

Better coordination for a more efficient European energy system

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Executive Summary

THREE STEPS SHOULD be taken to improve the efficiency of the European Union's energy system: 1) enhance transparency through open data and modelling, 2) better integrate network planning with policy targets and across borders, and 3) strengthen alignment of national policies and plans. As the EU transitions towards greater reliance on domestically produced electricity, the economic stakes of fragmentation rise. These three elements are essential to address the weak coordination and incoherence of national system-development plans and policies.

MOVING BEYOND OPAQUE planning by national grid companies will enable investors to set realistic expectations. A shared understanding of the system's state and policy vision de-risks planning, accelerates deployment, lowers capital costs and reduces the risk of premature or stranded investments.

TO RESOLVE THE current lack of data transparency, an EU Energy Data Hub should be established to aggregate, clean and publish timely energy data, replacing the current reliance on opaque, fragmented and often private sources.

EU-LEVEL INTEGRATED NETWORK planning would tie long-term energy and climate goals to strategic energy system development. While countries would continue to decide on their own energy mixes, this approach would ensure transparency and justify projects based on European welfare rather than special interests.

POLITICAL COOPERATION SHOULD be strengthened by transforming current National Energy and Climate Plans into documents that guide public policies and investment, requiring stronger dialogue between EU countries and fostering trust between neighbours. This requires consistency across EU countries in terms of data and methodologies. The credibility of these plans would be based on links to EU policies, such as state-aid approval or subsidies for infrastructure projects.

THESE RECOMMENDATIONS AIM to leverage the internal energy market as a strategic tool and to prevent regression to national, protectionist policies. By coordinating policies and infrastructure, the EU can ensure competitiveness and resilience, while transitioning to a decarbonised economy.

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1 Introduction

Decarbonisation of the European Union's electricity sector is fundamental to EU efforts to reduce greenhouse gas emissions, foreign dependencies and energy costs. Since 1990, the carbon intensity of electricity generated in the EU has more than halved and EU countries continue the rapid deployment of renewable energy sources¹. Clean electricity is projected to replace fossil fuels in industry, transport and buildings, and to provide most of the 'useful' energy² to the EU's economy by the 2040s. To meet these targets, the electricity sector requires massive additional generation and storage capacity, and network and demand-side investments, while some fossil-fuel infrastructure needs to be carefully decommissioned.

Decisions within the EU's energy system are governed by a complex and disparate mix of policies and actors

However, investment and operational decisions within the EU's energy system are governed by a complex and disparate mix of policies and actors. Fragmented, uncoordinated, opaque energy system development risks spiralling costs and threatens to undermine European competitiveness (Letta, 2024; Draghi, 2024). Public funds will not be sufficient for the needed investments in electricity infrastructure and generation, making it important to incentivise private investors. Investment in electricity must be directed efficiently: the amount and location of new infrastructure must be appropriate, while showing credible returns for private investment.

This Policy Brief focuses on three issues that hinder investment into a more integrated and efficient European energy system: 1) the lack of transparency in energy data and modelling, 2) uncoordinated cross-border infrastructure planning, and 3) missing political trust and cooperation. Leaving these issues unsolved risks a regression to national policies with less cooperation and coordination.

In the European Commission's Action Plan for Affordable Energy, published in February 2025, EU policymakers acknowledged the need for further reform and integration steps in these areas (European Commission, 2025a). The action plan proposed several short- and long-term measures to bring down energy costs. The European Grids Package, published by the Commission in December 2025 contains legislative proposals to speed up cross-border infrastructure deployment throughout the project cycle, including planning, permitting and cost sharing (European Commission, 2025b). The grids package is the

- 1 Several member states also follow ambitious nuclear expansion plans. See for example the French Ministries of Ecological Transition, Spatial Planning, Transport, Urban Planning and Housing, 'Nuclear Alliance meeting – Paris 16 May 2023 – Draft Statement', https://www.ecologie.gouv.fr/sites/default/files/documents/nuclear%20alliance%20statement_VEN.pdf.
- 2 Useful energy is "*the energy that goes towards the desired output of the end-use application*", which is the amount of light that is produced by a lightbulb or the amount of kinetic energy produced by a car. See Hannah Ritchie, 'Primary, secondary, final, and useful energy: Why are there different ways of measuring energy?' 4 April 2022, *Our World in Data*, <https://ourworldindata.org/energy-definitions>.

prelude to a wider EU-level policy discussion in 2026 on energy and climate³.

In examining the three issues that should be resolved to improve the European energy system, we take the current governance system largely as given. Within the wider policy sphere of energy systems, this Policy Brief focuses on cross-border political cooperation and cross-border infrastructure⁴, especially for electricity⁵. Better connected and more integrated systems unlock benefits such as improved operation, less need for infrastructure and a larger market (Box 1). We start, in section 2, by describing current energy governance in Europe. In section 3, we detail the shortcomings of this architecture. In section 4, we set out how improvements can be made.

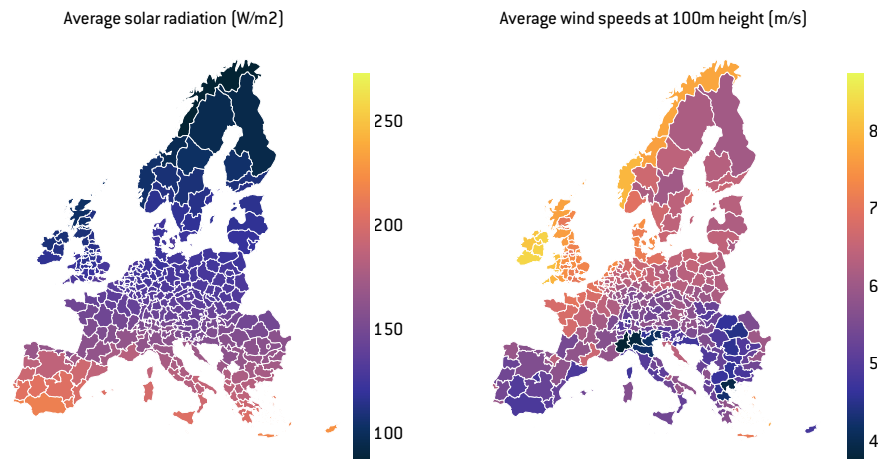
Box 1: The benefits of an integrated energy system

Deeper integration of Europe's energy system across countries and sectors would offer substantial benefits, including cost savings from the more efficient use of existing infrastructure, less need for additional infrastructure, lower prices and more innovation through increased competition, improved resilience, and lower capital costs for a larger and more predictable market (Zachmann *et al*, 2024).

With the rise of renewable electricity sources, 'interconnection' between national electricity markets and infrastructure has become even more important. The EU possesses geographically and seasonally complementary renewable energy potential (Kaspar *et al*, 2019): sunshine is prevalent in the south, while wind speeds are high in the north. Additionally, sun and wind patterns complement each other over the course of the year (Figure 1). Interconnection would allow these different sources to be harnessed (see the 'combined' line in Figure 1) and would help balance short-term variations in supply and demand across borders.

- 3 In the Action Plan for Affordable Energy and its 2026 work programme (European Commission, 2025c), the European Commission previewed for 2026, among other initiatives, a white paper on deeper electricity market integration, a revised 'Governance Regulation of the Energy Union', an 'Electrification action plan', a revised 'EU energy security framework', a simplification of energy product legislation and a revision of the EU emissions trading system.
- 4 EU energy governance goes beyond the elements mentioned. Another important part is the question of whether the EU and its member states need distinct goals for renewable energy and energy efficiency, at what level these goals should be set and whether countries need their own targets in addition to an EU target.
- 5 The EU has energy networks for electricity, gas and oil. There are plans to build a network for hydrogen and possibly carbon dioxide. With electricity as the future central energy carrier for the EU, this Policy Brief focuses on electricity grids. We argue, though, that networks of different energy carriers must be planned together to avoid costly overcapacity.

Figure 1: Geographic and seasonal variations in wind and solar power in Europe



Source: Bruegel based on Copernicus Climate Change Service (2024) and ENTSO-E (2026). Note: averages from 2015-2024. A capacity factor is the amount of generated electricity as a percentage of the total generation capacity: if a power plant has an installed capacity of two megawatts but generates one megawatt at a given moment, its capacity factor is 0.5.

Expanding transmission grid capacities and interconnection reduces overall costs (Fürsch *et al*, 2013; Abrell and Rausch, 2016; Schlachtberger *et al*, 2017; Brown *et al*, 2018)⁶, highlighting that balancing wind generation, which is less correlated across countries, is particularly beneficial (Schlachtberger *et al*, 2017; Roth and Schill, 2023). Meanwhile, an integrated energy market in the EU could offer substantial economic gains (Baker *et al*, 2018; ACER, 2022; Backer *et al*, 2023). Gains from cross-border electricity trading could amount to several billion euros per year (Newbery *et al*, 2016). Fraunhofer IEG *et al* (2025) and Agora Energiewende *et al* (2025) identified substantial cost savings (€550 billion in the period 2030-2050) from sector- and country-integrated European energy planning.

Transmission and interconnection can also play important roles in providing a robust and resilient energy system, both against weather uncertainty (Grochowicz *et al*, 2023) and in terms of averting blackouts arising from technical failures (Czyzak, 2025). To achieve energy-system resilience at reasonable cost, there is a need to coordinate planning and policies across borders to avoid expensive unnecessary infrastructure (Holmberg *et al*, 2025; ACER, 2025).

6 Schmid and Knopf (2015) go so far as to label grid integration a "no regret option".

2 How energy governance is organised in Europe

The European Union treaties grant the EU the competence to enact climate policies, ensure the functioning of the internal energy market, ensure security of energy supply, promote energy efficiency and energy saving, develop new and renewable forms of energy and promote the interconnection of energy networks. EU governments remain competent to decide on their national energy mixes.

The EU's target of climate neutrality by 2050 shapes the trajectory of the EU emission trading system (ETS), which drives operation and investment decisions in the European energy sector. The 2030 energy and climate targets require the EU to increase the share of renewables in the energy mix and reduce overall energy consumption. EU countries contribute individually to these collective targets. National Energy and Climate Plans (NECPs) are the central element of this governance structure. In these plans, countries outline their policies for the next decade on decarbonisation, renewable energy, energy efficiency, energy security, internal market integration and innovation. The European Commission evaluates these submissions and may issue recommendations, requesting adjustments to national contributions where an 'ambition gap' is identified⁷.

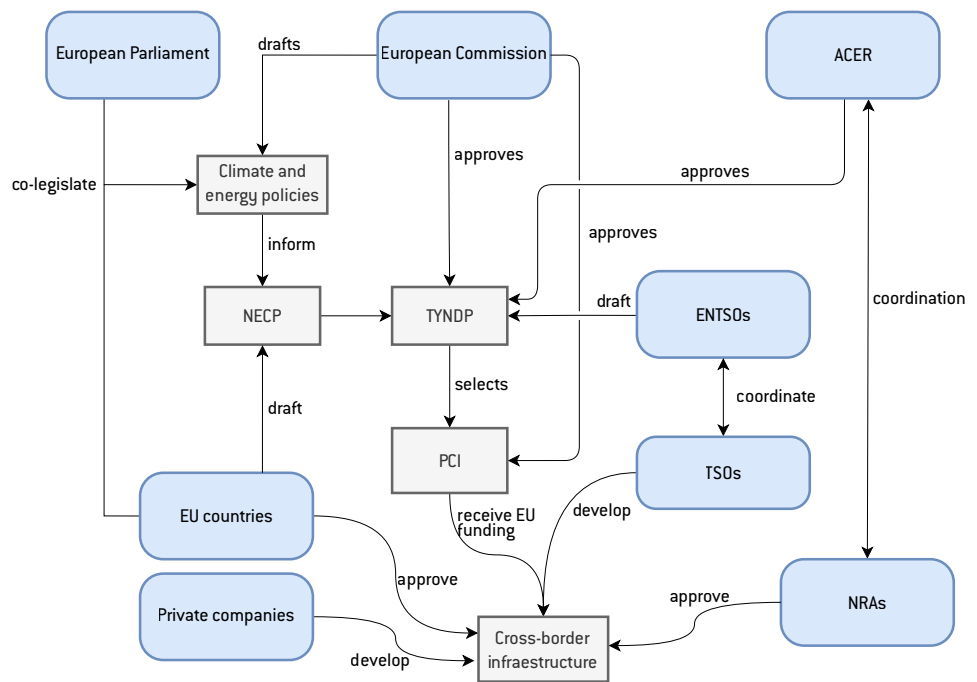
While the EU ETS and short-term electricity and gas markets are largely governed by EU rules and EU-level institutions⁸, important incentives for energy-system investment remain rooted in national policies. For instance, national governments and regulators primarily drive the organisation of mechanisms to ensure longer-term supply adequacy (Holmberg *et al*, 2025). However, these schemes remain subject to the European Commission's approval and operate within an EU-level coordination framework⁹.

Despite its importance, the development of electricity grids is strongly fragmented (Figure 2). Based on national modelling and planning processes, cross-border energy infrastructure plans are coordinated at the European level with the Ten-Year Network Development Plan (TYNDP), drafted every two years by the European Network of Transmission System Operators for Electricity (ENTSO-E) and for gas (ENTSOG). Ten-

- 7 The drafting of NECPs is an iterative process: a country submits a draft plan to the European Commission, receives feedback and recommendations, resubmits a final version and then reports biannually on implementation progress. Plans are updated regularly to accommodate new information and changing priorities.
- 8 Other elements of Europe's energy architecture include the Agency for the Cooperation of Energy Regulators (ACER), which aims to foster cooperation among the EU's energy national regulatory authorities and is mostly involved in the more operational parts of the energy system. Despite its role in reviewing and commenting on the TYNDP, its principal role lies in market oversight and in designing 'network codes' which define in detail how different parts of the energy system function. An important part is the 'bidding zone reviews', in which ACER designs methodologies, proposes alternative configurations and publishes opinions that influence the long-term structure of market areas for pricing and congestion management.
- 9 The European Resource Adequacy Assessment (ERAA), carried out by ENTSO-E, assesses how to ensure the security of European energy supplies using a unified, common methodology.

year plans are supposed to build on the NECPs to identify transmission and storage investments needed to support the energy transition. National transmission grid operators provide data on their planned developments, trying to integrate local and regional infrastructure considerations into a Europe-wide outlook. Projects deemed critical may receive an EU designation as so-called Projects of Common Interest (PCI), making them eligible for EU financial support and preferential regulatory treatment.

Figure 2: Depiction of the EU's energy cross-border infrastructure planning processes



Source: Bruegel. Note: this diagram leaves out some entities and processes; NRAs = national regulatory authorities; PCI = project of common interest; NECP = national energy and climate plan; TYNDP = ten-year network development plan; ACER = Agency for the Cooperation of Energy Regulators; ENTSOs = European Network of Transmission System Operators for Electricity/Gas [ENTSO-E/ENTSO-G].

3 Fragmentation and shortcomings of the current architecture

The internal EU energy market has achieved an impressive level of integration since the energy market liberalisations of the mid-1990s, lowering average prices and reducing emissions. During the 2022 energy crisis triggered by Russia's invasion of Ukraine, the internal market demonstrated its power to keep lights on and houses warm, even while large EU countries lost half of their gas supplies (Bachmann *et al*, 2022) and others lost

large parts of their electricity generation capacity¹⁰.

EU energy governance must build on this success of efficiently dispatching scarce resources across the continent, and must be equipped for the upcoming challenge of efficiently coordinating a massive wave of investments in new electricity generation, transmission, storage and demand assets. In the following subsections, we deal in turn with the three important areas for improvement (section 1): transparency, consistency in infrastructure planning and political coordination.

3.1 Lack of transparency

Access to open data and transparent modelling serves several purposes: it is the basis for robust research, good policymaking and business decisions. Beyond that, it fulfils an important coordination function. The energy transition requires coordinating the decisions of thousands of actors that invest in the supply side of the energy system and of millions who make decisions on the demand side. These decisions require a clear and shared understanding by governments, regulators and the private sector of how the energy system will evolve in the coming decades.

The current provision of energy data in the EU is far from ideal. It relies on opaque models to justify important decisions on strategy and energy targets, energy market design and infrastructure planning. Data is often hard to access, spread across several institutions, not harmonised, not comparable across European countries, not consistent, not accessible or simply missing (McWilliams *et al*, 2025).

Several public European institutions (the European Commission's energy directorate-general, Eurostat, ACER and the European Environment Agency) provide data on energy, but this data is often not available in a timely manner and not consistent, and granular data (in terms of geographic and time dimensions) is sometimes missing. For instance, ENTSO-E's transparency platform¹¹ is the principal European hub for electricity-related data, containing generation, flows and prices at the (quarter) hourly level. Despite its rich data offering, our experience is that there are inconsistencies and missing values in the data, which makes cumbersome correction and data-cleaning processes necessary.

Some crucial data on Europe's security of supply is gathered and published exclusively by private bodies¹². Granular data, especially related to market activities, often stays at the national level or behind paywalls. To address this lack of transparency and accessibility, many organisations (NGOs, research institutes and companies) are continuously gathering, cleaning, repackaging and visualising existing data and making it accessible in more useful and user-friendly ways than offered by European institutions and the

The provision of energy data in the EU relies on opaque models to justify important decisions

10 GRS, 'Half of the reactor fleet off the grid – the causes of the standstills in France', 15 August 2022, Gesellschaft für Anlagen- und Reaktorsicherheit, <https://www.grs.de/en/news/half-reactor-fleet-grid-causes-standstills-france>.

11 See the ENTSO-E Transparency Platform: <https://www.entsoe.eu/major-projects/transparency-platform/>.

12 There is, for example, no reliable public data source on the origin of the EU's natural gas imports.

ENTSO-E¹³.

A range of institutional modelling and planning documents already exists at European, national and sectoral levels. Yet they are rarely comparable or even consistent as underlying assumptions and scenarios are not harmonised. For example, central energy modelling exercises differ over basic data, such as projected electricity demand (Figure 3), making them impossible to compare.

Despite being a central element of the EU's energy and climate governance, NECPs remain opaque and inaccessible: essential indicators of member-state energy-sector trajectories are buried in long documents, while underlying assumptions remain unclear¹⁴. Moreover, only selected parts of these modelling and planning exercises are publicly accessible, which restricts opportunities for thorough scrutiny and meaningful comparison¹⁵. At present, no widely recognised scenario for the EU can serve as a consistent point of reference. As a result, modelling exercises often remain idiosyncratic reflections of the preferences of stakeholder groups that wield significant influence over the respective processes. Their opacity and non-reproducibility shields them from scrutiny, and they fail to foster a common understanding¹⁶.

Moreover, the modelling exercises led by the European Commission to justify its energy strategy and targets, and the modelling conducted by the ENTSOs underpinning grid development, rely to a significant extent on proprietary models developed and operated by for-profit companies, which limits transparency. The EU Reference Scenario, for instance, is produced using the proprietary PRIMES model. The proprietary PLEXOS model is used in electricity system expansion modelling for the TYNDP. Both proprietary models are owned by companies headquartered outside the EU. Consequently, major public policy decisions on EU electricity and gas market design, infrastructure planning

13 For instance, Energy-Charts: <https://www.energy-charts.info>, EMBER: <https://ember-energy.org/data/electricity-data-explorer/> and Eurelectric: <https://electricity-data.eurelectric.org/> gather and display electricity data, while Bruegel publishes data on gas demand (Bruegel Dataset, 2022a) and gas imports (Bruegel Dataset, 2022b). Our World in Data features a wide choice of (non-) European energy-related data: <https://ourworldindata.org/search?topics=Energy>.

14 Several private tracker initiatives have started to visualise and analyse certain aspects of NECP targets. See 1point5: <https://1point5.caneurope.org/necps-tracker/>, Unify: <https://unify.caneurope.org/policy-areas/necp/>, EMBER: <https://ember-energy.org/data/live-eu-necp-tracker/> and ECNO: <https://climateobservatory.eu/delivering-2030-targets-gaps-national-contributions-and-policies>. Other trackers focus mainly on solar power, such as Solar Power Europe's: <https://www.solarpowereurope.org/advocacy/national-energy-and-climate-plans>, or hydrogen such as Hydrogen Europe's: <https://hydrogeneurope.eu/necps/>.

15 For instance, the European Commission's 'EU Reference Scenario', published every five years, is a macroeconomic modelling exercise that considers EU policies and provides predictions for climate, energy and transport factors. While transparency improvements have been achieved in recent years with economic and technical parameters of the model now published, crucial details are still not public, such as the sources of parameters and the model itself. The model remains closed-source and run by a private company. Therefore, it is not clear whether the results of the reference scenario result from cost- or welfare-optimalisation or are the result of a specific choice on how the model is calibrated.

16 The modelling of more concrete infrastructure needs is done by ENTSO-E within the drafting of the TYNDP report. This process is crucial, as it identifies the cross-border projects that could later become eligible for EU funding. ENTSO-E is also responsible for the adequacy planning within ERAA. While both processes have improved the accessibility of data in recent years, the model code is still not public. Hence, it is not possible to verify how the results were obtained or to replicate the results.

and capacity support mechanisms, depend on modelling tools whose internal structures and assumptions cannot be scrutinised¹⁷.

3.2 Uncoordinated infrastructure planning

Europe's electricity system has seen a fundamental transformation in recent years and will continue to change. The EU has seen a drastic increase in renewable energy sources over the last 20 years, and these will form the backbone of electricity and energy supply in the future in most EU countries. Sufficient cross-border infrastructure is needed to distribute this electricity across Europe (Box 1), but interconnector capacity¹⁸ and cross-border trade have not increased at the needed pace (Heussaff and Zachmann, 2025). Strategic planning at the European level is lacking and the benefits of further integration and not being realised quickly enough.

Several issues are present in current planning schemes. First, planning and modelling exercises in the EU are not sufficiently harmonised. For instance, when it comes to inputs and assumptions, the crucial metric of total electricity demand in 2030 varies between the various modelling exercises (Figure 3). The sum of the NECPs is considerably lower than the foreseen demand in the EU Reference Scenario 2030, which in turn is lower than in both ENTSO-E coordination exercises (TYNDP and ERAA). Pisani-Ferry *et al* (2023) and Artelys (2025) have pointed out the lack of harmonisation between analyses at the European level: NECPs lack sufficient harmonisation and coordination to provide a coherent overall picture¹⁹. Opacity and incoherence across major institutional energy modelling exercises undermines their ability to provide a credible focal point for investor expectations. As a result, investors lack a clear and consistent view of future system needs, increasing uncertainty, raising the cost of capital, and discouraging strategic, cost-efficient investment in the sector.

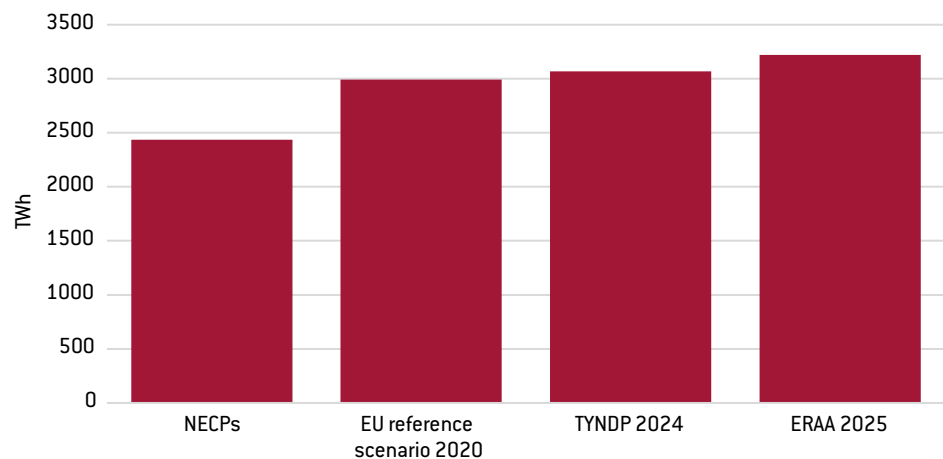
**Commission
ex-post evaluations
of legislation are
weak, often ill-timed,
of mixed quality and
with questionable
impact**

17 METIS is an energy system model developed for the European Commission by a consortium of private companies for more than ten years.

18 Neither Eurostat nor ENTSO-E publish data on current or historic installed interconnector capacities in the EU. Therefore, other indicators must be used to measure the level and development of interconnectors. For instance, one can use cross-border commercial electricity exchanges as a surrogate, which shows no growth in the covered period (Heussaff and Zachmann, 2025).

19 See also Elisabeth Cremona, 'Planning for Tomorrow: Making EU Power System Planning Fit-for-Purpose', *Latest Insights*, 23 September 2025, EMBER, <https://ember-energy.org/latest-insights/planning-for-tomorrow-making-eu-power-system-planning-fit-for-purpose>.

Figure 3: Total EU electricity demand projection for 2030 in different energy planning exercises



Source: Bruegel based on the electricity demand projections in the national NECPs (https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en), EU Reference scenario 2020 (https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en), ENTSO-E (2024) and ENTSO-E (2025).

Moreover, the planning of cross-border infrastructure remains primarily concentrated within ENTSO-E and its 40 constituent national transmission system operators. This predominantly public-owned group operates through a largely closed process, in which individual transmission system operators (TSOs) propose projects they identify as beneficial for coordination and discussion at the European level. In the current system, the European Commission and the European regulator, ACER, have only limited influence over this process, as their participation comes rather late.

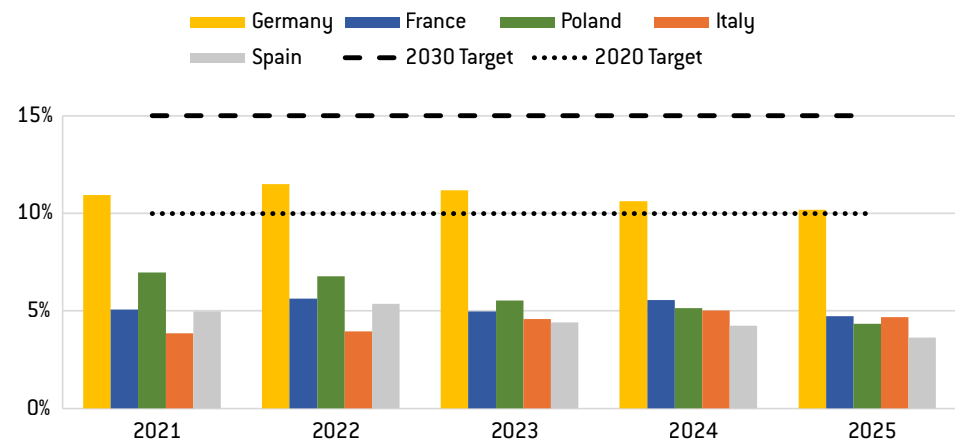
ENTSO-E's TYNDP is not only a crucial step for assigning EU Projects of Common Interest (PCIs), which can receive EU-funding and regulatory assistance. It is the only institutional blueprint for EU electricity-system development. Given the strategic importance of energy infrastructure planning for the EU, system development should not be guided primarily by an organisation representing only one segment of the value chain. Instead, it should be entrusted to an institution that is not only mandated to maximise overall societal welfare but also structured with the incentives necessary to act effectively on that mandate.

Finally, the current planning processes do not seem sufficient to achieve the EU's cross-border electricity infrastructure targets. The EU Energy Governance Regulation (Regulation (EU) 2018/1999) reiterates the interconnection target set by the European Council in 2014²⁰. This target requires member states to have a certain minimum of

20 European Council conclusions of 24 October 2014, <https://www.consilium.europa.eu/media/24561/145397.pdf>.

cross-border electricity import infrastructure installed²¹. By the end of 2025, of the five largest EU countries – Germany, France, Italy, Spain and Poland – only Germany had reached the 2020 target of 10 percent, and all remain far from the 2030 target (Figure 4)²². The slow growth of electricity interconnection capacity in the EU suggests that the current planning processes do not deliver the needed capacities. Without sufficient interconnection capacity, the benefits of electricity trade and the internal electricity market will not be realised (Box 1).

Figure 4: Interconnector targets and capacity of the five largest EU countries



Source: European Commission. Note: the share is calculated as follows: if a country has 100 GW installed generation capacity in its territory, the required import interconnection capacity would be at least 15 GW.

3.3 Weak political coordination

A lack of political coordination exacerbates the fragmentation of European energy governance. The EU treaties affirm the right of EU governments to decide their national energy mixes. A lack of coordination between countries can be observed through national preferences on certain policy topics, in which they prioritise their own strategic interests. For instance, Germany emphasises renewable energy sources – excluding nuclear energy – while France focuses mainly on nuclear energy and, like some Nordic

21 The Governance Regulation (Regulation (EU) 2018/1999) does not establish a legal obligation for countries to achieve their targets. The Governance Regulation also does not define how the 15 percent is achieved, naming only "indicators of urgency" based on renewable generation capacity price differences and transmission capacity. However, the website of the European Commission states: "The EU has set an interconnection target of at least 15% by 2030 to encourage EU countries to interconnect their installed electricity production capacity. This means that each country should have an electricity infrastructure in place that would allow it to import, from its neighbouring EU countries, an equivalent of at least 15% of the electricity production capacity on its territory". We therefore use the definition of the European Commission. The interconnection rate is defined as the amount of import interconnection capacity divided by total generation capacity. An increase in the generation capacity thus leads to a decrease in the interconnection rate if additional interconnection capacity is not added. Therefore, it might be useful to rethink whether the interconnection target should be made relative to total generation capacity or another metric, such as peak demand. See European Commission, 'Electricity interconnection targets', undated, https://energy.ec.europa.eu/topics/infrastructure/electricity-interconnection-targets_en.

22 Most other EU countries have already reached the EU interconnection target for 2030 but have seen falling rates in recent years.

countries, has shown limited enthusiasm for further integration of energy markets through additional interconnectors.

NECPs, in which EU countries describe how they contribute to the EU's climate and energy goals, were envisaged as a central tool to coordinate policies between the EU and member states. They have not delivered on that promise (Pisani-Ferry *et al*, 2023). The plans have been criticised for their lack of policy details and inconsistencies between them, leading to a greater risk that targets will be missed (Lalieu *et al*, 2024; CAN, 2025; Artelys, 2025). It also remains unclear how these plans are evaluated and enforced (Duwe, 2022; CAN, 2025).

The European Commission (2025d) itself has stated that member states lack ambition to implement their own NECPs. NECPs are inconsistent and not subject to proper consultation between countries as indicated by inconsistent export and import plans – if these are reported at all. NECPs were initially foreseen as helping coordinate policies between countries, but their failure in this respect is demonstrated by the limited mentions of neighbouring countries in individual NECPs. The plans remain inward looking despite the increasing importance of cross-border spillovers from energy policy decisions in the internal market²³.

An easily accessible, machine-readable database is missing that collects all the countries' indicators and targets. Instead, non-harmonised key indicators are buried in long documents. All in all, we observe that there is a missing link between the NECPs and other planning and coordination processes in Europe (such as the TYNDP) and inconsistencies between the plans. In their current form, NECPs do not and cannot coordinate EU energy and climate policy as intended and hence fail to perform their role in aligning stakeholder expectations.

BOX 2: The political hurdles of further integration

Deeper integration provides systemic benefits to Europe's energy system (Box 1). Despite this, integration faces resistance because of distributional effects and political factors.

As a hypothetical scenario, country A with low electricity generation costs could benefit from exporting additional electricity to country B with higher prices. However, distributional effects complicate things. Increased trade would raise domestic electricity prices in country A, profiting electricity producers but hurting households and electricity-dependent industries. In country B, on the contrary, electricity consumers would benefit from the lower prices, while electricity producers would be hurt. Finding effective and efficient ways to address these distributional effects is not straightforward. Cost-allocation for investments into cross-border infrastructure is complicated and there is little appetite for politically sensitive cross-border transfers.

In addition to these first-order distributional effects, there are further complications.

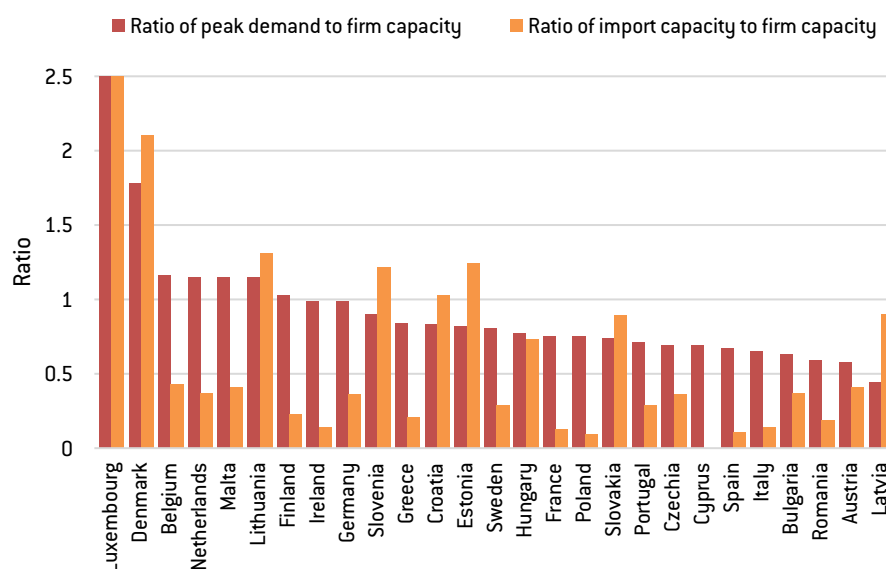
23 Ben McWilliams and Georg Zachmann, 'Beyond the numbers of EU national energy and climate plans', *First Glance*, 9 April 2024, Bruegel, <https://www.bruegel.org/first-glance/beyond-numbers-eu-national-energy-and-climate-plans>.

Countries that expect additional interconnection infrastructure to mainly lead to transit electricity flows have little incentive to invest in domestic or cross-border transmission infrastructure. The same is true for countries that need high grid investments to link, for instance, offshore wind power, yet expect that much of that generated electricity will flow out of the country. Low domestic electricity prices can attract energy-intensive industries, acting as an implicit subsidy but avoiding triggering EU state-aid rules.

Trust and security-of-supply concerns play another important role. More cross-border integration increases complexity, as balancing, congestion management and redistribution of power flows become more interdependent. Higher interconnector capacity in a country's total generation capacity implies that the country might end up importing more than it wants. This is regarded by some countries as a loss of control over their own security of supply.

Trust in neighbouring countries is needed so that electricity flows remain intact even in hours of high demand and systemic stress. While trust and security of supply are mentioned by some EU countries as a hurdle for further integration, a considerable number of small countries are already very deeply integrated into the EU electricity system: in some countries, the share of interconnector capacity over firm generation capacity²⁴ is very high, showing the importance of interconnectors for their security of supply (orange bars in Figure 5). Some countries rely structurally on interconnectors to satisfy their domestic electricity demand – their historical maximum demand is higher than their domestic (non-variable) generation capacity (red bars in Figure 5). This means that in periods of high-demand and in the absence of sufficient renewable generation, imports are required to meet domestic demand.

Figure 5: Electricity import dependencies, 2024



Source: Bruegel based on EMBER. Note: values for Luxembourg go beyond 2.5.

²⁴ 'Firm generation capacity' refers to electricity sources that can produce electricity reliably independently of weather conditions. In contrast, variable renewable energy sources such as wind and solar are intermittent.

In addition, uncoordinated policies in a cross-border market can increase uncertainty. Policy-driven spillovers, such as differences in renewable energy support schemes, remuneration mechanisms for security of supply and ad-hoc market interventions can complicate investment decisions and weaken consumer price stability. This is compounded by policy choices in renewable generation, grid build-out and industrial development, which depend on expectations about neighbours' future policy and system development.

4 Recommendations

To overcome the deficiencies outlined in section 3, we argue for improvements in three main areas:

- More constructive energy-policy discussions based on accessible, coherent energy data and widely accepted, reproducible reference scenarios;
- Aligning institutional energy infrastructure planning with long-term policy targets, and better synchronising grid, supply and demand investments through more binding frameworks;
- Fostering of policy cooperation between EU countries by a process that encourages increased NECP coherence, including by linking outcomes more to EU policies.

4.1 Open data and modelling

The uncertainties faced by the millions of investors that make up the energy system could be reduced substantially by a shared understanding of the current state of the system through reliable and accessible energy data, and by making the institutional scenario(s) of how this system might develop transparent and reproducible. The policy debate would also be improved when assumptions are known, results can be understood and alternatives can be discussed. Two improvements should be made: better public access to EU energy data and open-source energy modelling for policymaking.

To improve on the situation of fragmented energy data in the EU, we recommend the creation of an EU Energy Data Hub. We suggest a three-stage institutional evolution:

1. **Aggregation and accessibility:** establishment of an EU Energy Data Hub that will co-exist with current providers to host in a user-friendly, open-access environment multi-source data that is already used for policymaking. Relevant energy data commissioned by public authorities or as a result of public processes should by default be published there under fair-use licenses. Private data that is useful for proper policy monitoring and design should also be licensed – possibly with a certain delay and aggregation – to not limit private sector incentives from methodological innovation.
2. **Increasing data alignment:** development and implementation of methodologies

to make the diverse private and public inputs increasingly interoperable – defining and documenting standards. Existing data initiatives could serve as an example²⁵ when it comes to data accessibility, ease-of-use and visualisation.

3. **Institutionalisation:** ultimately, the Hub should transition into a permanent, properly staffed EU Energy Agency (Tagliapietra and Zachmann, 2023). This would move the EU from a reliance on *ad-hoc* data exercises toward a permanent institutional capacity for consistent, high-quality policy monitoring and modelling.

Energy systems are highly complex. Mathematical energy system modelling provides a framework to gauge the feasibility of policy targets, estimate the relative costs of different development pathways and simulate the potential impacts of policy decisions and infrastructure investments. However, because no ‘value-free’ modelling exists, the choice of tools and underlying assumptions profoundly shape the outcomes. Consequently, results from models with non-public inputs or non-reproducible methodologies cannot be considered a reliable basis for public policy.

If it is not possible to fully audit the energy system models used for policymaking – specifically the proprietary, for-profit models currently used for the EU’s long-term energy and climate scenarios and electricity system planning – they must be complemented and ultimately replaced by transparent alternatives. Open-source energy modelling has become academic best practice; several comprehensive frameworks now exist that can serve as the foundation for institutional capacity. Policy modelling processes should be managed by institutions with a mandate to serve the European public interest. While *ad-hoc* analysis can still be commissioned from third parties, such contracts must be contingent on the full publication of assumptions and outputs to allow for public scrutiny.

Long-term energy and climate scenarios (Figure 6), which describe plausible pathways for the achievement of policy targets, serve as vital focal points for policy discourse and long-term investment. This scenario development is essentially a process of consensus formation that should be moderated by a neutral and capable intermediary. Using open-source tools allows for an iterative process with stakeholders in which scenarios are regularly updated, for example when policy targets shift or when additional constraints or new technologies are introduced.

The European Commission’s Joint Research Centre, using its own internal modelling as a baseline, would be an ideal starting point for creating an open and inclusive long-term energy and climate reference scenario.

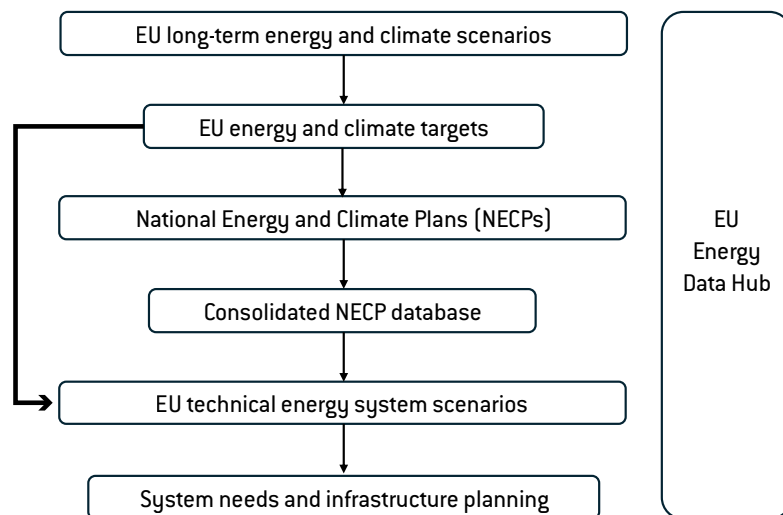
Technical energy system scenarios are needed to identify specific cross-border infrastructure or generation adequacy needs. This technical exercise should be based on the long-term energy and climate reference scenario and on a consistent interpretation of NECPs to determine which technical energy-system developments most benefit the EU. This model should ideally be integrated across energy vectors (electricity, gas and hydrogen).

25 For instance, Energy Charts (<https://energy-charts.info/>) provides an accessible overview of electricity-related data.

The use of open-source tools and transparent data empowers stakeholders to scrutinise the underlying logic of the model²⁶. Ultimately, such an open approach bolsters the credibility of the exercise and reveals the level of consensus, thereby reducing uncertainty for long-term investors.

Regardless which institution conducts this effort, open data and transparent models are crucial. A proposal in the European Commission's grid package (European Commission, 2025b) to run reference modelling for grid expansion in-house may lack the transparency required for genuine consensus formation. To build a trusted reference for stakeholders, the requirements for accessibility of methodologies must be exceptionally high, supported by a structured process for integrating stakeholder feedback.

Figure 6: Schematic proposal for an open and coherent energy system planning process



Source: Bruegel. Note: EU long-term energy and climate scenario modelling is currently largely based on the PRIMES model to underpin EU targets and strategies; the consolidated NECP database is a quantitative interpretation of key outcomes of the individual NECPs; the EU Technical Energy System Scenarios represent a feasible and efficiency-oriented pathway to achieve EU targets, taking NECPs into account.

4.2 An improved infrastructure planning process

The EU needs to update its energy infrastructure planning processes. The Commission grids package proposal (European Commission, 2025b) aims for an integrated assessment of electricity, hydrogen and gas to identify the most important cross-border infrastructure needs on a least-cost basis. These needs would then be passed to the European network operators' organisations to translate them into projects (Figure 6). The Commission, through this framework, aims to ensure that *"projects align with current and future European objectives"* (European Commission, 2025b).

This proposed more systemic approach to infrastructure planning is, in principle, a

²⁶ This transparency allows for the development of consistent, alternative solutions that can be integrated into subsequent scenario iterations.

step in the right direction²⁷. To improve the link between long-term EU energy objectives and the practical decisions taken in short-term infrastructure planning, an additional 'layer' is needed to interpret EU-wide climate and energy targets, translate them into practical system needs and provide consistent guidance for national and regional planning processes. Such a planning exercise would integrate demand projections, technology costs, cross-border constraints, security-of-supply requirements, restrictions related to countries' choice of energy mix and decarbonisation pathways, ensuring that infrastructure planning reflects collective EU priorities.

An EU-level model (Figure 6 and section 4.1) would be needed to underpin the creation of a reference scenario. That reference scenario could serve as a useful comparison to national plans and developments. While EU countries would retain the right to ultimately decide on their own energy infrastructures, such a benchmark could help to make any deviation by country from a coherent EU scenario more transparent and might push countries to better justify their decisions²⁸.

Crucially, this new EU-level infrastructure planning exercise must be as transparent as possible to succeed. To align stakeholders' expectations, its results must be credible and plausible.

4.3 Credible and effective political coordination

Political coordination is also necessary for further integration of the energy sector. The NECPs were designed as a tool to connect European targets to national policies and to coordinate policies among member states, yet this has so far not materialised. We propose developing NECPs into EU-aligned national energy transition and investment strategies to strengthen political coordination and commitment. NECPs should become the central documents through which countries, in collaboration with their neighbours, reliably commit to energy and climate policies and related investments. Strengthening collaboration between neighbours through their NECPs would support an efficient energy system by, for instance, encouraging the most efficient cross-border investments.

The NECPs could be further improved through harmonisation of their content and data. More consistent and comparable plans would build trust and accountability between countries.

To get there, the European Commission should provide a template for reporting by member states of the information needed on the state of national systems and their planned development. Because of local circumstances, member states might still deviate from this template. But for further analysis, the European Commission will transpose all NECPs into a coherent database – a process in which inconsistent inputs from member states will be standardised (of course, member states are invited to discuss the corresponding interpretations with other member states). Ultimately, a reference scenario should be built on this input to identify inconsistencies between the

27 At the time of writing, discussion on the Commission's European grids package proposal is at an early stage. See European Commission, 'European grids', undated, https://energy.ec.europa.eu/topics/infrastructure/european-grids_en.

28 ENTSO-E's TYNDP process should not cease but be complemented by the EU-level modelling.

national plans (eg in relation to infrastructure or trade flows) and inconsistencies with EU targets.

To ensure that NECPs become a central tool that EU countries take seriously in order to deliver the policies and investments needed to achieve the targets, they should be linked to EU infrastructure funding, such as subsidies for PCIs or the granting of state aid (for capacity mechanisms, for example). By tightening the conditions under which funds are allocated and linking them directly to the fulfilment of NECP targets, EU funds could be used more strategically, while the credibility of NECPs would be strengthened.

5 Conclusions

A broad EU discussion on energy will take place in 2026, based in part on proposals issued in 2025 (see section 1). This offers a unique opportunity to steer the EU's energy system towards greater efficiency and resilience while safeguarding the green transition. Therefore, the discussion on how the EU's energy system, especially cross-border infrastructure, is planned must be placed front and centre.

The EU's energy system has already achieved an impressive level of integration, but a choice must now be made between two distinct paths. The first is an increasingly fragmented market in which cooperation occurs, at best, at regional level, decisions revert to national authorities and countries attempt to outcompete one another through subsidies rather than innovation. The competition necessary to deliver better products and lower prices to consumers would be unlikely to develop. In such a scenario, a few countries might gain, but most would likely lose out. The entire energy system could become unnecessarily expensive because of duplication and a lack of cross-border coordination of infrastructure investments.

The alternative path is to regard the internal energy market as a strategic tool for reducing prices through innovation, competition and better planning, for ensuring a resilient energy supply and for achieving the EU's climate goals. However, this path requires all EU countries to understand the benefit of a unified approach: that long-term gains outweigh short-term costs and that specific decisions are better taken at EU level rather than the national level. The EU needs to develop a unified vision for its future energy system, so that stakeholders align on expectations and the necessary investments are pursued. This will reduce uncertainty and lower capital costs. To achieve this, better data availability and open modelling are crucial to properly inform energy policy and to align stakeholders on the future of the EU's energy system. EU-level planning of cross-border infrastructure, done in a transparent way, is necessary for a systemic assessment and to prioritise the most relevant needs. Finally, NECPs need to become more accessible and coherent, and should be backed by more political coordination.

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