

Thematic fiches

ENERGY

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Renewable energy

1. State of play

With the adoption of the revised Renewable Energy Directive (“revised RED”) in autumn 2023, the legislative framework to achieve the targets set under the European Green Deal and REPowerEU is in place with a binding EU-target of 42.5% by 2030 (and an aspiration to go to 45%). The revised directive includes provisions to improve planning, speed up and simplify permitting procedures for renewable energy (RES), storage and grids, to strengthen sector integration and bioenergy sustainability and to promote and RES deployment in heating and cooling, transport and industry where progress so far has been slow in comparison with the power sector. The newly adopted Electricity Market Reform will facilitate the deployment of renewables especially via new provisions to promote Power Purchase Agreements and two-way contracts for difference. Furthermore, the Net Zero Industry Act (‘NZIA’) will provide support to strengthen EU manufacturing of RES technologies among other means by using non-prince criteria in renewable energy auctions.

In the past years, the overall RES share grew from 19.9% in 2019 to 23% in 2022 (latest available official numbers), mainly due to a jump from 34% to 41% in the power sector. Member States’ level of RES development ranges widely, from very high RES shares of 66% in Sweden, 48% Finland, 43% Latvia and 42% Denmark to less than 14% in Belgium, Ireland, Luxembourg and Malta. The EU is far above the global RES electricity average (30% in 2023).¹ . According to Eurelectric, in the first half of 2024, renewables generated more than 50% of all power generation in Europe.² 56 GW of solar and 16,1 GW of wind were installed in 2023, up from 41 GW and 16 GW, respectively, in 2022.

This additional renewable energy capacity, together with the improved legal framework, in particular for permitting, contributed to reduce the increase in energy prices following the Russian war against Ukraine. Following the adoption of the Emergency Regulation on permitting in December 2022 we have seen speedier permitting already in 2023. E.g., Germany permitted 7.5 GW of wind, a 70% increase from the previous year with a similar trend in Spain with permits for over 3 GW granted in 2023, again a 70% surge compared to 2022.

Moreover, with the increasing share of renewables in the EU’s electricity system, electricity prices depend less and less on the price of imported natural gas. In hours where the cumulative share of wind and solar reach 40%-50%, wholesale prices decrease significantly, even reaching zero as the renewables share rises. Meeting the 2030 EU renewable energy targets will thus lead to much

¹ <https://ember-climate.org/press-releases/world-passes-30-renewable-electricity-milestone/> (There are no comparable statistics for overall renewable energy use internationally)

² https://www.eurelectric.org/news/eugreenest_power_mix#:~:text=In%20the%20first%20half%20of,growth%2C%20deindustrialisation%20and%20mild%20weather. (it is important to note that this increasing trend occurred in a context of lower electricity demand)

lower wholesale electricity prices that are largely independent from the price of natural gas. Even countries with relatively lower shares of renewables will benefit from this cheaper electricity through interconnections.

In this regard, further deployment of RES and its benefits are likely to be increasingly hampered by curtailment, lack of sufficient flexibility or available grid capacity, affecting the business case for investors. For the accelerated renewables deployment to continue, a more flexible and decentralised electricity system is needed that can smoothly absorb this additional generation in efficient way (with more and smarter grids and with flexibility and storage assets to defer generation to hours with more demand and more reactive demand that can shift consumption to the cheapest hours).

2. Ongoing / Open files / Implementation

The delivery of the remaining final NECPs and their assessment in the coming months will show if there will be an **ambition gap for achieving the renewables EU-wide binding target**. Depending on the existence and size of a gap in the final plans, the Commission will need to take action in order to ensure the collective achievement of those objectives and targets.

The **transposition of the 2018 recast Renewable Energy Directive** (RED II, predating the revised RED) is still not complete in many Member States, with ~~26~~ open non-transposition infringements . The Commission will continue to work with the Member States to solve the remaining issues and move to closure of these cases or refer Member States to Court. The conformity check of the RED II provisions will also have to be done during this mandate, as well as the transposition check of the revised RED, which will start in september 2024 with the checks of most permitting provisions (which had transposition deadline on 1 July 2024).

Linked to both RED II and the revised RED, there are **a number of delegated and implementing acts that need to be developed or reviewed** during this mandate, among which the review of the RFNBO delegated act³ and the review of the implementing regulation on sustainability certification⁴. In addition, many voluntary schemes will be seeking Commission recognition (via implementing acts) for compliance with the RED rules for sustainability certification. The delegated act on Indirect Land Use Change (ILUC)⁵ , which currently qualifies only palm oil for phase-out, will also have to be revised during the mandate. Moreover, the implementation of the Union database ('UDB') for traceability of liquid and gaseous renewable fuels throughout the supply chain will be in progress. Also under NZIA, several important implementing and delegated acts need to be developed of which the implementing act further specifying the non-price criteria for auctions is of specific importance for the deployment of renewables and the support for EU manufacturing of renewables technologies (to be adopted by 30 March 2025).

³ Commission Delegated Regulation (EU) 2023/1184

⁴ Commission Implementing Regulation (EU) 2022/996

⁵ Commission Delegated Regulation (EU) 2019/807

3. Key challenges

- a) **Risk of ambition gap** (if total contributions do not reach 42.5% EU RES target; this was the case for draft NECPs) in final NECPs, which will require the Commission to quickly propose measures to close the gap. If the EU as a whole falls below the expected trajectory in 2025 and 2027 (data to be known by end 2026 and 2028), underperforming Member States need to take action;
- b) **Challenges for the deployment of RES projects and the supply of clean electricity:** the length and complexity of permitting for renewables generation and grid projects, slow down the roll-out of renewables in the electricity sector. Mismatches between hours with highest generation of renewables and demand lead to curtailment and undermine the investment signals for renewables.
- c) **Challenges for the demand-side:** inadequate energy system integration hampers the uptake of renewables across sectors, which can be addressed by improved planning, investments in grids, flexibility (storage and demand side response) and electrification of end-use sectors (e.g. heat pumps, electric vehicles - EVs).
- d) **Manufacturing and raw materials dependency:** for some renewable technologies or critical raw materials decisive for the energy transition (PV panels, batteries, lithium, EVs), the EU heavily depends on imports, often from a single country, which requires diversification strategies (including recycling) to be prepared for possible disruptions of trade flows.
- e) Environmental challenges, including sustainability of bioenergy, public acceptance and litigation challenges: with the increased speed of deployment of renewables, public acceptance issues might increase and might risk blocking projects in litigation in courts. A strong enforcement of the current permitting rules (in particular appropriate designation of Renewable Acceleration areas) would help to alleviate this. Additional measures to promote and increase public acceptance (i.e benefit sharing measures) could be explored. Sustainably sourced bioenergy, in particular biomethane, will be needed to reduce our dependency on fossil gas imports from Russia and to reach the EU's climate and energy targets. The strengthened sustainability criteria are a good basis for ensuring that the use of bioenergy remains compatible with the biodiversity and climate neutrality goals.

4. Views of the co-legislators and other key stakeholders

1. Member States

There is a certain division between Member States with a group of MS "Friends of Renewables"⁶ and another group of MS "Friends of nuclear"⁷. The latter calls for a stronger EU focus on carbon-neutral sources of energy. Overall, there are calls from Member States for a simplification of the target architecture of the RES framework.

⁶ Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal

⁷ Led by France, including Bulgaria, Croatia, Czech Republic, Finland, Hungary, the Netherlands, Poland, Romania, Slovakia, and Slovenia

2. Parliament

In the negotiations of the revised RED, the EP was more ambitious than the Council, going into the negotiations with a position of 45% RES share by 2030. In the new EP, we can expect a reduced support for renewables compared with the last legislatures, but still an overall majority in favor of renewables.

3. Industry

The industry sector has largely embraced renewables in power, supported mainly by the strong decrease in costs. The need to quickly expand and upgrade the grids to be able to accommodate large further additions of variable renewables is underlined in this context. In heating and cooling – which still represents the majority of energy consumption in industry, interest in/acceptance of renewables is sometimes lower due to the high investment costs of replacing fossil-based heating and cooling with renewables-based electrification.

4. Civil society

While citizens show overall support to RES in the power sector, there is sometimes a vocal opposition to wind projects, partially by citizens, partially by NGOs, sometimes supported by lobby interests. NGOs are also often cautioning against hydropower projects and increased bioenergy uses.

5. The way forward

In the next mandate, the Commission will have to focus on the following key areas:

- ensuring that the NECPs and their implementation live up to the EU objectives;
- ensuring full and timely implementation of the new legislative framework, in particular the revised RED, revised EMD and NZIA, including the adoption of the required implementing acts under this Regulation;
- further facilitating renewables deployment and their integration in the system while ensuring public acceptance, including permitting reforms (generation, grids, storage), fostering innovation and coupling renewables and other uses of space (agri-PV, building-integrated PVs, hybrid projects (e.g. wind+solar, solar+hydropower), promotion of power-purchase agreements and flexibility (storage and demand side response, in particular in industry);
- promoting electrification and energy system integration of the end-use sectors (heat pumps and EVs, specifically through bi-directional charging, data access and interoperability, skills) by means of an electrification strategy to increase the stability and efficiency of the energy system and keep its costs in check, benefiting citizens and industries; integrating heating and cooling, which represents half of the EU's energy use, in the energy system through a possible heating and cooling strategy.
- ensure the operation and correct functioning of the certification and traceability systems for renewable fuels (Union Database) in order to mitigate the risk of any irregularities and fraud in the biofuels supply chains.

- mobilising both public and private funding, including through the European Investment Bank (e.g. EIB de-risking other RES technologies beyond wind, for instance for solar EU manufacturing) and targeted EU financial support, where necessary, including the top-up mechanism/poss. offshore investment bank;
- proposing a simple and effective legislative framework for the EU policy on renewable energy for the period post-2030.

This agenda will have positive effects on competitiveness of the EU economy, growth, jobs and security of energy supply.

6. Proposed lines to take

- Renewables are key for our decarbonization, because around 75% of the EU's emissions come from the energy sector. Renewables are also key to ensure affordable energy prices. There has been an unprecedented increase of RES in the last years, also thanks to favourable EU policy, including the revised RED setting an ambitious EU RES target for 2030 of 42.5%, with the aspiration to reach 45%.
- In order to sustain acceleration of RES deployment, expand the benefits they bring to consumers and increase the efficiency of the energy system, challenges such as curtailment risks, lack of sufficient flexibility or available grid capacity, affecting the business case for investors, must be addressed in order to fully and effectively pass on all the benefits of cheap renewables to consumers. This will bring benefits for competitiveness (RES as cheapest source of energy), security of supply and EU's energy sovereignty and economic resilience (home-grown resource).
- A first step in this direction is to focus on strong implementation of the new legislative framework and deliver ambitious NECPs. The Commission stands ready to support Member States to ensure that the framework can live up to its full potential. Strategic approach to promoting electrification across the end-use sectors (and for heating and cooling where fossil fuels continue to dominate) is needed.
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- Finally, we need to provide predictability for investors in the European energy transition with a simple and effective energy framework post-2030.

7. Linked to A-Z fiches

- Renewable Energy – overview
- Renewable Energy – Directives
- Renewable Energy Targets for 2030
- Permitting (of renewable energy)
- Governance of the Energy Union
- (Solid) Biomass, Solar PV energy, solar thermal energy, wind energy/European wind power package, hydropower, geothermal, offshore renewable energy and marine/ocean energy

- Agriculture, forestry, bioenergy sustainability
- Biofuels
- ILUC
- Guarantees of origin

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Energy Efficiency

1. State of play

Energy efficiency is essential for cost-efficient decarbonisation, growth, enhanced competitiveness and reduced EU dependencies on critical materials and fossil fuels. It delivers other multiple benefits, including costs reduction, increased productivity, better comfort and human health, improved environment, reduced energy poverty and more local jobs. In the context of President Von der Leyen's Political Guidelines for the next European Commission 2024-2029, energy efficiency is particularly relevant for the **Clean Industrial Deal**, to improve the resilience of EU economy and boost EU industrial productivity via better energy management, and to address the lack of affordable and sustainable housing.

The main legal instruments are the **Energy Efficiency Directive**, the **Energy Performance of Buildings Directive** and products legislation setting harmonised **EU single market: Energy Labelling** and **Ecodesign** requirements on a wide range of household appliances and other products such as electric motors, pumps and transformers.

From 2017 to 2022⁸, the EU reduced its primary energy consumption by 9.2% and its final energy consumption by 5,0%⁹. Within the **REPowerEU Plan and its EU Save Energy Communication, energy efficiency** played a key role in reducing natural gas demand in the EU by 18% between August 2022 and March 2024. The targets and measures agreed in the Energy Efficiency Directive recast will ensure that this positive trend will continue, contributing to decarbonisation and strengthening resilience of the European economy.

In 2024, the European Energy Efficiency Financing Coalition has been set up to bring together Commission, Member States' authorities and financial institutions to **mobilise private financing for energy efficiency**.

Internationally, a **Global Pledge for doubling energy efficiency** by 2030 was adopted at COP28. ENER co-sponsors and participates in international collaboration forums to help deliver on the Global Pledge's objectives.

2. Ongoing / Open files / Implementation

The 2023 **recast of the Energy Efficiency Directive (EED recast)**, which raises the EU's ambition on energy efficiency to deliver on the Green Deal objectives needs to be transposed by October 2025. By mid-September 2024, the Commission will have adopted the **nine recommendations**¹⁰ to support Member States **in the transposition and implementation** of key provisions and a specific one on the **energy efficiency first principle (EE1st)**.

The 2023 **recast of the Energy Performance of Buildings Directive (EPBD)** sets the delivery framework for the **Renovation Wave Strategy** of 2020 and for setting the buildings sector on the pathway towards decarbonisation by 2050. The Commission is in the process of **preparing guidance documents, implementing and delegated acts** to facilitate the transposition of the new measures. Member States

⁸ Eurostat publishes official energy data with a delay of 15 months, so data published in the period 2019-2024 refer to the years 2017-2022.

⁹ [EU primary energy consumption decreased 4% in 2022 - Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1).

¹⁰ Six Recommendation already adopted. Three to come by mid-September. State of Play: [Webpage](#).

will have to provide a first draft of their **National Building Renovation Plans** by the end of 2025, to be followed by an iterative assessment process including **Commission Recommendations**.

The secondary **legislation on products** needs to be updated regularly and properly enforced to deliver its benefits for consumers and for the **competitiveness of manufacturers** of efficient products. The key existing **regulations for heating and cooling** are due to be updated in line with technological and market developments to deliver their full potential in speeding up the transition to efficient electrification and decarbonised solutions. **EU Energy labels** guide consumers and public or private procurers to better products and stimulates innovation among manufacturers.

In 2024, the Commission held a **Citizens' Panel on energy efficiency**. The Commission will follow-up on its recommendations through the adoption of a **Recommendation on EE1st with sector-specific guidelines** and further policy initiatives. In 2024, Phase II of the **Citizen-led renovation initiative** was launched to facilitate the participation and engagement of citizens and communities.

Maximising public investment leverage and unlocking private financing is key to deliver on energy efficiency objectives and commitments. Within this framework, centrally managed EU programmes (LIFE Clean Energy Transition, ELENA Facility, Horizon Europe Cluster 5-Destination 4) will continue to provide leverage of private investments, project development assistance, capacity building and support actions to make energy-efficient solutions more accessible, bankable and affordable. The work programme of **the European Energy Efficiency Financing Coalition** with Member States and partner financial institutions will be defined in the first Plenary meeting in the second half of 2024.

3. Key challenges

Over the next five years, the key focus areas are **efficient electrification and optimisation of industrial processes** together with their more **flexible operation** and **heat recovery**, and **buildings**. The expected energy efficiency gains in the industrial processes operations and across the system will contribute to competitiveness and bring down energy bills for European companies.

There is also a great potential for increasing **energy efficiency in the transport sector**, where electrification, public transport and modal shift should be prioritised.

Energy-efficient system integration will be key to succeed the decarbonisation objectives in a cost-effective manner. The integrated local-level planning will be instrumental for achieving this objective through a bottom-up system design and an optimal use of energy and resources. **The Local Heating and Cooling Plans** (Article 25 of the EED recast) will bring significant changes and their development will require support and attention to serve system integration objectives.

The **building sector** is the biggest energy using sector, consuming 42% of energy in the EU. A significant share of the EU building stock has a poor energy performance and is heated using fossil fuels. A key challenge for the next mandate is to ensure an effective implementation of the EED recast and EPBD recast through various supporting actions to make energy efficiency and buildings renovation solutions available and attractive, including technical assistance to national and local authorities, skills development and targeted financial aid.

Following the assessment of the draft NECPs, in December 2023 the Commission identified an **ambition gap towards the Union's 2030 energy efficiency target**. In case such gap remains, the Commission shall propose measures and ensure the collective achievement of those objectives and targets.

Although public financing for energy efficiency has grown during the period 2021-2027, the investment needs (estimated at around EUR 300 billion per year until 2030, with an investment gap of at least EUR 165 billion per year) far outstrip the available public funds. Ambitious measures are needed, **as the EU budget has become the main engine** to scale up action, and support EU citizens and enterprises to invest in energy efficiency. In line with the Political Guidelines' focus on unlocking financing and investments as part of the new mandate and to address **the challenge created by the end of the RRF** in 2026 – **which accounts for 50% of the current EU-led funding available** for energy efficiency, it will be key to **bridge this funding gap with additional financing as part of the proposal for the preparation of the next-MFF post 2027** and by **increased leveraging of private capital** via de-risking measures, EU financial instruments and other measures able to tap into the wealth of Europe private capital.

4. Views of the co-legislators and other key stakeholders

While energy efficiency policy is welcomed by all stakeholders, there are some concerns about the upfront costs, medium-term payback and perceived complex implementation of the policy.

a) Member States

In general Member States (MS) are favourable to energy efficiency policies, recognising that it is a cost-effective support to industry, growth and decarbonisation. All MS are now preparing the transposition and implementation of the EED and EPBD recast (Italy and Hungary voted against EPBD). As regards product legislation, MS support that COM could do more, so that MS can do less nationally.

b) Parliament

The outgoing Parliament was clearly favourable to energy efficiency policies pushing for more ambitious provisions than the Commission proposal. The Greens, S&D and RE were particularly supportive, while the EPP was split. The Parliament is very supportive of product legislation and EU measures on reparability.

c) Industry and financial sector

The industry is generally supportive towards energy efficiency policies as a cost-effective way of reducing OPEX, improving industrial processes and increasing competitiveness. Industry supports proactive EU internal market action on products to avoid fragmentation and additional costs from national measures. The financial sector is committed to the energy transition. It needs support to create (industrial and residential) investment pipelines, as it is difficult to create scale.

d) Civil society

The recast EED and EPBD received widespread support from NGOs representing consumer, environmental and sectoral (e.g. buildings) interests. Opposition mainly came from private home owners' associations and from the fossil fuel industry. Consumer organisations are highly supportive of ambitious harmonised EU rules for products.

5. The way forward

- Making energy efficiency happen on the ground

- **Industry:** establishing, as part of the Clean Industrial Deal, **Energy Efficiency Partnerships** with key industry sectors (including **transport**) to promote demand reduction and energy efficiency strategies (e.g., flexibility, electrification) and identify bottlenecks (e.g., regulatory, administrative, pricing) to their full implementation.
- **Consumers:** promoting one stop shops and services (e.g. funded by the LIFE programme) offering practical and trusted advice, and relying on improved EU Energy Labels (and the EPREL database).

- **Skills:** online trainings for installers (with certification), then matching customers with the trained installers (e.g. supported by the Social Climate Fund) (cf. UK example of Heat Geek). Possibly as part of a future Net-Zero Industry Act Academy on Heat Pumps Skills.
- **Local actors including cities:** communication campaigns on existing EU initiatives and energy efficiency measures (e.g. energy performance contracting) via existing channels (e.g. Covenant of Mayors, EnergyCities, EuroCities). Capacity building support to the local-level integrated energy planning, including the development of the Local Heating and Cooling Plans. Support for developing investable EE projects (e.g. through national ELENAs) on public building renovation, district heating or public transport. Public procurement as lead market for efficient products, facilitated by EU Energy Labels and ecodesign benchmarks. Responding to the conclusions of the Citizens' Panel on energy efficiency will provide concrete answers to the citizens' requests in this area.
- **Energy system integration 2.0**
 - **Electrification strategy with a clear focus on efficiency:** electrification of industry, buildings and transport by identifying cost-effective solutions, addressing barriers and proposing enabling measures facilitating the link with a new heating and cooling strategy (see below) and work on industrial decarbonisation.
 - **Demand flexibility incl. from smart appliances:** Unlock flexibility potential in residential sector e.g. by promoting interoperable, smart EV charging and appliances (further develop recently launched Code of conduct on interoperability, promote use/uptake via the network codes on demand connection and demand response, and via "smart ready" icons on revised energy labels for relevant appliances).
 - **Heating and cooling strategy,** including an overall strategic assessment, dedicated strands on heat pumps, geothermal, solar thermal, storage, excess heat and waste heat, cooling (buildings and industry) and guidance for local governments on developing **Local Heating and Cooling Plans**.
 - Legal proposal on **minimum efficiency requirements for data centres**, building on the EU-wide scheme to rate the sustainability of EU data centres.
 - **Extend the aggregate demand mechanism to energy efficiency services/markets** as part of the **Clean Industrial Deal** and the **Industrial Decarbonisation Accelerator Act** to support industry competitiveness through more efficient and flexible energy use, whilst boosting the market for energy efficiency measures and services. As a first step, an industrial conference could be organised in the first 100 days of the new Commission, to identify possibilities for private investment into energy efficiency and for creating a market for energy efficiency measures/services.
 - An EU support framework for **industrialised energy renovations and construction** to help address the lack of **affordable and sustainable housing**, while improving the competitiveness of the EU building industry. Linking the Energy Service Companies (ESCO) market with industry players and consider support for ESCOs, such as guarantees (e.g. through the EIB, similar to recent initiatives for the wind industry). Sector-specific benchmarking of EE measures and sharing best practices (implementing the 'Energy Efficiency Partnerships' provisions of the EED recast).
- **A new EU Energy Efficiency Financing Strategy** To establish a medium and long-term viable funding framework, to ensure a sufficient and efficient use of public funds, together with actions to leverage private investments at scale. This could include the creation of an **Energy Efficiency Financing Mechanism at EU level** to top-up Member States' national contributions to the EU binding energy efficiency target, in particular if the ambition gap is confirmed. This could finance, for instance, EU energy efficiency auctions, an EU super-ESCO guarantee scheme, or policy

accelerators for the implementation of certain provisions of the EED and EPBD (e.g. district heating, local heating and cooling, residential buildings renovation).

- **Post-2030:** evaluation of EED recast (by 28 February 2027) and EPBD recast (by 31 December 2028), possibly with a focus on **simplification**.

6. Proposed lines to take

- On **energy efficiency** the priority is “**faster, simpler, more supportive**” – to help make it **happen on the ground** – for the benefits of consumers, businesses and society as a whole. Energy efficiency will remain key to the **energy transition, competitiveness, decarbonisation, affordable housing and social progress based on just transition of all**. The focus for the next mandate is the proper transposition and implementation of our policies, in close collaboration with MSs, industry, civil society and citizens.
- Thanks to the energy efficiency efforts between 2000 and 2022, **in 2022, EU needed to produce or import 240 Mtoe of primary energy¹¹ less** of what it would have needed otherwise. Adding to that, the EU reaps the multiple benefits in terms of environment, health, productivity and energy security. The priority will be to maintain these positive trends in the years to come.
- There is a great potential for energy efficiency improvements **in industry and transport sectors** and **across the system** through electrification, modal shift and public transport, as well as rationalisation of industrial processes together with their more flexible operation and heat recovery. Tapping into these efficiency gains will increase energy affordability and competitiveness of the European economy.
- The commitment in the Political Guidelines to ensure “effective customs, tax and safety controls and sustainability standards” implies a need for **better national market surveillance for ecodesign and energy labelling**. Manufacturers of efficient products should not suffer from an uneven level playing field because national market surveillance is inadequate and allows noncompliant products to prosper on the market, depriving EU buyers from the benefits they are entitled to.
- **Building renovation tackles the root cause of energy poverty and lowers energy bills**. Linked to the **European Affordable Housing Plan**, specific attention should be given to target funds and support for efficiency and renovation measures to address the lack of **affordable and energy-efficient housing**.
- The recast EPBD spurs **competitiveness of the EU industry** (notably as regards clean technologies and insulation) and creates local jobs in the construction sector. Barriers to increased capacity and investments in these sectors will be addressed with specific initiatives for instance on skills (e.g. heat pump academy).
- We will, together, need to secure sufficient financing for energy efficiency and ensure that more private sector capital is flowing to energy efficiency investments. Ambitious measures should be envisaged, also in the framework of the next MFF.

7. Linked to A-Z fiches

¹¹ For comparison, Germany’s primary energy consumption in 2022 was 260 Mtoe.

- Boilers and other space heaters and combination heaters, dedicated water heaters
- Renewable integration in buildings
- The European Climate, Infrastructure and Environment Executive Agency
- Cities & Regions
- Climate adaptation for critical energy systems
- Cogeneration
- Defence and energy
- District heating and cooling
- Ecodesign and Ecodesign for Sustainable Products Regulation (ESPR)
- European Energy Efficiency Fund (EEEF)
- European Energy Efficiency Financing Coalition (EEEFin Coalition)
- The European Local Energy Assistance Facility (ELENA)
- Energy Efficiency Directive
- Energy efficiency first principle
- Energy Efficiency Targets - implementation for 2030
- Energy Efficiency Contribution for 2040 climate targets and global pledge
- Energy labelling regulation
- Energy Performance Contracts
- Energy Performance of Buildings Directive
- Energy Sufficiency
- Financing for building renovation
- Flexibility
- Heating and cooling
- Labelling of tyres
- LIFE Clean Energy Transition (CET)
- Smart Appliances

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Hydrogen

1. State of play

The EU consumes **8-10 million tonnes (Mt) of hydrogen** produced mainly from natural gas. Under the previous mandate, the European Commission developed a comprehensive regulatory framework for scaling up the production of renewable and low-carbon hydrogen and derivatives. In the context of EU legislation, renewable hydrogen refers mainly to hydrogen which is produced using renewable electricity, included in the **Renewable Energy Directive** under the category of renewable fuels of non-biological origin, 'RFNBOs'. Low-carbon hydrogen is defined in a technology-neutral approach under the internal market directive for renewable and low carbon gas and hydrogen and includes notably hydrogen produced with low-carbon electricity (decarbonised through a mix of renewable and nuclear sources) or from fossil fuels where the carbon dioxide is captured and not released to the atmosphere. The regulatory framework includes criteria for the production of renewable hydrogen and targets for its consumption in industry and the transport sector, specific targets in the aviation sector for hydrogen-based fuels, rules for dedicated hydrogen markets and infrastructure planning and the first list of European cross-border hydrogen infrastructure projects.

Since 2020, around 200MW of additional 5-10 MW-scale electrolyzers have been installed in the EU, with the first 200MW electrolyser under construction. The first Final Investment Decisions in large-scale electrolyzers of >500MW electrolyzers are still expected this year and the results of the hydrogen auction showed that with the right support 8 GW of electrolyser production would already have off-takers. Around **€18 bln in financial support** has been provided to scale-up of renewable and low-carbon hydrogen production, infrastructure development, R&D and to support end-use sectors across the EU from national and EU funds. To **support the development of the hydrogen market**, the Commission has established the Hydrogen Mechanism. The Commission has also already signed eleven **international cooperation agreements**.

2. Ongoing / Open files / Implementation

The implementation of the hydrogen-related provisions of the amended Renewable Energy Directive and the new hydrogen rules under the internal market directive for gas and hydrogen has started. A **guidance on the RFNBO targets for industry and transport** is published in September 2024. The **Delegated Act to define the methodology** to calculate the greenhouse gas emission intensity of low-carbon hydrogen and derivatives is under preparation and should be adopted before end of 2024. It will be consistent with the methodology in place for renewable hydrogen and recycled carbon fuels. A compliance certification system is in place, six internationally operating certification schemes have applied for the EU recognition, adoption of first delegated acts on recognition is expected before end of 2024.

The **European Hydrogen Bank** has been established, consisting of a domestic and an international leg and the mechanism to scale up hydrogen market. Under the domestic leg, green

premium auctions under the Emission Trading Schemes' Innovation Fund support market creation by bridging the cost gap for RFNBO off-take contracts. After a first successful round of auctions concluded in 2024, the 2nd round of auctions is due by end of year. The international leg is focusing efforts on a TeamEurope approach to pool financial resources from Member States and the Commission aims to develop joint European auctions for imports of renewable hydrogen. Under the hydrogen mechanism, the Commission is designing a mechanism to support the market development of hydrogen and accelerate investments. This mechanism is provided for under the Regulation for internal market rules for hydrogen. It will support the development of the European hydrogen market by (i) connecting off-takers and suppliers, (ii) informing on hydrogen infrastructure needs and (iii) connecting with the financial institutions to incentivize investments. It may also include a **demand aggregation feature** to leverage the size of the European market. The Commission is designing the Hydrogen Mechanism and has launched a tender for the development of the IT platform supporting the operations of the hydrogen mechanism. The Hydrogen Mechanism is expected to be activated in mid-2025.

The **European Network of Network Operators for Hydrogen** (ENNOH) enabling the EU level cooperation of future hydrogen transmission network operators is expected to become operational in Q2/Q3 2025.

3. Key challenges

The European hydrogen strategy set a target of 6GW of electrolyser by 2024, and 40 GW by 2030. The **REPowerEU plan increased the aspirational targets** to produce 10 Mt of renewable hydrogen and 10 Mt of renewable hydrogen imports targets by 2030. With the legislation and associated demand obligations for 2030 in place (corresponding to around 4-5 Mt of RFNBO consumption in 2030), the European Court of Auditors has requested the Commission to assess whether the aspirational targets can be reached and to update its original hydrogen strategy.

Whilst the objectives that underpin the ambitions remain valid, there are a number **of challenges in scaling up the hydrogen value chain in the short-term**. The technical issues are the long delivery times and increased costs for European electrolysers and strong competition from Chinese electrolyser manufacturers. Furthermore, the current project pipeline both within the EU as well as internationally is not sufficiently advanced with only 4% of globally announced renewable and low-carbon hydrogen projects having reached final investment decision. Most projects are looking at the EU as the main offtake market, but the implementation of the RFNBO obligations at Member State level is taking time. Insufficient subsidies for the production and consumption of renewable hydrogen are hampering the deployment of electrolysers. Furthermore, there is still uncertainty regarding the year within which infrastructure will be available to connect producers and consumers, including for imports from third countries.

At the same time, **expectations from industry as well as third countries** towards the European Commission remain high. In particular, there are continued calls to increase EU funding for hydrogen projects and to establish financing schemes to enable the import of hydrogen from partner countries.

There is also a **proliferation of international forums on hydrogen**. Since the EU is expected to become one of the few importing countries while being a frontrunner in setting a policy and regulatory framework, it is important that sufficient resources are available to ensure the necessary EU international engagement and its coordination for the support of the EU policy objectives and priorities. It includes EU experience sharing via the bilateral (energy dialogues, ad-hoc exchanges) and multi-lateral intergovernmental cooperation formats (the International Partnership for the Hydrogen Economy 'IPHE', the International Energy Agency 'IEA', the International Renewable Energy Agency 'IRENA') as well as through strengthening the EU expert involvement in the EU and international standardisation bodies (CEN/CENELEC, ISO). Resources are also needed to help third countries to set similar policy and regulatory frameworks and to support the development of a competitive and diversified global market.

4. Views of the co-legislators and other key stakeholders

a. Member States

Most Member States support the development of a hydrogen market, and already 19 Member States have developed their national hydrogen strategies. 18 MS have earmarked budget under their Recovery and Resilience Fund allocations ('RRF') for hydrogen-related projects, and 7 Member States have state aid support schemes approved under the State aid guidelines for climate, energy and environment ('CEEAG').

Member States remain divided regarding the extent to which low-carbon hydrogen, in particular produced from grid electricity, will play a role in the future energy mix. Some of them, in particular those which see a role for hydrogen produced from nuclear power, stress that the industry and transport targets for renewable hydrogen will be particularly difficult to achieve and are not adapted to their energy systems.

National Regulatory Authorities, who play a key role during the transposition of energy legislation and in monitoring the energy market, were generally supportive. Some, however, raised their resource constraints to cope with new rules.

b. European Parliament

The European Parliament has been more ambitious than Member States in setting legal targets for the uptake of renewable and low-carbon hydrogen. The Parliament was split (50%/50%) in a vote on the rules for renewable hydrogen.

c. Industry

The European hydrogen industry has been gathered under the European Clean Hydrogen Alliance, where producers, consumers and infrastructure developers meet. There is a general consensus that hydrogen needs to be used for hard-to-abate sectors, and that hydrogen for buildings or large amounts of hydrogen blended into the gas grid should be avoided. The industry has put forward an impressive project pipeline for both production (>90 GW) and consumption (9 Mt of clean hydrogen), but in recent months some large project developers have delayed some projects. The industry has welcomed the domestic auction but is requesting larger budgets. It

expressed interest in the Hydrogen Mechanism to support the development of the hydrogen market.

Hydrogen Europe, one of the main interlocutors on hydrogen, is in general supportive of EU policies, but their position on some key issues (e.g. the rules on the definition of renewable hydrogen) has been critical. Furthermore, while Hydrogen Europe supports that European electrolyser manufacturers should be promoted over imported technologies, the industry's views remain divergent. Industry promoting renewable hydrogen gathers in the context of the Renewable Hydrogen Coalition and is generally supportive of EU hydrogen policies.

Current and future consumers of renewable hydrogen in the industry sector (fertilisers, chemicals, steel) have built decarbonisation strategies based on hydrogen. However, they are concerned about the cost that this process implies, the impact of mandatory targets on their competitiveness and the lack of sufficient financing to support it and the lack of lead markets for green products. Some industrial consumer representatives would like to be eligible for consumption targets. The industry has also called for an import auction that ensures a level playing field with the domestic auction.

d. Civil society

Civil society strongly supports the view that hydrogen should only be used in hard-to-abate sectors, and it is critical towards financing for fossil fuel companies that are investing in renewable and low-carbon hydrogen.

5. The way forward

In the short-term, the **obligations to consume 42% RFNBOs in industrial hydrogen** consumption in 2030, the **1% of RFNBOs in transport fuels**, and **1.2% of RFNBOs in the aviation** (“ReFuelEU Aviation”), and the use of RFNBOs and non-fossil low-carbon hydrogen to comply with the obligations under the Regulation to decarbonise shipping (“FuelEU Maritime”) will be key discussion points. A continuous dialogue, close monitoring and enforcement of the timely implementation of the renewable hydrogen targets set in the revised RED will be important to provide confidence to both producers and industrial consumers that there will be a secure market.

The Industrial Decarbonisation Acceleration Act can support the achievement of these targets by channeling investments into hydrogen infrastructure connecting industrial off-takers with renewable-rich regions, by creating lead markets for industrial products, and by speeding up the permitting for industry-related investments to shift processes from fossil fuels to hydrogen (e.g. replacing blast furnaces with Direct Reduced Iron processes).

The activation of the **hydrogen mechanism** will be another action to support both industry and Member States in meeting the renewable hydrogen targets as well as plans for the production of low-carbon hydrogen. The information gathered through the mechanism will **increase**

transparency and boost market development by assisting in mapping both aggregated demand and supply across regions, in planning hydrogen infrastructure, and in enabling off-take agreements.

The industry will continue the **calls to increase the budgets for hydrogen** as long as its cost is not competitive with fossil fuel consumption (likely up to 2030). At the same time, there are many projects that have received project financing, but where final investment decisions are delayed. Managing expectations about budgets will be important, including:

- Monitoring the total budget and success rate of projects that receive financing through the different fundings streams, including through Cohesion Funds.

Use this information to assess the funding gaps to allocated budgets and redesign funding schemes accordingly.

The topic of **hydrogen imports** will also remain relevant, including for the proposed deepening of energy partnerships with Africa and Latin America. Some Member States support imports to increase supply certainty and to decrease costs, whilst others want to promote domestic production to prevent strategic import dependencies. Under the EU Renewable Energy Directive, the European Commission has to develop a Union Strategy for imported and domestic hydrogen by taking into account the EU security of supply and sustainability considerations. For investment support, the European Commission will also have to work closely with the EIB, EBRD, EU Member States and development banks to promote a more coherent and coordinated approach towards project financing of hydrogen in third countries:

- Streamline **technical assistance and investment** support to projects outside the EU, through Global Gateway and EU financial instruments (with INTPA/NEAR and IFIs) such as EFSD+, and the EIB established Hydrogen Fund of €500 million, EU Member States initiatives combined under “Team Europe approach”.
- Continue work on developing the **international leg of the European Hydrogen Bank** by operationalising the TeamEurope approach. and exploring cooperation with H2Global Foundation for the implementation of a Joint European import auction;
- EU R&D funding to scale-up of renewable hydrogen and hydrogen valleys globally.

The planning and development of **dedicated infrastructure** will become increasingly important to enable access to lower-cost hydrogen from renewable-rich regions to industrial clusters. To implement the required infrastructure, several decisive actions are necessary:

- Member States must swiftly transpose and implement the requirements outlined in the Hydrogen and decarbonised Gas Market Package, including the certification of Hydrogen Transmission Network Operators (HTNOs), mandating the National Regulatory Authorities (NRAs) with hydrogen tasks and advance national and European hydrogen infrastructure planning (integrated with the infrastructure planning for electricity and gas).
- All relevant parties to ensure transparency regarding hydrogen supply and uptake, along with sharing data on infrastructure repurposing.
- The European Network of Network Operators for Hydrogen (ENNOH) must swiftly become fully operational and fulfil its planning tasks within designated timelines.

- Establish regular coordination among Member States and national competent authorities for expediting the permitting and implementation of hydrogen projects.
- The European Commission to actively monitor and facilitate collaboration among relevant parties, through the existing platforms such as High-Level Groups to ensure effective progress (see regional cooperation fiche).
- Provide adequate financial incentives and leverage financial support to expedite promoters' final investment decisions on infrastructure development.

Finally, **hydrogen will be central in the discussion on the 2040 Climate Target Plan**. The Commission scenarios foresee a rapid growth of renewable hydrogen to meet the decarbonisation objectives in 2040 (27-35 Mt) and 2050 (66 Mt).

6. Proposed lines to take

- The Commission has established a comprehensive framework for the development of a European and global hydrogen market, which provides certainty for producers, consumers, infrastructure developers as well as investors.
- The Commission will continue to support the development of hydrogen projects. The Commission and Member States have already committed around €18 bln, so it is important that these first projects are developed and become operational.
- We need to continue to support the full supply chain, from electrolyser manufacturers to the end-consumers that have to shift their industrial processes or transport equipment from fossil fuels to renewable and low-carbon hydrogen.
- The development of an early market for hydrogen is important for Europe's industrial competitiveness. It will enable our energy-intensive industry to invest in new equipment that is compatible with a climate-neutral economy. The Commission will support this market development with the future hydrogen mechanism.
- Renewable and low-carbon hydrogen will remain scarce and expensive during this decade. This is why we have to focus its use on the hard-to-abate sectors where there are no alternatives.
- The European Union has taken a leadership role in the development of a global hydrogen market. We are committed to bring our partner countries on board, and jointly work on projects that can help the energy transition within the EU as well as in our partner countries.

7. Linked to A-Z fiches

- Hydrogen and fuel cells
- Hydrogen and Gas decarbonisation Package
- European Hydrogen Bank
- Hydrogen Infrastructure Projects
- Hydrogen (International)
- ENTSO-E, ENTSG, ENNOH

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Grids/Interconnections

1. State of play

The European Union has one of the most dense and reliable electricity grids in the world. The EU has extensively worked for decades on establishing a comprehensive regulatory framework and a resilient pan-European network for electricity. During the energy crisis, well interconnected electricity systems brought valuable benefits in terms of increased security of supply, access to competitively priced electricity from neighbouring Member States and faster integration of renewable energies.

The **Trans-European Networks for Energy (TEN-E)** is the main policy framework to deliver cross-border infrastructure since 2013 with nearly 100 cross-border projects completed. It supports countries to work together to develop better connected energy networks through planning, permitting, ensuring public participation and political support, and provides eligibility for funding for energy infrastructure projects through the Connection Europe Facility (CEF) for Energy. CEF Energy is the EU funding programme dedicated to cross-border energy infrastructure. In 2022, co-legislators agreed on a revision of the TEN-E Regulation to fully align its scope with the European Green Deal by replacing fossil fuel infrastructure by hydrogen infrastructure. It also acknowledges the role of infrastructure projects with third countries, in particular the Energy Community, introducing the status of Projects of Mutual Interest (PMIs). In November 2023, the first Union list of Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs) under the new TEN-E Regulation includes 166 projects half of which electricity projects.

The revised TEN-E Regulation also includes a dedicated chapter on offshore grids to deliver on the **offshore ambitions of more than 300 GW by 2050** as agreed by EU Member States in non-binding agreements in January 2023. On that basis, ENTSO-E published the first Offshore Network Development Plans (ONDPs) in January 2024 as strategic outlook. In June 2024, the Commission published Guidance on collaborative investment frameworks for offshore energy projects to support the deployment of cross-border offshore projects.

Despite the important progress made, **grid investments remain insufficient** to match the identified needs required for an electricity consumption that is expected to increase by around 60% and renewable capacities to triple between now and 2030. The EU Grid Action Plan adopted in November 2023 aims to raise political awareness of the high investment needs in networks of around EUR 584 bn already this decade, elevate the visibility of the critical need of investment at distribution level, including smart grids, where most of the electricity infrastructure investments are necessary, and propose a set of 14 actions that support the sector in making such investments. Smart electricity grids are the backbone of a decarbonised energy system that is able to effectively incorporate large shares of decentralised renewables, electrified demand, and other system flexibilities.

2. Ongoing / Open files / Implementation

Delivery on grid infrastructure projects remains critical and will be supported through the implementation of the TEN-E framework, the CEF for Energy, the Grid Action Plan, and the Energy Digitalisation Action Plan.

TEN-E framework:

- Accelerated implementation of PCIs in particular through a strengthened role of the four High-Level Groups;
- Preparation of the 2nd Union list of PCIs and PMIs for adoption in November 2025;
- Implementation of the Commission Guidance on collaborative investment frameworks for offshore energy projects to support the deployment of cross-border offshore projects published in June 2024;
- Update of Member States' non-binding agreements on offshore goals until 2050 and the Offshore Network Development Plans;
- Evaluation of the TEN-E framework by 2027.

CEF for Energy:

- Execution of the remaining CEF Energy budget for PCIs of approximately EUR 3 billion under the current MFF until 2027;
- on-going call for proposals will close in October.

Grid Action Plan:

- Copenhagen Energy infrastructure Forum as platform to monitor progress took stock in June and showed continued political support;
- Need for continued strong focus on its implementation and delivery; ACER, ENTSO-E and EU DSO Entity are collaborating with the Commission in a number of the actions, other stakeholders are actively providing further information, case studies and best practices.

Energy Digitalisation Action Plan:

- Regulators (ACER, CEER and National Regulatory Authorities) to develop a European catalogue of key performance indicators to facilitate the monitoring of progress in developing smart grids;
- ENTSO-E and EU DSO Entity to coordinate the work of grid operators to develop and implement a digital twin of the European grids.

3. Key challenges

a) Planning - incorporating synergies between sectors at the local, national, regional and European level

With the strong increase in (offshore) renewable generation and electricity demand (e.g. heat pumps, transport), there is a need for more coordinated network planning, focusing further on sector integration

(e.g. synergies offshore wind – hydrogen production and transport), as well as adequate coordination between European, national and local planning (TSO-DSO interface). Implementing this cross-sectorial planning as well as its outcomes necessitates also a stronger regional coordination between Member States.

Additionally, closer coordination between (existing and future) grid users and system operators on grid planning, especially at local level, can be mutually beneficial and support a more efficient co-development of grid and renewables, e.g. by improving visibility on RES development plans on the one hand and grid hosting capacity on the other hand over the long-term.

b) Financing – an appropriate regulatory framework and sufficient financial support

Grid operators, both at the transmission and distribution levels, are faced with an unprecedented increase in the volume of capital expenditure. For electricity, EUR 584 billion in overall investments are needed, out of which EUR 375-425 billion will be for investment in distribution grids. Based on improved network planning, mid-/long-term needs should be considered in future infrastructure developments through anticipatory investments in order to reduce costs in the longer term. In addition system optimisation options such as the introduction of flexibility or efficiency equipment such as dynamic line rating should be reflected in remuneration incentives.

In view of the expected burden on consumers, the current payment structure where the final consumer pays the bill through network tariffs may need to be revisited. Given the high costs and the increasing share of cross-border projects, a robust CEF for Energy beyond 2027 will be critical. In addition, new approaches to project development and financing should be assessed, also in a regional context as set out in the Commission Guidance on collaborative investment frameworks for offshore energy projects to support the deployment of cross-border offshore projects.

For hydrogen, financing models for first major infrastructure projects, both national and cross-border, during market ramp-up and until regulation is firmly in place will still have to be further developed.

c) Speeding up project implementation – permitting processes and public acceptance

Infrastructure projects encounter complex and lengthy permitting procedures as they cover long distances crossing very often several jurisdictions. This entails the navigation through different permitting procedures in several languages with various set-ups and deadlines. Moreover, the implementation of infrastructure projects frequently faces significant public concerns and NIMBY effects that need to be factored in and mitigated in the project planning and implementation phases.

a) Digitalising the grids

Grid operators face challenges in digitalising their grids because: (i) grid tariffs are not always conducive to promoting smart solutions and (ii) it is not straightforward to choose the optimal smart solutions and technologies from the myriad of systems proposed by vendors.

b) Supply chains

In order to realise the objectives of the Green Deal Industrial Plan and to be able to implement the necessary grid infrastructure projects, a resilient supply chain is needed including a competitive grid technology sector in the EU that can contribute to the Net-Zero Industry Act target that 40% of the net-zero technology deployment needs is manufactured in the EU. The inclusion of grid technologies and its components in non-price criteria for public procurement, and the work on the application of the resilience criterion will require further assessment of the grid technologies supply chain, including imports, EU manufacturing capacity and priorities for investments. This will also require further work on procurement/technology specification and, improved visibility of grid project pipelines to facilitate investments in manufacturing capacity and secure supply chains.

4. Views of the co-legislators and other key stakeholders

a. Member States

Member States in general agree on the importance of grid infrastructure as enabler of the energy transition. This is reflected in the Council conclusions “Advancing Sustainable Electricity Grid Infrastructure on grids” adopted in May 2024 in full support of the EU Grid Action Plan. Baltic and Iberian Member States as well as Island Member States in particular support the deployment of adequate infrastructure and interconnections. Germany has shown particular interest in facilitating permitting rules for energy infrastructures and also has a particular interest in the deployment of transnational hydrogen corridors.

b. Industry

The electricity sector and industry have been very supportive to both the Commission’s Grid Action Plan and the Energy Digitalisation Action Plan, always stressing the message that strong focus on its implementation and delivery is required. ACER, ENTSO-E and EU DSO Entity are collaborating with the Commission in a number of the actions. Certain industrial sectors depend on the deployment of hydrogen infrastructure for their ability to decarbonize, and hence their capacity to survive in Europe.

5. The way forward

In addition to dedicated actions on grids, grids should be an integral part of **A European Industrial Green Deal for enhancing competitiveness and private investments**. Grids should therefore be appropriately reflected in the **policy communication outlining a genuine and competitive Energy Union** to frame energy policy towards 2030 and beyond addressing the above-outlined grid related challenges. Timely grid digitalisation and deployment, as well as faster uptake of innovative grid technologies, should also be an integral part of any policy initiative to keep electricity prices in check.

The **Investment Plan** should reflect the investments needed in grids with a particular focus on CEF for Energy and dedicated financing for distribution grids as well as for manufacturing of key grid technologies and their components.

Electricity market reforms should consider infrastructure related dimensions to ensure that actions in relation to the “software” and “hardware” go hand in hand.

As for the delivery mechanism, it will be important to build on the existing well-established policy framework and fora such as the TEN-E Regional Groups and High-Level Groups. These have been established over the last 10 years and more and have proven as effective.

6. Proposed lines to take

- The European Union has one of the most dense and reliable electricity grids in the world. We have made significant achievements in grid infrastructure over the past decade thanks to tailor-made regulation for large-scale and trans-European grid planning and projects.
- The current list of PCIs addresses the most pressing bottlenecks in the EU’s trans-European energy networks. Around half of them are planned to be commissioned between 2027-2030. Our priority is now to ensure their timely completion as key building blocks in the energy transition.
- There are significant additional system needs in the EU for 2040 and beyond to enable the integration of renewable energy sources, further interconnectivity and market integration as well as enhance security of supply including through interoperability and system flexibility. These needs should be addressed by new PCIs in the next Union lists.
- Infrastructure projects with third countries are expected to play an increasing role, in particular in view of contributing to the energy transition. A high level of convergence of the policy framework as in countries of the Energy Community is critical to ensure that PMIs are mutually beneficial. PMIs need to demonstrate clear benefits to Union, i.e. to more than one Member State.
- CEF Energy has played a significant role in enhancing the integration of the EU energy market by bolstering cross-border connections. In view of the investment needs, the CEF Energy remains critical.
- Limiting investment in the grids today will cost greatly to society by delaying the energy transition. Continuous effort on proposing and realising new cross-border electricity projects (including offshore) as well as local distribution grid expansion and modernisation are necessary. Absence of realisation of cross-border hydrogen infrastructure will severely impair the capacity of certain industries to decarbonise.
- Action is needed in a number of areas: more coordinated network planning, a forward looking regulatory framework considering the impact on consumers, access to new sources of financing (in addition to strengthened CEF for Energy), digitalisation and robust supply chain.
- The implementation of NZIA can play a role in supporting EU investments in grid technologies and its components to ensure a resilient supply chain and a competitive EU grid technology sector.
- Regional cooperation through existing well-established fora such as the TEN-E Regional Groups and High-Level Groups to be fully used for accelerated grid built-out.

7. Linked to A-Z fiches

List here the fiches relevant to this thematic policy fiche in the A-Z:

- Connecting Europe Facility (CEF)
- Grid Action Plan
- Projects of Common Interest (PCIs)
- Regional cooperation – infrastructure
- Trans-European Networks for Energy (TEN-E)
- Net-Zero Industry Act (NZIA)

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Energy markets

1. State of play

The liberalisation and integration of European energy markets and the progressive removal of obstacles to cross-border trade are significant achievements with direct benefits for European households and companies. Whereas the transition requires an urgent and significant roll out of infrastructure (“the hardware”), this needs to be complemented by the right market organisation to ensure that the infrastructure (existing and new) is used as effectively as possible for exchanges of energy in the internal market and well-functioning markets which benefit end consumers (“the software”).

The integration of the gas and electricity markets has reached a significant level of maturity and has been key in mastering the recent energy crisis, which Europe was able to withstand due to high interconnectivity and efficient market price signals. Short-term electricity markets are fully “coupled”, meaning that they are operated by EU-wide algorithms which optimise the flows and dispatch electricity across the EU, maximising overall welfare. The value of this increased efficiency and cross-border cooperation is estimated to save € 34bn per year. Competition at retail markets level has also been progressing, though development of innovative approaches such as aggregation and demand response has not been as fast as hoped for with the Clean Energy Package. Also, the internal market for gas has progressed over the past years, building on the improved functionality of gas trading hubs and the enhanced interconnection between national markets. The current mandate has seen significant and far-reaching reforms to the European energy market organization in the form of the recent Electricity Market Design (EMD) and REMIT reform, as well as the Gas Package.

2. Ongoing / Open files / Implementation

Follow-up to new legislation

The Gas Package, the Electricity Market Design (EMD) reform and the REMIT reform will all require extensive revisions of tertiary legislation. For gas, this concerns the areas of capacity allocation (envisaged for 2025), congestion management (envisaged for 2025/26), interoperability and tariffication. For electricity, the reform also requires the revision of the rules on capacity allocation and congestion management (envisaged for 2025) and on the forward markets (envisaged for 2026). New tertiary legislation is being developed concerning demand response, the use of flexibility solutions by grid operators as well as the associated data interoperability provisions (envisaged for 2025).

Delivery on the ground and implementation

The Commission will need to monitor closely the implementation of the new electricity and gas rules and the transposition of the new Gas Directive and new Electricity Directive provisions into national legislation. Incomplete implementation of internal market rules – particularly in relation to demand response and flexibility - hampered a more effective response during the energy crisis,

particularly from end-consumers. Enforcement work is also needed to preserve what has been achieved in terms of market integration by preventing harmful and uncoordinated national market interventions, such as those introduced by many Member States during the energy crisis. According to ACER, these measures have increased price divergence and altered cross-border trade. They had also an impact on the resilience of the European energy system.

3. Key challenges

The longer-term shift of the energy system towards full decarbonization poses challenges for the way the internal market in electricity and gas is organised that need to be addressed to make the system fully apt to drive the clean energy transition in the most cost-effective manner, by inter alia preventing system costs, taxes and levies from reaching unsustainable levels. These challenges are:

- Regarding the electricity system, it is necessary to complement the largely national market and bidding zone structure with stronger locational investment signals. This includes the design of renewables support schemes and the design of network charges, the need to push for a timely bidding zone reconfiguration under the ongoing bidding zone review and the need for strict compliance with the minimum 70% requirement on interconnector capacity availability for cross border trade.
- We need to make much better use of the transmission and distribution networks inside Member States to accommodate more renewables. Connection delays are increasing and many network operators are concerned about the capacity of their systems (even at DSO level) to meet demand. Increased use of demand response and flexibility solutions (including storage) can help address this, and at the same time bring direct benefits to end consumers as well as reducing overall system costs. This requires increased digitalisation of the energy system. NRAs and DSOs/TSOs need to ensure this is fully incorporated in network development plans including by making use of Smart Grid indicators.
- We need to ensure more efficient price signals to end consumers. The rising shares of renewable generation are leading to an increasing recurrence of hours with very low, zero and even negative electricity prices. This is creating risks for further investments in renewable generation. Demand should react to these signals, either by shifting demand to those hours or by bringing demand, often flexible, from other energy carriers to electricity (heat pumps, electric vehicles, electrified industrial processes, etc). An EU-level debate is needed on a common approach to make electricity more attractive as energy carrier.
- The strengthened integrated electricity market necessary for the transition requires a strong governance framework. Many decisions with direct cross-border relevance are currently still dependent on regulatory authorities established at national level, leading to delays and inefficiencies. In addition, the current governance system still reserves several regulatory tasks and responsibilities to private bodies with commercial interests. It also needs to be ensured that market functions which are key for the functioning of the European system, such as market coupling, are centralised. Also, higher interconnectedness of energy markets raises

the risk of transnational supply crises, which in turn necessitates that Member States engage in strong, proactive coordination to safeguard stability.

- As regards the gas system, it will be important to ensure that the future use of gas infrastructure and its potential repurposing or dismantling is planned well in advance. As the infrastructure is expected to downsize at a slower pace than its userbase, it also needs to be ensured that the costs related to the gas infrastructure remain bearable for the users. Finally, cross-border implications of diverging decarbonisation strategies need to be closely monitored, to maintain a functioning market and avoid security of supply issues.

4. Views of the co-legislators and other key stakeholders

a. Member States

The degree to which Member States rely on market-based solutions to drive decarbonization varies. Some Member States strongly rely on market-based approaches whereas others have introduced non market-based interventions - some of which originated during the crisis and are still applied despite not being in line with internal market rules. As regards deeper market integration, the support of Member States for this has not been tested, although higher support can be expected among smaller Member States. All Member States support increased digitalization and flexibility of the system – however, in practice both Member States and regulators have been concerned about the upfront investment costs.

b. European Parliament

The current expectation is that the narrative concerning the European Green Deal may shift to stronger focus on implementation, economic security and competitiveness, including affordable energy prices. These elements are also relevant vis-a-vis energy markets. Parliament has a strong focus on the needs of end consumers.

c. Industry

In the context of the Clean Transition Dialogues, industry confirmed their strong commitment to the European Green Deal, whilst highlighting the need for a reinforced industrial approach. Industry highlighted elements linked to energy markets, such as: risk for investments related to low electricity prices, ensuring delivery through effective implementation and simplification of the regulatory framework, securing the supply of abundant and affordable zero and low-carbon energy or leveraging the clean single market in a globally competitive environment.

On the gas side Member States and stakeholders are focusing on the transposition and implementation of the Package. There are no calls for a revision in the short-term.

5. The way forward

To enable the full decarbonisation and ensure more affordable energy prices (by mitigating system costs, taxes and levies) and more secure energy supply, it is important to renew the push for achieving a fully integrated internal market for electricity which:

- builds on a robust implementation of internal market rules, including the EMD reform;

- improves the way locational elements and temporal variations are reflected in wholesale price formation and in the design of renewable support schemes and network charges;
- ensures that sufficient infrastructure is not only physically available but can also be more effectively used for transporting electricity within and between Member States;
- prevents inefficient and excessive costs linked to system management and redispatch;
- optimises investment at EU level in a cost-efficient way and creates the right investment climate for innovative investment plans based on flexibility, digitalisation and better asset management at both transmission and distribution level;
- removes remaining regulatory obstacles to the market-based roll-out of non-fossil flexibility such as storage and demand response (including at the level of DSOs) and enables market participants to realise the value of this flexibility;
- revises the governance of the internal market to make it fit for purpose for a more integrated, secure and renewables-based power system;

To follow on the legal requirement set out in EMD, the next Commission could **launch a broad policy reflection** (e.g., in the form of Commission White Paper to be issued in 2025) to inform a possible European reform towards a fully integrated internal market for electricity. In addition, DG ENER could work towards a revision of energy taxation rules together with DG TAXUD, either through a change of the relevant legislation or through non-binding guidance.

On the gas side the immediate next steps are to implement the recently adopted Gas Package. This facilitates the phase-out of fossil gas on the one hand and the uptake of renewable and low-carbon gases on the other. In the context of the decarbonisation agenda, the Commission will closely monitor the appropriateness of the regulatory framework on a constant basis and come forward with revised legal proposals if necessary.

6. Proposed lines to take

- We need to drive forward the energy transition in a secure and affordable way. A successful energy transition will ensure that energy prices for European consumers are stable and affordable for households and do not jeopardise the competitiveness of European industry vis-à-vis our main trading partners.
- During the energy crisis, much of the focus of policy makers in ensuring affordable energy has been on the wholesale price of gas and electricity. Whilst the strong roll-out of renewable generation will drive down the wholesale price of electricity in the mid- 2030s during hours when abundant renewable energy is available, the other cost elements in the electricity bill such as network tariffs, taxes or levies may face a sharp increase related to the fact that the power system of the future will require significant investments in grids, renewables and flexibility to avoid bottlenecks during electrification.
- Such costs need to be kept under control so as not to turn into a new kind of affordability and competitiveness challenge going forward. It will be crucial to ensure that: (a) Inefficiencies resulting from a lack of European market integration and cooperation are mitigated as much as possible; (b) the investment framework for generation and flexibility (including storage)

maximises the potential for market-based investments to meet the targets but also directs these investments in a coherent and comprehensive manner to where they are most needed; and (c) the governance framework for the internal market needs to be made fit for purpose.

- For this purpose, it will be crucial to ensure a robust implementation of internal market rules. In addition, the next Commission could launch a broad policy reflection to inform a possible European reform towards a fully integrated internal electricity market for electricity.
- In gas the downsizing of the system will lead to similar challenges as the costs of the infrastructure will have to be borne by less and less customers. Long-term planning will be key to keep costs down and limit the volume of stranded assets.

7. Linked to A-Z fiches

- Electricity Market Design
- Flexibility
- Hydrogen and gas decarbonisation package
- Internal market for electricity
- Internal market for gas

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Energy Security (internal and external aspect)

1. State of play

Energy security is a core objective of the EU energy policy, alongside sustainability and affordability, and one of the five dimensions of the Energy Union. The EU has developed a robust energy security architecture over the years, built on oil stocks, gas security of supply, electricity risk-preparedness, offshore safety, critical infrastructure protection, and cybersecurity. This architecture was strengthened during the previous mandate with the adoption of several targeted energy and security related legislation, in the wake of the energy crisis and the launch of the REPowerEU Plan to get rid of Russian fossil fuels.

The new Regulation on underground **gas storages** have been instrumental, for instance, in absorbing the supply shock and in stabilizing gas prices¹². The EU also acted to coordinate the national efforts to reduce gas and electricity demand to compensate for missing Russian gas volumes (131 bcm were saved between August 2022 and April 2024)¹³. With AggregateEU, the EU also diversified its supplies by setting up a demand aggregation and joint purchasing tool for non-Russian gas. This was supported by international reach-out to reliable supplier countries.

As a result, the EU substantially **reduced its dependency on Russian gas** from 45% of imports in 2021 (150 bcm) to 15% in 2023 (43 bcm). In addition, the EU phased out most of the imports of Russian oil and oil products with the full ban of seaborne imports of Russian crude oil and oil products. With the acceleration of the energy transition, energy security encompasses more and more the security of supply chains of critical energy technologies and raw materials,

2. Ongoing / Open files / Implementation

In 2025, the Commission has to submit two reports: i) by 28 February, the report on the application of the Storage Regulation and of the solidarity provisions of the Hydrogen & Decarbonised Gas Package, and ii) by 1 September, the report on the implementation of the Electricity Risk Preparedness Regulation. Furthermore, the Commission has launched a cross-sectoral fitness check to evaluate the EU energy security framework (public consultation to be launched in the summer – to be updated).

In parallel, work is ongoing on a number of files:

- Following the revisions of the **Electricity Market Design**, the Member States should now undertake an assessment of their national electricity system flexibility. Also, the new Network Code on Demand response now has to be approved by ACER, around Q3/Q4 2024.
- Following the **Wind Power Action Plan**¹⁴, the Commission has issued a Guidance on auction design reinforcing the cyber-resilience of wind installations and has launched an assessment of cybersecurity risks, planned to be completed by xxx .

¹² Gas Storage Regulation (EU) 2022/1032.

¹³ Gas Demand Reduction Regulation (EU)2022/1369 and Council Regulation (EU) 2022/1854 on an emergency intervention to address high energy prices.

¹⁴ COM(2023) 669 final.

- The certification process of Storage System Operators is still ongoing¹⁵.
- The Commission and Member States will define the intermediary gas storage filling targets for 2024-25 by November 2024.
- The adoption of Commission's opinions on the Member States' Preventive Action Plans and Emergency Plans, as per the Gas Security of Supply Regulation is ongoing¹⁶.
- The Critical Entities Resilience Directive will be fully implemented throughout the EU as of 18 October 2024.
- As per the Council Recommendation on the resilience of critical infrastructure, the Commission has analysed the reports of the stress tests in the energy sector carried out by several Member States and is now discussing possible follow-up actions.
- The Commission is working with the IEA on global gas security of supply.
- The Commission is working on the implementation of the Critical Raw Materials Act adopted in 2024. Building on the successful experience of AggregateEU for natural gas, the approach is to develop a similar model to strategic raw materials for the transition.

3. Key challenges

Challenges to the EU's energy security will evolve and shift as the energy transition progresses. **Geopolitical challenges** will continue weighing on the energy security situation. Continued tensions with Russia in the wake of its aggression against Ukraine, geopolitical turbulence from the unresolved Middle East conflict, as well as possible new dependencies stemming from the sourcing of critical raw materials, will shape the future external energy environment of the EU. Uncertainty surrounding the outcome of key elections, notably in the US, which has become the EU's largest LNG supplier, will also linger over the near term.

Besides, one of the key challenges will be the **climate adaptation of the energy system**. Climate Change is exacerbating extreme weather events that impact production, transmission, distribution, and peak demand. The risks of energy disruptions due to heat and drought should be highlighted, particularly in Southern Europe, and those due to flooding. According to the first European Climate Risk Assessment, the energy sector is projected to experience the strongest rise in damage to critical infrastructure in comparison to transport, industry and social sectors.

The **decarbonization**, the **electrification** and the **digitalisation** of the energy system will bring new opportunities but also new challenges. The increasingly variable and distributed generation will challenge the management of the grids. The new vulnerabilities in critical electricity infrastructure could also be exploited by man-made threats like cyber-attacks to the digitalized processes, with an increased risk of propagation to other essential sectors and of cascading failures. The gradual fossil fuel phase out will also require assessing the adequacy of oil and gas infrastructures. Lastly, one of the biggest hurdles will be to **enhance the EU strategic autonomy**

¹⁵ In July 2024, 14 Commission opinions for the certification of 13 SSOs (corresponding to 19 storage sites) were adopted. On the EU territory there are 58 storage operators, corresponding to 135 storage sites. Several opinions are under adoption, in various stages of the procedure. Member States had to submit their draft decisions on certification by 2 January 2024. However, several Member States (Germany, Italy, Bulgaria, Czech Republic) have not submitted the draft decisions yet. DG ENER is in contact with them.

¹⁶ In July 2024, no Commission opinions have been adopted yet.

and resilience for renewable energy, for instance by producing renewables in the EU, while managing dependence on imports of raw materials.

In the shorter term, while the EU has made substantial progress towards its objective to phase out Russian fossil fuels, a key upcoming challenge will be the **end of the gas transit agreement between Russia and Ukraine on 31 December 2024**. The Commission has been very clear that no negotiations with Russia on the continuation of the agreement would happen, and it is therefore working closely with concerned Member States to replace the 14 bcm of Russian gas concerned via alternative sources and routes.

4. Views of the co-legislators and other key stakeholders

a) Member States

During the energy crisis, increased support for a stronger energy security policy was voiced:

- During the negotiations of the Hydrogen & Decarbonised Gas Package, most Member States called for an overhaul of the Security of Gas Supply Regulation¹⁷.
- On 22 March 2024, the European Council underlined the need for enhanced and coordinated military and civilian preparedness and asked the Commission *“to propose actions to strengthen preparedness and crisis response at EU level”*¹⁸.
- In its report of April 2024 to the European Council, Enrico Letta called for *“a systematic review of the gas security of supply framework”*¹⁹.
- The Council conclusions of 30 May 2024 on Electricity Grid Infrastructure asked the Commission to *“conduct a targeted legislative review to further reinforce the EU’s security of electricity supply architecture over the longer term”*²⁰.

b) European Parliament & other EU bodies

During the negotiations of the Hydrogen & Decarbonised Gas Package, the European Parliament asked for an overhaul of the Security of Gas Supply Regulation.

The major European parties referred to energy security as a priority in their 2024 election manifestos by committing to e.g., *“promote a common European resource strategy to avoid dependencies from third countries”* (EPP), *“strengthen Europe’s sovereignty by delivering security of supply in energy, raw materials, technologies”* (PES), *“effectively manage geopolitical risks (...) by consciously reducing dependence on external resources”* (ALDE).

In June 2024, the **European Court of Auditors** adopted a report on the EU framework for security of gas supply and called for several improvements to the framework.

¹⁷ Cf. text of the [provisional interinstitutional agreement](#) of 15 December 2023.

¹⁸ <https://www.consilium.europa.eu/media/70880/euco-conclusions-2122032024.pdf>

¹⁹ <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>. It notably recommended *“to take into account the new realities of the LNG market and promote greater solidarity in case of crisis. This review must also include the role of future clean gases, like hydrogen”*.

²⁰ It notably requested the Commission to focus *“on risk preparedness, whilst taking into account recent developments and lessons learned from the energy crisis, Russia’s war of aggression against Ukraine, climate risks and various low-probability high-impact scenarios”*.

Commission's DG NEAR is promoting renewable electricity exports from the Southern Neighborhood (Morocco, Algeria, Tunisia, Egypt) into the EU. This entails risks in terms of EU funding of potentially stranded assets and of creation of new dependences.

c) Industry

The dialogue with sectoral industry associations is lively and constructive, notably through the various Commission expert groups where they are represented.

The Industry Advisory Group – a body supporting AggregateEU in industry outreach - voiced concerns from gas traders about what companies considered as Commission's interference with market mechanism. The success of AggregateEU, with 180 companies registering and more than 75 bcm matched, showed that the mechanism introduced additional transparency and optionality to the oligopolistic gas market without undermining the market dynamics.

5. The way forward

The EU should build a new Energy security framework as the **new sword arm of the Green Deal**. This framework should enable an orderly and affordable phase out from fossil fuels throughout the energy transition, while allowing for an efficient handling of emerging and trans-sectoral risks, including: climate change impacts, infrastructures vulnerability, increased electrification and variability of electricity generation, stronger exposure to LNG global markets, higher risk of cascading disruptions, new energy-related dependencies. The future framework will also need to unlock the contribution of demand response for energy security.

In this perspective, the European Commission could notably:

- Introduce, among other things, a **modernized energy security architecture** in a “**Genuine Energy Union Strategy**”, by Q1 2025. This will be informed by the **fitness check** and should notably address the challenges of geopolitics, strategic autonomy, the energy transition and sectoral integration, lessons learned from the crisis.
- Adopt a Communication on **Strategy/vision on energy storage** (natural gas, hydrogen, electricity, repurposing for the transition, etc) **and system flexibility**, and **stockpiling (CRM²¹)**, possibly as part of the modernized energy security architecture.
- Propose a legislative revision of the “**Energy security framework**” notably through the revision of the gas security of supply and electricity risk preparedness regulations, also including emerging energy vectors and with emphasis on climate risks (Q4 2025/Q1 2026).
- Legislative proposal on **Safety and protection of offshore energy infrastructure** revising the Offshore Safety Directive covering oil and gas installations, connected infrastructure, decommissioning, and to be extended to CCS and offshore renewables.
- Explore within existing fora further **cooperation between energy and defence** actors.
- Adapt the **Energy Union Governance** to reinforce the energy security dimension, through new relevant indicators and possibly targets to be reported in the NECPs.
- Propose a legislative revision of **Oil stockholding directive**, anticipating the decrease of oil demand as well as gradual uptake of decarbonised liquid fuels.
- Fully implement the **energy efficiency acquis** to ensure continued contribution of demand reduction to energy security should also be a priority for the years to come.

²¹ Complementing CRMA and focused on renewable energy technologies and the energy transition

6. Proposed lines to take

- Energy security is a key prerequisite for our economic security, competitiveness and our decarbonization.
- The energy crisis following the Russian invasion of Ukraine has shown how the external energy dependencies of the EU can be weaponized.
- Thanks to the swift and coordinated response of the EU to the energy crisis, European energy security is now significantly reinforced.
- The REpowerEU Plan sets the trajectory towards the EU's phase out of Russian fossil fuels as soon as possible. The EU has already made important progress in record time.
- The next important step towards the EU's phase out of Russian gas will be the end of the Ukraine transit agreement on 31 December 2024.
- Enhancing our energy security is also about grasping the emerging challenges and threats, in order to adapt our energy system to future potential vulnerabilities.
- These emerging challenges notably include: the flexibility needs of our grid, the risk of moving from one dependency (fossil fuels) to another (CRMs and externally sourced renewables), as well as the vulnerability of energy infrastructures.
- As a way forward, the EU should draw all the lessons from the 2022/2023 crisis while supporting the transition towards climate neutrality. This is key to enable an orderly and affordable phase out from fossil fuels throughout the energy transition.
- International cooperation with strategic partners is a mean for decreasing the economic cost of keeping a high level of security of supply of imported energy carriers. Such structured cooperation should be privileged under IEA framework.

7. Linked to A-Z fiches

- AggregateEU
- Balkan Gas Hub
- Diversification
- Energy Security
- Gas Security of Supply
- Electricity Risk Preparedness
- Oil stocks
- Offshore oil and gas operations – ensuring its safety
- IEA
- Energy Storage
- Underground gas storage
- Climate Adaptation for critical energy systems
- Defence and energy
- Critical energy infrastructure protection
- Cybersecurity in the energy sector
- Critical Raw Materials
- Screening of foreign investments in energy
- Russian gas phase-out
- USA
- End of Ukrainian Transit Agreement

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Phasing out energy imports from Russia; REPowerEU

1. State of play

The European Council adopted the Versailles Declaration in March 2022 agreeing to phase out the European Union's dependency on Russian energy imports as soon as possible. Consequently, the Commission proposed **the REPowerEU Plan in May 2022** to address the energy crisis. The Plan set out the EU's strategy to drastically phase out Russian gas imports while accelerating the transition to a cleaner, renewables-based energy system in line with the European Green Deal.

REPowerEU's **primary objective is phasing out the European Union's dependence on Russian fossil fuels by 2027** - with specific focus on natural gas - through a set of actions aimed at a) saving energy b) diversifying energy imports c) substituting fossil fuels and accelerating Europe's clean energy transition and d) smartly combining investments and reforms.

The REPowerEU plan also increased **funding possibilities under the Recovery and Resilience Facility (RRF)**. Following the adoption of the REPowerEU Regulation, Member States (MS) submitted dedicated new Recovery and Resilience Plans (RRP) chapters outlining reforms and investments to increase the resilience, security and sustainability of the EU energy system. To date Member States have assigned a total of **EUR 184.7 billion** to energy-related measures.

To contribute to the diversification away from Russian gas, the EU also set up **the EU Energy Platform**, aiming at reaching out to reliable energy suppliers by pooling a share of gas demand in the EU and making the first step towards joint purchasing through AggregateEU.

Finally, still during the course of 2022, **several emergency legislative initiatives** were adopted in record time, under Article 122 TFEU, to mitigate the effects of the energy crisis. These included:

- Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage.
- Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas.
- Council Regulation (EU) 2022/1854 of 6 October 2022 on an emergency intervention to address high energy prices.
- Council Regulation (EU) 2022/2576 of 19 December 2022 enhancing solidarity through better coordination of gas purchases, reliable price benchmarks and exchanges of gas across borders.
- Council Regulation (EU) 2022/2578 of 22 December 2022 establishing a market correction mechanism to protect Union citizens and the economy against excessively high prices.
- Council Regulation (EU) 2022/2577 of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy.

In conclusion, much has been achieved at the EU level towards phasing out Russian fuels in the period 2022-2024. The measures implemented allowed to substantially reduce dependency on

Russian gas, bring down overall consumption through energy savings and renewable energy accounted for 50% of the EU electricity power generation in 2023.

More concretely, the EU diversified its supplies of natural gas away from Russia. Russian gas imports dropped from 45% of overall EU imports in 2021 (150 bcm) to 15% in 2023 (43 bcm). Norway and US became the EU's largest gas suppliers, representing 34% (47 bcm) and 18% (25 bcm), respectively of EU gas imports in the first five months of 2024, followed by North Africa (14%; 20 bcm), Azerbaijan (4%; 5.9 bcm) and Qatar (4%; 5.8 bcm). Cooperation under AggregateEU reached over 180 companies, 90 bcm of demand collected, 160bcm offered of non-Russian natural gas, 75bcm matched. **Moreover, the EU achieved significant results under its actions to reduce and replace gas consumption.** EU natural gas demand lowered by 18% between August 2022 and May 2024 (equivalent to 131 bcm of gas). Energy efficiency, energy savings and energy switch accompanied the accelerated deployment of renewable energy sources. Wind and solar capacity increased by 36% between 2021 and 2023, which means a saving of approximately 24 bcm gas over 2 years.

2. Ongoing / Open files / Implementation (max ½ page)

Russian fuels

Russian crude oil and oil products imports are now marginal due to the EU sanctions banning Russian seaborne crude oil and oil products imports from December 2022 and from February 2023 respectively²². However, **Russian fuels remain part of the EU's energy imports.** Up until May 2024, Russian imports constituted 18% (25.4 bcm) of the EU's natural gas imports. Russian pipeline imports share in total EU gas imports slightly increased to 12% in May compared to 10% in April 2024 while they were around 45% historically.

Russian nuclear fuel

An important workstream is **ending dependency on Russian nuclear fuel** for Russian-designed nuclear reactors. Utilities in four out of five Member States concerned have already contracted alternative supplies. The Commission is supporting manufacturers developing alternative fuels for such reactors through the Euratom Research and Training Programme. Further work is needed on ending existing dependencies on Russia as regards nuclear fuel cycle services - in particular uranium conversion and enrichment - and spare parts and maintenance services.

End of transit agreement through Ukraine

On 31 December 2024 the Ukraine transit agreement²³ will expire. In 2023, the route transported 14 bcm of Russian gas, mainly towards Central and Eastern European Member States. In the context of war, negotiations between Ukraine and Russia will not take place. The Commission is

²² Russian pipeline crude oil imports still allowed for: HU, CZ, SK. Such imports represent only 3% of total EU crude oil imports.

²³ The agreement between Gazprom and Naftogaz Ukrainy covering the transit of Russian gas through Ukraine for the period 2020-24 was facilitated by the Commission and signed on 31 December 2019.

working with the most affected Member States to mitigate the consequences of the end of this agreement both for the winter of 2024-2025, and for 2025-2026 and beyond.

Member States' call for further action

At the **meeting of the Energy Council on 30 May 2024, Member States** reasserted their commitment to the objectives of the REPowerEU Plan and some of them asked for a high-level meeting on the subject and a roadmap to achieve this goal. Following on the request, DG ENER organised a high-level meeting with national Directors-General (DGs) for energy on 21 June to share what Member States are doing at the national level, look at available instruments and see what further steps need to be taken to fully phase out Russian fuels. Member States requested that discussion be taken at political level to decide on further actions to be undertaken by the Commission. As a result, follow up on REPowerEU was part of the Informal Meeting of Energy Ministers of 15-16 July in Budapest under the Hungarian Presidency.

As signalled in President von der Leyen's statement to the European Parliament on 18 July and drawn from the **2024-2029 political guidelines**, further work of the EU acting together should be put forward to bring the era of Russian fossil fuels dependency to an end.

3. Key challenges

The High-level meeting with national DGs provided a short overview of the existing challenges causing Russian fuels to remain a part of the EU's energy mix. Those included: the lower price of Russian fuels, traceability of gas, dependency because of national or geographic particularities, infrastructure readiness and potential legal risks associated with unilateral measures (incl. using the clause of the Gas Regulation²⁴).

4. The way forward

The Commission is ready to intensify work along three workstreams: nuclear fuels, gas and horizontal. Oil is left out of the scope of this exercise due to it being subject to sanctions and the advanced work to provide alternative supply sources/routes. These measures are on top of the EU's efforts on renewable energy and energy efficiency measures.

- 1) **Nuclear fuels.** Given ongoing work on diversification of fuels, the Commission is ready to engage more strongly to diversify uranium conversion and enrichment services and the supply of critical spare parts. Similarly, the Commission is available to consider an import duty on nuclear fuels of Russian origin.
- 2) **Natural gas.** The Commission is ready to (1) provide stronger guidance on the use of the Gas Regulation clause, notably in the consultation phase; (2) continue engaging closely with Central and South-eastern Europe to help accelerate remaining priority projects of

²⁴ Referring to the option under Regulation (EU) 2024/1789 of the European Parliament and of the Council of 13 June 2024 on the internal markets for renewable gas, natural gas and hydrogen. The regulation provides to Member States the option to introduce measures to temporarily restrict LNG and pipeline supplies from the Russian Federation and Belarus by limiting the provision of capacity for deliveries from the Russian Federation or Belarus. The measures should be intended for protecting the essential security interests of the Member State and of the Union.

the CESEC High-Level Group²⁵; (3) consider the usefulness of a potential import duty or a price cap, together with an appropriate system to certify the origin of gas; and (4) consider the revision of the regulations on security of supply and gas storage. A challenge remains to prevent Russian gas from preserving or gaining market share, with more supplies via Türkiye.

- 3) Horizontal. Keep the ongoing work on monitoring, enhance information exchanges with MS. The Commission is open to explore new monitoring formats like a scoreboard on REPowerEU objectives linked to phase out of Russian fuels.

DG ENER is responding to the call of Member States by preparing the work linked to the different workstreams, identifying challenges, risks and cooperating with the Presidency of the Council and Member States. Only after a discussion at political level takes place at the Informal Meeting of 15-16 July follow up documents i.e., a roadmap and further initiatives will be undertaken.

5. Lines to take

- The Commission listened carefully to the positions expressed by Member States at the TTE (Energy Council) held on 30 May 2024. The Commission took good note of the call by several ministers to prepare a Roadmap or Action Plan on fully phasing out Russian fuels, including timelines and additional proposals.
- In 2022, the European Council set the objective in the Versailles Declaration ‘to phase out the EU’s dependency on Russian gas, oil and coal imports as soon as possible’. In response, the Commission adopted the REPowerEU Plan setting out actions to achieve this objective.
- In just two years REPowerEU Plan has achieved important and tangible results. The EU has notably:
 - Reduced:
 - EU **gas demand** reduced by **18%** between August 2022 and May 2024.
 - It saved Europe **130 bcm gas and contributed to compensate part of the Russian gas previously flowing to the EU and to historically high levels of gas storage filling over the last two years.**
 - Replaced:
 - Russian gas imports dropped from 45% of overall EU imports in 2021 (150 bcm) to 15% in 2023 (43 bcm).
 - Norway and US became the EU's largest gas suppliers, representing 34% (47 bcm) and 18% (25 bcm), respectively of EU gas imports in the first five months of 2024, followed by North Africa (14%; 20 bcm), Azerbaijan (4%; 5.9 bcm) and Qatar (4%; 5.8 bcm).
 - Establishment of **market cooperation between European buyers and gas/LNG sellers via AggregateEU**. More than 180 companies, 90 bcm of demand collected, 160bcm offered of non-Russian natural gas, 75bcm matched. On the basis of this experience, the

²⁵ Enabling full phase out of Russian gas imports i.e., via dedicated outreach to government, suppliers and industry and concrete targeted regional initiatives.

Commission will launch mechanisms to aggregate demand in the EU for strategic energy-related commodities such as strategic raw materials or hydrogen and seek offers from potential suppliers in order to support our decarbonisation efforts, ensure diversified and resilient supply chains and increase transparency.

- Through our investments in LNG terminals and gas interconnectors, every Member State can now receive gas supplies from at least two sources, and reverse flows are possible between neighbours. Notable examples of REPowerEU infrastructure projects include:
 - The ongoing construction of the **Krk LNG terminal** in Croatia, funded under REPowerEU and part of Croatia's Recovery and Resilience Plan.
 - The **Poland-Lithuania Gas Interconnector** started its commercial operation on 1 May 2022 and reinforces optionality and resilience of the whole Baltic gas market and was supported through the Connecting Europe Facility of the European Commission
 - The **Greece-Bulgaria Gas Interconnector** was inaugurated on 1 October 2022, also funded through the Connecting Europe Facility.
- Alternative nuclear fuels are already contracted by utilities in 4 of the 5 EU MS concerned (Finland, Czechia, Slovakia, Bulgaria), with Hungary being the exception. In May 2024, Bulgaria loaded for the first time the alternative Westinghouse fuel in one of its 2 VVER 1000 operating reactors. Ukraine could share knowledge as it has significant experience in diversification away from Russia.
- Imports of oil from Russia decreased from 28% of all petroleum oil EU imports in Q4 2021 to 3% in Q4 2023.

○ **Renewable energy:**

- Renewable energy installation: **installed wind and solar capacity has increased by 36% between 2021 and 2023**, which means a saving of approximately 24 bcm gas over 2 years.
- The EU has significantly reduced its dependency on Russian fuels. The Commission is ready to engage with the Member States and consider together further avenues towards this objective.
- This task should be approached in a careful and a strategic way since: (1) the global gas markets remain volatile (as recent price spikes after the Norway short-term outage attest), (2) we are preparing for the end of the Russia-Ukraine gas transit agreement and (3) Russia's attacks have seriously damaged and destroyed Ukraine's critical energy infrastructure, increasing the role of EU electricity imports into Ukraine.

6. Linked A-Z fiches

- REPowerEU
- Diversification
- Security of Supply in nuclear

- Energy Security
- Diversification
- AggregateEU
- EU Energy Platform
- Balkan Gas Hub
- Oil prices
- Investment and financing
- Intervention in price setting
- Recovery and Resilience Facility
- Recovery and Resilience Plans

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Energy Prices

1. State of Play

Europe's energy landscape has been profoundly impacted by the energy crisis caused by Russia's invasion of Ukraine. In 2022, at the peak of the crisis, Europe experienced unprecedented high and volatile prices for gas, and as a consequence for electricity.

Europe successfully implemented structural changes in its energy markets in a very short time, drastically reducing its dependency on Russian gas from 45% in 2021 to 15% in 2023, thanks to extensive and timely policy measures to diversify energy imports, reduce demand, increase energy efficiency and accelerate the roll-out of renewables.

This effort paid off and gas prices fell drastically compared to two years ago, but remain higher than pre-crisis levels. Despite the incontestable improvements since 2022, the crisis has had consequences on Europe's competitiveness by widening the energy price differential with some competing regions, in particular the US and China.

2. Lines to take

Current situation

- *Wholesale*: on the gas market prices are fluctuating between 30 and 35 €/MWh, about 50% higher than pre-crisis.²⁶ Electricity prices range from 40 to 65 €/MWh, with a tendency to stabilise around historical prices. Global oil prices have also dropped since 2022, and are currently in the range of 70-75 €/barrel, but remain some 30% higher than pre-crisis. Refined oil products have followed a similar trend.²⁷ Carbon price is currently at around 70 €/tCO₂eq, down from 95 €/tCO₂eq in February 2023.
- *Retail*: Prices remain higher than before the crisis (around +60% for gas and +30% for electricity). Following the price shock caused by the crisis, energy price differentials with other world regions increased, raising concerns about the competitiveness of the EU industry, especially energy intensive industries. For example, electricity and gas retail prices for industrial customers in the EU were historically between 1.5 and 2 and 2 to 3 times higher than the US, respectively. Now electricity has increased to 2-3 times, while the gas differential has widened to 4-5 times.

Short-medium term outlook

²⁶ Measured as the average in the first half of 2021.

²⁷ In June 2024 prices were at 1.60 €/litre, 1.74 €/litre and to 1.09 €/litre for diesel, gasoline and heating oil respectively. They remain between 20 – 50 % higher than pre-crisis.

Fundamentals in the EU gas markets are solid, driven by robust imports, reduced demand and a historically high level of gas is storage. The outlook for the coming winter is positive. Yet, global markets for LNG (on which the EU depends by approx. 40% of its gas consumption) remain somewhat tight and are as such vulnerable to shocks and price volatility. As new liquefaction capacity comes online globally (+250 bcm expected by 2030, an increase of almost 50% compared to the existing capacity) and the EU continues on its path to reduce gas consumption, the market tightness should further ease, and prices should progressively return to pre-crisis level.

Electricity wholesale prices have already returned to pre-crisis levels in recent months thanks to the increasing share of renewables in the energy mix (45% in 2023) supported by lower demand, compared to pre-crisis levels. However, gas generation is still the price-setting technology in many hours and therefore electricity prices remain partially exposed to the current volatility in the gas markets.

Background material

Figure 1: Energy prices in Europe

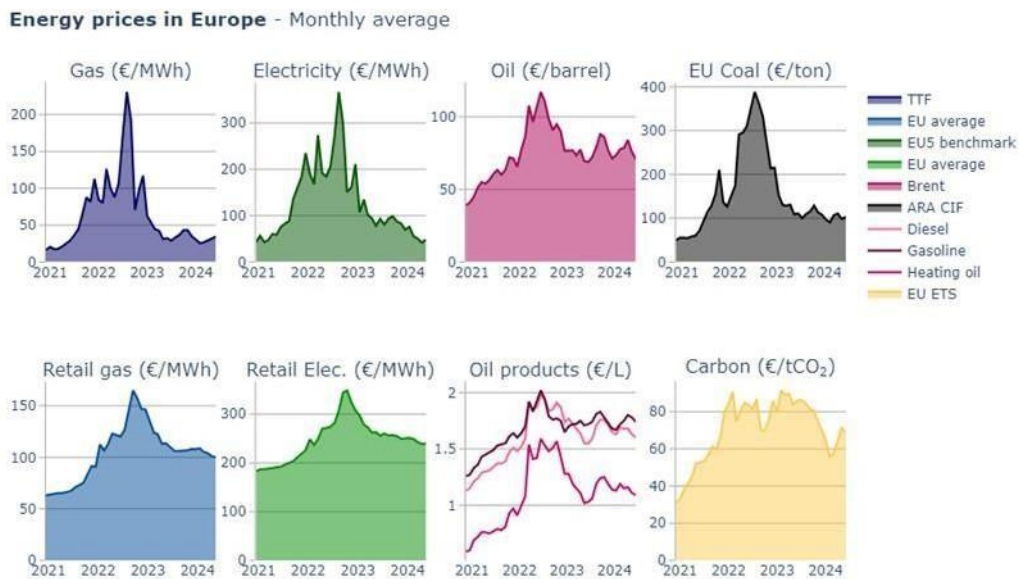


Figure 2: Ratio EU vs other countries: retail electricity prices for industrial customers

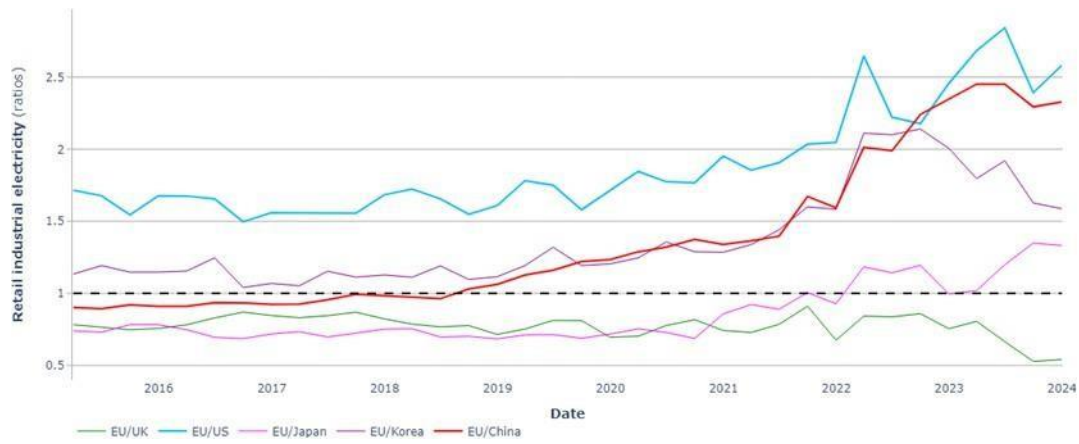


Figure 3: Ratio EU vs other countries: retail gas prices for industrial customers



Contact: Massimo Tognoni (ENER A4)

Just Transition and Consumer Empowerment

1. State of play

Citizen engagement and delivering a just energy transition affects all part of energy policy impacts all aspects of energy policy. The **Coal Regions in Transition Initiative** is the backbone of the **Territorial Just Transition Plans** developed for 96 regions and funded through the Just transition Fund. The Social Climate Fund aims at supporting Member States in addressing energy poverty, a concept now defined at EU level, while the **Commission's Recommendation on energy poverty** will help MS develop transition plans. Through initiatives such as the **Clean Energy for EU islands** and the **Covenant of Mayors**, the Commission has also provided support for local action to develop and implement transition plans – building on local resources and addressing local needs.

Building on the Clean Energy Package framework for consumer protection and empowerment, the Fit for 55 instruments and REpowerEU, the EU adopted the **Electricity market Reform** and the **Decarbonised Gas package** to give consumers new tools to actively participate in the market, as individual or collective renewable energy producers or by providing demand response. At the same time, customers are now better protected from volatile prices and from disconnection. The Decarbonised Gas package further recognises the role of coal and carbon intensive regions in the decarbonisation of industrial processes, tying these regions to the EU's efforts to scale up the manufacturing capacity under the **Net Zero Industry Act**.

2. Ongoing / Open files / Implementation

The Commission (DG REGIO and DG ENER) need to ensure that the Member States' territorial just transition plans are delivered upon and that the Just Transition Mechanisms' funds are used in a timely and effective manner. Further work will also be required with coal regions to help them reap the opportunities of the Net Zero Industry Act. The Karlovy Vary declaration signed by 22 governors of coal regions and discussed at the Council, asked the Commission to further study the competitiveness of coal regions in a net zero manufacturing industrial landscape.

Working with other Commission services, including SG RECOVER and DG CLIMA, DG ENER needs to ensure that Member States' Social Climate Plans address energy poverty in line with the Energy Poverty Guidance.

As part of the review of the Governance Regulation, the provisions on multi-level governance (i.e. the involvement of sub-national authorities) will need to be examined to ensure coherence and deliverability of National Energy and Climate Plans at local level. The ongoing local initiatives will continue to facilitate active participation in the energy transition by citizens and communities.

Close cooperation with Member States and stakeholders will be crucial to ensure that the regulatory framework delivers for citizens and consumers. This entails new implementing acts on customer switching and demand response, and guidance in several areas, including energy communities and energy sharing as required by the new legislation. The Council has also called

for an Action Plan on Energy Communities²⁸. The Commission is also required to prepare a report by end 2025 on the development of fully effective competition in electricity retail markets and the impact of regulated prices. The Citizens Energy Forum to be held in Budapest this December represents an important opportunity to foster citizen and community engagement in the energy transition including by youth groups.

3. Key challenges

The realisation on the ground of a just transition is being slowed down by **lack of social acceptance and insufficient implementation** of the legal and policy framework by the Member States. Many consumers consider the transition as **unaffordable** or pushing up housing costs with them bearing the costs while others benefit. They are often either unaware or not equipped to fully benefit from market dynamicity, to choose among offers made by suppliers, and make best use of energy digitalisation and innovations, such as aggregation or home energy management. These challenges apply to both consumers belonging to the middle class, and the energy poor and vulnerable.

During the crisis the level of energy poverty increased by over one third, with almost 10% of citizens now reporting not being able to keep their homes adequately heated. Many regions and cities lack the capacity to deliver the European Green Deal on the ground. When seeking support from the Commission they are often confused by the range of support initiatives and how these link to for example, cohesion funding could be improved.

4. Views of the co-legislators and other key stakeholders

a) Member States

Member States are strongly committed to implementing the consumer protection and empowerment provisions in the Electricity market reform and Clean Energy Package. At the same time, due to the complexity of many provisions, they have asked for guidance from the Commission. Regarding energy poor and vulnerable consumers, some Member States - such as the Nordics - which previously considered this purely a matter of social policy now may see the importance of addressing it in an energy policy context.

b) European Parliament

Consumer empowerment and protection is a major objective of the Parliament, which is also particularly concerned about the impact of the cost of the energy transition on (most vulnerable) consumers. The Parliament was very focussed on protection of energy poor and vulnerable customers during the negotiations on Electricity Market Reform and the Gas Decarbonisation Package and follows closely the work of the Energy Poverty Advisory Hub run by DG ENER. Parliament was key actor in getting the Coal regions in Transition Platform started, and in calling for the establishment of the Just Transition Fund. Calls for further action are likely.

c) Industry

Energy suppliers envisage new market opportunities but also feel risks of losing business to self-consumption, energy sharing or demand response. Their engagement is often designed to subtly

²⁸ TTE council of 30 May 2024 [Transport, Telecommunications and Energy Council \(Energy\) - Consilium \(europa.eu\)](https://www.consilium.europa.eu/en/transport-telecommunications-energy-council-energy/)

shape the rules in their favor rather than engaging in outright opposition. Solar power Europe, SmartEn and other actors are very keen to promote more direct engagement of businesses with consumers through energy sharing, aggregation and other innovative business models.

Network operators are very closely involved in preparing the implementing acts on customer switching through a Joint TSO-DSO working group which also includes other stakeholders. However, this often represents the most advanced operators – in practice the roll out of smart meters or other tools to enable more consumer engagement is slow in many Member States.

d) Civil society

The energy community/cooperative movement is very strong and active and has been a key support in developing citizen engagement. However, they are very concerned about corporate capture. All local initiatives and engagement with regions benefit greatly from the active involvement of civil society in developing energy transition plans, particularly in the carbon intensive and coal regions most impacted.

5. The way forward

Against these challenges and obstacles, what is needed is a clear political commitment for all consumers and citizens to be able to fully participate in and benefit from the energy transition. The next Commission should address this through the launch a **Citizens Energy Pact for a Just Transition and Consumer Empowerment** encompassing:

A consumer pact to give all consumers effective access to their rights –the ability and confidence to engage in the energy transition. This will include coherent and concerted implementation of the new legal framework for **consumer protection and empowerment** through:

- Guidance to the Member States on key areas of concern.
- An Energy Consumer Charter of Rights and accompanying measures.
- Energy digitalisation by developing implementing acts and a EU energy data space facilitating interoperability of energy services across the EU.
- Access to (new) financial instruments and tools to ensure all citizens can participate in the transition.

Engage with Member States to identify a **more ambitious commitment to reduce the rate of energy poverty** through the roll out of the Social Climate Fund and the support to Member States on delivering energy efficiency targets and delivering energy efficient housing.

A new focus for the Coal Regions in Transition Initiative (CRIT):

- Taking advantage of the opportunities offered by the Net Zero Industry Act and the Critical Raw Materials Act.
- An Ambassador for Coal Regions.

Supporting local actors delivering the energy transition through:

- Phasing out fossil fuel subsidies in support for electricity production on islands.
- A single-entry point/one stop shop within the Commission to access support to local and regional authorities for (just) energy transition plans.

- A Pact with network operators on ensuring renewables can be connected to the system in weakly connected areas – particularly in rural areas.

6. Proposed lines to take

- We have to bring all citizens with us in an energy transition which benefits all citizens, consumers, and communities and in which all can participate. We will work to ensure the energy poor and vulnerable get the additional help and support they need.
- Ensuring affordable energy for consumers is at the core of ensuring a just energy transition and will be key when it comes to social acceptance and ultimately the success of the transition. We will work with Member States, regulators and industry to implement EU rules so the market and regulatory framework allows consumers to manage their energy costs.
- We will provide guidance to Member States on key topics for citizens and consumers – notably on energy prosumers, preventing disconnection, and protecting consumers during the gas phase out.
- We will renew the Coal regions in Transition initiative to allow the regions take advantage of the net zero industries of the future. An ambassador for Coal Regions will give this the focus it deserves.
- Cities and regions more than anyone deliver the just energy transition on the ground – we will work with them to ensure this is recognized and they get the support they need.
- Cities and regions are key to delivering the energy transition on the ground – the Governance Regulation should ensure that NECPs allow for multilevel governance, to match their capacity to deliver change.

7. Linked to A-Z fiches

- | | |
|--|---|
| <ul style="list-style-type: none"> • Citizens and consumers participation in renewables (Energy Communities and energy sharing) • Coal, including Coal regions in transition • Cities & Regions • Cohesion policy for energy • Consumers • Covenant of Mayors • Data management • Demand response • Digitalisation • District heating and cooling • Electricity Market Design (EMD) reform • Energy Efficiency Directive | <ul style="list-style-type: none"> • Energy Performance of Buildings Directive • Energy poverty • Equality agenda in energy • Flexibility • Internal Wholesale Market for electricity • Internal Market for gas • Islands Initiative • Just transition, citizens and consumers • Net-Zero Industry Act • Intervention in price setting - Prices of energy – regulated prices • Smart meters • Supplier prudential regulation [Supplier risk management] |
|--|---|

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Future of the Governance Regulation

1. State of play

The Governance Regulation²⁹ establishes a cooperative governance process to ensure the collective implementation of EU Energy Union and climate action policy, notably the achievement of the 2030 energy and climate objectives, while minimising the administrative burden and contributing to greater policy oversight and transparency, regulatory and investor certainty. This process relies on key strategic planning and monitoring tools: the **10-year National Energy and Climate Plans (NECPs)**, the **30-year Long-Term Strategies (LTS)** and **biennial reporting** on progress towards the implementation of the NECPs (NECPR). In addition, it tasks the Commission to act in case of gaps at EU and MS level in ambition or progress towards the targets, including through the Union **Renewable Financing Mechanism** established in the Regulation. It also provides for transparency and cooperation in the preparation of plans by setting **requirements on public consultation, multilevel dialogue and regional cooperation**.

A **review report of the Regulation**³⁰ is being finalised [adoption foreseen in September 2024]. The main finding is that the Regulation has helped improve planning and reporting processes and has led to more effective, integrated, and transparent implementation of policy. At the same time, the review also highlighted several key areas for further improvement of the ongoing implementation and a possible revision of the Regulation. This revision and its timing are to be decided by the new College.

2. Ongoing / Open files / Implementation

We are currently in the final stages of the iterative process to update the NECPs³¹. Member States had to submit their draft updated plans by end of June 2023, which was followed by the Commission's assessment in December 2023. In this assessment, the Commission identified inter alia an ambition gap towards the 2030 targets for energy efficiency and renewable energy and issued country-specific recommendations to each of the 26 Member States.³²

Taking these recommendations into account, Member States had to submit final updated NECPs by end of June 2024 (SoP XX/XX: X out of 27 plans submitted: several MS are expected to deliver

²⁹ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action

³⁰ [Link to be added after publication](#)

³¹ The current NECPs and their updates are integrated strategic plans for the period 2021-2030 that set out national objectives for each of the five dimensions of the Energy Union and corresponding policies and measures to meet those objectives and have an analytical basis.

³² Austria is the only Member State who has not submitted a draft updated NECP. On 21 December 2023, the Commission opened an infringement procedure against Austria and sent a Letter of Formal Notice (To be updated after adoption of the next infringement cycle).

after summer). In case of late submissions, it is planned to open EU pilots for the Member States concerned.

Based on all 27 final updated plans, the **Commission will assess if the EU's objectives, targets, and contributions set out in the plans are sufficient** for the collective achievement of the Energy Union objectives (assessment planned for early 2025, possibly within the first 100 days of the next mandate, depending on submissions by Member States).

The Governance Regulation also integrates a large number of annual and biennial reporting obligations, in particular the NECPRs due on 15 March 2025, for which the preparatory process has started. In advance of the NECPRs in 2027, an implementing act must be adopted in 2026 to align the templates with the latest adopted legislation.

Finally, each year by 31 October, the Commission adopts a package centered around **the State of the Energy Union**, reporting on the progress achieved by the Energy Union on all dimensions of Energy and Climate policies.

The implementation of the Regulation, in particular the NECP assessment and the review of the Regulation, are being closely followed and scrutinized by media, industry, academics, and civil society.

3. Key challenges

The Strategic Agenda adopted by the European Council on 28 June 2024 called for a **genuine Energy Union**, securing the supply of abundant, affordable, and clean energy, requiring ambitious electrification using all net-zero- and low-carbon solutions, and investment in grids, storage and interconnections. This will require a stronger, agile, and tailored Governance for which the Regulation and its review provide a solid basis.

Following the assessment of the draft updated NECPs, the Commission identified an ambition gap towards both the Union's 2030 renewable energy and energy efficiency targets. This ambition gap may remain even after the submission of the final NECPs, both for renewables and for energy efficiency. The Commission is obliged to propose measures and exercise its powers at Union level to ensure the collective achievement of those objectives and targets.

In light of the first years of implementation, of the significant geopolitical developments and of the changes to energy and climate policy, several elements of the Regulation could be addressed in a potential revision of the Regulation:

- Ensure that future NECPs are true clean energy transition investment plans giving stronger signals to investors, highlighting the economic opportunities driven by the energy and climate transitions and removing the remaining barriers to supply and demand sectors (e.g. industry,

transport, and buildings). To the extent possible, future plans need to comprehensively identify investment needs and funding sources at EU, national and regional level.

- Make the Regulation fit for new energy and climate priorities. There is scope to update the framework to ensure it contributes fully to the pathway towards the 2040 objectives and climate neutrality. This includes removing remaining barriers, in particular in demand sectors, and addressing specific challenges such as reinforcing EU competitiveness and achieving strategic autonomy.
- Further simplification and digitalisation. While progress has been made in this area, notably through the e-platform, many elements that can simplify planning, reporting, and monitoring further, both in content, process, and accessibility, have been identified.
- Broadening participation in the preparation and implementation of energy and climate planning, through a more collaborative approach and new working methods with Member States to increase ownership and full involvement in the delivery strategy of the European Green Deal including at political level, and by strengthening regional cooperation and coordination with sub-national actors.

4. Views of the co-legislators and other key stakeholders

a) Member States

At the the European Council on 28 June, the Member States called for a genuine energy union. Member States are generally positive about the Governance Regulation and are particularly interested in further simplification and alignment with national and international processes. This includes simplifying the main planning and reporting tools under the Regulation to reduce administrative burden³³ and to make sure the plans can play a more strategic rather than administrative role.

Several Member States (e.g. Germany, Netherlands, Denmark) have emphasized that any revision needs to ensure a stable regulatory framework to achieve the 2030 objectives, and thus should focus on setting the framework towards 2040.

b) European Parliament

As no proposal to revise the Regulation was made under the previous Parliament, there has been no clear positioning of the EP. The Committee of the Regions presented an own initiative opinion in 2023, stressing in particular the need to ensure better consultation and involvement of local and regional authorities in the preparation and implementation of the NECPs.

c) Industry

³³ While the Governance Regulation significantly streamlined energy and climate obligations, it also introduced new obligations reflect the increase in ambition in this area, and its consolidated nature means that the burden of coordinating the planning and reporting exercise often falls on a small group of experts.

Industry is not directly addressed by the Regulation; however, it has led to more comprehensive and comparable energy and climate planning across the EU, which is generally appreciated. Many industry stakeholders see NECPs as a source of regulatory and policy stability and clarity. Similarly, stakeholders oppose to changes to the 2030 policy framework or to an early revision of the Governance Regulation that might undermine investor certainty. Industry would like to see more emphasis on elements such as financing needs and speeding up permitting processes, as well as on a longer time horizon than the current 10-year NECPs, to guide long-term investment decisions.

d) Civil society

NGOs & research institutes have been vocal advocates for the Governance Regulation, welcoming the benefit of comprehensive and publicly available data, while at the same time stressing the need for a revision. Frequently, they seek (1) stronger and more timely enforcement of insufficient progress towards targets (2) better consultation and involvement of cities and citizens in the preparation and implementation of NECPs, with stronger minimum requirements for consultation and access to justice.

5. The way forward

Based on the challenges above, a **revision of the Regulation should be considered**. As the Regulation is a framework for the achievement of several (sectoral) targets, it is best presented as part of a package of proposals. Given its complexity and breadth of scope, there is also a need for extensive analysis and public consultation in preparation of a proposal.

It is suggested to announce the initiative as part of the policy communication on future energy policy strategy to be adopted in the first 100 days of the mandate, to clearly establish its central role in delivering a genuine and competitive Energy Union.

The proposal itself could be part of the (Green Deal) delivery and simplification package in Q3/Q4 2026, together with the proposals for (revisions of) sectoral policies towards 2040. This would imply that the legislative framework would be ready in time for the next round of Member States NECPs to be submitted in 2028/2029, while allowing better knowledge of the implementation of the targets towards 2030 than an earlier timed proposal could accomplish. An earlier revision could bring risks to the 2030 policy framework and would have limited impact on delivery with just 5 years remaining for delivering on the 2030 policy and objectives.

To allow for proper preparation, the initiative for a revision should be validated as soon as possible after the new College is installed.

6. Proposed lines to take

- The Governance Regulation establishes a first of its kind cooperative governance process to ensure the collective achievement of Energy Union and climate action objectives, while

minimising the administrative burden and contributing to greater regulatory and investor certainty.

- As such, the Governance Regulation will be the cornerstone to deliver on a genuine Energy Union over the next mandate.
- The Governance Regulation should be updated to:
 - reflect the latest challenges and priorities in climate and energy policy, and to become a key driver towards the 2040 objectives, by ensuring that future NECPs are true clean energy transition investment plans.
 - deliver further rationalisation and simplification of reporting obligations and processes, including through further digitalisation.
 - provide a more collaborative approach and new working methods with Member States to increase ownership and full involvement in the delivery.

7. Linked to A-Z fiches

- E-platform
- Fit for 55 – European Green Deal
- Governance of the Energy Union
- REPowerEU
- State of the Energy Union Report

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Nuclear Energy

1. State of play

Europe has a long history of development, production and use of nuclear technologies, a low carbon energy source. Currently, **around 100 nuclear power reactors** (97 GWe total installed net capacity) are operating in 12³⁴ of the 27 EU Member States and electricity generated from nuclear energy accounts for **about 22% of the EU's electricity**³⁵. The **EU 2040 Climate Target Plan** and the draft updated **National Energy and Climate Plans** confirm that nuclear energy will **complement renewable energy sources and continue to play a key role in the EU's energy mix in the next decades**³⁶, while fully respecting Member States **right to choose their own energy mix**.

There is a **renewed interest** in nuclear in the EU and globally to meet **electrification, decarbonisation, security of supply and industrial policy objectives**. Almost all nuclear Member States aim at **extending the operating lifetime of existing nuclear power plants and/or building new ones**. Important EU tools have already been adopted to **support the financing of certain nuclear projects**, including in the Euratom Research and Training programme, the EU taxonomy framework, the electricity market design and Net-Zero Industry Act. Several Member States are also interested in new nuclear reactor technologies such as **Small Modular Reactors (SMRs)**. The Commission launched the **SMR Industrial Alliance** in February 2024 to allow for SMR deployment by early 2030 and for the EU industry to compete in this emerging market.

An increased use of nuclear in the EU needs to be accompanied by continuous attention to **nuclear safety, security and non-proliferation**³⁷, including **safe management of nuclear waste**³⁸, in accordance with the **Euratom legal framework** as key prerequisite for nuclear in the EU and internationally. Following the start of the **war in Ukraine**, early engagement with Member States operating **Russian-designed nuclear reactors** resulted in progress in finding alternative fuels. Further dependencies exist for uranium enrichment and conversion services, preliminary stages to the fuel fabrication. Security of supply objectives also underpin the Commission's **Strategic Agenda for Medical Ionising Radiation Applications (SAMIRA)** adopted in 2021 as a contribution to **Europe's Beating Cancer Plan**. Additional efforts are however needed to diversify in the nuclear sector.

Efforts are also being pursued worldwide to **develop nuclear power technologies based on fusion**. In December 2023, the **biggest nuclear fusion reactor in the world**, constructed by the EU and Japan, JT60 in Naka (Japan), was inaugurated. ITER – the **International Thermonuclear Experimental Reactor** - is under construction in Cadarache (France) by international partners (US,

34 BE, BG, CZ, ES, FI, FR, HU, NL, RO, SE, SI, SK

35 According to Eurostat data from 2022.

36 The nuclear share in electricity between now and 2050 will depend on how Member States together with the industry develop new reactors and replace existing ones.

37 In June 2024, the Council came to a political agreement on a revised Euratom Safeguards Regulation.

38 All EU Member States, irrespective of their position on the use of nuclear energy, generate radioactive waste, including from the use of nuclear technologies in research, medicine, academia or industry.

Japan, South Korea, India, China, Russia as well as Euratom). ITER is a key fusion project but has been experiencing delays and cost overruns. Its management is preparing a new project schedule and associated budget forecast (“baseline”). In the new baseline, the date for the start of ITER operations will be postponed, most probably to the 2030s (as opposed to the current 2025), which will also imply additional costs.

2. Ongoing files and key challenges

Enabling framework for an EU nuclear ecosystem fit for the future

As for other clean energy technologies, **the deployment** of projects in nuclear technologies strongly depends on regulatory stability and the predictability of political support as well as a **stable and comprehensive enabling framework to facilitate both public and private financing**. The existing EU regulatory framework could be insufficient to create the necessary market conditions and predictability of revenue. In this context, **long lead times of nuclear projects and difficulties in evaluating projects’ costs** represent an added complexity. It will be important to **assess nuclear investment needs** based on updated scenarios and National Energy and Climate Plans.

The progressive substitution of fossil fuel generation by renewables will also require an uptake of flexibility services and sources, and further system integration, where **nuclear will play a key role for energy security and stability of the energy system** (through ramping up, load following or frequency regulation services).

In addition, the long-standing but evolving divide **among Member States and in civil society on the role of nuclear energy** is sometimes making it challenging to reach agreement on energy policy at EU level, calling for stable political direction and enhanced dialogue among Member States and public engagement, in line with a technological neutral approach.

Finally, **adequate skills as well as reliable and competitive supply chains** must be secured; **proper waste management and decommissioning planning** must be insisted upon; and further **research and innovation** must be fostered. These will need to come together to ensure the uptake of innovative nuclear technologies.

Competitiveness and strategic autonomy in the nuclear sector

The EU nuclear industry is **in global competition** for the development and deployment of innovative nuclear technologies. EU industry should be enabled to take advantage of the opportunities of the energy transition and **compete with foreign state-supported actors** (such as Russia and China), including in the work of the **SMR Industrial Alliance**³⁹.

The EU also remains **too dependent on external unreliable partners** for the supply and/or production of nuclear fuels, nuclear fuel cycle services and spare sparts, as well as radioisotopes

³⁹ In addition to the generation of electricity, SMRs are expected to contribute to the phase-out of fossil fuel energy in hard to electrify industrial sectors and transport.

for indispensable medical uses⁴⁰. In line with the **REPowerEU plan**, the EU should **diversify supply chains away from Russia** while avoiding creating new dependencies.

With a longer-term focus, the EU should position itself as a leading player in the development of fusion energy technology worldwide due to progress and investments made in the fusion research and supply chain industry. It will be important to elaborate an **EU fusion strategy and regulatory framework** as enablers of the EU industry global competitiveness.

Need to maintain a safe and resilient nuclear sector

Increased use of nuclear energy in the EU and globally will require sustained high level of **nuclear safety, radiation protection, security, and non-proliferation** in the EU and in third countries, in particular the EU neighbourhood. In this regard, the EU is committed to supporting **nuclear safety in Ukraine** during war time (including at the **Zaporizhzhia nuclear power plant** currently occupied by Russia) and on its path to recovery, reconstruction, and accession to the EU and ensure **adequate emergency and preparedness response** in case of nuclear accidents in the EU or third countries (through Ukrainian accession to **ECURIE**⁴¹ and evaluation of the **EURDEP**⁴² system implementation).

It will be important to continue work on **post-Fukushima stress tests** and **topical peer reviews** of nuclear installations including in **neighbouring countries** and intensify implementation of **Euratom international obligations under bilateral and multilateral legal instruments** (Nuclear Cooperation Agreements and International Nuclear Conventions) as regards nuclear safety, security and safeguards, including through **close cooperation with the IAEA**.

Waste management and decommissioning of obsolete nuclear installations will also be critical in the next decade. It is important to **evaluate the EU waste management legislation** and share experience and continue implementation of the **Nuclear Decommissioning Assistance Programme** in Lithuania. At the same time, nuclear energy generation needs to face new challenges in adapting to climate change and ensure **resilient operation during extreme weather events (droughts, heatwaves, etc.)**

3. Views of the co-legislators and other key stakeholders

a. Member States

Almost all EU nuclear Member States aim at **extending the operating lifetime of existing nuclear power plants** or **building new ones**. **Belgium** has for example postponed phasing out of nuclear by 10 years (until 2035); **Poland** has plans to use nuclear energy; **Sweden** and **the Netherlands** planned to rely more on it and the possible use of nuclear energy is also being discussed in for instance **Italy** and **Estonia** (the phasing out of nuclear in **Germany** was accomplished in 2023). In France, president Macron has pledged to build 14 new nuclear reactors by 2050. Following the

⁴⁰ See also the **SAMIRA Action Plan** as regards medical radioisotopes

⁴¹ European Community Urgent Radiological Information Exchange (**ECURIE**)

⁴² European Radiological Data Exchange Platform (**EURDEP**).

results of the French national election in July 2024 it remains to be seen if these plans will be maintained. At COP28, 22 countries, including 11 EU MS, signed a declaration to triple nuclear energy by 2050.

A **Nuclear Alliance** (led by France)⁴³ has been set up by like-minded Member States seeking more recognition of nuclear as **contributor to EU energy policy objectives** and a **technology-neutral approach**, including as concerns **EU funds**.

As regards nuclear fusion, Germany has launched a significant national fusion programme to support research and new private fusion initiatives building on extensive fusion know-how and long-term expertise. Other Member States are also reinforcing, or considering reinforcing, their national fusion programmes (e.g. France, Spain, Czechia) and support the need for a European strategy to advance the fusion development in a coordinated way in the EU.

b. European Parliament

Conservative parties are generally more supportive of nuclear energy than centre-left forces. The parties affiliated to the EPP and ECR political networks are pushing for keeping (or even increasing) nuclear power as an important part of the EU energy mix.

Within the **Renew Group** there is a very wide range of views: at the pro-nuclear “extreme” we find the Czechs, the Swedish and the Dutch VVD, while at the anti-nuclear “extreme” we find the Slovaks, the Hungarians and the other Dutch party, the D66.

The **S&D group is generally sceptical of the role of nuclear energy**, but here too there are substantial variations, with the Romanian and Bulgarians being at the pro-nuclear end and the Hungarians and the French at the anti-nuclear end.

Among the other groups, the **Greens and the Left are on the anti-nuclear side**, while the parties in the nationalist **ID group are generally pro-nuclear**.

c. Industry

NuclearEurope (industry association) predicts nuclear will be at 150GW by 2050. Our current projections for 2040 show 88 GW of total capacity in 2040, increasing to 98GW in 2050, to reach **approximately the same level as today**. As total installed capacity will increase significantly, the relative share of nuclear in the gross electricity generation by all sources will however decrease to 12% in 2040 and 10% in 2050 (compared to around 22% today).

d. Civil society

The civil society is **split on the issue of nuclear energy in the EU** with different NGOs advocating both in favor and against the use of nuclear energy.

⁴³ Up to 14 Member States have participated at the different meetings, including Bulgaria, Croatia, Czechia, Finland, France, Hungary, Netherlands, Poland, Romania, Slovenia, Slovakia, and Sweden. Belgium and Italy have attended as observers. UK was also invited and attended as observer.

While traditionally environmentalist NGOs like Greenpeace have long advocated against nuclear, some environmentalists have changed views in particular following the start of the war in Ukraine and increased security of supply concerns.

4. The way forward

To address new challenges, nuclear energy should be included in the DG ENER policy packages as follows:

First 100 days initiatives

- An updated **Nuclear Illustrative Programme (PINIC)** with assessment of the total costs and investment needs for nuclear power and research reactors, production of medical radioisotopes, and nuclear fusion on the basis of the most recent data, including as provided by Member States in the National Energy and Climate Plans;
- **REPowerEU: Nuclear supply chain diversification measures** to ensure EU autonomy in the full nuclear supply chain (notably in nuclear fuel supply and services, spare parts and maintenance) by diversification targets/sanctions coordinated with like-minded countries.

Energy diplomacy package

- Key elements of the external dimension of the energy security framework and new international partnerships and business-oriented dialogues on nuclear.

Clean Industrial Deal package

- **Review of the framework for the evaluation of nuclear investment projects (Article 41 Regulation)** to ensure the framework's adequacy for its intended purpose and reflect contemporary needs and technologies.
- **A Communication on the Strategic Action Plan and Technology Roadmaps developed by the Small Modular Reactors Industrial Alliance** and identifying further action needed at EU level to tackle challenges and rapidly scale up the most promising projects in SMR technologies;
- **An EU Fusion Strategy** to establish a European approach and actions for the commercialization of fusion by setting up a clear technological roadmap and fostering industry's active participation and investments in fusion.
- Proposal for an EU structure (ERVI) to secure **EU autonomy and security of supply in the production of medical radioisotopes** in accordance with the SAMIRA Action Plan and in collaboration with ESA;

Delivery and Simplification Package:

- **An evaluation and legislative proposal to review the EU radioactive waste legislation;**

- **In parallel**, following approval of the new Safeguards Regulation, the next Commission should prepare a **recommendation providing guidance to nuclear operators** on its implementation.

5. Proposed lines to take

- The Commission has long acknowledged the role of nuclear as a low-carbon energy source, while recognising that the decision on its use remains within the discretion of each Member State. As there is a renewed interest, the EU needs to **better integrate nuclear energy in its overall energy strategy and mitigate the current divide among Member States**.
- Industry and Member States will need an **enabling framework to finance and invest**, including in life-time extensions of existing nuclear power plants, innovate in new technologies and maintain adequate skills as well as competitive supply chains.
- In the EU, the number of nuclear power plants that will **operate beyond their original design life** will continue to increase in the next years until 2030-35. If not, around 90% of the existing reactors would need to be shut down by 2030, which would imply for significant amounts of capacity to be replaced.
- Safety upgrades will be necessary to prolong operation. **Highest safety standards** must be ensured in accordance with Euratom/TFEU legislation and best practices.
- **Small Modular Reactors (SMRs)** could play an important role by providing low-carbon electricity and/or heat. However, challenges exist in validating the business case for SMRs, assuring predictable and streamlined licensing processes, developing global supply chains to ensure profitability, identifying suitable sites and achieving a transparent dialogue between stakeholders. The **European Small Modular Reactors (SMRs) Industrial Alliance** plans to address these challenges over the coming years.
- In line with the REPowerEU plan, the EU needs to continue its **diversification efforts away from unreliable suppliers** by ensuring alternative fuels for Russian-designed nuclear reactors, diversifying spare parts and fuel and maintenance services and by scaling-up nuclear fuel service capacities in cooperation with like-minded countries. It is also important to secure EU production of medical radioisotopes in line with the SAMIRA Action Plan to be used for diagnosis and treatment of the most common life-threatening diseases including cancer.
- There is also a pressing need to uphold **responsible and safe management of radioactive waste**. Decommissioning planning and funding should be integral components of every nuclear project. Long-term solutions for the storage of highly radioactive waste must be developed and licensed, in line with rigorous EU guidelines.
- Further investments in fusion development in Europe will require setting up an agreed technological roadmap, a specific regulatory framework and an improved EU governance of the European fusion sector. These actions will form the core of the **EU Fusion Strategy** which will have to underlie the budget proposal for European fusion activities under the next Multiannual Financial Framework and funding by the Member States.

6. Linked to A-Z fiches

- Nuclear Energy
- Emergency Preparedness and Response
- Euratom Supply Agency
- Fusion Research and Development
- ITER and the Broader Approach
- Fusion for Energy (F4E) Joint Undertaking
- IAEA
- Implications of the war in Ukraine in the EU nuclear sector
- Medical applications – Radioisotopes
- Nuclear Alliance
- Nuclear decommissioning
- Nuclear Energy Forum
- Nuclear security
- Nuclear safeguards
- Nuclear safety
- Radiation protection
- Safe Management of Spent Fuel and Radioactive Waste
- Small Modular Reactors

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Deliver investments in the energy sector

1. State of play

The Fit for 55 legislative package, which has been adopted under the last mandate provides a clear regulatory framework to achieve the energy and climate targets of the Union until 2030⁴⁴, which lead to concrete investment needs for the different segments of the energy sector. The budgetary programmes financed through the EU budget of the current Multiannual Financial Framework (MFF 2021-2027) and the EU-ETS revenues, support energy broadly as one of the key areas across different programmes. However, DG ENER manages only a small number of these programmes as lead DG. Beyond the climate mainstreaming, which ensures that at least 30% of the current budget are spent on measures, which help to mitigate the climate change or to adapt to it, there is no direct earmarking for energy investments.

2. Ongoing / Open files / Implementation

The targets adopted under the Fit for 55 package as described in Section 1 entail the need to ramp up investments in the energy sector. DG ENER currently pursues several approaches to mobilise the necessary investments. For a good understanding of barriers to investments DG ENER is in close **exchange with investors** (commercial financial institutions and promotional banks) **and Member States** in the framework of a strategic dialogue with the EIB, the Investors Dialogue on Energy, the Energy Economics Member State Expert Group and the European Energy Efficiency Financing Coalition. These exchanges and studies, which are committed by DG ENER on energy financing complement DG ENER's own analyses to develop DG ENER's investment strategy.

On **budgetary EU programmes** DG ENER is working closely together with the lead DGs of the energy relevant programmes⁴⁵ to ensure a consistent support for energy from the EU budget, while ENER itself manages only a small number of programmes itself. To direct further investments to the decarbonization of the energy sector DG ENER is involved in the Commission's **sustainable finance framework** including the EU Taxonomy. For the next budgetary period of the **Multiannual Financial Framework** the preparatory work at services level has kicked off and DG ENER is actively contributing to that (see Section 5). The European Commission will present a proposal for the next Multiannual Financial Framework before the summer break 2025.

⁴⁴ The process on setting the 2040 targets has been launched. The next Commission will make the legislative proposal to include the 2040 target in the European Climate Law and will ensure that the appropriate post-2030 policy framework is in place to deliver the 2040 target in a fair and cost-efficient manner.

⁴⁵ **(Partly) Managed by ENER:** Connecting Europe Facility for Energy, ITER, Nuclear safety and decommissioning programmes, LIFE (ENER manages subprogramme on Clean Energy Transition), InvestEU (ENER in charge of Sustainable Infrastructure Window together with MOVE), Euratom Research and Training Programme, REFM (based on MS voluntary payments), Horizon Europe (under Cluster 5, ENER coordinates part of Destination 3 (energy system, grids and storage) & Destination 4 (energy efficiency in buildings and industry (including the Built4People Partnership))

Not managed by ENER: ERDF, Cohesion Fund, Just Transition Fund, RRF, NDICI, IPA, Innovation Fund, Modernisation Fund

Discussions at services level have kicked off in spring 2024 for the next-MFF architecture, and in winter 2023 with regard to the existing EU Programmes spending review.

3. Key challenges

The key challenge will be to provide the necessary policy and financing support to mobilise the very significant investments required to achieve the EU's energy and climate targets. These include both sustainable investments but also transition investments to convert economic activities, which are not yet sustainable into activities, which are also aligned with the net-zero target in 2050.

Average annual investment needs are projected to rise from EUR 565 billion in 2021-2030 to EUR 713 billion in 2031-2040. The residential sector emerges as a primary focus, requiring EUR 216 billion annually in 2021-2030 and EUR 248 billion annually in 2031-2040 for energy efficiency renovations and appliances upgrades. Next to it, energy efficiency and energy demand side investments in the industry and tertiary sector present an investment need of EUR 110 billion annually in 2021-2030. On the supply side, power generation (EUR 92 billion in 2021-2030 to EUR 151 billion in 2031-2040) and grid infrastructure (EUR 61 billion to EUR 96 billion during the same periods). Renewable energy sources, particularly wind (EUR 85 billion) and solar (EUR 36 billion), will dominate generation investments in 2031-2040.

According to DG ENER's assessment the actual investments in the last years fell short of the investment needs. This currently leads to an annual investment gap of more than EUR 130 billion. Therefore, MSs and the EU have to join forces to overcome barriers to investments, dedicate sufficient volumes of public funds and mobilise private capital to accelerate investments in the energy sector. The EU budget will have to concentrate support on the areas in which market failures exist and which can be best dealt with on EU level, meaning that there is an EU added value.

To identify these areas and the right financial and non-financial measures DG ENER is currently working on a so-called "mapping and matching" document.

4. Views of the co-legislators and other key stakeholders

a) Member States

Reducing administrative burden and bottlenecks, increasing grid and storage capacity to accommodate renewables, and broadening the use of financial instruments to reduce grant dependence are essential steps for delivering investments in the energy sector. This can be achieved by de-risking instruments through InvestEU, enhancing the role of the European Investment Bank (EIB) and national promotional banks, and increasing the involvement of financial institutions by providing tools and instruments to boost investments in the energy sector. Additionally, public institutions should offer more guarantees to mitigate risks for private investors. Revising state aid rules on energy financing and encouraging investments by

prosumers, who can provide significant production capacity, are also crucial. Stability in policies, avoiding frequent legislative changes, and supporting schemes based on market premiums are necessary to foster a favorable investment climate. Moreover, increasing the availability of blended products combining loans and grants, and ensuring flexibility in investment approaches tailored to different renewable energy sources are vital. Direct guarantees are underdeveloped and need to be further developed to support various investments. Finally, there is a need to improve the visibility of EU funding opportunities for smart grids and distribution to enhance the overall energy infrastructure.

The Council of the European Union places a strong emphasis on delivering substantial investments in the energy sector as essential for meeting the EU's climate and energy objectives. It underscores the need for a balanced approach that supports both renewable energy expansion and the modernization of existing energy infrastructure. The Council advocates for leveraging a mix of public funding and private capital, facilitated by clear and stable regulatory frameworks that mitigate investment risks and promote market confidence. It also highlights the importance of fostering innovation and research in clean energy technologies to drive efficiency and sustainability. Furthermore, the Council recognizes the critical role of enhancing energy security and interconnectivity among member states, ensuring a resilient and integrated energy market. Through coordinated efforts and strategic investments, the Council aims to propel the EU towards a greener, more sustainable energy future while ensuring economic competitiveness and energy affordability for all citizens.

b. European Parliament

The European Parliament views delivering investments in the energy sector as a critical component of achieving the EU's climate and energy goals, particularly the transition to a sustainable, low-carbon economy. It emphasizes the necessity of significant funding to support the development and deployment of renewable energy sources, energy efficiency measures, and innovative technologies. The Parliament advocates for robust regulatory frameworks and financial instruments to attract both public and private investments, ensuring that projects are economically viable and environmentally beneficial. Additionally, it highlights the importance of energy infrastructure modernization and cross-border cooperation to enhance energy security, affordability, and accessibility across the member states. By fostering a stable and supportive investment environment, the European Parliament aims to drive progress towards the EU's 2030 and 2050 climate targets while promoting economic growth and job creation in the green energy sector.

c. Industry ,civil society and financial sector

Expanding the offer of financial instruments for clean energy production and increasing technical assistance facilities to foster capacity building are crucial for delivering investments in the energy sector. Tailored advisory support for projects requiring long-term planning is essential. Raising awareness and conducting information campaigns are important tools to increase citizens' awareness of the benefits of becoming prosumers or joining energy communities. National

funding authorities should strengthen cooperation with implementing partners such as European institutions and National Promotional Banks and Institutions (NPBIs).

Adapting regulatory frameworks to facilitate private capital involvement is crucial, with successful models in countries like the Netherlands, Sweden, and the UK underscoring the importance of regulatory environments that encourage private investments. The financial sector is committed and sees an economic opportunity in the energy transition, with many financial institutions having signed up to net-zero commitments and energy efficiency voluntary standards.

5. The way forward

DG ENER will support the preparatory works for the Commission proposal for the next Multiannual Financial Framework (MFF) and make sure that the **future EU budget** (from 2028 onwards) serves to mobilise the necessary investments to close the investment gap in the energy sector in the most efficient way. This budgetary framework is expected to also ensure higher ambition and progress by the Member States in achieving the decarbonisation objectives, such as the targets for renewables and energy efficiency, as well as the deployment of enabling technologies (e.g. grids, storage) and energy system integration. Notwithstanding the structure of the next MFF the key priority for DG ENER is to ensure a consistent support for energy across the different instruments of the future MFF to support energy projects with the suitable financial solution (e.g. grant, loan, guarantee, technical assistance or combination of them) depending on the energy segment, the investment barrier to be tackled and the maturity of the technologies implemented in the respective projects. The objective is to use the scarce financial resources from the EU budget in the most efficient way and to further increase the leverage factor of EU funding support for energy.

With respect to leveraging the EU budget and making the EU energy sector more attractive for investments from private investors the continuation of the **exchange with financial institutions** like the EIB, but also national promotional banks and large private capital investors (e.g. banks, funds, insurers) will be instrumental. DG ENER has already established platforms for such exchanges: European Energy Efficiency Financing Coalition, Investors Dialogue on Energy and a Strategic Dialogue with the EIB. These dialogues shall lead to **deployment of instruments and good financing practices**, specifically on blended finance mixing repayable and non-repayable support.

A **new EU Energy Efficiency Financing Strategy** will be needed to set the principles and measures to establish a medium and long-term viable funding framework together with actions to leverage private investments at scale, that could include EU energy efficiency auctions, an EU super-ESCO guarantee scheme, and policy accelerators (e.g. district heating, local heating and cooling, residential building renovation).

6. Proposed lines to take

- The investment needs in the energy system to achieve the EU energy and climate targets are huge (EUR 565 billion per year in 2021-2030 projected increase to EUR 713 billion per

year in 2031-2040) and currently actual investments fall short by more than EUR 130 billion on an annual basis.

- DG ENER is prepared to actively contribute to the design of the Commission proposal for the next MFF and should take the lead position when it comes to instruments relevant for energy projects.
- DG ENER exchanges on a regular basis with various actors from the financial industry to identify investment barriers for private capital investors and develops solutions for those barriers (e.g. loans, guarantees, counter-guarantees).
- DG ENER sees an opportunity to stimulate cross-border cooperation in renewable energy and to further incentivise the implementation of an enabling framework for renewables deployment by Member States as part of the next MFF.
- The EU budget has become the main engine to scale up action and support EU citizens and enterprises to undertake energy efficiency investments, and the next MFF is an opportunity to ensure a sufficient and efficient use of public funds, to leverage private investments at scale, and provide a fundamental contribution to deliver on the EU energy efficiency objectives.

7. Linked to A-Z fiches

- EBRD
- EIB
- Investment and Financing

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Digitalisation

1. State of play

The EU Action Plan on the Digitalisation of the energy system (⁴⁶) adopted on 18 October 2022 aims at delivering on the Commission's priorities of the European Green Deal and a Europe Fit for the Digital Age. It has proposed a strategic vision on the following 6 areas:

1. Facilitate the seamless **exchange of data** along the energy value chain;
2. **Promote investments in digitalising the electricity grid** as an enabler to integrate higher shares of renewables and facilitate electrification of end-uses such as heating and mobility;
3. **Support consumers** to benefit from the energy transition;
4. Ensure the **cybersecurity and resilience of the energy system**;
5. Ensure **energy efficiency and sustainability** of digital technologies;
6. Facilitate an **EU coordinated approach** and support for research and innovation.

Meanwhile, **Artificial intelligence (AI)** becomes increasingly integrated in the energy sector with a great potential to drive the twin green and digital transition. AI is fully integrated in the actions of the Digitalisation of Energy Action Plan.

2. Ongoing / Open files / Implementation

The Digitalisation of Energy Action Plan is in full implementation and the first successes are observed:

- In August 2024 the Commission established the **Smart Energy Expert Group (SEEG)**, which brings together stakeholders of the energy and digital domains, as well as Member States to advise on the twin green and digital transition.
- The **Common European Energy Data Space (CEEDS)** aims to facilitate data exchange for the deployment of flexibility services in the grid; smart charging of EVs; and energy-efficiency services in buildings. Its deployment is underway, with input from 5 pilot projects supported by Horizon Europe. **The Data 4 Energy working group under SEEG**, building on the results of the Horizon projects, will advance the deployment of CEEDS.
- The Commission is working on a number of Regulations on interoperability and access to data. In June 2023, the Commission adopted an **Implementing Regulation on access to electricity metering data**⁴⁷. Work is ongoing on developing implementing regulations on access to data for demand response and customer switching.
- In April 2024 the Commission launched the **Code of Conduct for energy-smart appliances** to boost the participation of residential appliances in demand response.

⁴⁶ COM(2022) 552 final

⁴⁷ (EU) 2023/1162

- In March 2024, the Commission adopted a Delegated Regulation under the EED recast **on the first phase of the establishment of a common Union rating scheme for data centres**⁴⁸. More delegated acts are foreseen in the EED recast on data centres.
- In January 2024, the grid operators (ENTSO-E, EU DSO Entity), supported by the EC and by a large Horizon Europe project (TwinEU), established a joint task force for developing a **digital twin of the electricity grid**. Additionally, the energy regulators (ACER, CEER and national regulatory authorities) and grid operators (ENTSO-E, EU DSO Entity) started to develop common Smart Grid Indicators to drive investments and monitor progress in digitalisation of the electricity grid.
- The **large-scale Partnership (LSP)** on digitalisation of energy was launched in December 2023 under the Pact for Skills framework, and implementation is ongoing.
- The **Network Code** on sector specific rules **for cybersecurity aspects of cross-border electricity flows**⁴⁹ was adopted in March 2024.

Additionally, the Commission aims to consistently monitor the use of AI in the energy sector, across the energy value chains. This will allow to have a comprehensive understanding of AI applications, to assess the AI contribution in delivering the energy transition, as well as its underlying risks and the need for further policy action.

7. Key challenges

a) Creating a data sharing framework to enable smart energy services

The data landscape in Europe is fragmented with a multitude of standards and protocols that hinder data exchanges. Several data hubs and technical solutions are proprietary closed ecosystems that do not allow data access to third parties. Unlocking these data in a secure and trusted manner is a major challenge to allow for enabling innovative energy services.

b) Accelerating the digitalisation of the electricity grids

The EU's electricity grid has become increasingly digitalised in the last decade, but the speed of transformation varies and should increase in many areas. A digitalised electricity grid offers better observability and controllability, leading to more coordinated planning, optimised network operations, reduced losses and overall better reliability. A recent Eurelectric study⁵⁰ recognizes 2 types of challenges to accelerate digitalisation:

- External challenges: regulation not in pace with business needs of system operators, supply chains disruptions and cybersecurity risks.
- Internal challenges: talent acquisition, keeping pace with change and data availability.

c) Empowering consumers

Digitalisation brings benefits to households and SMEs in the form of innovative data-driven services that enable them to better manage their bills, monitor their energy consumption in real

⁴⁸ C(2024) 1639 final

⁴⁹ C/2024/1383

⁵⁰ Wired for Tomorrow - <https://powersummit2024.eurelectric.org/wired-for-tomorrow>

time, share self-generated electricity with their neighbors or sell it back to the grid. Digital inclusion should ensure that also the most vulnerable citizens are enabled to enjoy these benefits and that the consumer protection framework remains adequate.

d) Upskilling the workforce

Energy companies face significant challenges in finding skilled workers and trained professionals to implement the digital transition. There is an imminent need for reskilling and upskilling the existing workforce, integrating energy and digital transition-related topics into mainstream education, and facilitating mobility of workforce across borders.

There are also a number of **intrinsic challenges** raised by the use of digital technologies, especially when applied to critical infrastructures such as energy:

e) Addressing data privacy, cybersecurity risks, accountability and transparency

Digital technologies, especially when integrated into critical infrastructures such as the electricity grid, pose significant risks related to cybersecurity threats, data privacy concerns, market manipulation, accountability, traceability of decision making, and transparency.

f) Monitoring the energy consumption of the ICT sector (e.g. data centers) that comes with widespread use of digital technologies

According to the IEA⁵¹, electricity consumption from data centres could double by 2026, with most of the increase coming from AI. However, data are not systematically collected. Improving the data collection is an important step to identify past developments, better understand future trends and correctly inform new policies.

g) Controlling risks and ensuring good use of AI in the energy sector

There are several challenges raised by AI technologies, especially when applied to critical infrastructures such as electricity grids. These are data privacy concerns, cybersecurity risks, potential for market manipulation, lack of accountability when something goes wrong, difficulties in tracing decision making processes, lack of transparency and potential loss of control. Some of these challenges are dealt by relevant provisions in the AI Act.

h) Ensuring consistent progress across the EU

The pace of digitalisation of the energy system varies per Member State, and policies to promote digitalisation also differ per MS. This can be related to the urgency or the priority of digitalisation, or the innovative capacity of the network operators. Differentiation of the pace of digitalisation is not a problem per se, as long as the potential of the internal market for innovative digital solutions for the energy system is assured, to support at the same time a competitive energy prices, a competitive digital industry and a fast energy transition.

8. Views of the co-legislators and other key stakeholders

a) Member States

⁵¹ IEA Electricity 2024 - <https://www.iea.org/reports/electricity-2024>

Member States in general agree on the importance of digitalising the energy system as enabler of the energy transition. This is reflected in the National Energy and Climate Plans (NECPs) where MSs are integrating more digitalisation components in their energy policies.

b) Other EU bodies

The European Economic and Social Committee (EESC) has recently (July 2024) published an own-initiative opinion on Digitalisation of Energy⁵². The opinion concludes that digitalisation presents tremendous opportunities for the decarbonisation of the energy sector as long as we can manage the risks that are already identified in the Action Plan.

c) Industry

The energy sector and industry have been very supportive to Digitalisation of Energy Action Plan, always stressing the message that strong focus on implementation is required. The Commission works closely with ACER, CEER, ENTSO-E and EU DSO Entity in a number of the actions for digitalising the grids. Through the Smart Energy Expert Group, the Commission is working closely with industry associations from the energy and digital domains to further promote the digitalisation of the energy sector. Industry has widely supported actions on the energy consumption of data centres and is actively engaging with the Commission.

9. The way forward

- a) As mentioned in the Political Guidelines for 2024-2029 by the President, **digitalisation of energy should remain central to future policy developments**. To achieve the European Green Deal targets and to strengthen the EU competitiveness requires **accelerating the pace of digitalisation of the EU energy system**. Significant investments should be driven to research, innovation and market uptake of digital tools using both private investments (e.g. by electricity grid operators) complemented by EU and national funds (e.g. Horizon Europe, Digital Europe, CEF, LIFE, structural funds, recovery and resilience programmes).
- b) As the energy system is more integrated and solutions need to be interoperable, a coordinated implementation is needed. The **Digitalisation of Energy Action Plan remains fit for purpose**, providing the implementation mechanisms and a coordination framework.
- c) The energy sector, due to its large scale, has the potential to contribute to the **competitiveness** of European digital companies, by offering a mature market to develop and scale innovative products and services. The Commission should support an ecosystem of European innovators (SMEs, startups, big-tech) to train AI algorithms, and develop digital tools and smart energy services at scale.
- d) As digitalisation of the energy sector deepens, so do the systemic risks against cyber incidents and data breaches. **Security by design**, should be an integral part of any policy initiative to ensure a resilient energy system.
- e) We need to develop mechanisms to monitor **the energy consumption and overall sustainability of the digital sector, including data centres**. The Digitalisation Action Plan and the Energy Efficiency Directive recast already foresee relevant actions. Moreover, as

⁵² [Energy Digitalisation: Balancing Opportunities and Risks for European Consumers](#)

technologies evolve (i.e. generative AI), there is an increased need to systematically collect data to better understand future trends and design new policies.

- f) **Artificial intelligence** is not new to the energy sector, as it is already used in optimisation processes of power grids. The emergence of generative AI brings new use cases with the potential to accelerate the energy transition. The Commission should assess the most prominent use cases, support the innovators, and develop a comprehensive strategy and a governance framework (including through the AI Act), to ensure that AI is deployed in a secure and sustainable way.
- g) The Commission should **facilitate close cooperation and twinning between Member States** to ensure consistent progress across the EU, a fast spreading of digitalisation and digital innovations by reaping the benefits of the EU's internal market, through partnerships at national, regional or local level based on a mutual interest from Member States. The NECPs and the annual Digital Decade report provide an adequate instrument to coordinate implementation efforts with the Member States.

10. Proposed lines to take

- Smart, efficient and digitalised energy systems are instrumental for decarbonisation bringing multiple benefits: (i) **integration of renewables** and less/no need for curtailment; (ii) enabling **system integration** across multiple energy carriers and electrification of end-uses (such as heating and mobility); (iii) enhancing the overall **system resilience** and its ability to effectively and efficiently manage decentralised resources; and (iv) **empowering consumers** to become prosumers or active players that monetise their flexibility and reduce their energy bills. Therefore, we refer to the **twin – green and digital – transition**.
- The Digitalisation of Energy Action plan establishes a strategic vision and actionable steps, addressing both facets of digitalisation in energy – (i) **opportunities/benefits** and (ii) **challenges** (cybersecurity, energy consumption of digital technologies). Implementation is in full swing, mobilising resources across the EU. First successes are already witnessed.
- The Energy Efficiency Directive recast for the first-time addresses **energy consumption of data centres**, aiming at their sustainability as part of the energy transition.
- The Commission works closely with the **Member States** on advancing the energy transition and the digitalisation of our energy system. The Commission encourages MSs to better integrate the digital dimension into national energy policies and to assign specific targets and deliverables and overall supports close cooperation between Member States.
- **Artificial intelligence** is a game changer in the digital realm and could accelerate the energy transition. Multiple opportunities arise. Nonetheless, AI raises important concerns, especially in critical sectors such as energy. The EU is acting on harnessing the opportunities of AI, while also establishing appropriate safeguards. Cooperation on AI and establishing governance mechanisms are important elements.

11. Linked to A-Z fiches

- Consumers
- Cybersecurity in the energy sector

- Data management
- Demand Response
- Digitalisation
- Energy system integration
- Energy efficiency
- Regulatory sandboxes
- Smart grids and applications (homes, industry, transport)

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