

Energy Market Redesign For a Decarbonised Europe



Redesigning the electricity market is crucial for Europe to achieve its net-zero targets.



"The EU electricity market system does not work anymore. We have to reform it. We have to adapt it to the new realities of dominant renewables."

Ursula von der Leyen (2022)

President of the European Commission

Achieving Europe's deCarBonisation goals

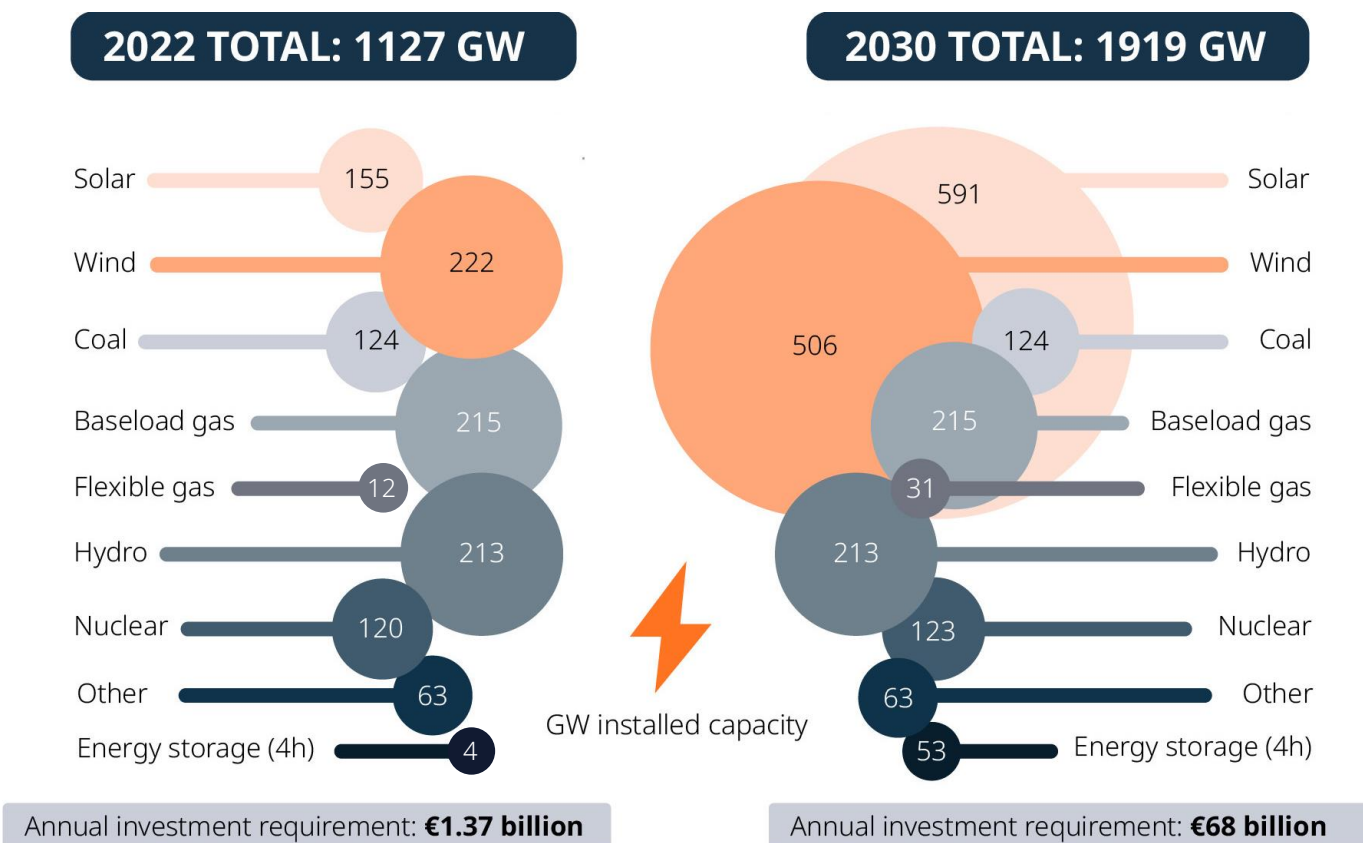
It's not as easy as A, B, C.
But it can be sorted out.

Renewable energy hampered by insufficient flexible balancing power capacity

For the EU to achieve its net zero targets and improve energy security, the European Commission needs to reform its electricity market design to place a value on flexible balancing power capacity.

The increasing share of renewables in the global energy system has led to an increase in curtailment. For example, in 2020, Germany alone had to curtail 6,146 GWh of renewable energy, resulting in a cost of €761.2m paid in compensation to operators.

Europe will require at least 1,100 GW of renewable capacity by 2030 to continue its decarbonisation journey and increase energy security



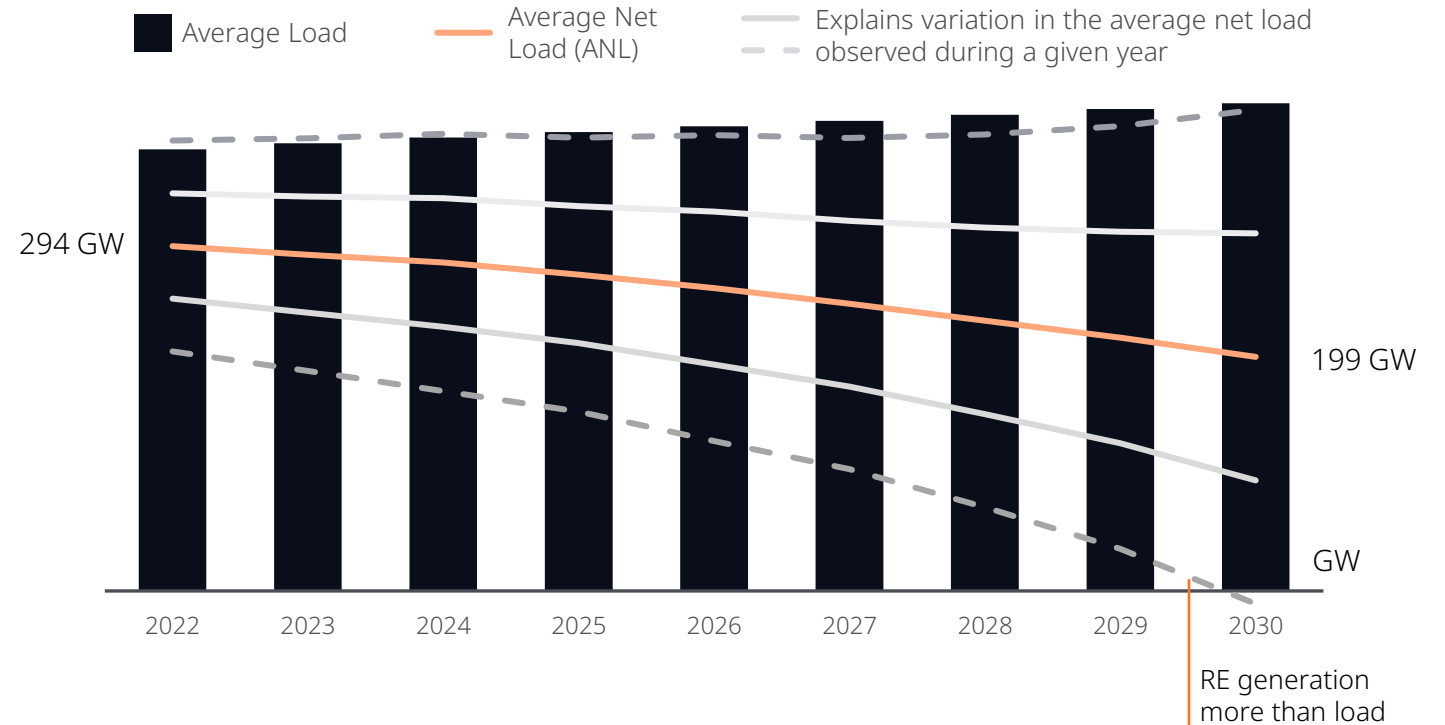
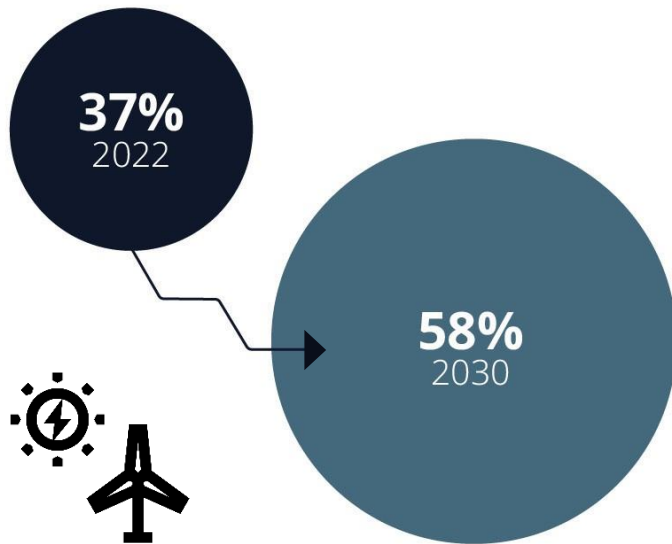
Achieving climate goals and security of supply requires a substantial increase in capacity across both renewables and balancing power capacity.

Note: (1) Battery Storage system is a 4-hour storage system. The capacity addition between 2022 and 2030 is based on the accelerated renewable scenario, i.e., the total RE capacity in EU is ~1100 GW by 2030 as defined in REPowerEU plan. The annual capacity additions results are based on PLEXOS modelling. (2) Future LNG and other imports include LNG imports and additional gas supply availability from Algeria and Norway pipeline.

Source: PLEXOS Modelling, BNEF, IHS Markit Presentation on Gas Outlook.

Balancing a 1,100 GW renewable system

The inherent variability of renewables means the capacity supplied by a system powered by 1,100 GW of wind and solar could vary by as much as 500 GW over the course of a year. Flexible balancing power capacity is urgently needed to plug the supply gap during these periods of imbalance.



Increasing the **share of renewables** in the energy mix in Europe...

..will **increase energy imbalances in the system**, which is why flexible balancing power capacity will be needed.

Net load is the difference between the load and generation from variable renewable sources (Solar and Wind) at a given point in time. The upper and lower boundaries of the net load represent the extreme variations observed in net load during the year. Two standard deviations was used as a measure to estimate extreme variation.

The energy future is renewable
– investments in flexible balancing capacity is needed to achieve it

Relying only on wholesale prices and current market mechanisms is not sufficient to attract investments in flexible technologies with low running hours.

- The existing capacity market model does not value flexibility, as the marginal cost of electricity in the system does not recover investments in new power plants.
- The investment case for flexible capacity could become more challenging in future, as rising renewable capacity causes price and revenue depression.

“For the EU to continue to benefit from the competitive cost of renewable energy, we urgently need market reform to ensure security of supply and to give clear market signals to investors to encourage much greater investment in flexible balancing power technologies.”

Håkan Agnevall, President & CEO Wärtsilä



Accelerating investments in flexible balancing power can save costs and reduce carbon emissions

For a renewable-based system of this scale to run reliably, it must be supported by 19 GW of new flexible gas capacity and 50 GW of energy storage to deliver power at times of low generation. To enable 100% renewable energy systems, the grid balancing gas engines can be converted to run on sustainable fuels such as hydrogen, when these become readily available.

By accelerating investments in flexible balancing power capacity, EU can achieve its 1,100 GW renewable target by 2030, accumulatively saving in 2023-2030 approximately:



~ €100 Billion



~ 1014 Million tonnes CO₂

Accumulative savings here are compared to a scenario where only half as much new renewable capacity is built.



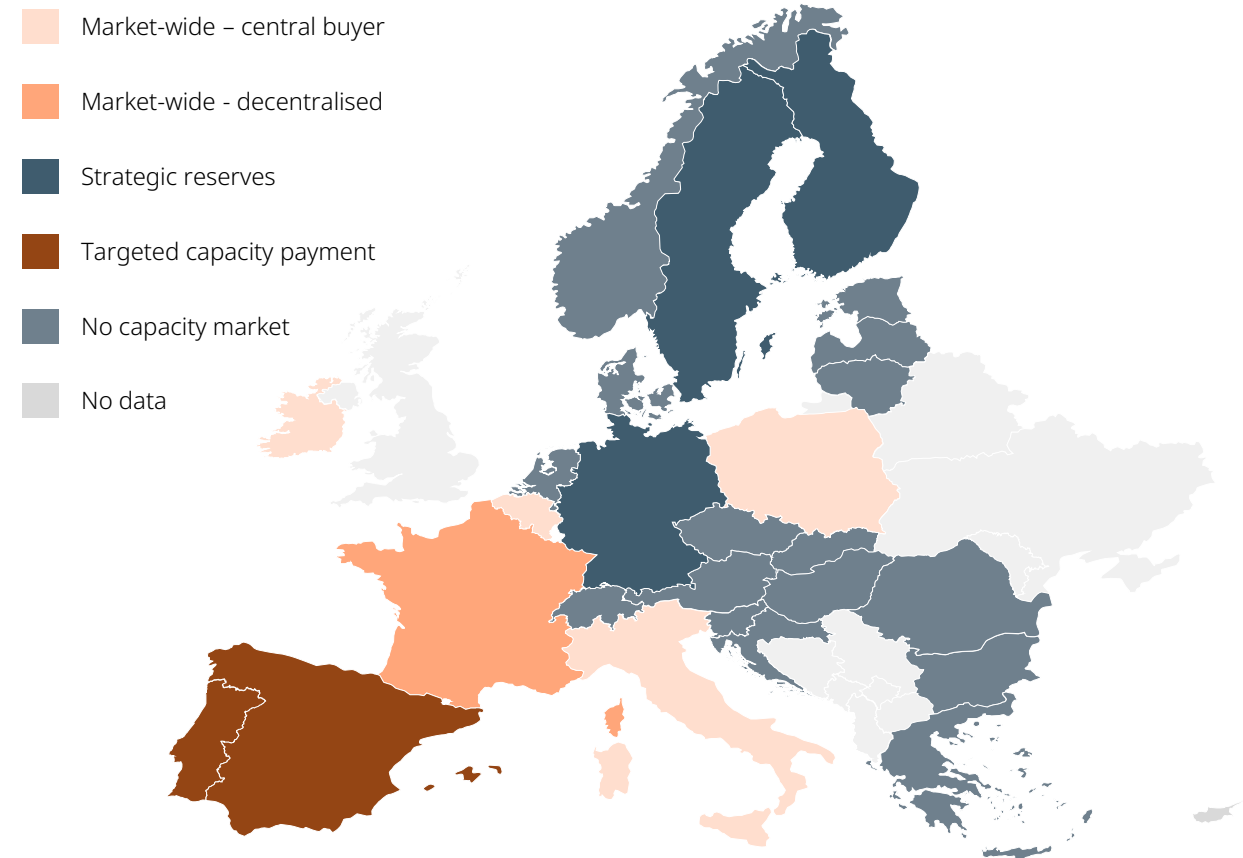
Shifting to a capability market

- 8 EU Member states have active capacity mechanisms, namely: Belgium, Finland, France, Germany, Ireland (I-SEM)⁴⁴, Italy, Poland and Sweden.
- Europe has invested upwards of 4.7 billion EUR in 2021 to add new capacity to the system.
- However, this has predominantly been delivered by new inflexible fossil fuel baseload assets which are incompatible with intermittent renewables.

€4.7 billion

Invested in inflexible baseload assets to deliver capacity

I-SEM refers to the Irish single energy market that includes the electricity systems of both Ireland and Northern Ireland.



Source: ACER Market Monitoring Report, Team Analysis

Key recommendations for Europe's energy market redesign

- 1 Define a technology agnostic regulatory framework - creating a new capability market to attract investments in flexible balancing power capacity to support renewables
- 2 Improve price transparency to stimulate growth for flexible balancing power capacity services to support renewables
- 3 Enable strong, granular price signals



1 Define a technology agnostic regulatory framework - creating a new capability market to attract investments in flexible balancing power capacity to support renewables

Challenge

Europe has invested upwards of 4.7 billion EUR over recent years to add new capacity to the system, however, this has predominantly been inflexible fossil fuel baseload assets which are costly and incompatible with intermittent renewables. These investments occurred against the backdrop of current mechanisms which guarantee generation capacity but do not consider how well it facilitates renewable energy targets.

Solution

It is, therefore, imperative to put in place a capability market in Europe that will drive investments in balancing plants. A capability market would reward power plants that provide reliable firm capacity and offer well-defined operational attributes that enable them to provide essential services to the electrical system to maintain grid stability. Such attribute-based capacity addition is a more targeted and efficient way to drive investment in the generation assets of the future.

2 Improve price transparency to stimulate growth for flexible balancing power capacity services to support renewables

Challenge

Existing inflexible technologies which today provide support services to the grid, such as coal, nuclear or Combined Cycle Gas Turbines, are designed to run at full load for long periods. This makes them unsuited to balance renewable-based grids which demand agile reserve power that can dynamically ramp up and down as needed. This leads to higher system costs, as assets are running longer than is required, and the unnecessary burning of fossil fuels, as renewables are curtailed in favour of inflexible fossil fuels.

Solution

We should provide transparent prices for support services which offer clear investment signals to stimulate the growth of flexible, sustainable solutions.

3 Enable strong, granular price signals

Challenge

The current electricity pricing system lacks transparency as it sets uniform prices across a large region without taking into account transmission limitations that affect the flow of electricity. This leads to higher costs for maintaining supply and demand balance, as the system operator is forced to continually adjust the dispatch of power plants.

Solution

To address this, a more granular pricing system is needed, one that accurately reflects local supply and demand conditions at different locations within the grid, while taking into account the available transmission network. This will not only provide a clear picture of electricity prices, but also promote competition and enable efficient allocation of resources in the electricity market.

The design of the EU's current incentives for investment in flexible balancing power capacity risk undermining investment, causing a bottleneck in the energy transition.

Our modelling shows that the investment case for flexible balancing power capacity could become even more challenging in the future without the right market pricing mechanisms for balancing power.

Redesigning the electricity market is crucial for Europe to achieve its net-zero targets.





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