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IMPACT ASSESSMENT REPORT

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1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

1.1 Political context

Renewable energy sources (RES) are a **key contributor to the EU's energy security and affordability objectives, as well as to the objective of reaching climate neutrality** by 2050 in a cost-effective and environmentally sustainable way. Recent major geopolitical shocks have highlighted the important role that RES play in delivering on EU security of supply objectives, notably the reduced dependence on volatile fossil fuel markets. RES are also a key driver of EU industrial development and economic resilience and sovereignty, contributing to lower energy prices and to building up a European clean tech industrial base with resilient and more reliable European supply chains.

The **European Climate Law**[1] enshrines into law the EU's climate neutrality objective by 2050 and sets an interim target for 2040 of reducing greenhouse gas (GHG) emission by 90% compared to 1990 levels. Of this reduction, at least 85% is to be achieved through EU domestic measures and up to 5% via high-quality international credits. The **energy sector accounts for about 75% of the EU's GHG emissions,** making its cost-effective decarbonisation central to achieve these objectives. The EU has developed various climate and energy policy tools to reduce emissions in the energy sector. The EU Emissions Trading System[2] (EU ETS1) is a key tool, accompanied by the ETS for buildings, road transport and additional sectors[3] from 2028 (ETS2), supported by binding national targets under the Effort Sharing Regulation[4] (ESR), which applies to sectors where carbon pricing alone is less effective. On the energy policy side, the Renewable Energy Directive[5] (RED), the Energy Efficiency Directive[6] (EED), the Regulation on the Governance of the Energy Union and Climate Action[7] (Governance Regulation) and other sector-specific legislation support the cost-effective functioning of the carbon market by removing regulatory, market and other non-regulatory barriers to the clean energy transition.

To ensure that the **energy transition is achieved at the lowest possible cost**, while contributing to energy affordability and competitiveness in the Union, the required emissions reduction to deliver on the **EU's 2040 climate target would need to be met largely by renewable energy**, as the most cost-effective option. This should be complemented by the deployment of other clean energy sources, including nuclear power. Due to the maturity of many renewable technologies and their near-zero marginal costs, renewable energy – alongside energy efficiency – can deliver the majority of the cost-effective emissions reductions needed by 2040, according to current projections.

[1] Regulation (EU) 2021/1119.
[2] Directive 2003/87/EC
[3] Directive (EU) 2023/959
[4] Regulation (EU) 2018/842
[5] Directive (EU) 2018/2001, as amended by Directive (EU) 2023/2413
[6] Directive (EU) 2023/1791
[7] Regulation (EU) 2018/1999

The 2026 Commission Work Programme features an Energy Union Package for the decade ahead, which includes simplifying and updating the renewable energy and energy efficiency frameworks, the EU climate framework, the hydrogen strategy, all drawn together with the revision of the Governance Regulation.

1.2 Legal and policy context and scope of the initiative

The framework for the promotion of RES has **evolved over the last decades**, through several major legislative milestones: the first Renewable Energy Directive (REDI) set a renewable energy target of 20% of final energy consumption by 2020 and mandatory national targets. The 2018 revision (REDII) set a renewable energy target of 32% to be achieved by 2030, which was raised to 42.5% (with an aspiration to reach 45%) in the 2023 revision (REDIII). The 2023 revision also significantly enhanced the permitting framework of the RED to streamline and accelerate administrative procedures. The latest targeted amendments proposed to the RED as part of the Grids Package[8] in December 2025 aim to further accelerate permitting of RES and other assets (i.e. storage and recharging stations) and to increase public participation. For a detailed overview of the current legislative framework see Annex 7.

Given the ongoing transposition and implementation work in the Member States, the setting of the renewable energy framework for the next decade aims to **strike a balance between simplification and modernisation of the framework** to reduce deployment costs and preserve continuity in order to provide regulatory certainty to investors and operators with minimal legislative disruption for Member States' transposition and implementation. This Impact Assessment thus proposes to maintain the current RES framework with appropriate adaptations where required. It focuses on the specific **problems and drivers falling under the remit of the EU renewable energy framework**. It does not address factors that contribute to the insufficient roll-out of renewables but fall outside the scope of the renewables framework, such as insufficient grids capacity and associated long grid connection times, clean tech manufacturing, the availability of critical raw materials and the shortage of qualified personnel in the public and private sectors across the lifecycle of renewable energy projects. These issues are dealt under other EU initiatives.

1.3 Links with other EU initiatives

The post-2030 renewable energy framework will operate within an **increasingly integrated security, climate, energy and industrial policy landscape**. The preparation of this Impact Assessment has been done in close coordination with, and is complementary to, other related Commission initiatives and existing legal acts.

In the field of energy, the post-2030 renewable energy framework should remain closely aligned with several initiatives, including the **governance framework** to ensure coherent target setting, policy implementation and monitoring, the **post-2030 energy efficiency framework**, notably in relation to renewable heating and cooling, electrification, demand side management and energy system

[8] European grids - European Commission

integration, and the **electricity market design rules**[9] which include important measures to support RES integration into the electricity system. The **Electrification Action Plan**[10], and the **legislative proposal on future proofing electricity bills**[11] were also adopted on 17 July 2026 and will speed up cost-effective and system-friendly electrification and incentivise through the design of network charges a flexible use of the grid and the integration of renewables electricity. The post 2030 RES framework should also be consistent with the new framework envisaged for cross-border infrastructure under the proposal for a CEF Regulation for 2028-2034.

This initiative follows on the back of the **proposal for the revision of the EU ETS (ETS1)** adopted on 17 July 2026 and the rollout of **ETS2 and the Land Use, Land Use Change and Forestry Regulation (LULUCF**[12]**)**. Carbon pricing creates economic incentives for renewable energy deployment, energy efficiency and fuel switching. These initiatives **support and complement the current RES framework** and highlight the need for enabling measures to address identified barriers preventing RES deployment as necessary complements to the general price signal sent by the EU ETS towards decarbonisation. The sustainability criteria for biomass sourcing and the certification and traceability system to prove compliance of sustainability attributes for renewable fuels are necessary tools ensuring a coherent application of EU climate and environmental objectives throughout multiple pieces of legislation (including EU ETS, **RefuelEU Aviation and FuelEU Maritime**).

The improvement of the renewable energy framework will also address other major EU policy objectives, notably industrial policy goals. It follows the **Competitiveness Compass**[13] **and the Clean Industrial Deal**[14] with a focus on energy-intensive industries and clean-tech manufacturing. The **Nuclear Illustrative Programme** indicated the investments needed to realise the national plans on nuclear capacity. At the same time the strategy to accelerate the development and deployment of **Small Modular Reactors (SMRs)** set out actions to complement RES with those innovative nuclear technologies that can support the decarbonisation of the power sector.

1.4 Need for a post-2030 framework for renewable energy sources

While modelling[15] estimates that the EU ETS will achieve the GHG reduction objective by 2040, it requires and assumes a cost-effective and significantly increased deployment of RES[16]. However, there are multiple obstacles, including **regulatory and non-regulatory barriers**, that limit RES expansion and their integration into the energy system, and that **risk making the achievement of**

[9] Regulation (EU) 2024/1747, Directive (EU) 2019/944.
10 COM(2026) 595.
[11] COM/2026/600 final
[12] Regulation (EU) 2018/841
[13] COM(2025) 30 final.
[14] COM(2025) 378 final
[15] See section 5.1 for further details.
[16] Other than incentivising with a carbon price, the modelling does not reflect the constraints, barriers and costs of achieving the RES rollout and RES integration, which are the subject of this IA. See methodological annex 4.

the greenhouse gas emission reduction target more costly.[17] The use of RES varies highly across Member States due to several factors including different starting points, geographic potentials, energy mix choices, remaining administrative, regulatory and market barriers, legal complexity and different degree of implementation of the current framework. As an illustration, a difference of up to 4 percentage points on average exists between the cost of capital for onshore wind projects in Germany versus Greece, due to country-specific factors which results in different Levelized Cost of Energy (LCOE)[18] across different geographies. There are also differences across technologies. Whilst certain renewable technologies have scaled up and achieved close to zero marginal cost, the penetration of innovative renewable technologies with higher capital expenditure costs still faces specific barriers to be able to enter the market and secure stable revenues. Innovation may be too slow relative to the social optimum, or hampered because of non-appropriable knowledge creation, financial frictions, or coordination failures. Since these technologies are needed to reach climate neutrality objectives and have to grow and scale up to bring down their costs, the renewables framework is necessary to tackle the barriers standing in their way.

According to PRIMES, achieving the greenhouse gas emission reduction target requires a RES share of between [X]-[Y] %. Taking into account that the Union RES share in 2025 was 26.2%, a fast deployment of RES is required. While carbon pricing remains the cornerstone of the decarbonisation of the EU's energy system, previous modelling exercises[19] showed that the absence of accompanying sectoral regulatory policies (including a dedicated RES framework) would require higher carbon prices to drive the necessary investments and behavioural changes across all sectors. As a result, an updated dedicated RES framework after 2030 is required. **The RED includes a comprehensive framework tackling these barriers**, including important enabling horizontal and sectorial rules for a cost-effective deployment of RES (see Annex 7). A solid legislative framework for the promotion and integration of RES is necessary beyond 2030 to **address the remaining barriers** to electrification, cost-effective RES deployment, its integration into the electricity system and the uptake of RES across those sectors more difficult to decarbonise. This is necessary to intensify efforts towards the 2040 climate target and avoid that more costly action would be needed at a later moment. The academic literature is also supportive of a renewable energy framework as a complement to the

[17] An optimal portfolio of policies achieves emissions reductions at a significantly lower cost than any single policy. See for instance, Carolyn Fischer, Richard G. Newell, Environmental and technology policies for climate mitigation, Journal of Environmental Economics and Management, Volume 55, Issue 2, 2008, Pages 142-162, ISSN 0095-0696, https://doi.org/10.1016/j.jeem.2007.11.001.

[18] Overall Strategic Analysis of Clean Energy Technology in the European Union Status Report, https://publications.jrc.ec.europa.eu/repository/handle/JRC146873 figure 3; Irena (2026) Renewable power generation costs in 2025.

[19] Reference

ETS[20,21] recognising the existence of market, innovation[22] and deployment failures. From a dynamic efficiency perspective, a RES target and a dedicated RES framework support the functioning of ETS in the long term. Both types of policies (ETS and a dedicated RES framework) mutually reinforce each other. Finally, bioenergy is currently the largest part of renewable energy share in the EU.[23] In order to ensure that deployment of biomass for bioenergy use is consistent with the EU climate and environmental objectives[24][25], a **robust sustainability framework** for its sourcing and use must be ensured.

Beyond not delivering cost effectively on the Union's climate objectives, the failure to boost the use and integration of RES impacts directly on delivering affordability and stability of energy prices (by bringing lower wholesale prices from renewable energy generation to consumers and the whole economy), energy security (by reducing reliance in volatile and imported fossil fuels), and European competitiveness.

2. PROBLEM DEFINITION

2.1 What are the problems and their drivers?

2.1.1 Problem 1: Slow and insufficient growth of new renewable energy installed capacities

In 2025, renewable energy accounted for 26.2% of final energy consumption (FEC) in the EU.[26] The Commission's EU wide assessment of the final NECPs[27] showed that the EU is projected to reach a 41% share of RES in the gross FEC, i.e. an ambition gap of 1,5% to the EU's 2030 target. While the situation varies from one Member State to another, the current trajectory for renewable energy deployment suggests that even the projected 41% share may be difficult to achieve with current progress at Member State level.[28]

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[20] Michael Grubb, Alexandra Poncia, Paul Drummond, Karsten Neuhoff, Jean-Charles Hourcade, Policy complementarity and the paradox of carbon pricing, *Oxford Review of Economic Policy*, Volume 39, Issue 4, Winter 2023, Pages 711–730, and Pablo del Río, Why does the combination of the European Union Emissions Trading Scheme and a renewable energy target makes economic sense?, *Renewable and Sustainable Energy Reviews*, Volume 74, 2017, Pages 824-834, ISSN 1364-0321, .

[21] For the road and building sector see: Günther, C., Pahle, M., Govorukha, K., Osorio, S., & Fotiou, T. (2026). Carbon prices on the rise? Shedding light on the emerging second EU Emissions Trading System (EU ETS 2) *Climate Policy*,*26*(1), 92–103.

[22] Overall Strategic Analysis of Clean Energy Technology in the European Union Status Report, https://publications.jrc.ec.europa.eu/repository/handle/JRC146873 figure 3; Irena (2026) Renewable power generation costs in 2025.

[23] Eurostat, Energy Balances (2026)

[24] Regulation (EU) 2023/2405

[25] Regulation (EU) 2023/1805

[26] Renewable energy statistics - Statistics Explained - Eurostat.

[27] COM/2025/274 final

[28] Reaching a 42.5% RES share in 2030 would require an increase of over 4 percentage points per year.

In 2025 the total renewable electricity installed capacity in the Union amounted to 779 GW, which represents an increase of 33% compared to 2021, with approximately 260 GW new capacities[29] installed in that 4-year period.[30] While this is a positive development, the **annual installed capacity falls short of the benchmark set in the Clean Industrial Deal of 100 GW$_{DC}$**[31] increase in new installed renewable electricity capacity annually up to 2030. Deployment of renewable heat sources such as geothermal, and especially solar thermal capacity remains slow due to high upfront costs, complex planning, regulatory barriers and lack of awareness. Renewable fuels have also registered a limited domestic increase. Despite a considerable increase of biofuel consumption in the EU between 2004 and 2020, the past five years saw a relative stabilisation of EU production of both biofuels and biogases at around 16 Mtoe per year each[32]. The 2025 projected electrolysers capacity installed in Europe ranged between 514 MWel and 800 MWel, falling short of the estimated amount of 3.3 Mt of renewable hydrogen required to meet the 2030 targets. There is also **underutilised potential for innovative RES technologies** (e.g. ocean energy, geothermal) and forms of deployment (e.g. agri-PV, floating wind) at different levels of maturity that would contribute to achieving EU targets.

2.1.2.1 Driver 1 (horizontal for problem 1 & 3): Complexity of the RES regulatory framework and slow implementation

To date, implementation of the RED remains incomplete, which limits its impact.[33] While this may be partially explained by the relatively recent expiry of its transposition deadlines (in 2024 and 2025), the **complexity of the RED architecture** appears to be an additional factor behind the slow implementation. This complexity stems from several factors. First, the 2023 revision introduced or amended specific sub-targets to promote the development of RES in sectors which are more difficult to decarbonise, and to promote the development of new markets such as renewable hydrogen for hard-to-abate sectors. These sub-targets, in the form agreed by co-legislators, partially overlap with measures in other Union legislation[34]. Second, recent revisions of other closely related pieces of Union legislation, such as legislation part of the Clean Energy Package, have also added multiple layers of obligations, in areas very closely linked to those covered by the RED[35]. Third, certain

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[29] Figures are expressed in alternating current capacity

[30] IRENA Renewable capacity statistics 2026.

[31] Corresponding to 85 GW in alternating current capacity

[32] Consumption has instead marginally increased for biofuels, signalling an incremented dependence of both refined biofuels and feedstocks, especially for advanced and waste-based biofuels. Biogases are instead 100% homegrown (EUROSTAT, Energy Balances, 2025 and SHARES, 2026).

[33] See Implementation Report Annex 9

[34] For example, the RFNBO and advanced biofuel sub-targets in the transport sector partially overlap with RefuelEU Aviation obligation on fuel suppliers. The sub-targets in heating and cooling, district heating and cooling and buildings overlap with legal obligations stemming from the EPBD and EED. The industry sector is already heavily regulated, especially by the ETS.

[35] Areas where inconsistencies and duplications between the Renewable Energy Directive and other related acts have been identified, include the electricity market legislation, energy efficiency and buildings legislation, transport-related legislation including ReFuelEU Aviation and FuelEU Maritime. For example, the new electricity market design rules included new provisions on areas such as support schemes or energy sharing, which overlap to some extent with similar provisions of the RED. The RED meausres in the areas of buildings are heating and cooling overlap to some extent with measures in the EED and EPBD.

horizontal provisions such as the rules on regional cooperation also appear to be excessively complex, which limits their use and hence their contribution to a more cost-effective renewable energy deployment in the EU. These factors underpin the need for simplification of the RES regulatory framework, both within the RED but also vis-a-vis other pieces of EU legislation, to facilitate better implementation, alignment and consistency across legal texts.

2.1.2.1 *Driver 2: Lack of consistent monitoring of permitting progress in Member States*

Slow and complex permitting procedures have been identified as a long-standing bottleneck slowing down RES deployment. As a result, extensive legislative and non-legislative measures have been taken in recent years (REDIII, Council Regulation (EU) 2022/2577 (no longer in force),[36] Commission recommendations[37] and guidance[38]) to streamline and accelerate permitting procedures.

Implementation of the REDIII and the measures under the Grids Package (once adopted), can contribute to accelerate procedures significantly. Available data shows that implementation in this key area remains slow and uneven, although some positive trends can be observed (i.e. Germany where onshore wind approvals have increased ~60% in a single year) which show a direct correlation between advanced implementation and substantial acceleration of renewable energy deployment.[39] The main challenge for the 2040 trajectory is the extent to which Member States can convert the recent permitting reforms into predictable, legally robust, and adequately staffed project-level authorisations. A recent study on permitting shows that, while some progress on permitting monitoring is done by some Member States,[40] overall, consistent approaches for data collection and reporting are missing, which limits the ability of Member States to track progress in the implementation of permitting reforms.[41] This absence of consistent monitoring and lack of comparable data across Member States significantly limits the ability to steer and prioritise reforms and investments where they would be most impactful.

2.1.2.1 Driver 3: Suboptimal design and use of the Renewable Energy Financing Mechanism (REFM)

Regional cooperation for the deployment of RES projects increases the cost-benefit ratio by leveraging the best natural resource locations and economies of scale across borders and promotes a greater market integration of RES. Such cooperation has so far been very limited.[42] One of the

[36] Council Regulation (EU) 2022/2577

[37] C/2022/3219 final; C/2024/2660; C(2025) 4024.

[38] SWD/2022/149, SWD/2024/124, SWD/2024/333, C/2025/8562, C/2026/128

[39] See Implementation Report – Annex 9

[40] Of the 10 Member States assessed by the Study, only one (Germany) was identified established a relatively structured monitoring system, with official bodies tracking RES deployment.

[41] Monitoring progress of measures to streamline permit-granting procedures

[42] See Implementation Report – Annex 9

available tools to foster such cooperation is the Renewable Energy Financing Mechanism (REFM),[43] which was conceived with two distinct functions: "gap filling" and "enabling".[44]

To date, the REFM operates only under the gap filling function. It has supported almost 517 MW of new RES capacity and has helped mobilise an estimated EUR 688 million of private investments into new RES projects thanks to its leveraging effect.[45] However, even if its use has grown the mechanism as gap filler remains underutilised. Only one Member State contributed to the mechanism to date, and only three Member States hosted projects in the first three calls for proposals. The reluctance of potential contributors can have different motives, including the allocation of statistical shares spread over the next 15 years (vs. immediate allocation for statistical transfers, which are however less cost-effective), and administrative complexity due to overly rigid legal requirements which make the organisation of auctions transactional and burdensome. Potential hosts can be reluctant to give away RES production sites before their own contribution to the target is secured.

The enabling function of the REFM has not been used mostly due to the lack of EU wide auctions and dedicated EU funding. For the next MFF 2028-2034, the Commission has proposed a simplified clause as part of the revised Connecting Europe Facility Regulation (CEF III proposal)[46] which would facilitate the transfer of funds from CEF to REFM up to 5% of the programme budget for energy objectives. To this end, the Commission would be able to allocate the Programme budget envisaged for cross-border projects in the field of renewable energy, including cross-border storage projects[47], to the REFM.[48] If approved by co-legislators and budget authorities, this available Union funding would greatly help organising calls for proposals on a regular basis and scaling up the mechanism.

2.1.2 Problem 2: Limited RES integration into the electricity system

The **share of renewables in the electricity sector** reached a record 49.9% of electricity generation in 2025[49], up from 33% in 2021, largely reflecting an expansion of wind and solar generation[50]. Electricity generation from renewables has a positive impact on wholesale prices, which are higher in Member States that rely more on fossil sources.[51] Typically, bidding zones with low levels of fossil fuel price-settings have in common a higher share of renewables and nuclear. While this is a positive

[43] Established by Commission Implementing Regulation (EU) 2020/1294.

[44] The gap filling function aims to provide targeted support for new RES projects intended to cover a Member State's gap towards their RES target contribution; the enabling function aims to promote RES deployment across the EU —even without an explicit target shortfall—by encouraging cost-effective cross-border cooperation in regions with high natural resource potential.

[45] See REFM Evaluation Report - Annex 8.

[46] COM/2025/547 final

[47] The PCI window of Connecting Europe Facility already supports large-scale storage with cross-border impact. This new proposed category in CEF for 2028-2034 would be storage projects of cross-border relevance yet falling behind the cross-border impact threshold defined in the TEN-E Regulation.

[48] The total contribution made for the period from 1 January 2028 to 31 December 2034 shall not exceed 5% of the budget of this Programme

[49] [sdg_07_40] Share of renewable energy in gross final energy consumption by sector Renewables make up 26% of EU energy use - News articles - Eurostat.

[50] Eurostat (2024) Renewable energy statistics

[51] ACER Key developments in European electricity and gas markets - 2026 Monitoring Report

trend, **the integration of these growing volumes of generation is challenging for the electricity system** due to the variable nature of most renewable generation and a temporal and locational mismatch between generation and consumption. This mismatch is reflected in the rise of symptoms of system stress which increase the overall system costs, renewable energy curtailment and the difficulty to connect new grid users.[52,53]

A marked increase in price volatility and negative electricity prices can be observed associated with high levels of renewable generation,[54,55] **signalling the need for increased flexibility**. Since 2020, the average daily gap between the lowest and highest day-ahead electricity prices has increased fivefold[56]. The need for additional system flexibility to absorb variable renewable electricity generation can also be observed in the growing levels of renewable energy curtailment and grid congestion costs.[57] In 2024, the **cost of renewable energy curtailment amounted to EUR 7.2 billion in seven countries alone**[58] and over 10 TWh of electricity from RES could not be used in the EU due to grid congestion and insufficient capacity being available for cross-border trade. Expensive fossil technologies had to be activated to cover the difference despite cheaper electricity available elsewhere (so-called redispatch). Such measures cost the consumers about EUR €4.3 billion and concerned 60 TWh (comparable to Austria's annual electricity consumption).[59] It is estimated that redispatch costs, currently amounting to EUR 5.2 billion per year, will increase to EUR 26 billion per year by 2030 if not addressed.[60] The costs of these system inefficiencies are passed on to consumers through network tariffs and electricity bills.

This points to remaining challenges in integrating RES in the electricity system, such as the lack of system flexibility due to insufficient investments in flexibility and limited hybridisation of existing renewable capacities (both across different technologies and combining RES with storage), leading to the concentration of gas-based generation in peak demand hours, which pushes wholesale prices upward at those hours especially in Member States with limited non-fossil flexibility and interconnectivity.[61]

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[52] COMMISSION STAFF WORKING DOCUMENT Reform of Electricity Market Design Accompanying the documents Proposal for a Regulation (EU) of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design Proposal for a Regulation (EU) of the European Parliament and of the Council amending Regulations (EU) No 1227/2011 and (EU) 2019/942 to improve the Union's protection against market manipulation in the wholesale energy market.

[53] EUR-Lex - 52023SC0058 - EN - EUR-Lex

[54] IEA (2025) Electricity 2025. Analysis and forecast to 2027 https://iea.blob.core.windows.net/assets/7c671ef6-2947-4e87-beea-af0e1288e1d7/Electricity2025.pdf

[55] ACER (2026) Market Monitoring Report

[56] ibid

[57] How Europe's grid operators are preparing for the energy transition, Ember, E3G, Beyond Fossil Fuels, Institute for Energy Economics and Financial Analysis report, 2025. Note: these costs are broader than redispatching as referred to by ACER and may concern also economic losses of respective power plant operators linked to curtailment.

[58] ibid

[59] ACER flexibility methodology assessment report 2025

[60] JRC (2024) Future-proofing the European power market: Re-dispatch and congestion management

[61] ibid

2.1.2.1 Driver 4: Lack of regulatory incentives to reduce RES curtailment

Curtailment is defined in literature as the involuntary reduction in a generator's output due to the grid operator restricting electricity delivery from the generator to the grid.[62] RES curtailment occurs when the supply of renewable electricity exceeds the grid's capacity to utilise it, leading to the waste of valuable clean energy. Whilst a certain level of curtailment can provide a tool of flexibility for managing and reducing overall system costs, this requires close monitoring as higher levels of curtailment are an important indicator reflecting system failures leading to low levels of integration of generation from existing renewable installations into the energy system.

Renewables deployment, without simultaneously expanding the underlying grid infrastructure and system flexibility assets, allocates generation capacity asymmetrically across the system, leading to RES curtailment. Existing regulatory and market arrangements do not give investors sufficiently clear information to decide where new renewables, upgraded installations, storage and demand response would best reduce grid congestion, improve system efficiency and hence reduce RES curtailment. Many investment decisions are often based on electricity market zones rather than the actual limits of the grid. As a result, renewable and storage projects may cluster in already congested areas, causing more curtailment, higher network pressure and delays or barriers for new connections. Better transparency and stronger local investment signals would help integrate more renewable energy into the system, while reducing curtailment and costs for consumers.

There is currently **no consistent EU-wide definition of curtailment**. ENTSO-E and ACER have prepared a methodology for non-fossil flexibility needs assessment, as required in the Electricity Market Regulation[6364], which includes a definition of curtailment adapted to that framework. As a result, it is difficult to measure it in a robust and consistent manner, act and keep track of progress.[65]

2.1.2.2. Driver 5: Insufficient regulatory incentives for flexibility solutions (co-located, stand alone or mobile)

Existing and new renewable generation can become more dispatchable and responsive to market signals, for instance through the hybridisation of assets with the installation of co-located or mobile[66] storage, which would reduce curtailment rates and allow generation to be shifted towards periods of higher market prices and lower grid congestion. The electricity market design regulation[67] requires

[62] See Laimon, M. (2025): Results in Engineering, Volume 26, 2025, 104925, ISSN 2590-1230, https://doi.org/10.1016/j.rineng.2025.104925.

[63] ACER flexibility methodology assessment report 2025. https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER-flexibility-needs-assessment-methodology-2025.pdf

[64] Regulation (EU) 2019/943

[65] Existing datasets already show that curtailment can be quantified as curtailed renewable generation in GWh and as a share of total renewable generation, but the underlying definitions, reporting perimeter and responsible data providers may differ across countries.

[66] Through smart and bidirectional charging of EVs

[67] Article 19f of the Electricity Market Regulation.

Member States to set their indicative national objectives for non-fossil flexibility, based on identified market barriers and system needs. However, **deployment of flexibility solutions[68] remains insufficient**. As of 2026, 56.5 GW of storage is deployed in the EU.[69]

The RES framework on **support schemes** lacks clarity regarding the principles applicable to hybrid projects combining RES generation and storage. In particular, it is not clear whether hybrid projects where the storage assets can feed from the network and inject that electricity back in the grid are covered within the scope of the RES framework on support schemes.[70]

Markets that remunerate flexibility are still immature, and barriers remain.[71] Revenue streams are not sufficiently adapted to assets that provide flexibility, such as storage, demand-side flexibility or hybrid installations, and do not properly remunerate consumers for the provision of flexibility services. To secure financing, non-fossil flexibility projects often depend on private contracts, where revenues come from electricity markets or private offtakers[72]. These may include flexibility purchase agreements or hybrid power purchase agreements, where a flexibility service is linked to generation. However, these contracts are still relatively new, involve high transaction costs, and require complex decisions on risk allocation and revenue sharing. While PPAs are currently recognised and promoted in the EU energy aquis, flexibility purchase agreements are not yet explicitly covered.

As regards **EU funding**, the CEF III proposal for the 2028-2034 Multiannual Financial Framework includes a broadened definition of Cross-Border Renewable Energy (CB-RES) projects, to also include cross-border storage projects. One of the eligibility criteria for such CB-RES storage projects is to be covered by a cooperation mechanism in the RED, which are currently limited to electricity and heating/cooling.

[68] This includes stand-alone storage, mobile storage, bioenergy flexibility, demand-response and digital infrastructure, such as smart metering systems, which are all needed to integrate growing shares of variable renewable electricity generation. Turning electric vehicles (EVs) into flexible loads also has considerable potential as they would act as distributed storage assets that can absorb surplus renewable electricity and return flexibility to the system when needed. This potential is currently untapped.

[69] Predominantly pumped hydro (around 42 GW), with battery storage (around 12 GW) growing fastest. ACER (2025), Unlocking flexibility: No-regret actions to remove barriers to demand response, https://www.acer.europa.eu/monitoring/MMR/barriers-demand-response-2025

[70] Given that this framework targets support schemes for electricity from renewable sources, while the storage asset would not only be fed with renewable energy (but it would also storage some non renewable electricity when feeding from the grid).

[71] Gonzalez Cuenca, M.I. (2025) Overview of Energy Storage Deployment in Europe (JRC). https://data.europa.eu/doi/10.2760/3846606, JRC141463.

[72] The Electricity Regulation and CISAF allow for the possibility to provide non-fossil flexibility support schemes. Furthermore, under CISAF Member States are entitled to provide investment aid for storage.

2.1.3 Problem 3: Insufficient electrification and RES uptake in end-uses across demand sectors (industry, transport, heating and cooling, and buildings)

Buildings, transport and industry account for large shares of the EU's GHG emissions[73]. Renewable energy shares are increasing across these sectors but remain insufficient to reduce dependence on fossil fuels and to reach the EU's 2040 and 2050 targets. There are two main channels for this demand to increase its renewable consumption: electrification and direct use of renewables (e.g. through renewable fuels or renewable heat).

The share of renewable energy in the electricity system has increased rapidly, rising from 37% in 2020 to almost 50% in 2025.[74] But **insufficient electrification of energy demand is preventing the optimal use of this growing renewable electricity supply**. For example, the electrification rate of the transport sector increased only marginally, from 1.75% in 2019 to 2.16% in 2023.[75] The slow pace of electrification has also contributed to flat electricity demand across the Union, weakening the business case for additional renewable energy investments. At the same time, the **direct use of renewable energy in demand sectors is not expanding quickly enough**. In heating and cooling, solid biomass - predominantly traditional biomass - still accounts for nearly 80% of renewable energy consumption, while the deployment of other renewable heating and cooling technologies, such as solar thermal, geothermal, and ambient heat and cold, remains limited. As a result, key end-use sectors, including buildings, transport, and industry, remain heavily dependent on fossil fuels.[76] Moreover, there are sectors such as data centres that are already electrified, currently accounting for around 2.5% of EU electricity consumption, where cooling is challenging and power demand is expected to grow substantially from approximately 12 GW in 2025 to around 28 GW by 2030[77]. Such new demand should be integrated sustainably in the energy system and would require additional clean generation and flexibility to avoid fossil back up generation and potential acceptance issues caused by rising electricity prices.

In **hard-to-abate sectors** (certain sectors and end-uses such as long-distance shipping and aviation and some industrial processes) where electrification is not a viable option, alternative solutions must be considered. However, markets for alternative solutions such as renewable and low-carbon fuels are still very nascent. Renewable hydrogen and its derivatives remain more expensive to produce and require significant capital investment, which hampers their uptake in those sectors.[78]

The horizontal driver on the complexity of the RES regulatory framework and slow implementation applies to this problem, as regards the multiple layers of obligations, created by the interaction of the sectoral sub-targets with other pieces of legislation.

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[73] 36% of GHG emissions from buildings, around a third from transport, and 20-25% from industrial installations in carbon-intensive manufacturing (e.g. iron, steel, cement, chemicals and fertilisers).

[74] Renewable energy statistics - Statistics Explained - Eurostat

[75] Eurostat, rate of electrification data.

[76] The share of renewable energy in transport increased from 8.8% in 2019 to 11.4% in 2024, while the renewable share in heating and cooling rose from 22.4% to 26.7% over the same period.

[77] Study: "Cloud and AI": Technopolis, Wavestone, Timelex, STL Partners, OpenForum Europe, KAPA Research (2025)

[78] See Implementation Report Annex 9

2.1.3.1. Driver 6: Slow uptake of direct use of renewable heat

While the push for electrification is expected to provide strong incentives for the uptake of heat pumps, the market visibility and investment certainty for other renewable heating solutions (e.g. geothermal energy, solar thermal energy, or renewable district heating) remains insufficient. This **slows down their uptake to below cost-efficient level** and creates a risk of technological concentration. In addition, barriers remain regarding the market integration of renewable heat, including limited support for renewable heat purchase agreements, constraining local regulations and insufficient incentives for innovative business models.

2.1.3.2. Driver 7: High production costs of renewable fuels

The high cost of producing renewable fuels is the main reason for their limited uptake and for the shortage of off-take agreements, leaving them less competitive even once EU ETS costs are taken into account.[79] The consumption of renewable fuels in transport and industry has increased only marginally, while imports of advanced and waste-based biofuels have risen steadily over the same period.[80]

The cost driver differs by fuel type. For biomass fuels, it lies in collecting and processing the feedstock: biomass has to be harvested, collected, stored and converted into energy commodities and this requires labour[81], which is reflected in high operational and logistics costs. For renewable hydrogen, it lies in the cost and intensity of electricity use, together with high capital costs[8283] and high investment risk. Slower-than-planned deployment of renewable electricity generation, and delays in building the infrastructure to support it, are also impacting market uptake.

2.1.4 Problem 4: Complex and inefficient bioenergy legislative framework

Energy from biomass remains an important component of the EU's energy system. Its domestic sourcing, potential storability, versatility and dispatchability makes it particularly valuable for sectors that have fewer options to decarbonise such as aviation, maritime, and certain industrial applications. However, its long-term increase is constrained by ecological limits, notably regarding primary biomass coming from forests, and by inefficiencies in the current regulatory framework governing its production, feedstock sourcing and use. At the same time, a consistent part of sustainable biomass,

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[79] Günther, C., Pahle, M., Govorukha, K., Osorio, S., & Fotiou, T. (2026). Carbon prices on the rise? Shedding light on the emerging second EU Emissions Trading System (EU ETS 2). *Climate Policy*, 26(1), 92–103. https://doi.org/10.1080/14693062.2025.2485196. On Hydrogen: The European hydrogen market landscape - November, 2025, European Hydrogen Observatory https://observatory.clean-hydrogen.europa.eu/tools-reports/observatory-reports.

[80] See Implementation Report Annex 9.

[81] MOTOLA, V., SCARLAT, N., REJTHAROVA, J., HURTIG, O., BUFFI, M., GEORGAKAKI, A., LETOUT, S., MOUNTRAKI, A., SALVUCCI, R., RÓZSAI, M. and SCHADE, B., Clean Energy Technology Observatory: Bioenergy in the European Union - 2024 Status Report on Technology Development, Trends, Value Chains and Markets, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/0461007, JRC139331.

[82] Agora Industry and Umlaut (2023): Levelised cost of hydrogen. Making the application of the LCOH concept more consistent and more useful. A-EW_301_LCOH_WEB.pdf

[83] Cost of hydrogen production | European Hydrogen Observatory

especially low-quality, heterogenous and locally available (e.g., straw), is under deployed, due to uncertainty and requirements mainly suited to high-quality, primary biomass.

To ensure that biomass contributes effectively to the Union's climate and environmental objectives, REDIII strengthened the sustainability criteria applicable to bioenergy, with a transposition deadline of May 2025. Implementation of the criteria has however proved challenging, due to their complexity and inconsistencies, fragmented practices and unharmonized certification across the Union. The divergencies in the framework risks undermining investor confidence, distorting competition, and exposure to fraud, ultimately failing to realise the full climate mitigation potential of biomass.

2.1.4.1 Driver 8: Inefficiency and complexity of sustainability criteria for bioenergy

The design of the RED sustainability criteria and the requirements of the cascading principle[84] are difficult to operationalise, leading to delays in transposition and to challenges in effectively enforcing the provisions.

Key difficulties include costly, time-consuming risk-assessments[85] for forest biomass, ambiguities in the classification of waste and residues, the unclear articulation of the rules related to the cascading principle, and unclear interactions with the targets established under the LULUCF Regulation[86]. Additionally, misalignment among different policy frameworks governing biomass (Common Agricultural Policy, environmental and climate legislations[87]) further complicate implementation of provisions at economic operator level[88]. Different sector-specific GHG-emission thresholds add compliance burdens[89] without guaranteeing optimal sustainability outcomes as the same biomass fuel has to comply with different GHG-emission savings thresholds, depending on the end-use. These inefficiencies increase administrative burdens, undermine investor confidence, restrict deployment of sustainable biomass and hinder the Union's decarbonisation efforts.

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[84] In particular articles 3(3) and 29.

[85] All economic operators need to demonstrate compliance irrespective of the determined risk (level A country is a country where legislation exists that respects the sustainability criteria for forest biomass and there is appropriate enforcement- vs level B). The risk-based approach foresees that a third party is tasked with preparing an assessment on whether a country is level-A or level-B, therefore adding administrative burden, costs and delays.

[86] Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, as amended by Regulation (EU) 2023/839, OJ L 107, 21.4.2023, pp. 1–94.

[87] CAP and bioenergy - Agriculture and rural development - European Commission; EU ETS review opens new opportunities for the energy transition - Bioenergy Europe ;The EU Emissions Trading System (EU ETS) - European Commission; Intergovernmental Panel on Climate Change (IPCC). 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Prepared by the National Greenhouse Gas Inventories Programme. Eggleston, H.S., Buendia, L., Miwa, K., Ngara, T., and Tanabe, K. (eds). Published by the Institute for Global Environmental Strategies (IGES), Japan, and its refinement IPCC (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Published by IPCC, Switzerland.

[88] Brandao, M., Ekvall, T., Poulikidou, S., Johansson, K., Nilsson, J., Nojpanya, P., Wikstrom, A., & Rydberg, T. (2022). RED, PEF, and EPD: conflicting rules for determining the carbon footprint of biofuels give unclear signals to fuel producers and customers. Frontiers in Climate, 4, 988769.

[89] MAGIC H2020 / CORDIS (2024). Marginal lands for growing industrial crops: turning a burden into an opportunity.

2.1.4.2 Driver 9: Fragmented certification framework for biomass used for bioenergy

The certification framework for biomass under the RED is fragmented and unevenly enforced. Voluntary and national schemes recognised by the Commission are subject to strict governance standards as laid down in Implementing Regulation (EU) 2022/996. On the other side, national schemes, not recognised by the Commission, do not have to comply with the detailed implementing rules on certification and are governed generally by national rules, whose stringency varies between Member States. The result is a two-tier system with uneven assurances across the single market. Certificates issued under schemes recognised by the |Commission benefit from Union-wide acceptance, whereas those issued by unrecognised schemes do not, leading to market distortions and legal uncertainty[90].

Disparities in supervision persist even within recognised schemes, in particular between certification bodies based in the Union and those operating in third countries, owning to limited cooperation with authorities of key supplier nations (e.g. China). This has in the past led to fraud allegations in relation to the sustainability certification of certain waste-based biofuels [91]. The coexistence of Guarantees of Origin and Proof of Sustainability for gaseous fuels adds an additional layer of complexity for economic operators[92].

2.1.4.3. Driver 10: Inefficient allocation of scarce forestry biomass in bioenergy

Its dispatchability, storability and versatility make sustainably sourced biomass a key renewable energy input for sectors that are hard to decarbonise, yet its availability faces growing constraints. While secondary biomass use (e.g. wood shavings, sawdust, bark, sawmill residues or food production, food waste, sewage sludge) is growing along with the primary use sector and consumption rate, primary biomass especially originating from forests (e.g. fuelwood, treetops, bark) is subject to ecological limits. Climate change is set to further reduce its supply in the medium-long run, and its resource limitation is at times aggravated by suboptimal allocation. The GHG-emission accounting methodologies and efficiency rules under RED and EED do not distinguish between biomass types and therefore often incentivise the deployment of low-value energy system uses of high-quality feedstocks, as around half of solid biomass is used in low-temperature heat - when other decarbonisation options are economically available - instead of e.g., high-temperature heat which is more challenging to decarbonise.

An additional factor that further contributes to misaligned incentives of inefficient technology use is statistical accounting of heating and cooling. International energy statistics record fuels by their thermal input, which shifts the focus away from conversion efficiencies. This results in reduced

[90] Member States are required to accept certificates issued by national and voluntary schemes recognised by the Commission without asking for more information. On the other side, Member State authorities don't have to necessarily recognise certificates issued by national schemes - as they don't follow the same stringent rules across the Union, which therefore creates a fragmentation in the single market, especially when fuels certified by national schemes are traded across the Union.

[91] Commission Implementing Decision of 18 July 2025 replying to the relevant examination request by the German authorities pursuant to Article 30(10) of Directive (EU) 2018/2001, C/2025/4888

[92] Stakeholder consultations carried for the purpose of this impact assessment. For more details see Annex 2.

attractiveness of more efficient renewable heat technologies. The efficiency gains of heat pumps and direct renewable heat are not recognised e.g., compared to bioenergy installations[93], and efficient bioenergy appliances are also not incentivised compared to inefficient technologies.

2.1.5 Interdependencies between problem areas

Problem areas 1, 2 and 3 are closely interconnected. In particular, improving the integration of new and existing RES capacities into the electricity system will help tackling problem 1 as it will allow to fully utilise installed RES capacities (i.e. by reducing RES curtailment) and improve the business case and attractiveness for new RES projects, contributing to more cost-effective RES growth.

Increased RES capacity (targeted by problem 1) also drives broader electrification by lowering power costs, supporting the decarbonisation of sectors like transport, industry and heating and cooling, and decoupling electricity generation from volatile fuel markets. Improving problem 1 therefore indirectly contributes to address problem 3.

Problem area 4 focus on sustainability of biomass for bioenergy. Beyond the sustainability criteria and certification, that ensure that bioenergy is aligned with the EU climate and environmental objectives, addressing problem drivers under Problem 4 will reduce administrative burden for economic operators in end-use sectors, hence contributing to the objective of areas 1 and 3. Addressing the inefficiencies of biomass use, especially regarding primary biomass for forests in heating and cooling, will also contribute to address problem 3.

3 WHY SHOULD THE EU ACT?

3.1 Legal basis

The initiative is based on Article 194(2) and Article 192(1) of the Treaty on the Functioning of the European Union (TFEU), which provides the legal basis for proposing measures to develop new and renewable forms of energy, one of the goals of the Union's energy policy, set out in Article 194(1) (c) TFEU. It is an initiative in an area of energy, which is a shared competence between the EU and the Member States.

3.2 Subsidiarity: Necessity of EU action

A cost-efficient accelerated development of renewable energy within a more integrated and efficient energy system cannot be sufficiently achieved by Member States alone. An EU approach is needed to remove remaining barriers to RES deployment and integration into the energy system across the Union. Action at EU level is necessary to address obstacles and provide the right incentives to Member States with different levels of renewables development, potential and ambition to accelerate, in a coordinated way, the energy transition from the traditional fossil fuel-based energy system towards a clean energy system.

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[93] Rosenow, J., Gibb, D., & Thomas, S. (2025). From Inefficient to Efficient Renewable Heating: A Critical Assessment of the EU Renewable Energy Directive. *Sustainability*, *17*(9), 4164. https://doi.org/10.3390/su17094164

The 2040 Climate Target Plan establishes that renewables have a key role in decarbonising the Union's economy and must be substantially increased to respond to the Union's new climate ambition. Taking into account the different energy policies and priorities among Member States, action at EU level is more likely to achieve the required increased deployment of renewables than national or local action alone. This collective effort is also more likely to succeed in reaching the Union's climate targets for 2040.

3.3 Subsidiarity: Added value of EU action

EU action on renewable energy brings added value by addressing the transition of the European energy system in a coordinated way and ensuring net reduction of GHG emissions and pollution and protecting biodiversity. It harnesses the benefits of the internal market, fully exploiting the advantages of economies of scale and technological cooperation in Europe, and giving investors certainty in an EU-wide regulatory framework.

The role of Member States, including local and regional authorities, is crucial to achieve the increased overall EU GHG ambition. Putting in place measures at Union level aims to focus action at national and sub-national level where it can be most effective, taking into account the different deployment levels in Member States and national prerogatives such as the Member States' right to determine the conditions for exploiting their energy resources, their choice between different energy technologies and the general structure of their energy supply. This is fully in line with Article 194(2) of TFEU. The balance between obligations and the flexibility left to the Member States on how to achieve the objectives is considered appropriate given the imperative of achieving climate neutrality by 2050.

This review ensures a high level of environmental protection and the improvement of the quality of the environment and is therefore in line with Article 37 of the Charter of Fundamental Rights.

4 OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1 General objectives

Table 1: General policy objectives of the initiative

General policy objective
An enabling policy design to remove obstacles and address market and regulatory barriers preventing: 1) the increase of the share of renewables in final energy consumption in a cost-effective and sustainable manner at the pace needed to achieve the EU's 2040 Climate Target, and 2) the use and optimal integration of existing renewable energy capacities in the energy system The general objective is in line with Art 194 (1)(c) TFEU which requires, among others, that Union policy on energy shall aim to develop renewable forms of energy.

4.2 Specific objectives

Table 2: Specific objectives of the initiative

Problem area	Objective	Sub-objectives
1, 3, 4	SO1: Simplification for better and more targeted implementation	• Eliminating superfluous or outdated stipulations • Eliminating overlaps with other regulations • Reducing implementation burden on Member States and project developers
1	SO2: Remove obstacles to new renewable energy installed capacities in a cost-effective manner commensurate to the 2040 Climate Target	• Lower the cost of capital and increase the volume of private investments in new renewable energy projects. • Improve implementation of permitting by enhanced monitoring.
2	SO3: Improve the integration of existing and new installed renewable energy capacity in the electricity system to reduce system costs.	• Reduce RES curtailment by enhancing transparency and monitoring. • Promoting deployment of non-fossil flexibility such as different energy storage solutions and increasing demand response and market responsiveness.
3	SO4: Accelerate the electrification rate and uptake of renewable energy sources in end-uses across demand sectors.	• Accelerate the uptake of electrification solutions across demand sectors • Increase the share of renewables in end-uses through alternative solutions where direct electrification is not feasible.
4	SO5: Ensure renewable energy produced from biomass is sustainable through simple yet robust sustainability criteria and that it is used efficiently.	• Increase efficiency and effectiveness of sustainability criteria for biomass sourcing. • Strengthen the certification and verification framework, to allow for a level-playing field in certification of sustainability attributes • Optimise bioenergy use, by increasing efficiency and allocation in high-value uses.

4.3 Intervention logic

Figure X shows the intervention logic of this impact assessment. It illustrates how the problem drivers relate to the general and specific objectives of the initiatives and intervention areas.

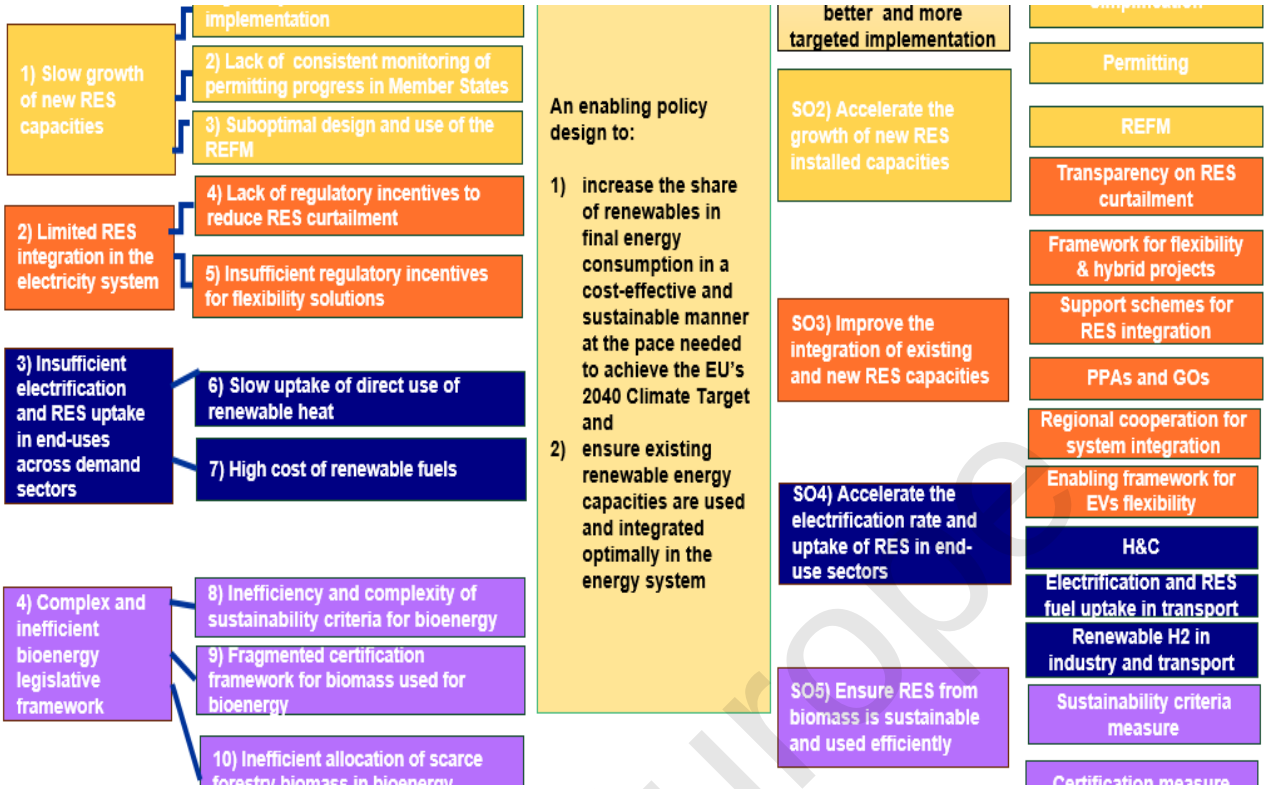

Figure X: Intervention logic

5 WHAT ARE THE AVAILABLE POLICY MEASURES?

5.1. What is the baseline from which options are assessed?

The baseline scenario describes how the problems will evolve towards 2040 if no additional policy action is introduced. Under this Impact Assessment, it is defined as the continuation of the current framework established by the REDIII beyond 2030, without changes. However, some of the targets and sub-targets are limited to the year 2030, hence those are not accounted in the baseline.[94] For the sub-targets legally defined to be reached "by 2030"[95], the 2030 level is assumed to continue until 2040.

In terms of expected developments and trajectories, the baseline assumes achievement of the RES target of 42.5% by 2030. Based on the proposal of the revision of Emission Trading System[96], the

[94] There is legal uncertainty about the continuation of the overall RES target and the indicative target for buildings as they are defined as "in 2030" in the main article, while corresponding recitals use "by 2030". The RFNBO target and the advanced biofuels 5.5% target in transport are set to be achieved "in 2030" and therefore cease to apply thereafter. The sub-targets for renewables in industry and heating and cooling sectors would cease to apply after, since the RED sets them to be achieved in the periods 2021-2025 and 2026-2030.

[95] The indicative target for innovative RES technologies and the transport target (29% RES or a GHG intensity reduction of renewable fuels of at least 14.5 %) would remain in force at this level for the years 2031-2040. The RFNBO target in industry would have to increase to 60% by 2035.

[96] Proposal amending Directive 2003/87/EC and Decision (EU) 2015/1814

baseline assumes -85% domestic GHG emission reductions in 2040. Other energy, climate and transport legislations (including Electricity Market Design, ETS2, RefuelEU Aviation, FuelEU Maritime, CO2 standards for cars and vans, EPBD, Ecodesign for Sustainable products Regulation) are considered implemented. The adoption of the Grids Package, currently in co-decision phase, is also considered. The complexity of the RED and the barriers to transposition and implementation, as described in Section 2, are also considered under the baseline.

The Central Scenario[97] models the most cost-efficient pathway to reach the climate targets. The baseline partly deviates from the Central Scenario: while the climate targets are still achieved, renewables penetration and electricity system integration are lower. This results in less-than-optimal decarbonisation pathway and higher carbon costs stemming from the energy transition.

5.2. Description and assessment of the policy measures

Based on desk research and stakeholder consultation, the Commission services developed individual policy measures having the potential to address the problems and drivers identified in the problem definition (Section 2) and achieve the specific objectives (SOs) of the initiative (Section 4.2). This section provides a summary of the identified policy measures and an assessment of their key impacts.[98] Annex 10 contains a longer description of the measures.

The assessment of the measures focuses on economic, environmental and social impacts when these are expected to be material and proportionate to the measures under consideration. On the basis of the assessment, preferred measures are identified in each intervention area feeding into a policy package (see section 5.2.3). The impacts of the policy package are assessed in Section 6.

5.2.1 Measures addressing problem area 1: Slow and insufficient growth of new renewable energy installed capacities

The measures under this section aim to address problem 1 while contributing to SO1 and SO2.

A. <u>Simplification</u>

Description of measures

One broad simplification measure (A1) was identified to respond to the horizontal problem driver 1 and SO1. The packaged policy option includes measure A1.

A1. Simplification of the enabling framework for the deployment of renewable energy sources

[97] [REFERENCE and explanation of PRIMES central scenario] See Annex IV

[98] The 2040 climate and energy target architecture, including the EU's 2040 objective for renewable energy, is assessed as part of the Impact Assessment of the revision of the Governance Regulation.

Measure A1 proposes a simplification of the enabling RES framework, including alignment across different legal Union acts with a view to removing overlaps and to facilitate implementation. The following areas have been identified:

- Simplify the rules for RES self-consumption and renewable energy communities and better align this framework with the rules on energy sharing and active customers in Directive 2019/944.
- Simplify the existing mechanisms for regional cooperation (joint projects, joint support schemes, opening of support schemes) by reducing the large number of articles covering these provisions in the RED and making the overall framework voluntary, in light of its limited use to date (see Driver 1, Section 2.1.1).
- Simplify the rules for organising calls for proposals under the Renewable Energy Financing Mechanism.
- Simplify the rules on buildings, heating and cooling, and district heating and cooling in the RED and remove overlaps with the rules laid down in the EPBD and EED.
- Remove obligations for Member States to issue, trade or accept guarantees of origin for heating and cooling, in view of the low level of maturity of this market and lack of demand for a consumer-driven cross-border market of heating and cooling.[99]

Stakeholder feedback

Stakeholder expressed support for simplification of EU legislation in stakeholder workshops and the public consultation. When asked about factors hindering or slowing progress towards higher share of RES, respondents cited administrative and regulatory barriers at national level (82%), lack of implementation of EU legislation in Member States (80%), complexity of national implementation (77%) and complexity of EU legislation (76%). Respondents notably expressed support to simplify the legislative framework for renewables self-consumption and energy communities (56%) and financing and support (70%). NGOs were less supportive of this measure (28%).[100]

Assessment of impacts and identification of preferred measure

Measure A1 is expected to have limited direct economic, social or environmental impacts and is considered a "no regret" measure. This measure mainly streamlines and clarifies the existing RES framework by eliminating provisions that remain largely unused and better aligning similar provisions across legislation, rather than introducing substantively new requirements, incentives or rights, thus resulting in a more effective and coherent framework. Its primary effect is to reduce administrative burden and enhance legal clarity and consistency across the relevant Union legislation, thereby facilitating implementation by Member States and market participants and reducing administrative burden for competent authorities and project promoters. Any resulting increase in

[99] RED Article 19 requires Member States to establish a legal framework to handle request for issuing Guarantees of Origin from heating and cooling. However, the actual issuing level and trade have been insignificant. The reason for this is the absence of use cases due to the lack of unbundling rules requiring separation of producers, network operators and suppliers in the heating/cooling sector. Furthermore, there is no demand for a consumer driven cross- border market of heating and cooling Guarantees of Origin. See Implementation Report Annex 9.

[100] OPC feedback

renewable energy deployment is expected to be indirect and incremental, arising from a more coherent and effective regulatory framework.

B. Permitting

Description of measures

One policy measure (B1) was identified to respond to problem driver 2 and SO2. The packaged policy option includes measure B1.

B1. Introduce KPIs for improved monitoring of permitting timelines

Measure B1 proposes to introduce in the Governance Regulation dedicated KPIs to monitor permitting. [101]

Stakeholder feedback

Most stakeholders highlighted administrative and regulatory barriers at national level (82%), lack of implementation of EU legislation in Member States (80%), complexity in the national implementation of EU legislation (77%) and complexity of EU legislation (76%) as key factors hindering or slowing down deployment regulatory aspects namely.

Assessment of impacts and identification of preferred measure

Measure B1 is not assessed to have direct economic, environmental and social impacts. Improving the monitoring of permitting procedures could, however, facilitate identification of remaining bottlenecks and thereby accelerate RES deployment. Measure B1 is estimated to have a one-off administrative cost of EUR [13.5 million] for Member States which would be lower for Member States that already have a relatively structured monitoring system in place such as Germany or some partial monitoring such as Portugal, Netherlands or Sweden. This administrative cost would, however, be recoverable through recurring annual savings of [EUR 7.9 million] resulting from improved effectiveness of the implementation of the permitting framework in the medium to long term. Moreover, this measure would be embedded in the simplified reporting framework under the Governance Regulation revision, which would reduce the added administrative costs.

C. The Renewable Energy Financing Mechanism

Description of measures

Three policy measures (C1, C2 and C3) were identified to address problem driver 3 and SO2. The packaged policy option includes both C1 and C2, building on the simplification measures in A1.

[101] The Impact Assessment of the Governance Regulation includes measure CP1 – Inclusion of a KPI framework in the NECPs that aims at introducing 20-40 KPIs, both system-wide and sector specific, selected based on their policy relevance and data availability, in order to monitor progress in line with the energy and climate targets.

C1. Enhance the Renewable Energy Financing Mechanism (REFM) as a tool enabling cost-effective deployment and innovative use cases

Measure C1 reinforces the 'enabling function' of the REFM by allowing the Commission to organise and design EU-wide REFM auctions for RES deployment, including for innovative RES technologies or forms of deployment, and/or RES integration solutions irrespectively of the final shape of the energy target architecture.[102] All Member States would be eligible to participate in these auctions. However, in the case of a substantial delivery gap by a Member State, this default "eligibility" would be re-assessed. These EU wide 'enabling framework' auctions could be financed by the Union budget instead of the current voluntary national contributions or, possibly, in complement to those (auction-as-a-service model[103]).

C2. Reinforce the role of the REFM as voluntary gap-filling mechanism

Measure C2 further incentivises the current use of REFM as a gap-filling mechanism, i.e. a tool for regional cooperation and cost-effective target achievement, by allowing the fictional[104] immediate attribution of RES shares for all the future generation of the funded project at the moment of the start of the project, rather than in line with the delivery years. This measure acknowledges that an underperforming Member States has taken additional measures to cover the RES share gap.[105] This measure links to an [EU target for renewables, supported by national contributions- cross reference IA Governance Regulation]. This measure would include stricter requirements to ensure project implementation such as bid and completion bonds or guarantees to make the measure fully effective.

C3. Turn the REFM into a mandatory gap-filling mechanism for all Member States

Measure C3 requires Member States to use the REFM as a gap-filling mechanism if their contribution to the Union target is below a given reference point. The level of the financial contribution by the underperforming Member States would be set by the Commission at the required level to deliver the gap. The Commission would use the payment to launch a call for proposals aiming at financing new projects that can deliver an equivalent amount of generation. The call for proposals should be EU-wide as the participation of specific host Member States cannot be justified.

Stakeholder feedback

On regional and cross-border cooperation, a large majority of stakeholder (70-79%) supported almost all proactive measures, led by removal of national barriers (79%) and improved EU financing (76%). With regard to the REFM specifically, Stakeholders identified limited familiarity with the mechanism

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[102] The Letta report highlighted the benefits of organising auctions jointly among a group of Member States for allocating new renewables power capacity. Source: Enrico Letta - Much more than a market (April 2024), page 64.

[103] Similar to what is done as part of the European Hydrogen Bank 'domestic' auctions under the Innovation Fund where Member States can choose to top-up the auction budget with their own resources.

[104] The RES share will be effectively attributed when the projects deliver the RES output.

[105] In the current framework, the only available tool that allows to bridge the gap are statistical transfers that operate *ex post*. Compared to a statistical transfer measure C2 would bring added value because it would lead to the buildout of new RES generation capacity.

as a key barrier to Member State participation, with 53% of respondents rating it as important or very important, closely followed by administrative barriers and procedural complexity (both around 53%). For project developers, the lack of long-term visibility regarding auction schedules and budgets emerged as the main concern, cited as important or very important by 65% of respondents, ahead of procedural complexity (59%) and eligibility conditions (56%).

Assessment of impacts and identification of preferred measure

Measures C1, C2 and C3 are expected to have positive economic and environmental impacts by supporting more cost-effective RES deployment and displacing fossil fuels. Measure C1 is also expected to improve energy system integration and support the scaling up of innovative solutions.[106] All measures would enhance the potential of the REFM which has a powerful leveraging effect to attract private investment.[107]

Measure C1 is expected to have positive economic impacts by improving the effectiveness of the REFM as a tool for a cost-effective deployment of renewable energy across the EU and improve revenue certainty for cross-border and innovative projects. Based on previous REFM calls, this measure is expected to lead to an additional capacity of [18.4 GW] of renewable electricity if the transfer clause in CEF 2028-2034 (currently in legislative negotiations) is fully activated[108]. The intervention of the mechanism could be tailored to relevant EU policy priorities or specific projects with high impact. However, the scope of intervention should avoid overlaps with the Innovation Fund. The reassessment of eligibility of projects in case of delivery gap minimises free-riding behaviour i.e. Member States not actively supporting RES deployment as they expect Union funding to support projects located on their territory. In terms of proportionality for SMEs, standardised Commission procedures may lower entry barriers, but the scale of centralised auctions may favour larger bidders unless explicit SME provisions are included. The measure would reduce the administrative costs for Member States, especially with an auction-as-a-service model, by transferring the auction-administration function to the Commission for participating projects (non-REFM auctions would remain being managed by Member States, as is the case currently). According to the REFM Evaluation Report, the leveraging effect of REFM grants observed in the first two calls for proposals is 1:5 i.e. for each euro of public support 5 euros of capital expenditures is funded by the private sector. Finally, as regards social impacts, the measure has no noticeable impact on household affordability.

[106] The primary goal of measure C2 is to deliver RES statistics at the lowest costs to the contributing MS. Hence, the technology focus of the auctions would rather be on mature and fast to deploy RES. Under measure C1, other policy priorities can be supported in line with EU agenda.

[107] The leveraging effect of the first two calls for proposals was 1:5 i.e. for each euro of public support 5 euros of capital expenditures is funded by the private sector.

[108] The exact amount to be transferred should be defined in the relevant CEF financing decision and work programme for the energy sector while taking into account the financing needs of all the programme objectives.

For both **measure C2 and measure C3**, the exact economic and environmental impacts cannot be quantified as the RES capacity to be supported through the REFM in the coming decade will depend on Member States delivery of the Union target.

Measure C2 entails certain drawbacks, stemming from the risk that the projects underdeliver the RES amount that they were supposed to produce. This can be partially mitigated by stricter requirements ensuring that projects will be realised can be put in place, e.g. completion bonds or guarantees. In any event, the risk of under delivery is compensated by the fact that the financial contributions to the REFM will not be lost if the project is not ultimately built (such contribution can be re-assigned to another call if contributing Member States agree).

Measure C3 consists of a financial settlement between the Commission and Member States that have not taken sufficient action in terms of renewable energy deployment. The measure can be an effective way of enforcing the target and support deployment of additional renewable energy capacities because Member States are faced with financial consequences in case of underperformance. However, the political acceptance of this measure is likely to be very low and could result in refusal of payments or transactional behaviour from Member States that do not want to use the mechanism. If proposed, the measure would also make it more difficult to agree on the reference trajectory and expected national contribution.

Based on the above, the preferred measures are C1 and C2 while C3 is discarded.

5.2.2 Measures addressing problem area 2: Limited RES integration into the electricity system

All measures aim to address problem 2 and SO3 in order to improve the integration of existing and new installed renewable energy capacity in the electricity system to reduce system costs.

D. <u>Increasing transparency on RES curtailment</u>

Description of measures

Two policy measures (D1 and D2) were identified to address problem driver 4 and SO3. The packaged policy option includes measure D1.

D1. Task ENTSO-E and ACER with defining and measuring curtailment of renewables

Measure D1 would introduce an EU wide definition of RES curtailment in the RES framework, which currently does not exist. On the basis of this definition, ENTSO-E and ACER would be tasked to develop a methodology for system operators to measure RES curtailment. Finally, the measure would require system operators to measure it and publish the results. The aim is to better track the integration of RES in the electricity system and facilitate monitoring of the impact of actions to reduce RES curtailment. Measure D1 would build on the existing work by ACER on non-fossil flexibility assessment and align with the reporting process required under the Electricity Market Regulation.

D2. Introduce an objective on curtailment in the Governance Regulation

Building on measure D1, measure D2 additionally introduces an EU-wide curtailment objective in the Governance Regulation, with the aim to support the definition of the amount of RES that needs to be deployed for the overall achievement of RES target.

Stakeholder feedback

The stakeholder consultation indicated that 42.5% of respondents support setting indicators to track progress and reinforce monitoring of curtailment. In this regard, NGOs demand stricter legislative targets, while industry favours market-driven flexibility.

Assessment of impacts and identification of preferred measure

Regarding **economic impacts,** measure D1 and D2 are expected to reduce energy system costs stemming from renewable energy curtailment to varying degrees. Without further action renewable electricity curtailment is set to grow significantly from current levels (see Section 2.1.2.1). The exact economic impacts stemming from these measures are difficult to quantify depending on scenario assumptions on the deployment and costs of alternative flexibility technologies. Recent analysis by the JRC[109] concluded that redispatch levels of 800 TWh (comparable to the annual electricity consumption of France and Germany combined), and associated RES curtailment of nearly 400TWh, could be expected by 2040 due to a combination of limitations in the grid and market-based decisions. Reducing that amount of curtailment by 37% would lead to savings in system costs associated to redispatch of at least 35 billion EUR in 2040.

While it is not possible to quantify the exact impact of **measure D1** in terms of curtailment reduction, its direct impact is assessed to be relatively low. Measure D1 is expected to increase transparency and availability of coherent data on curtailment across the EU, which is currently lacking[110], and thereby improve investment signals for the deployment of flexibility assets, contributing to mitigating the expected system costs by 2040 resulting from RES curtailment. Furthermore, measure D1 is expected to facilitate action to mitigate periods of negative electricity prices and network congestion which often cause RES curtailment. Measure D1 introduces a moderate one-off compliance cost for ENTSO-E and ACER to develop a curtailment definition and monitoring system and low recurring administrative costs for system operators to collect and publish statistics. As ACER and ENTSO-E already conduct extensive market monitoring, including on curtailment to a certain extent[111], and ACER has taken up closely related tasks for the flexibility needs assessment under the EMD, the one-off administrative costs for developing a common definition and methodology are expected to be limited (~2 FTEs). For system operators, the recurrent costs related to monitoring of curtailment are also estimated to be low, depending on existing set-up for market monitoring. These additional compliance costs are considered to be outweighed by the potential energy system cost savings.

[109] Thomassen, G., Fuhrmanek, A., Cadenovic, R., Pozo Camara, D. and Vitiello, S., Redispatch and Congestion Management, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/853898, JRC137685.
[110] Aurora Energy Research (2025)
[111] ACER collects data on curtailment on an ad hoc basis, currently covering eight Member States. See: ACER database

Measure D2 could help further guide the anticipatory grid investment framework, enhance location-based connection signals, with improved spatial planning for RES projects and encourage hybrid projects to absorb excess generation locally. A defined objective can have the strongest effect to reduce RES curtailment, but this measure faces an important limitation. First, given that a certain degree of curtailment can be economic efficient, it is difficult to set an appropriate EU wide curtailment objective given the high sensitivity and dependence of forward-looking curtailment indicators on modelling assumptions. Second, this measure would require Member States and system operators to act but it would not in itself deliver transmission or storage capacity. Moreover, measure D2 carries the risk of inducing inefficient placement or support of RES or flexibility and increasing energy system costs. Measure D2 entails higher administrative and adjustment costs compared to measure D1. A material one-off adjustment cost to define a legally robust, enforceable ceiling (including rules for distinguishing exceedances due to genuine non-compliance from those due to grid capacity lag), and a higher recurring administrative cost for compliance verification and enforcement, with added risk of legal challenges from affected system operators.

As regards **environmental impacts,** according to the ACER's monitoring report 2025[112] curtailing renewable energy production generally leads to increased use of more polluting generation sources, such as coal or gas fired power plants which can hinder the ongoing transition to a net zero power system. Therefore, measures D1 and D2 are expected to have positive environmental impacts in terms of reduced GHG emissions from energy use. Measure D2 could be expected to achieve a larger reduction of fossil energy use due to the stronger investment signal created by a binding curtailment ceiling, although its effectiveness depends on whether curtailment is driven by flexibility gaps rather than only grid capacity lag. The measures do not have direct biodiversity impacts, but it influences outcomes indirectly through its effect on system efficiency and subsequent infrastructure needs. Where curtailment reductions translate into improved utilisation of existing assets, additional land take may be avoided. However, where reductions are achieved through additional grid, storage or generation build-out, local biodiversity impacts may arise from habitat loss, fragmentation and increased infrastructure density.

Regarding **social impacts,** reduced curtailment would lead to lower electricity prices and system costs, with a positive distributional effect for households and SMEs in particular. It also reduces stranded asset risks by improving RES integration and infrastructure utilisation.

Measure D1 is considered the preferred measure as it will provide for increased transparency to support RES integration and help to signal investment opportunities for flexibility solutions thereby reducing system costs, while to some extent mitigating the risk to induce inefficient placement or support of RES or flexibility associated with measure D2.

E. Improve the regulatory framework for flexibility and hybrid projects

Description of policy measures

[112] ACER Monitoring Report on cross-zonal electricity trade and congestion management in the EU (2025)

Two policy measures were identified to respond to problem 2, driver 4 and SO3. The packaged policy option includes both these measures, E1 and E2.

E1 Creating a regulatory framework for hybrid installations to improve the integration of renewables

Measure E1 introduces a general framework applicable to hybrid projects combining RES generation and storage, which currently does not exist under Union legislation. This framework would include general rules related to flexible connection agreements in the context of hybrid projects, network code on demand response (local flexibility markets), or provision of ancillary services.

E2 Transparency obligations on system operators regarding the framework for flexibility solutions

Measure E2 imposes transparency obligations on system operators about the flexibility arrangements they make available, including clear information about the conditions for flexible connection agreements, or if they have developed market-based sourcing of flexibility or ancillary services. This measure would build on the existing provisions on non-fossil flexibility and grid hosting capacity in the EMD and provide a clearer link to the achievement of the RES target.

Stakeholders feedback

Stakeholders overall expressed support for removing national regulatory barriers for flexibility solutions (68%)[113], boosting digitalisation/data exchange (66,2%), enhanced EU financing for flexibility (58%) and simplification of EU legislation (58%) while EU guidance and best practice sharing (54%) is seen as valuable measure. Measures mentioned by respondents include scaling flexibility and storage solutions, locational and dynamic price signals, grid expansion and digitalisation, regulatory simplification and consumer empowerment (smart meters, energy sharing rights, etc.).

Assessment of impacts and identification of preferred measures

As regards **economic impacts,** measures E1 and E2 are expected to contribute to reduce energy system costs associated with renewable electricity integration by increasing energy system flexibility. The JRC projects total flexibility needs of 288 TWh in the EU in 2030 with a substantial increase to 2,189 TWh in 2050.[114] The study shows that without adequate levels of non-fossil flexibility, the system may become more instable, and systems costs increase for variable supply and demand to meet[115]. JRC projections indicate that, already in 2030, a share of 30% of solar generation leads to daily flexibility needs of 15% of total demand. Ensuring that new RES generation and flexibility investments receive appropriate locational signals would reduce the costs associated to those

[113] Non-existence of national frameworks for hybrids was mentioned as a prominent barrier by market participants.

[114] European Commission. Joint Research Centre., *Flexibility Requirements and the Role of Storage in Future European Power Systems.* (Publications Office, 2023), https://doi.org/10.2760/384443.

[115] Estimating exact system cost savings from addressing flexibility needs is complex as it depends on scenario assumptions on the deployment and costs of alternative flexibility technologies.

flexibility needs. According to the Journal of Energy Storage 2025[116], data, the hybrid system reduces installation costs by 10 %–15 % and lowers the overall levelized cost of energy[117] of the system compared to a battery only configuration. However, hybrid energy storage systems are currently more expensive to build and manage than a single storage system and due to their need for costly smart controls and a slower economic benefit then stand-alone energy systems they may be less appealing for large scale use and investment.

Measure E1 is expected to positively contribute to reducing system costs as co-located storage helps to balance the system and respond to congestion or local network constraints. The measure is expected to have a positive impact especially in case of underdeveloped local flexibility markets where flexible agreements could enable DSOs to procure flexibility more efficiently. Measure E1 could also have a significant impact due to stronger site-specific incentives for storage and flexibility investments. Hybrid energy storage systems need a good compatibility across several aspects, otherwise they can be less efficient and less cost-effective than stand-alone systems as poor compatibility can reduce the operational efficiency and economic performance for renewable energy grid integration. More, current grid interfaces and control systems are not designed for the multi-functional nature of hybrid energy systems, making data exchange, coordinated control and real-time optimisation and secure grid operation difficult[118].

Measure E1 may entail limited administrative costs and regulatory complexity for NRAs and Member States when implementing the relevant framework for hybrid projects at the EU level. Moreover, measure E1 may entail higher upfront investments costs for co-located storage and hybrid projects, which could create some barriers for smaller market participants and may slow the deployment in some areas. Setting regulatory conditions under measure E1 for hybrid installation projects can help to make electricity supply more reliable, efficient and potentially more cost-effective for consumers. However, where project requires substantial grid reinforcements, there is potentially an increased risk that part of the costs could ultimately be passed on to consumers.

Measure E2 is expected to improve the business case for operators to undertake investments in non-fossil flexibility more broadly (i.e. going beyond hybrid systems and including demand response) and send a stronger locational signal by increasing transparency of the offered flexibility services at local level. Clearer rules, better information on grid capacity, flexible connection agreements and market-based procurement of flexibility services would contribute to improving investment certainty for non-fossil flexibility and increase the overall flexibility of the energy system. This is expected to enable a higher share of RES in the system and reduce grid bottlenecks, especially at the distribution level, with positive impacts on overall energy system costs. This measure may still entail some short-term administrative and implementation costs for system operators and Member States in order to set up the transparency systems, including operational burden associated with adapting flexible

116 Journal of Energy Storage 2025:
https://www.sciencedirect.com/science/article/pii/S2352152X25009399

117 The levelized cost of energy (LCOE) is defined as the average cost to generate one kilowatt-hour (kWh) of electricity, calculated as the ratio of the annualized system cost of electricity production to the total useful electric energy generation by the system.

118 Journal of Energy Storage 2025: https://www.sciencedirect.com/science/article/pii/S2352152X25009399

connection agreements and information systems. These adjustment costs are considered to outweigh the economic benefits. The social and distributional impacts of the measure E2 may be uneven as benefits of flexibility at local level could be less beneficial to more vulnerable consumers who are less able to invest in smart devices, EVs, storage.

As regards **environmental impacts**, **measure E1** (depending how the project is designed and operated) could lead to lower GHG emissions due to the better RES integration, reducing RES curtailment and the hours in which fossil fuel fired stations are dispatched. Hybrid projects can also contribute to more efficient use of land and grid infrastructure, though they may also lead to land-use change and habitat disturbance if built on sensitive ecosystem areas. Disposal of decommissioned energy storage devices could create major environmental challenges as recycling of key materials such as cobalt, lithium and nickel remains costly and inefficient while improper disposal can cause serious environmental impacts and pollution119.

F. RES support schemes

Description of policy measures

Two policy measures were identified to respond to problem 2, driver 5 and SO3. The packaged policy option includes measures F1 and F2.

F1. Enhancing energy system integration for small-scale RES installation

Measure F1 proposes to enhance the market responsiveness and energy system integration elements of support schemes for small scale installations. It would do so by limiting the possibility to apply the exception currently foreseen in the RES framework on support schemes[120] (by making its application conditional to certain requirements).

F2. Principles for support schemes applicable to hybrid projects combining RES generation and storage

Measure F2 proposes to clarify that the general principles of the RES framework on support schemes apply to support schemes for hybrid projects combining RES generation and non-fossil flexibility assets, such as storage. This would ensure that support schemes targeting hybrid projects operate in a market responsive manner and contribute to energy system integration

Stakeholders feedback

119 Journal of Energy Storage 2025:
https://www.sciencedirect.com/science/article/pii/S2352152X25009399

[120] Requirement to design support schemes for electricity from renewable sources to maximise the integration of electricity from renewable sources in the electricity market and to ensure that renewable energy producers are responding to market price signals and maximise their market revenues.

Stakeholders expressed broad support for improving renewable energy support schemes. In addition, 50% supported reinforcing rules on the opening of support schemes and joint support schemes, whereas only 13% considered that no additional EU-level action is needed.

Assessment of impacts and identification of preferred measures

As regards the **economic impacts**, **measures F1 and F2** are expected to have a positive effect on overall system costs and public budgets as the lack of efficient energy system integration of many small-scale renewable installations and insufficient consideration of energy system integration in support schemes results in system inefficiencies and higher costs. Moreover, the development of hybrid installations (generation assets combined with non-fossil flexibility assets), supported by efficiently designed support schemes aimed at enhancing their market integration, allows for better system integration.

By maximising the market responsiveness of small-scale installations and self-consumers, **measure F1** can increase the actual self-consumption rate (which remains low on average,[121] see Implementing Report, Annex 9). Low self-consumption rates mean that system operators are exposed to uncontrollable inflow of renewable power from the growing number of distributed generation units. While this may be beneficial for the system at times when the energy is injected in an area of high simultaneous consumption but with insufficient generation and transmission capacity, it can also represent a cost (for example, when an area sees an excess of generation that has to be moved somewhere else or that may force the curtailment of other generation, causing problems with ramp up and ramp down rates). These problems may appear to a different degree across Member States depending on the penetration of small-scale installations, the degree of system flexibility, and whether or not Member States have made use of the exceptions provided for in the RED. **Measure F1** will also decrease the use of the network since electricity is consumed where it is generated and therefore it would limit the effect of small-scale installations on grid imbalances at peak production times.

By clarifying the legal framework applicable to hybrid projects, **measure F2** will have an effect on reducing revenue uncertainty and enabling project financing at a lower cost of capital. It will also promote the hybridisation of projects, which can reduce fossil fuel generation and dependency on fossil fuel backup and coverage of the evening peak demand, and consequently reduces emissions. Economic literature has shown that when storage is co-located with a renewable energy plant storage owners consistently charge when renewables are abundant and discharge when they are scarce, reinforcing the economic alignment between the two technologies.[122] On the negative side, the promotion of hybrids may result in flexibility assets being located next to generation assets, while it may be optimal to locate these flexibility assets in locations where they are more beneficial for the system. While this may be true in theory, the long connections queues and permitting procedures outweigh this, since hybrids will make a more efficient use of a single connection point and are likely

[121] Overall, in the EU it was estimated that in 2022 40% of the electricity produced by self-consumers was self-consumed.
[122] David Andrés-Cerezo, Natalia Fabra, Storage and Renewable Energies: Friends or Foes?, The Economic Journal, 2026;, ueag048, https://doi.org/10.1093/ej/ueag048

to result in reduced permitting procedures relative to two separate connection requirements. **Measure F2 will complement measure D1** in contributing to a reduction of curtailment by improving the integration of renewable generation through more flexibility-oriented support schemes. By reducing curtailment, existing renewable generation can be utilised more efficiently, reducing the need for additional generation capacity to deliver the same amount of renewable electricity. This may lower pressure for additional land take and associated habitat conversion and fragmentation, with positive implications for biodiversity.

As regards **social impacts**, while **measure F1** may negatively impact the business case for consumers to invest in small-scale installations without any further flexibility potential in the short term. However, the increase of the actual self-consumption rate will lead to lower electricity bills, thus resulting in overall positive economic impact in the medium-to longer term. This risk would also be minimised by defining the conditions when Member States may apply the exception. The final effect on households, SMEs, public authorities would depend on the design of the support scheme which Member States put in place by following the requirement to expose small-scale installations to market signals.

G. Power Purchase Agreements (PPAs) and electricity Guarantees of Origins

Description of the policy measures

Three policy measures were identified to address problem driver 5 and SO3. The packaged policy option includes measures G1 and G2.

G1. Extend the enabling framework for RES PPAs to flexibility purchase agreements

Measure G1 would extend the current framework under the RED related to PPAs for renewables to cover flexibility purchase agreements and hybrid PPAs. Member States would be required to ensure there are no barriers to the signature of flexibility purchase agreements. This measure would include the introduction of a definition of these contracts, under the generic name of "flexibility purchase agreements", which would provide a basis for regulatory provisions. A second definition for "hybrid PPAs" could also be considered, to refer to contracts that cover at the same time generation and flexibility.

G2. Enable market actors to create value and market-based revenue streams via guarantees of origin for storage

Measure G2 would require the mandatory issuing of guarantees of origin (GOs) for storage and close to real-time stamp[123] (thus enabling hybrid RES PPAs) and the right for offtakers in PPAs to receive the GOs associated to the generation under the contract. Flexibilities for Member States can be foreseen in terms of whether the GOs shall be issued when the generation receives public support.

[123] This is the time granularity that is precise enough to show when electricity was put into the storage and when it was taken out (GOs would reflect the timing of charge and discharge).

The requirements for disclosure by suppliers would be similar to the existing ones. It reflects the recommendation 10 in the Commission Recommendation on removing barriers to PPAs[124].

G3. Build a new market for RES GOs with higher transparency and matching of GOs based on close-to-real-time stamp

Measure G3 would create a new market for RES GOs, combining confirmation of time of production and grid connection point and matching of demand, mandatory use of GOs for disclosure provided by suppliers. It will enable consumers across the Union to specify their electricity mix in terms of both source of energy, the contribution to the energy transition and enable the balancing of the supply and demand. To ensure the robustness of the EN 16325 standard[125] and a coherent application across the Union, it needs to be made a harmonised standard, i.e. based on a Commission standardisation request, and published in the OJEU.

Stakeholder feedback

Stakeholders expressed strong support for measures to strengthen market-based financing for renewable energy. In particular, 78% of respondents considered removing barriers to energy purchase agreements, including PPAs, important or very important. Stakeholders also supported targeted improvements to the GOs framework, with 56% favouring simplification of the GO system and greater flexibility for Member States, while 43% supported strengthening the framework through additional consumer information and rights. Only 13% of respondents considered that no additional EU-level action is needed.

Assessment of impacts and identification of preferred measures

All measures are expected to have positive **economic impacts** to varying degrees by increasing system flexibility and thus reducing **energy system costs**.

Extending the coverage of the existing RES framework on PPAs to flexibility purchase agreements and hybrid PPAs under **measure G1** is expected to further support market uptake of such contracts. The achievement of the 2040 target of –90% on GHG emission implies a level of storage deployment of around 500 GW[126], compared to 56.5 GW in 2025. In 2025, 12 GW of new storage capacities were deployed in the EU[127], a rhythm that needs to more than double in the next years. The contribution of private capital to that effort is going to be essential and already in 2025, 12 GW of energy storage were contracted under private flexibility contracts[128], for which deployment is likely to take place over the following two or three years. This measure is expected to support continued growth in this

[124] Commission Recommendation (EU) 2026/917 of 22 April 2026 on removing barriers to the development of power purchase agreements and other energy purchase agreements, C/2026/2676

[125] Article 19 (6) require Member states to ensure that all GOs are compliant with the EN 16325 standard. The standard provides technical rules for issuing, transferring and cancellation of GOs, although it is not developed as a harmonised standard

126 Commission modelling, reflected in the Electrification Action Plan.

127 Energy Storage Europe / LCP Delta - 10th edition of the European Market Monitor on Energy Storage (EMMES)

128 Pexapark - Renewables Market Outlook 2026

emerging FPA sector by incentivising the acceleration of flexibility markets which will both incite investments into flexibility and reduce incidences of price cannibalisation.

Measure G1 is expected to entail a moderate one-off cost for Member States to establish a framework at national level, as well as limited recurring NECP reporting costs. While transaction costs for corporate buyers and project developers are necessarily high in a sector with emerging contractual modalities and sophisticated dynamic transactions, the measure seeks to promote an acceleration of standardisation that benefits smaller buyers.

Under **Measure G2,** the issuing and use of GOs for storage associated to renewable generation and the close to real-time stamps in generation GOs would strengthen the private market for renewable generation associated to flexibility. Potential buyers of PPAs seek a better matching between the renewable supply under the contract and their own consumption; the costs associated to this mismatch are one of the reasons for the recent downturn in the renewable PPA market, despite historically low prices offered in the market. The reduction of costs for storage assets creates a new configuration in which project developers can offer supply profiles that espouse the buyer's consumption profile. While the volume in the PPA market in Europe decreased from 17 GW in 2023 to 13 GW in 2025, the market for private flexibility contracts has grown from 2 GW to 12 GW over the same period[129]. Creating the conditions for a flexible (or hybrid) PPA market can unlock fresh growth in the PPA market, pushing it to levels around 20 GW annually.

By ensuring guarantees of origin provide better time granularity and can be issued for renewable generation supplied by a battery or another storage asset, this measure seeks to unlock that market. Nevertheless, this measure falls short of creating any obligation on buyers to make use of these features and match generation and supply. The administrative burden would fall on Member States and more specifically on issuing bodies in charge of the GO system at national level to ensure the issuing of GOs with improved time granularity. Generators may also incur an additional cost related to metering and time granularity, which is nevertheless necessary to put in place the conditions for this flexible PPA market to grow. Finally, the measure adds a layer of legal certainty for buyers of PPAs by creating a right to receive the GOs associated to the renewable generation under the contract.

Measure G3 is expected to have more significant impact than measure G2, based on a stronger regulatory approach. It would set out a mandatory use by consumers of the features for GOs put forward under G2 to demonstrate the actual matching between renewable generation and their consumption. This measure would contribute to an acceleration of the creation of a flexible PPA market but also implies an additional administrative and compliance burden for both Member States and buyers, which also runs the risk of deterring potential buyers and reducing the market's growth potential. The other aspect of the measure is the adoption of the EN 16325 standard for GOs at EU level. While this would improve compliance, it would also reduce the flexibility enjoyed by the respective standardisation committee to decide on the level of specificity and frequency of revisions.

129 ibid

Overall, measure G2 is considered to strike a more appropriate balance on implementation cost compared to both economic impacts.

As regards the **environmental impacts**, all measures are expected to have positive environmental impacts by improving RES integration. The reduced curtailment and improved flexibility can lower the need for additional generation and grid expansion thereby reduce pressure for new land take. Measure G2 will have reduced pressure for new land use than G1 but higher than G3 and thus limited biodiversity loss. Measure G3 will have even further reduced pressure for new land use than Measure G2 and thus the lowest biodiversity loss.

As regards **social impacts**, the impacts on household affordability are expected to be indirect, although with slightly positive trends. **Measures G2 and G3** show a more positive outlook, mainly driven by expected improvements in distributional effects, reduced costs and improved electricity availability.

H. Regional cooperation for energy system integration

Description of measures

One policy measure was identified to address problem driver 4 and SO3. The packaged policy option includes measure H1.

H1. Broaden the scope of regional cooperation beyond electricity and heating and cooling

In addition to the simplification measures on regional cooperation presented under measure A1, measure H1 proposes to expand the scope of cooperation mechanisms, particularly joint projects, to cross-border cooperation on energy system integration, including energy storage and non-fossil flexibility, RFNBOs and biogas/biomethane, Today, the cooperation mechanisms of the RED only apply to projects concerning production of electricity and heating and cooling. Being included in such cooperation mechanisms is a prerequisite for becoming a CB-RES projects in line with the CEF Regulation and to benefit from CEF funding. As the CEF III proposal expands the scope of CB-RES projects to certain standalone projects, the cooperation mechanisms of the RED should be revised to also encompass cross-border storage where it not already addressed by TEN-E.

Stakeholders feedback

Stakeholders strongly supported enhanced regional and cross-border cooperation. The highest support was for removing national administrative and regulatory barriers (79%), followed by improving EU financing instruments (76%) and strengthening EU support for regional investment planning and coordination (72%). Only 19% of respondents considered that no additional EU-level action is needed.

Assessment of impacts and identification of preferred measures

The measure is assessed to have positive economic impacts. Extending the scope of cooperation mechanisms to new categories will create additional cooperation opportunities. Similarly, extending cross-border cooperation to storage could help reduce costs associated with procuring flexibility and

the integration of renewable energy, ultimately lowering system costs and consumer bills[130]. The measure could also increase cross-border cooperation driven by the private sector, including industrial collaboration, rather than keeping cooperation agreements primarily motivated by renewable energy statistics sharing. The measure does, however, generate compliance costs, primarily at the level of national authorities responsible for negotiating, concluding and monitoring cooperation agreements. The compliance costs are expected to remain limited due to the voluntary nature of the cooperation and the envisaged simplification and streamlining of the requirements (see above under problem 1).

I. Create an enabling framework for EVs flexibility

Description of measures

Three measures were identified to address problem driver 5 and SO3. The packaged policy option includes measures I1 and I2.

I1. Make smart charging the default option for electric vehicles

Measure I1 requires Member States to ensure that smart charging[131] is made the default option in contractual arrangements with vehicle manufacturers, aggregators or energy suppliers linked to EVs. EV owners and users would always retain the possibility to disable smart charging. Member States would have to ensure that clear information is provided to consumers on the benefits of smart charging and the opt-out possibility, while putting in place strong data protection rules. The measure would build on the obligation for recharging points to implement interoperability standards[132], and the definition of a charging schedule, including through vehicle manufacturers' applications. Exceptions to the obligation may be considered for the smallest vehicles that may be not necessarily connected.

I2. Promote interoperability for bidirectional charging

Measure I2 would scale up bidirectional charging through requiring private recharging points to ensure interoperable bidirectional charging. The measure would favour V2G systems based on open interoperable (non-proprietary) standards, complementing the revision of network codes (RfG). The measure would build on the common technical specifications and communication protocols continuously developed under AFIR[133] to unlock the potential of interoperability-based bidirectional recharging.

[130] "Much More Than a Market: Report on the Future of the Single Market" by Enrico Letta, published in April 2024
[131] The overwhelming majority of upcoming electric vehicles types will be equipped with smart charging functionality.
[132] Based on AFIR, ISO 15118-20 must be implemented in recharging points from 1 January 2027, and will notably allow the charging planning to be shared
[133] REGULATION (EU) 2023/1804 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU

I3. Require Member States to adopt national roadmaps for V2X services

Measure I3 would require Member States to create national roadmaps for V2X services in order to integrate mobility and energy strategies at territorial level and make the links with Sustainable Urban Logistics/Mobility and Energy Plans. National roadmaps would set a vision for an enabling framework and a governance model, with assigned roles for ministries, regulators, TSOs/DSOs, local authorities and industry. Roadmaps would prioritise use cases with high-value applications, align public funding, incentives and procurement, and promote citizen engagement. Monitoring of implementation would use KPIs for the deployment across segments (households, corporate fleets, public fleets). This measure would build on the results of the V2G regulatory sandboxes, where implemented.

Stakeholder feedback

Stakeholders supported measures to facilitate the deployment of smart and bidirectional charging for electric vehicles, with 62% of respondents identifying the removal of national administrative and regulatory barriers as important or very important. Strong support was also expressed for providing EU guidance and exchange of best practices (58%) and improving EU financing instruments (58%), while around half of respondents supported strengthening Member State obligations (49%) to accelerate the rollout of e-mobility solutions.

Assessment of impacts and identification of preferred measures

As regards economic impacts, **all the measures are expected to reduce overall system costs** by better using the potential of EVs in providing demand-side energy system flexibility and thereby reducing the number of hours where expensive fossil fuels are setting the price and the volumes of RES curtailment. It indicated that by 2040, more flexible electric vehicles could deliver over €44 billion in annual savings for owners and additional benefits to the power system through reduced investment need. They are also expected to reduce to some extent the need to build out grid infrastructure by reducing peak load.

Measure I1 requiring smart charging by default, could contribute to reducing the total European electricity system peak power output by 30 GW (around 6%) by 2035[134], resulting in substantial savings in electricity grid investment. Smart charging by default is also expected to reduce the morning and evening peaks of demand from passenger cars by between 50% and 65%, contributing to flatten demand and absorb midday solar generation. Measure I1 is expected to entail low compliance cost for manufacturers and aggregators/energy suppliers. Enabling smart charging by default would require software, rather than hardware, adaptations, including updates of contracts that take into account the tariff design of the consumer, and contact to be made with the aggregator/energy supplier when the EV is bought. Where cost reflective network charges and/or dynamic tariffs apply, vehicle manufacturers and electricity suppliers can already propose smart charging to consumers.

[134] Source: upcoming study from ICCT "Spatiotemporal analysis of EV charging demand and smart load management in Europe"

The success of this measure, however, requires Member States to introduce dynamic tariffs as required in the Commission's proposal on network charges[135].

Regarding **Measure I2,** widespread adoption of bidirectional charging by 2040 has the potential to reduce annual energy system costs across the EU, by 8.6%, amounting to €22.2 billion in savings per year. [136] Total savings between 2030 and 2040 could amount to €175.45 billion, comparable to the annual budget of the EU. The adjustment costs are expected to be limited, as the cost of adding bidirectional capabilities to recharging points is decreasing quickly[137] and the gap today compared to a conventional charger is very limited. Greater interoperability can also stimulate innovation, competition and investment in EVs, chargers and energy services.

Measure I3 is expected to also contribute to reducing renewables curtailment, as part of the overall flexibility strategy. The cross-cutting nature of bidirectional charging (touching upon mobility, energy, industry and digitalisation) could benefit from comprehensive planning, ensuring that widespread adoption leads to benefits for the entire energy system, and reduces inefficiencies. However, the administrative burden for drafting such roadmaps is assessed as being disproportionally high compared to the expected effects. NRPPs could be used as delivery tools to ensure this necessary integration.

Regarding **social impacts**, **measure I1** would reduce charging costs for consumers who benefit from cost-reflective network charges and/or dynamic energy prices by making smart charging easier and more automatic. It is expected that a substantial number of EV owners would participate in smart charging if it were made the default option. (while retaining the possibility to give up this functionality). Relevant studies[138] in closely related areas have shown that around 75% of participants who are passive customers remain enrolled under the default option. This measure thus has the potential to lead to more EVs automatically charging when electricity demand and/or market prices are low as long as they are on dynamic tariffs. Findings of a recent study[139] published by the European Commission shows that the complexity and presentation of offers is a barrier to smart charging[140], even when the technology is available. Its evidence base also shows that when benefits are made visible and participation is simplified (including through default smart settings in some international examples[141]), uptake is materially easier to achieve.

Measure I2 is also expected to have positive social impacts by enabling EV owners and users to save money or earn revenues by making use of interoperable smart and bidirectional charging. The

[135] This legislative proposal will ensure that network charges incentivise electrification, a flexible and system-friendly use of the grid, including storage installations and accelerating smart meter deployment.

[136] Study on the "Potential of a full EV-power-system integration in Europe & how to realise it", T&E/Fraunhofer, 2024

[137] 22 kW bidirectional chargers are sold on the market for EUR 650 in July 2026.

[138] Study on Default Effects And Follow-On Behaviour: Evidence From An Electricity Pricing Program, The Review of Economic Studies, November 2021; Broman Toft et al., 2014

[139] Study on the assessment of use cases and business models for smart and bidirectional recharging in the context of energy system integration, June 2026

[140] idem

[141] For example, the UK's EV Smart Charge Points Regulations (2022) illustrate how default smart-charging functionality can normalise participation by requiring smart settings on all newly installed private charge points.

measure is expected to improve user awareness and trust through fit for purpose interoperable chargers, making it easier for consumers to adopt V2G.

As regards **environmental impacts**, **measures I1, I2 and I3** are expected to reduce fossil fuel use in electricity, with positive impacts on climate, air pollution and biodiversity. By making better use of the existing EV assets, which are mobile, measure I1 would reduce to some extent the land requirements for the installation of stand-alone battery capacities and grid expansion. Default options can increase the uptake of green electricity contracts by 44.6%[142] and influence the choice of contract[143].

5.2.3 Measures addressing problem area 3: Insufficient electrification and RES uptake in end-uses across demand sectors (industry, transport, heating and cooling, and buildings)

The Electrification Action Plan[144] adopted on 17 July 2026 proposes an electrification target of 46% electricity in final energy consumption to be reached by the Union by 2040. As illustrated by the Impact Assessment of the revision of the Governance Regulation, the electrification target is expected to provide a substantial policy signal on electrification technologies throughout the EU and across end-uses, partially addressing Problem Area 3.

The measures included in this section complement the electrification target by introducing enabling elements and by promoting other forms of renewables uptake across end-uses. The measures aim to address SO3, and to a certain extent SO1.

J. <u>Promotion of renewable energy and electrification in heating and cooling</u>

Description of measures

Two measures were identified to address problem driver 6 and SO 4. The packaged policy option includes measure J2.

J1. Prolong and increase the binding annual increase of renewables of heating and cooling to 2040 with less flexibility for Member States

Measure J1 sets a new, higher binding RES sub-target for the heating and cooling sector[145] compared to the current target for 2030 under the RED (which is set to expire), while removing the possibility for Member States to account waste heat. Waste heat is expected to receive dedicated attention under the energy efficiency framework and therefore this measure would simplify the current framework.

J2. Setting specific KPIs for geothermal and solar thermal technologies and heat pumps instead of a sectorial sub-target

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[142] Momsen & Stoerk, 2014

[143] Vetter & Kutzner, 2016

[144] Electrification Action Plan

[145] In order to deliver a clear additional increase, the binding sub-target would need to be set at a sufficiently high level.

Measure J2 sets specific KPIs for geothermal and solar thermal technologies and heat pumps in the Governance Regulation and trajectories in the NECPs, instead of a binding RES increase or trajectory to be achieved by 2040. It aims to give technology-specific investment signals and dedicated visibility to clean heat solutions which benefit from limited visibility under the current heating and cooling target, and to track progress. Expressing KPIs in terms of installed thermal capacity (geothermal, solar thermal, large heat pumps) and installed units (residential heat pumps) gives a more tangible indication of the required deployment than a target expressed in share of energy consumption, which relies on other factors (energy consumption trends, evolution of other technologies).

Stakeholders feedback

A majority of stakeholders underline the role of RED and its implementation to accelerate deployment of clean heating technologies but also address rising cooling demand through heat pumps. Stakeholders underline the need of dedicated policy signals to promote renewable heat, in particular geothermal and solar thermal energy which need visibility. Bioenergy and renewable fuel stakeholders promote a technology-neutral approach to the decarbonisation of heating and cooling, arguing for complementarity and hybridisation.

Assessment of impacts and identification of preferred measure

With no further action the sub-target laid down in Article 23 for the heating and cooling sector would cease to apply after 2030, since it is designed as an annual RES increase to be achieved over in the periods 2021-2025 and 2026-2030.

Measure J1 would maintain a sectorial sub-target for the heating and cooling sector beyond 2030 and would therefore retain the strongest policy signal. In addition, measure J1 would enhance the sectorial RES target by removing the flexibility currently available for Member States to also count waste heat. As a result, measure J1 would achieve a stronger reduction of fossil fuel imports than measure J2. However, the added value of measure J1 to achieve these savings, compared to other available options (i.e. maintaining a general RES target without sectorial sub-targets, complemented by the effects of energy prices and ETS), is not clear. The annual increase of renewables in heating and cooling between 2021 and 2025 is slightly above the required increase under the RED but still significantly below the indicative top-up, and it does not show a clear correlation with the sub-target compared to other possible drivers such as energy prices. Measure J1 would also entail moderate additional administrative costs from the need to track the revised target up to 2040 (given that the current obligation to track a RES increase expires in 2030), with a possible one-off adjustment cost where Member States must renegotiate compliance pathways in high-waste-heat systems. On the other hand, the measure would slightly reduce the accounting and reporting burden of Member States by removing the accounting of waste heat under this target.

Measure J2 is expected to drive renewables uptake as a whole by setting KPIs for concrete technologies, without the need for a sectorial RES sub-target. This measure gives sufficient signals for specific technologies such as solar thermal or geothermal, whose current volume is too low to be statistically visible compared to fluctuations in biomass use in particular. In addition, KPI for heat pump deployment introduced in the REPowerEU has provided an important reference to benchmark

progress in deployment, allowing to assess that on current sales trends the EU faces a shortfall of roughly 15 million units of heat pumps installed, around 25%, against the level needed for its 2030 climate-consistent trajectory. This measure would add a moderate additional reporting burden, concentrated on national statistical offices and NECP authors, as data availability for geothermal and solar thermal varies across Member States. However, in line with the Impact Assessment on the Governance Regulation this burden would be minimised by relaying as much as possible on other available data sources.

Measure J1 is not retained as the renewable heating and cooling sub-target has not demonstrated a significant impact under the current framework (see Annex X Implementation Report), its added value to the headline renewable target and the impact of carbon price is not clear and the intended investment signals for renewable technologies can be more efficiently provided through other measures.

K. Electrification and RES fuel uptake in transport

Description of measures

Three policy measures were identified to address problem driver 7 and SO 4. The packaged policy option retains measure K2.

K1. Discontinuation of transport targets and fuel supplier obligation

This measure would discontinue the dedicated renewable energy and GHG intensity reduction targets for transport and fuel supplier obligations on renewable fuels supply from 2030 onwards under the renewable energy framework. Decarbonisation in the sector would be driven by relevant sectoral legislation, notably RefuelEU Aviation and FuelEU Maritime for the aviation and maritime transport sectors. CO_2 emission standards for cars and vans would reduce emission from newly registered vehicles by notably supporting BEV uptake. The Governance Regulation would monitor the renewable fuels uptake in the EU. The transport sector will be covered by ETS1 and ETS2. The 1% RFNBO target for the transport sector from Article 25(b) RED is assessed, separately under measure L.

K2. Retain the fuel supplier obligation

This measure would retain the fuel supplier obligation for the next decade without a stand-alone transport target. The credit mechanism for the remuneration of the supply of renewable electricity to electric vehicles would be retained and extended to private charging point operators, to ports and airports. Nuclear electricity and electrolytic low-carbon fuels would be considered eligible for supplier obligations and the credit mechanism. The 1% cap on food and feed crop-based biofuels against 2020 levels would be discontinued by harmonising the existing maximum cap at 7% for all Member States[146]. Member States would also be allowed to count high ILUC-risk protein crops

[146] Under the REDIII, the cap for food and feed biofuels is set to 1% more compared to 2020 levels, without the possibility to exceed 7%.

towards the target. To counter potential food prices impacts, an "emergency break" would be introduced at Member State level to reduce or halt supply obligations of these feedstocks in the event of global food price spikes. Multipliers would be retained under the accounting rules supply obligation for 'resilient' EU-sourced advanced biofuels to strengthen incentives for sustainable domestic production and supply.

K3. Production targets for renewable fuels

This measure would establish binding Member State production targets for renewable transport fuels for 2040, based on national potential, thereby maintaining the dedicated framework to support the scale-up of advanced biofuels and biogases.

Stakeholder feedback

73% of stakeholders agreed that obligations for fuel producers and suppliers should be maintained or strengthened, as well as for obligations on Member States (69%). 74% argued for the removal of national administrative and regulatory barriers, while only 28% argued for the simplification of EU legislation.

Assessment of impacts and identification of preferred measure

With no further actions, the RED architecture for transport decarbonisation will remain largely in place, except for dedicated targets on advanced biofuels and RFNBOs. With a lower push at Member State level to supply advanced and waste-based biofuels, and with sectorial legislation driving consumption of these fuels towards 2050, it can be expected that import dependency on Annex IX biofuels will deepen throughout the EU.

The discontinuation of the transport targets under **Measure K1** would simplify the regulatory framework by reducing overlap with the targets under the sectoral RefuelEU Aviation and FuelEU Maritime regulations. The measure would reduce administrative burden by reducing the need for target monitoring under renewable framework, although the impact on economic operators would be limited: the sustainability and certification rules for renewable fuels would be maintained and remain applicable under climate and transport legislations.

The key mechanism driving decarbonisation of the ICE fleet in the road transport sector would be ETS2 carbon pricing. This instrument, however, cannot alone deliver the certainty, pace and cost-effectiveness that a policy mix can deliver. The Impact Assessment accompanying ETS2 illustrated that a regulatory approach leaning on prices and less on accompanying regulatory measures needed a significantly higher carbon price than a pathway combining carbon pricing with regulatory measures.[147] A reliance on higher carbon prices is also regressive: with fuels representing a higher cost of for lower-income households than for higher income ones a proportionally larger price increase passed through at the pump imposes a comparatively heavier burden on lower income

[147] see SWD(2021) 601 final, Part 1/4, p. 18.

households, whereas a policy mix combining price signals with supply obligations or sectoral targets would distribute the burden more evenly.

A push for advanced and waste-base biofuels in maritime and aviation, coupled with the lack of national framework for the promotion of these fuels would deepen the import dependencies of renewable fuels for the compliance of FuelEU Maritime and RefuelEU Aviation. In addition, the discontinuation of the credit mechanism under the fuel obligations would reduce incentives for investments for Charging Points Operators, weakening the business case of electric vehicles.

Compared to K1, **Measure K2** would preserve a clear demand signal for renewable transport fuels and clean electricity while limiting duplication with sectoral legislation. It would entail reduced compliance and reporting costs for both fuel suppliers and national authorities, building on the fact that most Member States have already set up such mechanisms under the current legislation, while the achievement of the target would be discontinued. The greater flexibility attributed to Member States to choose the level of ambition of the fuel supplier obligations would come at the expense of EU-harmonisation, but at the same time it would allow Member States to adapt the level to their energy mix and transport specificities. It is thus expected that Member States will implement different domestic levels of ambition. EU resilience criteria in advanced fuels and harmonisation of food and feed biofuels are set to give a clear signal to EU production of fuels. The remuneration of Charging Points Operators through the credit mechanism would keep providing a favourable business case for the uptake of electric vehicles, whose benefits would be extending to private charging points, ports and airports.

The harmonisation of the 7% cap for Member States would increase the cap on food and feed crop-based biofuels from their current average of 4.9% to 7%[148]. Against an estimated EU cap of 13.6 Mtoe[149], the 2024 EU consumption levels of food and feed biofuels was limited to around 8.8 Mtoe. The harmonised 7% results in a potential of 30% increase of eligible conventional biofuels[150], with differentiated levels of potential increase depending on Member States levels in 2020. This measure can increase the displacement of fossil fuels in road transport, especially in the short term, by fuels that are predominantly produced in the EU[151]. However, adverse environmental impacts stemming from reliance of first-generation biofuels can increase. The increased Indirect Land Use Change (ILUC) risks would be mitigated by leaving it optional for the Member States to promote such biofuels. Additionally, the “emergency break” would act in crisis situations as stabiliser of the price

[148] Calculation based on Eurostat shares of 2020, applying REDIII methodology for the calculation of the cap.

[149] The cap has been calculated against 2020 consumption level, considering 280 Mtoe as a denominator for the total energy use in transport in the EU.

[150] This estimation is the maximum potential increase, based on 2020 consumption levels. The actual value is expected to be lower, depending on Member State biomass availability and policy choices. In particular, two Member States did not report any consumption of food and feed biofuels, and are unlikely to promote them.

[151] See implementation Report in Annex 9

of agricultural commodities[152]. Land use change and deforestation are driven by commodity prices[153]. The emergency break will help to dampen commodity prices during crisis situations and therefore also reduce incentives to expand agricultural production area including into land with high carbon stock such as tropical forest which would otherwise spike under such circumstances. The increased flexibilities for Member States for using co-products from protein crops will facilitate Member States to align biofuels policy with national policies aimed at strengthening strategic autonomy within the European protein value chain[154].

The option would entail moderate compliance and reporting costs for both fuel suppliers and national authorities, and in any case less compared to the baseline. The greater flexibility attributed to Member States to choose the level of ambition of the fuel supplier obligations would come at the expense of EU-harmonisation, as it is expected that different Member States will implement different domestic levels.

With regards to social impacts, there is limited evidence of the impacts of biofuel blending mandates on fuel prices, while there is evidence of its impact on driving transport emission reduction. Global oil prices are a more determinant factor in fuel prices increase than biofuels share in Member States[155]. The flexibilisation of biofuel production obligations can mitigate the impacts on food price shocks[156], suggesting that the emergency break can address global food security concerns.

Replacing the current fuel supplier obligation with a production target under **Measure K3** would address the investment certainty: it would require Member States to set measure to ensure sufficient domestic production, stimulating feedstocks and waste collections in each Member State. This measure would reduce import dependency on both fossil and renewable fuels, while complementing sectorial legislation. However, the measure would also create the highest administrative and compliance burden for Member States, which each would be required to fully reshape their national frameworks to ensure the creation of renewable fuel production chains in all Member States. This approach would require significant public investment support for creating local industries which may

[152] Member States have already implemented similar policies to halter potential negative effects of the oil price crisis in 2022, following Russia's war of aggression against Ukraine, showing flexibilities in imposing mandates are already adopted and practicable. Certain jurisdictions (e.g., Brazil) already implement variable blending mandates following fluctuations in feedstocks and fossil fuel prices.

[153] Berman, N., Couttenier, M., Leblois, A., & Soubeyran, R. (2023). Crop prices and deforestation in the tropics. *Journal of Environmental Economics and Management, 119*, 102819. https://doi.org/10.1016/j.jeem.2023.102819

[154] Action Plan for resilience, strategic autonomy and sustainability of the EU protein system

[155] Lundberg, L., Cintas Sanchez, O., & Zetterholm, J. (2023). The impact of blending mandates on biofuel consumption, production, emission reductions and fuel prices. *Energy Policy*, *183*, 113835. https://doi.org/10.1016/j.enpol.2023.113835

[156] A 20% cut in biofuel production can mitigate up to 53-58% of extreme weather shocks, while a 50% cut can fully offset increase in maize and wheat prices. Rielaender, J., et al. (2025). *Biofuels and trade policies to mitigate food price shocks: Reinforcing global food markets* (OECD Development Centre Working Papers, No. 357). OECD Publishing. https://doi.org/10.1787/40c49187-en

not be cost-competitive. Additionally, if the ambition level is set too high, it would risk setting overpressure on local ecosystems, potentially involving detrimental environmental effects.

In stress-test across four extreme energy scenarios, K2 emerges as the most robust one, supporting domestic demand and environmental outcomes under constrained supply, although affordability issues remain.

L. Renewable hydrogen in industry and transport

Description of the measures

Three policy measures were identified to address problem driver 7 and SO4. The packaged policy option includes measure L2.

L1. Retain binding RFNBO targets for industry and transport combined with flexibilities

Measure L1 would keep the current RED model based on RFNBO consumption targets for both transport and industry at national level up to 2040 (X% in transport, and XX% in industry in 2040). This measure would include additional flexibilities such as allowing statistical transfers among Member States (to promote hydrogen production in areas with high-RES potential), cross-sector transfers (e.g. overachievement in industry can count towards transport) and allowing low-carbon electrolytic hydrogen to be counted towards the national targets.

L2. EU renewable hydrogen consumption target with enabling measures

Measure L2 would remove the binding national RFNBO targets and replace it by an EU indicative renewable hydrogen consumption target for energy and non-energy use in industry and refineries, including certain flexibilities (e.g., considering low-carbon electrolytic hydrogen as compliant).

The EU hydrogen target would be combined with financing support and incentives at EU and national level to promote domestic production and consumption (including through the Industrial Decarbonisation Bank, European Competitiveness Fund and NRPPs) and enabling measures. These measures would include adding the renewable hydrogen suppliers under the credit mechanism, established under the transport fuel obligations in the REDII (i.e., hydrogen suppliers can sell credits to transport fuel suppliers for the fulfilment of their obligations, when renewable hydrogen is supplied to industry or to refineries, for both the production of conventional fuels, biofuels and RFNBOs). This measure would also strengthen the demand side incentives to promote lead downstream markets (e.g., setting minimum carbon intensity levels for certain end-use products, similarly to what is proposed on steel under the IAA and which could cover e.g. in the refineries sector such as bitumen and lubricants, in agri-food sector using fertilisers – dairy and crops), but it would need to be addressed as part of other legislation. This measure is closely linked to measure L2, as without the credit mechanism and fuel supplier obligations an essential element of this measure would not exist.

L3. Focus on monitoring

Measure L3 would aim at discontinuing the RFNBO targets for industry and transport while removing the 60% target in industry in 2035, recalling that RefuelEU Aviation sets sustainable aviation electro-fuel targets until 2050, and FuelEU Maritime contains provisions for the promotion of RFNBOs in maritime. The measure would aim at increasing focus on monitoring of KPIs under the Governance Regulation. Existing financing measures and other policy instruments supporting uptake of renewable and low-carbon hydrogen would still remain in place to promote hydrogen deployment and demand creation.

Stakeholder feedback

For the uptake of renewable hydrogen and derivatives in industry, less than 20% of stakeholders argued for the continuity of the current framework, although the majority (60%) are still strongly arguing in favour of EU-level provisions. Over 75% asked for simplification, while 60% specifically asked for the introduction of market-based rules, such as the credit mechanism (with only 9% explicitly against). Removing administrative barriers and improving financing instruments were also cited amongst the most popular solutions (72% and 79% in favour respectively).

Assessment of measures and identification of preferred measures

While renewable hydrogen will be needed to decarbonise sectors that currently do not have viable alternatives, its uptake level and trajectory will impact the overall energy system costs and electricity prices. To assess the impact of the renewable hydrogen measures, a sensitivity analysis of different electrolytic hydrogen[157] levels in the system in 2040 has been carried out, based on the Central scenario, used as a baseline[158]. Under current trends and with existing legislation in place, it is estimated that 18 Mt of electrolytic hydrogen will be consumed by 2040[159]. Two alternative scenarios have been developed using POTEnCIA: a *low-hydrogen* scenario, with [8 Mt] of electrolytic hydrogen consumed in 2040, against a *high-hydrogen* scenario[160], with [20 Mt] consumed. All scenarios are consistent with [-85%] emission reduction target[161].

Overall, in the period 2031-2040, annual hydrogen supply in the low-hydrogen scenario is projected to be on average lower by [8] MtH2 or around [50%] compared to the central scenario (**Error!**

[157] PRIMES and POTenCIA models incorporate electrolytic hydrogen, compliant with RFNBO and low-carbon production rules, and do not make a distinction between them. Impacts of the inclusion of low-carbon energy in the scope is therefore estimated through a qualitative assessment. For the purpose of this Impact Assessment, when the word electrolytic is used, considering compliance with EU law for the production of renewable and low-carbon hydrogen and derivatives.

[158] Reference to central scenario

[159] The estimations assume 3.3 Mt of renewable hydrogen consumed in 2030. According to latest estimates, this is considered challenging to achieve.

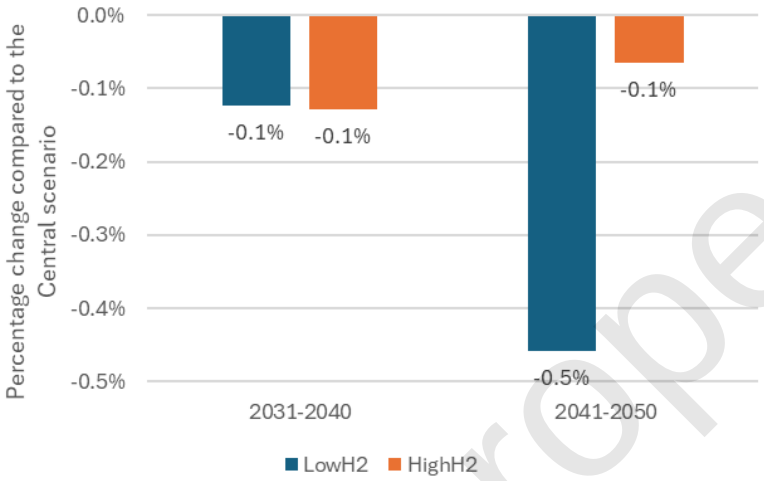
[160] Which has been built by aggregating data presented and expected by Member States in their NECPs.

[161] A Low-hydrogen scenario assumes removal of RFNBO-related targets after 2030 and makes hydrogen less attractive in industry and transport, while a high-hydrogen scenario assumes increasing acceptance of hydrogen in different sectors. More details in Methodological Annex 4.

Reference source not found.). To produce the amount of hydrogen, ca. [340] TWh of renewable electricity would be required, which is [335] TWh less than in the *Central scenario*.

Despite the differences in the total hydrogen supply, the total energy system costs vary only marginally (less than 0.5% before 2040, resulting in cumulative saving of EUR 16 billion for the

Figure 1 The variations in energy system costs in the sensitivity scenarios compared to the Central scenario



decade 2041-2050) across different scenarios (Figure 2) which suggests that alternative hydrogen pathways can be equally efficient from a cost perspective.

Taking into account the recent developments of the renewable hydrogen industry[162], the market is evolving at a slower pace than anticipated, which entails that the cost of production of renewable hydrogen have not declined as anticipated[163]. The measure chosen will therefore have to ensure that the optimal level of renewable hydrogen deployment will be reached, considering system costs and electricity integration. Given the market and infrastructure developments, this optimal level corresponds to the *low-hydrogen* scenario rather than the *Central* or *high-hydrogen* scenario. One key advantage would be avoiding excessive electricity demand from electrolysis beyond what the power system can efficiently accommodate, which would result in lower electricity prices than in more ambitious scenarios and thus more electricity could become available for direct uses. At the same time, optimal renewable hydrogen deployment can support the integration of variable renewable electricity, provide long-duration and seasonal energy storage, and enhance the resilience of the electricity system.

Enlarging the scope to low-carbon, electrolytic hydrogen is expected to reduce cost of compliance and system costs in some Member States[164].

By retaining national targets in transport and industry, **Measure L1** would maintain obligations for Member States to reach the targets, stimulating production in all EU Member States. As of 2040, the

[162] See Implementation Report in Annex 9

[163] ACER 2025 European hydrogen markets - Monitoring Report & IEA (2025) & Global Hydrogen Review 2025, IEA, Paris https://www.iea.org/reports/global-hydrogen-review-2025, Licence: CC BY 4.0

[164] source

renewable and low-carbon electricity penetration in the electricity grids will vary greatly among Member States[165], driving production of electrolytic hydrogen in regions with lower renewable potential, and where costs of production are higher[166]. Flexibilities envisaged under this option could reduce compliance costs and overall energy system costs, although it is unlikely that demand will be met through imports and statistical transfers only, therefore driving domestic production. While this measure helps build a hydrogen economy across all Member States, it may also result in the use and production of renewable electricity for hydrogen production where it is not efficient.

Measure L2 would set an EU indicative target of consumption of renewable hydrogen at 8 Mt, i.e. the average optimal level for the period covered by the policy. This measure would concentrate production in areas with greater clean electricity potential, where production is most cost-effective.

This would result in reduced energy system costs. Investment decisions would be based on economic considerations. Direction of renewable hydrogen consumption to hard-to-decarbonise sectors would be facilitated by enabling measures, including the credit mechanism established under Measure I2. The credit mechanism would also be instrumental to reduce the cost gap between fossil and clean hydrogen, similarly to the case of electric vehicles electricity supply[167], by allowing hydrogen suppliers to earn additional revenues in the transport fuel quota markets. Through incentives (such as multipliers), the supply of renewable hydrogen would be directed to industry applications such as to conventional and biorefineries (for desulphurisation applications) and to the production of derivatives (for maritime and aviation applications). By establishing common rules for integrating renewable hydrogen in the credit mechanism, that incentivise rather than impose the use of renewable hydrogen, competitiveness concerns could be avoided, which is especially relevant for international competition-exposed sectors, such as the ammonia and fertilisers sectors, while narrowing the cost gaps of end products. However, this measure would effectively transfer part of the costs to produce renewable hydrogen to transport fuel suppliers, that are likely to further transfer them downstream.

The focus on renewable hydrogen, i.e. the exclusion of its derivates from the target, would incentivise that the transformation process for the derivatives production is located in the EU, therefore improving resilience of the domestic fuel production sector.

Incentives on downstream lead markets would allow distributing the costs along the whole value chain and reducing the burden placed on the industrial consumers, albeit it would take time until a robust carbon accounting methodology is put in place.

The measure requires a new EU-level credit mechanism registry and allocation tracking, which would impose a limited additional administrative burden. RFNBO certification costs fall disproportionately on smaller electrolysis producers who cannot spread audit and documentation costs across large production volumes.

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[165] Central Scenario, PRIMES. [placeholder for details]

[166] source

[167] See Implementation Report

Measure L3 would reduce the regulatory pressure and compliance costs for Member States, while avoiding competitiveness concerns for sectors subject to international competitiveness, namely ammonia and fertiliser sectors. However, given the higher cost of renewable hydrogen vs fossil, relying solely on monitoring is unlikely to generate sufficiently strong investment signals for industry to shift towards renewable hydrogen. The resulting policy uncertainty could delay investment decisions, as EU and national funding alone would not address the consistent cost gap. This would result in a sub-optimal level of deployment of renewable hydrogen, and increased system and carbon costs due to the reliance on alternative decarbonisation technologies. This option would also highly penalise first-movers.

5.3.4 Measures addressing problem area 4: Complex and inefficient bioenergy legislative framework

M. <u>Sustainability criteria inefficiency and complexity</u>

Four measures (M1, M2, M3, M4) have been identified to address SO5, and to a certain extent SO1. The packaged policy option includes measures M1, M2 and M3.

M1. Simplification of sustainability criteria

Maintaining the current logic on the substance of the sustainability criteria for biomass sourcing for bioenergy and their robustness but simplifying to align with existing climate and environmental legislation, latest developments and clarify elements which are currently either unclear or contradictory. This approach will aim to ensure that legal stability is maintained, while rendering compliance from economic operator easier and clarifying the rules for both stakeholders and the general public. Reporting for Member States and Commission would be simplified.

M2. Introduction of "Bioenergy Scoreboard"

Introduction of a simplified greenhouse gas emission calculation, a 'Bioenergy Scoreboard', which would assign emission savings based on practices adopted (for local installations e.g., <20 MW[168]), while promoting the uptake of local, heterogenous biomass.

M3. Introduction of a solid biomass cap in households

An upper limit to the contribution of RES shares in the heating sector from primary solid biomass would be introduced - i.e., Member States cannot account primary solid biomass as renewable in households heating beyond 2024 levels.

[168] According to industry data, only 17% of solid biomass installations surpass the 20 MW thermal input threshold, with about half being below 5 MW thermal input threshold

M4. Introduction of a restrictive solid biomass cap in households

Introduction of a more restrictive ceiling for the accounting of renewable heat from solid primary biomass at 20% less than 2024 level.

Stakeholder feedback

Only 15% of stakeholders argued that no provisions on biomass sustainability are required at EU level, while over 70% of stakeholders are in favour of incentivising the production of locally available biomass. 60% are in favour of the simplification of current sustainability criteria, while 40% are arguing for a reinforcement of those.

Assessment of impacts and identification of preferred measure

For the proposed measures M1 would primarily reduce administrative burden and compliance costs through simplification and clarification, with indicative savings in sustainability compliance costs of around 20%[169], in particular for smaller feedstock producers and aggregators. It may also modestly improve feedstock availability, although it would not be expected to alter the overall structural supply ceiling. M2 would build on these effects by introducing a Bioenergy Scoreboard for small-scale and local operators, thereby further reducing compliance costs for this group through the replacement of full life-cycle assessments with standardised emissions values.

The ceiling to count, primary solid biomass in households, introduced by M3, is not expected to generate administrative burden among economic operators. However, it would require limited additional administrative costs for Member States to implement and potentially adapt support schemes. As primary solid biomass use in households has been decreasing on average by 6.2% in the EU in the last decade[170], and with cumulative contributions of better insulated houses and warmer winters, it is expected not to have practical negative impacts on stakeholders and Member States possibility to achieve renewable targets in M3. By contrast, M4 would foresee a stricter cap, and could affect the ability of 16 Member States to meet renewable energy targets[171]. However, in both cases, it would effectively reduce the distortive incentives at Member State level to rely on deployment of inefficient bioenergy installations for household heating[172].

M1 is expected to have only limited direct environmental effects. As the main principles under the sustainability criteria are maintained compared to the baseline, environmental safeguards remain the same. However, better implementation and enforcement stemming from simpler criteria, and notably

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[169] *Technical support for the Impact Assessment for the Renewable Energy framework post-2030* report, Section 4.5.1.1

[170] EUROSTAT, Energy Balances (2026). Overall, the EU saw a decrease of 6.2% (median: -8.7%) in the use of primary solid biomass in households in the decade 2015-2024, with over two-third of Member States registering a decrease. Among the biggest consumers of solid biomass in households, only two Member States saw an increase of respectively 4% and 52%, suggesting that for almost all countries this measure is not expected to have negative impacts in terms of achievement of 2040 renewable target.

[171] According to EUROSTAT, only 9 Member States saw a decrease in primary solid biomass use in households by over 20% in the past decade. By a conservative assumption of a similar reduction rate for the future decade, we can expect impact on the remaining 16 Member States.

[172] Rosenow, J., Gibb, D., & Thomas, S. (2025). From Inefficient to Efficient Renewable Heating: A Critical Assessment of the EU Renewable Energy Directive. *Sustainability*, *17*(9), 4164. https://doi.org/10.3390/su17094164

the simplified compliance granted for criteria covered by other EU legislations would bring clearer and better enforcement, with potential for positive environmental impacts (in terms of soil quality, water use and biodiversity restoration). For M2, the use of standard emissions values may entails some loss of methodological precision for small installations, but this would be considered proportionate insofar as it enables feedstock mobilisation that might otherwise not take place. The bioenergy scoreboard would in practice incentivise and mobilise heterogenous, locally available biomass mainly stemming from residues and waste. There is extensive literature on the environmental benefits of deploying the untapped potential of such biomass type (e.g. straw) in the EU[173]. However, the impact of the measure will depend on Member State adoption and local conditions, hence environmental impacts are not quantifiable.

Both M3 and M4 would deliver strong environmental benefits by introducing a ceiling for renewable heat from primary solid biomass, with impacts of M4 going further due to a more restrictive cap. They would exclude the highest air emission solid biomass pathways, improve the average GHG performance of the compliant bioenergy mix, reduce overall primary solid biomass use and lower risks linked to land use, land-use change and forestry (LULUCF). M4, however, would likely involve more uneven social effects, as it would place greater adjustment pressure on operators dependent on solid primary biomass - which are more likely to be lower-income households[174] - and on those Member States more reliant on this pathway for achieving their renewable targets.M1 and M2 are expected to have generally positive social effects, primarily by simplifying compliance and reducing barriers to participation for smaller and local operators, including farmers, aggregators and small bioenergy producers. This may support broader engagement in sustainable bioenergy value chains and improve consistency across Member States.

The package combining measures M1, M2 and M3 is retained in the policy package as it strikes a balanced and proportionate approach. M1 simplifies the sustainability criteria, reducing complexity while maintaining the core safeguards. M2 further simplifies and strengthens incentives for local biomass bioenergy through the introduction of a Bioenergy Scoreboard and M3 address sustainability concerns around sold biomass usage in households in a proportionate way.

By contrast, M4 is not retained because its stricter cap, set at 20% below 2024 levels, is considered too restrictive and risked undermining Member States' ability to meet their renewable energy targets.

N. Inefficient and ineffective certification

[173] Hamelin, L., Borzęcka, M., Kozak, M. and Pudełko, R., 2019. A spatial approach to bioeconomy: Quantifying the residual biomass potential in the EU-27. *Renewable and Sustainable Energy Reviews*, *100*, pp.127-142.; Voccia, Diego and Abdel Sater, Sasha and Demichelis, Francesca and Savorani, Francesco and Tommasi, Tonia and Wachongkum, Somindu and lamastra, lucrezia, Unlocking the Power of Italy's Bioeconomy: Maximizing the Environmental Benefits of Temporary Crop Residues - a Comparative Analysis of Immediate vs. Deferred Impact on Energy Generation Through Straw Valorization. Available at SSRN: https://ssrn.com/abstract=4865138 or http://dx.doi.org/10.2139/ssrn.4865138; Schipfer, F.; Pfeiffer, A.; Hoefnagels, R. Strategies for the Mobilization and Deployment of Local Low-Value, Heterogeneous Biomass Resources for a Circular Bioeconomy. *Energies* **2022**, *15*, 433. Strategies for the Mobilization and Deployment of Local Low-Value, Heterogeneous Biomass Resources f…

[174] Fuel of the Poor, Household use of firewood in central and eastern Europe, WWF (2022) HfHH_Fuel_of_The_Poor_BioBalance_2022.pdf

N1. Strengthen the certification system while leaving certain flexibilities to Member States

This measure would reduce the scope of the applicability of national schemes not recognised by the Commission to specific cases (small scale installation using local biomass, e.g. installations <20 MW for solid biomass).

It would enforce the concept of cooperation in supervision duty of Member States competent authorities in cooperation with certification schemes and under the leadership of the Commission and allow certification in third countries only when in-person inspections from certification bodies are allowed[175].

It includes the deletion of all obligations of MS to issue gas GOs, irrespective whether the production is supported or not, and, linked to that, the abolition of the requirement for gas suppliers to use GO for demonstrating the RES share. The measure will not affect the right of MS to issue other certificates (e.g., green certificates).

N2. Strengthen the certification system with less flexibilities to Member States

Allow certification only through voluntary or national schemes recognised by the Commission. Fully align the rules for issuing, transfer and cancellation, including the technical standard for gas Guarantees of Origin, with those of the Proof of Sustainability certificates. Cooperation in supervision duty would be retained also under this measure.

Stakeholder feedback

Over 74% of stakeholders agree that stronger certification and traceability for biomass and bioenergy are needed. A rapid, fully operational and reliable Union Database (already mandated under the current RED) is seen as essential for integrity, efficiency and more consistent implementation across Member States. Many stakeholders view the Union Database as the key tool to link proofs of sustainability with Guarantees of Origin and support harmonised implementation.

Assessment of impacts and identification of preferred measure

Measure N1 would strengthen the certification system while preserving flexibility for Member States, simplifying the current framework, and reducing administrative burden by removing the obligation to issue gas GOs. Measure N2 would introduce a further regulatory push by leaving less flexibilities to Member States (in terms of using national schemes).

N1 is expected to deliver a significant improvement in certification and fraud prevention for domestic supply chains. Cooperative Member State supervision would strengthen the audit chain for small and local feedstock producers; restricting large operators to recognised schemes brings the highest-volume, highest-risk supply chains under uniform audit rules. The recognised-scheme share of

[175] In certain countries, inspectors from Certification Bodies are not allowed to inspect (e.g., Visa is not granted for inspection purposes).

certified volumes today rises above 80%[176], while this measure would further reduce the proportion of volume in less supervised audit chains[177]. These provisions combined would strengthen the certification system by effectively reducing the exposure to fraud and other irregularities in the value chain, especially in third countries. As 24% of imported refined biofuels came from China in 2024 (reduced from a share of 36% in 2023)[178], where in-person inspections are currently not possible, N1 would have the immediate effect of reducing imports by around 700 million EUR, or 4% of the total biofuel market consumed in the Union[179], while stimulating EU production to compensate reduced imports.

Relative to N1, N2 eliminates the residual national scheme tier entirely, requiring all operators to certify through Commission-recognised schemes. N2 achieves the maximum attainable market confidence effect within the certification architecture. 100% of biofuel volumes declared in official reporting - including SHARES - would be certified through Commission-recognised schemes, eliminating the two tiers system and harmonising the whole production criteria. However, transition cost for the economic operators on national schemes is material, with especially small and medium operators bearing both adaptation and higher administrative costs.

Measure N1, removing the obligation for Member States to issue gas GOs would generally reduce administrative complexity and compliance costs for gaseous biofuel operators, especially in markets with significant production[180]. Measure N2, which would maintain gas GO obligation, would entail additional compliance work in terms of maintaining and updating double standards and implementing regulation. In addition to that, a significant one-off cost for developing a new fully harmonised standard CEN 16325 for gases and parallel IT systems for GO and proof of sustainability (PoS) tracking in gaseous fuels. In this setting Member States and issuing bodies will also have to calculate and publish gas residual mixes annually.

5.3 Construction of a "policy package"

This impact assessment examines 32 identified measures to address the problem drivers and specific objectives of the initiative. In Section 5.2, an assessment of impacts was carried out of the individual measures and preferred measures were identified in each intervention area. Rather than comparing pre-defined policy options of varying levels of ambition, one policy package is constructed by selecting the best performing measures among those addressing each specific objective based on the

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[176] Based on a report prepared for EEA for 2023 where countries reported both from voluntary schemes and national schemes. Of that around 80% of total volumes refer to voluntary schemes and remaining 20% to national schemes. See: ETC CM report 2025/02: Greenhouse gas intensities of transport fuels in the EU in 2023: https://www.eionet.europa.eu/etcs/etc-cm/products/etc-cm-report-2025-02

[177] Based on industry data, around 17% of bioenergy installations are over 20 MW, therefore the minimum share of recognised schemes would be 83%. However, this share is expected to be higher under this measures, as installations below 20MW are also at times certified through Voluntary Schemes. Additionally, certain national schemes (e.g., Austrian Agricultural Certification Scheme) is recognised by the Commission. See: https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en

[178] Eurostat, Energy Shares (2026)

[179] EUROSTAT, [to complete]

[180] According to the latest reports from Member States gas GOs were issued for 27TWh production in 2023, See: Chapter 2.1.3.12 in SWD (2025) 351 final

assessment in section 5 (see Annex 4 on methodology) This modular approach is justified by the largely independent nature of the measures under consideration: their effects do not conflict or overlap in a way that would require trade-offs between objectives. As a result, the selected measures can be combined into a single policy without the need to develop sub-options or carry out a comparative analysis of alternative package configurations. This policy option is compared against the baseline in Section 7.

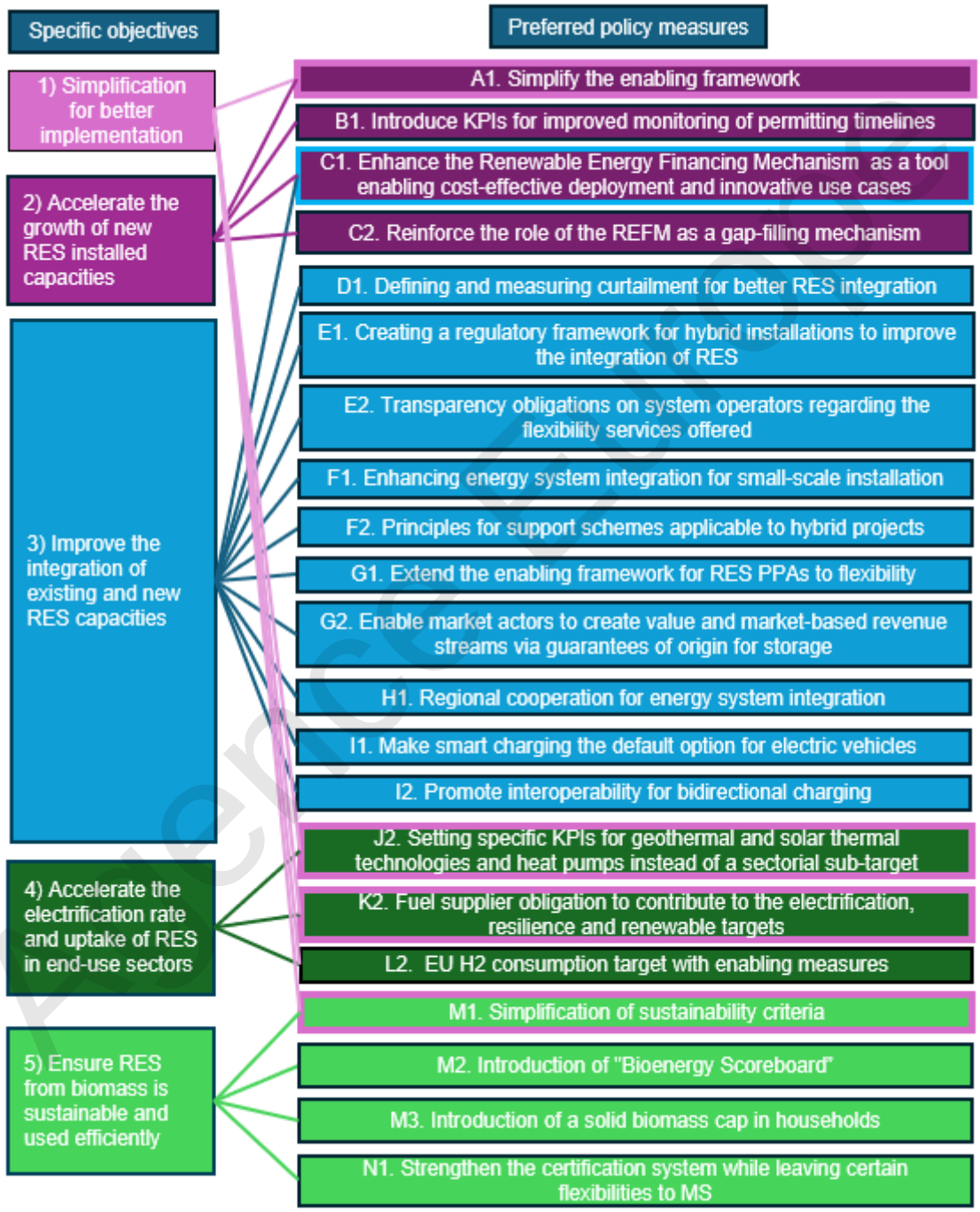

Table XX: Overview of the policy measures in the packaged option and specific objectives that they address

Without prejudice to political considerations and the final Commission legislative proposal, the specific analysis carried out in this impact assessment comes to the following main conclusions as regards the key elements of the preferred policy package for the post-2030 framework for renewables:

To address specific objectives 1 and 2, the policy package includes a no-regret simplification measure (A1) to streamline the current enabling framework for renewables deployment (specifically rules on self-consumption, energy sharing and renewable energy communities, regional cooperation, buildings and heating and cooling in order to facilitate its implementation, by removing unnecessary requirements and overlaps with other sectorial legislation. Additionally, the policy package includes measure B1 to improve monitoring of permitting progress through KPIs in the Governance Regulation. It also introduces amendments to enhance the REFM mechanism (C1 & C2) for more cost-effective RES deployment.

To address specific objective 3, the policy package includes measures to define and measure curtailment of renewables (D1) in order to better track RES integration in the electricity system; measures (E1, E2, F1, F2, G1, G2, H1) aimed at improving the regulatory framework to promote the deployment of flexibility assets and hybrid projects, through improved regulatory certainty and enhanced financing opportunities and targeted measures to strengthen the role of EVs and recharging points as flexibility providers (I1, I2). The improved framework for better renewables integration will also indirectly contribute to addressing specific objective 2, given that negative electricity prices caused by energy system imbalances (notably lack of system flexibility) diminish the business case for renewable energy deployment.

To address specific objective 4, the retained measures aim at simplification of the overall sub-target framework (J2, K2, L2), in coherence with the objective set out in the Impact Assessment for the revision of the Governance Regulation to provide Member States with greater flexibility regarding technology choices and delivery pathways, while demonstrating through plans, investments, reforms and indicators how they contribute to achieving relevant strategic objectives. When it comes to the heating and cooling sector, the policy package simplifies the current framework and introduces dedicated KPIs for specific renewable heating and cooling technologies which would provide the strongest policy and investment signals and visibility (J2). Regarding the transport sector, the national fuel supplier obligation is retained in the packaged policy option (K2), to ensure fossil fuel reduction in the sector and help bridging the cost gap between renewable fuels and fossil fuels. As regards renewable hydrogen in transport and industry, the policy option includes a Union indicative renewable hydrogen target coupled with enabling measures and flexibilities (measure L2), enabling production in most cost-efficient, renewable electricity-rich regions while avoiding technological-specific requirements on Member States and companies.

To address specific objective 5, the policy package includes measure M2 simplifying the legal provision and streamlining among different EU legislation to create a simpler and more robust framework, as well as the "bioenergy scoreboard" to reduce GHG emission calculation complexities and incentivise best practices across the value chain. Measure O1 will strengthen the verification of the sustainability attributes of biomass fuels, while leaving Member States certain flexibilities in designing national frameworks.

Taken together, the policy package would entail a transformation of the renewable energy framework from a framework focussing to a large extent on delivery through sectorial sub-targets, to a more enabling framework focussing on removal of barriers and creating the necessary incentives linked to related policies (i.e. ETS review, with revenues prioritising spending on uptake of electrification and renewables) to better address the specific objectives identified in this Impact Assessment. This new approach would facilitate the deployment of new RES capacities, enhance the integration of new and existing RES into the electricity system and complement the target architecture and bottom-up delivery framework assessed as part of the Impact Assessment for the Governance Regulation revision.

5.4 Measures discarded without in-depth assessment in the IA

The Commission discarded comprehensive legislative changes to the enabling framework for RES deployment set out in the RED in view of safeguarding regulatory stability. The stakeholder feedback received at stakeholder workshops emphasised the importance of regulatory stability in this area and pointed at insufficient implementation of the current framework as the key issue to tackle. In particular, the Commission discarded the following measures:

- Introducing additional mandatory measures for self-consumption and renewable energy communities.
- Further legislative action on permitting, in view of recent legislative reform of 2023 and 2026 as part of the Grids package, and ongoing implementation efforts by MS.
- Enhancing rules on regional cooperation and joint projects by making them mandatory.
- Introducing an EU binding target for innovative RES technologies
- Fuel supplier obligations common for transport and heating and cooling, by including fossil fuels supply in H&C under the fuel supplier obligations.

Further details about the measures discarded without an in-depth assessment are provided in Annex 10.

6 WHAT ARE THE IMPACTS OF THE POLICY PACKAGE?

This section presents the main expected economic, social and environmental impacts of the policy package compared to the baseline. The assessment focuses on impacts that are expected to be material and proportionate to the measures under consideration. To the extent possible, impacts are quantified using PRIMES modelling, [Prognos modelling] and other evidence (see Annex 4 for further details on methodology and data).

Several of the barriers addressed by the policy package, including regulatory complexity, incomplete implementation and insufficient market transparency, are not fully captured in energy system models, which generally assume well-functioning markets and timely implementation of existing legislation. Moreover, several measures are enabling in nature, and their effects will depend on future implementation by Member States and market participants. Consequently, certain impacts, notably those related to administrative simplification, investment environment, system integration and the synergies between individual measures, could not be robustly quantified. Where modelling is not

technically feasible or suitable, owing to limitations in data or analytical tools, the assessment relies on qualitative analysis informed by available studies and stakeholder input. The depth and methodology of the assessment are tailored to the expected magnitude and nature of the impacts identified.

As the policy package consists of several complementary measures, the assessment considers their combined effects while recognising that individual measures contribute to different extents to the overall impacts. Measures aimed primarily at simplification, monitoring, clarification or reporting, such as the simplification of the enabling framework (A1), the introduction of permitting KPIs (B1), the definition and monitoring of curtailment (D1), and the reinforcement of guarantees of origin for electricity (G2), are expected to have only limited direct effects and are therefore reflected qualitatively, where relevant, in the overall assessment. By contrast, measures that strengthen financing and deployment mechanisms (C1–C2), promote flexibility and grid integration (E1, F1–F2 and I1–I2), maintain obligations for fuel suppliers (K2), establish an EU renewable hydrogen consumption target (L2), the sustainability criteria simplification (M1), the introduction of the "Bioenergy Scoreboard" (M2), or reinforce certification requirements for biomass (N1) are expected to be the principal drivers of the package's impacts.

6.1 Economic impacts

Economic impacts are assessed with a focus on the indicators most directly affected by the policy measures, notably energy system costs, resilience and energy security, competitiveness, impacts on SMEs, and administrative or adjustment costs.

The quantitative assessment draws on the **central scenario**[181] which provides the main reference pathway and projects a cost-effective energy system transformation consistent with the 90% GHG reduction target (out of which 85% domestic). In the central scenario, installed renewable generation capacity is projected to reach approximately 2000-2400 GW by 2040, compared to around [680 GW] in 2024. This is well illustrated by the changes in the fuel mix in Final Energy Consumption (FEC). The **renewables share is projected to grow from approximately 26.2% in 2025 to ~65-70% in 2040.**

Reaching the level of renewables estimated by the central scenario is expected to entail substantial economic benefits. The central scenario indicates that the transition towards a cleaner energy system will be accompanied by a substantial reduction in EU fossil fuel use and overall energy import dependency from 57% today to 25% in 2040. By 2040, Europe is projected to reduce gas demand by more than 70% and oil consumption by approximately 50% compared to 2024. Coal is set to be almost completely phased out. The remaining fossil fuel consumption is projected to account only for approximately 20%. The savings in the EU's fossil fuel import bill will increase annually up to EUR 260 billion[182] by 2040. With domestically produced clean energy progressively replacing imported fossil fuels, the European energy system becomes structurally less exposed to international

[181] Based on PRIMES

[182] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0079

fuel price volatility. This improves the predictability of future energy costs for households and industry and strengthens Europe's long-term competitiveness. As renewables increase their share in electricity generation, the number of hours when fossil-based technologies set the marginal price decreases in wholesale markets, lowering the level and the volatility of prices. A European Commission analysis shows[183] that the fossil-fuel price-setting declined approximately from 74% in 2015 to 50% in 2025 (for gas it went down from 37% to 30%). This is set to decrease further till 2040.

The **policy package** is expected to contribute to achieving a RES share in final energy consumption consistent with the 2040 climate target in a more timely and cost-efficient manner. There is a gap between the projected RES share (~65-70%) under the central scenario and the RES share estimate for 2040 based on current trends (~53%)[184]. The cumulative effects of the policy package (taking into consideration other relevant EU legislation, notably the revised ETS1, and the full implementation of the current and future renewables framework) are expected to bridge this gap, with the strongest effects of the policy package coming from reduced barriers to renewable deployment, lower system integration costs and higher revenue certainty for renewable projects and flexibility providers, accelerated electrification, smart charging, geothermal/solar thermal and certification services. While the ETS price will provide an important economy-wide carbon price signal, the policy package will provide added value in removing regulatory and market barriers to the achievement of the required RES share that are not resolved through carbon pricing alone (see Section 2). The policy package facilitates the achievement of the required RES share in a timely and more cost-efficient manner, reducing the risk that delays in RES deployment would need to be compensated by more expensive emissions reductions in other sectors or through less cost-effective technologies, which could drive unnecessary spikes in the ETS allowance prices. However, it is not possible to quantify the exact contribution of the policy package under this initiative, separated from the contribution of other complementary policy initiatives.

The packaged option will lead to an accelerated and more cost-efficient deployment of RES (SO2) by unlocking the full potential of the existing enabling framework for deployment under the RED, bridging the gap of 600 GW (~43%) between installed renewable electricity capacity under the central scenario (2000- 2400 GW) and estimates for 2040 based on current trends (~1400 GW). The post-2030 renewable energy framework would help ensure that these least-cost generation technologies continue to be deployed and integrated into the energy system by addressing regulatory, infrastructure and investment barriers that are not resolved through carbon pricing alone First, simplification, harmonisation and clearer rules will support improved implementation of the framework with positive indirect implications for deployment and reduced the associated administrative burden. Secondly, the measures improving the design and use of the REFM are expected to improve financing efficiency and accelerate deployment by facilitating deployment where it can be achieved most cost-effectively. In addition, measures to improve the integration of

[183] [Placeholder] Price-setting technologies in the EU electricity market Working Paper.

[184] 53% is an estimation based on market developments of renewable uptake on the ground, based on historical data. The estimation therefore does not account for the ETS1 review post-2030, the implementation of ETS2 and sectorial legislations. Assumption and details for the assessment are explained in Annex IV.

RES in the electricity system under problem area 2 will contribute to address problem 1 as they will improve the business case for new renewable energy projects by facilitating their better integration into the system. The measures are expected to further stimulate investments, supply chains and have positive impacts on employment.

The policy package will improve the integration of existing and new installed renewable energy capacity (SO3), by increasing non-fossil system flexibility and addressing system imbalances associated with increasing share of variable RES, amongst other factors. This is expected to reduce total energy system costs and electricity price volatility[185]. While key instruments to address system flexibility fall outside the scope of the renewable energy framework[186], the packaged policy option will complement the existing framework and improve investment efficiency by enhancing transparency of RES curtailment[187] and improving the framework and conditions for investments in flexibility assets (including in EVs[188]), including by improving locational and temporal signals, helping to correct information failures and reduce fragmentation, which can unlock investment and improve market integration. Exact economic impacts are difficult to quantify depending on scenario assumptions on the deployment and costs of alternative flexibility technologies. JRC analysis[189] shows how fully benefiting from industrial demand response may not only benefit the industrial power bill, but also lower power prices overall. Moreover, it is indicated that by 2040, more flexible electric vehicles could deliver over €44 billion in annual savings for owners and additional benefits to the power system through reduced investment need. Further JRC analysis[190] indicates that reducing expected redispatch levels of 800 TWh, and associated RES curtailment of nearly 400TWh, in 2040 by 37% would lead to savings in system costs associated to redispatch of at least 35 billion EUR in 2040.

The packaged policy option is expected to accelerate the electrification of end-uses together with stronger and better targeted direct RES uptake (SO4). The electrification target assessed under the Governance Regulation Impact Assessment will provide a strong political signal towards electrification solutions. The packaged policy option will support this by providing a strong business case for the supply of clean electricity to electric vehicles (via the credit mechanism for the transport sector). The packaged policy option will help bridge the gap between fossil fuels and renewable fuels in transport and industry, notably for renewable hydrogen and advanced biofuels and biogases. Fuel supplier obligations under the renewable legislation will promote fuels domestic production,

[185] Rollout of greater flexibility assets can lower curtailment costs 20-80% and achieve a 5–15% reduction in total power-system costs (IEA – *Electricity Grids and Secure Energy Transitions*, 2023)

[186] Electricity Market Design and TEN-E Regulation

[187] Curtailment currently costs billions (ACER Market Monitoring Reports), but better monitoring can boost operational improvements, which could reduce curtailment costs by 20-40% (IEA – *Electricity Grids and Secure Energy Transitions*, 2023)

[188] Smart EV charging, and vehicle to grid operations can reduce peak demand by 10-20% and reduce investment needs by 10-15% (IEA Global EV Outlook).

[189] Terça, G., Koolen, D., Miletic, M. and Finck, R., The development of flexibility provision in EU power systems, Publications Office of the European Union, Luxembourg, 2026, doi/10.2760/6856407, JRC144042

[190] Thomassen, G., Fuhrmanek, A., Cadenovic, R., Pozo Camara, D. and Vitiello, S., Redispatch and Congestion Management, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/853898, JRC137685.

increasing the resilience of the sector. Compared to 2024, reaching the levels indicated by the central scenario will reduce fossil fuel use by [XX% in transport, XX in residential sector by XX and XX in industry]. While this is an EU average overview, the flexibility presented in the packaged policy option will allow Member States to decide on the ambition level for each sector, as well as for the technological pathways to pursue.

Addressing SO4 is not expected to have materially different economic impacts compared to the baseline. The bioenergy scoreboard is expected to incentivise the uptake of more unused and locally available EU feedstocks, as well as less stringent restrictions on food and feed are likely to mobilise additional homegrown biofuel production. The sustainability criteria framework will be simplified, while environmental protection principles will be maintained. Main impacts of M1, M2, M3 and N1 will regard administrative and compliance costs, presented in the section below.

6.2 Administrative and adjustment costs

In line with SO1, the packaged policy option will overall **simplify the framework and reduce administrative and adjustment costs** for Member States and economic operators, notably as regards measures under problem area 1, 3 and 4. Under problem area 1, measures to simplify the framework for deployment of renewables (A1) and enhance the REFM (C1) will reduce administrative costs for Member States simplifying implementation and shifting certain tasks (auction-administration function under REFM) to the Commission. Reforms removing duplication and overlaps across legislation can typically reduce administrative costs by 15-30%[191]. Measure B1 introducing a KPI on permitting will entail a one-off administrative cost (EUR 13.5 million) which will be outweighed by recurring annual savings (EUR 7.9 million/y). Under problem area 3, the reduction of sub-targets will simplify and reduce administrative costs for Member States. In this context, several measures also streamline existing reporting and implementation arrangements, including the integration of new monitoring requirements into the Governance Regulation. It is expected that benefits will be transferred to economic operators, although impacts of the measures are not direct or possible to quantify. For bioenergy supply chain, measure M2 is expected to deliver material reduction in administrative costs, especially for EU producers that are compliant with existing agricultural and environmental policies. Simplified GHG calculation methodologies and clearer definitions reduce the need for external technical support, primarily benefiting smaller feedstock producers and aggregators.

Some one-off and recurring adjustment costs will, however, be incurred for system operators, ACER, NRAs and Member States, and to a smaller extent generators, in relation to new monitoring, transparency and implementation requirements under D1, E1, E2, G2 (see Section 5.2.2). The additional administrative and adjustment costs are generally outweighed by expected long-term system cost savings from a more efficient and better integrated energy system. This is achieved

[191] World Bank, Doing Business – Dealing with Construction Permits and World Development Report 2017: Governance and the Law; OECD Regulatory Policy Outlook 2021.

through reduced curtailment, congestion and balancing costs and improved investment visibility by sending clearer market signals.

As a consequence of N1, more companies in the bioenergy value chain will be subject to Commission-recognised certification schemes, implying additional adjustment costs. These schemes would apply only to bigger installations, while SME would still be eligible to be certified under national schemes. N1 is also expected to increase controls over imported biofuels. These trade-offs appear manageable and proportionate, relative to the broader benefits, especially because the package combines enabling measures with measures that reduce barriers and improve support frameworks.

6.3 Environmental impacts

The policy package is expected to foster the uptake of renewables and their more efficient use, both leading to direct positive impacts on the environment through the replacement of fossil fuels. The use of fossil fuels has negative impacts especially on the climate through the emission of GHG, on air quality through the emission of air pollutants and on biodiversity which is negatively affected by both GHG emissions and air pollutant emissions. Therefore, the enhanced and more efficient deployment and use of renewables will positively affect all three areas, especially as the bulk of the increase in RES is expected to come from non-combustion sources with no GHG or air pollutant emissions associated with their production. However, GHG emission reduction benefits of the policy package are not quantified, it is expected that if emissions are not displaced through renewables, other technological solutions will be deployed in response to price signals under the EU ETS in less cost-effective manner.

Addressing specific objective 2 and closing the 600 GW gap between the projected RES generation capacity under the central scenario and estimates based on current trends is expected to bring significant reduction in fossil fuel use. Individual renewable energy projects may nevertheless have adverse impacts on the local environment, including on biodiversity, landscapes and water resources, depending on their location and design. Such impacts will continue to be subject to the existing environmental safeguards under Union law, notably the Environmental Impact Assessment (EIA) Directive and, where applicable, the Strategic Environmental Assessment (SEA) Directive, as well as other relevant environmental legislation. These frameworks require environmental impacts to be identified, assessed and, where necessary, avoided, mitigated or compensated before projects or plans are implemented.

Several measures to address specific objective 2 will improve the environmental performance of the energy system by reducing renewables curtailment, promoting storage and flexibility, and enabling a more efficient use of existing renewables generation. Reducing redispatch levels of 800 TWh, and associated RES curtailment of nearly 400 TWh, in 2040 by 37% could displace marginal fossil electricity generation and reduce CO2 emissions by XX. Improving the integration of RES in the electricity system will also reduce the need for additional generation and associated infrastructure, thereby limiting land take and pressures on biodiversity as well as need for critical raw materials.

The measures to address specific objective 4 are expected to have the following positive environmental benefits:

- The simplification of sustainability criteria is expected to maintain levels of environmental integrity comparable to the baseline. Environmental benefits are foreseen from better implementation of the criteria and the more robust certification system.
- The bioenergy scoreboard would allow to deploy additional local, heterogenous biomass, by incentivising collection and use of locally available waste and residues.
- The primary solid biomass cap and the bioenergy scoreboard are expected to increase efficiency of biomass combustion, thus reducing pollutant release.

Overall, the positive environmental impacts of the package are expected to significantly outweigh any negative effects.

6.4. Social impacts

The package is expected to generate positive social impacts through increased employment, improved energy affordability for households and industries through lower and more stable energy costs and improved energy security. The reduction in fossil fuel imports and exposure to international energy price volatility improves the resilience of the EU energy system and contributes to more stable energy prices for households and businesses with positive implications on competitiveness. An improved regulatory framework for RES deployment, system integration and flexibility will reduce system costs and can translate into lower and more stable electricity prices in the medium to long term.

Some measures may create adjustment challenges for certain consumer groups, particularly regarding the increased smart charging arrangements. However, these impacts can be mitigated through adequate consumer information, simple opt-out mechanisms and targeted support measures. In addition, facilitating smart charging will enable EV owners/users to save money or earn revenues. Moreover, while some of the measures give investment signals for certain clean technologies which can lead to higher upfront investment in clean energy assets (such as heat pumps or electric vehicles) these are more than offset over time by substantially lower fuel costs[192].

The measures supporting renewable heating and cooling and electrification also contribute to improved public health through reduced air pollution and lower use of fossil fuels and inefficient biomass technologies.

6.5 Small and medium-sized enterprises (SMEs)

The policy package is expected to have a limited, but generally positive impact on SMEs, indirectly resulting from lower energy costs. A limited number of SMEs are directly affected by the packaged option, particularly SMEs that produce their own RES electricity,[193] SMEs in the bioeconomy and

[192] The fuel component of electricity generation costs declines by around 60% between 2030 and 2040, reflecting the progressive replacement of imported fossil fuels by domestic clean energy sources.

[193] According to the 2024 Eurobarometer on Small and Medium-sized Enterprises, more than one in ten SMEs (12%) generate renewable energy onsite and 23% of SMEs purchase energy from a supplier of renewable energy.

biomass supply chain, small and medium sized flexibility and storage providers, the preferred option is designed primarily to simplify existing rules, reduce administrative burdens, and improve legal clarity. One of the packaged measures proposes to enhance the market responsiveness and energy system integration elements of support schemes for small scale installations, which may include SMEs. As explained in section 5.2.2 (F) this measure is expected to result in overall positive economic impact in the medium-to longer term, and Member States retain flexibility for the design of their support schemes. SMEs active in the fossil-heating value chain, notably gas-boiler installers and heating-oil distributors, will be indirectly impacted as electrification of these sectors progresses.

Measures such as streamlining biomass sustainability and certification requirements, aligning provisions across legal frameworks, and simplifying the establishment of renewable energy communities are expected to reduce high compliance costs for smaller operators and contribute to the EU's SME burden reduction objective. At the same time, standardised Commission procedures for renewable energy financing may lower entry barriers for SMEs, although the scale of centralised auctions could continue to favour larger participants unless complemented by SME-friendly provisions.

The initiative's most significant benefit is expected to come from increased renewable energy deployment and improved system integration, which should reduce curtailment, congestion and system costs, putting downward pressure on electricity prices and benefiting all EU SMEs as energy consumers. Although certain measures may create short-term adjustment costs for some SMEs, these impacts are expected to be outweighed over time by higher self-consumption rates, lower electricity bills, and improved competitiveness.

7 HOW DOES THE OPTION COMPARE TO THE BASELINE?

In this section the policy package is compared against the baseline on the criteria of effectiveness to achieve the specific objectives, efficiency, coherence as well as subsidiarity and proportionality, based on the assessment of the impacts in the previous section.

7.1 Effectiveness

The policy package will achieve **SO1** more effectively than the baseline by simplifying the legislative and regulatory framework and enhancing the monitoring tools in relation to RES deployment (SO2), electrification and uptake of RES in end-uses (SO4) and sustainability framework for bioenergy (SO5). The policy package removes compliance complexity and thereby improves the ability of Member States and project developers to implement and enforce the framework, at very low cost.

The policy package is more effective than the baseline in accelerating renewable energy deployment (**SO2**) by removing regulatory barriers to implementation of the enabling framework for RES deployment and reducing compliance costs, better monitoring RES permitting, and improving cost-effective financing through the REFM.

The policy

package substantially improves the effectiveness of the framework in supporting RES integration in the electricity system (**SO3**)**,** which is addressed only to a limited extent under the current RED. Under the baseline, some improvements in RES integration are expected from the implementation of existing EU legislation, notably Article 20a of the RED on facilitating system integration of renewable electricity, the EMD rules, the Grids Package once adopted, and the NZIA rules on non-price criteria for renewable energy auctions. However, RES curtailment and integration constraints are expected to remain substantial by 2040 without further action, leading to unnecessary system costs. The packaged option introduces set of mutually reinforcing measures complementing the current rules on EU level by filling in some legal "gaps", notably in relation to defining and monitoring curtailment, rules on hybrid projects, transparency of flexibility frameworks at national and local levels, market responsiveness of small-scale installations, market-based revenue streams for flexibility and integration, and smart charging and V2X functionalities. Taken together, these measures improve investment signals and the enabling framework for storage and flexibility, and be more effective than the baseline in untapping the full system value of renewable generation.

The policy package is more effective in promoting electrification and renewable energy uptake in end-use sectors (**SO4**) compared to the baseline. The baseline assumes that some progress would continue under ETS1/ETS2 and other relevant measures at EU level supporting decarbonisation of industry, transport and heating and cooling. Still, under the baseline important regulatory barriers would remain to electrification and renewables uptake, including the complexity of the existing sub-targets (see Section 2.1.3). The policy package addresses these issues by simplifying the sectoral target architecture, improving the coherence of the framework while retaining strong investment signals and incentives.

The policy package addresses the complexity and fragmentation of the bioenergy framework more effectively than the baseline (**SO5**). Under the baseline, the REDIII sustainability criteria would continue to apply, but ambiguity, uneven certification approaches, fraud risks and unnecessary administrative burdens persist. Through measures M1, M2 and M3 and N1, the package simplifies compliance for smaller operators, improves traceability and strengthens certification in higher-risk areas, thereby improving the functioning and credibility of the framework relative to the baseline.

7.2 Efficiency

The policy package reduces the gap between modelled cost-optimal deployment under the central scenario and the less efficient outcomes likely under baseline implementation conditions. Under the baseline, renewables growth is expected to continue in line with the 2040 climate target supported by existing legislation REDIII, ETS incentives and other relevant market developments. However, the regulatory and market barriers and inefficiencies in the current framework (identified in Section 2) would remain unaddressed, raising the overall cost and leading to potential delays in target achievement (see Section 6.1). The baseline modelling assumptions do not capture many obstacles, such as slow implementation, market fragmentation, permitting delays, curtailment and limited investor visibility which imply higher system costs and a less efficient pathway to the 2040 target.

The policy package enables more cost-efficient achievement of the required RES share by reducing the regulatory complexity of the enabling framework and facilitating implementation at lower cost.

The policy package enables more cost-efficient RES deployment including as regards innovative RES technologies through the enhanced the use of the REFM. It strengthens the framework for RES integration in the electricity system and enhances investment signals for flexibility assets, reducing energy system costs associated with curtailment and congestion at low costs mainly building on the current regulatory framework at EU level. The policy package simplifies the target architecture and monitoring for end-use sectors with expected efficiency gains for Member States and economic operators. Bioenergy efficiency will be enhanced by simplifying sustainability criteria, introducing a Bioenergy Scoreboard, and capping the use of solid biomass in households, while strengthening certification systems in a way that preserves Member State flexibility.

While the policy packages introduces moderate additional adjustment and administrative costs for national authorities, system operators and market actors, these are generally limited and outweighed by the economic, environmental and social benefits generated. Some implementation costs will arise upfront, while several benefits, particularly those linked to investment certainty, market development and system integration are expected to materialise only gradually over time.

Overall, the policy package is more efficient than the baseline because it addresses the sources of avoidable cost that the baseline leaves in place.

7.3 Coherence

The packaged policy option is coherent with the wider EU climate, energy and economic policies as it aligns the RES framework with post-2030 objectives on competitiveness, affordability, security, resilience and decarbonisation. It complements the revision of the Governance Regulation, the energy efficiency framework and other related initiatives for post-2030, by sharing a common target architecture, governance, monitoring and reporting framework and by combining the common EU direction with flexibility for different national circumstances and energy mixes. This is the case notably for the proposed measure to introduce KPIs on permitting, geothermal and solar thermal technologies and heat pumps.

Thanks to the simplification proposed in the packaged policy option, overlaps with existing EU legislation will be addressed. The package is coherent with electricity market legislation, the Grids Package, the Electrification Action Plan, industrial decarbonisation initiatives, and transport legislation. Measures on flexibility, hybrid projects, smart charging, V2X and guarantees of origin complement the existing electricity market framework and help make renewable deployment more system-efficient. Measures on heating and cooling, hydrogen and transport complement parallel sectoral instruments while seeking to avoid unnecessary duplication. On bioenergy sustainability criteria, the measures are set to increase synergies with environmental, agricultural and climate legislations, addressing overlaps and reducing complexities.

Lastly, the package is coherent internally. Its measures are designed to address the four identified problems in a complementary manner: deployment measures are supported by integration measures and end-use uptake measures, and simplification measures improve the workability of the framework as a whole.

7.4 Subsidiarity

The policy package complies with subsidiarity as it focuses EU action on what is necessary to support delivery of the shared post-2030 objectives. It limits itself to areas where cross-border and cross-cutting challenges and market integration make national action alone insufficient. The problems identified in the impact assessment have a clear cross-border or internal market dimension. While the deployment of RES varies highly across Member States partly due to different starting points and energy mixes, the identified barriers are cross-border and systemic with implications for the EU energy system as a whole. Regulatory fragmentation, divergent practices as regards monitoring the implementation of permitting reforms, uneven access to cost-effective deployment opportunities, inconsistent treatment of flexibility and hybrid assets, incomplete interoperability, limited cross-border cooperation, uneven application of bioenergy sustainability requirements all affect the functioning of the internal energy market and the Union's ability to meet its climate and energy objectives efficiently.

At the same time, the package does not harmonise more than necessary. Many measures are enabling in nature and leave significant flexibility to Member States regarding implementation choices, support scheme design, planning and national trajectories. This respects national differences in energy mix, geography, infrastructure and administrative organisation. The package therefore only includes measures where Union action clearly delivers added value.

7.5 Proportionality

The packaged policy option is proportionate because it builds on the existing framework, limits administrative burden and preserves or in some areas increases Member State flexibility. The package consists of simplification, clarification, monitoring or enabling measures rather than prescriptive obligations. The package introduces only those additional measures considered necessary to address clearly identified gaps in the existing framework. Where new obligations are introduced, they are generally targeted and limited to what is needed to improve transparency, comparability or market functioning. It builds on existing RED structures and on related Union legislation to limit transition costs and avoids unnecessary regulatory disruption. The proportionality of the package is also supported by the balance of impacts. While some measures entail moderate one-off or recurring administrative costs, the expected benefits in terms of lower system costs, greater investment certainty, reduced fossil fuel use, lower emissions and improved resilience exceed these costs.

The package is more proportionate than either maintaining the baseline, which would leave costly inefficiencies unaddressed, or pursuing a significantly more prescriptive approach, which could impose higher compliance costs and reduce flexibility for Member States.

Overall, compared with the baseline, the packaged policy option is expected to perform better on all criteria.

Table XX: Summary table of comparison of policy package against the baseline

Intervention areas	Effectiveness	Efficiency	Coherence	Proportionality	Subsidiarity
Problem area 1	+	++	++	+	0
Problem area 2	++	+	+	0	+
Problem area 3	+	++	+	+	0
Problem area 4	+	+	++	+	0

8 REFIT AND ONE IN, ONE OUT APPROACH

8.1 REFIT (simplification and improved efficiency)

The policy package brings positive impacts in terms of simplification and improved efficiency. It is expected to have a strong simplification effect, mainly by reducing the number of sub-targets, and eliminating the overlaps and duplication with other legislation.

The following measures in particular would reduce compliance and regulatory costs, as detailed in chapter 5:

- Simplification of rules on how to engage in regional cooperation
- Aligning rules on self-consumption and energy sharing with the EMD
- Eliminating the requirement for Member States to issue Guarantees of Origin for Heating and Cooling
- Deletion of sub-targets for RES in overall heating and cooling and district heating and cooling, RES in buildings and in industry
- Facilitating bioenergy sustainability certification and removing the obligation on Member States to issue Guarantees of Origin for gaseous fuels

8.2 Application of the 'one in, one out' approach

The preferred policy option imposes limited additional administrative and adjustment costs, e.g. on the measurement of KPIs, which would mainly affect national authorities for the permitting indicator and for the curtailment indicator, the System Operators who would have to follow a methodology to compile and present the curtailment indicator. The costs created relate predominantly on the research and work for designing, setting in place and monitoring the implementation of these measures. The burden will be shared between the different levels of competence depending on the organisation of each Member State. However, these would be more than offset via the overall simplification measures mentioned under chapter 5 such as the removal of sub targets, elimination of overlapping requirements, streamlining the framework for regional cooperation and facilitating the proof of compliance with the bioenergy sustainability requirements. For citizens and businesses, the preferred option is not expected to entail any costs except for the electromobility providers which may have to adapt their contracts and process to enable smart charging as the default option. However, these would be more than offset via the measures to support smart charging, the framework to promote interoperability for bidirectional charging as well as for V2X services, which will reduce overall system costs and promote EVs flexibility.

9 HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The success of the preferred policy option can be measured against the following operational objectives and set of indicators, in particular addressing:

- the accelerated deployment of new RES capacities;
- the extent of integration of renewable power production in the electricity sector;
- the extent to which electrification in end-uses develops as well as solar-thermal and geothermal is expanding;
- the extent to which renewable fuels consumption increase;
- the resulting simplification and robustness of the bioenergy sourcing and use.

As regards the speed of deployment of new RES capacities, the impact of the proposed measures will be monitored first and foremost via the well-established annual Member State reporting to Eurostat, where they provide detailed information on the overall deployment of RES and for all technologies and the development of the RES share overall and in the relevant sectors. The length of permitting procedures and curtailment will be monitored via a new KPI in the Governance Regulation.

For the better integration of renewables in the power sector, several indicators will serve to monitor progress: the development of battery storage, the level of curtailment, the hours in which fossil fuels set the wholesale market price, the number of negative price hours, the level of participation of EVs in VtG.

Elements of compliance by Member States fail to reach certain targets/milestones/reference points will be ensured by the Governance Regulation.

The impact of the other proposed measures and the KPIs relevant for RES can be measured and monitored via the reporting of the Member States under the NECPs (see IA for the Governance Regulation).