Power in Unity

Doubling electricity interconnection can boost Europe's green transition and strengthen security of supply

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Introduction

Europe's energy transition is accelerating, led primarily by the twin processes of power system decarbonisation and electrification of end-uses in buildings and transport.

But deploying renewables and incentivising electrification is not enough. The underlying infrastructure must be prepared to integrate new wind and solar capacities, serve new demand and provide flexibility. This is where electricity grids come in, with a special role for cross-border interconnectors in the European context.

The present moment is a crucial opportunity to plan how Europe's energy transition plays out over the next decade.

State of Play

Europe must double its current interconnection capacity over the next ten to fifteen years to deliver on its energy targets and the climate neutrality objective. Current interconnection expansion plans fall short of this (see Figure 1), leaving a gap compared to the power system needs for interconnection. They even fail to meet the cross-border expansion needs for a (now outdated and under-ambitious) 2030 energy system based on National Energy and Climate Plans (NECPs).

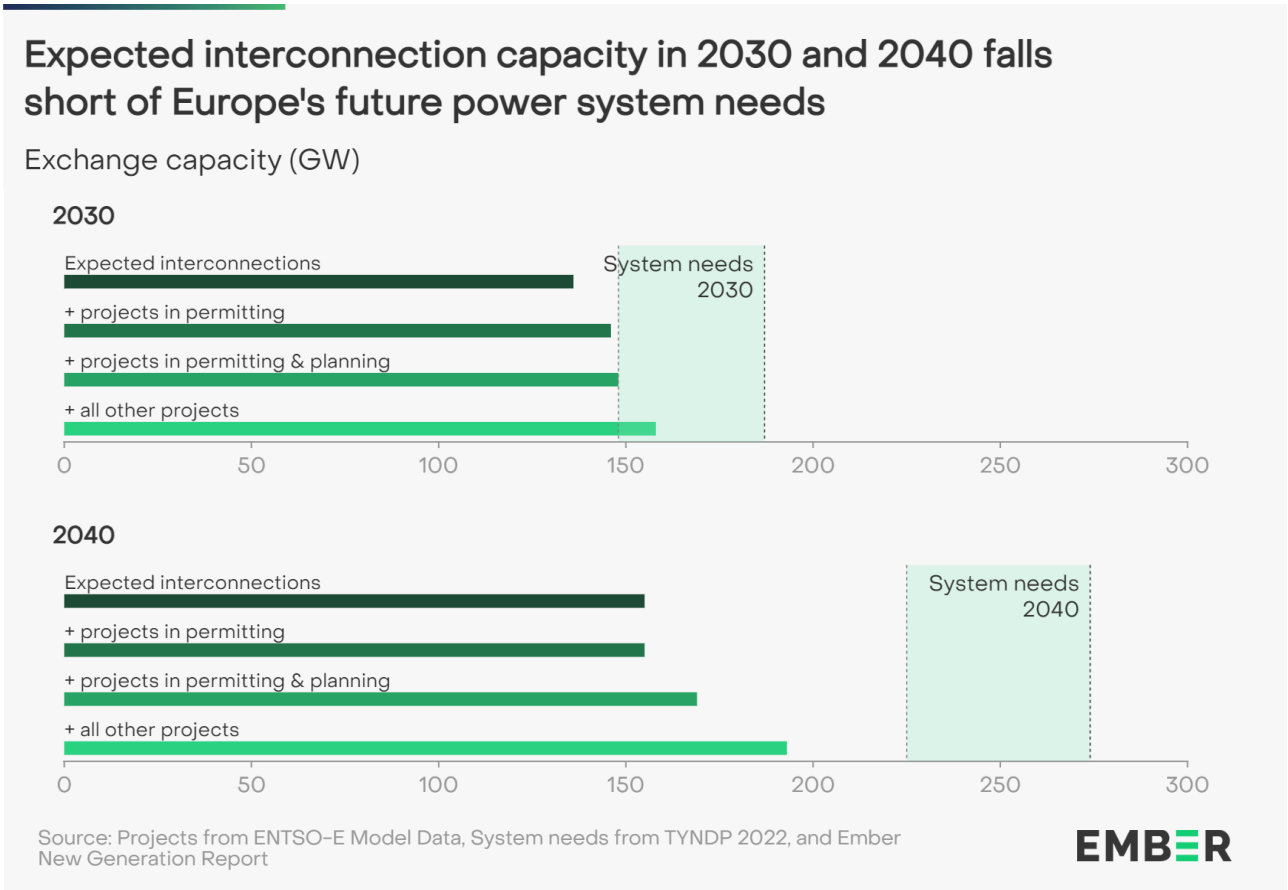
What are interconnectors?

Interconnectors are cross-border, high voltage cables that link Europe's national power grids. Together with shared market rules, they create the integrated European electricity market, allowing electricity to flow freely across the continent. Europe's electricity system is the world's largest interconnected grid, with more than 400 interconnectors linking nearly 600 million citizens. It is operated, developed and planned by Europe's Transmission System Operators (TSOs).

Interconnectors are vital for achieving net zero in the most cost-efficient manner. They facilitate the integration of renewables and improve power system efficiency across the continent. This decreases reliance on fossil gas for flexibility, without compromising reliability of supply. Increased interconnection can also unlock significant renewable potentials in optimal locations, lowering the costs and capacities required for decarbonisation.

An integrated European electricity system facilitates coordination and cooperation among Member States and beyond, and allows them to assist each other during critical situations. Interconnectors enhance Europe's security of supply and reduce its vulnerability to volatile gas prices and geopolitical risks.

Figure 1



Interconnection project timeframes are an average of nine years in Europe, so actions to address this must be taken now. Otherwise, this risks becoming a bottleneck for the expansion of wind and solar power, and a missed opportunity to improve security of supply and reduce costs for consumers.

The importance of interconnectors for capturing benefits on costs, flexibility and reliability is supported by numerous studies and models, including the Paris Agreement Compatible (PAC) scenario, developed by the Climate Action Network and the European Environmental Bureau, Ember's New Generation study on least-cost power system decarbonisation, and ENTSO-E's own System Needs Study.

Priorities through 2030

Interconnection needs vary by region and across decarbonisation pathways. Certain borders are consistently identified as critical but remain chronically unaddressed (see Figure 2). In particular, these include:

- The triangle between Austria, Hungary and Slovenia
- The line from Spain to France to Germany
- Links between the UK and France, and the UK and Ireland
- Links between Western Balkan countries and with their neighbours, such as between between Greece and North Macedonia

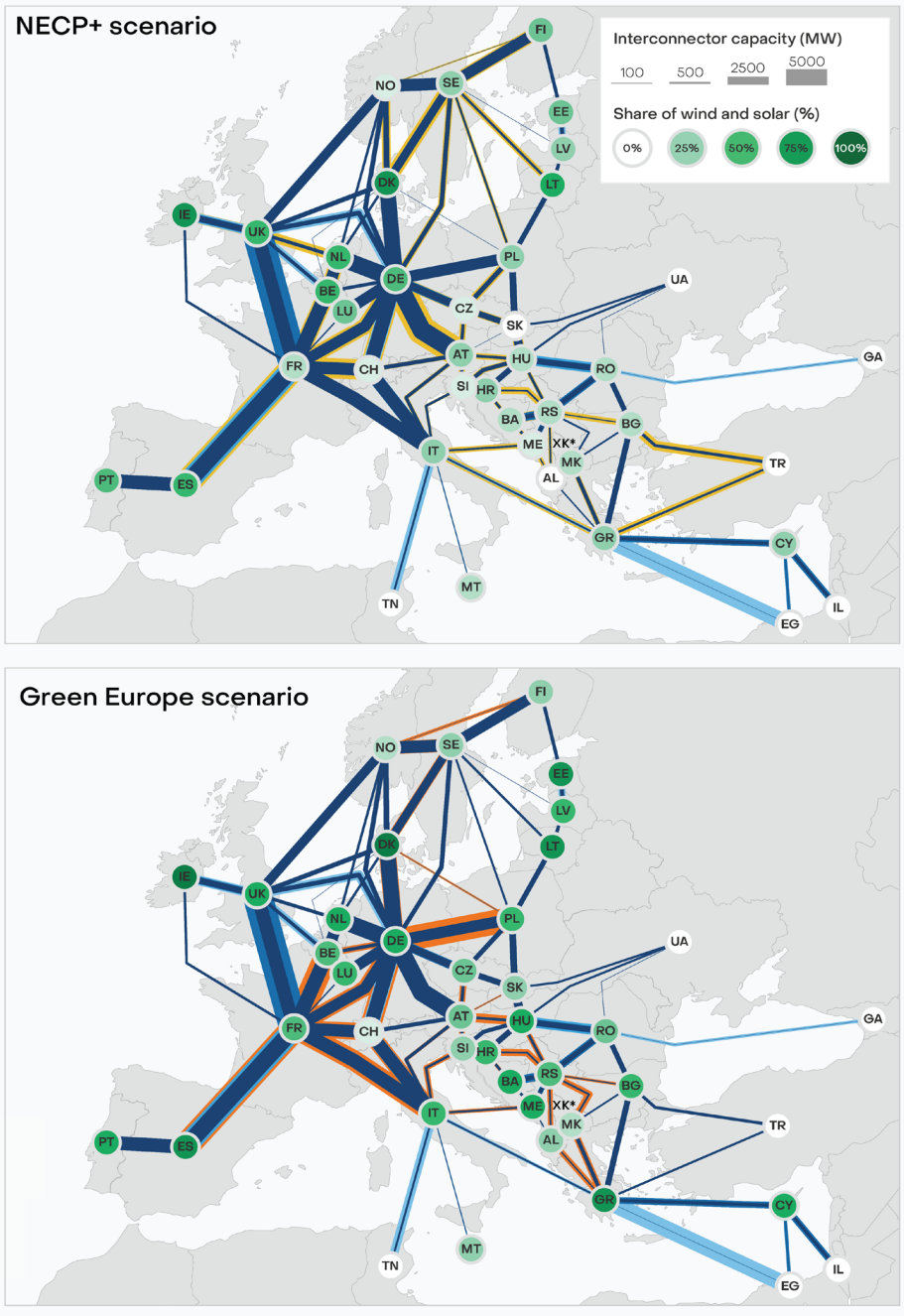
By 2040, the gap between system needs and expected capacity will widen further. While this is less concerning given the longer time horizon, it should be expected that this investment opportunity will start to be seriously addressed in the nearterm, given the long lead times for infrastructure projects.

Figure 2

Comparing expected interconnection capacity and system needs highlights clear priority corridors for 2030

Cross-border exchange capacity (GW)

Reference grid | System needs: NECP+ | System needs: Green Europe



Source: Projects: ENTSO-E Model Data, System needs for NECP+: ENTSO-E System Needs Study, System needs for Clean Europe and Green Europe: Ember New Generation. Information for Kosovo** is currently absent from the data sources. The map will be updated in due course. **This designation is without prejudice to positions on status and is in line with UNSCR 1244 and the ICJ opinion on Kosovo Declaration of Independence. Graphic by Reynaldo Dizon and Elisabeth Cremona.

Ways forward: three options

There is some progress on grids development: power grids were included in revised EU emergency permitting rules; key stakeholders continue to urge stronger support; and Greece proposed centralising existing EU funds under a special "European Grid Facility".

There are additional ways to address the gap between current projects and anticipated power system needs, particularly those just seven years away. These are not mutually exclusive, and we may see a blended approach.

Political support to accelerate existing interconnection projects:

The most efficient and cost-effective option is to deliver the additional 22 GW of interconnection which is already in the pipeline. This 22 GW could be brought online by the end of the decade, going a long way to close the gap. Accelerating such infrastructure solutions require political support, particularly where slow progress or gaps reflect wider issues such as the need for parallel development of internal grids.

Looking beyond 2030, the most critical corridors requiring additional capacity should be identified and prioritised for development in the coming years (given long lead times). Needs-oriented forward planning is critical for interconnection.

Strengthen investments in non-wire solutions:

While interconnection offers the optimal solution to meet certain system needs, other non-infrastructural solutions can also provide system benefits. To maximise existing interconnection capacities and relieve stress on the power grid, national power system planners should explore further investment in flexible technologies. These include storage and peaking units, demand response and energy efficiency. However, these do not necessarily cover needs best addressed by interconnection (and vice-versa). Either way, forward planning remains essential, as even non-infrastructure solutions require time to deliver results.

Increase domestic renewable capacities:

To meet growing electricity demand while also phasing out fossil fuels with inadequate support from interconnection, countries would likely have to increase investment in domestic clean power generation at greater cost. Given that the speed and scale of renewables deployment required to achieve European energy goals will already require enormous political determination and push planning processes to the limit, increasing the scale of renewable capacity needed could make this the most challenging option to deliver.

Conclusion

Europe's plans for decarbonising the power system need to be matched by development plans for supporting cross-border infrastructure. Depending on forward planning decisions taken now, this could mean expanding cost effective interconnection that would come with multiple co-benefits, while strengthening European unity in the face of geopolitical uncertainty and energy insecurity.

But with current plans for grid development falling short, Europe needs to act swiftly to close the gap or risk choosing riskier and more expensive pathways that rely more heavily on storage and flexibility technology or much higher volumes of renewables deployment.

About Ember

Ember is an independent, not-for-profit climate and energy think tank that produces cutting-edge research and high impact, politically viable policies that aim to accelerate the global transition to clean electricity.

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About EEB

The EEB is Europe's largest network of environmental citizens' organisations. It brings together over 180 member organisations from 40 countries working for sustainable development, environmental justice and participatory democracy.

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