



# Empowering Central and Eastern Europe

Central and Eastern European countries are advancing renewables ambition, but not yet in line with their potential. The upcoming Three Seas Initiative Summit is an opportunity to secure a low cost, resilient and interconnected clean power system.

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# About

While Central and Eastern Europe (CEE) is moving toward renewable energy sources, the region is still expanding gas infrastructure over cross border transmission grids, undermining its vast renewable potential. The Three Seas Initiative (3SI), the largest intergovernmental platform in the region, could support CEE in addressing this issue by fostering cross-border collaboration and connectivity in the area. This analysis looks at current and planned energy transition progress in Three Seas countries, and concludes with recommendations for interventions from the 3SI to contribute towards a roadmap for an innovative, secure and prosperous Central and Eastern Europe.

3SI includes Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Bulgaria, Romania, Austria and Greece. These countries work with associated States (Ukraine and Moldova), as well as strategic partners the US, Germany and the European Commission, to foster development and convergence within the CEE region in the areas of transport, energy and digitalisation.

# Highlights

## 39%

In 2023, renewable energy accounted for 39% of the electricity generated across the 3SI members, surpassing coal for the first time.

## 173 GW

In updated National Energy and Climate Plans, Three Seas countries increase wind and solar targets from 94 GW to 173 GW by 2030.

## 53%

Between 2023 and 2030 cross-border electricity flows are expected to increase by 53% across the 3SI region.

**Central and Eastern Europe's transition is possible, but inadequate investment and infrastructural gaps loom large. However, through the development of robust systems led by the Three Seas Initiative, Central and Eastern Europe has the opportunity to unlock the potential of a cleaner future. The road toward cleaner Central and Eastern Europe could evolve from mere aspiration to realisation.**

**Pawel Czyzak**

Regional Lead - CEE, Ember

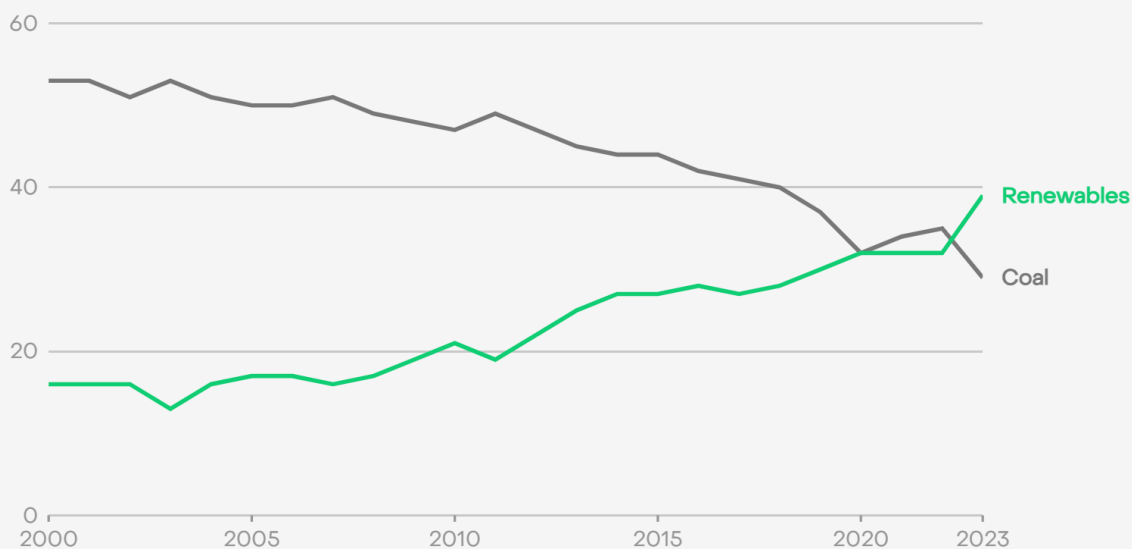


# Central and Eastern Europe is already moving from coal to renewables

Three Seas countries have historically been very fossil fuel dependent, containing some of the most coal-reliant countries in Europe. However, this is rapidly changing. In 2023, renewable energy accounted for 39% of the electricity generated across Three Seas members (up from 30% just 5 years ago in 2019), surpassing coal for the first time in power market share.

## Renewables are now producing more electricity than coal in Three Seas countries

Share of 3SI countries' electricity generation, by source (%)



Source: Annual electricity data, Ember  
3SI member countries include: Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Bulgaria, Romania, Austria and Greece

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A mix of factors have fed into this. The main driver has been the declining costs of wind and solar. This drop has made wind and solar the [cheapest source of electricity](#). In addition, coal

generation became largely uncompetitive under the EU Emissions Trading Scheme, prompting most governments to introduce coal exit strategies [due in the 2030s](#).

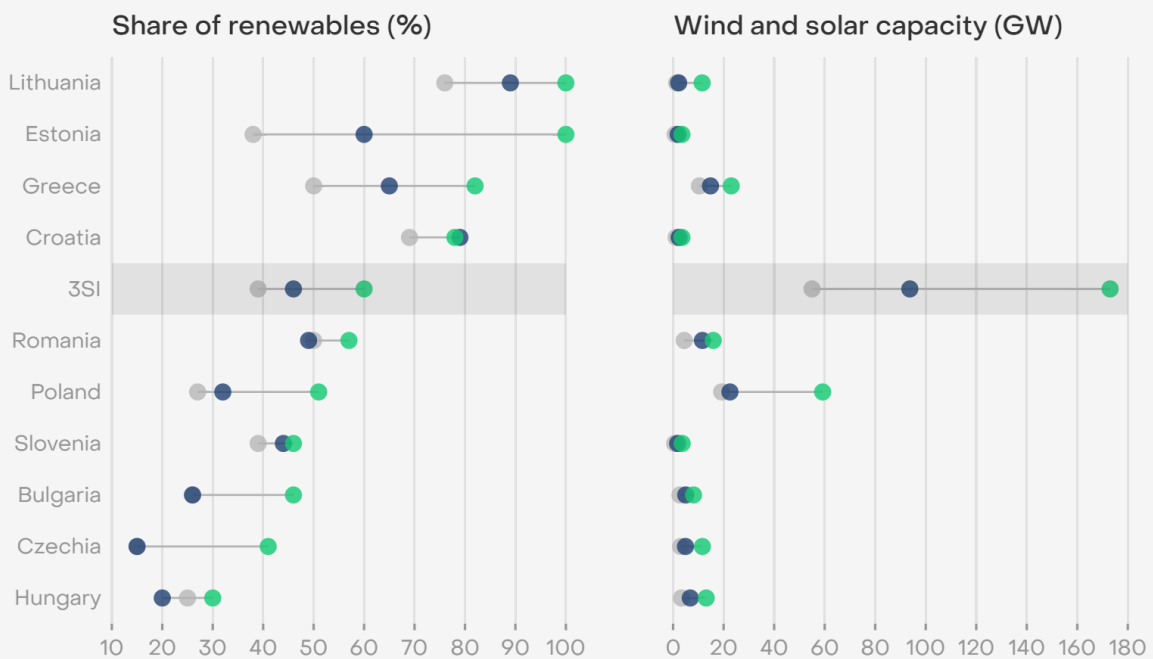
**Government ambition is increasing**

With this structural shift towards a clean power system already happening, 3SI governments are now aligning their energy strategies more closely with that reality. This is evidenced by updated [National Energy and Climate Plans](#) (NECPs), which guide the EU’s combined greenhouse gas emissions reduction efforts at the Member State level.

**Countries across the Three Seas have significantly raised their 2030 renewables ambition, led by Lithuania and Estonia**

Current and 2030 planned share of electricity generation from renewables and wind and solar capacity

● 2023 ● Previous NECP target ● Latest target



Source: Ember NECP tracker  
 For Austria, Slovakia and Latvia 2019 NECPs were used due to data gaps in the draft 2023 updates.  
 3SI member countries include: Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Bulgaria, Romania, Austria and Greece

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Previous NECPs, submitted in 2019, failed to propose ambitious climate targets. They substantially underestimated the pace of the energy transition, especially in Central and Eastern Europe. Goals set by countries like Romania, Czechia, Bulgaria, Hungary and Slovakia were so low that their 2030 renewable electricity targets were already achieved by 2023. Poland had surpassed its 2030 solar capacity milestone already in March 2022.

However, there has been a major shift in the draft [NECP updates](#) submitted in 2023. Among Three Seas countries, ambition is led by Lithuania and Estonia, which join Austria in aiming for 100% renewables-based electricity by the end of the decade. Coal bastions like Czechia or Poland also significantly increased their renewable electricity targets by 2030: Czechia from 15% to 41% and Poland 32% to 51%.

In total, 2030 renewable electricity targets across 3SI countries increased from 46% share in the previous NECPs to 60% in the updated drafts. Expected 2030 wind and solar capacity grew significantly as well, from 94 GW in 2019 to 173 GW in the latest NECP drafts. Achieving this would mean more than doubling of wind and solar capacity in the region from 76 GW in 2023.

## CEE countries can achieve more

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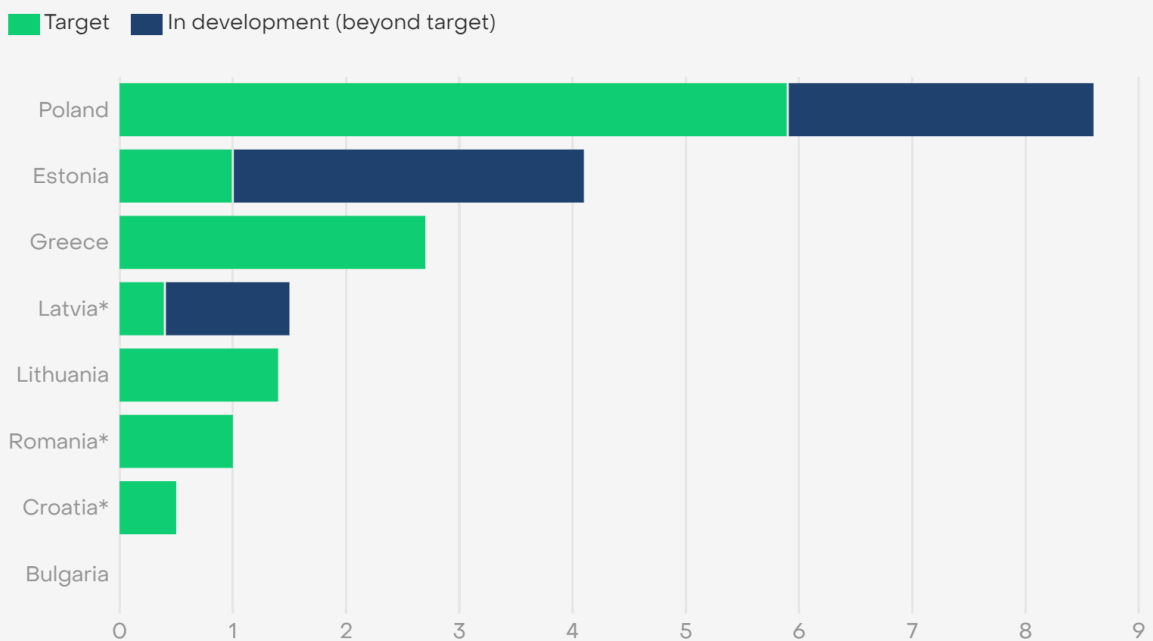
While renewables shares are increasing and signs of increased government ambition in the energy space are visible across the 3SI region, national strategies still fall short of what is achievable and beneficial.

[Previous Ember analysis](#) shows that 3SI countries can deploy 200 GW\* of solar, 60 GW of onshore wind and 23 GW of offshore wind capacity by 2030. In total, this is a sizable 110 GW above what is expected under the most recent NECP drafts. This untapped potential could increase the share of renewables in electricity generation to 67% by 2030, surpassing the 60% suggested in the draft NECP updates, and lead to a further [decrease in electricity prices](#). It would also provide sufficient power for electrification of heat and cooling in industry and buildings, and of mobility.

The gap between the government ambition and the potential is most clearly visible in the case of offshore wind. Offshore wind targets in Baltic Sea countries Poland, Estonia and Latvia fall behind current projects by nearly 50% with the bloc officially aiming for 9 GW of offshore wind by 2030, instead of the [16 GW](#) already scheduled for delivery in the early 2030s. Using such conservative forecasts in policy guidance can mean severe consequences: supply chains, port infrastructure, grid connection and expansion are all planned in accordance with government targets. There is a risk these crucial enabling elements will not have adequate investment without realistic targets in place to guide planning.

### Uneven offshore wind plans - some Three Seas countries are set to surpass their targets and others have not even set them

Projected 2030 offshore wind installed capacity (GW)



Source: Ember's analysis of multiple sources including National Energy and Climate Plans, Offshore Network Development Plans, Offshore wind in the Baltic States

"In development" includes only projects expected to be commissioned by 2030 and beyond the government target  
 \*non-binding

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### Investment support falls short

In the [Black Sea](#) the major challenge for offshore wind projects, aside from weak target frameworks, is the lack of direct policy support. Both Romania and Bulgaria have been delaying the introduction of necessary legal frameworks and financial instruments to support offshore wind development, which has stalled any efforts to take advantage of the regions' substantial wind potential.

Without instruments such as [contracts-for-difference](#), which are commonly used for revenue stabilisation and price risk minimisation, financing renewables projects is much more difficult for investors. This is particularly true in the CEE region, which has [always](#) faced higher weighted cost of capital (WACC) due to less developed renewable markets and higher uncertainty with fewer government safeguards and policy commitments. Financing a wind farm in the Baltic States is [seven times more](#) expensive than in Germany or France. With many CEE countries experiencing [above average inflation](#), the high cost of capital raises concerns about the bankability of renewable energy projects. In fact, even in a more favourable market environment and lower WACC setting such as the USA, several [offshore wind farms in the US](#) have been cancelled due to, among other factors, unforeseen interest rates.

One option to address this is to make preferential funding available for wind and solar investments. De-risking measures such as contracts-for-difference have been shown to lower the cost of renewable energy projects by some [twenty percent](#). Implementing these measures is therefore necessary to ensure a roadmap of energy investments that will deliver on targets.

## Cross border infrastructure could unlock CEE renewables

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CEE countries are now exhibiting strong growth in renewables deployment, but much more can and needs to be done to fully exploit the region's potential. Key interventions could be



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boosting off-shore wind in the coastal countries and strengthening interconnections, allowing cheap renewable energy to flow to demand centres across borders, reducing electricity curtailment and stabilising power prices. Interconnectors help to balance generation from countries with different renewable generation patterns and smooth out residual demand by aggregating variations over [larger zones](#). To this end, even though building a new cross-border transmission line is a capital intensive and inherently complex undertaking, the project economics are [favourable](#) (i.e. they have a relatively short payback period) wherever markets are not well connected.

Interconnectors are expected to play a dominant role in providing pan-European flexibility across all time scales, but especially for longer duration (monthly) balancing requirements, becoming even more significant towards [2050](#). The more a country is interconnected to its neighbours, the less it needs to invest in other flexibility options like utility scale batteries or gas peaking plants.

Several interconnection projects in the CEE are already in discussion, including the [Latvia-Estonia hybrid off-shore interconnector](#), [Lithuania-Poland high voltage direct current \(HVDC\) line](#), [Poland North-South HVDC bridge](#), [Black Sea Corridor](#), [Central Balkan Corridor](#), Romania-Hungary HVDC link, and priority corridors from the updated [TYNDP 2024](#) such as North-South Electricity Corridor in Eastern Europe and Baltic Energy Market Interconnection Plan. But these aren't necessarily aligned, nor on the top of the political agenda, which can be problematic for their ultimate realisation.

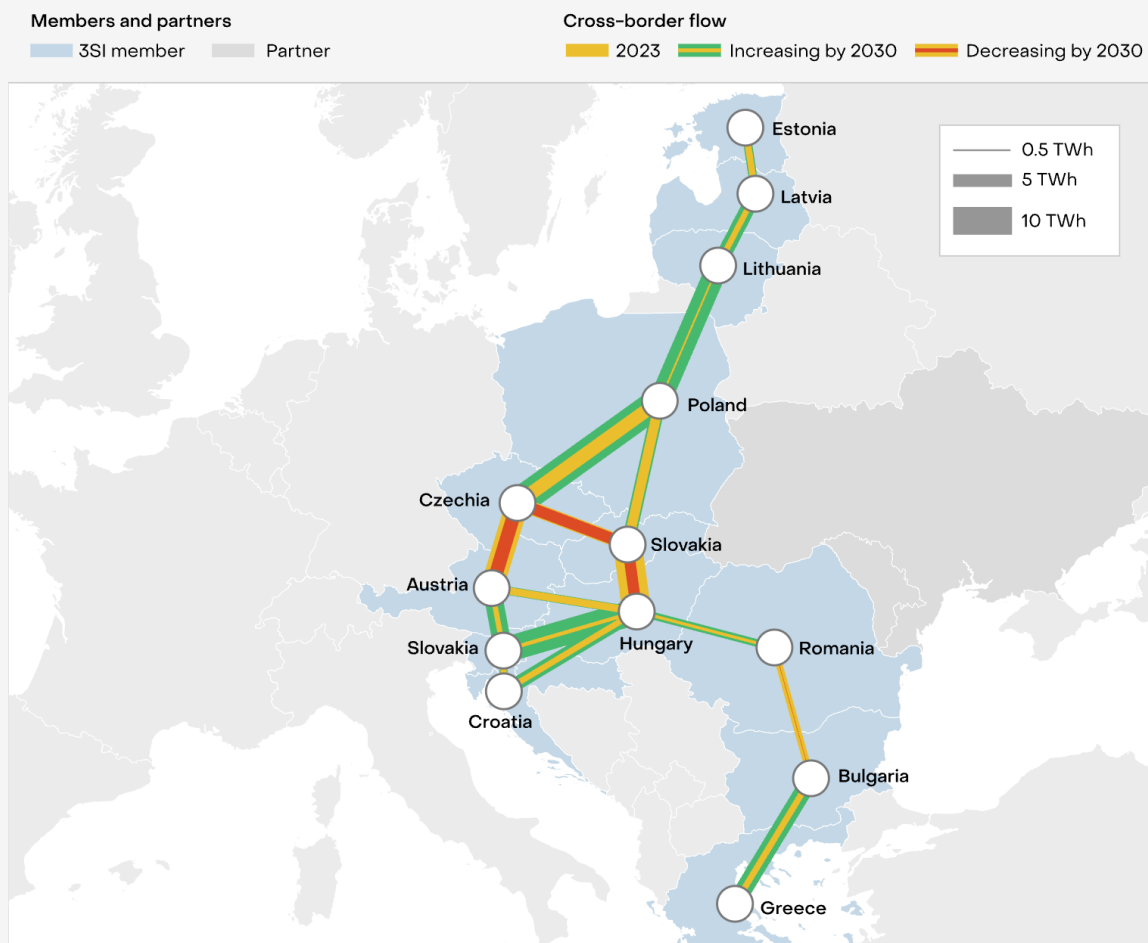
In addition to the higher WACC and elevated inflation levels, CEE grid operators are [struggling to access EU funds](#), citing associated administrative bottlenecks. This is with the caveat of the 2021-2027 Connecting Europe Facility (CEF)-energy being [reduced](#) from the Commission's initial proposal and kept to this level despite the 2022 TEN-E revision expanding its scope to include several new categories. This means there will be less public money available for upcoming cross-border projects, amplifying the need for private equity.

### **Aligning infrastructure with shifting regional dynamics**

The need for interconnection will only increase in Three Seas Countries. This is especially true in Central and Eastern Europe, where planned interconnection capacity expansion is still [minor](#) compared to western Europe. [Ember's modelling](#) indicates that annual cross-border electricity flows between 3SI countries are expected to increase by 53% between 2023 and 2030 as wind and solar projects are rolled out in line with 'high' industry forecasts. To meet this demand for interconnection capacity, new cross-border investments will be needed.

## Cross-border electricity exchange between Three Seas countries will increase on the North-South axis

Cross-border electricity flows in 3SI countries in 2023 and 2030 (projected)



Source: PyPSA-CEE model, Annual electricity data, Ember  
 3SI member countries include: Estonia, Latvia, Lithuania, Poland, Czechia, Slovakia, Hungary, Slovenia, Croatia, Bulgaria, Romania, Austria and Greece

This trajectory is part of a wider shift in the regional balance. The Baltic States are already turning from electricity importers into exporters, and this will be further amplified by the development of offshore wind farms, with more power to export. The closer integration of Ukraine, Moldova and the [Western Balkans](#) with the EU electricity market will also open new transit routes. This could potentially incentivise neighbours like Czechia, Slovakia and Hungary, who are hesitant to fully embrace the energy transition despite having the ideal location for facilitating power transits as well as selling renewable electricity across borders.

## Conclusion

# Recommendations

The Three Seas Initiative's objectives of enhancing cross-border collaboration and North-South connectivity means that 3SI is perfectly positioned to facilitate large cross-border energy projects that require a variety of funding sources.

Despite the energy security opportunities related to cross-border power exchange, however, just [one](#) out of [forty-one](#) 3SI priority projects have been dedicated to regional electricity interconnection. Instead, twenty projects have been dedicated to diversifying natural gas supply, which only doubles down on this external dependency. Renewables investments are equally underrepresented in the Three Seas agenda. This represents short, and at best, medium term thinking without proper consideration of the long-term trends and needs beyond 2030 - in particular the expected [decrease in gas demand](#).

This year's Summit provides a unique opportunity to align the 3SI's objectives with the updated energy transition plans of 3SI members, especially under the presidency of Lithuania, a renewables leader not only among CEE countries, but the wider Europe.

## Key recommendations

### 1. 3SI Transmission highway

The strengthening of electricity interconnection on the North-South axis, from Estonia to Greece, allowing for efficient transport of electricity from offshore wind farms in the Baltic, Black and Adriatic seas to demand centres inland. An umbrella megaproject could combine the projects already in discussion and put it higher on the political agenda, ensuring its timely execution.

### 2. Offshore wind declaration

Recognising the potential of 3SI's offshore wind resource, which is especially relevant given that the whole initiative was built around the Baltic, Black and Adriatic seas. The declaration should set targets aligned with the project pipeline, ensuring related infrastructure is built on time – including ports, grid connections and supply chain elements.

### **3. One stop shop to streamline cross-border grid projects**

Overcoming administrative bottlenecks CEE TSOs are facing with EU funds, including access to the Connecting Europe Facility (CEF). Furthermore, TSOs would coordinate with existing long-term financing programmes under international financial institutions such as 3SIIF, [EIB](#), DCF, Nordic Investment Bank, [EBRD](#), World Bank, and KfW that could increase the efficiency of the funding mechanisms and encourage commercial banks to increase long-term lending capacity for infrastructure projects.

### **4. 3SI joint bonds for clean energy projects**

Proposing a 3SIIF joint or pooled bond for financing projects contributing to regional energy transition with cross-border implications, including wind and solar farms and interconnectors. The main objective is to smooth and reduce the wide variance in costs of capital across 3SI countries.

### **5. Facilitating the integration of Ukraine, Moldova and Western Balkans**

Being immediate neighbours, 3SI countries are best placed to support the integration of Ukraine, Moldova and Western Balkans into the EU electricity market. This could include facilitating the ETS and CBAM discussions or proposing PCI and 3SI priority projects that would expand interconnection capacities on the EU-WB-UA borders.

As 3SI countries exit from fossil fuels, electrification and sector coupling driven by clean technologies will provide new opportunities for local communities. Going forward, the expansion of wind and solar can lead to independence from fossil fuel imports and turn the CEE region into a clean energy hub. This will improve the bloc's energy security in the face of war, while also strengthening grid resilience, local economies and fostering innovation in an increasingly electrified world in the long term.

## Acknowledgements

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## Supporting Materials

# Methodology

### Generation and capacity data

\*Solar capacity is now provided in GWdc, both for 2023 and 2030. If provided in GWac, NECP solar capacity data was converted to GWdc with a 1.25 conversion factor. If unspecified in the NECP, GWdc were assumed.

Wind and solar capacity for 2023 from [WindEurope](#) and [SolarPower Europe](#), in the latter case the numbers need to be treated as preliminary and are likely to increase.

NECP data from Ember's regularly updated [NECP tracker](#). Where data was missing in the 2023 NECP drafts (especially in the cases of Austria and Latvia), 2019 NECP values were used instead.

2023 electricity generation and cross-border flow data from [Ember's European Electricity Review 2024](#).

### Offshore wind projects in development

Data on offshore wind project development pipelines came from a number of sources, mainly:

- Baltic States - [report by Netherlands Enterprise Agency](#) (2023)
- Poland - [report by Polish Wind Energy Association](#) (2022)
- ENTSO-E [Offshore Network Development Plans](#) that contain non-binding offshore wind targets for all coastal EU countries

### Modelling of cross-border flows

The forecast of interconnection flows in 2030 comes from Ember's [PyPSA-CEE](#) EU-wide open power system model developed using the [PyPSA](#) framework. The results and input data are publicly available under the [MIT](#) licence, allowing for all analysts to replicate our results or build their own scenarios for Europe's future energy system.

Details of the modelling assumptions and input data are provided in the ['In it together'](#) report, this study uses the ambitious scenario, as described extensively in the link above.