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REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

State of the Energy Union Report 2025

(pursuant to Regulation (EU)2018/1999 on the Governance of the Energy Union and Climate Action)

1. INTRODUCTION: BUILDING A STRONG ENERGY UNION

As highlighted in the Draghi report, high energy costs are at the core of the challenges Europe is facing. While significantly lower than during the 2022 energy crisis, energy prices are still significantly higher than our competitors, and largely differ across EU Member States, remaining a source of concern for many industries and European citizens. These are mainly driven by Europe's reliance on imported fossil fuels amounted close to **EUR 375 billion in 2024**[1]**,** and structural inefficiencies due to incomplete integration of the EU electricity system.

A genuine Energy Union relying on domestically produced clean energy generation, based upon a strong renewable energy sector and efficient use is absolutely vital for EU's security and competitiveness and to achieve our climate neutrality objectives. Europe has already reached 47% renewable in its electricity mix in 2024, and energy efficiency measures led to an estimate of around **EUR 120 billion savings** on energy bills paving the way to energy independence.

In early 2025, the Commission presented the **Clean Industrial Deal** (CID)) outlining actions to lower energy prices and create quality jobs and the right conditions for companies to thrive as regards financing, lead markets, trade and access to resources. The **Clean Industrial Deal** embeds climate neutrality into industrial policy by outlining concrete actions to turn decarbonisation into a driver of growth for European industries. Alongside, the **Action Plan for Affordable Energy** (AEAP**)** introduces short term and structural measures to deliver stable and predictable energy costs, increase energy efficiency, and expand renewable generation, ensuring that businesses can remain competitive while consumers benefit from affordable energy. Together, these initiatives mark a new phase to complete the Energy Union and achieve a truly integrated energy system allowing cheap homegrown clean energy to flow freely across Europe.

Over the past years, the rapidly evolving geopolitical landscape has influenced global energy markets worldwide. Russia's weaponisation of energy has threatened Europe's energy security and impacted the Union's economic stability and growth. In response, the EU launched the REPowerEU Plan in May 2022 to phase out its dependence on Russian fossil fuels in line with the Versailles Declaration. By now, all national Recovery and Resilience Plans under NextGenerationEU include a **REPowerEU chapter** with a total of EUR 65.3 billion in estimated investment. Thanks to the European rapid coordinated action and cooperation with international partners, EU's gas imports from Russia went down from 45% in 2021 to 19% in 2024 and 12% in 2025 (until August) with the interruption of the Ukraine transit. Russian oil imports have also shrunk thanks to EU efforts and sanctions, from 27% at the beginning of 2022 to 3% in the first half of 2025[2], while Russian coal imports have been completely phased out.

To fully cut dependence, the Commission has delivered on its promise to address the remaining dependencies in May 2025 by presenting a **Roadmap towards ending Russian energy imports** followed by a first legislative proposal in June. This landmark proposal, currently under negotiation by the co-legislators, includes a **strong political signal** - Europe will no longer tolerate the weaponisation of energy supplies. This is in line with the 19th package of sanctions against Russia, where the Commission proposed an EU-wide import ban on Russian LNG from 1 January 2027, paired with tougher action on the shadow fleet and full transaction bans on Rosneft and Gazprom Neft to choke oil cashflows.

Europe is the fastest-warming continent in the world, a threat to its prosperity and security. By reducing its reliance on fossil fuels from Russia and the rest of the world, the EU aims not only, to strengthen its energy independence, but also to protect its citizens and pursue Europe's leadership in decarbonisation efforts, as the EU cannot be relying on fossil fuels it does not produce.

According to the Commission's **EU-wide assessment of the final updated National Energy and Climate Plans (NECPs)**, if Member States implement the NECPs alongside EU policies,

[1] Imports of energy products to the EU down in 2024 - News articles - Eurostat

[2] Quarterly reports highlight solar (record and progress away from Russian gas - European Commission
EU imports of energy products - latest developments - Statistics Explained - Eurostat

the EU will be closing in on its 2030 objectives for GHG emission reductions and renewable energy. However, a significant gap remains in energy efficiency, indicating that additional measures and stronger implementation are needed to meet the EU's 2030 energy savings targets, together with further actions to secure the necessary investments and financing.

Despite the acceleration of clean investments in recent years, notably with the support coming from the Recovery and Resilience Facility and cohesion funds, current investment levels fall short of the estimated annual energy system investment needs amounting to **EUR 660 billion** over the period 2026-2030 and even higher over the period 2031-2040– needed to reach our climate and energy targets[3].

Against this backdrop, the proposal for an ambitious Multiannual Financial Framework (MFF) amounting to EUR 1.98 trillion for the 2028-2034 period (in current prices), puts forward a fivefold increase of the **Connecting Europe Facility** budget for cross-border energy infrastructure - **showcasing the absolute necessity to significantly increase investment in the European grids**.

The annual **State of the Energy Union Report is the annual stocktaking exercise of the EU's progress towards the objectives of the Energy Union** and the **clean energy transition**.

This year's report presents progress made in 2024–2025, outlining how the EU has responded to evolving global and domestic challenges in the first year of this Commission's mandate. The report is structured in three parts: it first addresses **how the delivery of the Action Plan for Affordable Energy is progressing and anchors the implementation of 2030 policy objectives and targets**. The **second part analyses the state of play in the implementation of the Energy Union** across its five dimensions, based on the results of the assessment of the Member States' biennial progress reports on the implementation of the NECPs submitted in 2025. The **third part is forward looking, paving the way to decisive actions to complete the Energy Union and prepare the climate and energy policy framework for the decade ahead**.

[3] Energy in the next long-term EU budget: Commission invites input

KEY 2025 ACHIEVEMENTS TOWARDS A GENUINE ENERGY UNION

- *The **Action Plan for Affordable Energy** presented by the Commission on 26 February 2025 alongside the **Clean Industrial Deal** will contribute to lowering energy costs for industries, businesses and citizens. It contains a comprehensive set of measures, including investment mobilisation, boosting flexibility and streamlined permitting to scale up clean and affordable energy supply, investments in energy efficiency measures as well as grid reinforcement.*

- *To support its implementation, the Commission adopted on 2 July 2025 a package of Guidance documents **promoting anticipatory grid investments, innovative renewable energy technologies and forms of renewable energy deployment**, **designating grid and storage infrastructure areas**, and **revising network tariff methodologies**, with a view to supporting Member States, national regulatory authorities and grid operators in expanding the renewable fleet, reinforcing our grids and network planning, and designing network tariffs that incentivise flexibility and a cost-efficient use of the network.*

- *The first two **Tripartite Agreements for Affordable Energy covering respectively offshore wind and grids, and energy storage** were announced by Commissioner Jørgensen on 4 September 2025, and are expected to be concluded in the coming months. By bringing together energy producers, industrial consumers and the public sector represented by the Member States and the Commission, these contracts will set mutual commitments to unlock the investments needed for the rapid integration of home-grown, affordable energy into the system. In addition, the Commission is currently assessing the potential for similar contracts in other sectors, such as biomethane, energy efficiency, small modular reactors or energy integration of data centres.*

- *The EU has drastically reduced its dependence on Russian energy: **gas imports from Russia (pipeline gas and LNG) dropped from 45% in 2021 to 12% in 2025 (until August)**, while oil imports fell from 27% at the beginning of 2022 to just 3% as a result of the implemented sanctions. These substantial reductions, driven by coordinated EU measures and energy diversification efforts, mark a major step towards phasing out Russian energy imports and strengthening the Union's energy security.*

- *The **Roadmap towards ending Russian energy imports** put forward by the Commission on 6 May 2025, set out a coordinated and gradual approach to end Russian gas, oil and nuclear imports to the EU. The first **legislative proposal for a Regulation on phasing out Russian natural gas imports** will ensure the gradual but effective phase out of Russian gas and oil, while preserving the EU's security of supply and market stability. It also provides for measures to strengthen the transparency and monitoring of the EU's security of the energy supply, by fully ending the EU's dependency on Russian energy. With the 19th package of sanctions against Russia, the Commission proposed an EU-wide import ban on Russian LNG from 1 January 2027, paired with tougher action on the shadow fleet and full transaction bans on Rosneft and Gazpromneft to choke oil cashflows.*

- *Estonia, Latvia, and Lithuania have successfully synchronised their electricity grids with the Continental Europe Synchronous Area on 9 February 2025. The **synchronisation of the Baltic countries** is a flagship project ensuring EU energy security, which has been supported by the Commission with unprecedented political, technical and financial backing over the past 15 years. This includes over EUR 1.23 billion in grants from the EU's Connecting Europe Facility (CEF) and EUR 60 million from the Recovery and Resilience Facility (RRF).*

- ***The EU is getting ready for winter with a gas storage filling trajectory** in line with the recorded average of 2016 – 2021 (83 % by the beginning of October) and on track to meet the 1 November target of 90%. Recent amendments to the Gas Storage Regulation provide greater flexibility, helping Member States optimise storage operations and strengthen energy security.*

- *The final **National Energy and Climate Plans** (NECPs) show that Member States have **significantly reduced the gap towards the 2030 energy and climate targets** with an estimated decrease in total net GHG emissions of around 54% in 2030 compared to 1990, a limited 1.5% ambition gap towards the 42.5% renewable energy target but more efforts are needed as regards Member States' contributions to the energy efficiency target of 11.7% by 2030,, as well as regards securing the necessary investments and financing.. The Commission is closely monitoring the implementation of the plans and exploring further action to deliver on Member States' projections. To support closing the energy efficiency gap, the Commission has launched the Efficiency Action Forum at the Informal Energy Council on 4-5September 2025.*

- *The **Energy Union Task Force** announced in the Affordable Energy Action Plan and launched already in June 2025, brings together high-level representatives of the Commission and Member States to enhance coordination across the Energy Union and reinforce its governance and completion. It aims at giving **political impulse** to concrete key challenges that shape our collective energy system of the future.*

- ***The new installed renewable energy capacity** in 2024 is estimated at around **77 GW** (12.9 GW for wind and 65.5 GW for solar), which represents a 17% annual increase compared to 2023. Electricity generation from renewables consolidated its leading position in 2024 in the EU, providing 47.3% of the total electricity. For the first time ever, solar energy became the EU's largest power source in June 2025.*

- ***The 2030 EU target of 42.5% renewables** in EU energy consumption (with the aspiration to achieve 45%) will require **a much faster uptake of renewables in the coming years**, with an annual increase of 2.6 percentage points needed to reach the next reference point of 29.7% in 2025.*

- *Regarding the transition away from fossil fuels, **coal production and consumption continues declining**. From 2018 to 2024, the EU roughly halved its consumption of both hard coal and brown coal.*

- ***Primary energy consumption** in the EU decreased by 4.1% in 2023 and final energy consumption decreased by 3% compared with 2022. Main reductions in final energy consumption are to be observed in the residential sector, followed by industry and services.*

- *On 11 September 2025, the **Energy Efficiency in SMEs initiative** was launched, to support energy investments for 350 000 Small and Medium-sized Enterprises across Europe with a new financing envelope of EUR 17.5 billion (2025-2027). The Commission will continue to mobilise public and private capital through coalitions, national hubs, investment platforms, EIB support, and encouraging the establishment of new investment tools to scale up energy efficiency.*

- *The Commission's eighth **Nuclear Illustrative Programme** (PINC) of June 2025 provides a comprehensive, fact-based overview of nuclear development trends. Delivering on Member States' plans will require significant investments estimated at EUR 241 billion until 2050 covering the newbuild of large-scale reactors and lifetime extensions ('base case scenario' with 109 GW capacity). At the end of 2024, there were 101 nuclear power reactors operating across 12 Member States, or almost a fourth of the over 400 reactors in operation in the world.*

- *The **EU Energy and Raw Materials Platform** has been set up by the Commission to leverage the size of the European market and empower European companies in effectively procuring energy-related products and raw materials. It hosts different mechanisms aiming at covering, hydrogen, raw materials, biomethane, liquified natural gas (LNG) and natural gas**.***

- ***Work has progressed to align candidate countries with the EU's energy policies** as part of the broader enlargement priorities. Screening meetings were held for **Ukraine** and **Moldova**, to assess their alignment with EU energy acquis. The Commission has completed the screening process for **Albania** and **North Macedonia**. Negotiations on Chapters 15 (energy) and 21 (Trans-European Networks) of Cluster 4 of the accession process are ongoing for **Serbia** and **Montenegro**.*

- *In January 2025, President von der Leyen launched the **Global Energy Transitions Forum** (GETF), that will focus on the delivery of the first-ever Global Stocktake (GST) by tripling global renewable energy capacity and doubling the rate of energy efficiency improvements by 2030.*

- *In addition, the Commission has adopted a **Communication on the new EU vision for enhancing global climate and energy transition**, in October 2025.*

- *A new governance framework is being proposed **for the Strategic Energy Technology Plan** (SET Plan) to craft Common Implementation and Investment Agendas for each clean energy technology, enhancing collaboration between the EU, Member States, research and industrial stakeholders, in alignment with the Net-Zero Industry Act ambitions.*

2. DELIVERING ON THE ACTION PLAN FOR AFFORDABLE ENERGY

The European Union faces a pressing challenge: **high and volatile energy prices threaten to erode public support for the energy transition, with 47 million Europeans affected by energy poverty** and growing price disparities with other major economies undermining the EU's industrial competitiveness.

To address the combined challenges of import dependence of expensive fossil fuels, inefficiencies in the energy market and lack of full integration of the energy system, the EU is taking a comprehensive approach to complete the Energy Union. The Action Plan for Affordable Energy presented actions to lower energy bills in the short term such as the lowering of electricity taxes already showing results in some Member States, while aiming at more structural measures to modernise Europe's energy system by investing in grids and interconnectors, improving enabling conditions such as permitting and governance, and boosting renewable energy production and energy efficiency. The Commission is committed to swiftly implement this Plan and support Member States at every step. On 21 October, the Commission has announced to step up efforts to lower energy prices with a set of 7 actions to bring relief to industries and consumers. An overview of progress achieved in every action of the plan is provided in Annex 1.

Member States' actions lowering energy taxation

***Denmark** introduced the 2026 Finance Bill including a reduction on electricity taxes to the EU minimum in 2026-2027. That's a drop from about €97/MWh to roughly €1.1/MWh, or almost zero. According to Denmark, this will lead to savings of €134/year (DKK 1,000) for a single person, and about €533/year (DKK 3,975) for a working family in a house (3 September).*

***Germany** has announced the intention to cut electricity taxes to the EU minimum for specific sectors (industry, agriculture, forestry) to benefit around 600,000 companies with supported by EUR 1.5 billion in 2026 and EUR 3 billion in 2027, as well as EUR 6.5 billion to support transmission grid charges (3 September).*

Further integrating the EU energy system

Completing the Energy Union is paramount for overcoming inefficiencies in the Internal Energy Market. The EU's energy system remains characterised by limited cross-border capacity, lack of energy system integration resulting in price spikes and regional price disparities. This prevents the optimal use of clean electricity and undermines security of supply. Half of Europe's cross-border infrastructure needs remain unmet and long queues for renewable producers and consumers to connect to the grid hinder Europe's competitiveness and the energy security and transition.

Storage also remains a critical challenge: despite record growth, EU battery energy storage capacity stood at only 61 GWh in 2024, while some estimates consider that EU needs to achieve 200GW energy storage deployed **by 2030**, equivalent to at least 18.5 GW annually[4].

To address these persistent gaps and fast forward the benefits of a fully integrated Energy Union, the Commission has launched the **Energy Union Task Force**. Bringing together high-level representatives from the Commission, Member States, relevant EU bodies and stakeholders the Task Force will enhance political cooperation on issues such as accelerating interconnectivity, deploying storage, digitalising the energy system, enhancing preparedness for challenging situations to the electricity system, and improving grid planning across Member States.

In parallel, to support implementation of the Affordable Energy Action Plan, bring down energy system costs and support Member States in managing the transition, the Commission has adopted a series of guidance documents. These include *inter alia* **guidance on anticipatory investments**,

[4] New report: European battery storage grows 15% in 2024, EU energy storage action plan needed - SolarPower Europe

designed to ensure that electricity grids are expanded and reinforced in line with future needs and growing demand. The Commission recommendation on network tariff methodologies will also create the right price signals for investment in flexibility, demand-side response and efficient grid use. By aligning tariffs more closely with system needs, for example through time-of-use and location elements, they help reduce peak demand, improve flexibility avoid congestion, and ultimately lower costs for consumers.

T**he European Grids Package**, which will be presented later this year, aims, inter alia, to increase the EU role in infrastructure planning, strengthen EU planning and delivery of cross-border interconnections. Among its objectives the Package will help accelerating the development of national networks, streamlining and simplifying permitting processes for grids, storage and renewables, as well as improving cost-sharing mechanism. By facilitating the timely deployment of energy projects and enhancing market integration, these measures will help reduce system bottlenecks, increase renewables integration, and bring down prices for consumers. The Commission is also launching the **Energy Highways initiative** to remove eight critical bottlenecks in EU's energy infrastructure by bringing governments and developers together and ultimately, bring more affordable energy in Europe.

Member States' actions on grids' investments

Spain has announced grid investment needs of €13.59 bn by 2030 to accommodate for the increases in grid connection requests. This will enable accommodating 13.1 GW renewable hydrogen, 9 GW of industrial plants, 3.8 GW for data centres, 1.8 GW for buildings and 1.2 GW for ports. To enable such investments, a *draft* proposal is underway.

Inefficiencies in the use of our existing grids in the form of redispatch already today result in costs of **EUR 5.2 billion per year**. If left unaddressed, this could rise to EUR 26 billion per year by 2030. The cross-border trade of electricity in the internal market already today offers consumers benefits of around EUR 34 billion every year.

Deeper market integration and better governance can significantly increase these benefits by ensuring a smoother flow of electricity across borders and a better oversight of the relevant processes. Further integration of energy market can increase these benefits up **to EUR 40-43 billion annually by 2030**. The Commission will also kick off the reflection process on deepening the integration of the internal electricity market by publishing a **White Paper on Deeper Electricity Market Integration.**

Finally, a Gas Market Task Force has been set up to scrutinise the functioning of the gas market and to rigorously evaluate the oversight processes to identify areas for improvement and ensure energy markets optimal functioning. The findings of the task force, together with possible recommendations, are expected **by the end of year**, aiming to foster a more resilient and efficient energy system for the future.

Accelerating the clean energy transition

The EU's energy mix is still heavily reliant on fossil fuels, mostly imported. About 70% of the energy consumed in the EU came from fossil sources in 2023, almost 90% of which is imported. In 2024, alone, the import cost for Europe was above EUR 375 billion.

To support the consumption of higher priced fossil fuels, Member States' have roughly allocated **one fifth more public funds** to fossil fuel subsidies in 2024 (+18%) than in 2021 (pre-crisis year), albeit the level of such subsidies declined, by more than one third compared to 2023 (-34%) and halved compared to the energy supply disruption year 2022 (-49%)[5]. This dependence

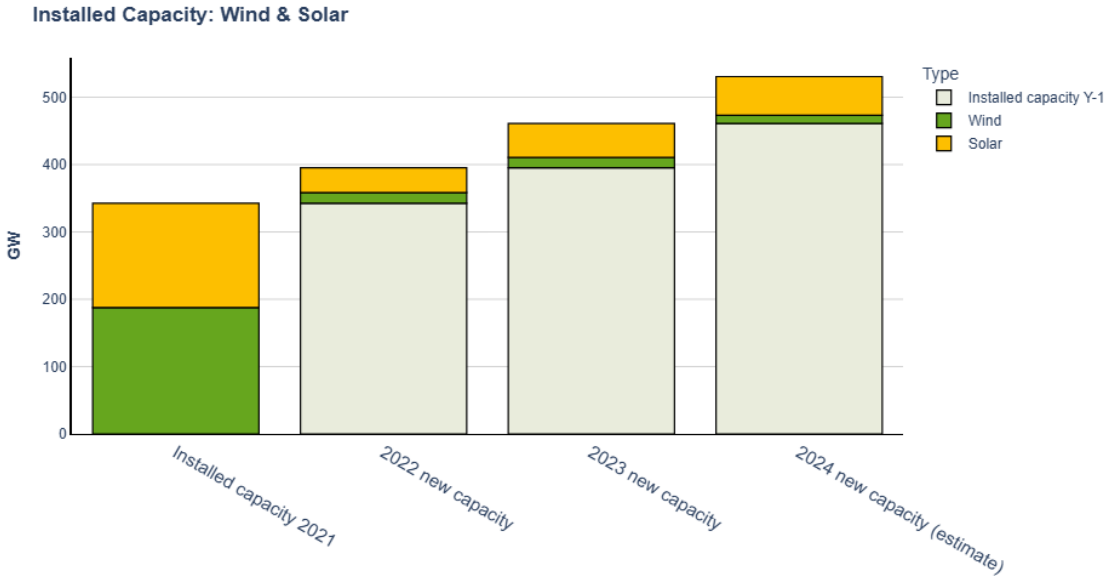
[5] Study on Energy Subsidies - 2025 edition, Enerdata, Trinomics and Seven (preliminary data).

on imported fuels poses a significant risk to the EU's energy security and resilience[6] and it constitutes a drag on competitiveness by distorting incentives to invest in energy transition.

Therefore, the EU must diversify and expand its homegrown clean energy production.

Significant progress is already visible. Between 2021 and 2023, EU electricity consumers saved EUR 100 billion thanks to electricity generation from new solar PV and wind capacity, demonstrating the importance of unlocking renewable energy's potential to reduce fossil fuel reliance and lower costs[7].

Rapid grid expansion and their integration is essential, with renewable electricity capacity growing rapidly –around 77 GW added in 2024 alone, including 12.9 GW of wind and 65.5 GW of new solar photovoltaic capacity – and annual expansion of renewable electricity capacity that should reach around 100 GW up to 2030 as underlined in the Clean Industrial Deal. A swift implementation of the recently adopted rules, notably on faster permitting, is a prerequisite to support this crucial acceleration.



Source: Eurostat, WindEurope, Solar Power Europe

Member States' actions on permitting

***Ireland** has introduced, for renewables, mandatory acknowledgement of application completeness or request of further info within 45 days; sets decision deadlines depending on capacity (52 weeks for ≥150 kW, 30 weeks for <150 kW or repowering); requirement that authorities cannot extend scope of EIA after opinion is given (12 August 2025).*

***Italy** made a preliminary review (subject to Parliament approval) of the permitting legislation proposing the removal of obstacles for interventions that do not require new land use, smooth integration of storage, faster regime for projects with no or limited environmental impacts, the simplification of processes for upgrading/repowering plants, introduction of single municipal point of* contact *(11 September 2025).*

Increased energy efficiency also means reducing our energy import dependency. Every 1% of improvement in energy efficiency translates into a 2.6 % reduction in gas imports. Continued efforts to improve efficiency play a decisive role in enhancing energy security and lowering

[6] Only about half of the Member States have partially addressed the phase-out of fossil fuel subsidies in their NECPs according to the EU-wide assessment of the final NECPs (COM(2025) 274, 27.5.2025).
[7] How much money are European consumers saving thanks to renewables? – Renewable Energy Market Update - June 2023 – Analysis - IEA

energy prices and costs. The contribution of energy efficiency measures in lowering fossil fuel import bills is around 25%.

To advance energy efficiency, the Commission will focus its efforts on 10 specific areas outlined in the **Energy Efficiency Roadmap**. These initiatives range from supporting and simplifying the implementation of energy efficiency regulations to developing a tradable energy efficiency market and enhancing collaboration and international cooperation. The **energy efficiency for SMEs initiative** was launched on 11 September. The additional €17.5 billion financing effort by the EIB Group will use a combination of existing and new financial products, including debt and equity instruments, support the rollout of proven energy-saving technologies for SMEs, that lower their energy bills and boost their resilience and competitiveness. There is considerable appetite for take up of such financial solutions for SMEs to decarbonise and be more resilient and competitive.

Member States' actions on energy efficiency

***Italy**'s approval of the scheme Conto Termico 3.0, enabling incentives for energy efficiency and renewable thermal energy in public (€400 million) and private buildings (€500 million) (4 August).*

Clean energy investments

To meet its energy and climate targets, the Commission estimates that the EU needs to mobilise **over EUR 660 billion annually** between 2026 and 2030 and **EUR 695 billion annually from 2031 to 2040** for energy related investments such as in renewable energy, energy efficiency and grid capacity.

The core of energy-related EU-level investment is clearly geared towards accelerating the deployment of renewable energy, reducing energy consumption through energy efficiency measures, reinforcing flexibility, deploying interconnectors and upgrading electricity infrastructure.

While the bulk of these investments needs to come from **private capital**, public funding needs to be better targeted to mobilise private investments. This requires a flexible approach, deploying a coordinated mix of **non-financial actions** and a comprehensive **toolbox of financial instruments** –from de-risking mechanisms to return-enhancing and structured finance solutions– to address the specific barriers faced by the full spectrum of investors, from **large institutional investors to commercial banks and project developers**, across all segments of the energy sector.

By channelling EU funds into expanding renewable energy capacity and large-scale electricity storage at the same time into modernising transmission and distribution grids across the Member States, the Recovery and Resilience Facility contributes to the objective of increasing the share of renewable energy to at least 42.5% by 2030. Alongside investments, the RRF supports Member States in adopting investment-enabling reforms aimed at expediting renewable energy permitting, faster access to the grids and a more flexible electricity system. The RRF is expected to deliver 61 GW of new renewable installed capacity allowing to save several billion cubic meters of natural gas, around 40 million households will be covered with electricity, and it will modernise and construct more than 10 000 km of electricity grids. **A large share of the RRF has also been dedicated to energy efficiency, particularly in buildings**. Out of the EUR 723,8 billion available under the recovery facility, EUR 106,5 billion were used to finance energy efficiency investments, representing 15% of the funds.

As a follow up to the Affordable Energy Action Plan, the Commission is stepping up efforts under the electricity market rules to decouple electricity bills from price volatility by boosting the uptake of long-term electricity supply contracts. The **European Investment Bank (EIB)** has taken a leading role in this regard, **launching several financial products with InvestEU support such as EUR 500 million in counter-guarantees for clean Power Purchase Agreements (PPAs)** to support the bankability of new renewable generation projects and de-risk buyers, and launching a **EUR 1.5 billion programme to provide bank guarantees to European grid component manufacturers**. Furthermore, it has expanded the financing capability of the

Wind Package from EUR 5 billion to EUR 6.5 billion, and established a new guarantee product for emerging clean tech of EUR 250 million to be also supported by InvestEU.

The **Innovation Fund** is the EU's flagship investment fund in highly innovative clean technologies. With an estimated EUR 40 billion in funding available between 2020 and 2030, the programme is funded entirely by the EU Emissions Trading System (EU ETS), which support energy independence.

The **Modernisation Fund** also provides investment support, funded entirely from the EU ETS. Since January 2021, around 200 schemes and individual projects have been confirmed for a total amount of EUR 19.1 billion, which has been disbursed to beneficiary Member States. These initiatives mostly relate to renewable energy, energy efficiency, energy storage and the modernisation of energy networks.

In the area of nuclear energy, the Commission published the eighth **Nuclear Illustrative Programme** (PINC) on 13 June 2025, offering a comprehensive, fact-based overview of nuclear investment needs to achieve Member States plans, and pinpointing areas where Member States' action should be prioritised. The '*base case*' scenario requires investments of around EUR 241 billion in present value terms, with new-build of large-scale reactors accounting for EUR 205 billion and lifetime extensions accounting for EUR 36 billion. Recent operational data confirms that the EU's nuclear fleet is performing at a high-capacity factor of over 80%, contributing to baseload supply and decarbonisation goals, all while being an important component for industrial competitiveness and security of supply in certain Member States.

Realising the full impact of these reforms requires a long-term investment strategy. The upcoming **Clean Energy Investment Strategy** will address systemic barriers to investments in clean energy technologies, infrastructure, storage and energy efficiency, and outline actions to unlock private capital and better leverage public funding.

In addition, the development of sustainable alternative fuels, particularly for aviation and maritime sectors, offers strong possibilities to enhance Europe's energy security, and reinforcing domestic capabilities and innovation. The upcoming Sustainable Transport Investment Plan outlines an array of relevant measures in this regard.

Finally, the preparation of **Tripartite Agreements for Affordable Energy** for Europe's industry, bringing together governments, producers, industrial consumers and other relevant stakeholders will further help to unlock the necessary investments by increasing predictability, addressing project risks and barriers to their deployment, reducing financing costs and strengthening Europe's industrial base. During the informal Energy Council held in Copenhagen on 4 September, Commissioner Jørgensen announced the first two **tripartite agreements on offshore and grids, and on storage**, expected in the coming months. The Commission will consider, in collaboration with stakeholders and Member States, other possible priority sectors such as biomethane, energy efficiency, small modular reactors, and energy integration of data centres.

Replacing the Temporary Crisis and Transition Framework (TCTF), the recent adoption of the **Clean Industrial Deal State Aid Framework (CISAF)** adopted on 25 June 2025 will also be a key enabler for the acceleration of the roll out of clean energy and industrial decarbonisation. It aims at streamlining State aid for renewables, industrial decarbonisation, and clean-tech manufacturing by enabling Member States to deploy grants and tax incentives under clearer conditions to bolster EU competitiveness as part of the broader Clean Industrial Deal.

Member States' State aid

Czechia *€960 bn State aid for investment in manufacturing activities in the production of clean equipment (batteries, PV panels, wind turbines, heat pumps, electrolysers, CCUS) and respective raw materials (18 March 2025).*

Germany *State aid scheme of €5 bn approved by the Commission to help industries subject to ETS decarbonise their processes through electrification, hydrogen, CCUS and energy efficiency. It will consist two-way carbon contracts for difference with annual grants based on companies' bids and the evolution of ETS and energy prices, to cover additional costs from decarbonising (24 March 2025).*

Portugal *€612 bn electricity-levy reduction scheme (75-85%) for sectors that rely heavily on electricity and are particularly exposed to international trade, under certain conditions (24 April 2025).*

Romania *direct investment State aid grant for the upgrade of the Bucharest municipality district heating network to improve energy efficiency in final energy consumption due to reduced losses (10 April).*

Making energy affordable in the medium to long term

Renewables and efficiency measures already driving down the cost of electricity, it is now necessary to create an integrated energy system that smartly scales up electrification, improve overall system efficiency and flexibility by better integrating cheap and abundant renewables across sectors.

The next wave of actions under the Action Plan for Affordable Energy as listed in the Annex, will focus on structural changes to make this shift possible. This refers to, for example, the **Electrification Action Plan and the Heating and Cooling Strategy** to address barriers to electrification and unlock the potential of clean electricity and energy efficient system integration. These initiatives will be further supported by the **Strategic Roadmap on Digitalisation and Artificial Intelligence (AI)**, which aims to translate advances in digital solutions and AI technologies into actionable steps that benefit the energy and digital transitions while addressing challenges and risks like the integration of data centres consumption in EU energy system.

The **Citizen Energy Package** aims to provide guidance on how consumers can participate in and benefit from renewable energy and demand response, including as part of an energy community or via energy sharing.

Affordability of energy is an important aspect of the overall affordability of housing. There are significant variations in being exposed to energy poverty across socio-economic groups both in the short term[8] and in the long run[9]. There are also remarkable differentiations in energy poverty rates across EU Member States. The Commission will adopt the first-ever **European Affordable Housing Plan** by the end of the year aiming to support Member States to address the structural drivers of the housing crisis and unlocking public and private investment for affordable and sustainable housing[10]. This includes the operationalisation of the Pan-European Investment Platform for Affordable and Sustainable Housing, launched with the EIB, national promotional banks and other financial institutions, which will also promote sustainable investment in housing projects across the EU.

8 Koukoufikis, G., Ozdemir, E., and Uihlein, A., Shedding Light: Unveiling the Dynamics of Energy Poverty in the EU, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/7432189, JRC138567.

9 Ozdemir, E., and Koukoufikis, G., The persistence of energy poverty in the EU, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/745025, JRC138409.

10 Some descriptive analysis on this issue were conducted in Ozdemir, E., and Koukoufikis, G., Addressing Housing Affordability and Energy Poverty: A Dual Challenge for the EU, European Commission, Petten, 2025, JRC140895. In addition, the authors of this study are currently preparing a forthcoming comprehensive report on the analysis of the trends in changing house prices and households' affordability of housing costs related expenditure.

Investments in energy efficiency and renovation of buildings, clean heating and cooling and integration of renewable energy as well as for zero- and low-emission mobility solutions will be supported by the **Social Climate Fund**. The primary goal of the Fund is to, in parallel to the ETS2, ensure a fair transition to climate neutrality by supporting the most affected vulnerable groups, notably households in energy or transport poverty.

In addition, the Commission will continue to leverage the **EU's Strategic Energy Technology (SET) Plan,** one of the main instruments of the Energy Union's 5th pillar on research, innovation and competitiveness, to develop new technologies and bring down their costs through coordinated research and innovation efforts.

3. TAKING STOCK OF 2030 IMPLEMENTATION: EVIDENCE BASE FOR THE NEXT STAGE IN THE ENERGY UNION

By 2025 almost all Member States[11] have submitted their updated integrated NECPs. These plans are critical to deliver a fair, resilient, and climate-neutral Europe, and to steer the much-needed investments for the climate and energy transition.

The Commission's assessment of the plans[12] shows that Member States have substantially improved their plans following the Commission's recommendations on the drafts, and as a result the gap to achieving the agreed 2030 energy and climate targets has significantly narrowed. However, more ambition and effort are needed from Member States to remain on the trajectory to meet the target, notably on energy efficiency. An improved analytical framework and targeted action to address the fairness, jobs and skills aspects of the transition also come short. In addition, the plans often lack comprehensive strategies for mobilising public and private finance. Few of them have specified the sources of financing, assessed the level of public support needed and discussed how private investment can be mobilised. This demonstrates the value of the iterative and cooperative process between the Commission and the Member States. This progress also supports the 2050 climate neutrality objective and the broader transition framework, linking energy autonomy, security of supply, competitiveness and reduced reliance on fossil fuels.

By 15 March 2025, Member States were due to report on their progress towards implementing their NECPs. This reporting covered progress towards their targets, objectives and contributions across the five dimensions of the Energy Union, including on greenhouse gas emissions and removals, the phasing-out of fossil fuel subsidies, as well as the implementation or amendment of Member State policies and measures and their financing.

Moreover, Member States had to report on progress towards their adaptation goals, the impact of their policies and measures on air quality and emissions of air pollutants as well as the steps taken to establish a multilevel energy and climate dialogue.

Based on these reports, the Commission assessed the progress achieved and took stock of where the EU stands in meeting its 2030 climate and energy ambitions[13]. The complete **Commission assessment of the Member States' biennial reports** is published together with this Report. In addition, the annual **Climate Action Progress Report** reviews climate policy progress under the

[11] Except Poland

[12] The package published on 28 May 2025 includes an EU-wide assessment of the final updated NECPs, a Staff Working Document with the individual assessments of 23 national plans, and guidance to facilitate implementation. This is complemented by a Staff Working Document with the assessment of the Slovakian and Estonian national plans that was published on 2 October 2025. . Belgium submitted its final plan on 7 October 2025 and the Commission's services are currently assessing it. Poland is urged to submit their final updated NECPs as soon as possible.

[13] Each Member State is to report to the Commission every two years on the status of implementation of its national energy and climate plan by means of an integrated national energy and climate progress report covering all five dimensions of the Energy Union. Where possible, the reporting and assessment makes use of comparable energy statistics. As a result, the latest consolidated data in certain areas relate to 2022 or 2023.

Governance Regulation. The key take-aways of the assessment are summarised in the below sections.

3.1 **Decarbonisation**

In **2024**[14], **net greenhouse gas emissions**, including land use, land-use change, and forestry (LULUCF) and international maritime and aviation emissions under the EU target scope, **decreased by 2.5% compared to 2023. Emissions continue the downward path observed following the exceptional drop of 9% achieved in 2023.** Emissions were 37.2% lower than in 1990 (or 39% when only domestic net emissions are considered), while GDP was 71% higher, meaning that economic growth continues to decouple from emissions.

In 2024, the **EU Emissions Trading System** (EU ETS) achieved a further reduction in emissions from power and industry installations, with a 5.8% decrease compared to 2023 levels. This brings these emissions to around 50% below 2005 levels. **Aviation** emissions covered by the EU ETS rose compared to 2023 by around 15%, although around half of this increase was due to an enlarged geographical scope [15]. In the **Effort Sharing sectors**, emissions remained at a similar level compared with 2023. Provisional 2024 data for GHG emissions and removals from the land use, land-use change, and forestry (**LULUCF**) sector show an increase in net carbon sinks of around 7% (or 15 $MtCO_2$-eq) compared to 2023, although approximated data remain subject to large revisions (for more details see the Climate Action Progress Report 2025).

In 2023, the EU reached a share of **24.6% of renewable energy** in gross final energy consumption, an increase of 1.5 percentage points **compared to 2022**.

On average, the overall renewable energy share has been increasing by 0.8 percentage points annually since 2020. **Progress has been strong in the electricity sector**, with an increase in the renewables share from 37.4% in 2020 to 45.3% in 2023. Onshore wind accounted for 15% of electricity consumption in the EU, followed by solar PV with 9% and biofuels with 3%.

The **progress in heating and cooling** (from 23.0% to 26.2%) **and transport** (from 10.3% to 10.8%) was more **limited**. The 2030 EU target of 42.5% renewables in EU energy consumption (with the aspiration to achieve 45%) will require **a much faster uptake of renewables in the coming years**, with an annual increase of 2.6 percentage points needed to reach the next reference point of 29.7% in 2025 (in line with the Governance Regulation). In the heating and cooling sector, renewable energy production comes mainly from biomass (86.6 Mtoe) and heat pumps (19 Mtoe), with solar thermal playing a relatively minor role.

Transport is among the highest emitters of greenhouse gases, necessitating targeted efforts to reduce emissions through advancements in zero-emission mobility and sustainable alternative fuels, specifically in aviation and maritime sectors. In transport, renewable energy was mainly supplied by biofuels (18 Mtoe), outweighing electricity (2 Mtoe).

To meet the aviation decarbonisation climate targets set by the ReFuelEU Aviation framework, Europe must prepare to produce/import 3 million tons of Sustainable Aviation Fuel (SAF), including 600 thousand tons of e-SAF, by 2030, with projected increases to 35 million tons of SAF, including 17 million tons of e-SAF, by 2050.

For the waterborne sector, it is estimated that by 2030, 1.5 Mt of Sustainable Maritime Fuels (SMF) will be required. Moving towards 2035, the targets will require approximately 6.4 Mt of bio-SMF and 4.6 Mt of e-SMF.

These targets will create a high demand for the usage of both sustainable biofuels and RFNBO-derived fuels, particularly after 2030.

[14] Latest official EU greenhouse gas (GHG) data submitted by the European Environment Agency (EEA) to the United Nations Framework Convention on Climate Change (UNFCCC) in March 2025 and approximated GHG emissions submitted by the EU Member States to the EEA in July 2025.
[15] Re-inclusion of non-domestic flights to and from airports in outermost regions.

Despite the increase at EU level, the share of renewable energy in total energy consumption in 2023 continued to vary widely across Member States, reflecting the different starting positions of each Member State. Sweden achieved the highest renewable energy share in 2023 (66%), followed by Finland (51%), Denmark (44%) and Latvia (43%), while Luxembourg, Belgium, Malta and Ireland had the lowest shares (of less than 16%).

Considering both national consumption and currently notified statistical transfers, **in 2023** two **Member States had a renewable energy share still below their 2020 binding renewable energy target under the 2009 Renewable Energy Directive: France and Ireland, both 0.7 percentage points lower than the baseline 2020 target**. Consequently, these Member States had to take, within one-year, additional measures to cover the gap within the next year. Moreover, three Member States still had **not met their reference point for the year 2022**[16]. Those Member States are expected to explain in the next integrated progress report how they intended to close the gap[17].

Overall, there is progress in the implementation of permitting reforms with a positive dynamic in Member States. When monitoring the implementation of the Commission Recommendation on permitting, 1200 national measures were detected, of which 520 were deemed in strong alignment.[1] Many of those measures are recent and still need to show their full effects. As part of the Action Plan for Affordable Energy, the Commission announced further legislative measures as well as implementation support and capacity building measures to help Member States in speeding up permitting for renewable energy and related infrastructure projects[18].

Energy Communities are successfully expanding across the Member States, contributing to the energy transition through citizen-led initiatives. More than 8,000 energy communities now exist across the EU.[1] The Commission is supporting these developments through the recently launched **Citizen Energy Advisory Hub**[1] and the **Energy Communities Facility**. Moreover, the LIFE programme has supported the cooperation between energy communities and local and regional authorities to implement more than 50 local services helping citizens materialize and scale-up energy community projects.

EU Member States are actively working on enhancing climate resilience and adaptation through various plans, strategies and frameworks. All Member States have established national adaptation policies, and some have also sectoral adaptation policies in place or under preparation. Several Member States are integrating adaptation rules into their national climate laws to enhance legal support for adaptation efforts. Member States are also making progress in developing and refining their national climate risk assessments, crucial for evidence-based policymaking on adaptation.

Local and regional efforts in building climate resilience and climate change adaptation across the EU are also advancing. In Member States with legal requirements, regional and local authorities are mandated to prepare and implement adaptation plans, with many integrating resilience into sector-specific programmes. Where mandates are absent, numerous regions and cities are voluntarily developing adaptation strategies within the framework of national adaptation plans or EU cross-border programs, often supported by government incentives, guidance, and joint initiatives.

3.2 **Energy efficiency**

[16] Ireland (falling short by 4 pp), France (2.5 pp) and Slovenia (0.3 pp). Reference point as set in Article 4 of the Governance Regulation based on the previously EU-level target before the entry into force of the revised Renewable Energy Directive.

[17] The Commission progress assessment of the Member States which in 2022 missed their baseline and/or reference points is presented in the dedicated staff working document, based on the measures and explanations provided in the progress reports.

[18] European Commission: Directorate-General for Energy, COWI, Eclareon and Prognos, Monitoring the implementation of the Commission recommendation and guidance on speeding up permit-granting procedures for renewable energy and related infrastructure projects – Final report, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2833/2257747

In 2023[19], primary energy consumption in the EU reached 1,209 million tonnes of oil equivalent (Mtoe), a 4.1% decrease compared with 2022 and a yearly average decrease of 2.7% since 2020, **moving slightly closer to the new 2030 target of 992.5 Mtoe with a significant gap still at 22% from the 2030 target**.

Final energy consumption reached 894 Mtoe in 2023, a 3.0% decrease compared with 2022 and a yearly average decrease of 2% since 2019, and still 17% away from the new 2030 target (763 Mtoe), which translates into at least 2.2% yearly average efforts needed to 2030[20]. Thus, energy efficiency efforts will need a further step up to achieve the 11.7% final energy consumption reduction target by 2030, as the Commission 2025 EU-wide assessment of the final updated NECPs identified a reduction of only 8.1% compared to the 2030 projections.

Despite the decrease at EU level, the average yearly reduction since 2019 of primary as well as final energy consumption continued to vary widely across Member States, reflecting the different conditions and starting points of each Member State. **Luxembourg achieved the highest average yearly reduction in final energy consumption** since 2019 (5,4%), followed by the Netherlands (3.8%) and Finland (3.0%), while in Malta, Croatia and Portugal final energy consumption even increased since 2019.

In 2023, final energy consumption decreased by 6.1% in the EU residential sector, by 5.4% in the industry sector and by 3.0% in the service sector compared to the levels of 2022. Climate-corrected data in the residential sector (-3.5% compared to 2022) suggest that the decrease is largely linked to an improvement of the energy performance of residential buildings, but also to a milder winter compared to that of the previous year. Efforts to improve the rate of building **renovation and monitor its evolution** as well as to **increase efforts to decarbonise and electrify heating need to be stepped up**. While 2.8 million heat pump units were installed in 2022, deployment slowed to 2.7 million units in 2023 and 2 million units in 2024.[21] Other clean technologies in buildings experienced significant growth: rooftop solar photovoltaic (PV) capacity reached approximately 338 GW by the end of 2024, and battery storage installations in Europe totalled around 66 GW in the first quarter of 2025, supporting both grid stability and integration of renewable energy. **National measures are not yet at the necessary pace to reach a zero-emission building stock by 2050**, for which a swift implementation of the recast Energy Performance of Buildings Directive will be key.

In June the Commission published a package to support Member States' implementation of the Energy Performance of Buildings Directive. Member States must transpose the Directive by May 2026.

Policy and regulatory measures are being strengthened to remove barriers to energy efficiency. Regulatory efforts, including as part of the Recovery and Resilience Plans of many Member States, focus on removing barriers by simplifying permitting procedures for building renovations and grid connections, addressing split incentives in rental markets, and promoting training and certification for energy professionals. Furthermore, market-based instruments, such as energy taxes, levies, and allowances, are used to incentivise investments in energy efficiency and support the uptake of low-energy technologies. Energy Efficiency Obligation Schemes (EEOS) and tradable White Certificates require suppliers to achieve energy savings for end-users. Carbon pricing mechanisms, including the EU ETS, generate revenue for efficiency initiatives, while energy taxes and vehicle levies encourage reduced consumption. Eco-design and energy labelling regulations further promote efficient products and informed consumer choices.

The implementation of energy efficiency measures, including updates to energy labelling and ecodesign regulations, led to an estimated savings of around **EUR 120 billion** on energy bills in 2023, and could rise to about EUR162 billion in 2030[22].

[19] Latest available data
[20] This refers to the period 2023-2030
[21] JRC, forthcoming CETO report on heat pumps.
[22] Action Plan for Affordable Energy.

3.3 **Energy markets**

Sufficient cross-border interconnection between Member States is an absolute prerequisite to allow clean and cheap electricity to flow freely and reach citizens and businesses across Europe, contributing to lower electricity prices, higher security of supply and better integration of renewable energy.

Member States have made good efforts to **increase cross-border capacity**, exemplified by projects such as the **Baltic Interconnector** between Finland and Estonia, the ElecLink interconnector between the UK and France, and the Greece-Bulgaria IGB gas pipeline. The completion of various projects of common interest should further **improve the interconnectivity levels**. Member States currently report 83 ongoing PCI projects, most of which concern electricity interconnectors. The process for establishing the second PCI/PMI list is underway, with 230 eligible projects so far, and is expected to conclude by the end of 2025.

Nevertheless, thirteen Member States (BE, DE, IE, EL, ES, FR, IT, CY, NL, PL, PT, RO, SE) have still not reached the 2030 interconnection target of a minimum of 15%, with eight (IE, EL, ES, FR, IT, CY, NL, PL) also remaining below the 2020 interconnection target of 10%.[23] Further effort is required to meet the 2030 objectives, in particular in terms of timely delivery of planned cross-border projects.

In April last year, ACER sent an opinion paper to the European Parliament and European Commission, highlighting the urgent need for Transmission System Operators (TSOs) to make **further progress.** The internal electricity market is the foundation of our shared security of supply and a key enabler of our renewable's deployment targets. Maximising the use of interconnection capacity by reaching the minimum 70% requirement is a pre-requisite for the energy transition as cross-border trade supports the deployment of renewables, it keeps costs down and enhances security of electricity supply by optimising the use of the existing grid.

In addition, it is important that Member States **enhance the non-fossil flexibility capacity** available in their electricity systems by completing the transposition and implementation of all relevant EU regulations enabling the effective participation of demand-response, storage and distributed generation into all relevant markets. Many Member States have set ambitious targets for consumer participation, smart meter roll-out, and electricity system adequacy, laying the groundwork for a more responsive and integrated energy system.

3.4 **Security of supply**

The successful **extension of the Gas Storage Regulation** underscores Europe's commitment to **energy security and resilience**. Given the crucial role of security of supply for the energy transition, this development will help prepare for the next winters while providing flexibility for Member States to prevent excessive prices and market distortions.

Gas storage levels of 90% were reached before the end of August 2024, and there were **no gas security of supply issues despite a cold winter and relatively low supply of LNG** throughout the winter months. The Commission and Member States worked closely together to ensure that security of supply would not be affected by the end of the Russian gas transit through Ukraine in December 2024. Although the impact has varied in different regions, overall security of supply and prices were not affected significantly EU wide thanks to the collective anticipatory work, including the diversification efforts through the **AggregateEU** mechanism, which achieved remarkable results: almost 190 registered companies, 90 bcm of demand aggregated, 160 bcm of supplies and more than 77 bcm matched between off-takers and suppliers. As a result, the share of Russian gas imports dropped to 12% in 2025 (until August) compared to 19% in 2024. The EU Energy and Raw Materials Platform will also extend demand aggregation to new products and commodities, leveraging the power and size of the European market. On 14 October 2025, gas storage levels were at 83% capacity.

[23] Based on ENTSO-E Winter Outlook 2024-2025 data *(DG ENER calculations based on import interconnections capacity and generation capacity data reported for 10 January 2025, 19:00)*.

There have also been **no security of supply concerns for oil**. Small oil stock releases took place due to disruptions in oil pipelines and/or refinery closures, but all Member States retained or returned to the mandatory oil stocks. Due to the continued sanctions on the import of Russian oil, as well as the shadow fleet, there are only 3 Member States that continue to import Russian oil (accounting for 3% of EU oil imports in 2024).

The **electricity security of supply situation has been overall favourable** in the EU, owing to increasing renewable installed capacities, moderate demand for electricity, generally good nuclear generation and favourable hydro levels across the EU. A major development for electricity security of supply was the **synchronisation of the Baltic state**s with the electricity system of Continental Europe, which has allowed Estonia, Latvia and Lithuania to gain full energy independence from Russia and thereby EU's collective energy security.

December 2024 was also marked by the incident of the disruption of the Estlink-2 submarine power cable between Finland and Estonia, which did not endanger the security of electricity supply in the region but evidenced the vulnerability of critical energy infrastructure to malicious acts, especially undersea. In response, the Commission adopted in February 2025 a Joint Communication to strengthen the security and the resilience of submarine cables around four key pillars: prevention, detection, response and deterrence.

Last year, some localised extreme weather events also put EU electricity system under high pressure, such as Eowyn Storm in Ireland in January 2025.

Another major event was **the Iberian blackout on 28th April 2025**, which affected the whole Iberian Peninsula and a small area in France near the Spanish border. The restoration of the Portuguese and Spanish transmission grid was completed throughout the same night, in accordance with the network code on electricity emergency and restoration. While the underlying factors are still being examined, the Commission is monitoring them closely. The Commission is analysing all findings, including the ex-post evaluation reports submitted by Spain and Portugal and the report of the expert panel set up by ENTSO-E, and may consider taking action to improve overall EU security of supply, for instance through the upcoming revision of the EU energy security framework.

Reported national targets on energy security focus mainly on ensuring uninterrupted supply, secondly on diversification of energy sources. Member States report a strong focus on enhancing gas supply security through the development of new LNG terminals, alternative pipeline routes, and renewable gases.

3.5 Research, innovation and competitiveness

Clean energy technologies provide an important economic contribution, with the renewable energy sector estimated to employ around 1.8 million jobs in the EU and its total turnover estimated at around EUR 233 billion in 2023[24]. The competitiveness of the EU clean energy technologies sector is crucial not only to achieve the energy and climate objectives, but also to create jobs, while strengthening energy and economic security[25].

The Net-Zero Industry Act (NZIA), which entered into force in 2024, marked an important step in supporting EU net-zero technology manufacturing. In May 2025, the Commission adopted four pieces of secondary legislation[26], an important milestone for the implementation of the act. The Commission also presented a Communication assessing the EU supply in net-zero technologies and showing a strong reliance on China, in particular for solar PV systems (94% of PV modules and PV cells) and batteries (50% of battery packs, modules and cells as well as 81% of anode active materials)[27]. Overall, the EU clean tech sector continues to face strong competitive pressure. At the global level, substantial manufacturing overcapacities in batteries,

[24] EurObserv'ER, *The State of Renewable Energies in Europe, 2024 edition*, 2025.
[25] For a more comprehensive assessment see the 2025 Progress Report on Competitiveness of Clean Energy Technologies, COM(2025) 74 final.
[26] See: https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1324..
[27] C/2025/3236.

solar, wind (nacelles) and hydrogen (electrolyser stacks) are expected to persist in the next years without further policy actions[28].

The EU leads globally in public R&I spending in clean energy technologies and has increased its public investments in the sector in recent years[29]. In 2023, Member States provided nearly EUR 8.5 billion research funding for the Energy Union R&I priorities, increasing their expenditure by a fifth on the year before. This was supplemented at EU level by over EUR 2 billion in relevant Horizon Europe projects. The combined amount places the EU in the lead among major economies for public R&I spending in clean energy technologies[30]. However, **private R&I investment**, which provides over three quarters of R&I funding for clean energy technologies across major economies remains significantly higher in major Asian economies than in the EU and the US[31]. The **Startup and Scaleup Strategy**, launched in May 2025, aims at closing the innovation gap between the EU and its main global competitors, with key actions ranging from fostering innovation-friendly regulation, to improving access to finance and accelerating market uptake and expansion.

The new governance of the **Strategic Energy Technology Plan** (SET Plan), proposed by the Commission in 2025, aims at **defining Common Implementation and Investment Agendas per technology** with the Member States to further harness synergies between the EU, Member States and energy research and industrial stakeholders. In addition, in 2025 the SET Plan has started to **give more consideration to cross-cutting challenges,** such as market uptake of innovation, circularity, digitalisation and societal skills. Member States reported national targets translating SET plans objectives show a strong focus on energy systems and hydrogen. With regard to nuclear technologies, the European Industrial Alliance on Small Modular Reactors (SMRs) in September 2025 published its strategic action plan, outlining specific actions to support and accelerate the development and deployment of SMRs through a number of selected projects by the early 2030s. On fusion energy, the ITER project met all its KPIs last year and on 1st Semester 2025, indicators showed that the project is on schedule, bringing it closer to the scientific exploration phase that will open the doors to industrial commercialisation.

4. A DECISIVE MOMENT TO COMPLETE THE ROBUST ENERGY UNION

Decarbonisation presents a powerful growth opportunity: it can provide stability for energy prices and markets, lower energy bills costs, create high-quality jobs and boost the competitiveness of European industries, all while increasing domestic energy production, bringing benefits in terms of security of supply and energy independence.

The full implementation of the Affordable Energy Action Plan is starting to show its first effects on the ground. It will remain a priority in the coming months to bring energy prices down to all European citizens and business, while accelerating the implementation of the 2030 framework. The Commission will step up efforts building on the set of actions announced on 21 October[32].

At the same time, it will lay a solid foundation to sustain the transformation well into the next decade **on the path to climate neutrality by 2050**.

The Commission proposal to amend the European Climate Law setting a 2040 EU climate target of 90% reduction in net greenhouse gas emissions, compared to 1990 levels, is currently under consideration by the co-legislators.

Once agreed, the 2040 EU climate target will serve as a benchmark for the EU policy framework for the decade ahead. The experience gained from implementing the current regulatory

[28] BloombergNEF, *Energy Transition Supply Chains*, 2025.
[29] CETO, *Overall Strategic Analysis of Clean Energy Technology in the EU - 2024 Status Report*, 2025.
[30] JRC analysis for CETO 2025 reports (forthcoming).
[31] COM(2025) 74 final.
[32] Commission steps up efforts to lower energy prices with a set of actions to bring relief to industries and consumers - Energy

framework, including the Governance Regulation, has underlined the importance of aligning ambition with the capacity to deliver, and of ensuring coordination of national strategies.

Focus should lie on putting forward a coherent and predictable policy framework providing long-term certainty to Member States, investors and citizens throughout the next phase of the energy transition. To do so, several challenges lie ahead.

First, **deeper electrification will be essential to achieving an ambitious reduction in greenhouse gas emissions and meeting the energy needs for a competitive and prosperous EU**. Yet, electricity's share in final energy demand has remained flat at around 23% for over a decade. To reach the EU's decarbonisation goals and deliver large-scale electrification of land transport, of space and water heating and of many industrial processes, it needs to rise to one third by 2030, around 32%, as indicated in the Clean Industrial Deal and to almost double to reach 50% by 2040.

When considering also the electricity needed to produce hydrogen, this shift will require the generation capacity to more than double by 2040, as well as investing approximately **EUR 1 trillion in grids and flexibility by 2040**.

Second, for this **strategic approach to be cost-effective**, it will also be necessary to continue driving the adoption of **energy-efficient** technologies, and ensure that all households and businesses are equipped with smart meters. Most importantly, the lion's share of the investment needs for energy efficiency between 2030 and 2040 relate to **renovation of existing buildings**, including heating and cooling refurbishment, in particular, for the residential sector with needs of up to EUR 241 billion per year[33].

Third, **innovative technologies made in Europe need to flourish for the energy transition to succeed** and to ensure that the future energy system is based on a competitive EU clean tech sector. The development and uptake of digital solutions and AI applications have a great potential to ensure greater efficiency and flexibility of the energy system, and to facilitate the integration of renewables at a lower cost. At the same time, it is important to ensure cybersecurity of EU energy system and plan the integration of growing consumption of data centres[34].

To support massive evolution of the energy system, clean energy investments will need to rise from approximately EUR 240 billion in 2020 to around EUR 695 billion per year by 2040. This investment must support the expansion, digitalisation and modernisation of electricity infrastructure, domestic manufacturing, storage.

Leveraging public and mobilising private investments will be crucial, as will be the creation of innovative financial instruments to support sustainable investments in energy and climate across the EU and to foster cross-border cooperation. For instance, the EU renewable energy financing mechanism could support cost-efficiency and increase Member States ambition through the facilitation of EU-wide renewable energy auctions, as recommended by the Letta report.

As indicated in the Affordable Energy Action Plan and in the Energy Efficiency Roadmap, scaling up EU guarantee schemes for energy efficiency services and energy efficiency accelerator instruments will contribute to enhance the market for energy efficiency and to turn energy savings into a market-driven commodity that help Europeans to benefit from services able to reduce their energy bills. The upcoming revision of the Energy Governance offers an opportunity to transform National and Energy Climate Plans into **credible investment strategies** that steer reforms and effectively channel funding towards the clean transition.

Following the **mid-term review of Cohesion Policy**, Member States are able to use cohesion funds to support energy interconnections projects and related transmission, distribution and storage infrastructures.

[33] (SWD(2024) 64 final)

[34] IEA reporting growth by 70% of data centres consumption in Europe between 2025 and 2030: Energy and AI

Moreover, the proposal for an ambitious Multiannual Financial Framework (MFF) amounting to EUR 1.98 trillion for the 2028-2034 period (in current prices), suggests a fivefold increase of the **Connecting Europe Facility** budget to reinforce the cross-border infrastructure needed in for a robust Energy Union.

National and Regional Partnership plans will support domestic transmission and distribution grids also taking into account the Trans-European Network (TEN-E). The climate resilience framework will seek, inter alia, to ensure that all investments and major policies vulnerable to the impacts of climate change are designed to face climate risks that could materialise in their lifetime. The proposal also relies on a **European Competitiveness Fund** that will simplify and accelerate EU funding and catalyse private and public investment in strategic technologies, including those critical for the clean transition.

Ensuring coherence between future NECPs and the development of National and Regional Partnership Plans, including their mid-term review, will be essential. It will support the alignment of investment priorities with long-term energy reforms and the delivery of the infrastructure underpinning a truly integrated Energy Union, including removal of the eight critical bottlenecks identified under the Energy Highways.

Simplification has a key role to play in order to achieve the national and EU-level energy policy objectives and targets in a faster pace, building on Implementation Dialogues and reality checks. The current Governance Regulation already represented a major step in this regard, but a renewed push is necessary to further streamline and align planning, reporting and investment tracking elements. This could streamline processes and ensure the future energy and climate policy framework **remains responsive and well targeted while ensuring ambitious climate and energy transition.** The future energy and climate framework should be used more strategically to attract investment and support Member States' implementation.

European citizens need to feel the benefits of the energy transition in their daily life. Ensuring citizen engagement opportunities at the planning and development phase of energy projects and grid infrastructure or supporting them to benefit from innovative offers to avoid price volatility, will ensure the necessary social acceptance to achieve the EU's targets and contribute to lower energy bills. The citizens' panel on energy efficiency organised by the European Commission in 2024 could serve as an example to feed into upcoming EU initiatives.

Taken together, these improvements must contribute to a more coherent, forward-looking framework capable of supporting the EU's clean transition for the decade ahead, while safeguarding competitiveness, affordability, security and social fairness and contribute to complete the Energy Union.

ANNEX 1

Table: Implementation progress of the Action Plan for Affordable Energy

 completed  in progress

Actions Pillar I: ***Lowering energy costs***	**Sub-action**	**Status**	**Deadline**
1. Affordable energy bills	**Guidance** on network tariff methodologies and anticipatory grid investments		Q2 2025
	Recommendation to Member States on using flexibilities (including ETD) in lowering electricity taxation		Q4 2025
	Citizens' Energy Package including Guidance and measures on energy poverty and communities		Q1 2026
2. Lowering electricity supply costs	**EIB pilot** for clean **PPAs** (EUR 500M), **grids manufacturing** package (EUR 1.5 bn)		Q2 2025
	Guidance on innovative forms of renewables and on grid and storage acceleration areas		Q2 2025
	Commission implementation support through Accele-RES expansion, Expert Group on permitting, CA-RES, implementation dialogue, Q&A guiding tool		Q2 2025
	State aid framework revision		Q2 2025
	Guidance on design of contracts for difference		Q4 2025
	Legislative proposals for streamlined permitting of energy infrastructure, storage and renewables		Q4 2025
	European **Grids Package**		Q4 2025
	Guidance on promoting remuneration of flexibility in retail contracts		Q4 2025
	Network code on demand response		Q1 2026
	Forward market rules to increase hedging opportunities		Q3 2026
	Member States to adapt national permitting procedures and strengthen national authorities		ASAP
3. Improving gas markets	**Harnessing EU purchasing power**		Q2 2025 - 2026
	EIB energy efficiency product for SMEs, guarantee scheme, pilot		Q3 2025
	Assessment EU-wide market **certification scheme for energy savings**		Q3 2025
	EU energy **labelling and eco-design rules** update		Q3 2025
	Assessment access to capital and financial incentives		Q4 2025

	Gas Market Task Force assessment		Q4 2025
	Member States and market surveillance authorities to strengthen surveillance and enforcement		As soon as possible
4. Energy efficiency	**EIB programme** for energy efficiency in SMEs		Q3 2025
	Strengthen **efficient appliances and products**		As soon as possible
Actions Pillar II: ***Completing the Energy Union***	**Sub-Actions**	**Status**	**Deadline**
5. Completing the Energy Union	Establishment of an **Energy Union Task Force**		Q2 2025
	Illustrative programme for nuclear (PINC)		Q2 2025
	White Paper on **Deeper Energy Market Integration**		Q4 2025
	Clean Energy Investment Strategy		Q4 2025
	Strategic Energy Technology Plan		Q4 2025
	Electrification Action Plan, **Heating and Cooling Strategy**, **Strategic Roadmap for Digitalisation and AI**		Q1 2026
	Fusion Strategy		2026
	Governance Regulation revision		By mid-2027
Actions Pillar III: ***Attracting Investment and Ensuring Delivery***	**Sub-action**	**Status**	**Deadline**
6. Tripartite agreements	Launch of process for **tripartite sectoral agreements** for affordable energy for Europe's industry		Q4 2025
Action – Pillar IV ***Ready for Potential Crises***	**Sub-action**	**Status**	**Deadline**
7. Security of supply for price stability	**Energy security framework** revision		Q1 2026
8. Price crises preparedness	**Guidance** on schemes to **lower peak demand for price spikes** in periods of system stress		Ongoing
	Cross-border interconnection capacities temporary increases during crises		Permanent
Action - Monitoring	**Sub-Action**	**Status**	**Deadline**

State of the Energy Union Report	Commission to implement, monitor and report on the progress delivering the Action Plan in State of the Energy Union report.		Yearly

ANNEX 2 – Progress report on competitiveness

This annex provides an update on the competitiveness of the EU in clean energy technologies, complementing section 3.5. It builds on the progress report[35] adopted with the Clean Industrial Deal and the Action Plan for Affordable Energy in February 2025, as well as on the work of the Clean Energy Technology Observatory (CETO).

1. Global market developments

Global investment in clean energy has overtaken investment in fossil fuels, with around two thirds of the EUR3 trillion capital flow to energy expected for 2025 going to clean energy technologies[36]. Renewables are the most cost-competitive sources of electricity in the EU, which reached a 47% renewable share in its electricity mix in 2024.

The EU remains a major player in clean tech trade, with recent reductions in trade deficits for heat pumps, solar PV and batteries, and a surplus in solar thermal. Yet these improvements partly reflect weaker demand and high inventories rather than a rebounding manufacturing base. Exports fell in 2024, with the EU losing 7% in export value[37]. At global level, manufacturing overcapacity in solar, batteries, wind and hydrogen are expected to persist, with China dominating investment and production, hosting over 85% of global solar and battery capacity. EU production costs remain significantly higher, with Chinese solar modules estimated at 35–65% cheaper than European ones, and wind turbines around one third cheaper[38].

2. Net-zero technology manufacturing and supply chains

Fostering clean tech manufacturing is central to EU policy under the Clean Industrial Deal and the Net-Zero Industry Act. New state aid and tax frameworks were adopted in 2025 to support investment, while the NZIA's secondary legislation provides tools to boost EU capacity and apply resilience criteria in procurement and auctions. Despite these measures, dependencies remain significant: in 2023, China provided more than 90% of PV modules, nearly 80% of PV systems overall, half of battery components, and the vast majority of permanent magnets for wind turbines[39].

The EU retains strong positions in wind turbines, grid technologies, hydropower and high-end heat pumps, as well as global leadership in biogas and biomethane. It is also well placed in innovative fuels for aviation and maritime transport, though production remains small-scale and costly. In 2024, overall EU clean tech production value for six key clean energy technologies fell by 11% to EUR35 billion, with strong growth only in wind and hydropower[40].

3. Research and innovation trends

The EU remains the global leader in public R&I investment in clean energy technologies, with more than EUR 10.5 billion mobilised in 2023. However, private R&I – which dominates globally – is much stronger in major Asian economies (0.37%-0.64% GDP) than in the EU (0.17% GDP) and the US (0.08 GDP)[41] , leaving the EU at a disadvantage. The EU continues to be well placed in high-value patent filings in renewables and energy efficiency. Considering

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35 COM(2025)74 final.

36 IEA, *World Energy Investment*, 2025. Converted to EUR using the average exchange rate of EUR 0.9239 for USD 1 over the year 2024, based on ECB.

37 JRC based on COMEXT/COMTRADE data for selected technologies (Li-ion batteries, PV modules, solar thermal, heat pumps, hydropower, wind energy) for CETO 2025 reports (forthcoming).

38 IEA, *Advancing Clean Technology Manufacturing*, 2024

39 COM(2025)3236.

40 JRC based on PRODCOM data for selected technologies (Li-ion batteries, solar PV modules, solar thermal, heat pumps, hydropower, wind energy) for CETO 2025 reports (forthcoming).

41 CETO, *Overall Strategic Analysis of Clean Energy Technology in the EU: 2024 Status Report*, 2025.

these patenting trends, the EU is well positioned in technologies such as wind, hydrogen, smart grids and ocean energy, but lags behind countries such as the US and China in batteries, solar PV, geothermal and digital technologies[42]. During 2024, global venture capital investments in clean energy technologies continued the decline observed in 2023. In the EU venture capital investment in clean tech fell by half in 2024. However, Europe's global share has grown to nearly one fifth over recent years. Unlike the US and China, which benefit from a broad pool of mid-sized deals, EU performance relies on a small number of very large transactions[43].

Recent initiatives in nuclear energy include the creation of the Industrial Alliance on Small Modular Reactors, preparations for a European Fusion Strategy. Furthermore, the reform of the SET Plan will strengthen coordination with Member States, research stakeholders and industry. Looking ahead, the proposed European Competitiveness Fund will work alongside Horizon Europe to provide continuous support from research to deployment, while the EIB's TechEU programme is expected to mobilise EUR250 billion by 2027, including through EU support. Together, these instruments aim to strengthen Europe's ability to scale up innovation, secure supply chains and maintain competitiveness in the global clean energy race.

[42] CETO, *Overall Strategic Analysis of Clean Energy Technology in the EU: 2024 Status Report*, 2025.
[43] JRC analysis for CETO 2025 reports (forthcoming).