



# Electricity grids: Key policy actions

Ember puts forward its key policy recommendations on the topic of grids, specifically with the view to the European Commission's upcoming Grids Action Plan.

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## About Ember

Ember is an independent, not-for-profit energy think tank that aims to shift the world to clean electricity using data. It gathers, curates and analyses data on the global power sector and its impact on the climate, using cutting edge technologies and making data and research as open as possible. It uses data-driven insights to shift the conversation towards high impact policies and empower other advocates to do the same. Founded in 2008 as Sandbag, it formerly focused on analysing, monitoring and reforming the EU carbon market, before rebranding as Ember in 2020. Its team of electricity analysts and other support staff are based around the world in the EU, UK, Turkey, India, China and Indonesia.

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## Summary

The combination of power system decarbonisation and direct electrification is undoubtedly the most efficient and cost-effective route to a carbon neutral economy by 2050. This means the power grid will become the backbone of the energy system, transporting 50% or higher of Europe's energy by 2050.

The recent political attention on grids is proof of the growing recognition of their critical role for Europe's future and the credibility of the EU's net-zero commitments. Without strengthening the grid, [climate targets will remain out of reach](#).

Ember recognises the important strides that have been made on grids over the years. However, there is still work to be done. At this critical juncture, Ember welcomes the upcoming Grids Action Plan from the European Commission and seeks to provide input to its development.

Further detail is provided on select recommendations (indicated by an asterisk) in the annex.

The action plan should seek to:

- Recognise the **critical role of power grids** in achieving EU energy and climate targets and **embed this in the political agenda**, as demonstrated by the [example](#) of the Biden-Harris administration. Strengthened political support will be essential to implement proposed reforms, drive key projects and enhance [regional cooperation](#). The latter is particularly important for interconnection, where current plans are [falling short](#) of future system needs.
- **Place clean power at the core of grid development plans\***, [in line](#) with the EU's commitment to carbon neutrality. This is key to **enable [anticipatory grid investments](#)**, ensuring that power grid developments pave the way for clean electrification, rather than lag behind growth. It is also crucial to ensure grid constraints do not negatively impact the ambition level of National Energy and Climate Plans, especially with regard to wind and solar capacity and renewable electricity shares.
- **Clearly distinguish** between distribution, national transmission and interconnection. They each have their own set of challenges, timelines and solutions. Reference to "grids" will not provide sufficient momentum, identify key priorities or provide clarity on additional resources.

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- Seek to **identify and tackle the structural and economic\*** reasons behind grid underinvestment. This may include incomplete implementation of market reforms, tariff structures, lack of investment incentives, amongst others.
  - **Improve data availability and transparency on grids\***. This would provide reliable information critical for investors and electricity consumers, and allow grid development to be better assessed and monitored.
  - **Boost European manufacturing capacity of grid components**. Since [six of the world's top industry players](#) in the high-voltage and line market are located in Europe, investing in electricity grids also means investing in European industry.
  - **Address grid connection queues with urgency\*** by shifting from a “first come, first served” approach to a “first ready, first served” cluster approach.
  - **Reform power system planning\***, integrating the currently separate planning processes for highly interconnected elements on the electricity system. The ultimate objective would be an integrated, streamlined, system-level planning framework for the power sector that prioritises system efficiency.
  - Recognise that grid constraints are already a barrier to the energy transition, and **prioritise investment in alternative grid solutions** i.e. dynamic line ratings, cable pooling, storage, demand flexibility, in the near and medium term.

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# ANNEX

## Further detail on select recommendations

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### 1. Seek to identify and tackle the structural and economic reasons behind grid underinvestment

Grid investments under REPowerEU are estimated at [€583.8 billion](#) by 2030, with around [€400 billion](#) of that allocated to distribution grids. Yet currently distribution system operators (DSOs) in EU27+UK countries spend [€25 billion](#) yearly, far below the [€34-39 billion](#) needed by 2030.

There are several reasons behind this investment gap, but a clear one is the lack of incentives to implement grid investments. Historically and still now, grid operators are state-owned companies noticing limited competition. In countries such as Poland, Distribution System Operators are still integrated with incumbent fossil fuel electricity producers due to the incomplete market unbundling. This introduces a clear conflict of interest, with private renewable energy producers potentially receiving [unequal treatment](#) in terms of grid connection procedures and related investments. This could be one explanation behind the [51 GW of grid connection declines](#) in Poland in 2022 alone, an increase of 253 percent compared to 2021.

Grid investments are often financed by strictly regulated grid charges, subject to political pressure due to the impact on household cost of living. These tariffs are renegotiated on a quarterly or annual basis, providing no certainty regarding long-term investment budgets. As a result, grid operators might face difficulties in financing costly multiannual projects such as grid expansion or smart meter rollout. On the other hand, the tariff regulation and lack of competition do not incentivize [investment decision optimization or an increase of the quality of service](#).

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**Recommendation:** Regulators should introduce clear incentives for grid investments, through the review of the status of electricity market unbundling in Member States and the alignment of end-user tariffs with long-term grid investment plans.

Targeted funding should also be provided for grid operators, supported by one-stop shops and incentives related to the timely delivery of investments. A fund specifically related to grid investments could be introduced, such as the [Connecting Europe Facility](#) or [US Grid Resilience and Innovation Partnerships \(GRIP\) Program](#). This would make it easier to access and monitor, and therefore more effective than broad programs such as the Modernisation Fund that cover a very wide range of competing projects.

## 2. Improve data availability and transparency on grids

Grids, unlike other elements of the energy system, are subject to limited oversight consisting of public consultations (on a highly technical subject) and an opinion from regulatory authorities. This makes it difficult to assess whether grid developments are in line with power system targets or [monitor progress](#).

This is particularly important in view of the recent conclusions of the European Scientific Advisory Board on Climate Change. They found that the TYNDP process [does not](#) sufficiently address the transformation changes necessary to achieve the EU's climate neutrality and climate resilience targets by 2050. As this process is driven by Europe's Transmission System Operators, it implies that planning of the national transmission grid equally does not reflect the needed transformation of the energy sector.

**Recommendation:** Grid operators should be required to publish data on key indicators.

This includes data on grid connection queues, available grid capacity, performance of grid infrastructure, investment levels, average lead times and others. Much of this information is already available from power system operators but is not reported.

This will: (1) enable [assessment of alignment](#) and progress monitoring; (2) provide reliable information [critical for investors and electricity consumers](#); and (3) could promote social acceptance as stakeholder groups increasingly understand the importance of grid expansion for the energy transition.

### 3. Address grid connection queues with urgency

Around the world, huge capacities of renewables are waiting to connect to the grid. While we lack a comprehensive picture on the situation in Europe, data from [select countries](#) shows the EU is no exception. For example, Spain and Italy have nearly 200 GW of wind and solar energy waiting to connect, and France has nearly 50 GW.

**Recommendation:** *Regulatory authorities should implement immediate reforms to alleviate grid connection queues*

Authorities should shift from a “first come, first served” approach to a “first ready, first served” cluster approach, similar to that [implemented](#) by the US Federal Energy Regulatory Commission (FERC). This allows projects to be grouped by location and time of queue entry to be assessed as a single cluster, instead of running separate studies for each project. Projects are also required to demonstrate readiness through financial deposits and proof of site control at key check points, eliminating unviable projects. In the UK, developers are allowed to terminate their connection contracts [without incurring liabilities](#), freeing capacity in the queue without deterring future investors.

### 4. Reform power system planning

A clean, expanded power system is at the heart of a carbon-neutral economy, and its planning framework is critical to a successful delivery. However, a comprehensive system-level planning framework is absent. Even in the electricity sector, the planning of highly interconnected elements is artificially segmented between power generation (ERAA); transmission grids (TYNDP and national grid development plans); flexibility (separate assessment proposed under the revised EMD); and electrolyzers (national hydrogen strategies), among other elements. Notable drawbacks of this approach:

- This creates a particular challenge for planning the power grid which [facilitates benefits](#) across the entire power system;
- National energy and climate ambitions risk being derailed as the planning of key infrastructures lags behind;
- It renders it impossible for planners to identify solutions that represent the highest system efficiency, thereby keeping costs down;
- New solutions such as digitalisation, different forms of flexibility and storage, electrolyzers and hydrogen production are typically not integrated into existing assessments;

- Risk of misalignment between plans of interrelated elements. For instance, even planning at different electrical voltage levels (transmission and distribution) in the same country is often [not aligned](#).

Ultimately, the current planning framework for the power system is [insufficient](#) to inform and coordinate the investments required to deliver on the Green Deal or net-zero commitments.

**Recommendation:** *The European Commission should initiate a power system planning reform to integrate and streamline the process*

This would be similar in principle to the clean energy package which sought to consolidate most of the energy and climate planning of reporting requirements under a single framework. The ultimate objective would be creating an integrated, streamlined, system-level planning framework for the power sector that prioritises system efficiency. The timely development of grids, flexibility, storage and other solutions will be assessed alongside the evolution of the power generation mix. Such an assessment would also provide a stronger knowledge basis for identifying key anticipatory investments.

**Recommendation:** *The new planning framework should establish an independent central coordinator*

There is growing recognition that the complex task of power system planning is best served by a central and independent coordinator. This has been stated by Terna, Italy's electricity TSO, and is reflected in Germany's drive to [merge its four TSOs](#) which it believes could accelerate the modernisation of power lines. Reform to establish an independent system operator is [underway in the UK](#), where the Future System Operator will be responsible to achieve three objectives: (1) net-zero; (2) security of supply; and (3) efficiency and economy.

In the EU, similar reform could be accomplished by ascribing the role to national regulators and ACER, the latter providing an essential platform to ensure EU coordination and exchange of best practices. Given the urgency of action, this would be preferable to establishing a new institution.

This central and independent body could be tasked with establishing the methodology for integrated power system planning, and provide oversight to the process, ensuring that plans are sufficiently aligned with EU ambitions.

## 5. Net-zero should be at the core of the new power system planning framework

Renewable deployment is accelerating but grid development is struggling to keep pace. Grid investments [typically follow growth](#) rather than anticipate it, largely driven by often outdated energy and climate targets. In such cases, lack of grid capacity is thus a result of grid development plans that lag behind concrete developments and stronger climate ambitions, and risks derailing the energy transition. Grid development plans should enable higher ambition, rather than constrain it. In other planning processes, grid constraints cannot be used as an excuse to lower climate ambition. This is especially relevant for renewables deployment targets under the currently reviewed National Energy and Climate Plans (NECPs).

**Recommendation:** *Grid development plans should be mandated to incorporate at least one clean power aligned scenario*

In this way, power system planners would be required to assess the system needs of a clean power system and identify necessary investments from an early stage. This, particularly with a view to the higher ambition that can be expected next year following the establishment of a 2040 carbon budget target which is likely to increase pressure on grid operators to prepare the power grid to deliver and support a clean power system.

Additionally, modelling higher ambition is not just about meeting targets but would present numerous benefits. It would enable system operators to identify the trade-offs between different pathways and identify those that would bring [significant advantages](#) in terms of security of supply and cost reduction. System operators could also use such assessments to identify optimal locations for renewable generators, taking into account both grid capacities and optimal generation conditions, and incentivise investments accordingly. This would improve certainty and foresight for investors, stimulating renewable deployment rather than inhibiting it.



# Supporting Information

## Detail of inquiry

Following the High-Level Electricity Grids Conference in September 2023, the Commission is preparing an action plan for grids, with an indicative publication date of the end of [November 2023](#). With a view to providing input on this, Ember prepared its key recommendations on grids. This was sent to DG ENER at the European Commission and made available on Ember's website.