

EU Governance Regulation: An opportunity to ensure a reliable clean electricity provision

The EU Governance Regulation can be a key tool for facilitating strategic planning and implementation with regards to the five dimensions of the Energy Union: Energy Security, a Fully Integrated Internal Energy Market, Energy Efficiency, Decarbonisation, and Research, Innovation, and Competitiveness.

However, as it stands, the Regulation is arguably not meeting its stated objectives. Numerous stakeholders, including the [European Scientific Advisory Board on Climate Change \(ESABCC\)](#), have noted significant shortcomings in its set up and implementation, linked particularly to its delivery mechanisms, i.e. national long-term strategies and integrated national energy and climate plans (NECPs). Without an effective planning and implementation framework, the EU risks falling short of its climate objectives, both under the Paris Agreement and the EU's own law.

The upcoming revision offers an opportunity to strengthen the strategic planning framework, particularly keeping in mind crucial considerations for meeting the EU's Energy Union objectives, like the availability of clean firm electricity.

Why clean firm electricity generation matters

Achieving an affordable, reliable, and abundant clean energy future will require electricity systems to grow while rapidly decarbonising. Delivering a reliable, least-cost power system will depend not only on scaling renewables, storage, and demand-side solutions, but also on deploying clean electricity technologies with complementary capabilities.

One category of clean energy technologies with significant untapped potential is "clean firm" generation — dispatchable, low-emission electricity generation sources that do not rely on the weather. This includes^{1,2} nuclear fission, fusion, geothermal energy, fossil generation with high levels of carbon capture and upstream methane mitigation, and combustion or gasification of sustainably sourced biomass or low-carbon synthetic fuels (such as low-carbon hydrogen). While

¹ This includes technologies that are dispatchable for an effectively indefinite amount of time at an individual asset level and therefore does not include non-firm generation + storage and demand-response technologies. While those can approximate some the capabilities of firm resources, the capacities required would be exceedingly large and are generally most costly on their own.

² The commercial readiness of these technologies varies. Many have been technically demonstrated at or near commercial scale, but still face cost, supply chain, or other infrastructure and financing challenges. Others remain more nascent, requiring additional research, development, and demonstration to achieve commercial readiness.

each of these technologies has unique characteristics, their common value lies in the ability to reliably deliver clean electricity whenever and for as long as it is needed.

To illustrate, Germany generates more electricity from renewables than France — 58% compared to France's 27%³. Yet Germany's grid emitted an estimated 298 kgCO₂ e per MWh in 2024, nearly seven times the French figure of 43 kgCO₂ e per MWh⁴. This divergence is attributable to the carbon intensity of the dispatchable generation that backs it — in Germany, the non-renewable 42% is almost entirely coal and gas, whereas in France nuclear provides 67% of electricity generation at near-zero carbon. This shows that renewable penetration as a standalone metric is an inadequate proxy for electricity sector decarbonisation and attention needs to shift towards clean firm generation.

Clean firm generation technologies can provide a number of benefits, including:

- **Reduced need for fossil fuel back-up generation**

To address renewable variability, the current EU energy system often relies on unabated fossil fuels as backup. Clean firm generation can replace fossil fuels, ensuring low-carbon electricity even during periods of low wind and solar generation.

- **Reduced infrastructure buildout**

Academic and industry-led electricity systems studies⁵ have consistently demonstrated that deployment of clean firm resources drastically reduces the scale of the infrastructure buildout necessary to decarbonise the power sector while meeting demand growth, in comparison to pathways without clean firm generation technologies. This generally also translates into additional benefits such as **low land use, flexible siting, low material requirements** overall, and **low critical mineral requirements** in particular.

³ International Energy Agency. Germany – Energy Mix. <https://www.iea.org/countries/germany/energy-mix> & France – Energy Mix. <https://www.iea.org/countries/france/energy-mix>

⁴ European Environment Agency. (2025). Greenhouse gas emission intensity of electricity generation in Europe. <https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emission-intensity-of-1>

⁵ Quantified Carbon for Clean Air Task Force. (2025). Clean Firm Power in Europe's Energy Transition: Evidence, Constraints, and System Roles. www.shorturl.at/YhxGg

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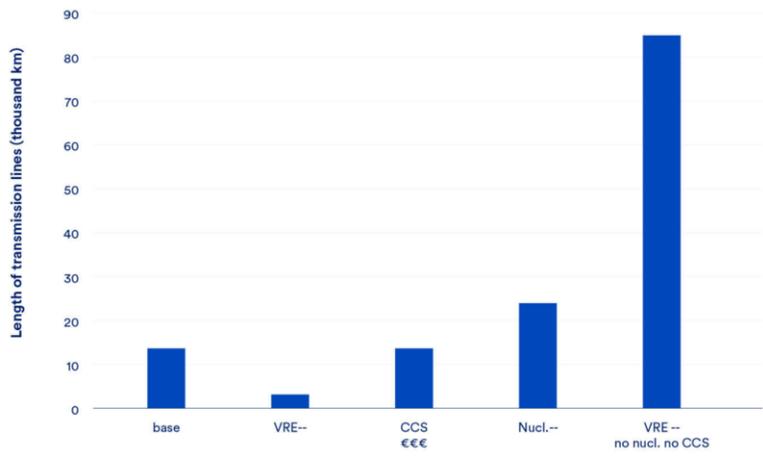


Figure 1: Estimated transmission capacity required in different scenarios⁶ of achieving a decarbonised power grid in Poland by 2050

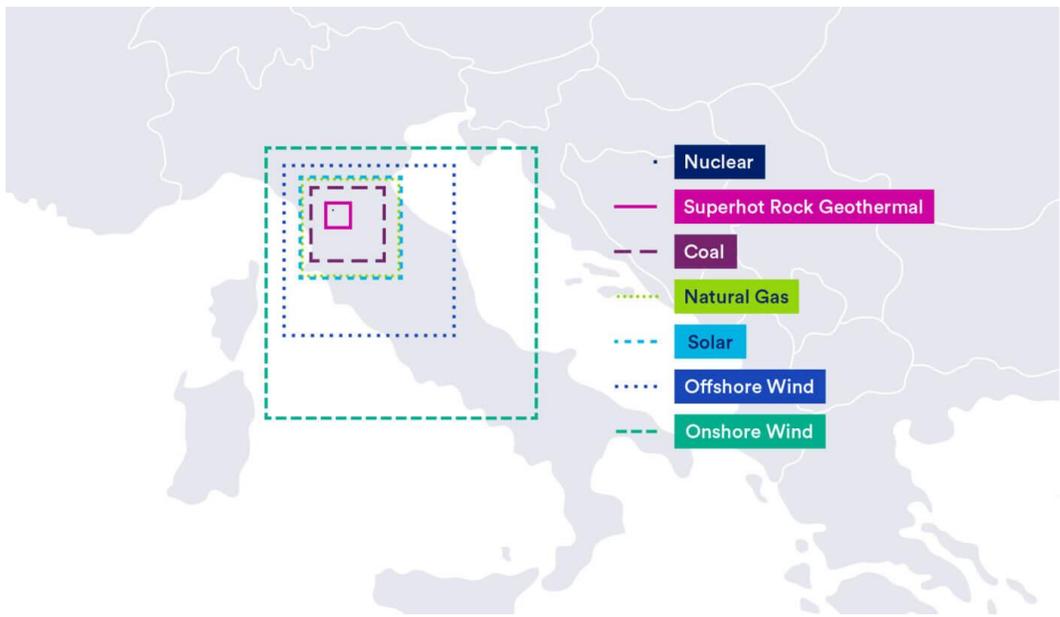


Figure 2: Relative magnitude of surface area used for different energy sources to meet the total energy demand of Italy. Source: CATF

⁶ Quantified Carbon for Clean Air Task Force. (2025). Decarbonising Poland’s Power System: A Scenario-Based Evaluation. www.cleanairtaskforce.org/resource/decarbonising-polands-power-system-a-scenario-based-evaluation/

- **Reduced costs of power sector decarbonisation**

Studies have also consistently concluded⁷ that the cost of fully decarbonising the electricity sector could be significantly lowered through the development and cost-effective commercialisation of one or more clean firm generation technologies.

- **Higher likelihood of an effective and timely decarbonisation**

The inclusion of more technology solutions means that risks that affect technologies asymmetrically are less likely to become severe bottlenecks to decarbonisation. If one technology pathway faces unique constraints at any point in time or in any region, a diverse technology portfolio ensures that other options are available to fill the gap.

The need to advance clean firm technology options is as pressing today as ever. Increasing electricity costs, concerns about reliability, projected but uncertain load growth, and the backsliding of climate progress are putting more pressure on clean energy strategies to achieve decarbonisation at lower costs. If growing electricity demand is to be met and economy-wide decarbonisation is to be achieved in the coming decades, clean firm generation technologies could be essential pieces of the solution, provided they are commercially available and deployable.

For more information, please refer to [Clean Firm Electricity Technologies: What, Why, How](#).

How EU policy can promote the deployment of clean firm generation technologies

While the EU climate and energy policy framework includes incentives for certain clean technologies, it currently lacks a clear policy signal and effective incentives for clean, dispatchable generation. As variable renewables scale, the absence of a technology-neutral clean firm generation strategy risks prolonging reliance on gas, increasing system costs, and complicating the decarbonisation.

Recommendation 1: Introduce the concept and definition of clean firm electricity generation in the EU policy framework

Despite clean firm electricity being a key concept in bringing about a low-carbon, reliable, and resilient energy system, it has not been meaningfully considered in EU climate and energy policy. Establishing a clear legal definition in the EU Governance Regulation could be a foundation for any subsequent policy measures in this area.

⁷ Quantified Carbon for Clean Air Task Force. (2025). Clean Firm Power in Europe's Energy Transition: Evidence, Constraints, and System Roles. www.shorturl.at/YhxGg

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Recommendation 2: Set an EU-wide target for installed clean firm generation capacity

Multiple measures will be required to unlock the potential benefits from clean firm generation technologies, including public investment, workforce development, and the build out of enabling infrastructure. As part of that portfolio of measures, targets can be an effective deployment incentive, providing a strong signal of supportive and predictable policy framework. Notably, an EU target for installed clean firm generation capacity that would be required by the EU Governance Regulation and open to all the technologies that meet the agreed criteria would both stimulate clean firm generation deployment and ensure it is properly monitored.

While individual Member States retain the right to determine their own energy mix, the EU energy policy aims to ensure the functioning of the energy market, ensure security of EU energy supply, promote energy efficiency and the development of new and renewable forms of energy, and promote the interconnection of energy networks. The EU is also responsible for promoting measures to combat climate change, protect human health, and utilise natural resources in a prudent and rational manner. In this spirit, the EU Renewable Energy Directive (RED) requires the Member States to collectively ensure that at least 42,5 % of the EU's gross final consumption of energy in 2030 comes from renewable sources, as well as requires them to set national contributions to the overall EU target. Nonetheless, there is no comparable incentive mechanism for dispatchable, low-emission electricity generation sources that do not rely on the weather. Given that clean firm generation technologies can deliver multiple benefits for climate, environment, security, resilience and cost, as discussed above, it is appropriate – and indeed critical – to consider clean firm generation technologies more intentionally at both the EU- and Member State-level, as well as set up strong incentive mechanisms for their deployment.

Recommendation 3: Integrate clean firm electricity generation into National Energy and Climate Plans

Accordingly, Member States should be asked to monitor and report within the integrated National Energy and Climate Plans on the implementation of their national contribution to the EU clean firm generation capacity target. This would offer a better insight into the progress towards the EU climate targets, as well as allow to identify any potential gaps in dispatchable capacity at Union level. More concretely, it would enhance the EU's ability to assess whether planned capacity additions are sufficient to maintain system adequacy under high shares of variable renewables. By systematically monitoring the installed capacity trajectory, retirement schedules, and investment pipeline of dispatchable assets, policymakers could identify emerging gaps in clean firm generation capacity early on and be better able to manage the risks. It would strengthen both decarbonisation credibility and energy security, improve transparency and comparability across Member States, while preserving a coordinated, EU-wide approach to system planning.

In addition, Member States should be asked to outline in their integrated national energy and climate plans the implemented, adopted, or planned policies and measures that would help them achieve their national contribution to the EU clean firm generation capacity target.

About Clean Air Task Force

Clean Air Task Force (CATF) is a global non-profit organisation working to safeguard against the worst impacts of climate change by catalysing the rapid development and deployment of low-carbon energy and other climate-protecting technologies. With 25 years of internationally recognised expertise on climate policy and a fierce commitment to exploring all potential solutions, CATF is a pragmatic, non-ideological advocacy group with the bold ideas needed to address climate change. Visit cleanairtaskforce.org and follow @cleanaircatf