



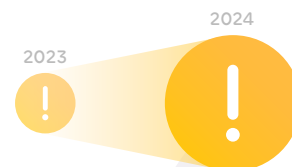
# Electricity



## Too slow

Electricity powers modern societies, and its importance will only increase over time with the electrification of demand sectors. Renewable energies and their integration into the system are crucial.

# 4.1 Electricity



**Past progress:** The power sector decarbonisation continues to be **too slow** to be in line with the EU’s long-term climate target, unchanged from last year’s report. The increase in coal power generation in the aftermath of the energy prices crisis has temporarily increased emissions. But favourable weather conditions, continued uptake of renewable energy sources (RES) and lower demand have allowed the emissions to fall again in 2023. In many important areas that are enabling the transition of the electricity sector, the trends do not show sufficient progress yet. This includes investments into grid infrastructure, digitalisation efforts such as smart meters, the provision of non-fossil flexibilities, especially storage and demand-side management (DSM) or electrification of demand sectors.

**Policy context:** The EU has put policy frameworks in place in all major areas addressed in this report. The updated RES targets, permitting rules and revised guidance for power market design rules aim to further strengthen RES uptake. Other policy areas are far less advanced. Digitalisation and grid development are mainly supported at the EU level through the initiation of planning processes, but the slow uptake points to insufficient policy and/or implementation. While non-fossil storage and DSM have seen a significant policy push at the EU level, a trend towards fossil flexibility solutions, especially fossil gas, can be observed in capacity markets. The EU, through its taxonomy and other policies, is sending the wrong policy signals, enabling continued investments into fossil gas.

**Areas of action:** Member States need to update their currently largely insufficient RES targets in line with the RED III. A related proper national policy design, including policies to remove barriers for wind energy and to implement Contracts for difference (CFDs) would support continued RES uptake. Similarly, Member States need to further develop schemes to enable the uptake of non-fossil flexibility options, such as the creation of a level playing field in market-based solutions such as capacity mechanisms, and should consider setting flexibility targets. Efforts to enable the digitalisation of the grid, such as faster rollout of smart meters, need to be intensified and investments into the grid increased. All this needs to be paralleled by continued planning and coordination from EU level entities, such as the Agency for the Cooperation of Energy Regulators (ACER) and the EC.

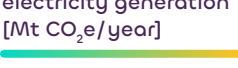

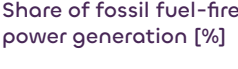

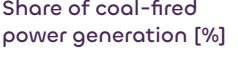



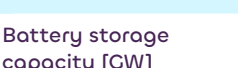

**Table 4: Progress in electricity towards the objective and enablers**

OBJECTIVE	ENABLERS		
Decarbonising electricity supply and phasing out fossil fuels 	Reforming electricity markets 	Building out, digitalising, and enhancing the grid 	Increasing demand and supply flexibility 

Note: Large circles show the progress classification of this year and small circles the one from last year’s progress assessment. Arrows indicate positive or negative changes in classification. See Table 35 for further information.

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Table 5: Details on indicators' past progress and required change

2023 ▼	2024 >	Historical data			Required change	
		Time period	Relative change p.a.	Absolute change p.a.	Benchmark	Absolute change p.a.
<b>OBJECTIVE: Decarbonising electricity supply and phasing out fossil fuels</b>						
 		GHG emissions of electricity generation [Mt CO <sub>2</sub> e/year]	2018–2023 (EEA, 2023b; Ember, 2024b)	-5.5% per year	-40.9 Mt per year	265.9 Mt in 2030 -47.4 Mt (2023–2030) → 1.2 times faster
 		Share of fossil fuel-fired power generation [%]	2018–2023 (Ember, 2024b)	-3.3% per year	-1.3%-points per year	17.1 % in 2030 (EC, 2020l) -2.2% points per year (2023–2030) → 1.8 times faster
 		Share of gas fired power generation [%]	2018–2023 (Ember, 2024b)	-0.5% per year	-0.1%-points per year	n/a n/a
 		Share of coal-fired power generation [%]	2018–2023 (Ember, 2024b)	-6.8% per year	-1.1%-points per year	n/a n/a
<b>ENABLER 1: Reforming electricity markets</b>						
 		Share of variable renewable electricity [%]	2018–2023 (Ember, 2024b)	11.6% per year	2.2%-points per year	47% in 2030 (EC 2020k) 3.1%-points per year (2023–2030) → 1.4 times faster
 		Electricity interconnector capacity for cross-zonal trading [%]	n/a	n/a	n/a	70% of capacity (ACER, 2022) n/a
<b>ENABLER 2: Building out, digitalising, and enhancing the grid</b>						
 		Investment into power grid [mEUR/y]	2021–2022 (EIB, 2024)	n/a	n/a	84 bn Euro per year between 2031–2040 (EC, 2024j) n/a
 		Share of electric smart meters [%]	2018, 2021, 2022 (Berg Insight, 2022, 2023; EC, 2020e)	14.8% per year	5.7%-points per year	n/a n/a
<b>ENABLER 3: Increasing non-fossil demand and supply flexibility</b>						
 		Battery storage capacity [GW]	2017–2022 (IEA, 2023h)	97.2% per year	1.3 GW per year	38 GW in 2030 (EC 2020k) 3.4 GW per year (2023–2030) → 2.5 times faster
 		Non-fossil participation in capacity markets [%]	2019–2023 (ACER, 2023b)	-7.2% per year	-4.9%-points per year	n/a n/a
 		Flexible power demand [GW]	n/a	n/a	n/a	n/a n/a
 		Share of electricity in final energy demand [%]	2017–2022 (Eurostat, 2024q)	0.09% per year	0.02%-points per year	49.5 % in 2050 (EC, 2024j) 1.2%-points per year (2023–2050) → 56 times faster

Note: Icons indicate progress classification of this year's progress assessment and coloured lines the change in classification; See Table 35 for further information. n/a indicates that data are not available.

Source: ©ECNO.

## Objective: Decarbonising electricity supply and phasing out fossil fuels

**Past progress:** Due to a temporary increase in 2022, power sector emissions have moved off track. However, 2023 has seen a reversal of this trend thanks to a growth in renewable electricity generation caused by a continued build-out of RES and favourable weather conditions (see enabler 1), but also due to decreasing electricity demand (Ember, 2024b). The phase out of fossil fuels continues to progress **too slowly**, and needs to double in speed by 2030 (see Table 5) (ESABCC, 2024). The share of coal generation increased both in 2021 and 2022 due to the energy crisis, but this trend was reversed in 2023, putting the EU back on track for a coal phase-out by 2035, which is five years later than the IEA net zero scenario suggests for the EU (IEA, 2023h) and two years behind the latest phase-out targets set by those Member States that have a target (Ember, 2024b). The share of gas has decreased over the last four years, but only started to decrease significantly in 2023. A continuation of the trend for gas power generation would not allow the EU to reduce unabated gas to zero by mid-century, let alone by 2035, as suggested by the IEA (2021b).

### Indicators:

- GHG emissions of electricity generation
- Share of fossil fuel-fired power generation
- Share of gas fired power generation
- Share of coal-fired power generation

**Policy context:** The EU Emissions Trading System (EU ETS) continues to be a major backbone for phasing out coal, and to a lesser extent gas. Recently it was revised to better align with the EU Climate Law's GHG emissions reduction targets – the annual linear emissions reduction factor was nearly doubled from 2.2% to 4.3% in 2024 and 4.8% in 2028. Despite this reform, the ETS price has decreased from a 2023 high of between 80 and 100 EUR/tCO<sub>2</sub> to around 60 EUR/tCO<sub>2</sub> at the beginning of 2024, likely due to the significant amount of surplus still in the system (EC, 2023k). At the same time, while the majority of Member States committed to phasing out coal by 2033 at the latest (Ember, 2024b), there is a lack of guidance from the EU to support Member States in reaching their targets (ESABCC, 2024). Other mechanisms that contribute to further reduce the role of fossil fuels include the proposed revision of the Energy Taxation Directive (EC, 2021h) or the Taxonomy Regulation.

**Areas of action:** The EU needs to further reform the ETS, including preparing the carbon market for when the cap reaches zero (ESABCC, 2024) and reducing its complexity (Borghesi et al., 2023). For advancing the coal phase-out, the EU should outline EU fossil fuel phase-out targets in line with the long-term strategy and/or support Member States with their own targets. Remaining loopholes that continue to enable fossil gas investments, such as the inclusion of fossil gas as a sustainable investment under the taxonomy or vaguely formulated condition (e.g. concerning CCS readiness, blending of fossil gas with hydrogen, or definition of low carbon gases as only partially reducing GHG emissions), need to be addressed. Additionally, direct or indirect subsidies, such as under the Temporary Crisis and Transition framework, need to be discontinued and the EU Industrial Emissions Directive could be further reformed to exploit synergies between depollution and decarbonisation (ESABCC, 2024).

## Enabler 1: Reforming electricity markets

**Past progress:** The share of the variable renewables, wind and solar, in electricity generation continues to increase, but progress is still **too slow** for the EU's trajectory toward climate neutrality (Table 5). On average, it increased 2.2%-points per year over the last five years, a significant increase of 0.6%-points over last year's report and the reason why the enabler moved from **"far too slow"** to **"too slow"**. Build-out of wind continues to be moderate at 17 GW in 2023 (WindEurope, 2024) at about half of what the IEA (2022a) suggests is needed, but together with favourable wind conditions in 2022 and 2023 compared to 2021 (Ember, 2024b) contributed to an average increase of 1.2%-points per year. Solar continues to surpass its forecasted installed capacity figures at 56 GW new capacity in 2023 (IEA, 2022a; SolarPower Europe, 2024), contributing 1%-points per year to the increase. While the integration of European electricity markets is a central part of the market design reform to enable the uptake of renewables, there continues to be a lack of indicators with good data quality and data availability (EC, 2023af).

### Indicators:

- Share of variable renewable electricity
- Electricity interconnector capacity for cross-zonal trading

**Policy context:** The EU has intensified its efforts to address the major barriers to RES deployment (IEA, 2022a). The RED III sets an updated EU wide RES target of 42.5% by 2030 (aiming for 45% and including a capacity target for innovated RES of 5%), requiring Member States to transpose its provisions into law within 18 months. The Directive also includes provisions on speeding up permitting procedures (along with EC, 2022a) by establishing common rules, creating renewable acceleration areas and providing technical assistance to Member States on the matter (ESABCC, 2024). The new close-to-adoption Electricity Market Design Rule (EC, 2023af) further clarifies that Member States are to use 'Contract for Differences (CFDs)' as the instrument to support renewable uptake, and further supports the establishment of long-term contracts. Furthermore, the EU also explicitly targeted wind power deployment under its Wind Power Action Plan (EC, 2023o), and the improvement of the RES value chains through its Net Zero Industry Act proposal (ESABCC, 2024) (see 4.8).

**Areas of action:** With key policies in place to address the major barriers to renewable uptake, the EU should intensify its efforts in supporting innovative zero-carbon energy solutions through, for instance, changes to the market design. In addition, Member States must translate EU policy into national policies to have any impact, which the EU should further facilitate through coordination and harmonisation of market design and support mechanisms across Member States. National implementation should aim at including stable support schemes structured as CFDs and the continued removal of barriers especially around permitting and citing. This is especially important for wind energy through, for instance, well-designed permitting processes with stakeholder engagement (ESABCC, 2024).

## Enabler 2: Building out, digitalising, and enhancing the grid

**Past progress:** Investments into the electricity grid continue to increase in the EU (IEA, 2023g), but it remains difficult to judge to what extent these are sufficient to be in line with the long-term climate target due to a mismatch in the scope of the data (EC, 2018, 2020l, 2024j). Other studies suggest that grid investments need to increase by between 15% (EC, 2020k), 50% (ESABCC, 2024) or even need to double if electrification is to become a stronger backbone (Kreusel et al., 2022). There is a consensus that significant investment is required, particularly for the distribution grid. (ESABCC, 2024; Rack, 2021). The share of smart meters, enabling prosumer participation and being an instrumental part for the digitalisation of the grid, continues to grow, but at a pace that is **far too slow**.

### Indicators:

- Investment into power grid
- Share of electric smart meters

**Policy context:** The Grid Action Plan (EC, 2023t) identifies measures to accelerate investments, including improved access to finance, faster permitting, better long-term planning and the identification of project of common interest (PCIs). The revised TEN-E Regulation addresses cross-border links and smart grids as the backbone of EU electricity planning. It includes provisions for faster permitting of transmission projects and provides an incentive structure for certain types of transition projects (ACER, 2023a). The EU continues to work on its Ten-Year Network Development Plan (TYNDP) (ENTSO-E; ENTSO, 2023), aiming to better harmonise grid planning across the EU. It will be published by the end of 2024 but has already been criticised for not being aligned with the long-term climate target of the EU (ESABCC, 2024). The EU action plan on digitalising the energy system (EC, 2022d) lays out important measures, such as increasing consumer control through digital tools.

**Areas of action:** The Grid Action Plan is a step in the right direction but now needs to be implemented to ensure investments are happening. A continued coordination and integration of grid planning, in light of achieving the climate targets, is needed as well as a stronger focus on operating the electricity system as a whole (ESABCC, 2024). The EU should continue to support Member States in identifying and developing grid projects, with a focus on permitting and/or other means of risk mitigation. The EU should also support countries in identifying and implementing the most cost-efficient grid projects, including those that could reduce costs but are currently missing (ACER, 2023a; ESABCC, 2024). Furthermore, the EU needs to continue to support Member States in overcoming barriers to the implementation of the digitalisation plan. Electrification needs to be accelerated significantly and prioritised, where possible, over hydrogen solutions, which currently sometimes seem to have a higher priority (ECNO, 2024c). Effective direct electrification support is a major gap at the EU level (ESABCC, 2024).

## Enabler 3: Increasing non-fossil demand and supply flexibility

**Past progress:** There continues to be a lack of comprehensive data on demand and supply flexibility. Indicative targets for energy storage suggest a need of 200 GW by 2030 (EC, 2023al); similar figures do not exist for demand flexibility. A look at the development of battery storage capacity highlights that progress is **far too slow** (Delta-EE, 2022; IEA, 2023h). This is especially critical as flexibility needs are predicted to double by 2030 (EEA & ACER, 2023; ESABCC, 2024). Non-fossil flexibility is decreasing in existing capacity mechanisms (mainly due to the introduction of the natural-gas focused mechanism in Italy in 2022), i.e. heading in the **wrong direction**, and new flexibility sources such as DSM, dispatchable RES and storage, start from a low level and are picking up far too slowly. Also, electrification is advancing **far too slowly**, with the share of electricity in energy consumption having stagnated in the last five years.

### Indicators:

- Battery storage capacity
- Non-fossil participation in capacity markets
- Flexible power demand
- Share of electricity in final energy demand

**Policy context:** The EU continues to mainstream storage and DSM across a broad set of Directives (RED III, EED, EBPD). The RED III addresses faster permitting of storage facilities, including designated areas, the integration of DSM, such as EVs, workforce development and a level playing field for participation in energy markets amongst other things. The close-to-adoption Electricity Market Design Rules (EC, 2023af) would further support the creation of a level playing field for flexibility services, thus enabling market-based solutions for DSM and energy storage. Both documents call on Member States to support DSM and storage, with further guidance provided on how Member States can support energy storage (EC, 2023al). Furthermore, system operators are currently working on new rules that aim at facilitating the market participation of flexibility options (EEA & ACER, 2023). Hydrogen, which is also likely to play an important role in future flexibility, has seen a significant push in the RED III and EC communications (EC, 2020c, 2022l, 2022f). Electrification of end-use sectors is encouraged through the RED III and particularly sectoral policies.

**Areas of action:** While the EU has taken significant actions to enable storage capacity uptake with notable success, its efforts to support DSM have been far less successful. As a first step, the EU could set clear targets for energy storage and DSM at the EU level (Colthorpe, 2022). Creating a level playing field for flexibility options through, for instance, further reforming (and implementing) capacity mechanisms or strengthening of short-term markets is essential to ensuring the uptake of these options. Furthermore, there is a need for a push in innovation, especially around long-term storage capacity. The EU needs to continue to help Member States to identify and overcome barriers and foster collaboration to provide better flexibility services, especially at the distribution grid level. DSM, as the most cost-effective option for flexibility, should be considered more, removing barriers to involvement of consumers (ESABCC, 2024). The EU should support Member States in passing incentives for consumers to actively adopt their consumption, thus enabling the electrification to be flexible (EEA & ACER, 2023).