxing fossil consumption also needs to be factored in. Taking road transport as an example, Member States that have provided consumers with significant tax deduction for electric vehicle purchases, could phase out the tax deduction, when the share of new sales reach 100 percent. At a European level, this would mean around 2035, when the sale of new internal combustion engine cars is restricted.

Taking an economy-wide approach, **the EU will reduce its total energy system costs, as it cuts energy imports and increases electrification.** As such, electrification, if done right via an integrated electricity market, will drive down the total energy system costs as a percentage of GDP from approximately 13,3 percent in 2030 to 10,6 percent in 2050, according to the European Commission.[64] Notably a slightly lower electrification rate, as forecasted by the Commission in other scenarios, would result in similar costs, but fewer benefits in terms of savings related to fossil fuel imports and improved energy security.

Figure 10: Total energy system costs as percentage of GDP



On this basis, the conclusion is clear: the cost of action is lower than the cost of inaction. **Continuing the fossil-based business as usual will extend the EU's declining competitiveness and security, while undermining the household budgets of families.** Accelerating the transition from fossil fuel to clean electricity can reduce energy costs and import dependence.

Climate

In terms of climate action, the oil and gas diversification approach misses the opportunity to reduce consumption and emissions through a switch to clean electricity and energy efficiency.[65] To make matters worse, the shift from pipeline gas to LNG is problematic because the latter could increase emissions.[66] On top of this, some European industries shifted from natural gas to oil during the energy crisis of 2022, resulting in even higher emissions, albeit for a limited time.[67]

In a political sense, **the fossil diversification approach limits the political and economic appetite for investing in sustainable alternatives**, including competitive technologies such as heat pumps and wind power that could lower emissions quickly and cost-effectively, using European technology.

Moreover, as commodities and skilled labor are scarce resources, investments in additional fossil infrastructure will increase the price and decrease the pace of electrification, including the expansion of electricity grids. Ultimately, diversification based on imported fossil fuel is not only a distraction, but a liability to the EU's attempt to improve its security, competitiveness and climate action in a cost-effective manner.

Electrification: A more secure, competitive, fair and sustainable union

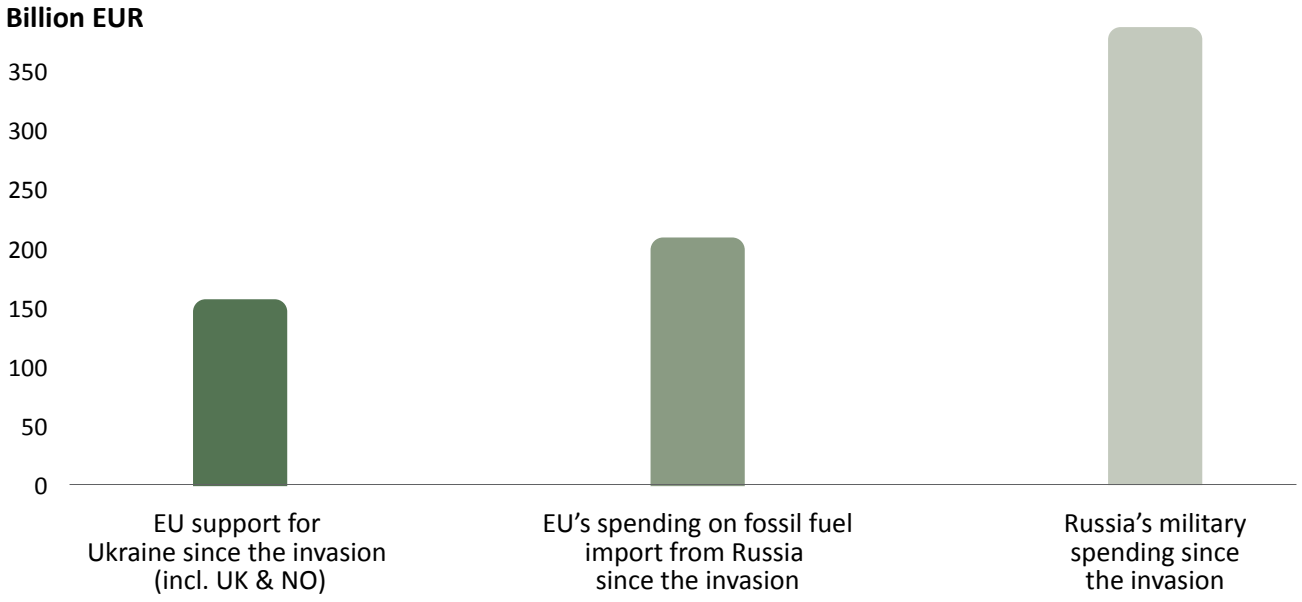
Electrification is a case in point when it comes to effective climate policy that can improve European security, competitiveness and cost-of-living, and where the cost of action is significantly lower than the cost of inaction. However, European electrification has halted for decades[68] even though the EU's electricity generation is cleaner than ever[69], its (Russian) suppliers of fossil fuels are more aggressive than previously[70], and climate action is urgently needed.[71]

In technological terms, solutions such as heat pumps, electric vehicles, wind and solar are mature, accessible and competitive, which further strengthens the case for electrification. Politically, **electrification can even work as a unifying agenda that bridges Member States** that are divided over preferences for either nuclear or renewable energy, which has been one of the main fault lines in European energy policy in recent years.[72]

Security

Electrification can improve European security by reducing direct and indirect fossil fuel imports from its main geopolitical adversary, Russia, without increasing dependence on other unstable[73] or politically challenging suppliers.[74] With the Russian economy being heavily reliant[75] on exports of oil and gas[76], European electrification will work as an effective and lasting sanction, limiting the very high import of Russian energy[77], which amounts to at least a trillion EUR in the decade following Russia's illegal annexation of Crimea in 2014.[78] The amount is even higher if one factors in how the EU's demand has pushed up global price levels for oil and gas and thus allowed Russia to export oil and gas to other actors at a high price. This is particularly important, as the Russian economy is reliant on a high global oil price, and large parts of Russian reserves are only profitable with prices above 60 USD/barrel.[79]

Figure 11: EU support for Ukraine and spending on Russian energy (by 30 June 2025)



Source: Kiel Institute, CREA and IISS.

To put this unintentional support for Russia into context, **the value of the EU's direct oil and gas imports exceed the aggregate support for Ukraine since the invasion[80] - approximately 167 bn. EUR** (by 30 June 2025)**.**[81] The latter even includes support from the UK and Norway as well.

To contextualize the European imports of Russian oil and gas, Russia spent approximately 320 bn. EUR on its entire military in 2022, 2023 and 2024 combined.[82] Thus, the EU's import has contributed very significantly to the Russian war efforts in Ukraine. The EU accounts for 11-13 percent of global gas demand, and thus the EU has a chance to significantly limit Russia's revenue by reducing consumption.

This confirms that **electrification of key European sectors, where the use of oil and gas remains high, can significantly limit the economic and eventually the military power of Russia.** This will make the support for Ukraine more effective and reduce the need for European military spending (which has already increased by 50 percent since 2014).[83] Indeed, the Kiel Institute estimates that every time the EU cuts its oil imports by one euro, Russia's war chest shrinks by 13 cents, which conversely allows Member States to spend less on their defense budgets.[84] Given this synergy, the Commission and Member States should explore how to spend the 1.5 percent of the defense budget dedicated to critical infrastructure[85] in a manner that reduces fossil fuel imports.

Looking further ahead to 2040, the Commission's projection suggests that a 51 percent electrification rate enables reductions of oil and gas consumption to a degree that allows the EU to only import fossil fuel from NATO countries, and almost only Norway: In a 90 percent reduction scenario, the EU's annual demand will be around 50 bcm gas and 100 million tonnes oil[86], while Norwegian 2040-export is forecasted to 124 bcm gas and 70 million tonnes oil.[87]

Competitiveness

Several factors challenge the EU's competitiveness, including high energy prices, caused mainly by its reliance on imported fossil fuel, as confirmed by the Draghi Report, the Clean Industrial Deal[88] and the Action Plan for Affordable Energy.[89]

The primary drivers of this reliance is the EU's persistent use of fossil fuel for electricity generation[90], and its lack of electrification, which has stalled at around 20 percent since the beginning of the century[91] for a variety of reasons; insufficient cross-border integration[92] and infrastructure[93] fail to reduce electricity prices via increased competition; the Member States' persistent state aid for fossil fuel consumption and infrastructure locks in a fossil status quo[94]; and high electricity taxes on end-users limit incentives to electrify on the demand side, including through heat pumps and EVs.[95] In addition, European businesses have been too slow to adapt and incorporate new technologies, such as high-temperature heat pumps - even though they have become mature and competitive.[96]

The European automakers' hesitation to invest in electric vehicles is another example, though they appear to be catching up.[97] From a competition perspective, this is regrettable since electrification allows the EU to use its abundant and attractive renewable energy resources to reduce prices and improve competitiveness; by increasing the share of renewable energy to 75 percent by 2040, and by increasing electrification to 51 percent by 2040, the EU can reduce electricity generation costs by at least 30 percent compared to 2023.[98]

Adding to this point, the EEA recently concluded that upscaling renewable electricity generation to meet the EU's 2030 climate and energy targets could lower the variable costs of EU electricity generation by up to 57% below 2023 levels, though capital costs will increase as short term investments are required.[99] While the numbers vary, clean electrification can reduce prices, if the EU invests in grids and storage and integrates its markets.

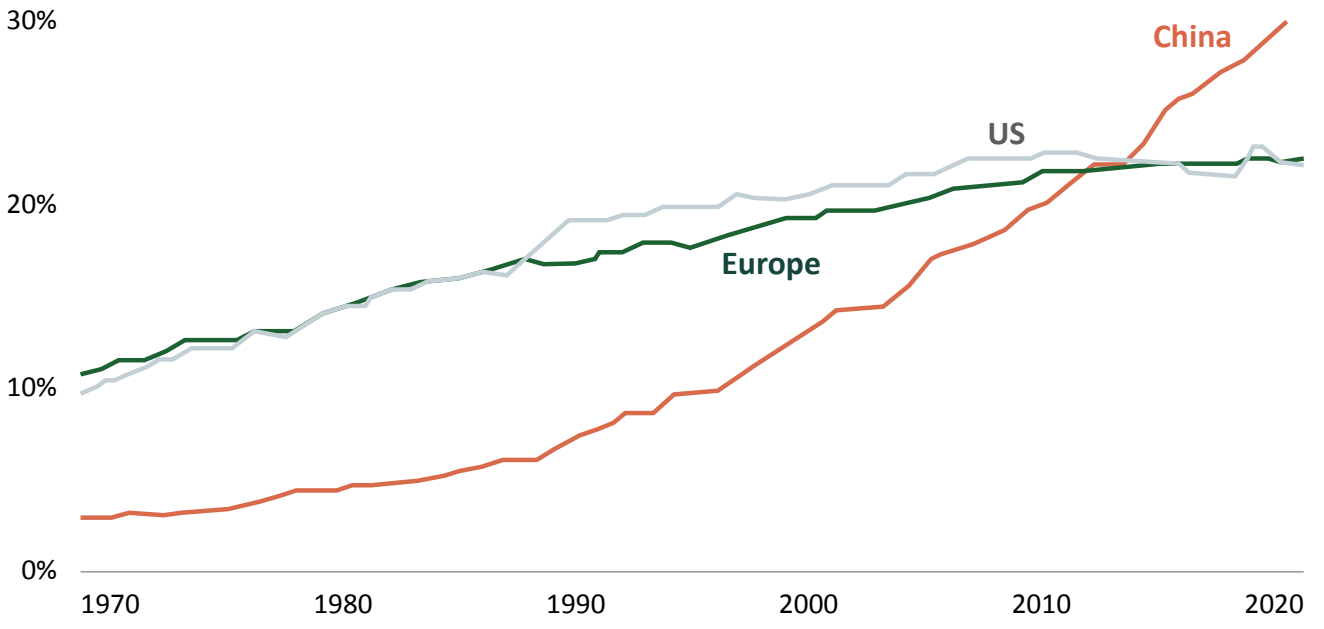
In contrast to the EU, China has accelerated its electrification significantly[100], rising from approximately 10 percent in 2000 to about 30 percent today[101] (see Figure 12), supporting high economic growth rates and industrial leadership.[102] In particular, the Chinese manufacturing industry has been able to electrify its processes and Beijing has also been able to electrify Chinese road transport significantly (see Figure 13). In parallel, US competitiveness benefits from access to cheap, domestically produced energy, both fossil and renewables.[103]

Against this backdrop, the EU needs to invest and reform to improve its competitiveness. Looking at industrial electrification specifically, **the EU has a major potential across several industries, some of which could double or even triple their electrification rates already by 2035**[104]. However, companies need access to risk capital to make the necessary investments.[105]

Fortunately, the Commission has highlighted this tool as one of the key enablers in the Clean Industrial Deal and the EIB is already starting to deliver on the access to risk capital.[106] To this end, the Commission has launched a 1 bn. EUR pilot to decarbonize industrial process heat[107], which will precede the actual *Industrial Decarbonisation Bank*, which should increase in scale to make a difference for European electrification (cf. policy recommendations). However, the industry also needs strong, stable price signals, both low electricity prices, and higher gas prices, as concluded by Agora in their recent report on European industrial electrification.[108]

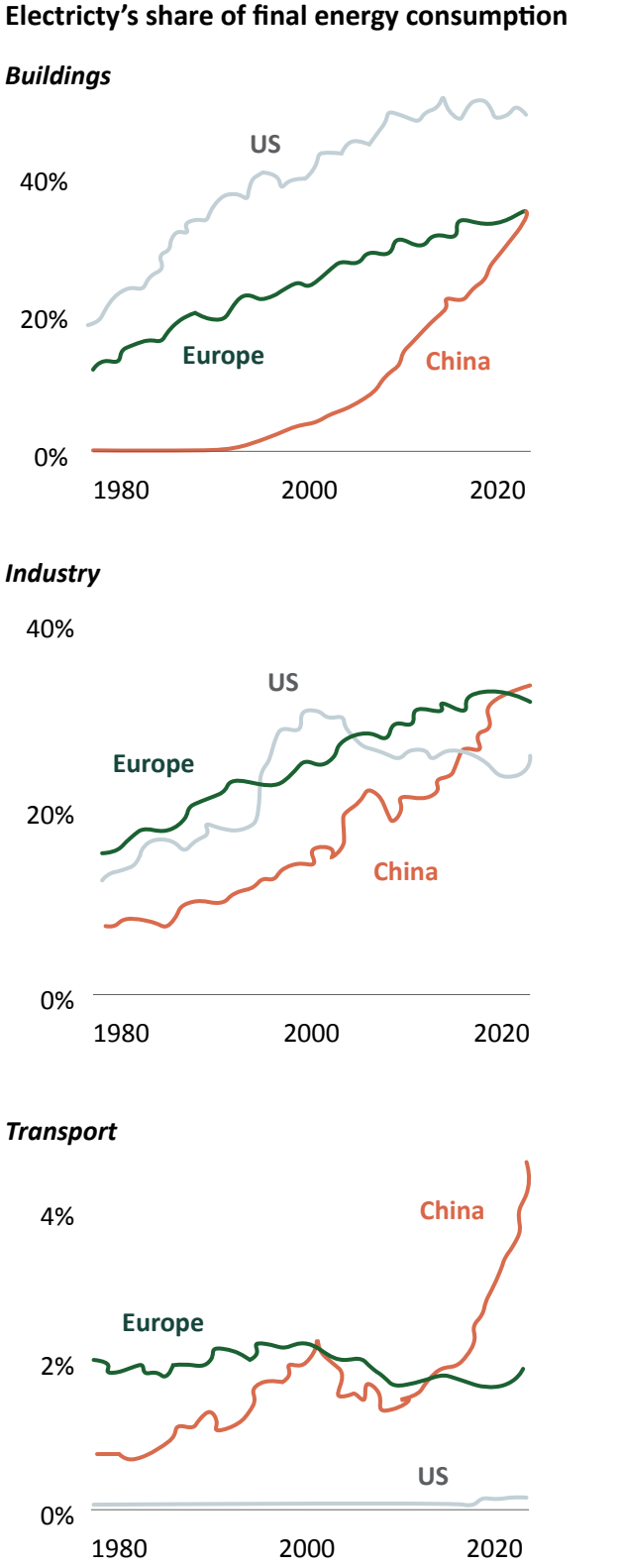
In a broader sense, **investing in and prioritizing electrification contributes to European industrial leadership** in the key technologies of the future. While solar is dominated by Chinese value chains, the EU still has a fighting chance[109] on heat pumps[110] and wind[111] and could make a comeback on storage and EVs[112].

Figure 12: China's electrification leadership



Source: Financial Times

Figure 13: Chinese electrification by sector



Source: Financial Times

If the EU fails to secure industrial leadership in these technologies, it will merely replace its fossil dependence on Russia with a clean-tech dependence on China (and potentially the US) and also fail to improve competitiveness and create the jobs of the future. Ultimately, the EU could face a similar set of problems pertaining to security, competitiveness and sustainability even though a dependence on e.g. Chinese solar technology is less problematic from an energy security perspective, as solar panels can deliver electricity for years, while a barrel of oil can only deliver once.[113] The innovative trend towards electrification is here. The question is whether the EU will lead it or be forced to follow it on Chinese terms.

Cost of living

European citizens support EU leadership on climate action[114], but at the same time concerns about cost-of-living was the most important issue for voters in the 2024 election to the European Parliament[115]. More families cannot pay their bills or heat their homes[116], and air pollution continues to undermine public health.[117] Belief in a brighter future for the next generation fades[118], and social cohesion and trust in institutions is in decline[119], as voters are increasingly attracted by populist parties, especially to the right.

It is important to note that this critical status is not exclusively caused by unaffordable, imported, fossil fuel. However, the green transition, driven by electrification based on renewable energy, offers to reduce energy costs for households. And while some jobs in e.g. coal mining and fossil fuel extraction will be lost, a properly managed transition can safeguard most jobs in the economy via improved competitiveness, and it can create additional local, skilled labor jobs via increased demand for e.g. heat pumps, grids, wind, solar and EV charging.[120] A transition based on clean electrification will also improve safety and health of citizens by limiting air pollution, which causes hundreds of thousands of premature deaths in the EU every year.[121]

Electrification can provide Europeans with lower utility bills in the short term, especially if national authorities lower the tax on electricity for EVs and heat pumps, which in some Member States constitutes the lion's share of household utility bills.[122]

While this tax has been established to incentivize energy efficiency, decision-makers should consider if the tax should be reduced for EV charging and heat pumps, when the electricity supply becomes increasingly decarbonized.

Even with high electricity taxes and no subsidies, heat pumps and EVs can help many Europeans lower their bills as the total cost of ownership of heat pumps[123] and EVs is lower than for gas and internal combustion engine cars respectively, especially for those who drive more than 10.000 km. annually.[124]

If Member States provide a subsidy to cover up-front costs, they can limit the payback of the initial investment significantly in a majority of Member States[125] and thereby speed up demand. To limit redistributive effects, governments could consider a progressive reform that provides the most benefit for households that cannot make the investments without state support, as seen in the French support scheme for electric vehicles.[126] When it comes to heating, this is particularly important in Member States with a high share of fossil boilers such as France, Germany, Italy and The Netherlands.[127]

Electrification through e.g. heat pumps and EVs also allows regular citizens to reduce costs through demand-response. With smart meters, citizens can actively participate in the market by adjusting their consumption and thereby lower their bills – Denmark is a case in point.[128] This promotes the agency of citizens and allows them to take control of their utility bills, which can ultimately improve the legitimacy of the transition. Demand-response also offers important systemic gains for the electricity market, balancing supply and demand and using energy resources more effectively.

Notably, the Commission estimates that greater system flexibility overall, of which demand-response is a subset, can deliver approximately 30 bn. EUR of annual savings towards 2030.[129] To this end, the Commission should focus investments in large-scale batteries, and improve integration of them into the electricity market. To support just transition, this saving could be used to assist vulnerable citizens in their phaseout of fossil-based heating and transport.

Looking at job creation, the transition to electrification also delivers tangible benefits for Europeans: Manufacturing, developing and servicing renewable energy employs more than a million Europeans in wind[130] and solar[131] combined, far outnumbering European jobs in coal, gas and oil combined.[132] The forecasts for 2030 suggest that the number of clean tech jobs will rise even further[133] with the deployment of renewable energy and energy efficiency solutions, including heat pumps, as well as grids and storage.[134]

Notably key technologies such as heat pumps are predominantly manufactured in Southern and Eastern Europe, confirming the notion that the transition has the potential to benefit regions across the continent, and not merely the Nordic Member States that have traditionally argued for higher climate ambitions.[135]

On the demand-side, the need for local, skilled labor will rise with the installation of millions of heat pumps, EV-chargers and smart meters across the EU. More than 400.000 people are employed in the European heat pump sector[136] across manufacturing, installment and servicing[137].

As these technologies take off, driven by replacement of at least 80 million oil and gas boilers[138] and the rollout of infrastructure for more than 145 million additional EVs[139] towards 2040, **the installing and servicing of heat pumps, EV charging and distribution grids alone will generate millions of additional, well-paid local jobs that cannot be offshored** (to China or India) or automated easily.[140] Notably, clean tech jobs in energy manufacturing, installment and servicing tends to take place outside the big cities (if clean tech pioneer Denmark serves as an indication[141]), contributing to a just transition in provincial regions that need economic development.

This benefit should be highlighted especially as fossil energy production and other industries lower their output and employment following dwindling demand. It is important that decision-makers prioritize the skills agenda and attempt to draw on the experience of (and potentially employ) workers from legacy industries even if that requires retraining. Workers in offshore oil and gas, whose expertise is highly needed for establishing offshore wind farms and grids, is one obvious example.[142]

Climate

Electrification is the fastest and most cost-effective way to reduce the EU's greenhouse gas emissions.[143] First, electric processes are more efficient in and of themselves, including heat pumps and electric vehicles, as compared to fossil boilers and combustion engines, where energy is lost in process.

Second, the EU's electricity supply is 74 percent clean and thus electrification delivers immediate emissions reductions.[144] In 2024, solar and wind combined overtook coal and gas in aggregate generation of power in the EU. For the first time coal use was even reduced to less than 10 percent[145], driven by the EU ETS[146], which ensures effective price signals and thereby emissions reductions.[147]

Key coal regions in Germany and Poland delivered significant reductions[148], and additional retirements of coal power plants are expected in the coming years[149]. Even in Member States that have announced coal phaseouts after 2030, such as Bulgaria, the market will drive down operating hours and economic feasibility, which will accelerate the phaseout.[150]

Looking ahead to 2040, the European Commission presupposes an unprecedented acceleration of electrification to reach its 2040 climate target in a feasible and cost-effective manner.[151]The share of coal and gas will decline even further[152], if current policies such as the Emissions Trading System and the Renewable Energy Directive are properly implemented and enforced, and therefore electrification will increasingly mean decarbonization of the energy system.[153]

The push to make the EU's electricity supply more sustainable has been successful so far and has limited fossil demand and emissions significantly. However, the potential for solar and wind power to deliver emissions reductions is even greater, when electricity constitutes a larger share the EU's final energy consumption.

To reduce emissions with sufficient speed and scale, **the EU therefore needs to electrify three key sectors: industry, transport and buildings**. Doing so would not only limit emissions but also reduce pressure on other planetary boundaries by improving energy efficiency and limiting resource usage.[154]

Policies needed to accelerate electrification

The Commission has maintained its commitment to a 90 percent reduction target for 2040.[155] Reaching this target requires fast, deep and structural electrification. The Commission has set a 2030 KPI of 32 percent electrification, up from a decade-long stagnating level of around 20 percent. By 2040, electrification will reach 51 percent according to the Commission's 2040 Communication Impact Assessment. To foster this historic increase, the Commission should propose and promote policies that foster electrification across the most important sectors, in particular industry, transport and buildings, while also decarbonizing the EU's power supply.

Implement and enforce existing policies

The lowest-hanging fruit on the electrification tree is a proper implementation of existing policies. Therefore, the fastest and most effective Commission initiative would be to strengthen its enforcement of existing EU energy policy, and only then consider how new policies could add value.

Focus on implementation respects the calls from large parts of the Commission, Council, Parliament and the business community, to limit new regulation and additional red tape. Second, proper enforcement would not require extensive and unpredictable negotiations with the increasingly fragmented co-legislators in Council and Parliament, which could, in some cases, even lower ambitions vis-a-vis the current legislative framework. Third, implementing existing policies would not require additional funding as carrots for incentivizing (or sweetening) new initiatives.

This is particularly important as the European and national budgets are strained following the increasing defense spending. Fourth, this approach would deliver results already in the short term, as it does not require as lengthy preparations within and among DGs.

In this regard, it is encouraging that President von der Leyen, in her Mission Letter to Energy and Housing Commissioner Dan Jørgensen, makes this point explicitly:

"The success of this new Commission will be measured against our ability to meet the targets and objectives we set, notably as part of the European Green Deal. You will be responsible for the delivery of the policy objectives and targets within your portfolio. ***To achieve this, you should make full use of all instruments for implementation and enforcement, including infringement proceedings****"*

In terms of concrete policies, Member States should implement the **Electricity Market Regulation** to allow electricity to flow where it is most needed. If they fail to do so by the end of 2025, when the implementation phase ends, the Commission should take measures to ensure enforcement, as it did in the 2018 antitrust case against TenneT.[156] With the current Electricity Market Regulation, the rules and the mandate to enforce them are even clearer.

An integrated electricity market will increase competition and thereby reduce electricity prices overall, improving European competitiveness and citizens' access to affordable energy[157]. Integrating electricity markets will also make much better use of the grids and renewable energy resources of Europe[158] and limit the billion euro payments to coal- and gas fired power plants to stay ready as backup.[159]

To this end, the Commission and Member States should work to better integrate large-scale batteries into cross-border capacity markets, which will bring lower prices to consumers and provide developers with a better business case, which ultimately saves taxpayers billions in CfD-support.[160]

An integrated electricity market and a proper buildout of electricity grids can save consumers approximately 50 bn. EUR annually towards 2040 via reduced need for congestion management and redispatch, as well as better usage of energy resources and infrastructure.[161] It will also provide greater certainty for investors and developers of renewable energy projects that count on access to more markets, especially as uncertainty and CAPEX have increased.[162]

To this point, an integrated market with sufficient grid and battery capacity can moderate the concerning increase in the number of hours with negative prices in the electricity market, and can thus support the business case for developers.[163]

To further enhance the implementation of the Electricity Market Regulation, the Commission should consider the perspective of enforcing the bidding zone review. Some Member States, including Germany, refuse to reform their bidding zone to align the electricity market to the geography, even though that would improve the energy system and provide important savings. ENTSO-E confirms this point in their recent report in which it recommends splitting Germany into five bidding zones.[164]

The single German bidding zone fails to provide the relevant manufacturing industry with incentives to place factories close to affordable electricity providers. To make matters worse, the potential increase of hydrogen production will exacerbate the problem as producers of hydrogen will have an incentive to place their facilities close to off takers rather than near electricity generation. This will further strain the electricity grid of Germany, as consumption is in the South while renewable energy is in the North - and will require even larger and more expensive buildout.

The second order of business is to cost-effectively accelerate electrification via price signals. Member States should **adjust state aid and energy taxes to incentivize a shift from fossil fuel to clean electrification**, which the Commission has made easier with its Clean Industrial Deal State Aid Framework (CISAF).[165]

In parallel, the Commission should maintain the environmental integrity of the new Emissions Trading System (ETS2) that incentivize reduced fossil fuel consumption in road transport, small industry and buildings – the sectors where electrification is both needed and feasible. Experience shows that pricing of emissions have worked very effectively together with targeted supplementary policies[166]. Therefore, the Commission should carefully assess calls from some Member States to adjust the system before its beginning.[167]The most effective way to stabilize and moderate prices within ETS2 is to implement measures aimed at reducing emissions in the relevant sectors, such as energy efficiency investments, heat pumps and electric vehicles.

At the same time, a targeted adjustment of ETS2 (e.g. through the Market Stability Reserve) to further mitigate concerns around high price levels and social impact at the beginning of the system can be considered as a concession to facilitate adoption of a 2040 climate target. Changes should not damage the environmental integrity of the system and continue to be market-based, e.g. related to the Market Stability Reserve.

In addition, the Commission are currently working closely with the Member States to finish their submissions of Social Climate Fund plans, which could help to mitigate the valid concerns of citizens by, among other things, supporting their investments in e.g. heat pumps, clean mobility, and energy efficiency.

Third, Member States should implement the 2030 energy directives properly, which is not yet the case.[168] In particular, **the Commission should address the relatively high number of Member States that have failed to implement[169] the Energy Efficiency Directive and the Energy Performance of Buildings Directive and the Ecodesign for Sustainable Products Regulation**, and the few Member States that fail to deliver on the Renewable Energy Directive**.**[170] These files have the potential to provide citizens with lower energy bills and give utilities and industry a more predictable framework for clean investments, which in turn will generate local skilled labor jobs and reduce energy import dependence.

Fourth, **the Commission should maintain and enforce specific legislation pertaining to road transport, both the CO2 emission standards for passenger cars and light vehicles, as well as the CO2 emission standards for heavy duty vehicles**.[171] This will effectively phase out the internal combustion engine and thereby reduce the EU's high level of oil consumption, as transport accounts for a third of the EU's energy consumption, three quarters of which stems from road transport.[172]

Notably, the transport sector emissions have remained high despite technological breakthrough of EVs[173], and thus decisive action through implementation of policies is required to drive the necessary change. To further accelerate electrification of road transport, the Commission should promote production of small electric vehicles, for instance through legislation following the *Decarbonizing Corporate Fleets* communication.

This will make EVs accessible to a broader segment of the population and will reduce the overall carbon footprint and pressure on global supply chains by limiting the use of raw materials such as steel, aluminum, and critical battery metals during production. Smaller electric vehicles can charge faster and take up less space, which is particularly relevant in densely populated urban areas, which are the first to restrict access for combustion engine cars.

New policies: Clean Electrification

To achieve the 2040-target, the Commission should consider the EU's energy policy architecture. The Commission should consider how the EU can double electrification and decarbonize electricity supply by 2040 in line with the Commission's 2040 Impact Assessment (see figure 2 from Strategic Perspective).

The Commission should consider the benefits and challenges of extending the existing legal 2030 frameworks to 2040, including the Energy Efficiency Directive and the Renewable Energy Directive. The two directives have delivered important results and improved certainty for investors and developers, while also facing political opposition, especially from Member States that have struggled to ensure proper implementation.

Against this backdrop, the Commission should consider whether to integrate the electrification agenda into the existing directives, or whether to replace them with a new framework. In the former case, the Commission could consider allowing Member States to fulfil a limited part of their post-2030 renewable energy obligation through nuclear energy. Likewise, the Commission could allow Member States with a clean electricity supply to focus on electrification rather than on reducing final energy demand overall, in their post-2030 implementation. However, these ideas should be subject to thorough impact assessment.

As an alternative to integrating electrification into existing directives, the Commission could consider a *Clean Electrification Directive.* The idea would be to promote electrification while leaving room for Member States to choose their (clean) energy mix. The benefit is that this will provide flexibility, while reducing emissions and driving both energy efficiency and demand for clean electricity. Politically it might even be more feasible than extending both the Renewable Energy Directive (RED) and the Energy Efficiency Directive (EED) to 2040.

While a strong focus on demand-side electrification would strengthen investor certainty for all energy developers as well as TSO's and producers of heat pump and EVs, more flexibility on the supply side could blur the outlook for renewable energy developers, that could face increasing competition from nuclear energy.

However, in this regard, one should remember the high costs and slow pace of nuclear energy deployment: the Commission expects European nuclear capacity to stagnate around 100 GW, while the EU's renewable energy capacity is expected to quadruple from approximately 500 GW to more than 2000 GW by 2040, according to the Commission's Impact Assessment. In other words, if a level playing field is kept between nuclear and renewable energy, the latter should, by and large, be able to handle the competition.

Targets

To promote clean electrification, the Commission should consider an overall target that is consistent with its 2040 Impact Assessment of 51 percent. The target could include a 2035 milestone to provide the industry, system operators and developers with more investor certainty in the medium term. The 2035 milestone could be 41,5 percent, which reflects a direct line drawn from 32 percent by 2030 to 51 percent by 2040, just as the EU's NDC is expected to be derived. The Commission should consider whether the electrification target for 2035 should be more binding in nature than the 2030 KPI in the Clean Industrial Deal.

The Commission could consider dividing the overall electrification target into three main sectors, industry, transport and buildings, to reflect the respective challenges and opportunities, both technical, political and economic that characterize each sector. The targets should be complemented by concrete measures that can help industry and Member States deliver, considering regional circumstances. This should be carried out in a thorough impact assessment that guides a potential *Fitfor90* policy package.

Grid Investments

The increasing European electrification requires grid investments of approximately 100 bn. EUR annually towards 2030[174] and beyond[175] up from 63 bn. EUR today.[176] The need for grid investments is further accentuated by the decarbonization of European electricity supply (cf. 97 percent clean by 2040 if the EU is to reach its 90 percent reduction target).[177] The majority of investments are needed for the distribution system[178], driven by electrification of road transport in particular, as approximately 147 million EVs are expected by 2040[179] compared to around 6 million in 2024.[180]

The electricity use of transport in general will grow by more than 700 pct. as trucks and trains will also go electric, requiring investments in distribution grids and charging infrastructure.[181]

The increasing need to expand electricity grid investments follow decades of under-investments, especially in Germany[182], where the previous and current government have committed to historic grid investments.[183] To this end, the Commission has appropriately prioritized grids as part of its proposal for the Multiannual Financial Framework (MFF), including CEF. It is also very welcome that the Commission has recently launched a derisking tool to accelerate grids manufacturing[184] and that it has targeted the Modernisation Fund to energy systems.[185]

Furthermore, the Commission should increase funding for storage, in particular batteries, to deliver clean electrification with high security of supply. The Commission is on track[186], but Member States in Council and the European Parliament must support the push as well.

Investments in grid infrastructure is crucial, but not sufficient. The need for closer and better cross-border cooperation is increasing, including on standards, investment decisions and maintenance of grids[187] in order to integrate electricity markets, which remains a prerequisite for a fast and cost-effective transition.[188]

To calibrate the buildout of electricity infrastructure, the EU needs to rely on proper data from ENTSO-E, including for its Ten-Year Network Development Plan (TYNDP). To this end, ENTSO-E should adjust its assumptions to account for accelerated electrification. Otherwise, the electricity grid will remain insufficient, which will delay and overprice European electrification.

Finally, the Commission should take a realistic, value-for-money approach to hydrogen and e-fuels. It should consider the costs of reducing emissions[189], when looking towards 2040.[190] This could inform an increased focus on direct electrification, saving hydrogen for the few selected end users, where hydrogen is necessary and the value added is significant.

Policy Measures

Industrial decarbonization requires access to risk capital, especially for small- and medium-sized enterprises (SMEs). While large-scale heat pumps are increasingly mature and competitive, especially for industrial processes below 200 degrees[191], some companies face a challenging payback period[192] . This is particularly the case for SMEs that do not have the same equity capital, or access to risk capital, as larger companies.

Therefore, it is vital that the EIB and others provide access to financing so that companies can lower the risks of such investments. As such, it is welcome that the Commission's Clean Industrial Deal mandates the EIB to derisk clean electrification investments, and that the EIB is already starting to deliver.[193] It is important that concrete policies and Member State implementation support this initiative to accelerate electrification.

In terms of energy policy, the Commission should address the growing need for cost-sharing. The Governance Regulation already allows Member States to co-finance measures in other Member States, but only ad hoc and voluntarily, and more is needed to address the increasing asymmetry of European energy policy: some Member State have attractive geography for e.g. offshore wind, while other Member States host the energy-intensive industries that need it.

The Commission should consider how to incentivize cost-sharing between Member States to speed up and scale up offshore wind to socialize the costs and risks of offshore wind deployment, especially hybrid projects that are connected to several Member States.

The Commission could consider adjusting the Governance Regulation (and potentially the Energy Efficiency Directive) to allow for a similar setup for energy efficiency. For instance, Nordic Member States with a clean supply of electricity and heating have limited incentives to invest in energy efficiency. Instead, they could invest in energy efficiency in Member States that rely on coal and gas for heating and electricity such as Poland or Estonia. While requiring a thorough impact assessment, this adjustment would provide Member States with more flexibility, while making the overall European investment in energy efficiency more effective.

As an alternative to bilateral solutions, the Commission could consider adjusting existing common European measures such as Energy Labelling or Ecodesign in a manner that further increases the effect by either deepening the effect within the existing scope or accelerating the implementation of the measures to have a faster impact.

To improve social acceptance and sustain a just transition, the Commission and Member States should consider how to support low-income groups that could experience too high upfront costs related to electrification and energy efficiency. To this end, the Commission and Member States should consider how the Social Climate Fund and revenue from ETS2 could support a switch to inter alia heat pumps and electric vehicles.

On buildings, the Commission should consider how to phase out new fossil-based boilers for heating in line with the Ecodesign for Sustainable Products Regulation. The Commission should consider a performance standards approach that mirrors the CO2-emissions standards for road transport, which requires producers to gradually shift from vehicles with an internal combustion engine to electric vehicles.

This is particularly important as heating of buildings covers 40 percent of the EU's gas consumption. While the legal framework enables this phaseout already by 2027, it has been blocked in Council. The Commission should use the momentum of the roadmap to phase out Russian energy to relaunch and enhance the push for banning sales of new fossil-based heating appliances or alternatively set in motion performance standards for producers.

Clean electricity supply

As part of a potential Clean Electrification Directive, **the Commission should set out initiatives that will minimize the use of fossil fuel for electricity generation.** According to the Action Plan for Affordable Energy, replacing fossil-based electricity would reduce annual European energy costs by 65 bn. EUR by 2030.[194]

This would require measures to reduce coal and gas-based electricity, which constituted respectively 10 and 16 percent of the EU's electricity generation in 2024. While this share has been declining in recent years, more is needed to accelerate the reduce coal and gas to respectively 0 and 3 percent by 2040, which is needed in accordance with the Commission's 2040 Communication Impact Assessment. This is especially important as electricity consumption is set to almost double.[195]

To substantiate the decarbonization of the EU's electricity generation, **the Commission should consider a 2040 target for clean electricity supply, for instance 97 percent**, to match the 2040 Impact Assessment. This should supplement a target for electrification of 51 percent. The Commission could consider potential milestones for clean electricity for 2030 and 2035 towards the 97 percent 2040 target. This should reflect the greenhouse gas reduction targets of 2030 and 2035 to be proportionate and effective.

To get there, the Commission could consider coupling incentives or requirements related to EU funding as applied in the Recovery and Resilience Facility to provide Member States with clear incentives to transition to clean electricity.

To support the decarbonization of European electricity supply, the Commission should consider adjusting the permitting procedures to allow for faster deployment of renewable energy, faster grid access as well as the needed grids and storage infrastructure. First, the Commission should seek to maximize the potential for co-existence of nature protection and renewable energy buildout, drawing on best practice from within and outside the EU. Second, the Commission should allow Member States to identify and explore areas where the renewable energy resources are attractive, and where the potential environmental damage is limited, to accelerate deployment.

With the Clean Industrial Deal, the Commission has indicated an ambition to revisit the permitting framework to this end. To ensure proper protection of nature, the Commission must tread carefully, when considering a population-based approach to species and parallel compensatory measures.

Conclusion

Status quo is not an option: European security is challenged, European industry is struggling with high energy prices, more European families cannot make ends meet, and the continent is already experiencing the first of many extreme weather events, as climate change escalates.

The EU imports more than 90 percent of its oil and gas and will never access cheaper or more reliable fossil fuel than e.g. the US or Russia. Electrification based on clean European energy is therefore needed to pave the way to a more secure, competitive and fair Europe, which leads the way towards climate neutrality.

Therefore, the European Commission should prioritize electrification as part of its legislative framework for 2040, and Member States should implement energy policies for 2030 to provide investor certainty for European TSOs, developers and industry.

References

[1] https://www.bruegel.org/analysis/european-union-russia-energy-divorce-state-play

[2] https://beyondfossilfuels.org/russian-fossil-fuel-tracker/

[3] https://www.statista.com/statistics/1281752/eu-energy-import-value-from-russia/

[4] https://ec.europa.eu/commission/presscorner/detail/it/statement_22_4583

[5] https://www.ft.com/content/f7a0117f-e158-4854-9e4d-49f7eac9f287?emailId=38fc8709-de11-4664-96e3-33bc674f-80f5&segmentId=22011ee7-896a-8c4c-22a0-7603348b7f22

[6] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_-_latest_developments

[7] https://csd.eu/publications/publication/navigating-sanctions/

[8] https://www.bruegel.org/policy-brief/decarbonising-competitiveness-four-ways-reduce-european-energy-prices

[9] Europea Commission 2040 Impact Assessment, Figure 104

[10] https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf

[11] https://acer.europa.eu/monitoring/MMR/crosszonal_electricity_trade_capacities_2024

[12] https://www.acer.europa.eu/monitoring/MMR/crosszonal_electricity_trade_capacities_2024

[13] https://publications.jrc.ec.europa.eu/repository/handle/JRC137685

[14] https://www.eea.europa.eu/en/newsroom/news/europe-is-not-prepared-for

[15] https://www.theguardian.com/artanddesign/2024/nov/29/floods-in-valencia-spain-then-and-now-in-pictures

[16] https://www.ft.com/content/51893d2c-7c0b-4d5e-8942-560c35fd3673?emailId=0d0c1569-7ca3-48ce-b564-69312ecbc740&segmentId=ccee9840-6c9b-2776-04de-b87d446b96a1

[17] https://www.telegraph.co.uk/world-news/2025/08/19/spanish-wildfire-season-worst-record-devastation-continues/

[18] https://www.reuters.com/sustainability/cop/extreme-weather-could-cause-5-drop-euro-zone-gdp-bank-watchdogs-find-2025-07-09/

[19] https://www.unhcr.org/news/press-releases/unhcr-report-reveals-climate-change-growing-threat-people-already-fleeing-war

[20] https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040

[21] https://www.sei.org/publications/consumption-emissions-opportunities-eu-climate-mitigation/

[22] https://concito.dk/en/udgivelser/danmarks-globale-forbrugsudledninger

[23] https://ourworldindata.org/grapher/consumption-co2-per-capita

[24] https://www.politico.eu/article/ursula-von-der-leyen-competitiveness-compass-pitch-relies-on-government-help/

[25] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1687

[26] https://yearbook.enerdata.net/electricity/share-electricity-final-consumption.html

[27] https://www.ft.com/content/f86782fa-9f2e-448a-b710-29e787dc9831?shareType=nongift

[28] https://www.eea.europa.eu/en/analysis/publications/renewables-electrification-and-flexibility-for-a-competitive-eu-energy-system

[29] https://ec.europa.eu/commission/presscorner/detail/it/statement_22_4583

[30] https://csd.eu/publications/publication/navigating-sanctions/

[31] https://foreignpolicy.com/2025/01/03/europe-russia-ukraine-war-energy-imports-oil-gas-pipeline/

[32] https://www.politico.eu/article/europe-azerbaijan-gas-gambit-good-news-russia/

[33] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_trade_with_Russia_-_latest_developments

[34] https://csd.eu/publications/publication/navigating-sanctions/

[35] https://beyondfossilfuels.org/russian-fossil-fuel-tracker/

[36] https://ec.europa.eu/commission/presscorner/detail/en/speech_25_626

[37] https://www.ft.dk/samling/20241/almdel/FIU/bilag/25/2928050/index.htm

[38] https://energyandcleanair.org/january-2025-monthly-analysis-of-russian-fossil-fuel-exports-and-sanctions/

[39] https://www.acer.europa.eu/monitoring/MMR/gas_key_developments_Q3_2024

[40] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview

[41] https://www.politico.eu/article/eu-new-energy-chief-vows-end-russian-fuel-dan-jorgensen/

[42] https://www.bruegel.org/dataset/european-natural-gas-imports

[43] https://www.theguardian.com/environment/2025/jan/09/european-imports-of-liquefied-natural-gas-from-russia-at-record-levelsto%207%20bn%20EUR

[44] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_trade_with_Russia_-_latest_developments

[45] https://www.ft.com/content/f7a0117f-e158-4854-9e4d-49f7eac9f287?emailId=38fc8709-de11-4664-96e3-33bc674f80f5&segmentId=22011ee7-896a-8c4c-22a0-7603348b7f22

[46] https://www.bruegel.org/policy-brief/decarbonising-competitiveness-four-ways-reduce-european-energy-prices

[47] https://www.altinget.dk/forsyning/artikel/klimachef-luk-gasnettet-foer-det-er-for-sent

[48] https://ec.europa.eu/commission/presscorner/detail/en/ip_24_6546

[49] https://www.reuters.com/markets/commodities/italys-lng-deal-with-qatar-shows-how-hard-it-is-quit-gas-2023-10-24/

[50] https://www.sciencedirect.com/science/article/pii/S0360544224000252

[51] https://strategicperspectives.eu/wp-content/uploads/2024/06/4-pager-for-EU-Gas-Insight.pdf

[52] Europea Commission 2040 Impact Assessment, Figure 133

[53] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_570

[54] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_570

[55] https://www.acer.europa.eu/gas-factsheet

[56] https://www.agora-energiewende.org/fileadmin/Projekte/2024/2024-10_EU_Clean_Heat/EU_heating_market_analysis.pdf

[57] https://orbit.dtu.dk/en/publications/strengthening-industrial-heat-pump-innovation-decarbonizing-indus

[58] https://ember-energy.org/latest-insights/putting-the-mission-in-transmission-grids-for-europes-energy-transition/

[59] https://energy.ec.europa.eu/news/focus-eu-investing-energy-infrastructure-2024-10-15_en

[60] https://www.iea.org/reports/world-energy-investment-2024/european-union

[61] Europea Commission 2040 Impact Assessment, Figure 106

[62] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_570

[63] European Commission 2040 Impact Assessment page 54

[64] Europea Commission 2040 Impact Assessment, Figure 112

[65] https://www.sciencedirect.com/science/article/pii/S0360544224000252

[66] https://scijournals.onlinelibrary.wiley.com/doi/10.1002/ese3.1934

[67] https://www.spglobal.com/commodity-insights/en/news-research/latest-news/crude-oil/090722-global-gas-to-oil-fuel-switching-to-jump-80-as-european-asian-gas-prices-soar

[68] https://www.e3g.org/publications/an-electrification-action-plan-to-secure-eu-industry-s-future/

[69] https://ember-energy.org/latest-updates/solar-overtakes-coal-in-eu-power-sector-as-gas-declines-for-the-fifth-year-in-a-row/

[70] https://www.ft.com/content/e33d9eec-b34c-4afc-8948-dda91ccbb70d

[71] https://climate.copernicus.eu/copernicus-2024-first-year-exceed-15degc-above-pre-industrial-level

[72] https://www.reuters.com/sustainability/climate-energy/new-eu-renewable-energy-target-faces-nuclear-road-block-2024-12-16/

[73] https://www.altinget.dk/forsyning/artikel/laekket-brev-afsloerer-qatar-truer-med-stop-for-gas-hvis-ikke-eu-slaekker-groenne-krav

[74] https://www.politico.eu/article/donald-trump-says-eu-must-buy-350b-of-us-energy-to-get-tariff-relief/

[75] https://www.sciencedirect.com/science/article/abs/pii/S0301420721001148

[76] https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/03/Follow-the-Money-Russian-Oil.pdf

[77] https://beyondfossilfuels.org/russian-fossil-fuel-tracker/

[78] https://www.eia.gov/todayinenergy/detail.php?id=51258

[79] https://www.economist.com/business/2020/07/18/oil-giants-want-to-own-only-the-cheapest-cleanest-hydrocarbons

[80] https://www.ifw-kiel.de/publications/news/ukraine-support-after-3-years-of-war-aid-flows-remain-low-but-steady-shift-towards-weapons-procurement/

[81] https://www.ifw-kiel.de/topics/war-against-ukraine/ukraine-support-tracker/

[82] https://www.iiss.org/publications/the-military-balance/2025/defence-spending-and-procurement-trends/

[83] https://www.iiss.org/publications/the-military-balance/2025/defence-spending-and-procurement-trends/

[84] https://www.ifw-kiel.de/publications/news/climate-policy-contributes-to-europes-security/

[85] https://www.nato.int/cps/en/natohq/official_texts_236705.htm

[86] European Commission 2040 Impact Assessment, Figure 32

[87] https://www.dnv.com/news/2024/energy-transition-outlook-norway/#:~:text=Norway%20is%20Europe's%20largest%20energy%20exporter%20and,until%202040%2C%20before%20being%20halved%20by%202050

[88] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0085

[89] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0079

[90] Action Plan for Affordable Energy page 5

[91] https://www.e3g.org/wp-content/uploads/E3G-Briefing-An-Electrification-Action-Plan-to-secure-EU-industrys-future.pdf

[92] https://single-market-economy.ec.europa.eu/news/enrico-lettas-report-future-single-market-2024-04-10_en

[93] https://climate-advisory-board.europa.eu/reports-and-publications/towards-climate-neutral-and-resilient-energy-networks-across-europe-advice-on-draft-scenarios-under-the-eu-regulation-on-trans-european-energy-networks/20240627advice-on-draft-scenarios-under-ten-e-regulation_for-publication.pdf/@@download/file Page 10 of the report

[94] https://www.eea.europa.eu/en/analysis/publications/monitoring-progress-towards-8th-eap-objectives

[95] https://ec.europa.eu/commission/presscorner/detail/es/speech_25_626

[96] https://concito.dk/concito-bloggen/varmepumpers-rolle-industriens-groenne-omstilling

[97] https://www.best-selling-cars.com/europe/2025-march-q1-europe-best-selling-electric-car-models-and-brands/

[98] https://www.woodmac.com/reports/power-markets-europe-power-2024-in-review-150348546/

[99] https://www.eea.europa.eu/en/analysis/publications/renewables-electrification-and-flexibility-for-a-competitive-eu-energy-system

[100] https://ember-energy.org/latest-insights/energy-security-in-an-insecure-world/

[101] https://www.iea.org/reports/electricity-2025/executive-summary

[102] https://rmi.org/insight/the-cleantech-revolution/

[103] https://ec.europa.eu/commission/presscorner/detail/es/speech_25_626

[104] https://initiatives.weforum.org/clean-power-and-electrification/industrial-electrification

[105] https://concito.dk/concito-bloggen/varmepumpers-rolle-industriens-groenne-omstilling

[106] https://www.eib.org/en/press/all/2025-247-eib-group-increases-2025-financing-ceiling-to-record-eur100-billion-to-step-up-investments-in-security-and-defence-energy-grids-and-europe-s-tech-leadership

[107] https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/competitive-bidding_en

[108] https://www.agora-industry.org/publications/direct-electrification-of-industrial-process-heat

[109] https://publications.jrc.ec.europa.eu/repository/handle/JRC134991

[110] https://www.iea.org/reports/the-future-of-heat-pumps-in-china/executive-summary

[111] https://energy.ec.europa.eu/topics/renewable-energy/eu-wind-energy_en

[112] https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/europes-economic-potential-in-the-shift-to-electric-vehicles

[113] https://ember-energy.org/latest-insights/energy-security-in-an-insecure-world/

[114] https://europa.eu/eurobarometer/surveys/detail/3472

[115] https://www.europarl.europa.eu/news/en/press-room/20240930IPR24358/cost-of-living-is-citizens-main-concern-at-the-start-of-the-new-legislature

[116] https://voxeurop.eu/en/europe-energy-poverty-heating-home/

[117] https://etuc.org/en/pressrelease/10-million-more-workers-cant-heat-their-homes

[118] https://www.pewresearch.org/global/2017/06/05/2-public-divided-on-prospects-for-the-next-generation/

[119] https://www.who.int/europe/news/item/12-07-2023-widening-inequities--declining-trust---they-are-inextricably-linked--with-significant-impacts-on-health--finds-new-who-europe-report

[120] https://www.woodmac.com/reports/power-markets-europe-power-2024-in-review-150348546/

[121] https://www.eea.europa.eu/en/analysis/publications/harm-to-human-health-from-air-pollution-2024

[122] https://www.ft.com/content/820543cf-a41f-4fbb-a887-0330f07d1b8f

[123] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC134991/JRC134991_01.pdf

[124] https://www.iea.org/data-and-statistics/data-tools/electric-vehicles-total-cost-of-ownership-tool

[125] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC134991/JRC134991_01.pdf

[126] https://www.iea.org/commentaries/cheaper-electric-cars-the-key-to-unlocking-mass-market-adoption

[127] https://www.agora-energiewende.org/fileadmin/Projekte/2024/2024-10_EU_Clean_Heat/EU_heating_market_analysis.pdf

[128] https://via.ritzau.dk/pressemeddelelse/14390147/tusindvis-af-danskere-har-flyttet-deres-stromforbrug-godt-for-pengepungen-og-elnettet?publisherId=13560063&lang=da

[129] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0079

[130] https://windeurope.org/newsroom/news/wanted-more-than-200000-wind-workers-but-where-to-find-them/

[131] https://www.solarpowereurope.org/press-releases/new-report-growth-of-eu-solar-jobs-stagnates-as-rooftop-market-slows-1

[132] https://www.delorscentre.eu/en/publications/skilled-workers-in-the-green-transition

[133] https://www.delorscentre.eu/en/publications/skilled-workers-in-the-green-transition

[134] https://ember-energy.org/latest-insights/the-electrification-imperative/

[135] https://www.euractiv.com/section/energy-environment/news/europes-heat-pump-valleys-take-root-in-the-east-closer-to-asia/

[136] https://www.euractiv.com/section/energy-environment/news/europes-heat-pump-valleys-take-root-in-the-east-closer-to-asia/

[137] https://single-market-economy.ec.europa.eu/system/files/2023-03/SWD_2023_68_F1_STAFF_WORKING_PAPER_EN_V4_P1_2629849.PDF

[138] https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/residential-heating-heat-pumps-would-knock-down-energy-consumption-and-emissions-2023-06-21_en

[139] European Commission 2040 Impact Assessment, Figure 67 estimates 57 percent of car fleet is EV. Assuming a steady number of passenger cars (259 million passenger cars in the EU in 2024), the number of EV is around 147 million in 2040 in a 90 percent 2040 scenario.

[140] https://www.delorscentre.eu/en/publications/skilled-workers-in-the-green-transition

[141] https://via.ritzau.dk/pressemeddelelse/13854641/energisektoren-runder-100000-ansatte?publisherId=13560944&lang=da

[142] https://www.gov.uk/government/news/support-for-workers-to-benefit-from-thousands-of-clean-power-jobs

[143] https://ember-energy.org/latest-insights/electricity-grids-key-policy-actions/

[144] https://ember-energy.org/latest-insights/european-electricity-review-2025/

[145] https://ember-energy.org/latest-updates/solar-overtakes-coal-in-eu-power-sector-as-gas-declines-for-the-fifth-year-in-a-row/

[146] https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-under-the

[147] https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-under-the

[148] https://ember-energy.org/latest-insights/european-electricity-review-2025/supporting-materials/

Page 13 of report

[149] https://www.reuters.com/business/energy/pge-shut-coal-units-rybnik-power-plant-by-end-2025-2024-09-26/

[150] https://www.reuters.com/sustainability/climate-energy/market-economics-cut-bulgarias-coal-use-before-2038-deadline-minister-2024-01-15/

[151] https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2040-climate-target_en Page 42 of Impact Assessment

[152] https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040 page 60

[153] https://www.iea.org/reports/electricity-2024/executive-summary

[154] https://www.sciencedirect.com/science/article/pii/S0196890422013802

[155] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1687

[156] https://ec.europa.eu/commission/presscorner/detail/en/ip_18_6722

[157] https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf

[158] https://www.bruegel.org/policy-brief/unity-power-power-unity-why-eu-needs-more-integrated-electricity-markets

[159] https://www.acer.europa.eu/news-and-events/news/acer-reports-lag-implementing-eu-framework-assess-and-tackle-electricity-security-supply-risks-coordinated-manner

[160] https://ember-energy.org/latest-insights/eu-battery-storage-is-ready-for-its-moment-in-the-sun/

[161] https://publications.jrc.ec.europa.eu/repository/handle/JRC137685 & https://tyndp.entsoe.eu/explore/what-are-the-concrete-benefits-for-europe-of-investing-in-its-cross-border-transmission-grid-and-storage-infrastructure & https://www.acer.europa.eu/monitoring/MMR/crosszonal_electricity_trade_capacities_2024

[162] https://www.eurelectric.org/news/the-clean-industrial-deal-must-be-a-vector-for-electrification/

[163] https://www.iea.org/reports/electricity-2025/prices

[164] https://www.entsoe.eu/news/2025/04/28/bidding-zone-study-released/

[165] https://competition-policy.ec.europa.eu/about/contribution-clean-just-and-competitive-transition/clean-industrial-deal-state-aid-framework-cisaf_en

[166] https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-under-the

[167] https://carbon-pulse.com/360933/

[168] https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

[169] https://www.eca.europa.eu/en/publications?ref=SR-2023-18

[170] https://www.eca.europa.eu/en/publications?did=52828

[171] https://climate.ec.europa.eu/eu-action/transport/road-transport-reducing-co2-emissions-vehicles/reducing-co2-emissions-heavy-duty-vehicles_en

[172] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Final_energy_consumption_in_transport_-_detailed_statistics

[173] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Final_energy_consumption_in_transport_-_detailed_statistics

[174] https://energy.ec.europa.eu/news/focus-eu-investing-energy-infrastructure-2024-10-15_en

[175] Europea Commission 2040 Impact Assessment, Figure 106

[176] https://ember-energy.org/app/uploads/2024/03/Grids-for-Europes-Energy-Transition-Report-1.pdf

[177] Europea Commission 2040 Impact Assessment, page 45

[178] https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_6045

[179] European Commission 2040 Impact Assessment, Figure 67 and assuming a steady number of passenger cars in the EU of 259 million: Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_cars_in_the_EU

[180] https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/european-union-eu27/vehicles-and-fleet

[181] Europea Commission 2040 Impact Assessment, Figure 18

[182] https://www.cleanenergywire.org/news/electricity-grid-upgrades-will-cost-germany-650-billion-euros-2045-report

[183] https://www.cleanenergywire.org/news/german-parliament-adopts-reform-allow-eu500-bln-new-debt-infrastructure-and-climate

[184] https://www.eib.org/en/press/all/2025-247-eib-group-increases-2025-financing-ceiling-to-record-eur100-billion-to-step-up-investments-in-security-and-defence-energy-grids-and-europe-s-tech-leadership

[185] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1714

[186] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1727

[187] https://www.bruegel.org/policy-brief/unity-power-power-unity-why-eu-needs-more-integrated-electricity-markets

[188] https://www.bruegel.org/policy-brief/unity-power-power-unity-why-eu-needs-more-integrated-electricity-markets

[189] https://concito.dk/en/udgivelser/e-fuels-or-storage-how-to-make-the-most-of-clean-electricity-and-captured-co2

[190] https://www.eca.europa.eu/en/publications?ref=sr-2024-11

[191] https://concito.dk/concito-bloggen/varmepumpers-rolle-industriens-groenne-omstilling

[192] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC134991/JRC134991_01.pdf

[193] https://www.eib.org/en/press/all/2025-247-eib-group-increases-2025-financing-ceiling-to-record-eur100-billion-to-step-up-investments-in-security-and-defence-energy-grids-and-europe-s-tech-leadership

[194] See page 5 of Action Plan for Affordable Energy

[195] https://2024.entsos-tyndp-scenarios.eu/scenario-results/

CONCITO

CONCITO - Denmark's green think tank is an independent knowledge partner for decision-makers across society - politicians, business, academia and civil society.