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COMMISSION STAFF WORKING DOCUMENT

Assessment of progress towards the objectives of the Energy Union and Climate Action

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1. Introduction

1.1 Submission, review and assessment of the National Energy and Climate Progress Reports (NECPRs)

The Governance Regulation requires[1] Member States to report every two years on the progress achieved towards the implementation of their integrated national energy and climate plans (NECPs) through National Energy and Climate Progress Reports (NECPRs). The progress report is part of the State of the Energy Report taking stock of where the EU stands in delivering its climate and energy ambitions. By 15 March 2025, Member States were due to report for the second time[2] notably towards their objectives, targets and contributions set out in their NECPs, across the five dimensions of the energy Union including on greenhouse gas emissions and removals as well as the implementation or amendment of Member States policies and measures and their financing. Moreover, Member States had to report on progress towards their adaptation goals, as well as on the impact of their policies and measures on air quality and emissions of air pollutants.

Importantly, Member States were also due to report on the steps taken to establish a multilevel energy and climate dialogue[3] to engage with local authorities, civil society organisations, business community, investors and other relevant stakeholders and the public on energy and climate policies.

The Commission's assessment of progress in this Staff Working Document is based on the Member States' objectives, targets and contributions as included within their NECPs, and framed by the content and timing of the submitted NECPRs. Six Member States submitted a *prima facie* full progress report around the 15 March deadline, and four more submitted their progress report relatively soon after the deadline. As of 1 October August, 23 Member submitted their *prima facie* full progress report. Unfortunately, this represents a step backwards in timeliness compared to the 2023 reporting cycle, when 26 Member States submitted their *prima facie* full progress report by 1 October.

The assessment is based primarily on the progress reports. It is complemented with other information and indicators where appropriate, with data quality and availability varying between topics. To ensure comparability and limit the administrative burden on Member States, the progress reporting makes use of comparable energy statistics where available. As a result, the latest consolidated data in certain areas relates to 2023 or 2024.

This SWD builds on the several in-depth assessments carried out by the EEA/ETC and contractors.[4] In several areas, a scoring scale based on the information from the reported information, expert judgement and the previous assessment is used, i.e. whether the progress reported can be considered strongly positive, positive, neutral i.e. no progress, negative, or progress is unclear. This scale allows for estimating the magnitude of the progress.

Following the submission of the progress reports, a quality assurance and control process was started, in which Member States resubmitted parts of the progress reporting to add or clarify information. This process has yielded good results in improving the completeness and consistency of the reported information, although it is not yet fully completed (80% complete by 1 October) in view of late submissions by the Member States.

[1] Article 17 of Regulation (EU) 2018/1999
[2] The 2023 assessment can be found here: EUR-Lex - 52023SC0646 - EN - EUR-Lex
[3] Article 11 of Regulation (EU) 2018/1999
[4] This SWD builds on the Final Report of the *Study to support the Commission in progress reporting under the State of the Energy Union ENER/A1/2024-59* performed by an external contractor. The report includes further information on the NECPR, the assessment methodology, as well as a wider evaluation of Union-level bioenergy contribution.

2. Progress towards meeting the objectives

2.1 Decarbonisation

2.1.1 Greenhouse gas emission and removals

With the adoption of the **European Climate Law** in 2021, the EU objective to reach net-zero emissions by 2050 became legally binding, as did the EU 2030 target to cut net greenhouse gas emissions by at least 55% compared to 1990. The law also requires EU institutions and Member States to make continuous progress in adapting to climate change, strengthening resilience, and reducing vulnerability.

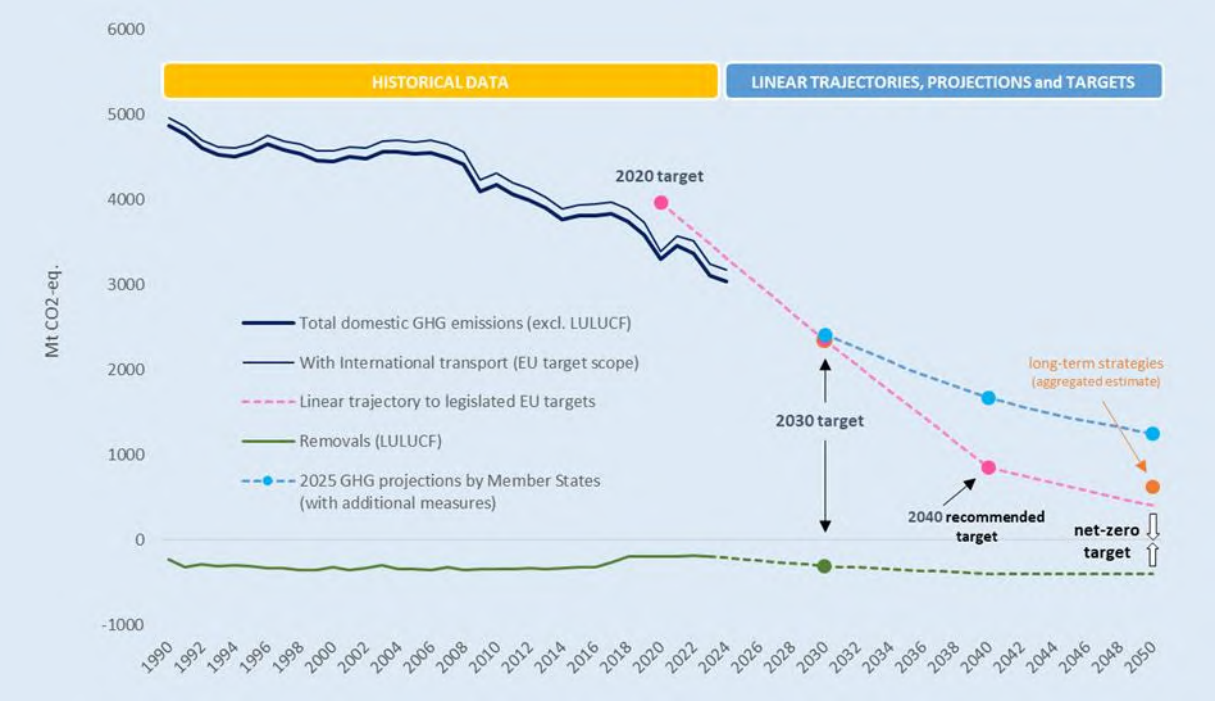
The focus in 2024 and 2025 has been on **ensuring implementation of the 2030 target** at Member States' level, and on **setting an EU-wide 2040 climate target** as an intermediate step on the path to climate neutrality.

The European Climate Law requires the European Commission to propose a 2040 target to keep the EU on the path to climate neutrality in 2050. In July 2025, the Commission adopted a proposal to amend to the European Climate Law Regulation to introduce a **2040 climate target** to reduce the EU's net greenhouse gas (GHG) emissions by 90% by 2040, relative to 1990. This target will ensure predictability for citizens, businesses and investors. The proposal is now being discussed by the co-legislators.

After the 2023 largest drop ever in the EU greenhouse gases (GHG) net emissions, preliminary 2024 data show a reduction of 2.8% compared with 2023, or 2.5% when emissions from international transport under the EU target scope are included5. This translates into a reduction in GHG net emissions of 39% compared with the 1990 base year (or 37.2% when international transport under the EU target scope is included). For a more detailed assessment on the EU and Member States' progress towards climate mitigation targets, refer to the Climate Action Progress Report 2025 and its accompanying technical annex.

[5] The EU GHG emission aggregate which better reflects the exact legal scope as provided by the European Climate Law can be obtained by adding to the EU-27 total domestic GHG emission, including LULUCF net emissions or removals, the EU-27 emissions from international aviation and maritime transport regulated in the Union Law. For more details, see Chapter 2 of this staff working document.

Figure 1. Total EU GHG emissions and removals (1990-2024), linear trajectories to EU targets, and Member States' latest GHG emissions projections (2024–2050).



Notes: (1) Historical GHG emissions and removals (1990-2023) are based on European Environment Agency's 2024 GHG Inventory and Approximated emissions and removals. (2) Linear trajectories for GHG emissions and removals (2023-2050) are based on the legislated EU 2030 targets, while emissions and removals by 2050 reflect estimates from the different model-based analyses supporting the 'Delivering the European Green Deal'. (3) The -55% 2030 target (EU Climate Law) considers a contribution of removals of -225 MtCO2eq.

Progress towards national objectives, targets and contributions for GHG emissions reduction

All Member States reported on progress towards national objectives, targets and contributions (Annex I). However, reports varied across Member States and information were largely insufficient to provide a collective EU assessment.

Climate neutrality

Almost all Member States, with the exception of Belgium, Croatia, Czechia, Poland and Sweden, defined the objective to achieve climate neutrality by 2050 or earlier, in line with their national long-term strategies (Table 1). Bulgaria, Cyprus, Malta, the Netherlands, and Romania have formally indicated, for the first time in a reporting document, a target year to achieve climate neutrality. Romania, in particular, set an early target of 2045.

Table 1. Target years for climate neutrality and scopes reported in the NECP progress reports and national long-term strategies.

	Target year for climate neutrality (2025 NECPR)	Target year for climate neutrality (2023 NECPR)	Target year for climate neutrality (LTS)
EU	**2050**	**2050**	**2050**
Austria	2040	2050	2040
Belgium			--
Bulgaria	2050		--
Croatia			--
Cyprus	2050		2050
Czechia			--
Denmark	2050	2050	2045
Estonia	2050	2050	--
Finland	2035	2035	2035
France	2050	2050	2050
Germany	2045	2045	2045
Greece	2050	2050	--
Hungary	2050	2050	2050
Ireland	2050		2050
Italy	2050	2050	2050
Latvia	2050	2050	2050
Lithuania	2050	2050	2050
Luxembourg	2050	2050	2050
Malta	2050		--
Netherlands	2050		--
Poland			--
Portugal	2050	2050	--
Romania	2045		--
Slovakia	2050	2050	--
Slovenia	2050	2050	2050
Spain	2050	2050	2050
Sweden			2045

National GHG targets

Most of the Member States have also indicated quantitative national GHG targets up to 2050, but not for all required years (2030, 2040, 2050). Member States have in general increased their climate ambitions. A comparison with national GHG targets reported in 2023 shows that the overall ambition has increased for the 2030 mid-point (around 150 and 50 MtCO2-eq, for total and net GHG emission targets, respectively), but less evident updates were reported for 2040 and 2050 (see Table 2 and Table 3). In general, assessing progress against previously indicated national targets, including those

reported in their national long-term strategies submitted under Article 15 of the Governance Regulation is not straightforward, due to missing data points and different scope of the reported targets.

Table 2. National GHG emission milestones from NECPR and national long-term strategies (LTS). Excluding LULUCF, excluding international aviation.

	NECPR 2025			NECPR 2023			Difference		
Total GHG emissions (excl. LULUCF)	**Milestones / targets** (MtCO2-eq)			**Milestones / targets** (MtCO2-eq)			**Milestones / targets** (MtCO2-eq)		
	2030	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Austria	29.6			36.5			-6.8		
Belgium									
Bulgaria									
Croatia									
Cyprus	3.2								
Czechia	104.0	70.0	39.0	118.1	70.0	39.0	-14.1	0.0	0.0
Denmark									
Estonia									
Finland	28.7	14.4	7.2	28.5	14.3	7.1	0.2	0.1	0.1
France	270.0			312.2	196.6	80.9	-42.2		
Germany	441.0	150.0		439.0	150.0		2.0	0.0	
Greece	48.0	26.8	11.7	60.5	56.0		-12.5	-29.1	
Hungary	47.5	42.7	37.0	57.0			-9.5		
Ireland									
Italy				329.4					
Latvia				6.5	8.5				
Lithuania									
Luxembourg	5.6	2.1	1.4	5.5	2.2	1.7	0.1	-0.2	-0.3
Malta	1.8								
Netherlands				112.8		11.1			
Poland									
Portugal	38.9	30.3	8.6	47.6	30.3	13.0	-8.6	0.0	-4.3
Romania	83.4	58.5	40.4	118.4			-35.0		
Slovakia	28.6	19.4	15.4	33.2			-4.6		
Slovenia				13.3	7.1	2.4			
Spain	193.4			221.0	101.1	28.7	-27.6		
Sweden									

Table 3. National GHG emission milestones from NECPR and national long-term strategies (LTS). Including LULUCF, excluding international aviation.

	NECPR 2025			NECPR 2023			Difference		
Total GHG net emissions (incl. LULUCF)	**Milestones / targets** (MtCO2-eq)			**Milestones / targets** (MtCO2-eq)			**Milestones / targets** (MtCO2-eq)		
	2030	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Austria									
Belgium									
Bulgaria									
Croatia									
Cyprus	2.8								
Czechia									
Denmark	23.7		0.0	23.4			0.3		
Estonia			0.0			0.0			0.0
Finland		0.0	0.0		0.0	0.0		0.0	0.0
France				272.4	143.0	13.6			
Germany									
Greece	40.4	18.8	2.7	55.7	50.4		-15.3	-31.6	
Hungary	41.2	38.0	33.0						
Ireland	35.0		0.0						
Italy	262.0								
Latvia				3.8	7.6				
Lithuania	15.7	7.2	0.0	15.7	7.2	0.0	0.0	0.0	0.0
Luxembourg	5.2	1.6	0.7	5.1	1.8	1.0	0.1	-0.2	-0.3
Malta	1.8								
Netherlands	102.4		0.0						
Poland									
Portugal									
Romania	34.3	8.4	-10.6						
Slovakia	22.8	14.7	9.6						
Slovenia			0.0	11.0	5.2	0.1			-0.1
Spain	147.4			186.4	66.6	-8.2	-39.0		
Sweden									

The latest Member State's GHG projections from March 2025 show a gap close to 1 percentage point to the EU target, in line with the recent assessment of national climate and energy plans. **Achieving the EU target requires the EU and Member States to implement both current and additional policies and measures in full**. Projections based only on existing policies and measures continue to fall short by around 8 percentage points. Extrapolating the trend over the past five years to 2030 points to a 6 percentage-points gap. With only five years left until the interim target to climate neutrality, these

findings highlight the critical importance of close monitoring, sustained action and sufficient investment for the EU to meet the 2030 target.

Progress towards ESR targets

The Effort Sharing Regulation (ESR) covers greenhouse gas (GHG) emissions from domestic transport (excluding CO2 emissions from aviation), buildings, agriculture, small industry, and waste, which in total accounts for 66% of the EU's domestic emissions. The ESR sets binding emission reduction targets at national level for the years 2021-2030.

In 2024, based on approximated data, emissions from these sectors remain at a similar level to in 2023, which is 20% lower than in 2005. 2024 is the first year where EU level emissions are above the aggregated EU emissions limit (by 1.6%) (6). 17 Member States exceeded their 2024 ESR emission limits based on the approximated data: [Austria, Belgium, Bulgaria, Cyprus, Germany, Denmark, Estonia, Spain, Finland, France, Croatia, Ireland, Italy, Lithuania, Malta, Romania, Sweden] (7).

Progress towards LULUCF targets

The LULUCF Regulation covers greenhouse gas emissions and removals in the Land Use, Land Use Change and Forestry sector. The legislation sets binding national targets to increase net removals in the sector by -42 Mt CO2eq in 2030 compared to the 2016-18 average. GHG projections show that EU-wide LULUCF net removals would fall short by 40-55 Mt CO2eq compared to the target. For a more detailed assessment on the EU and Member States progress towards the LULUCF target, refer to the Climate Action Progress Report 2025 and its accompanying technical annex.

2.1.2 Climate adaptation

Climate change is increasingly and recurringly affecting Europte. The urgency of climate change mitigation and adaptation action is pressing and impacts all sectors of society, including energy. The 2025 State of the European Union speech underlines the need to radically step up European efforts into climate resilience and adaptation To strenghten European efforts, the Commission will work on an ambitious European Climate Adaptation Plan to support Member States on preparedness and planning and ensure regular science-based risk assessments, and develop an ambitious **integrated framework for European climate resilience8**, planned to be adopted during the second half of 2026.

Currently, the Regulation requires Member States to include adaptation goals, into their National Energy and Climate Plans, as appropriate, to support the achievement of the Energy Union objectives. At the same time, Member States report on national adaptation policies under Article 19 of the Governance Regulations. These two parallel reporting processes on adaptation under the Governance Regulation, each with its own scope, has been a source of confusion.The below summary is based solely on Article 17 reporting, provides only a partial overview of actual progress on adaptation.

The current reporting round underlines the need for improved clarity, clearer guidance and a more harmonized approach. While all countries submitted their reports, the quality of data varies. In many

[6] Current GHG projections indicate that EU-wide ESR emissions will be around 38% lower than in 2005, whereas the target is to reduce them by 40% compared to 205 levels. For a more detailed assessment on the EU and Member States progress in cutting emission, refer to the Climate Action Progress Report 2025 and its accompanying technical annex.

[7] The final ESR emissions for 2021-2025 will only be determined after a comprehensive review of the emission inventory data in 2027. The Commission will then check Member State's compliance with the emissions limits applicable to each of the years 2021 to 2025. If the 2024 approximated emissions are confirmed, these 17 Member States will need to use flexibilities to comply with their annual target.

[8] European Climate Resilience and Risk Management – Integrated Framework - Climate Action

cases, the level of detail provided is limited, making it difficult to evaluate the progress made towards the adaptation goals set in the NECP context.

Risk of potential future impacts

All together 12 Member States report heatwaves (hot spells), drought, extreme weather with stronger storms, and an increased precipitation (Croatia, Denmark, EstoniaM). They decribe climate change impacts on agriculture and forestry, and the challenges in carbon capture and sequestration in forest, land and agriculture ecosystems. Six Member States (Austria, Cyprus, Czechia, Estonia, Lithuania and Portugal) expect changes in the energy demand, decrease heating and increased cooling needs due to climate change and climate vulnerability. Climate change poses a potential threat to business continuity and supply chains (reported by Germany, Slovakia and Sweden). Additionally, six Member States (Cyprus, France, Greece, Italy, Portugal and Spain) warn that forest carbon sinks might become a potential emitter or negatively effect emission by the end of the century due to new fire territories or further degradation and reduction/shrinking of carbon sinks for instance.

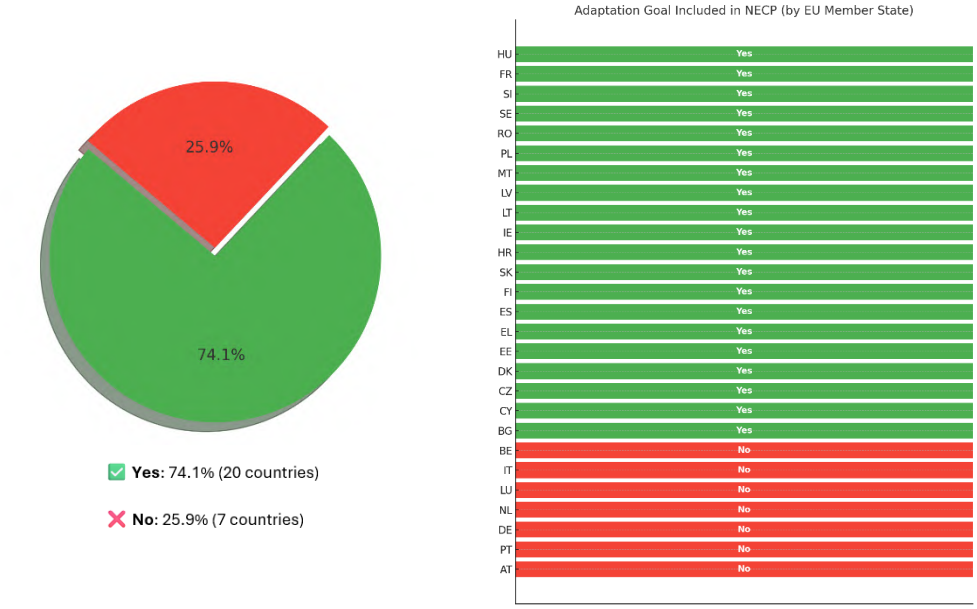
Vulnerabilities, including adaptive capacities

When it comes to vulnerabilities and adaptive, 12 Member States report direct effects of climate change due to extreme weather events, floods, heatwaves or drought affecting energy system demand and supply (Austria, Cyprus, Estonia, France, Hungary, Italy, Latvia, Luxembourg, Poland, Portugal, Romania and Slovakia). In addition, they report reduced energy production, for instance, hydropower (Croatia), lignite power plant (Greece) or nuclear power (Germany, Slovakia) and shortage of cooling water. A decrease in agriculture and forestry production and carbon sequestration combined with negative climate impacts on the amount of biomass available for energy production is reported (Czechia, France, Greece and Spain). Member Stats also report challenges in forest management and limits for biomass production for energy production due to climate change impacts (Finland, France and Lithuania).

Adaptation goals

Several Member States refer to their national adaptation strategies or plans in general terms, highlighting overarching goals or listing key sectors. Germany and the Netherlands explicitly state no relevance or no reporting under the *Decarbonisation* dimension with the justification that no adaptation goals relevant to the Energy Union dimensions were defined in their NECP (Figure 2).

Figure 2. Reported adaptation goals in NECPs.



There are two main approaches across Member States: some refer broadly to adaptation documents and overarching goals, while others provide a more detailed listing of sectors and present, sectoral goals relevant for the Energy Union, based on their national assessments or strategies. Member States list sectors such as energy sector, urban environment and buildings, water management, coastal protection, nature and biodiversity, circular economy, disaster risk management and reduction of economic losses. The reports also mention several key adaptation related principles (the importance of avoiding maladaptation, synergies between mitigation and adaptation, integration of climate risk considerations into mitigation planning, role of ecosystems as carbon sinks, the principle of prevention), reflecting the need to ensure coherence between adaptation and mitigation.

Adaptation goals were not systematically integrated into the updated NECPs and are rarely considered for all five dimensions of the Energy Union. Most Member States report climate adaptation as a separate issue from climate mitigation or energy sectors. However, some Member States recognize areas of synergies, signalling that future NECPs could better highlight such co-benefits.

Progress of implementation towards meeting the adaptation goals

When it comes to progress of implementation towards meeting the adaptation goals, the reporting reveals considerable variation in the data quality, availability and maturity of assessments. Several Member States (Belgium, Czechia, Denmark, Germany, Greece, Croatia, Latvia, the Netherlands, Romania, Sweden) either did not report concrete progress towards their adaptation goals or stated that progress assessments are under way, with results not yet available. In some cases, limited progress reporting is linked to missing adaptation goals in NECPs (Denmark, Germany, the Netherlands). In other cases (Croatia, Romania) Member States are yet to establish thorough methodology or systems to monitor and evaluate the implementation of the NECPs, or national adaptation policies. Some Member States (Belgium, Czechia, Latvia) noted that progress assessments are still under development or expected soon.

Several Member States (Bulgaria, Cyprus, Estonia, Hungary, Ireland, Italy, Lithuania Spain and Portugal) referred to the implementation of national adaptation policies as evidence of progress. In these cases, Member States state that implementation of adaptation measures is underway, or that established structures are in place or being set up to monitor progress towards adaptation goals. While such references suggest the existence of policy commitment to climate adaptation, their reports often lack detail on the effectiveness or outcomes of efforts. Most Member States reported ongoing activities, implementation of projects or establishment of institutional processes expected to contribute to progress on achieving adaptation goals, even if these are not presented as formal progress assessments.

2.1.3 Renewable energy

2.1.3.1 Overall renewable share

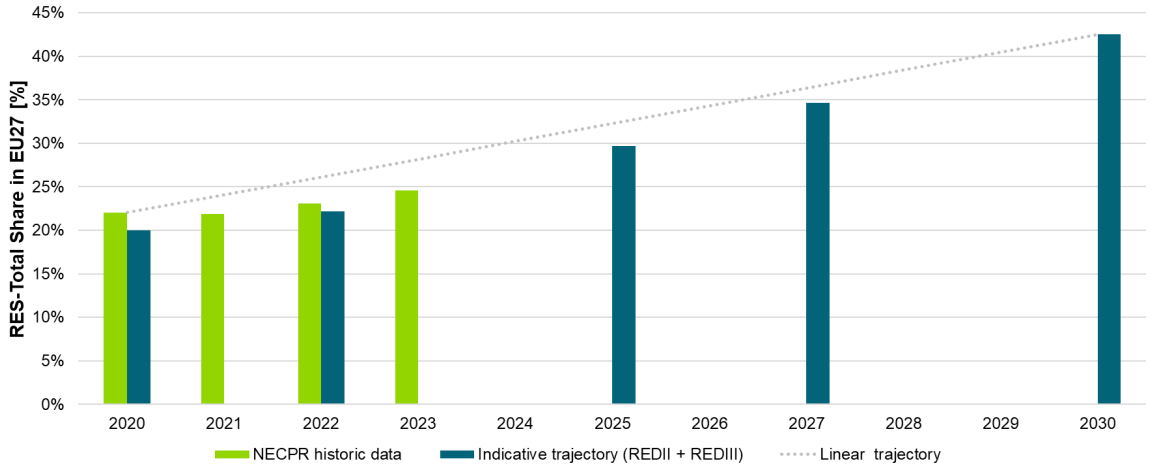
In 2023, the EU reached a **RES share of 24.6% of final energy consumption,** which is a 1.5 percentage point increase compared to 2022. The EU's RES volumes increased each year from 2020 (209.5 Mtoe) to 2023 (234.6 Mtoe). In comparison, the EU's total final energy consumption (including the aviation adjustment) declined. The drop in total consumption can be attributed to a decrease in the total electricity consumption and total consumption of heating and cooling. On the contrary, total energy consumption in the transport sector strongly increased during that period. RES consumption increased in all sectors (in absolute values and in percentages), although the RES consumption in heating and cooling showed the lowest increase.

Figure 3 shows the actual RES share of the EU from 2020 to 2023 (green bars) compared to two trajectories towards 2030, the indicative trajectory (blue bars) and the linear trajectory (dotted, grey line). The actual RES share of 2023 falls between the reference points for 2022 and 2025 of the indicative trajectory. In absence of a benchmark for 2023, the RES share can be compared to the reference point of 2022. This comparison shows that the **EU RES share of 2023 was above the required share of 22.2% of the reference point, i.e., the EU RES progress is in line with the 2022 reference point.**

Looking ahead, the next reference point is set for the year 2025, at which point the EU must have realized 43% of the required efforts between 2020 and 2030. This amounts to a required RES share of 29.7% in 2025. This comparison shows a gap of 5.1 percentage points between actual progress in 2023 and the reference point.

In lieu of a direct comparator of the indicative trajectory for progress in 2023, a linear trajectory between the reference points of 2022 and 2025 can be applied. In this comparison, the reported RES share of 24.6% is very close to the linearly extrapolated RES share of 24.7% in 2023. However, the linear trajectory should only be used as a supporting indicator as it neither reflects on a legally binding obligation nor follows the targeted trajectories of Member States. Moreover, the reference points for 2022, 2025 and 2027 have not been set with a linear trajectory in mind but with a stronger increase towards the end of the decade.

Figure 3. Actual progress of RES shares in the final energy consumption and projected trajectory towards 2030.



Sources: elaboration on Eurostat SHARES and Governance Regulation

Shifting the focus to the MS level, Figure 4 visualises the realized total RES shares on the MS-level in 2023 and compares the shares to the indicative trajectory defined in the REDII (2022 reference points)[9]. In 2023, the vast majority of Member States (24) exceeded their the 2022 reference point, with Sweden, Estonia, Finland, Denmark and Cyprus surpassing their 2022 reference points by 5 to 15 percentage points.

Considering both national consumption and currently notified statistical transfers, **in 2023** two **Member States had a renewable energy share still below their 2020 binding renewable energy target under the original Renewable Energy Directive: France and Ireland, both 0.7 percentage points lower than the baseline 2020 target.** Consequently, these Member States had to take additional measures to cover the gap within the next year. Moreover in 2023, three Member States, France, Ireland and Slovenia, **had a renewable energy share still below their reference point for the year 2022**[10]. These Member States are expected to outline how they intend to close the gap in their next integrated progress report. Conversely, three Member States (Sweden, Denmark and Finland) have already achieved the reference point for 2025 in 2023.

For the 9 Member States that were below their 2022 reference point for renewables[11], the information provided on how they will close the gap compared to their national reference points.

France provided limited explanations for missing the reference points, mentioning the fact that the targets were ambitious, as well as issues related to lengthy administrative procedures of projects. It notes that it has taken several actions to make up for the delay, notably the 2020 law on the acceleration and simplification of public action, and the 2023 law on the acceleration of renewable

[9] The 2022 reference points have been assessed under REDII, the indicative trajectory uses the REDII until 2022 after which the targets of the REDIII are used.

1. [10] Ireland (falling short by 4 pp), France (2.5 pp) and Slovenia (0.3 pp). Reference point as set in Article 4 of the Governance Regulation based on the previously EU-level target before the entry into force of the revised Renewable Energy Directive.

[11] As reported in the 2024 State of the Energy Union Report.

energy production, as well as a new obligation to accelerate the deployment of biomethane. However, it failed to provide quantified estimates of the additional impact of these actions and how they are expected to contribute to closing the gap. Important additional action is needed to reach future reference points.

Ireland provided detailed analyses of the slow increase of renewable shares, including slow growth in wind capacity between 2020 and 2023, and high electricity demand increases. It provided additional information on additional measures in electricity, transport and heating and cooling, with quantified elements for 2025 and 2030, including additional wind and PV capacity, the uptake of heat pumps and energy efficiency measures in the transport and building sectors. However, it does not explicitly specify when it expects to close the gap to the 2022 reference point, and significant acceleration is required to meet future reference points.

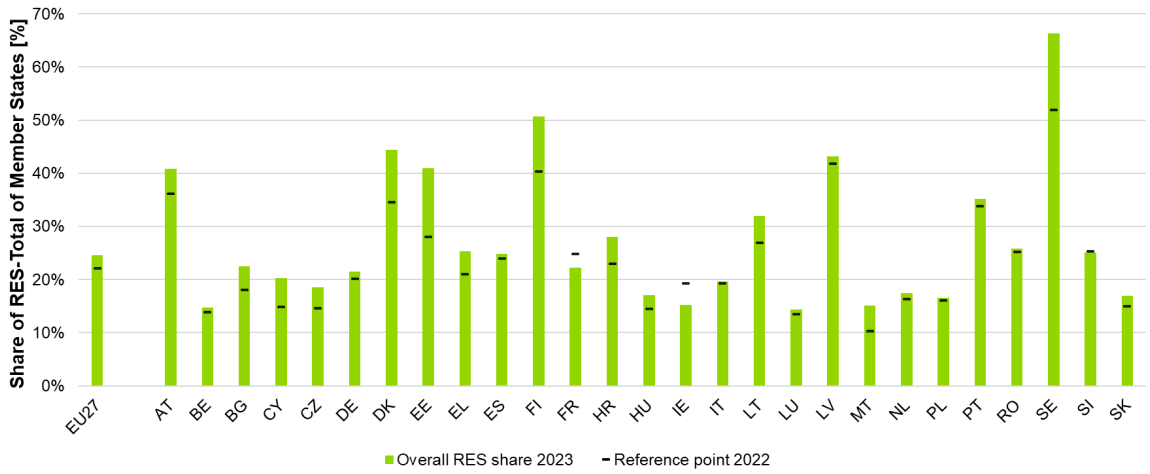
Slovenia provided unclear information on measures taken or planned to close the gap compared to the reference points. Slovenia highlighted their relative minor gap in its overall renewable share and made a general reference to the measures included in its updated NECP. The updated NECP includes new renewable energy measures, such as the promotion of geothermal energy, small hydropower and increased use of renewable energy in buildings. It is unclear however if and to which extent these additional measures will help closing the gap.

Italy, Spain and the Netherlands, which fell short on their 2022 reference point, but have since reached the reference point, have provided varying detail on how they intend to close the gap, for example by referring to the updated NECP, but emphasizing that it is difficult to compare reference points towards the old and new 2030 targets, and the non-linear development of renewable energy shares.

Austria, which in 2022 fell short on its 2020 baseline and its 2022 reference point, **Belgium** and **Romania** which fell short on their 2022 reference point, but which all three have since reached the reference point, did not outline how they they intend to close the gap.

Progress will need to accelerate to meet the upcoming reference point in 2025 which will be assessed under the more ambitious target framework of REDIII. The Commission will support and closely monitor the implementation of the final plans with the Member States, in particular those that have not yet reached their 2022 reference point, and will assess if further measures are needed to ensure the collective achievement of the renewable energy target, including the aspirational target of 45%, are necessary.

Figure 4. Total RES share of Member States in 2023 compared to 2022 reference point.



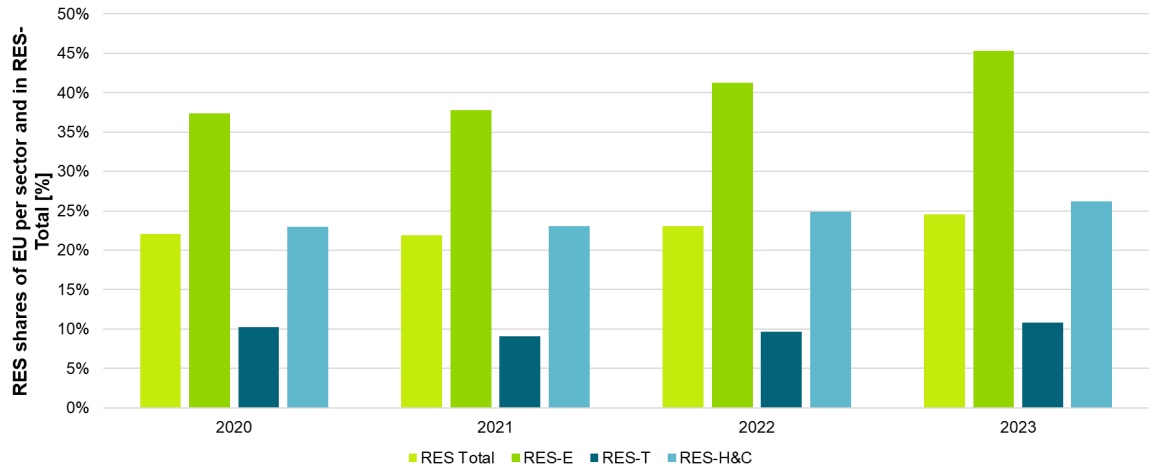
Sources: elaboration on Eurostat SHARES and Governance Regulation

Figure 5 visualises the actual RES shares across all sectors and per sectors between 2020 and 2023. The sectoral RES shares are reported for the sectors of electricity (RES-E), transport (RES-T) and heating and cooling (RES-H&C). The **share of RES-E is highest** compared to RES-T and RES-H&C, **reaching 45% in 2023**. In addition, the share of RES-E demonstrates the steepest increase (7.5 percentage points) from 2020 to 2023. This increase can be attributed to the addition of renewable energy capacities in Member States, as well as the decrease of electricity consumed from 2020 to 2023.

The **RES-T share is the lowest of all sectors with 10.8%** in 2023. RES-T increased only marginally by 0.5 percentage points since 2020. The small increase in the percentage share is affected by the rising total energy demand in the sector. Although the RES demand increased by 18% between 2020-2023, the total energy demand increased at the same time by 12%. Increases in total demand reduce the positive effect of RES demand increases in RES-T.

The **RES-H&C share increased moderately to 26.2%** of final energy consumed in the heating and cooling sector in 2023, compared to a share of 23% in 2020.

Figure 5 Historic renewable share of EU27 (Total and per sector).



Source: Eurostat SHARES

In order to meet the RES target trajectories laid out in NECPs, Member States may count statistical transfers to their target volumes of RES in their progress reporting. Compared to 2020-2022, the number of statistical transfers used by Member States has significantly fallen in 2023 (see Table 4). In 2023, Belgium, Germany and Luxembourg reported adding statistical transfers from Member States. In 2023, only Denmark reported deducting statistical transfers from its RES share. The total volume of statistical transfers (in GWh) has decreased from 4,527 GWh in 2020 to 1,534 GWh in 2023.

Table 4. Statistical transfers aggregated on EU level.

EU27	2020	2021	2022	2023
Statistical transfers to be added (GWh)	4,527	3,555	3,119	1,534
Statistical transfers to be deducted (GWh)	18,890[12]	3,554	3,119	1,534

Source: Eurostat SHARES

2.1.3.2 RES-Electricity

The RES-E share in the EU has increased from 37.4% in 2020 to 45.3% in 2023.

Progress in the RES-E share can only be compared to trajectories at MS level since the EU has no sector-specific RES-E trajectory or 2030 target. Member States are not obliged to contribute a specific share to the EU RES-E but most set target trajectories for electricity from RES in their NECPs, which can be used to assess progress.

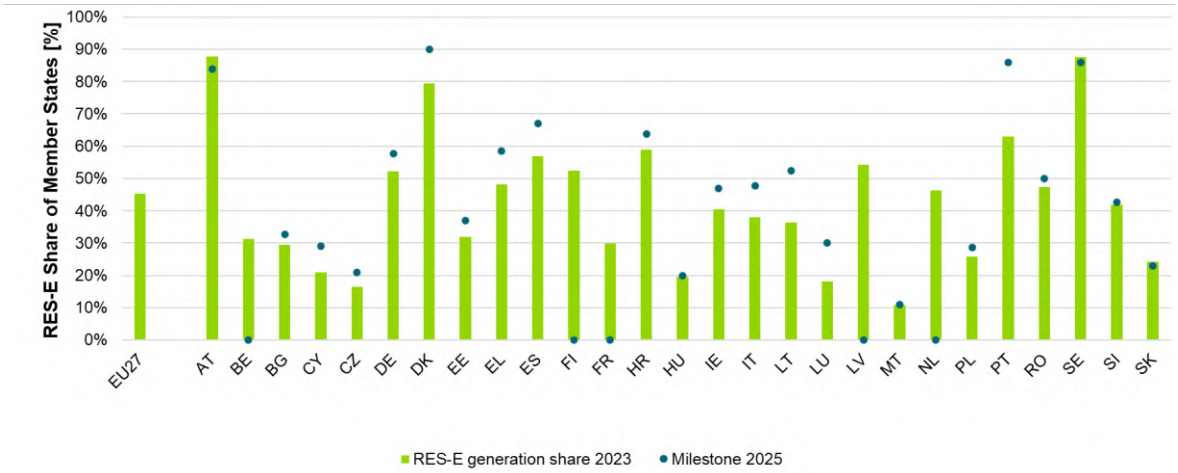
Figure 6 shows RES-E shares in 2023 (green bar) against 2025 reference points (blue dot). Many Member States are on track for their 2025 NECP trajectories; Austria and Sweden have already reached their 2025 milestones. Highest shares in 2023: Austria (87.8%), Sweden (87.5%), Denmark (79.4%), Portugal (63%), Croatia (58.8%). Lowest shares: Malta (10.7%), Czechia (16.4%), Luxembourg (18%), Hungary (19.5%), Cyprus (20.9%).

12 The aggregated values for the EU are derived from the sum of all statistical transfers to be added and deducted by Member States reported in the Eurostat SHARES database. In the year 2020, the sum of all EU Member States differs from the reported value for the EU. The Eurostat database reports values for the EU which amount to 22,212 GWh of statistical transfers to be added in 2020 and 24,856 GWh of statistical transfers to be deducted in 2020. The mismatch is caused by differences between reported values of Member States in the Eurostat SHARES database and Eurostat database (ktoe vs. GWh).

Largest increases 2021–2023: Lithuania (+15 pp), Austria (+14 pp), Netherlands (+13 pp). Smallest increases: Czechia and Slovakia (+2 pp each) and Malta (+1 pp).

Generation by different renewable technologies will be assessed in section 2.1.3.6.

Figure 6. RES-E Share of Member States in 2023 compared to the NECP milestone in 2025.



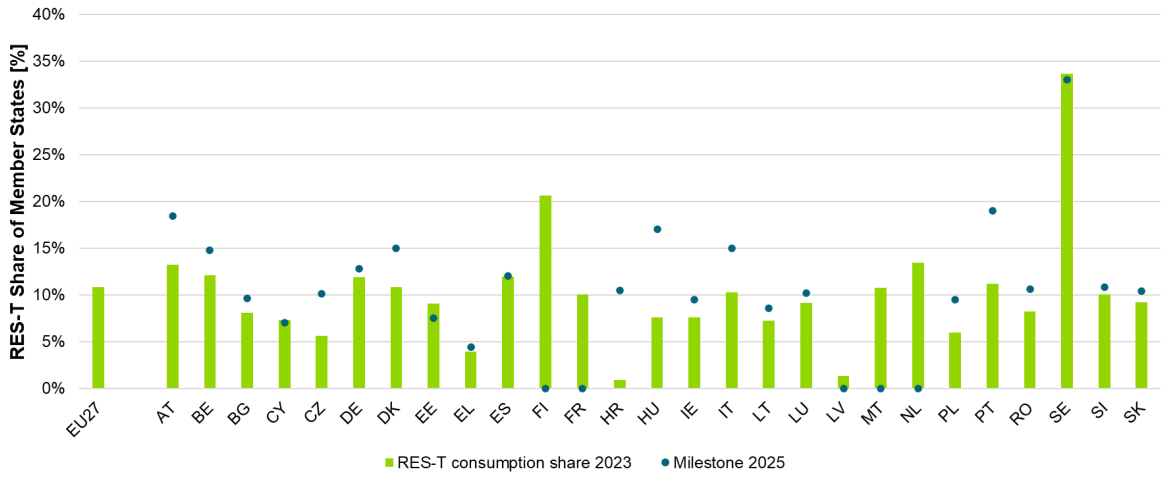
Sources: elaboration on Eurostat SHARES and Governance Regulation

2.1.3.3 RES-Transport

RED does not set a trajectory for the EU RES-T share but Article 25 establishes targets for all Member States. According to Article 25(1a)(i), Member States must reach a 29% RES-T share by 2030, with an opt-out possible if they achieve at least a 14.5% greenhouse gas intensity reduction. Member States must also meet sub-sectoral targets for specific energy carriers (advanced biofuels, RFNBOs), but these are out of scope here. The EU RES-T share rose from 10.3% in 2020 to 10.8% in 2023. Shares fell below 2020 levels in 2021 (9.1%) and 2022 (9.6%), but compared to 2021 the 2023 share is +1.7 percentage points.

Figure 7 shows RES-T shares at MS level in 2023: green bars = actual share, blue dots = NECP milestones. The largest increases 2021–2023 were in Sweden (+5 pp), Netherlands (+4 pp) and Germany (+4 pp). Seven Member States reported decreases: Greece, Slovenia, Romania (all <1 pp), Czechia (–1.1 pp), Estonia (–2.1 pp), Latvia (–5.1 pp) and Croatia (–6.1 pp).

Figure 7. RES-T Share Member States in 2023 compared to the NECP milestone in 2025.



Sources: elaboration on Eurostat SHARES and Governance Regulation

2.1.3.4 RES-Heating & Cooling

RED does not set an EU-level RES-H&C share or trajectory. Instead, Article 23 RED establishes sectoral targets as average annual increases per Member State. Between 2021–2025, Member States must achieve at least +0.8 percentage points per year; for 2026–2030, the minimum is +1.1 percentage points (Article 23(1)). Member States with RES-H&C shares above 60% are deemed compliant, without needing to meet the predefined increases (Article 23(2b)).

The EU RES-H&C share rose by 3.2 percentage points between 2021–2023, from 23% to 26.2%, in line with the +0.8 pp requirement for 2021–2025 and the +1.1 pp requirement for 2026–2030 under Article 23(1) of Directive (EU) 2018/2021.

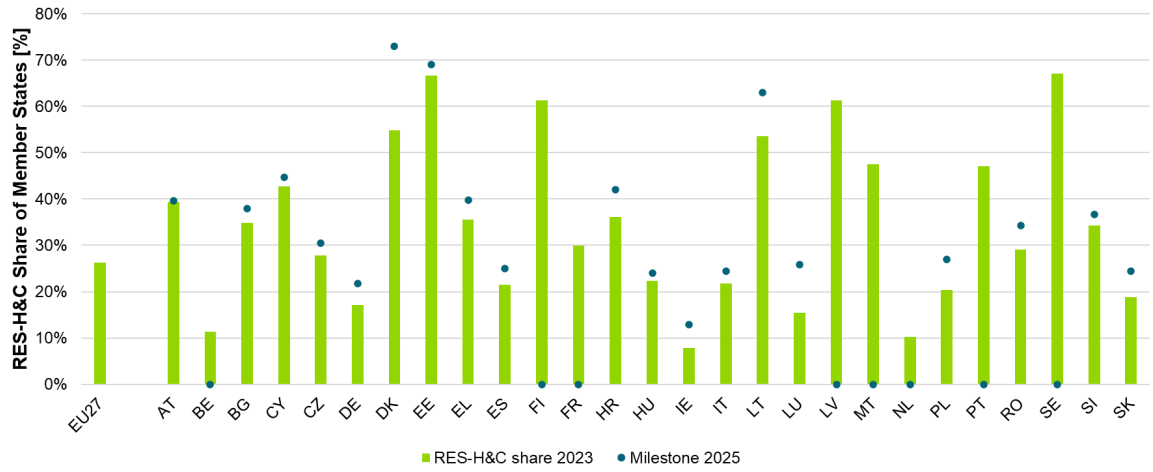
Figure 8 shows RES-H&C shares at MS level: green bars = actual 2023 shares; blue dots = NECP milestones (where available). Highest shares in 2023: Sweden (67.1%), Estonia (66.7%), Latvia (61.4%). Lowest: Ireland (7.9%), Netherlands (10.2%), Belgium (11.3%).

Largest increases 2021–2023: Malta (+14.9 pp), Finland (+9.2 pp), Austria (+6 pp). Decreases: Poland, Slovakia, Slovenia (<1 pp), Sweden (–1.5 pp), Croatia (–1.8 pp, largest).

In volumes, Bulgaria, Croatia, Poland and Slovenia reported decreases in 2023 vs. 2020. Croatia linked this to biomass use (≈90% of RES-H&C): stricter REDIII standards, mild winters (lower residential biomass demand), and energy efficiency measures reduced counted volumes. Croatia plans to accelerate deployment of advanced RES technologies and district heating. Slovenia and Poland also reported lower solid biofuel/biomass use; Slovenia attributed this to mild winters, efficiency measures, and switch in renewables (substituting old biomass boilers with heat pumps, lowering wood use). Such a switch in RES can thus reduce the share of RES-H&C despite positive effects on emissions.

In all other Member States, RES-H&C change ranged from 0 to +5 pp between 2021–2023.

Figure 8. RES-H&C share of Member States in 2023 compared to the NECP milestone in 2025.



Sources: elaboration on Eurostat SHARES and Governance Regulation

2.1.3.5 Further Assessment: Progress on additional reporting elements on renewable energy

The further assessment of additional reporting elements on renewable energy focuses on more heterogeneous aspects. These may not be directly related to the 2030 targets but focus on the progress on other elements mentioned in the RED and where available to trajectories of Member States.

2.1.3.6 Analysis of technology trajectories for RES-E

Figure 9 visualises the electricity generated in GWh by renewable energy technologies in 2023 in the EU. The technologies presented in the figure include wind onshore, wind offshore, biofuels (excluding biogas) and solar PV.

Compared to the total energy consumption of the electricity sector, electricity generation from wind onshore makes up 15%. The second-largest share is generated by solar PV, taking up 9% in the EU's final energy consumed. The electricity generation from biomass contributes 3% of the energy consumed.

Wind onshore and wind offshore

On the MS level, Germany reports the largest energy volumes generated by wind onshore and offshore with 137 TWh. That comprises 26% of the total wind-based electricity generation in the EU. Spain and France follow in second and third place, reporting 67 TWh in Spain (16%) and 48 TWh in France (11%).

Solar PV

Comparing the electricity generated from solar-PV per MS to the total solar-PV-based electricity generation in the EU, Germany leads with 26% (63 TWh), followed by Spain at 18% (43 TWh) and Italy at 12% (30 TWh).

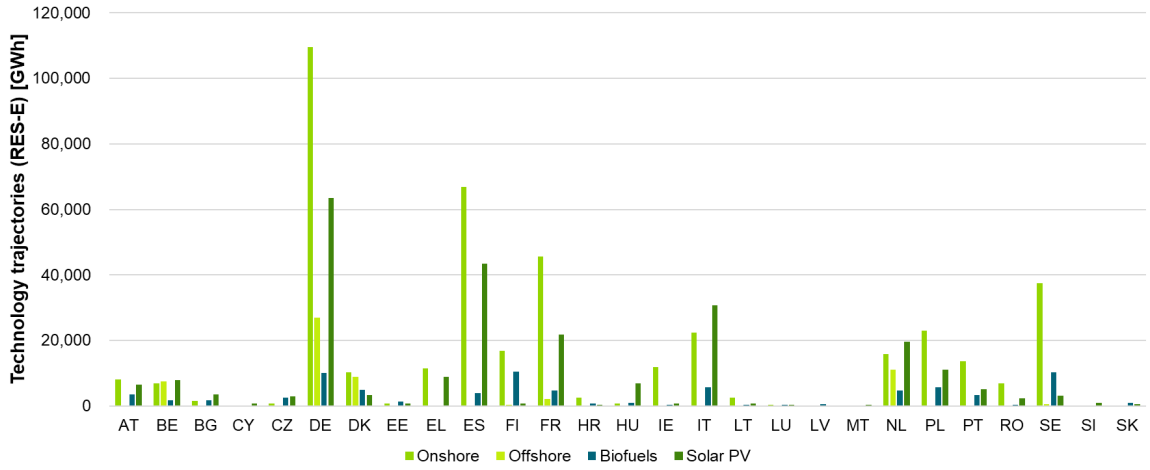
Biofuels

The largest volumes of electricity generated from biofuels are reported in Finland (10.5 TWh, or 13% of total electricity generated from biofuels in the EU) and Sweden (10.2 TWh, 12.9%), followed by Germany (10 TWh, or 12.7%).

Qualitative analysis

Eight Member States indicated a positive impact of the evolution of gross electricity generation on their RES trajectories, citing unexpectedly strong increases of capacity of renewable technologies.[13] For seven Member States, the provided information remained unclear as to the impact on the target trajectories.[14] Five Member States[15] reported no impacts while three Member States reported a negative impact (Ireland, France, Denmark). Member States attributed the negative impacts to rising electricity consumption. For example, Ireland underlined that the demand of data may balance out the positive effects of the deployment of RES capacities for electricity generation. France saw a similar risk in the effects of electrification. Denmark explained a potential negative evolution caused by two unsuccessful tenders for wind offshore capacities. The added capacity would have started operations in 2029-2030 so that a delay may affect the overall trajectories.

Figure 9. Electricity generation of Member States in 2023 per technology [GWh].



Source: Eurostat SHARES

2.1.3.7 Analysis of technology trajectories for RES-T

Figure 10 visualises the use of renewable energy in the EU's transport sector in 2023. The fuels presented in the figure include electricity consumed and the aggregated volumes of all compliant biofuels in transport.

Biofuels

Figure 10 shows biofuels as the most significant source of RES-T in 2023 in the EU, with 44 Mtoe of compliant biofuels consumed. This is seven times as high as the electricity (6 Mtoe) consumed and counted towards RES-T.

France reports the largest renewable biofuels consumption in transport at 3.2 Mtoe. This is 18% of total renewable biofuels consumed in the EU. Germany reports the second highest consumption at 3 Mtoe consumed (16.8% of EU total), followed by Spain at 1.9 Mtoe consumed (10.7%) (see Figure).

[13] Positive impact of evolution of gross final electricity generation: Lithuania, Poland, Spain, Croatia, Sweden, Bulgaria, Romania, Austria.
[14] Unclear impact of evolution of gross final electricity generation: Belgium, Germany, Latvia, Slovenia, Czechia, Italy, Cyprus.
[15] Neutral impact of evolution of gross final electricity generation: Finland, Estonia, the Netherlands, Hungary, Luxembourg.

Comparing the energy volumes reported by Member States to their individual demand in transport in 2023, the highest shares of biofuels were reported by Sweden (22.9%) and Finland (14.8%). [16]

Transport is among the highest emitters of greenhouse gases, necessitating targeted efforts to reduce emissions through advancements in alternative fuels and sustainable energy solutions specifically in aviation and maritime sectors. In transport, renewable energy was mainly supplied by biofuels (44 Mtoe), outweighing electricity (6 Mtoe).

Biofuels usage in the transport sector is expected to rise significantly from 2025 onwards, considering specific legal obligations stemming from initiatives connected to the Fit for 55 Package.

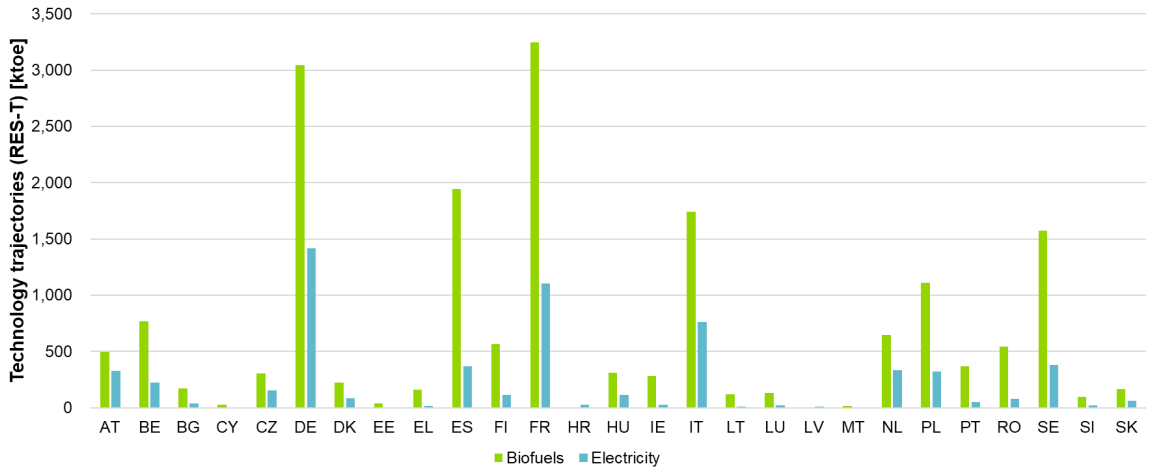
To meet the aviation decarbonisation climate targets set by the ReFuelEU Aviation framework, Europe must prepare to produce/import 3Mtoe of Sustainable Aviation Fuel (SAF), including 600 thousand tons of e-SAF, by 2030, with projected increases to 35 million tons of SAF, including 17 million tons of e-SAF, by 2050. For the maritime sector, to meet the targets of the Fuel EU Maritime, the EU will need to produce/import of Sustainable Maritime Fuel (SMF), including 600 thousand tons of e-SMF, by 2035, with projected increases to 33 million tons of bio-SMF, on top of 32 million tons of e-SMF, by 2050.

These targets will create a high demand for the usage of both biofuels and RFNBO-derived fuels, in the upcoming years.

Electricity

Regarding the use of electricity in transport, Germany reported the largest absolute value of 1.4 Mtoe. This encompasses 23.4% of the total electricity use in transport in the EU. France indicated the second highest value of 1.1 Mtoe (18.2%) and Italy ranked third at a reported electricity use of 0.7 Mtoe (12.5%) (see Figure 10). Looking at the share of electricity use in total transport consumption of the MS, Sweden and Austria took the lead with 5.3% and 4.3%, respectively.[17]

Figure 10. Biofuels and total electricity use in transport in 2023 [ktoe].



Source: Eurostat SHARES

[16] Note: For this comparison, multipliers were not added to the energy volumes reported.
[17] Note: For this comparison, multipliers were not added to the energy volumes reported.

In the NECPR, Member States were asked to report relevant information if the RES trajectories were affected by the evolution of energy consumption in the transport sector.[18]

Two Member States indicated an evolution which positively affects the target trajectories: Ireland and Luxembourg. Ireland included a comprehensive analysis of the status quo and expects to meet the target trajectory despite the current progress level which is below the 2020 RES-T share. Luxembourg expects a positive effect on the target trajectory levels by the electrification efforts and the addition of biofuels in parallel to a decrease in the final energy consumption of the sector. In three cases, the reported evolution of the transport sector can be classified as having a negative effect on the target trajectories. Slovenia and Croatia are noting a rise in the total energy consumption of the sector, which negatively affects the RES-T share if the rising demand is not based on electification from renewables. Latvia further reported on the negative impact of the removal of mandatory blending for fuel suppliers in an effort to reduce fuel prices for consumers. The decrease in blending of fossil-based fuels led to noticeably lower RES volumes in transport. The blending obligation has since been re-instigated. Apart from these effects, eight Member States[19] For Seven Member States it could not be determined.[20]

2.1.3.8 Analysis of technology trajectories for RES-H&C

Figure 11 visualises the reported energy volumes produced by renewable energy technologies in heating and cooling per MS in 2023 (gross heat production). The technologies presented in the figure include biomass[21], heat pumps and solar thermal energy.

Biomass

In terms of energy volumes of biomass used for heat, Sweden leads with 18.7% of the total sum of biomass used for heat in the EU with 2.9 Mtoe, followed by Finland which makes up a share of 14.9% (2.3 Mtoe) and Denmark (13.4%, or 2.1 Mtoe). Graph B in Figure 11 shows the final consumption of sustainable biomass in the heating and cooling sector per MSs in 2023. In contrast to Graph A, which considers gross production of heat, Graph B portrays final energy consumption. In terms of final energy consumption, Germany used the most biomass in 2023 making up 16.1% (11.5 Mtoe) of the total amount of biomass in the final energy consumption in the EU. Germany was followed by France with 13.2% (9.4 Mtoe) and Italy with 9.3% (6.6 Mtoe).

Heat pumps

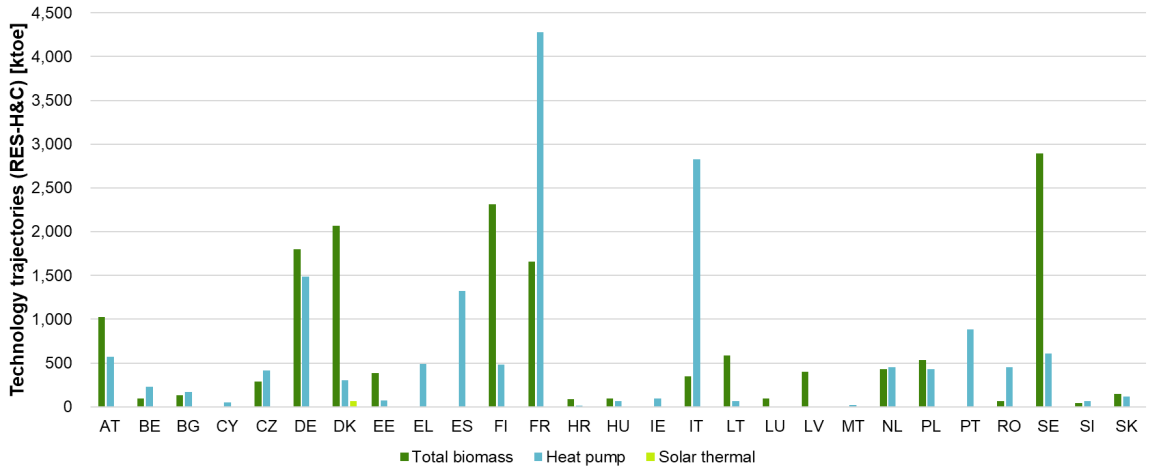
The leading MS in the use of energy from heat pumps for heating and cooling is France, making up a share of 26.8% of the total energy volumes reported by Member States with 4.3 Mtoe. The second and third largest energy use from heat pumps can be attributed to Italy, with a share of 17.7%, or 2.8 Mtoe) and Denmark (9.3%, or 1.5 Mtoe).

[18] The wording of the reporting field assessed in this section is: „"Relevant information, in case the evolution of final energy consumption for transport has an impact on the overall and sectoral trajectories for renewable energy from 2021 to 2030."
[19] Neutral impact of the evolution of consumption in the transport sector: Finland, Lithuania, Poland, Czechia, Hungary, Italy, Cyprus and Bulgaria.
[20] Unclear impact of the evolution of consumption in the transport sector: Estonia, Belgium, Germany, France, Netherlands, Spain and Denmark.
[21] The total biomass volume is a sum of municipal waste, solid biofuels, pure biogas, biogas blended in the grid, pure bioliquids and blended bioliquids.

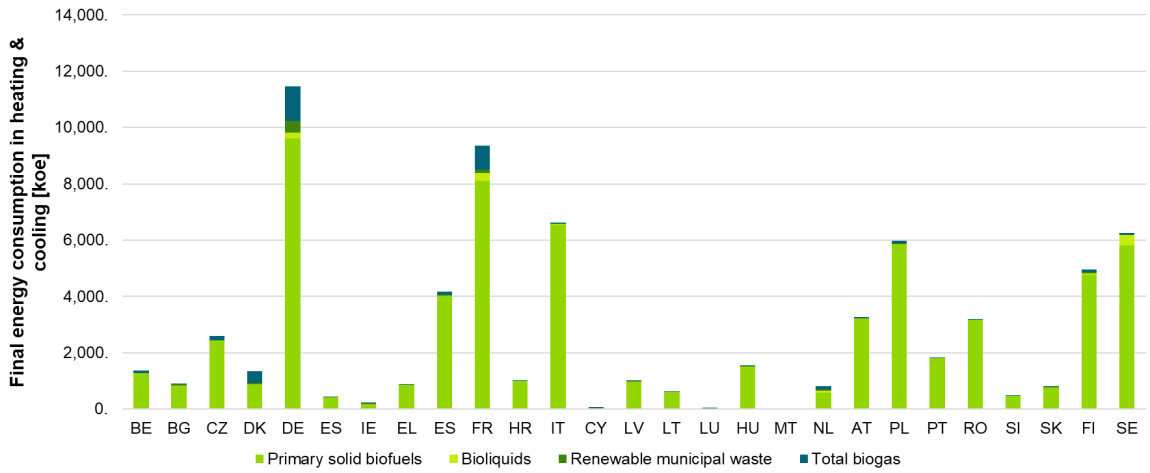
Solar thermal

Finally, the use of solar thermal for heat purposes plays a relatively marginal role compared to biomass and heat pumps. The large majority of the total energy volumes reported from solar thermal energy for the use in the heating and cooling sector is reported by Denmark. The MS reports the use of 0.062 Mtoe which comprises a 90% share of the entire reported energy volumes of Member States. However, it should be noted that Austria, Denmark, Estonia, Italy, Latvia and Slovakia are the only Member States which reported any energy volumes for the use of solar thermal energy.

Figure 11. Graph A: Gross production of heat from renewable energy technologies in heating and cooling per MS in ktoe.



Graph B: Final energy consumption of biomass used for heating and cooling.



Sources: Source: Eurostat SHARES and **Eurostat [nrg_ind_urhcd]**

In the NECPR, Member States indicated whether the evolution of the RES shares in H&C have any impact on the target trajectories of the sectoral targets or the overall RES target.[22]

Eight of the Member States' responses were classified as a positive impact on the target trajectories from the RES H&C evolution.[23] Estonia reported having already met the target (i.e., exceeding the target trajectory, while others remarked on the positive effect on the RES-H&C share caused by unexpected decreases in the total demand of H&C (Lithuania, Ireland, Latvia and Bulgaria). Five Member States' responses[24] confirmed not expecting any impact on reaching the target trajectories while four responses[25] remarked on impacts. The gaps to the target trajectories were largely attributed to lower actual RES-H&C consumption than expected, some of which was linked to warm winters which reduces the biomass-based heat demand in the residential sector while the largely fossil-based industrial heating and cooling processes remain mostly unaffected (Latvia). In six cases, the MS input did not provide sufficient details to ascertain a positive or negative impact.[26]

2.1.3.9 Other national trajectories and objectives

11 Member States reported additional national targets and in some cases, trajectories which are monitored, aimed at increasing the share of energy from renewable sources.[27] In general, the national targets focus on specific sections of the renewable energy production (e.g., prosumers, or energy communities) or of the use of renewable energy (e.g., in transport or in the heating and cooling sector), incentivising increases by setting caps, or minimum shares of renewables to be achieved.

Seven Member States listed a renewable energy use in district heating. [28] The reported progress of Member States with a district heating target was mainly positive, only Germany did not achieve its annual increase rate of 2.2 percentage points, reporting an increase of 0.8 percentage points and Croatia reported a very minor increase. Further, France, Croatia, Hungary and Latvia reported on a target on renewable energy use in buildings. France has already met its target value for 2028 (heat pump use in buildings) and Latvia has achieved 96% of the targeted share of renewable energy in buildings. Hungary and Croatia are both progressing more slowly towards their targets.

Next, Italy and Hungary indicated their aim to incentivise the installation of renewable energy capacities of energy communities. Lithuania and Hungary both reported on their target of increasing the number of prosumers using renewable energy by 2030. In the case of Lithuania, the number of prosumers has almost doubled from 2022 to 2023 while Hungary shows positive progress, albeit not to such a degree. Italy and Hungary both reported relatively marginal increases of their respective progress towards the target for energy communities. Hungary also reported positive progress towards its target of energy recovered from sewage sludge. Spain clarified that its other national targets refer to the transport sector and the use of biofuels. It described a comprehensive system of guarantees of

[22] The wording of the reporting field assessed in this section is: „Relevant information, in case the evolution of final energy consumption for heating and cooling has an impact on the overall and sectoral trajectories for renewable energy from 2021 to 2030"
[23] Positive impacts assessed for: Lithuania, Estonia, Ireland, Latvia, Netherlands, Luxembourg, Malta and Bulgaria.
[24] Neutral impact assessed for: Finland, France, Slovakia, Hungary, Cyprus.
[25] Negative impacts assessed for: Poland, Sweden, Italy and Denmark.
[26] Unclear impact assessed for: Belgium, Germany, Slovenia, Spain, Czechia and Croatia.
[27] Member States that included information in Annex 2, Table 7: Germany, Spain, France, Croatia, Hungary, Italy, Lithuania, Latvia, Poland, Slovenia and Slovakia.
[28] National target on the share of renewables in district heating: Germany, France, Italy, Lithuania, Croatia, Hungary and Latvia.

origin for the sale and use of biofuels and has established minimum sale shares for suppliers of gasoline, natural gas and diesel of biofuels. The required shares of biofuels in sales increase in several steps over time.

2.1.3.10 Analysis of Assessment of the support for electricity from renewable sources

Pursuant to Article 6(4) of Directive (EU) 2018/2001, Member States are required to perform an assessment of their support schemes for renewable electricity. In 2025, 23 Member States reported information however, several Member States indicated this reporting is not applicable to them. For example, in case no support system has been used, or in case of phasing-out the existing support systems, Member States have refrained from conducting an assessment.[29] Seven Member States referred to an external report (e.g., the publication of the finalised assessment), while 19 Member States did not. 14 Member States indicated that an assessment has been undertaken. Eight Member States[30] indicated that their assessment has been concluded while six Member States[31] reported the assessment status as ongoing. Finally, only few Member States included additional information on the support schemes assessed, or whether the assessment included a review of the support scheme's effectiveness and distributive effects on consumer groups and investments.[32] Ireland and Cyprus both highlighted the technical assistance provided by the Technical Support Instrument by SG REFORM, which supported their assessment of the relevant support schemes.

2.1.3.11 Analysis of biomass supply for energy use

Three Member States report positive impacts of the evolution of bioenergy on the target trajectories of Member States' renewable energy shares. Latvia indicates that the evolution of the bioenergy use had been negatively impacted by the invasion of Ukraine by Russia and the subsequent stop of imports from Belarus and Russia resulting in price increases which reduced consumption of bioenergy. In contrast to this dampening effect on the demand, Latvia reports that prices have reverted back to stable levels and domestic production of solid biomass and wood waste fuels increased. Spain and Luxembourg reported a positive evolution of the bioenergy use as well.

In contrast to these positive effects on the overall target trajectory by the evolution of the bioenergy use, 12 Member States[33] reported that they do not expect any impacts on the target trajectories from the evolution of bioenergy and five Member States' responses[34] were classified as reporting a negative impact. Similar to the price effects described by Latvia, Sweden notes a lower evolution of bioenergy use than expected due to the increased price levels for bioenergy which it expects to affect the renewable energy target trajectory. Lithuania and Croatia both see a potential dampening effect on

[29] Responses stating reporting is not applicable, or no support system has been in place include: Finland, Lithuania, Estonia and Denmark.
[30] Member States indicating assessment has been concluded: Cyprus, Sweden, Hungary, Spain, Slovenia, Germany and Belgium.
31 Member States indicating assessment is ongoing: Luxembourg, Malta, Croatia, Netherlands, Ireland and Latvia.
[32] Additional information was provided by Germany, Ireland, Hungary, the Netherlands, Slovenia, Spain, Sweden Luxembourg and Cyprus.
[33] Responses to the question on the impact of the evolution of bioenergy rated as neutral: Finland, Estonia, Belgium, Poland, Ireland, France, the Netherlands, Czechia, Hungary, Italy, Cyprus and Denmark. In the case of two Member States (Germany and Slovenia), the input provided by the MS did not provide sufficient information to rate the impact on the overall target trajectory as positive, neutral or negative.
[34] Responses to the question on the impact of the evolution of bioenergy rated as a negative impact: Lithuania, Slovakia, Croatia, Sweden and Malta

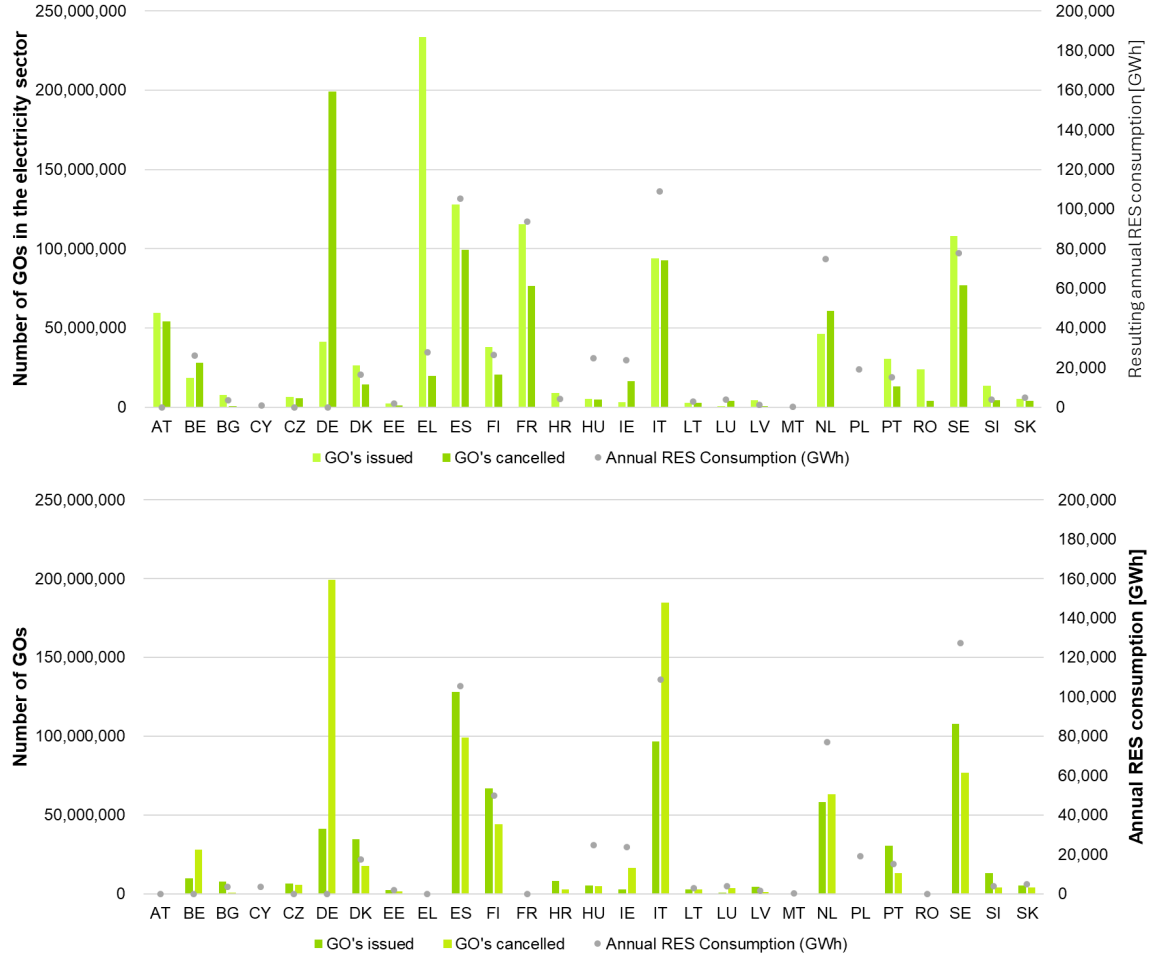
the use of bioenergy (especially in the case of biomethane and advanced biofuels) caused by a lack of sufficient production to cover the increasing demand – triggered by efforts to shift away from fossil-based fuels. Finally, Malta reports a decrease in biomass consumption in the residential sector while Slovakia reports a lower than estimated use of wood biomass – linking the lower consumption volumes of bioenergy to a lower target trajectory for renewable energy.

2.1.3.12 Guarantees of origins

In the NECPR, Member States are required to report on the functioning of the system of guarantees of origin (GOs) for electricity, gas and H&C from RES, when applicable. Figure 12 visualises the number of GOs issued and cancelled by each MS as well as the quantity of energy consumption for which the origin has proven to originate from renewable energy sources.[35] As shown in Figure 12, the highest number of GOs are issued by Greece (233.5 million GOs issued), Spain (127.9 million GOs issues) and France (115 million GOs issued). Of all issued GOs, the large majority is issued resulting from electricity generation, with 1,023.7 million issued GOs compared to 37.8 million issued in heating and 27 million issued from gas-based generationIn contrast to the leading Member States issuing GOs, Germany reports the highest number of GOs cancelled (199 million GOs alone in the electricity sector) in 2023, closely followed by Spain reporting 99.3 million cancellations of GOs and Italy (92.7 million cancelled GOs).

[35] According to the IR (EU) 2022/2299, the definition of the quantity of energy consumption for which the origin has proven to originate from renewable energy sources is being determined as the cancelled guarantees of origin for energy consumption from renewable energy sources in the reporting period + the renewable share of the residual mix multiplied by the total energy consumption for the reporting period that is not covered with guarantees of origin cancellation.

Figure 12. Overview of the use of guarantees of origin per MS[36].



Source: NECPR

In addition to reporting of quantities, Member States shared information on measures taken to ensure the reliability of the functioning of the system of guarantees of origin and to protect against fraud. The measures taken by Member States to ensure the reliability include the establishment of a legal framework (e.g., Finland introduced national legislation to regulate the GO system) and granting a state agency the oversight competency to ensure compliance of participants. In addition, Member States note the need for trainings of the personnel tasked with the monitoring of the system. Italy refers to the Association of Issuing Bodies (AIB) of which its relevant agency is a member and which unites almost all issuing bodies of GOs in the EU. The AIB ensures the adoption of the European standards and rules of CEN 16325. The Netherlands describe the cooperation among the relevant stakeholders such as network operators, certifying bodies, accountants and auditors which ensure the reliability of information in all steps from installation of a production plant, to registering support schemes for the plant to the start of operation and generating energy volumes.

[36] The Figure 2 does not show the value for the annual RES consumption which generated GOs for Croatia as its maximum value of 4.2 TWh. As this would by far exceeds any other value and would distort the legend of the right-hand y-axis. When cross referencing the website of the registry of GOs in Croatia, the total estimation production was (including power plants that do not participate in the GO system) 6,054,508 MWh. It seems that Croatia reported in MWh instead of GWh.

In response to the question how MS protect against fraud, the responses link to the previous section but add additional information. For example, Member States describe the use of bank guarantees, and official forms to enter into the registry as a producer or participant. Further, the Member States refer to the good practice guide, developed by AIB to protect against fraudulent activities and list the AIB audits as another preventive measure. Finally, several Member States described the automatization of processes to implement secure electronic transfers as well as automatic entries and verification checks of the data input in the registry

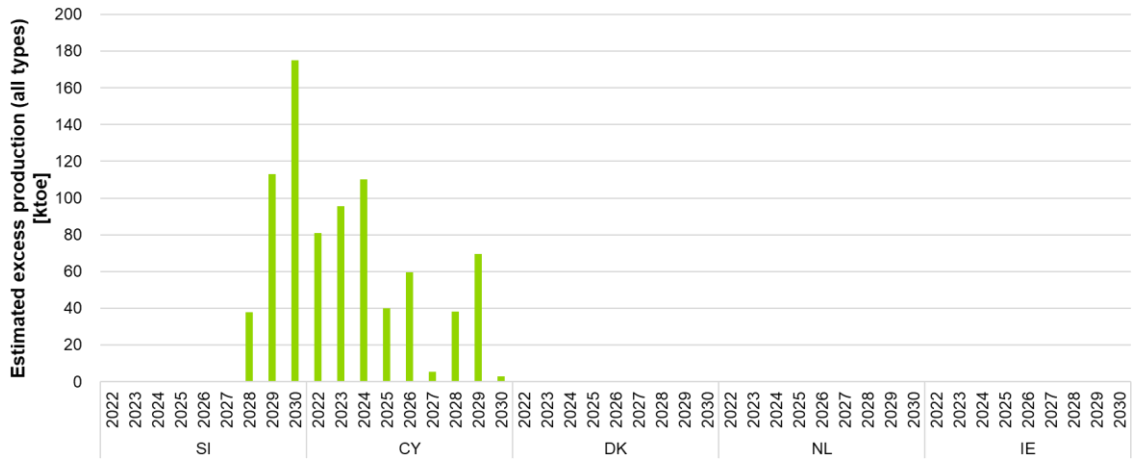
2.1.3.13 Estimated excess and deficit production of energy from renewable energy

In the NECPR Member States include information on the estimated excess production of energy from renewable sources compared to the national trajectory towards the 2030 target. The information is split into three production types (domestic renewables, joint projects between Member States or third countries and joint support schemes). Of all Member States, five Member States included information on the excess or deficit production estimations.[37] No MS reported estimated production resulting from joint projects or joint support schemes. With regard to the estimated excess production resulting from renewable energy sources, Slovenia reported a continuous increase of its excess production volumes from 2028 onwards, reaching 175 ktoe in 2030. Cyprus indicated a maximum estimated excess production level of 110 ktoe in 2024, which decreases to 3 ktoe by 2030 (see

[37] Cyprus, Denmark, Ireland, the Netherlands, and Slovenia.

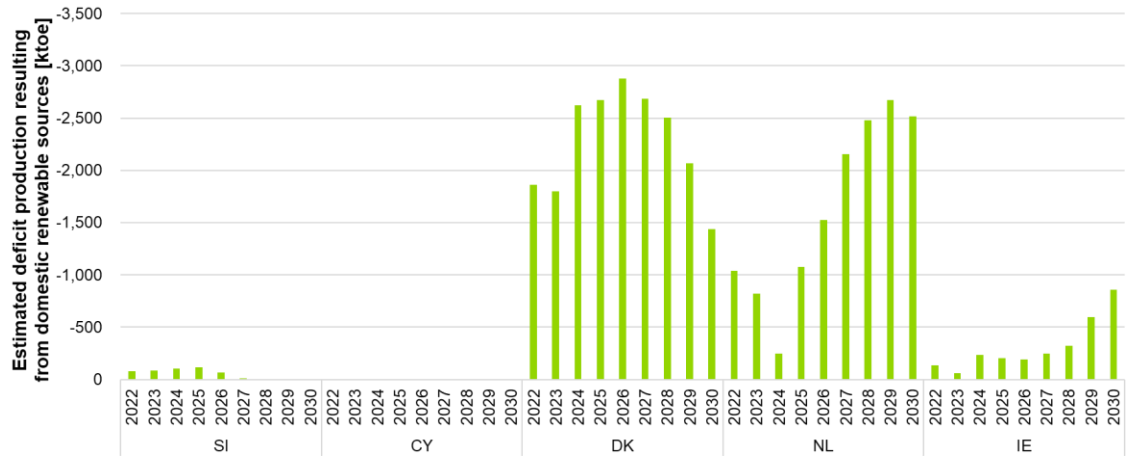
Figure 13). As Slovenia expects its excess production in 2028, prior to this, it reports an estimated deficit production resulting from domestic renewable energy which peaks in 2025 at 116 ktoe and falling back to 0 ktoe by 2028. Denmark and the Netherlands both report more significant estimated production deficits. Denmark estimates the highest deficit to be reached in 2026, at a level of 2,879 ktoe. The Netherlands report the highest estimated deficit in 2029 at 2,671 ktoe. Finally, Ireland indicates an estimated deficit production between 2021-2030, rising from 61 ktoe in 2023 to 857 ktoe in 2030 (see Figure 14).

Figure 13. Estimated excess production resulting from all types.



Source: NECPR, Annex XVI, table 3

Figure 14. Estimated deficit production resulting from domestic renewable sources.



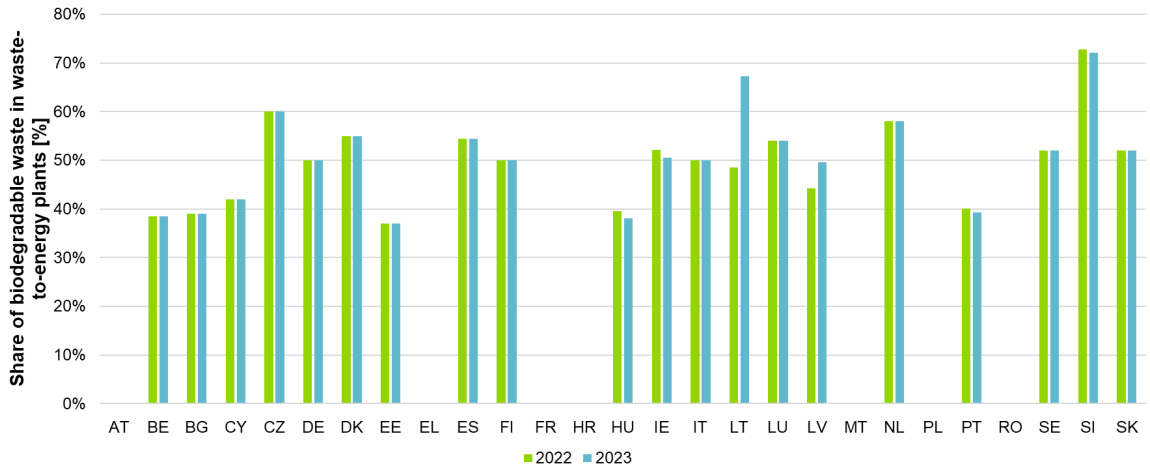
Source: NECPR, Annex XVI, table 3

2.1.3.14 Share of biodegradable waste and renewable energy generation in buildings

In the NECPR Member States should report on the share of biodegradable waste in waste-to-energy plants used for producing energy. Most Member States' biodegradable waste shares did not fluctuate significantly between the reporting years 2022 and 2023. In addition, the reported shares of biodegradable-waste used showed similar levels across Member States. Except for the Member States (38) reporting 0%, or no data, the lowest percentage recorded in 2023 is 37% by Estonia compared to the highest percentage at 72%, recorded by Slovenia (see Figure 15).

[38] Austria, Greece, France, Croatia, Malta, Poland and Romania. Croatia and Malte both do not operate any waste-to-energy plants and can not report on any values. Poland reported it lacks the data to report at this point in time.

Figure 15. Share of biodegradable waste in waste-to-energy plants used for producing energy per MS in %.



Source: NECPR, Annex XVI, table 7

2.1.3.15 Renewable energy generation in buildings

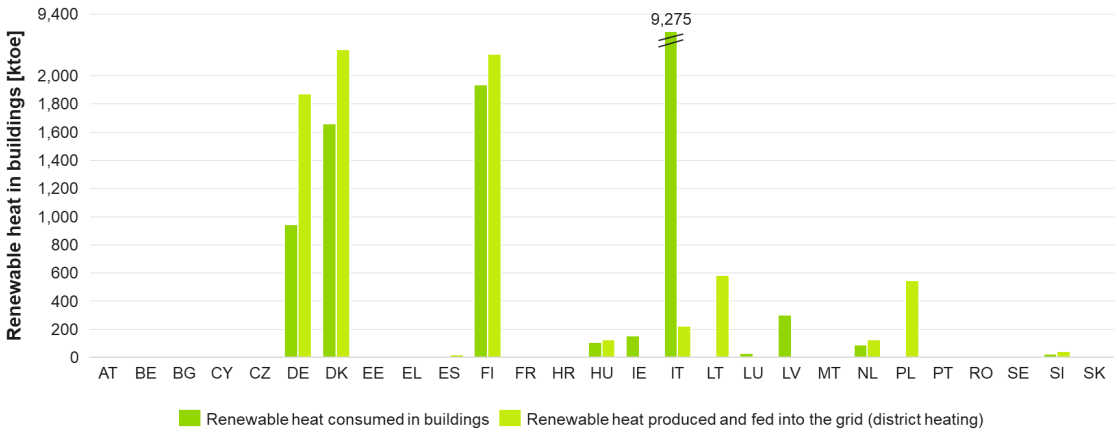
The renewable energy generation in buildings is monitored and reported in the NECPR, collecting information on six different categories. For one, the energy volumes of electricity are reported as the renewable electricity consumed in buildings, the renewable electricity produced in buildings and fed into the grid and the renewable electricity production in buildings. Next, energy volumes on heat are reported as the renewable heat consumed in buildings[39] as well as the renewable heat produced and fed into the grid (e.g., from district heating installations). Finally, NECPRs track the final energy consumption from renewables in buildings for heating purposes.[40]

Figure 16 visualises the reported energy volumes of the renewable heat in buildings (aggregated from solar thermal systems, biomass, heat pumps, geothermal systems and other decentralized renewable sources) in the year 2023. The left bars per MS show the renewable heat consumed (from district heating installations) while the right bars depict the renewable heat produced and fed into the grid (i.e., the total heat fed into the grid by e.g., district heating installations that is renewable). In terms of renewable energy heat consumed, Italy, Finland and Germany report the largest energy volumes. In contrast, Italy reports little renewable heat produced and supplied to the grid, while Sweden, Finland, Denmark and Germany report the highest values here. Reporting any significant energy volumes in these two categories depend on the existing infrastructure of district heating in the MS.

[39] In accordance with the reporting guidelines on the dataflow 16, (p.52): "Renewable heat consumed in buildings includes only heat consumed in buildings that is produced from renewables in a district heating installation and afterwards sold to buildings. It excludes final energy consumption of renewables directly in buildings."

[40] In accordance with the reporting guidelines on the dataflow 16, (p.52): this is the final direct consumption of renewable energy in buildings for heating purposes. This means, e.g., biomass directly combusted in households. It excludes heat produced from renewables in, e.g., district heating installations [...]. For heat pumps it is the renewable energy consumed by the heat pump.[...] photovoltaic systems, even if used for heating, are included in renewable electricity consumption in buildings."

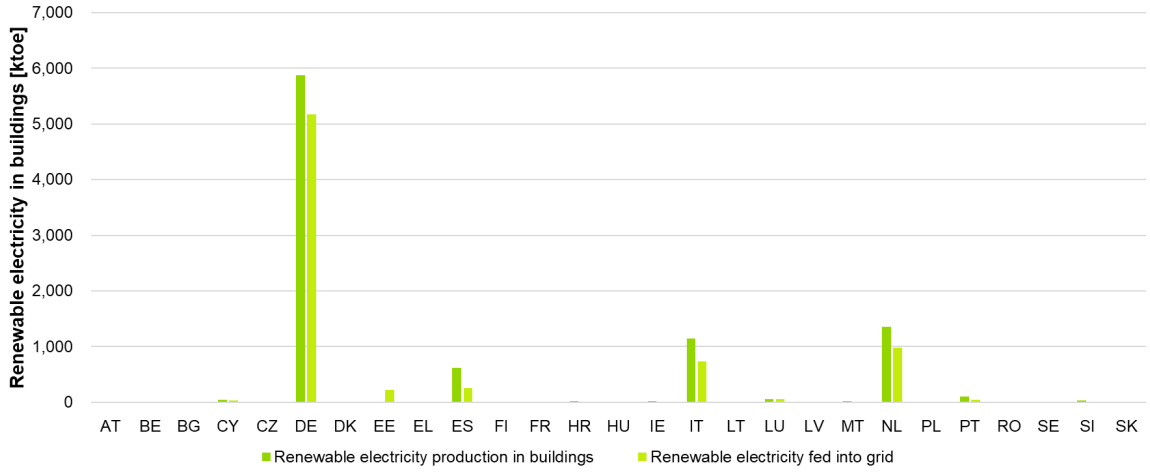
Figure 16. Renewable heat in buildings in per MS in ktoe in 2023.



Source: NECPR, Annex XVI, table 8

Figure 17 visualises the renewable electricity (in ktoe) in buildings reported by Member States in 2023. The values are aggregated sums comprising volumes from solar PV systems, biomass, geothermal systems and other decentralized renewable sources. Germany indicates similar electricity volumes of renewable electricity produced in buildings and fed into the grid. As Germany offers support to solar PV installations dependent on the dispatch into the grid, this is to be expected. Next to Germany, the Netherlands, Italy and Spain report significant electricity volumes produced in buildings and fed into the grid. In the majority of the listed Member States, the largest share of renewable electricity produced in buildings is fed into the grid.

Figure 17. Renewable electricity in buildings per MS in ktoe in 2023.

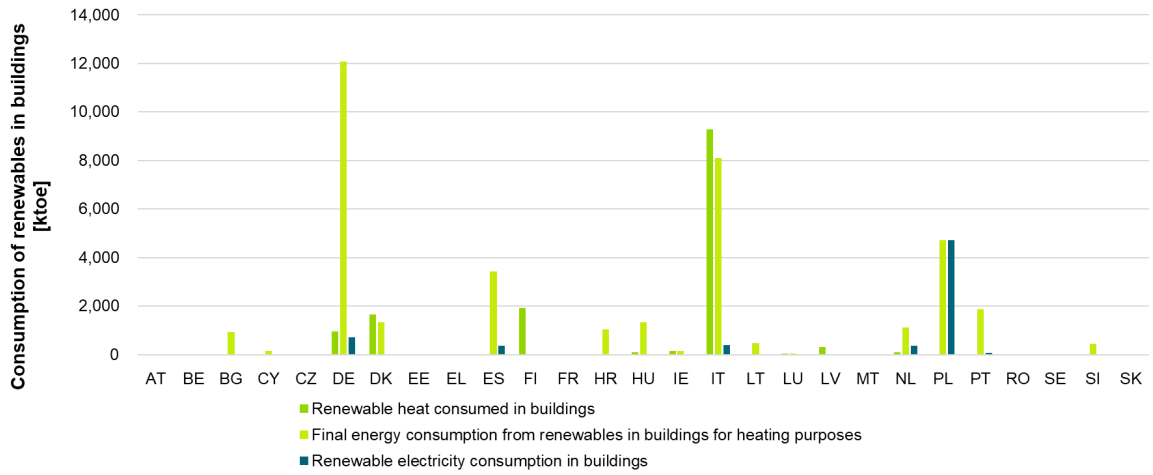


Source: NECPR, Annex XVI, table 8

Figure 18 visualises the consumption of renewables in buildings reported by Member States in 2023. The technologies aggregated in the values of the figure depend on the energy carrier used (heat or electricity). The light green bars depict the final energy consumption from renewables in buildings for heating purposes, focusing on the final direct consumption of renewable energy for heating purposes

(i.e., district heating energy volumes are excluded). The blue bars depicts the renewable electricity that is produced – and consumed in buildings while the dark green bars represent the renewable heat consumed in buildings. The latter comprises the energy volumes consumed in buildings from renewables in a district heating installation. For one, this comparison shows that Germany's renewable energy consumption in buildings for heating purposes relies heavily of direct consumption (light green bar) and much less on district heating systems (dark green bar). In correlation to the high share of electricity produced in buildings and fed into the grid in Germany (Figure 18), the blue bar depicts the relatively low share of electricity from renewables produced and consumed in buildings. In contrast to Germany, Italy, Denmark and Finland report significant energy volumes consumed in buildings from district heating installations. With regard to electricity produced and consumed in buildings from renewable sources, Poland reports the highest energy volumes across the EU.

Figure 18. Consumption of renewables in buildings per MS in ktoe in 2023.



Source: NECPR: Annex XVI, table 8

2.1.3.16 Hydrogen funding measures

In their National Energy and Climate Plans (NECPs), Member States have provided only limited information on funding measures to support hydrogen development. Hydrogen subsidy schemes often include grants allocated in the framework of broader energy and climate funds. For example, part of the Dutch subsidy scheme "Sustainable Energy Production and Climate Transition" (SDE++) is also dedicated to the production of molecules including hydrogen. Denmark organised in 2023 hydrogen-specific tenders for a total bid of DKK 1.4 billion.

A few Member States, such as Spain, Lithuania and Austria, are making use of the Auction-as-a-Service model within the framework of the European Hydrogen Bank domestic auctions. Additionally, Member States such as Germany and the Netherlands are using the market intermediary H2Global to subsidise imports and intra-EU trade of RFNBO[41] hydrogen and derivatives through double-sided auctions.

[41] Renewable fuels of non-biological origin, as defined in the Renewable Energy Directive and Commission Delegated Regulations (EU) 2023/1184 and 2023/1185.

A few Member States allocate resources to demand-side funding. Germany launched in 2024 the first bidding process within its Carbon Contracts for Difference funding programme. Other Member States combine hydrogen supply and demand funding. For instance, Spain promotes through a dedicated state aid scheme hydrogen valleys aiming to produce and distribute renewable hydrogen in the same area.

The most comprehensive support scheme targeting hydrogen infrastructure is the German 'amortisation account', which aims to make up the difference between the high up-front investment costs and the low revenues due to low demand in the initial phases of network development.

Several Member States have introduced funding mechanisms aimed at decarbonising mobility, including support for refuelling stations and hydrogen-powered buses. Additionally, a limited number of Member States have mentioned state aid under the Important Projects of Common European Interest (IPCEI) initiative. For instance, Spain allocated in 2024 EUR 794 million in direct aid to seven IPCEI projects. The Commission has approved a total of EUR 38 billion dedicated to hydrogen projects and another EUR 127 billion to projects where hydrogen competes with other decarbonisation solutions for support.

The vast majority of Member States are late with the transposition of the RFNBO industry and transport targets set in the Renewable Energy Directive, including via hydrogen support measures.

2.2 Energy efficiency

Energy efficiency helps reduce overall energy consumption without affecting the energy services delivered and it is therefore central to achieving the EU's climate ambition, while enhancing energy security and affordability. The Energy Efficiency Directive 2012/27/EU (EED), as amended by Directive (EU) 2018/2002, forms a key part of the EU climate and energy acquis, setting the EU's energy efficiency targets and laying the foundation for measures to realise the full energy efficiency potential of the EU economy. In 2023, Directive (EU) 2023/1791 has been adopted, recasting the previous EED (hereinafter, "EED recast"). The deadline for transposition into the national legal systems of the Member States is October 2025. Therefore, for the purposes of the present report, which covers the years 2022 and 2023, the new provisions of the EED recast are not considered, except for the new reporting obligations on financing.

The EED requires all EU Member States to implement measures to improve energy efficiency throughout the different stages of the energy chain, from production to final consumption. These efforts are key to achieve the EU's energy efficiency targets and an essential contribution to the decarbonisation of the EU economy by 2050.

2.2.1 Progress towards indicative trajectory and 2030 savings contribution

In the period from 2005 to 2023, the EU energy consumption has followed a general downward trend, as depicted in Figure 19. The decreasing trends in energy consumption continued in 2023 (42), although these are still far away from the 2030 PEC and FEC targets[43].

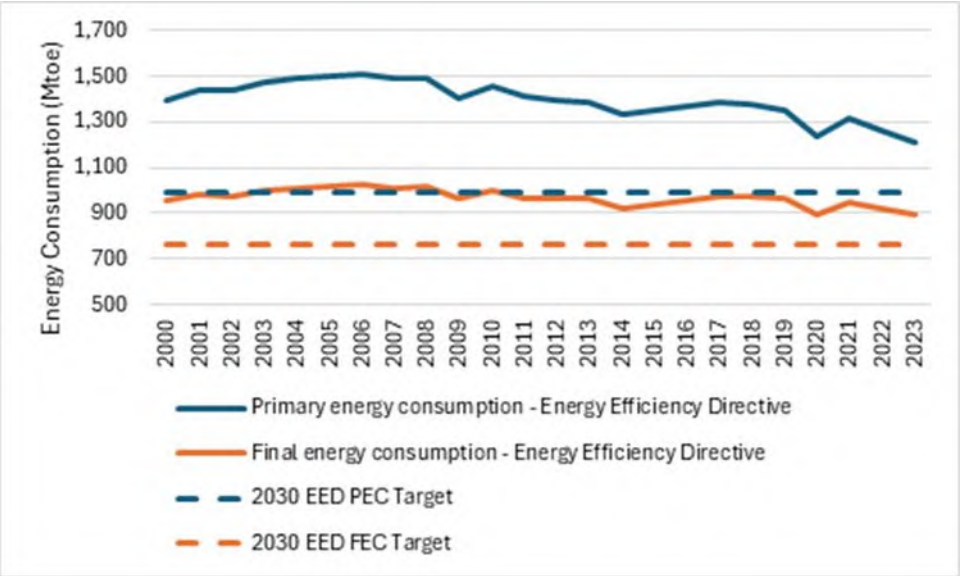
Final energy consumption in the EU in 2023 stood at 894 Mtoe, corresponding to a decrease of 3% compared to 2022. The annual decrease in 2022 was equal to 2.8% compared to 2021. In 2023, FEC

[42]Eurostat data, Simplified Energy Balances (NRG_BAL_S), update of May 2025, PEC and FEC Energy Efficiency Directive indicators

[43] As set out in the EED recast.

reached its second lowest value since 2005, after 2020. The absolute final energy consumption in 2023 declined in 23 Member States since 2005, while in 4 Member States it experienced an increase, in two cases (Malta and Poland) higher than 20%. In 2023, 4 Member States have experienced increases in total final energy consumption compared to 2022 (Croatia, Cyprus, Malta, Portugal).[44]

Figure 19. Final and primary energy consumption trends of the EU27.



Note: PEC and FEC 2030 Targets according to EED Recast 2023

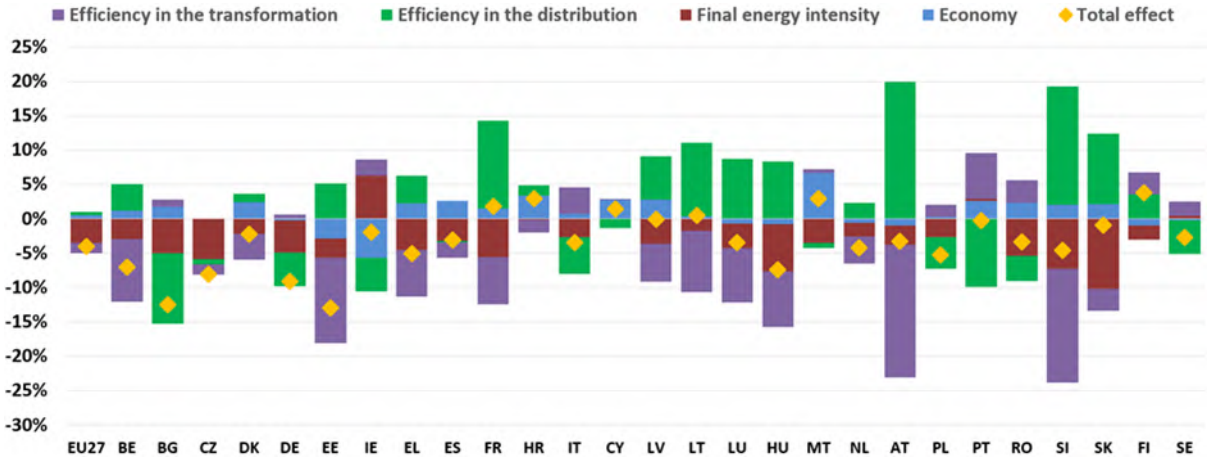
Source: JRC elaboration on Eurostat data, 2025.

Figure 20 presents a breakdown of the additive decomposition results in the period 2022-2023, showing the impact of the economic effects and further disaggregating the primary energy consumption into the effects of the final energy intensity and the efficiencies of the distribution and transformation. Improvements in the final energy intensity[45] and in the transformation were determinant factors for the energy consumption decrease, both at EU and Member States level. While efficiency in transformation improved, efficiency in the distribution sector worsened across the EU.

[44] Denmark, Ireland and Sweden registered increases under 1%.

[45] Two intensity indicators are often used as energy efficiency indicator for a country. They are presented as a ratio between energy consumption and activity data. In this case, final energy intensity is built as the ratio between final energy consumption and gross domestic product (GDP) of EU27.

Figure 20. Contribution of different effects on the variation of the PEC in EU27 and Members States over the period. 2022-2023.



Source: JRC elaboration on Eurostat data, 2025

In 23 Member States (all except from Croatia, Cyprus, Malta and Portugal) a stable[46] or growing final energy consumption is observed. The reasons indicated for growing or stable consumptions (sorted from high to low recurrences) over the period 2022-2023 are summarised in Table 5 below.

Table 4. Main reasons provided by Member States to justify growing or stable final energy consumptions (2022-2023).

Sector	Reasons
Industry	Economic growth. Increase of value added. Increase of employment
Residential	Increase of disposable income of households. Increase of population. Decline in fuel prices.
Services	Economic growth. Increase of value added. Increase of employment.
Transport	Increase of transport goods/passengers. Economic growth. Increase of value added.

Source: JRC elaboration on NECPR data, 2025

Trends in consumption

The sector with the most significant FEC decreasing trend from 2022 to 2023 is the residential sector, with a 6.1% decrease at the EU level. All the Member States (except Denmark and Portugal) show decreasing or stable trends in FEC in the residential sector from 2022 to 2023. The largest decreases were noted in Greece (-13.2%), Czechia (-11.7%) and the Netherlands (-11.6%).

[46] The change was within the range of +/-1%.

Energy consumption in the industry sector experienced the second largest decrease after the residential sector, with an annual decrease at the EU level of 5.4% in 2023 compared to 2022. The most significant annual reduction rates are observed in Malta (-13.8%), Romania (-13.6%), followed by Luxembourg (-10.2%).

The services sector has registered decrease in FEC levels by 3% at the EU level. At Member State level, five countries report an increase of FEC higher than 1%. The largest increases were observed in Romania (+2.3%), Ireland (+4.5%) and Italy (+1.7%).

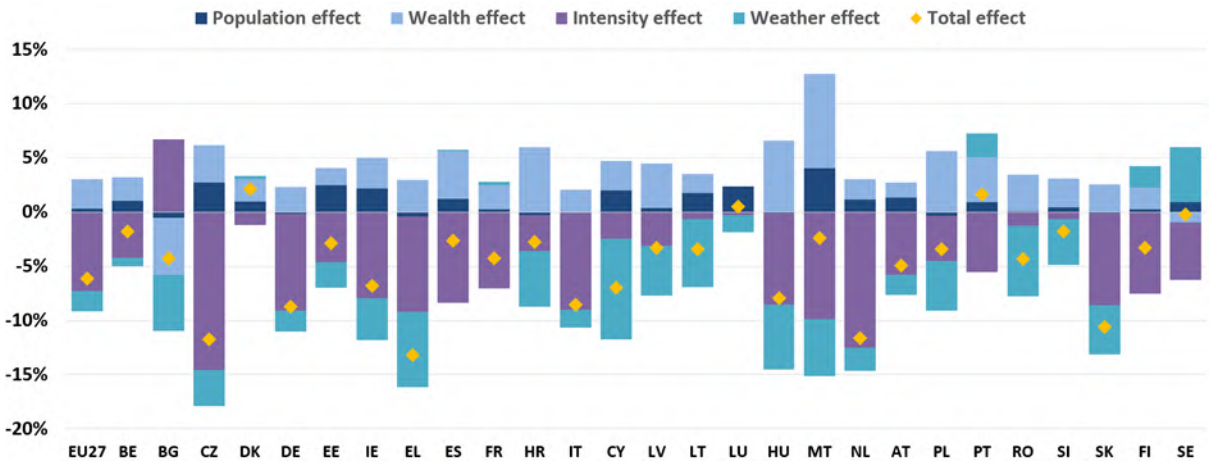
The transport sector (including international aviation) remained relatively stable (+0.7%). Sixteen countries recorded increases higher than 1%. The most noticeable increases were observed in Croatia (+11%), Malta (+10.4%) and Portugal (8.3%).

Contribution of different effects to the variation of residential FEC in 2022-2023

Figure 21 provides a breakdown of the additive decomposition results in the residential sector in the selected Member States in the period 2022-2023, expressed as share of 2023 consumption levels. In 2023, FEC in the residential sector at EU level decreased by -6.1% compared to 2022. The combined impact of intensity and weather effects led to a decrease in energy consumption, partially offset by increases of population and wealth effects.

Warmer winter conditions in 2023 with respect to 2022 exerted a limiting force on consumption in 21 Member States. Finally, intensity drops contribute to abate the energy consumption in 26 Member States, with remarkable results in Czechia, and the Netherlands. While trends vary from country to country, the Member States' results also suggest that wealth and population effects were two important factors in growing the energy consumption in many countries.

Figure 21. Contribution of different effects on the variation of the residential FEC over the period 2022-2023.



Source : Eurostat, JRC, Odyssee-Mure, 2025.

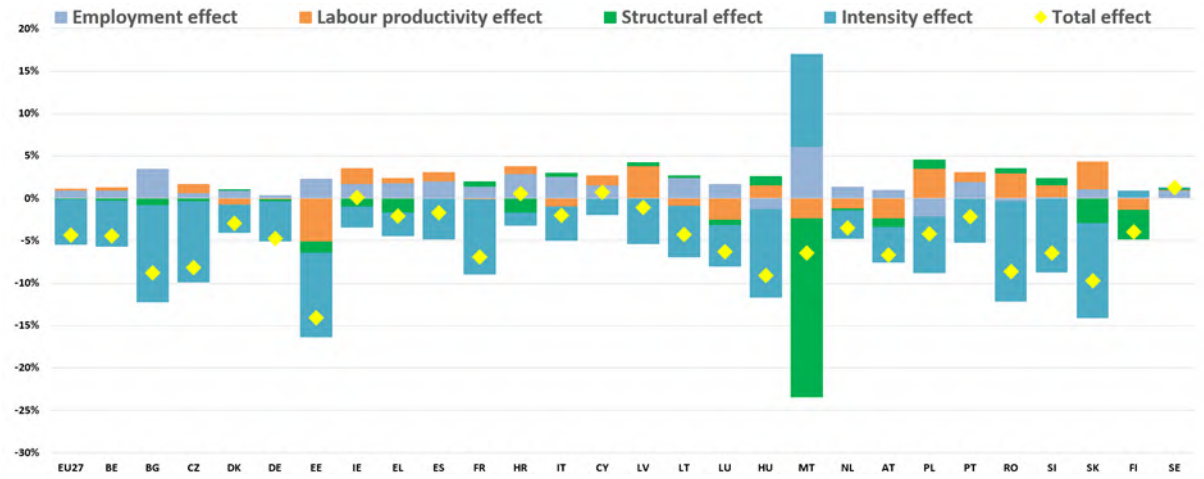
Contribution of different effects to the variation of the productive sectors FEC in 2022-2023.

Figure 22 shows a breakdown of the additive decomposition results in the productive sectors (industry, services and agriculture) in the Member States in the period 2022-2023. At the EU level, the intensity effect drives the decrease of the final energy consumption. The activity effect (employment and labour productivity effects) partially offset the intensity effect, while the structural effect has a

negligible effect on the final consumption. Overall, the FEC of the productive sectors decrease by 4.3% in 2022-2023 at EU level.

The trend at EU level is also confirmed at Member States' level, where the intensity effect plays a key role in decreasing the FEC, except for Malta, Finland and Sweden. Breaking down the activity effect, the labour productivity contributed to increasing the consumption in 15 Member States, while the employment effect shows positive results for almost all the countries (24 Member States out of 27). The structural effect results that highlight a shift from sub-sectors of higher energy intensity towards those of lower intensity are negligible in most of the Member States, with the exception of Malta, Slovakia , Finland, Croatia, Greece and Estonia.

Figure 22. Contribution of different effects on the variation of the FEC of productive sectors over the period 2022-2023.



Source: Eurostat, JRC, 2025.

2.2.2 Exemplary role of public bodies' buildings[47]

The public sector plays an important exemplary role in promoting and advancing energy efficiency practices. Therefore, Article 5(1) of the EED requires Member States to ensure yearly renovations, as from 1 January 2014, of 3% of the total floor area of heated and/or cooled buildings owned and occupied by their central government and not in compliance with minimum energy requirements. Alternatively, Member States may opt for an alternative approach (under Article 5(6) of the EED) and achieve energy savings that are equivalent to or greater than those that the deafult approach under Article 5(1) would have generated.

As shown in Table 6, only three Member States out of the twelve countries that have chosen the default approach have achieved their annual target in terms of renovated floor area in 2023 (Bulgaria, Greece and Lithuania). Moreover, three Member States (Netherlands, Romania, and Portugal) provided either no or incomplete information for Article 5. Therefore, Member States will have to step up their efforts as early as possible in the next years of the obligation period to be able to meet the savings requirement for the whole obligation period ending in 2030.

[47] Article 5 of the EED 2012 (amended in 2018) and Article 6 of the EED Recast

Table 6. Implementation status of Article 5 of Member States thathave chosen the default approach (Article 5(1)), based on the assessment reports of Member States.

		Central government with floor area > 250 m2 in 1/1 of year 2023		Article 5. annual requirement	Article 5. progress in 2023		Central government with floor area > 250 m2 in 1/1 of year 2024	
MS	Implementation approach	All [m2]	Which did not meet the energy performance requirements [m2]	Floor area renovation obligation [m2]	Renovated floor area [m2]	Annual obligation achieved in 2023 in terms of floor area [%]	All [m2]	Which did not meet the energy performance requirements [m2]
BG	Default	2,755,062	1,919,002	57,570	78,350	136%	2,754,980	1,863,826
EE	Default	1,300,915	824,425	24,733	16,308	66%	1,380,476	855,606
EL	Default	212,725	200,725	6,022	12,000	199%	212,725	175,782
ES	Default	8,798,890	11,241,010	337,230	269,032	80%	849,019	11,373,504
IT	Default	16,485,850	13,162,979	394,889	85,000	22%	16,485,850	13,162,979
LT	Default	0	1,909,731	57,292	146,079	255%	0	1,939,692
LU	Default	126,523	58,003	1,740	0	0%	126,523	58,003
LV	Default	1,514,287	923,104	27,693	22,800	82%	1,514,287	858,014
NL	Default	12,000,000	1,287,000	38,610	n/a	n/a	12,000,000	n/a
PT	Unclear	1,683,167	1,683,167	50,495	n/a	n/a	1,683,167	1,683,167
RO	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SI	Default	966,210	897,593	26,928	5,820	22%	932,593	858,156

Source: JRC elaboration on NECPR data, 2025

Table 7. Implementation status of Article 5 of Member States that have chosen the alternative approach, based on the assessment reports of Member States.

		Central government with floor area > 250 m2 in 1/1 of year 2023		Article 5. progress in 2023		Central government with floor area > 250 m2 in 1/1 of year 2024	
MS	Implementation approach	All [m2]	Which did not meet the energy performance requirements [m2]	Primary energy savings achieved in year 2023 [ktoe]	Final energy savings achieved in year 2023 [ktoe]	All [m2]	Which did not meet the energy performance requirements [m2]
AT	Alternative	2,917,517	2,882,842	n/a	6	n/a	2,882,842
BE	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CY	Alternative	340,638	306,224	0	0	340,638	306,224
CZ	Alternative	2,502,144	1,805,017	n/a	0	2,521,687	1,807,135
DE	Alternative	n/a	n/a	n/a	n/a	n/a	n/a
DK	Alternative	1,763,594	1,202,640	n/a	-2	1,754,280	1,199,708
FI	Alternative	n/a	2,122,000	n/a	2	n/a	2,085,800
FR	Alternative	0	0	794	493	0	0
HR	Alternative	5,994,354	2,224,861	1	1	7,066,549	2,744,550
IE	Alternative	n/a	844,387	0	n/a	n/a	844,387
HU	Alternative	n/a	n/a	n/a	n/a	n/a	n/a
MT	Alternative	167,166	42,456	22	6	167,166	39,816
PL	n/a	0	0	0	0	0	0
SE	Unclear	n/a	52,672,573	n/a	n/a	n/a	57,776,371
SK	Alternative	n/a	1,338,089	3	2	1,338,089	1,338,089

Source: JRC elaboration on NECPR data, 2025

Table 7 shows the Member States that have chosen the alternative approach. Among them, Belgium did not report any information, Poland reported partial information, while all other Member States, except for Germany and Hungary, reported the value (in m^2) of the central government buildings not meeting the energy performance requirements (for both years 2023 and 2024). Furthermore, there are some discrepancies on the energy savings reported by Member States. Some of them have reported both primary and final energy savings (Cyprus, France, Croatia, Malta and Slovakia), while Austria, Czechia, Denmark and Finland only final savings. Germany, Hungary and Sweden did not report any savings.

Finally, regardless of the chosen approach, five Member States notified a larger non-compliant total floor area in 2022 with respect to the previous year (2021): i.e. Czechia (+0.1%), Croatia (+23.4%), Estonia (+3.8%), Spain (+1.2%), Sweden (+9.7%) and Lithuania (+1.6%).

2.2.3 Energy savings obligation[48]

Table 8 shows the data reported by the Member States on new energy savings achieved in 2021, 2022 and 2023 under Article 7 EED, next to the new 0.8% annual savings required based on the annual rate applicable to the years 2021-2023. Potential concerns about eligibility, additionality and materiality, or inconsistencies or possible mistakes in the data reported are not taken into account for the purpose of this report.

Table 8. New annual savings (in ktoe/year) reported by the Member States under Article 7 EED and benchmarks.

	New annual savings reported for 2021 (ktoe/year) Source: NECPR2023[49]	**New annual savings reported for 2022** (ktoe/year) Source: NECPR2025	**New annual savings reported for 2023** (ktoe/year) Source: NECPR2025	Required new annual savings based on a 0.8%/year rate[50]
Austria	116.5	180.2	252.0	225.2
Belgium*	275.6			290.5
Bulgaria	23.6	51.4	88.0	78.6
Croatia	83.3	47.1	57.7	54.4
Cyprus	54.4	39.4	26.2	4.4
Czechia	119.9	0.0	0.0	201.8
Denmark	63.7	680.0	565.4	116.4
Estonia	65.6	7.8	39.5	23.1
Finland	462.9	754.0	910.0	203.4
France	2072.0	1970.0	2083.0	1187.9
Germany	3691.4	4219.2	4560.5	1735.1
Greece	34.6	285.8	227.7	130.9
Hungary	45.3	8.8	0.0	146.1
Ireland	65.7	252.9	294.3	96.0
Italy	1128.0	1642.0	1540.6	926.5
Latvia	45.8	158.3	188.3	32.0
Lithuania	177.5	144.8	159.6	42.7
Luxembourg	20.0	183.3	163.9	33.5
Malta	1.9	1.7	1.5	1.5

[48] Article 7 of the EED 2012 (amended in 2018) and Article 8 of the EED Recast

[49] Member States may have revised data about 2021 energy savings since the NECPR2023

[50] 0.24% for Cyprus and Malta; The required savings rate is applied to Member States' annual final energy consumption averaged over 2016-2018. The calculation of the required amount of new annual savings was done here by using Eurostat data of annual final energy consumption (data series FEC2020-2030), with two simplifying assumptions: (1) savings would have a lifetime of at least 10 years; (2) the same rate of savings would be achieved each year from 2021 to 2030. In practice, Member States might need to achieve a higher rate of savings to meet their cumulative savings obligation for 2021-2030 (e.g. when they report energy savings from energy taxes, that have an equivalent lifetime of 1 year).

Netherlands	751.5	822.8	786.3	400.1
Poland	552.0	1223.6	953.4	566.3
Portugal	105.0	103.2	216.0	132.3
Romania**				184.4
Slovakia	106.0	289.2	568.8	87.0
Slovenia	51.9	56.7	80.8	39.4
Spain	270.2	174.7	192.2	676.5
Sweden**				256.8

Source: based on data reported by the Member States in their NECPR 2023 (first column), and in their NECPR 2025 (second and third columns).

* data of energy savings achieved in 2022 and 2023 not yet available by October 2025
** data of energy savings achieved in 2021 not reported in the NECPR2023, and data of energy savings achieved in 2022 and 2023 not reported in NECPR2025

By 10 October 2025, 24 Member States [51)] had reported energy savings data that amount to 13296.9and 13955.4ktoe/year of new annual savings achieved in 2022 and 2023 respectively. The same 24 Member States reported in 2023 a total of 10108.7ktoe/year of new annual savings achieved in 2021. The minimum rate of new annual savings corresponding to the target of of 0.8%/year [52] is equivalent to 7141.1 ktoe/year for these 24 Member States.

The figures of new annual savings provide a good overview of the year-to-year trends. However, they should be taken with caution when monitoring the progress towards the overall energy savings target for the whole obligation period 2021-2030. The energy savings obligation covers cumulative energy savings over the period from 2021 to 2030. This means that when reported energy savings have a lifetime ending before the end of 2030, further energy savings are needed to fill this gap. Part of the savings reported by Member States have a short lifetime (e.g. savings from energy and CO_2 taxes have a lifetime of one year). These Member States will thus have to achieve higher rates of new annual energy savings to meet the required cumulative savings over 2021-2030. Moreover, Article 8(1) of the EED recast increased the savings rates required for years 2024 to 2030, from 1.3% in 2024 and 2025 up to 1.9% from 2028 onwards. [53]

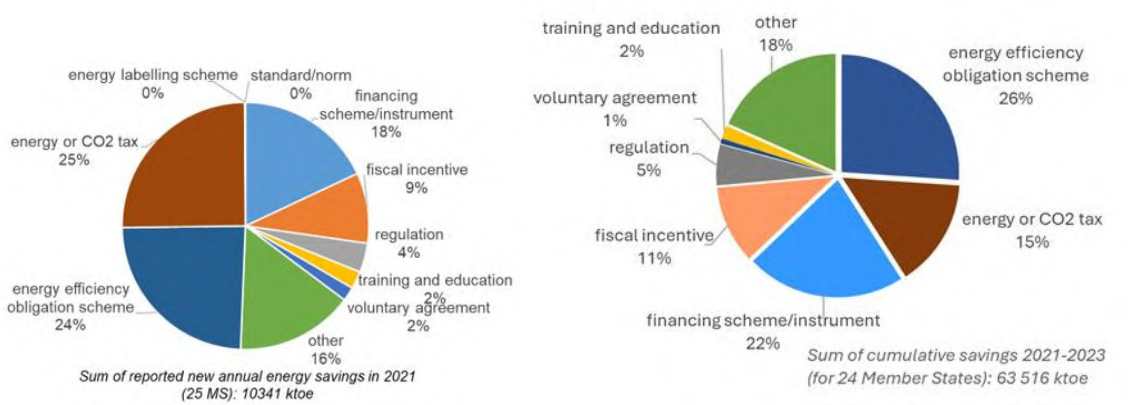
Due to the cumulative nature of the energy savings obligation, the results achieved in the first years of a period are essential to the likelihood of achievement of the target. A higher rate of savings than needed does not necessarily mean that a Member State will achieve its target. However, a significantly lower rate of savings in the first years of a period can be very difficult to compensate in the remaining years of the period.

[51] At that time, Annexes X and XI were not yet reported by Belgiumand Romania. And Sweden did not report any savings data in Annex XI.
[52] This rate is 0.24%/year for Cyprus and Malta. The required savings rate is applied to Member States' annual final energy consumption averaged over 2016-2018. The calculation of the required amount of new annual savings was done here by using Eurostat data of annual final energy consumption (data series FEC2020-2030).
[53] This rate is 0.45%/year for Cyprus and Malta, from 2024 onwards.

Figure 23 below provides information on the distribution per main type of policy instrument for new annual energy savings in 2021 (left; from NECPR2023) and for cumulative savings over 2021-2023 (right; from NECPR2025). The cumulative nature of the energy savings obligation explains why the share from energy or CO_2 taxes decreases, due to their short savings lifetime. [54] The same reason explains part of the increase in the shares of the other policy measures. Like in the period 2014-2020, Energy Efficiency Obligation Schemes (EEOS) delivered the largest share of savings (26%). Together with financing schemes/instruments (22%) and energy or CO_2 taxes (15%), they represent close to two thirds of all savings.

The "other" category (18%) includes for example investments of public bodies (e.g. in public buildings or in public transport infrastructures), umbrella measures (e.g. national mobility plan) or when a Member State reported savings data for a single package or sectoral packages including various policy measures. Member States may indeed report energy savings per group of policy measures, for example to avoid double counting.

Figure 23. Share of new annual energy savings in 2021 (left) and of cumulative energy savings for 2021-2023 (right), by type of policy measure at EU-level (data for 24 Member States).



Source: DG ENER's own calculations based on the data submitted by the Member States in their NECPRs 2023 and 2025 about the policy measures reported to Article 7(1) for the period 2021-2030 and related cumulative energy savings for 2021-2023 (data available for 24 Member States).

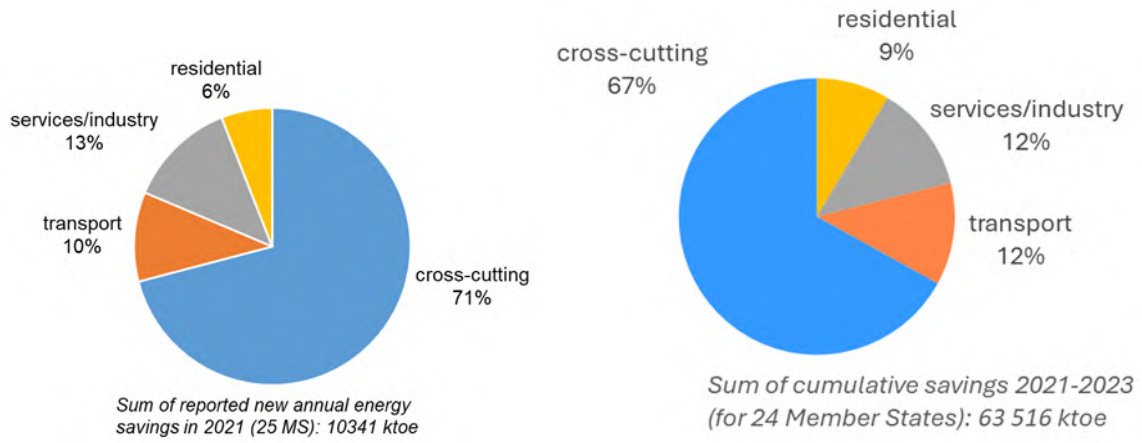
Figure 24 below provides the distribution per type of end-use sector targeted by the policy measures. The distribution per end-use sector remains stable between 2021-2023. The largest share of energy savings reported by Member States comes by far from cross-cutting measures (67%). These includes policy measures or packages that cover several sectors, [55] like all EEOS. Cross-cutting measures have a larger scope than measures targeting a given sector. This is one of the reasons why they represent the largest share of savings (as in the period 2014-2020). The low share of savings in the residential

[54] Energy savings from energy and CO2 taxes have an equivalent lifetime of 1 year. So 1 ktoe in 2021 from an energy tax will make 1*1 = 1 ktoe of cumulative savings over 2021-2030. Whereas energy savings from renovation programmes have a lifetime of more than 10 years. 1 ktoe in 2021 from a renovation programme will make 1*10 = 10 ktoe of cumulative savings over 2021-2030.

[55] The data reported by Member States about cross-cutting measures do not include the details about the shares of energy savings achieved per sector.

sector can be partly explained because policy measures targeting all buildings are considered cross-cutting (residential and services/industry).

Figure 24. Share of new annual energy savings in 2021 (left) and of cumulative energy savings for 2021-2023 (right), by sector at EU-level (data for 24 Member States).



Source: DG ENER's own calculations based on the data submitted by the Member States in their NECPRs 2023 and 2025 about the policy measures reported to Article 7(1) for the period 2021-2030 and related new annual energy savings for 2021 (data available for 24 Member States).

By 10 October 2025, 24 Member States have reported a total of 260 policy measures (or groups of measures) on Article 7 EED. Member States with the highest number of reported measures are Slovakia (51), Germany (32) and Spain (24). At the opposite, France reports a single policy measure (white certificates' scheme).[56] Ireland and the Netherlands report four sectoral packages of measures (plus a carbon tax for Ireland). Finland, Greece and Hungary have reported their energy savings for a single group of measures, without providing results per policy measure.

19 (out of 24 Member States) mentioned that at least one of their policy measures or group of measures is contributing to energy poverty alleviation (with a total of 53 policy measures or group of measures)[57]. However, only 12 Member States reported an amount of energy savings related to energy poverty alleviation (for a total of 23 policy measures or group of measures with energy savings data related to energy poverty alleviation).

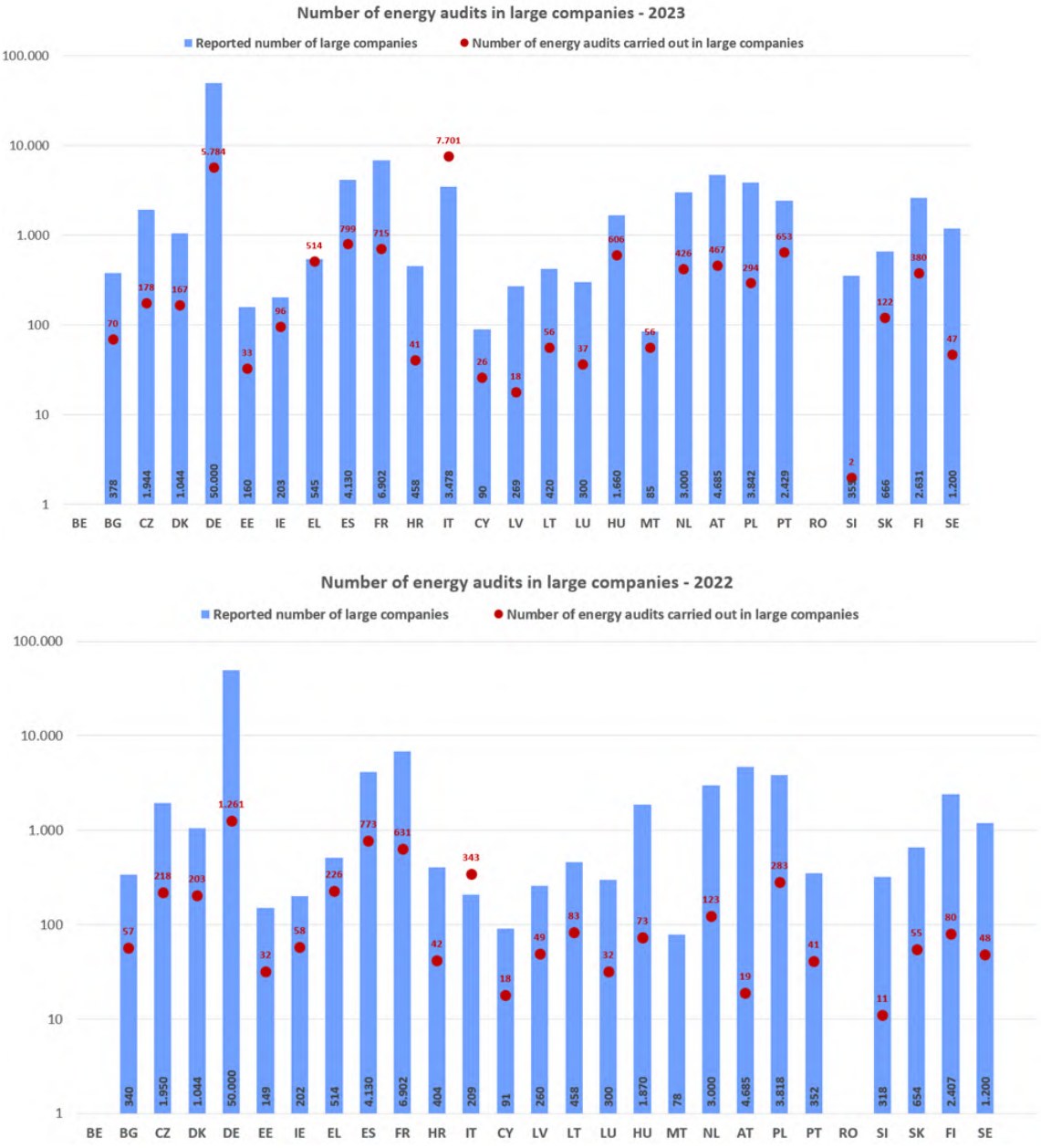
2.2.4 Energy Audit Obligation[58]

To optimise energy savings in the industrial sector, Article 8 of the EED requires large companies to carry out an energy audit or to implement an energy management system at least once every four years. In their NECPRs, Member States were required to state the total estimated number of large companies in their territory to which Article 8(4) of the EED is applicable and the number of energy audits carried out in those enterprises. The overview for 2022 and 2023 is shown in Figure 25 below.

[56] Sweden reported a single type of measures (energy and CO2 taxes) but did not report yet data about energy savings, as in its NECPR2023.
[57] Some of these policy measures are fully dedicated to energy poverty alleviation. Others contribute to energy poverty alleviation among other objectives.
[58] Article 8 of the EED 2012 (amended in 2018) and Article 11 of the EED recast

For both 2022 and 2023, only Belgium and Romania did not report information on the number of large companies. In general, mismatches observed between the values in the two years can be explained by the fact that energy audits are not required on a yearly basis, but at least every four years. In addition, given national specific circumstances, a certain number of companies may have postponed their energy audits.

Figure 25. Energy audits carried out in large companies in 2023 and 2022.



Source: NECPR 2025, JRC, 2025.

2.2.5 Energy efficiency financing[59]

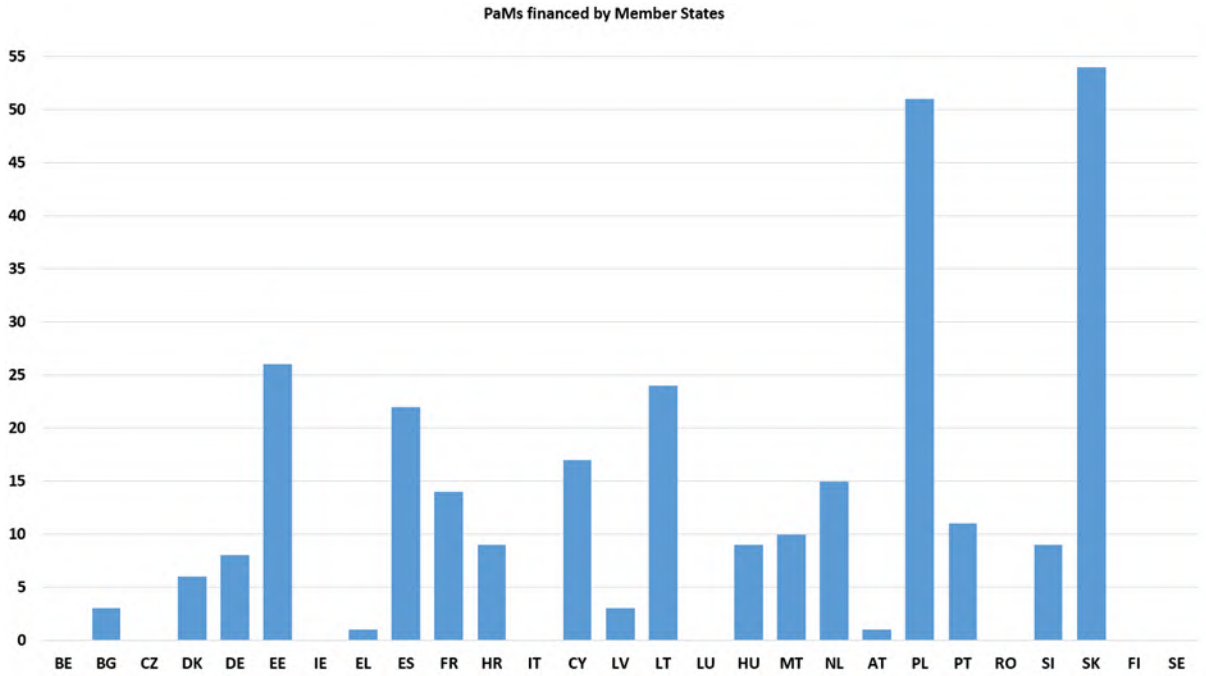
[59] Article 20 of the EED 2012 (amended in 2018) and Article 30 of the EED recast

In accordance with the Governance Regulation, Member States have to report the information on progress towards financing the policies and measures (PaMs), or group of policies and measures, including a review of actual investments against initial investment assumptions. Furthermore, pursuant to Article 30(17) of the EED recast, Member States should report to the Commission:

a) the volume of public investments on energy efficiency and the average leverage factor achieved by public funding supporting energy efficiency measures;
b) the volume of energy efficiency lending products, distinguishing between different products;
c) where relevant, national financing programmes put in place to increase uptake of energy efficiency and best practices, and innovative financing schemes for energy efficiency.

Figure 26 below reports the number of policies and measures related to energy efficiency financed by each Member State. Nineteen Member States have reported information on progress towards energy efficiency financing policies and measures.

Figure 26. Number of Policies and Measures financed by Member States.



Source: 2025 NECPR Reporting, JRC, 2025.

Among Member States that have reported information regarding the PaMs financing, the average completeness of the mandatory information is 99.2%. The missing data refer to the description of funds source employed. The most accurate information reported is the national public funding allocated, for a total of EUR 46.2 billion. Approximately 41% of the funds allocated relate to the building sector (of which 35% relates to the private/residential sector and 6% to public buildings). The supported actions are mainly related to existing buildings renovation, alleviation of energy poverty and integration of renewable energies. About the 56% of public funds are dedicated to transport efficiency. Most actions are targeting electric vehicles or the modal shift to more sustainable transport modes. There are also actions supporting transport infrastructure and public transport management. Finally, industry, and other sectors (e.g. energy supply, agriculture and cross-sectoral measures) account for the remaining 3.4%.

Article 30(17) of the EED recast, requires Member States to reports the volume of public investments on energy efficiency and the average leverage factor achieved by public funding supporting energy efficiency measures and the volume of energy efficiency lending products for both 2022 and 2023. Only 7 Member States reported all the information required (Bulgaria, Germany, France, Cyprus, Luxembourg; Slovenia and Slovakia), while 6 countries indicated only partial values. Among them, Denmark, Croatia, Netherlands and Poland reported information only on the volume of public investments. Greece, Denmark and Portugal reported partial data on the volume of energy efficiency lending products (for Denmark and Portugal only for the year 2023). The remaining Member States (Belgium, Czechia, Estonia, Ireland, Italy, Latvia, Lithuania, Hungary, Malta, Austria, Romania, Finland and Sweden) did not report any information related to Article 30(7).

2.2.6 Progress towards the long-term strategy for renovation

The 2025 NECPR includes reporting for Member States to track milestones and indicators of progress of the national stock of residential and non-residential buildings[60] of the long-term strategy for the renovation. Data collected in this area are grouped into seven main fields: building stock, energy use, emissions, renovation, contribution to EU targets, milestones (Annex IV) and NZEBs (Annex XVII)[61]. While the reporting completeness has improved compared to 2023 NECPR (with more than 40% of entries submitted on average, compared to 35% in 2023), it remains low. Almost all Member States reported information on the contribution to the Union's target, which is also the only mandatory field.

This shows the need to improve the tracking of data about the building stock and its evolution. Many provisions in the recast Energy Performance of Buildings Directive (EPBD)[62] will contribute significantly towards that goal, also improving Member States knowledge of the building stock and drafting their national roadmaps towards highly energy-efficient and decarbonised building stock by 2050.

National long-term renovation strategies evolved into the National Building Renovation Plans (NBRPs), introduced in Article 3 of the recast EPBD. NBRPs are due in draft by the end of 2025, with full submission by the end of 2026. The plans will ensure the renovation of the national stock of residential and non-residential buildings, both public and private, into a highly energy-efficient and decarbonised building stock by 2050.

2.2.6.1 Building stock

Member States reported data of the residential, non-residential and public building stock, in terms of number of buildings and/or floor area, with different degrees of completeness: 20 Member States reported data on number and/or floor area for residential buildings, 20 Member States reported some information on non-residential buildings (although more limited in scope) and only 17 Member States reported information on public buildings. Overall, there is a slight improvement on the completeness with respect to the previous reporting exercise (for 2021, 17 reported some information for residential buildings, 18 for non-residential buildings and 14 for public buildings).

[60] This section fulfils the obligation, introduced at the Article 35 of the Governance Regulation 2018/1999, for the Commission to submit biennially to the European Parliament and to the Council, as part of the State of the Energy Union Report, an overall progress report on the renovation of the national stock of residential and non-residential buildings, both public and private. It follows up the "*Report on renovation of the national stock of residential and non-residential buildings and on nearly zero-energy buildings*", annexed to the State of the Energy Union Report 2023 (COM(2023) 650 final).

[61] A more extensive analysis of NECPR will be provided in Paci, D., Tsemekidi-Tzeiranaki, S., Clementi, E., Maduta C., *Assessment of the 2025 NECP Reports Monitoring Member States' progress in their energy and climate plans – Summary Report*, 2025 *(forthcoming)*

[62] Directive (EU) 2024/1275.

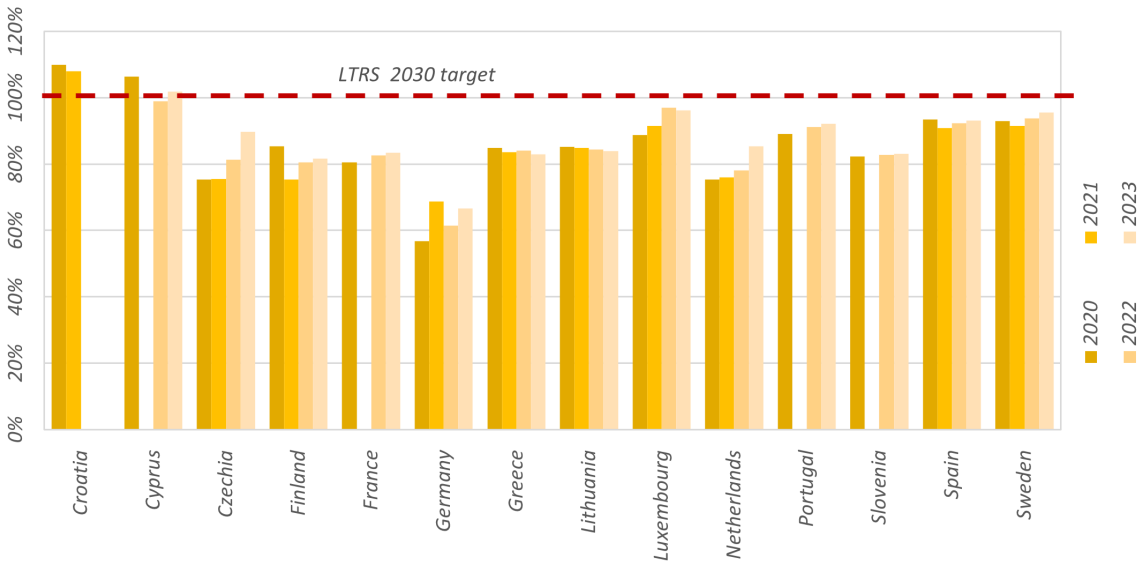
Member States currently use different approaches to define their worst-performing stock: energy class, age, energy consumption, etc. Member States also use data from different years. Overall, data on worst-performing buildings is generally less complete in the NECPRs. This results in significant heterogeneity in the definitions, data and presence of gaps. The EU average for residential buildings identified as worst-performing residential buildings was 29% in 2022 and 24% in 2023. For non-residential buildings, the EU average is 34%. The changes from year to year are more related to changes in definition or quantification rather than an actual evolution of the building stock.

2.2.6.2 Energy use and emissions

Twenty Member States reported data on **final energy consumption**, indicating an overall decrease. However, missing data limits the possibility to draw general conclusions at EU level (especially as regards public buildings). Fourteen Member States reported some data on **primary energy consumption**, but data are very scattered across building types. In 2022-2023 there is a general decrease of 3% in primary energy consumption in the residential sector (-8% compared to 2020). In non-residential buildings, on the basis of the limited Member States' reporting, primary energy consumption decreased of 3% in 2023 compared to 2022, while compared to 2020, it increased of 8%, excluding the reported data of outliers (Spain and Ireland) which may reflect inconsistencies in the data collection or reporting over the years. Seventeen Member States reported data on **GHG emissions** (in particular direct emissions) with an overall decrease in 2020-2023 for residential, non-residential and public buildings.

Figure 27 shows the progress made by countries towards achieving their 2030 energy use targets in buildings. The progress is measured from 2020 to 2023 for countries that reported consistent data. Overall, the data shows that most countries made progress towards their targets in 2023, with more countries getting closer to achieving their goals compared to 2022.

Figure 27. Progress in final energy reduction towards the 2030 target set in the 2020 Long-Term Renovation Strategies. Values are provided as the ratio of the 2030 target to the final energy value in each year.



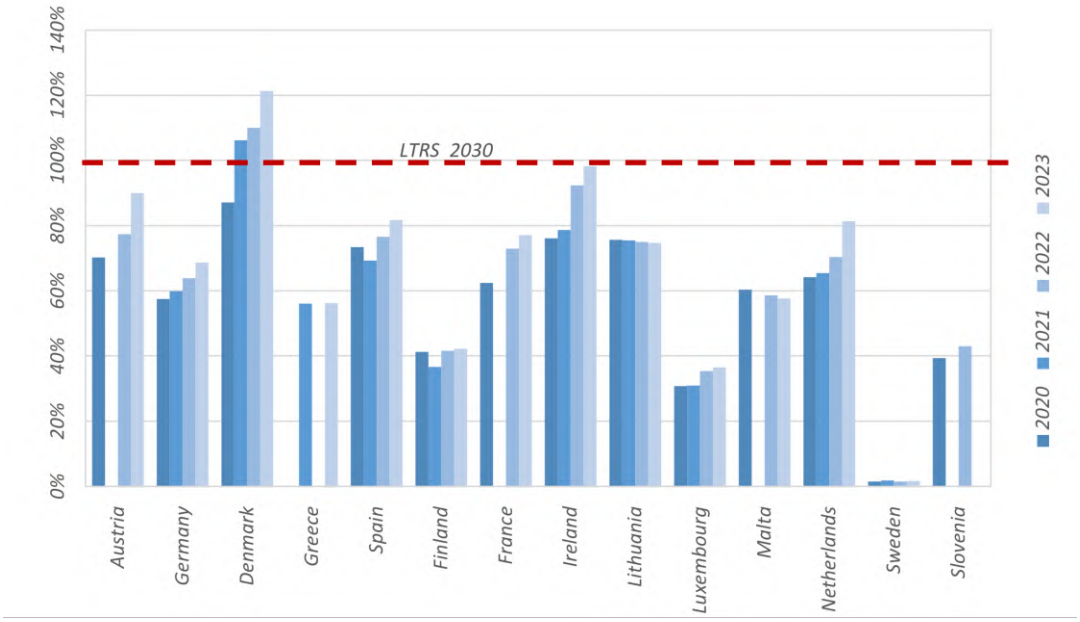
Notes: For France, the 2030 target was calculated for the entire building stock assuming the reduction set for the services sector (-22% compared to 2015). For Portugal, the 2030 target was calculated using the 2020 reference values (-11% in

primary energy use). For Sweden, the 2030 target for the entire building stock was calculated assuming the reduction set for heat and electricity in apartment buildings, schools and offices (-7% compared to 2020).

Source: JRC elaboration on NECPR 2025, NECPR 2023, and LTRS 2020

Figure 28 illustrates the progress made by countries towards achieving their 2030 GHG emission reduction targets in buildings, as outlined in their 2020 Long-Term Renovation Strategies. The progress is measured from 2020 to 2023 for countries that reported consistent data. By 2023 most countries are showing improvement, with five countries having made significant progress, reaching or exceeding 80% of their targets.

Figure 28. Progress in GHG emission reduction towards the 2030 target set in the 2020 Long-Term Renovation Strategies. Values are provided as the ratio of the 2030 target to the GHG emission value in each year.



Notes: For Denmark, Greece and Luxembourg, the reference values to calculate the 2030 target are taken from the European Environment Agency. Luxembourg covers only residential buildings.

Source: JRC elaboration on NECPR 2025, NECPR 2023, and LTRS 2020

2.2.6.3 Renovation and milestone indicators

The central role of building renovation in energy and climate policies is reflected in the NECPs through multiple milestones and targets. However, data on renovation remain highly incomplete and scattered. There are also differences across countries, years, depth of renovation, building types, and measure units. This makes it difficult to have a coherent overview, identify trends and draw general conclusions at EU level. However, there is an improvement compared to 2023.

Fifteen Member States reported some data on number of renovated buildings in 2022 and 2023, with a large variability in the results, particularly for the residential sector. Some countries had less renovated buildings in 2023 compared to the previous year, while others had significant increases. There are also differences in terms of renovation depth and its progress. For example, in Italy the number of medium renovations decreased between 2022 and 2023, while the number of buildings with deep renovation rose by 40%, and a slight increase is reported for light renovations.

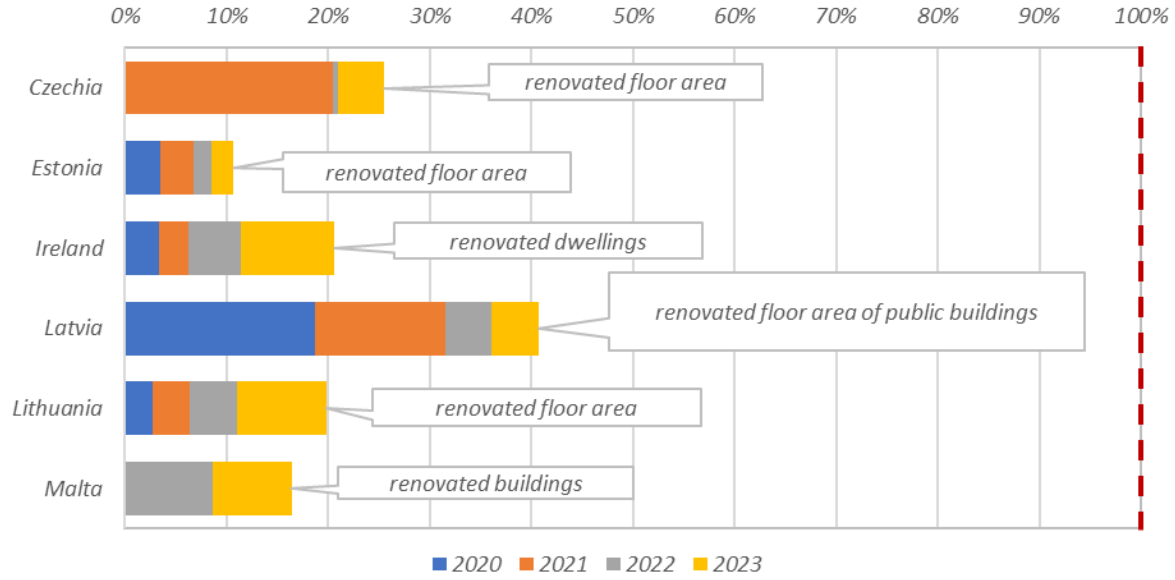
Only 6 Member States reported some data on renovation rates: Lithuania, Luxembourg, Malta, the Netherland, Austria, and Portugal. **Renovation rates remain too low and so does their use as indicator to monitor the progress of the building stock**. The lack of data, even in those countries that did report, suggests that the tracking of renovations is deficient. Efforts to improve rates of renovation and their monitoring need to be stepped up, for which a swift implementation of the recast EPBD will be absolutely key.

NECPRs show a wide variety of specific milestones and indicators set by Member States. In eleven cases, targets and progress are all clearly specified and quantified, while in the other reporting countries some missing values either on target or progress, make the reporting only partly complete. The large majority of Member States indicates targets for 2030, but there are some cases with intermediate targets or more forward-looking ones (2040, 2050). Three Member States reported only 2050 targets. It is possible to group milestones and targets in categories:

- **Improvement of the building stock:** this category includes an important variety of approaches and indicators: renovation rate; floor area / number of buildings; specific increase in the share of NZEBs; increase in the share of buildings in high energy classes or the phasing-out of the worst performing buildings. Some Member States have set specific targets for social housing or public buildings. It is the most frequently reported category, representing 42% of the milestones reported and indicated by 16 Member States.
- **Reduction in energy consumption:** both final and primary energy consumption, representing 32% of the milestones reported.
- **Reduction in GHG emissions:** target or milestone related to reducing CO_2 or GHG emissions. This objective represents 8% of the total number of targets and milestones reported.
- **Other targets** reported include technical systems (e.g. IE, SE), installation of PV panels (e.g. MT) or funding opportunities for building energy renovations (e.g. AT).

To provide an overview on how countries are progressing towards the 2030 building renovation target, Figure 29 shows the renovation achievements in each year from 2020 to 2023 normalised with the 2030 LTRS target. Due to differences or changes in indicators, such analysis was possible only for six countries. For comparability reasons, the graph considers year 2020 as the baseline with the target and progress calculated accordingly. Notably, the progress in 2023 was accelerated in all countries compared to 2022.

Figure 29. Progress towards the 2030 building renovation targets set in the 2020 Long-Term Renovation Strategies. Values are provided as the ratio of the 2030 target to the renovation values in each year.



Source: JRC elaboration on NECPR 2025, NECPR 2023 and LTRS 2020

The NECPR exercise evidences the need to further **increase efforts in stock-taking and reporting** as well as **harmonizing of milestones and indicators of the renovation of buildings** in the EU. The NBRPs, substituting existing long-term renovation strategies, will contribute to this with more targeted indicators. The NECPR exercise will remain the main tool to monitor the progresses made by Member States towards the targets set in their NECP and the future NBRPs.

2.2.6.4 Contribution to energy efficiency targets

The NECPR obligations require Member States to describe how the renovation of the building stock contributed to achieving the Union's energy efficiency targets[63]. The reporting rate is close to 90%, due to this being a mandatory element. This requirement is open to descriptive and/or quantitative information and the responses show a variety of interpretations from Member States. However, in some cases, responses are incomplete or with missing references. Overall, these differences and lacking information make it very complex to provide a comprehensive picture of the contribution of the building stock.

2.2.6.5 Nearly zero-energy building (NZEB)

Since 31 December 2020, all new buildings must be NZEBs. Tracking the progress of NZEBs means also tracking the progress of new constructions across Europe, until Zero-Emission Buildings (ZEBs), introduced by Article 7 of the recast EPBD, become the new standard.

The reporting on progress towards NZEBs improved compared to NECPR 2023: 20 Member States reported some figures in terms of number of buildings and/or floor area (15 in 2023 NECPR), even if wide differences occur in terms of type of data available. Despite the mentioned improvement, high number of missing entries persists across years and countries. A decline in completeness in 2024 data compared to 2023 is also observed.

[63] In accordance with Directive 2012/27/EU, revised in 2023 (Directive - 2023/1791 - EN - EUR-Lex).

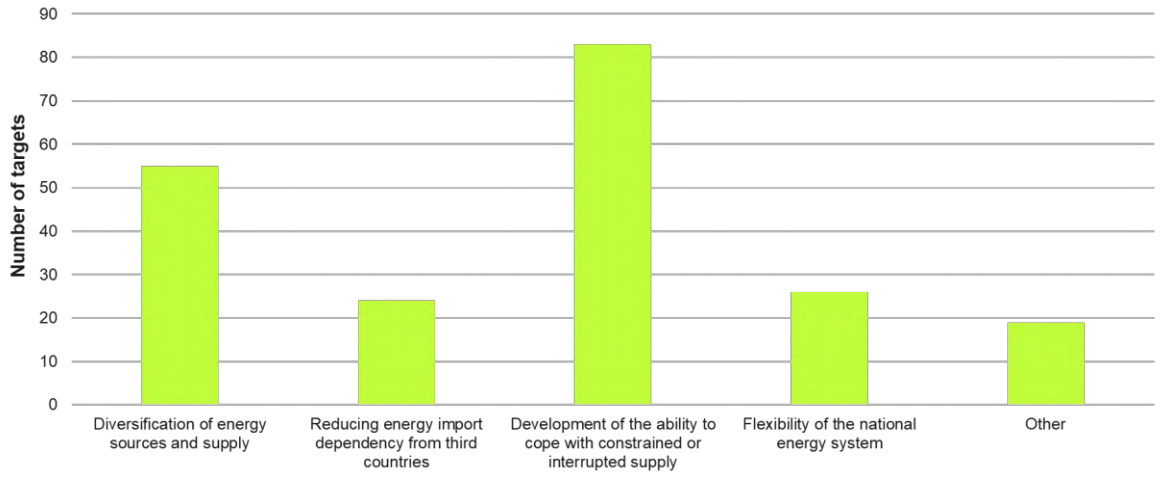
Aggregating the reported data from Member States for both years, the overall number of NZEBs increased by 24%. This is an increase from the 11% growth reported from 2021 to 2023. The overall number of residential NZEBs, the numerically most relevant sector, increased by 23% from 2023 to 2024.

2.3 Ensuring energy security

Ensuring secure and affordable access to energy for all Europeans requires diversified supply sources, and balance between supply and demand in all circumstances. Member States have reported on energy security data that can be categorised to diversification of energy sources and supply; reducing energy import dependency from third countries; development of the ability to cope with constrained or interrupted supply, and; flexibility of the national energy system. Czechia and France reported only partial data, and Bulgaria did not submit any data on the progress of energy security.

Figure 30 shows that most targets that are set within the topic of energy security focus on the objective of developing the ability to cope with constrained or interrupted supply. Diversification of energy sources and supply is the second most targeted objective, with 55 reported targets. Sections 0 to 0 provide more detailed information and examples on the content and types of targets for each of the four energy security goals.

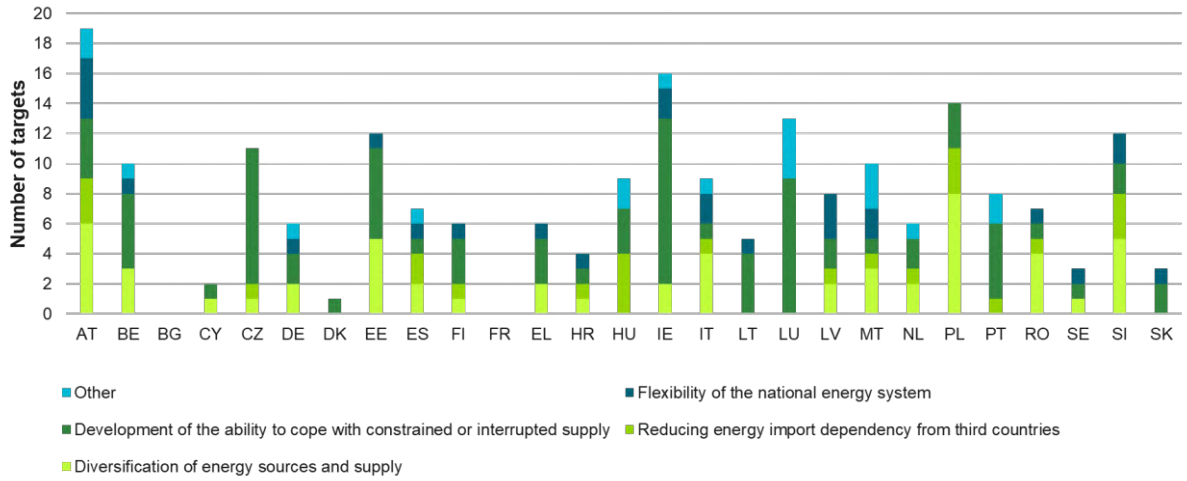
Figure 30. Number of targets / objectives for all EU27 by energy security goal.



Source: NECPR, Annex V

Figure 31 shows where Member States focus their energy security targets on. Austria has set the highest number of targets in total (19), followed by Ireland (16), Poland (14), Slovenia and Estonia (both 12). On the other hand, Denmark only reported one national target, Cyprus two, Sweden and Slovakia three and Croatia four.

Figure 31. Number of targets / objectives per MS by energy security goal (Data for BG is not yet available and for FR and CZ not yet complete).



Source: elaboration on NECPR, Annex V

2.3.1 Diversification of energy sources

Across the EU, Member States are actively pursuing a broad range of targets to diversify their energy sources and supply routes. Member State reports show that their key focus is on enhancing gas supply security through the development of new LNG terminals, alternative pipeline routes, and renewable gases. Member States such as Austria, Cyprus, the Netherlands and Germany are developing infrastructure that supports diversified import routes and resilient supply chains. For example, one target of the Netherlands is to increase LNG import capacity, to which positive progress is being made through the construction and expansion of the GATE and EET LNG terminals.

Renewable energy expansion is another central pillar of diversification targets as reported in the NECPRs. Many Member States are increasing the share of solar, wind, and bioenergy in their energy mix, while only three Member States report of energy from nuclear heat (Belgium, France, Sweden). Some Member States also target improvements in interconnection infrastructure to further facilitate cross-border trade (e.g. Belgium, Greece, Slovenia). These efforts are often complemented by regional cooperation initiatives, such as cross-border energy projects and shared infrastructure planning, which are particularly evident in the strategies of Malta and Ireland. Nuclear energy remains part of the diversification strategy for a few countries, including Belgium, the Netherlands, Slovenia and Poland, which are exploring the development or maintenance of nuclear capacity.

Hydrogen is also gaining prominence, with a few Member States setting ambitious targets for electrolysis capacity and hydrogen-ready networks (e.g. Austria, Croatia, Malta), aiming to integrate renewable hydrogen into their national energy systems.

These national strategies reflect a shared EU commitment to reducing reliance on single energy sources and enhancing the robustness of supply systems through infrastructure investments, generation capacity additions and regional collaboration.

2.3.2 Import dependency

Import dependency from third countries (outside of the EU) remains a critical concern for many Member States and the EU.

The available data shows that several Member States rely significantly on third countries for their energy needs, with 6 out of the 16 Member States relying significantly on third countries for energy needs having an overall import dependence of above 50% (Belgium, Greece, Lithuania, Malta, Portugal). This makes them particularly exposed to fluctuations in global markets and geopolitical risks. Reliance on third countries is especially high for fossil fuels (coal, natural gas and oil and petroleum products) since primary production of these energy sources in the EU is limited. This underlines that decarbonisation is not only a matter of improving sustainability, but also a matter of improving energy security through decreased import dependency.

Therefore, setting of national targets to reducing the current import dependencies is paramount. Targets as reported in the NECPRs show that reducing dependency on energy imports - particularly from geopolitically sensitive suppliers - is an important point of action for several Member States. A regular objective is the phasing out of fossil fuels, with countries like Austria, Finland, Croatia and Hungary implementing measures to eliminate or significantly reduce reliance on gas, oil, and coal. As one of their reported targets, Finland specifically set a targeted ban on natural gas imports from Russia and Belarus. These efforts are supported by policies aimed at boosting domestic energy production, especially from renewable sources, and by enhancing energy efficiency to lower overall demand.

Many Member States have also set general targets (often also in their NECPs) on their level of import dependency and level of self-sufficiency (e.g. Germany, Denmark, Italy, Spain, Czechia, Estonia, Hungary). In some cases, this target applies to overall energy import dependency, while in some cases it aims at specific energy sources or carriers. Spain for example reports that it aims to improve energy independence from external sources from 27% in 2019 to 50% in 2030.

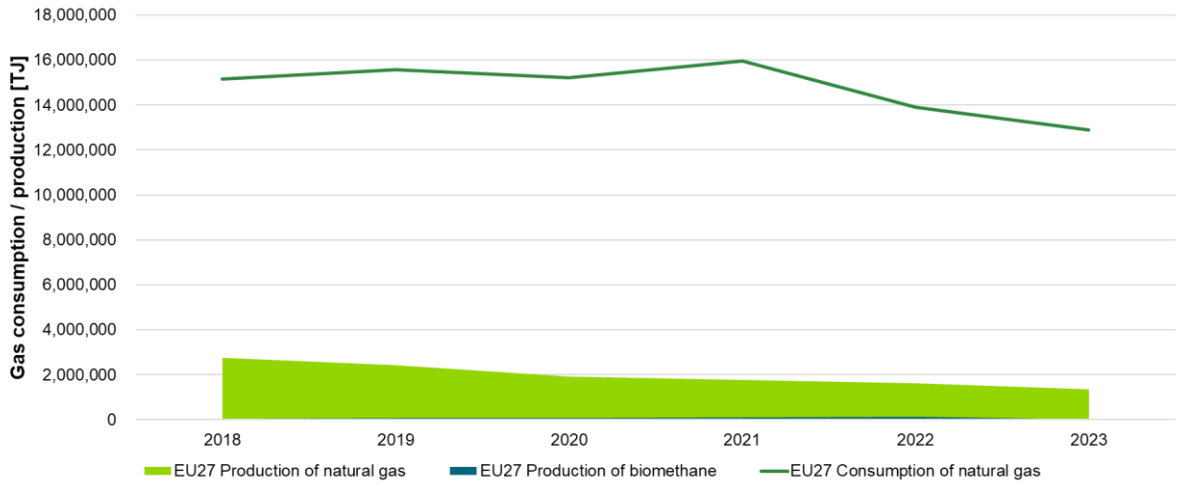
In addition, to enhance Europe's energy security, it is essential to focus on the development of alternative fuels for aviation and maritime sectors, reducing dependency on imported feedstocks from specific areas of the world, and reinforcing domestic capabilities and innovation.

These initiatives reflect Member States' effort to strengthen energy sovereignty, reduce exposure to external supply risks, and build a more resilient and self-reliant energy system. In addition to the quantitative insights on import dependency, and qualitative insights on targets to reduce this (both based on the NECPRs).

Figure 32 provides further detail on the import dependency for natural gas specifically. This figure shows that even though a gas consumption reduction of approximately 2,000,000 TJ has taken place from 2018 to 2023, dependency on imports has further increased. Where in 2018 20% of the natural gas consumed was also produced in the EU, in 2023, the share was only 11%64. Biomethane production is ramping up, but not at a pace high enough to offset the decrease in EU domestic natural gas production.

[64] Eurostat, 'Supply, transformation and consumption of gas – monthly data', Eurostat data browser, 21 October 2025, accessed 22 October 2025, https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm__custom_16815301/default/table?lang=en – Indicators 'Inland consumption – observed [IC_OBS]' and 'Indigenous production [IPRD]' are used, for 'European Union – 27 countries'.

Figure 32. Gas consumption and production in EU27 from 2018 - 2023 (Note: data for 'Production of biomethane' is only available for 2018 – 2022).



Source: Eurostat [nrg_cb_gasm] (65) and EBA Statistical Report 2023 (66).

2.3.3 Ability to cope with constrained or interrupted supply of an energy source

Ensuring the ability to cope with constrained or interrupted energy supply is an important element of energy security, as it demonstrates resilience to keep energy systems operational. Various quantitative indicators, such as N-1 (resilience if the largest network element fails) for the gas system, are used to measure and benchmark each Member State's coping ability. Most Member States have reported some information on these indicators.

For the N-1 indicator, which assesses whether the gas system can remain fully operational if its largest network element fails, usually the target is set at 100%. Nevertheless, six countries - Estonia, Finland, Croatia, Malta, Portugal and Slovenia - fall below this threshold.

To enhance resilience against supply disruptions, Member States are implementing a range of targets aimed at strengthening their energy systems. Within the targets as reported in their NECPRs, many Member States focus on stockholding obligations, storage filling targets or mandatory reserve supplies (Austria, Czechia, Germany, Poland, Romania, Hungary, the Netherlands, Finland), for a wide range of fuel types (i.a. natural gas, oil, peat). State-owned as well as privately owned reserves are considered.

Infrastructure upgrades are also being pursued to ensure the resilience of electricity and gas systems, as seen in the targets of Lithuania, Greece and Italy. Emergency preparedness is also a priority, with Member States updating risk assessments, action plans and crisis response plans (e.g. Cyprus, Luxembourg, Portugal, Malta).

For the Baltic states, integration and synchronisation of their electricity system with the continental European electricity grid was a key target. In this regard strongly positive progress has been made, as synchronisation is completed.

[65] Eurostat, 'Supply, transformation and consumption of gas – monthly data', Eurostat data browser, 28 July 2025, accessed 29 July 2025, https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm__custom_16815301/default/table?lang=en – Indicators 'Inland consumption – observed [IC_OBS] and 'Indigenous production [IPRD] are used.

[66] EBA, 'Publications – EBA Statistical Report 2023', EBA website, 2025, accessed 29 July 2025, https://www.europeanbiogas.eu/eba-statistical-report-2023/

Cross-border cooperation is increasingly being considered as a way to improve Member State's ability to cope with constrained or interrupted supply. Finland for example set the target of maintaining agreements on security of supply with other countries, which it did by entering into agreements with Sweden and Norway.

Collectively, these strategies demonstrate a proactive and multifaceted approach to ensuring energy security under constrained or interrupted supply conditions.

2.3.4 Flexibility of the national energy system

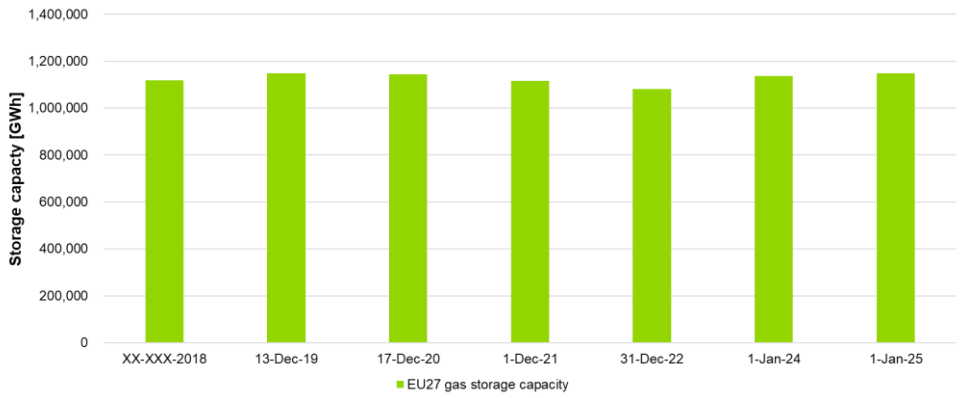
Enhancing the flexibility of national energy systems contributes to building energy systems that are capable of responding dynamically to evolving energy needs and challenges. For this energy security goal, no quantitative data is reported. However, targets to increase flexibility of national energy systems are reported.

Energy storage is the critical area of focus within the targets for this energy security goal. Several Member States (i.e. Austria, Belgium, Italy, Romania, Slovenia) report promoting the scale-up of battery storage to manage fluctuations in supply and demand. Italy for instance has set ambitious targets for both centralised and distributed storage, with notable progress in distributed storage systems (target of 7.0 GW in 2030, reported value for 2024 is 4.7 GW).

Enabling integrating variable renewable energy resources is a target that is also regularly mentioned (e.g. Austria, Ireland), however, often no clear indicators are connected to this target, making it challenging to reflect on approaches and progress.

Figure 33 shows that the gas storage capacity in the EU27 has remained stable over the past seven years. Gas storage is a key element that accommodates for flexibility in the EU gas system (and electricity system through their interrelation). The majority of the gas storage capacity is concentrated in five Member States: Germany, Italy, the Netherlands, France and Austria. Together, their capacity is more than 70% of the total gas storage capacity in the EU at 1st of January 2025 totalling a capacity of 1,147,753 GWh. In parallel, nine Member States do not have any gas storage capacity at all. This indicates that a disparity exists between Member States in how they to the flexibility of their national energy systems.

Figure 33. Gas storage capacity in EU27 for 2018 – 1 Jan 2025. Note: The values are snapshot values for the indicated dates, while for 2018 no exact date was provided.



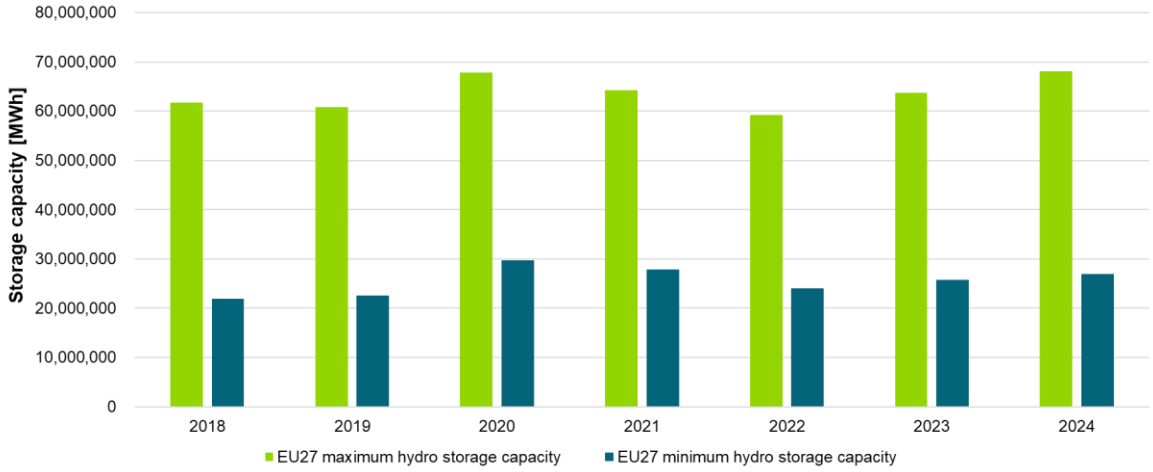
Source: ENTSOG[67]

Another fossil storage type is **coal**, despite the fact that it emits significant amounts of CO_2. Coal reserves indicate the potential availability of this energy source within a MS' geography ("storage" in a broader sense of the word). Coal reserves in the EU27 have been very constant over the last decade (for 2016 in total 83,467 million tonnes is reported, while for 2023 84,193 million tonnes is reported). (68) The coal reserves have only slightly changed for Member States in Eastern Europe (Bulgaria, Poland, Czechia, Hungary) and for Germany.

Next to these fossil energy storage types, energy can also be stored in non-fossil storage. **Pumped-hydro storage** is a way to store energy through water storage in reservoirs. Because of the influence of environmental elements (e.g. rainfall) and high seasonal variability, it is challenging to represent the storage capacity of pumped-hydro storage as one static value. Instead, a minimum and maximum range better reflects its availability. As such, figure 34 shows the maximum and minimum stored energy of pumped hydro storage in the EU27 for 2018 – 2024. While the capacities fluctuate mainly due to environmental reasons, the EU27 combined yearly maximum and minimum capacities are relatively stable at around 65,000,000 MWh and 25,000,000 MWh respectively (with for both a fluctuation of about 5,000,000 MWh upwards and downwards). Since pumped-hydro storage is highly dependent on geographical suitability, only 13 Member States have some level of pumped-hydro storage in place.

[67] ENTSOG, 'System Capacity Map', ENTSOG website, 2025, accessed 29 July 2025, https://www.entsog.eu/maps
[68] TheGlobalEconomy.com, 'Coal reserves – Country rankings', TheGlobalEconomy.com website, 2025, accessed 29 July 2025, https://www.theglobaleconomy.com/rankings/coal_reserves/European-union/

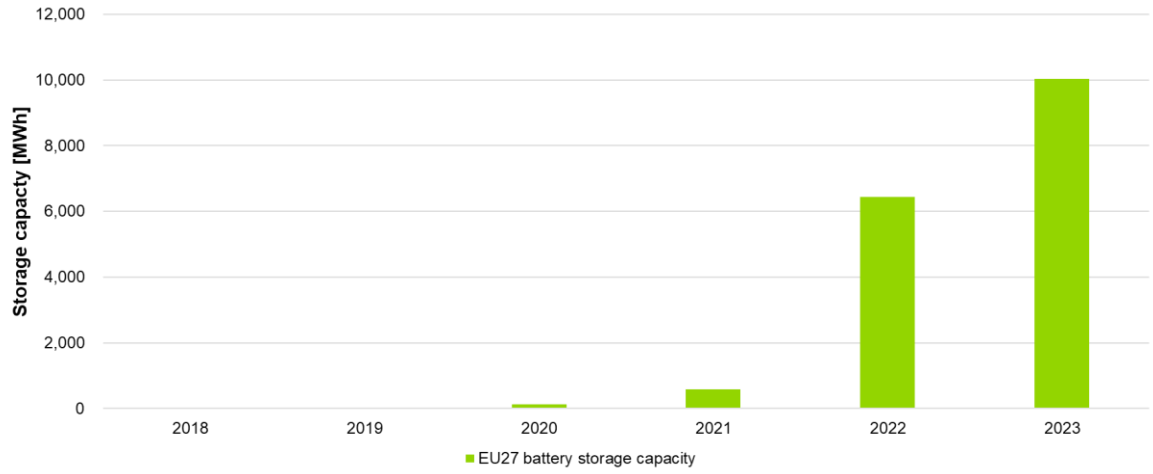
Figure 34. Pumped-hydro storage capacity in EU27 for 2018 - 2024. Source: ENTSO-E (69).



Source: ENTSO-E[70]

While pumped-hydro storage is a mature technology already, **batteries** are still in a phase of maturation. Figure 35 shows the increase of battery storage capacity in the EU from 2018 (still zero installed capacity) to 2023 (10,034 MWh installed capacity). Italy is the main driver of battery deployment, with 7,014 MWh of installed capacity in 2023. At the same time, 13 Member States still show zero installed battery capacity.

Figure 35. Battery storage capacity in EU27 for 2018 - 2023.



Source: Eurostat [nrg_inf_bt][71]

[69] ENTSO-E, 'ENTSO-E Transparency Platform - Generation - Water Reservoirs and Hydro Storage Plants', ENTSO-E Transparency Platform, 29 July 2025, accessed 29 July 2025, 2025 accessed 29 July 2025, https://newtransparency.entsoe.eu/
[70] ENTSO-E, 'ENTSO-E Transparency Platform - Generation - Water Reservoirs and Hydro Storage Plants', ENTSO-E Transparency Platform, 29 July 2025, accessed 29 July 2025, 2025 accessed 29 July 2025, https://newtransparency.entsoe.eu/
[71] Eurostat, 'Batteries power capacities and energy storage - [nrg_inf_bt]', Eurostat data browser, 16 June 2025, accessed 29 July 2025, https://ec.europa.eu/eurostat/databrowser/view/nrg_inf_bt__custom_16815866/default/table?lang=en

2.4 Achieving an interconnected internal energy market

2.4.1 Electricity interconnectivity

The 15 % interconnectivity target set in Article 23(1) of the Governance Regulation refers to net transfer capacity of interconnectors with neighbouring Member States divided by installed generation of a given country.

Based on the latest data, 15 Member States have their electricity interconnectivity level above both the 2020 (10%) and 2030 (15%) EU targets. 5 countries were below 15% and above the 10% threshold, while 8 countries were still below the previous target from 2020. Table 9 presents the latest data for the interconnectivity indicator in line with the methodology used for the calculation of the targets.

Table 9. Net transfer capacity to installed generation capacity [%] for EU27 Member States.

Member State	2024	2025		Member State	2024	2025
Belgium	15.86	13.54		**Lithuania**	41.03	39.21
Bulgaria	16.80	21.91		**Luxembourg**	163.82	95.65
Czechia	27.01	26.33		**Hungary**	41.74	34.11
Denmark	35.95	36.53		**Malta**	39.47	38.54
Germany	10.63	10.18		**Netherlands**	10.31	7.12
Estonia	62.82	59.63		**Austria**	28.96	25.54
Ireland	0.00	0.00		**Poland**	5.13	4.33
Greece	4.82	6.30		**Portugal**	11.47	14.01
Spain	4.23	3.62		**Romania**	16.34	12.72
France	5.56	4.72		**Slovenia**	85.46	91.88
Croatia	36.70	49.03		**Slovakia**	47.81	41.04
Italy	5.03	4.68		**Finland**	15.47	15.23
Cyprus	0.00	0.00		**Sweden**	12.83	11.43
Latvia	66.98	46.80				

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

One key reason for most of Member States to have a lower level of interconnectivity is their geographical location and (lack of) proximity to other EU Member States or comparably short land borders to their neighbouring countries. As island nations, it is more challenging for Ireland and Cyprus to develop electricity interconnectors with other Member States. Missing cross-border infrastructure and internal grid constraints also play a significant role in limiting transfer capacities available for cross-border exchanges. If finished on time, the interconnection projects in the pipeline are expected to further improve interconnectivity levels in most of the Member States. However, more interconnections are needed in general, particularly in view of increasing renewable generation

capacities. The pace of deployment of renewable energy sources is not matched by the pace of deployment of new cross-border capacities leading to year-on-year reduction of interconnectivity levels in some countries.

2.4.2 Infrastructure projects

Infrastructure development plays a pivotal role in achieving the objectives of the Energy Union. Among these efforts, Projects of Common Interest (PCIs) are a specific category of cross-border infrastructure projects that are deemed essential for completing the EU's internal energy market and reaching its energy and climate goals. PCIs are distinguished from other infrastructure projects by their strategic importance, regulatory support, and eligibility for EU funding. While PCIs are typically large-scale, transnational initiatives with high policy relevance, other infrastructure projects may be national or regional in scope and are assessed based on their individual progress, implementation status, and contribution to national objectives. Progress on these projects is outlined in section **Error! Reference source not found.** for PCIs and section **Error! Reference source not found.** for other main infrastructure projects.

Out of 85 PCI projects indicated by MS in their reports 26 are on time (positive progress rating), 11 are delayed (negative progress rating) and the progress of 48 is unclear (Figure 36). Five Member States (Bulgaria, Czechia, Germany, Finland and Poland) did not report on PCI projects. The reporting does not provide sufficient information to accurately evaluate the progress of PCI implementation in various Member States,

Member States reported a total of 283 other main infrastructure projects, of which 195 are electricity projects, 62 are natural gas projects and 26 are hydrogen projects. **Error! Reference source not found.** Figure 36 shows that a handful of countries stand out for the number of infrastructure projects reported. Cyprus leads with 58 projects, primarily focused on electricity transmission upgrades. Italy and Croatia also report a high number of projects, with 42 and 27 respectively. Italy shows a particularly strong emphasis on electricity grid reinforcement and interconnection since the vast majority of projects (29 out of 42) reported are electricity projects. Croatia's portfolio of 27 projects includes a mix of electricity and gas projects, with several initiatives aimed at improving regional connectivity. Cyprus, despite its high volume, presents a mixed picture in terms of progress, with many projects rated negative (47) or unclear (9).

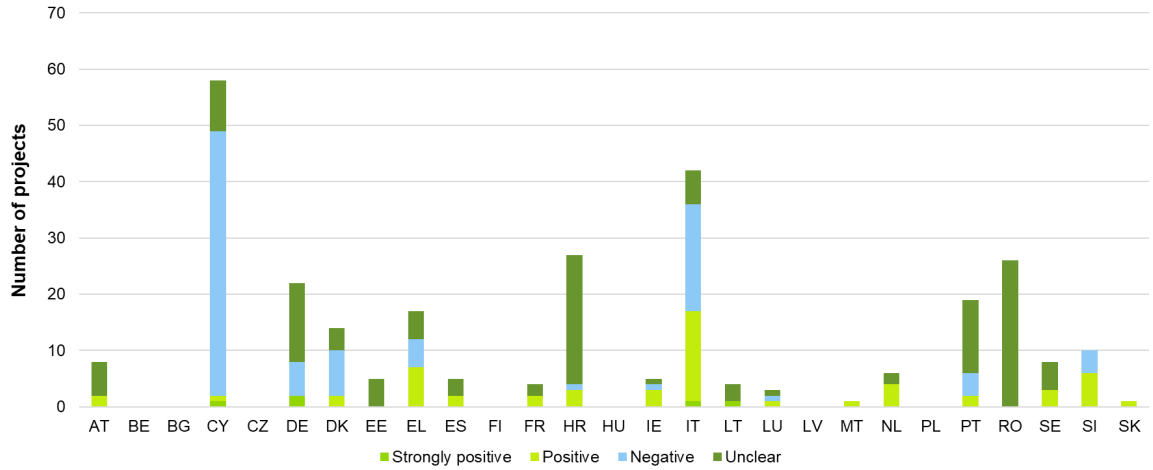
Italy, Greece and Slovenia stand out for their positive ratings. Italy has 16 projects rated as ahead of schedule or on time, including well-documented electricity upgrades and new transmission lines such as the Sicily – mainland link. Greece's 17 reported projects include 7 positively rated ones, largely tied to its island interconnection projects, which are critical for improving energy reliability. Slovenia's 10 projects include 4 positively rated electricity and gas infrastructure initiatives, such as the Divača-Beričevo line.

On the other end of the spectrum, Cyprus, Italy, and Denmark report the most negatively rated projects. Cyprus has 47 delayed projects out of 58, primarily due to a combination of factors including the rescheduling of the national network development plan, and disruptions caused by the COVID-19 pandemic, roadworks by local authorities, and legal proceedings related to tenders. These delays span between 2 and 10 years, and while Cyprus provided relatively clear reporting on delays and completion rates, the sheer number of delayed projects began to create knock-on effects, with delays in some initiatives contributing to setbacks in others. Italy has 19 delayed projects, mostly tied to natural gas projects where planning and permitting issues have slowed progress, and Denmark has 8

delayed projects out of 14, including offshore grid components that have faced regulatory and cost-related setbacks.

Romania, Croatia, Portugal, and Germany show a high proportion of unclear ratings (26 out of 26 for Romania, 24 out of 27 for Croatia, 13 out of 19 for Portugal, and 14 out of 22 for Germany). In most of these cases, Member States not filling out key fields related to progress or delays, making it difficult to assign ratings.

Figure 36. Number of other main infrastructure projects per MS and the progress rating.



Source: elaboration on NECPR, Annex VI, table 3

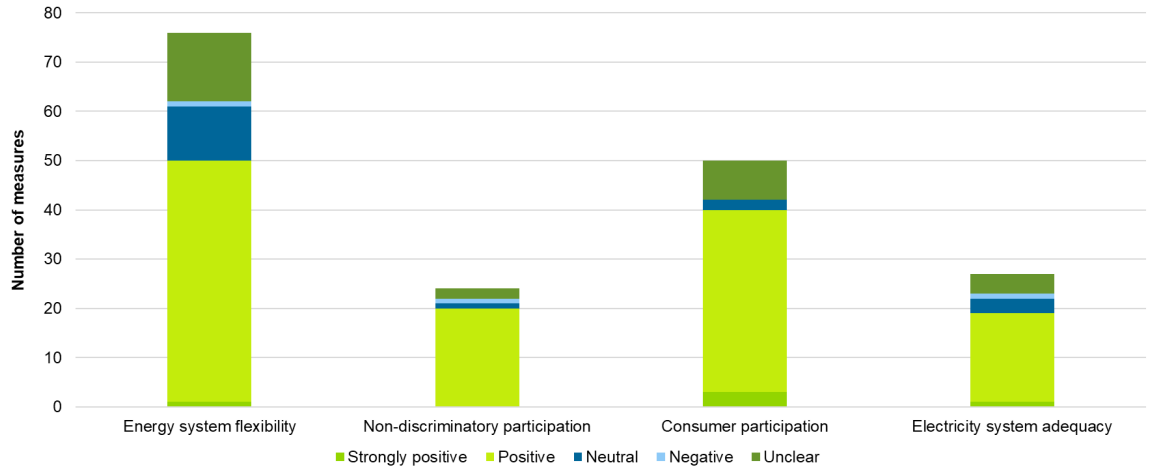
2.4.3 Progress on internal energy market

This section provides a progress update on national objectives towards the internal energy market. This includes national objectives on four topics (Annex VI, tables 4 – 7) related to energy system flexibility, non-discriminatory participation, consumer participation and electricity system adequacy.

An EU27 overview of number of targets and their progress rating per topic is provided in Figure 37. On the four topics, the Member States have set the most targets for energy system flexibility (76) and consumer participation (50). The highest share of targets which are in line with or ahead of the trajectory are for the topics of non-discriminatory participation and consumer participation, with 83% and 81% (respectively).

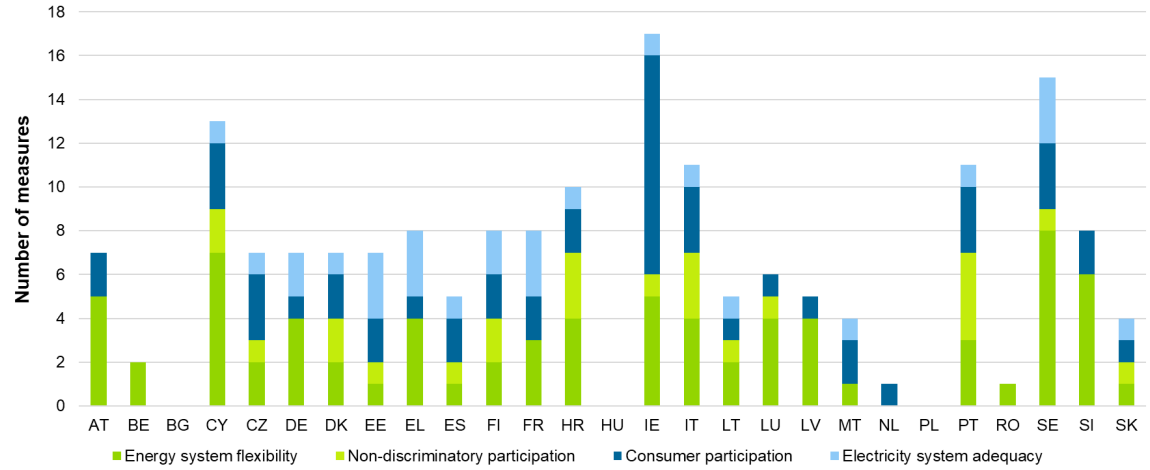
An overview of number of targets per topic for each MS is provided in Figure 38. Ireland, Sweden and Cyprus have set the most targets, with 17, 15 and 13 targets respectively. The number of targets set by the countries shows large variation, in particular for energy system flexibility and consumer participation. Bulgaria, Hungary and Poland reported no targets on the four topics.

Figure 37. EU27 total number of measures for energy system flexibility, non-discriminatory participation, consumer participation and electricity system adequacy and the progress rating.



Source: elaboration on NECPR, Annex VI, tables 4-7

Figure 38. Number of measures for energy system flexibility, non-discriminatory participation, consumer participation and electricity system adequacy per MS.



Source: elaboration on NECPR, Annex VI, tables 4-7

2.4.3.1 Energy system flexibility

Increasing the energy system flexibility enhances the system's capacity to integrate increasing shares of renewable electricity and to adapt to the variability of generation, consumption patterns, and grid availability. The Member States are actively working on developing flexibility solutions, such as demand response, storage, and dynamic pricing mechanisms which is reflected in the high number of targets set in this area.

The Electricity Directive (EU) 2019/944 requires Member States to put in place appropriate measures and provide incentives to distribution system operators to procure market-based flexibility services to efficiently operate their networks and to avoid costly network expansions. While some progress is visible, development of flexibility services remains slow in certain Member States. Member States such as Cyprus, France, Italy, Lithuania, Latvia, Malta, Portugal and Romania have set targets to increase electricity storage capacity, while Cyprus, France and Malta have sent targets on demand response, and Cyprus and Luxembourg on dynamic pricing measures.

A few Member States (Cyprus, Luxembourg, Sweden) have also included smart metering targets under this topic, creating overlap with consumer participation reporting. The wide diversity of approaches and indicators used makes it difficult to provide a unified progress update.

In addition, the Electricity Regulation (EU) 2019/943 obliges Member States to adopt a report on the estimated flexibility needs for a period of at least the next 5 to 10 years at national level, within one year of the approval by ACER of the flexibility needs assessment methodology. These reports, detailing on flexibility needs should be ready by 25 July 2026 and should be followed by an indicative national objective for non-fossil flexibility in no later than six months after the adoption of the report.

2.4.3.2 Non-discriminatory participation

Non-discriminatory participation in energy markets and unlocking flexible consumption are key actions for energy market liberalisation and create opportunities for consumers to benefit from lower energy prices. The join ACER-CEER market monitoring report[72] outlines the different elements on more active participation of consumers in the energy market.

In the framework of their National and Energy Climate Plans, 14 Member States have reported a total of 24 targets and objectives for non-discriminatory participation in energy systems including access to grid or to the market. Overall, the reported targets are of relatively high quality and show positive progress: 20 have been rated positively, while two are less clearly defined and one shows negative progress.

According to the data of ACER-CEER market monitoring report, in 2023, fifteen countries have a smart meter roll-out rate above 80 % (Denmark, Estonia, Spain, France, Italy, Latvia, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia, Finland and Sweden, and EEA member Norway). Belgium, Ireland, Lithuania and Great Britain have a roll-out rate of between 30 % and 80 %. This progress supports wider and more equal participation of consumers in the energy market.

Most reported targets and objectives under the NECP framework include changes in regulation and connecting markets with neighbouring markets or countries. Regulation changes are part of targets set by Finland, Croatia, Ireland, Italy, Lithuania including for instance measures to increase access to balancing markets (Croatia) and to liberalise retail markets (Lithuania). Targets on improving market integration or interconnectivity with neighbouring countries or markets are included for both gas and electricity markets. For example, gas markets integration with Belgium is targeted by Luxemburg, while electricity market connectivity to the North Italy market is targeted by Croatia.

2.4.3.3 Consumer participation

Consumer participation in the energy system is vital for achieving a sustainable and efficient energy future. Figure Member States reported on a range of measures to improve consumer empowerment and participation in the energy system.

One key aspect of this transition is the adoption of self-generation and new technologies, including the widespread implementation of smart meters. The roll-out of smart meters is one of the frequently used measures reported, and many Member States exceed their target. Member States also report on measures to support self-consumption such as incentive schemes for residential solar-PV installations but assessment of progress is often hindered by a loose definition.

[72] Joint ACER-CEER Market Monitoring Report 2024 ACER-CEER_2024_MMR_Retail.pdf

2.4.3.4 Electricity system adequacy

Capacity Mechanisms have been introduced in several EU Member States[73] [74] to give more revenue predictability and ensure security of supply, enabling Member States under certain conditions, to provide subsidies to power generators and other technologies, such as demand response and storage.

18 Member States have reported targets related to system adequacy. The indicators used by Member States vary significantly, including the Loss of Load Expectation (LOLE) and Expected Energy Not Served (EENS). This diversity makes cross-country comparison of progress challenging. Regulation (EU) 2019/943 requires Member States with an adequacy concern, to develop and execute an implementation plan (market reform plan), setting out how they intend to address the root causes of their adequacy problem with market reforms. To date, many Member States (13 out of 27) have already received Commission Opinions on their implementation plans.

To ensure that the internal market level-playing field is preserved, the rules prescribe that subsidies are granted only when an adequacy issue exists or will arise in the future, justified on the basis of robust assessments (either performed at EU level or nationally). These assessments should be based on a common European methodology (ERAA methodology) adopted by ACER in 2020. To date, there have been four editions of the European resource adequacy assessment ('ERAA'), out of which the latest two have received an approval from ACER. Some Member States have relied on National resource adequacy assessments ('NRAA') to justify the need of a capacity mechanism. The Commission has adopted State aid decisions on three schemes (Belgium, Finland, Sweden) since the entry into force in 2019 of the new capacity mechanisms framework in the Regulation.[75]

Setting a reliability standard is necessary for any robust decision-making regarding adequacy. It enables a Member State to decide whether measures are needed to ensure that resource adequacy risks remain within limits. That is why under Regulation (EU) 2019/943 Member States implementing or intending to implement a capacity mechanism must set their own reliability standard at national level. So far, only a few Member States have reportedly calculated the reliability standard according to the framework[76]. In addition to setting reliability standards, some Member States (e.g. Germany, Estonia, Greece) have included measures on improving interconnectivity and balancing markets as part of their adequacy objectives. Overall, references to progress on electricity system adequacy remain vague and do not allow to draw conclusion.

The Electricity Market Design reform[77] introduced a number of changes to the rules regarding capacity mechanisms, in particular, on streamlining the Commission procedures for a quicker approval of capacity mechanisms. The main measure proposed by the Commission report on 'streamlining capacity mechanism's procedures'[78] is the review of the ERAA Methodology, with the aim to simplify and give EU countries more flexibility when justifying the necessity of a capacity mechanism. In addition, ACER has been tasked to calculate metrics to facilitate Member States in setting their reliability standard.

[73] In Belgium, Finland, France, Germany, Ireland, Italy, Poland and Sweden.
[74] ACER SoS Monitoring Report (2024), page 18.
[75] For a detailed update of the state aid cases approved by the Commission, stakeholders are invited to check the State aid register at the following link: https://competition-cases.ec.europa.eu/search?caseInstrument=SA
[76] ACER SoS Monitoring Report (2024), page 10.
[77] Article 69(3) of Regulation (EU) 2024/1747 as regards improving the Union's electricity market design.
[78] Commission report on 'streamlining capacity mechanism's procedures' (COM/2025/65)

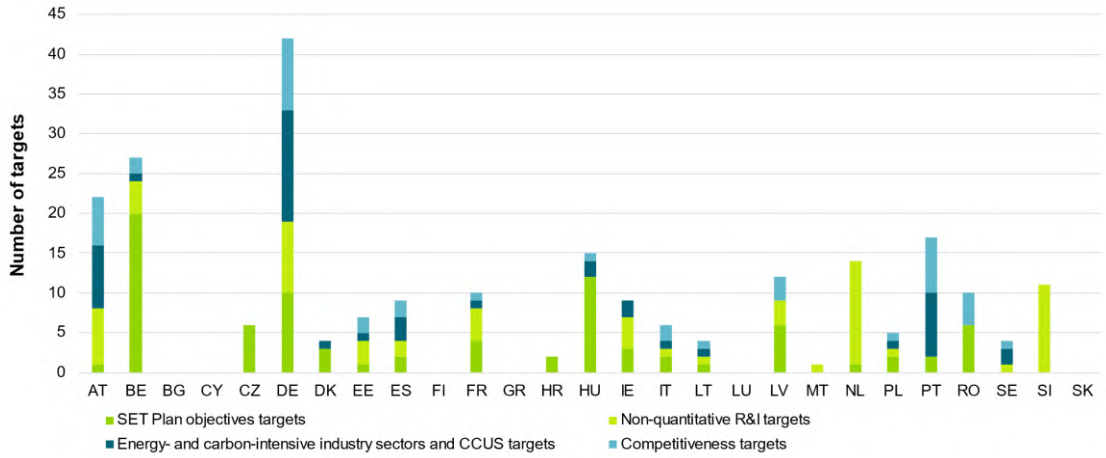
2.5Research & innovation and competitiveness

12 Member States reported in their NECPR partial data on 'research, innovation and competitiveness', and Romania did not submit any data on the progress towards research, innovation and competitiveness.

The research, innovation and competitiveness topic consist of a quantitative and a qualitative part. The quantitative part entails reporting of yearly public and private expenditure on research and innovation to clean energy technologies.

Member States cooperate on R&I and competitiveness in the context of the revised Strategic Energy Technologies Plan (the SET Plan). They seek to align to the extent possible the national with European R&I agenda and priorities and coordinate some funding initiatives, for example through the coordinated calls for proposals. In the context of the revised SET Plan governance, Member States will elaborate Common Investment and Implementation plans.

Figure 39. Number of research, innovation and competitiveness targets set by each MS.



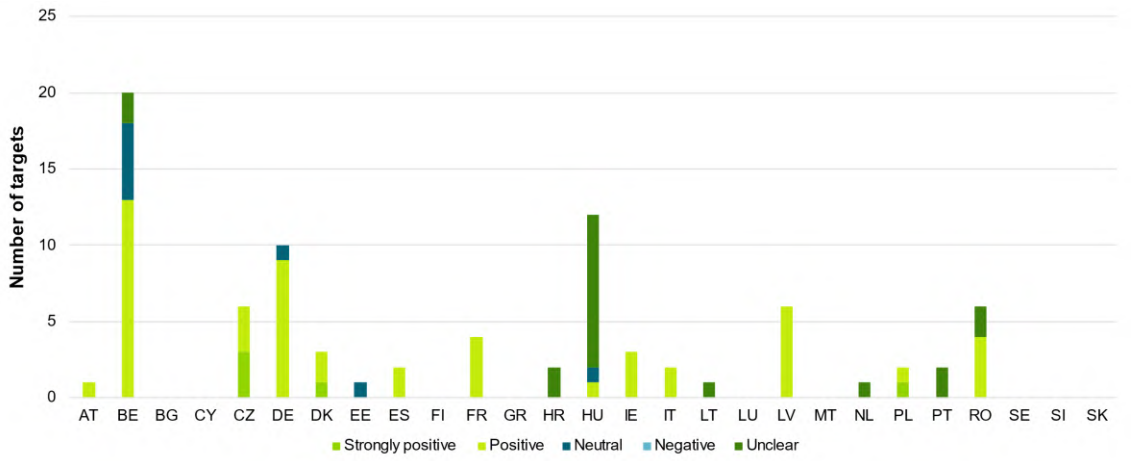
Source: elaboration on NECPR, Annex VII

2.5.1 Progress towards SET Plan objectives and policies

The Member States have reported a total of 84 national targets and objectives for translating the SET Plan objectives and policies to a national context (40). Of these, five received a strongly positive rating, 51 a positive rating, eight a neutral rating. For 20 targets the progress is less clearly defined.

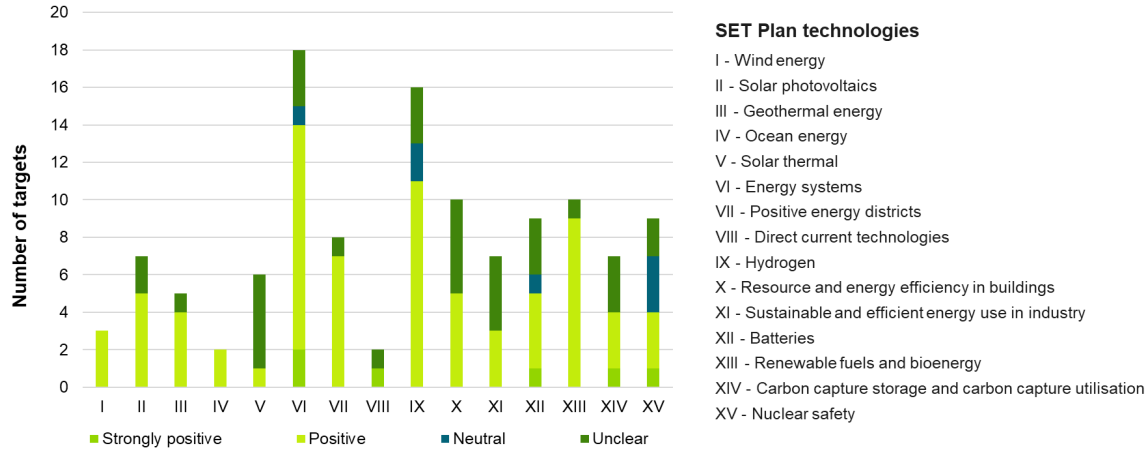
Analysis of the targets revealed a variation in the way of target setting between the Member States. Some Member States have set very detailed and specific targets, with a narrow scope for each target. Examples include Belgium, Hungary and Germany. This approach generally results in an increased number of targets. Other Member States have defined targets with a wide scope, supporting multiple SET Plan technologies with a single target. Examples include the Netherlands and Estonia. This approach generally results in a lower number of targets, potentially underreporting the SET Plan technology support. The number of targets is therefore not necessarily an accurate indicator of the level of support the Member States provide to the SET Plan objectives.

Figure 40. Number of targets and progress rating for translating the SET Plan targets and objectives to a national context, for each MS.



Source: elaboration on NECPR, Annex VII, table 1

Figure 41. Number of targets and progress rating supporting the Strategic Energy Technologies Plan in 15 technologies.



Source: elaboration on NECPR, Annex VII, table 1

Collectively, the national targets support all SET Plan technologies (Figure 41). Energy systems and hydrogen are supported by the most targets (18 and 16, respectively), while ocean energy and direct current technologies are supported by the least targets (two targets each).

Energy systems receives support from a high number of targets as this is a broad topic. Targets include for example activities for smart metering, grid flexibility and balancing, and digitalization. Hydrogen is supported by many targets as there is a high level of international cooperation and research, innovation and demonstration. This results in multiple targets mentioning joint development programmes and funding of research, innovation and demonstration. Nuclear safety is supported by countries with a strong existing nuclear sector, such as France, Belgium, and Czechia. Similarly, ocean energy is supported by coastal Member States (Belgium, Denmark), though only a limited number of all coastal Member States. The most used progress indicators for the implementation of the targets are public and private spending and the number of supported projects or programs for innovation and technology development.

2.5.2 Public and private spending in research and innovation relating to clean energy technologies

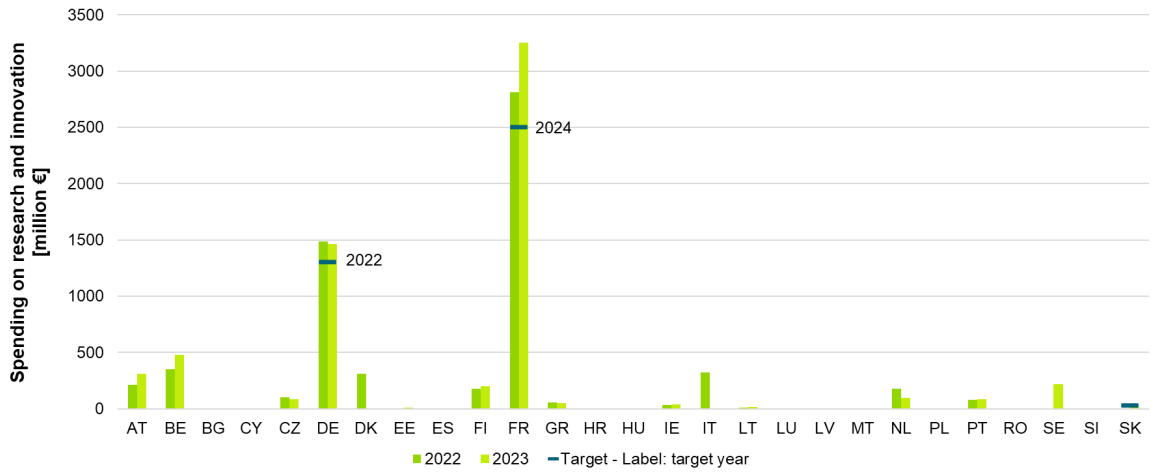
Public expenditure on research and innovation relating to clean energy technologies is reported by 20 countries (Figure 42).[79] Of these countries, Germany reported 2022 as target spending year and France reported 2024 as the target year, while Slovakia reported a target without specifying a target year.

There is a wide range in public expenditure from 0,14 million € to 3,25 billion €, reflecting the differences between Member States.

Of the 17 countries which reported public expenditure for both reporting years of 2022 and 2023, ten have increased their spending.. The relative largest expenditure increase is reported by Slovakia (+750%, from two to 15 million €, Malta (+109%, from 1 to 2 million € and Latvia (+62%, from 9 to 15 million €.

Hungary and the Netherlands reported the largest drops in public expenditure, with less2,3 million € and a decrease of-85 million €respectively.

Figure 42. Yearly R&I public expenditure in clean energy and low carbon technologies, expenditure target and target year.



Source: elaboration on NECPR, Annex VII, table 2

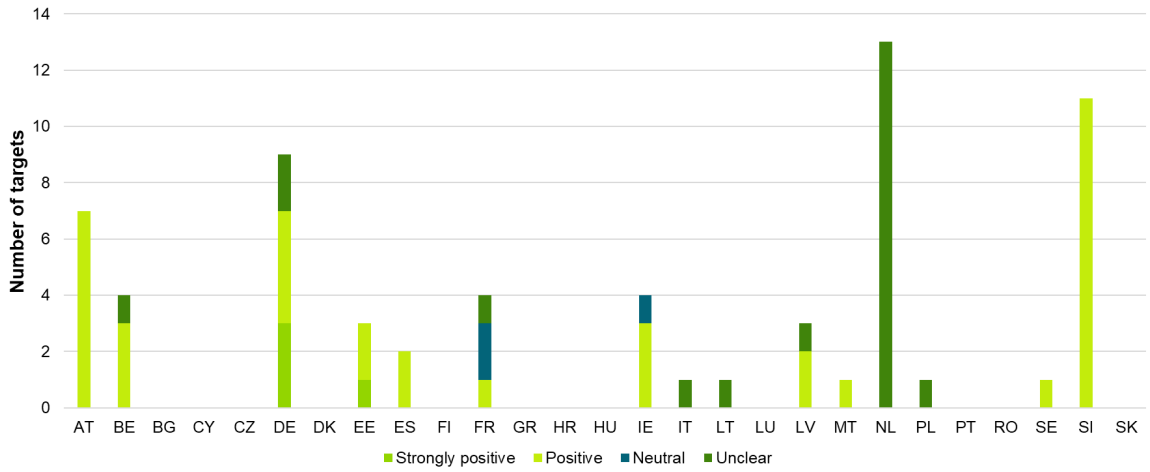
Seven countries have reported private spending on research and innovation (Estonia, Portugal, Sweden, Czechia, Denmark, Greece, Italy), with none of them disclosing a target value and target year. The resulted data gaps prohibited a progress update on private sector spending on R&I expenditure.

Besides quantitative expenditure, Member States also reported on the non-quantifiable targets and objectives for research and innovation to showcase their progress on clean energy technology development and improvement. 15 Member States have reported a cumulative of 65 non-quantifiable targets and objectives for public and private spending on research and innovation relating to clean energy technologies as well as for technology cost and performance development (Figure 43). Of these, four received a strongly positive rating, 37 a positive rating, three a neutral rating.. For 21 targets the progress is less clearly defined.

[79] Member States Bulgaria, Cyprus, Croatia, Luxembourg, Poland, Romania, Slovenia have not reported public R&I expenditure.

It is worth noting that countries report differently on expenditures versus non-quantifiable targets. Four countries (Denmark, Czechia, Finland, Greece) have reported expenditure, but no non-quantifiable targets. Vice versa, Slovenia and Estonia have reported non-quantifiable targets but no expenditure. Furthermore, the Netherlands has the highest number of non-quantifiable targets (13), yet these are formulated as goals and lack explicit targets or indicators attached to them. The high number of targets non-quantifiable targets of the Netherlands is even more noteworthy compared to their reported decrease in expenditure between 2022-2023. In comparison, Germany and France have a limited number of non-quantifiable targets next to their high expenditure. An example of balanced and detailed reporting can be seen in case of Slovenia, which has set 11 non-quantifiable targets which are notable for the sound objectives and clear description of scope.

Figure 43. Number of non-quantifiable objectives and targets for public and private spending on research and innovation on clean energy technologies for each MS.



Source: elaboration on NECPR, Annex VII, table 3

2.5.3 Decarbonising energy- and carbon-intensive industries and Carbon Capture Utilisation and Storage

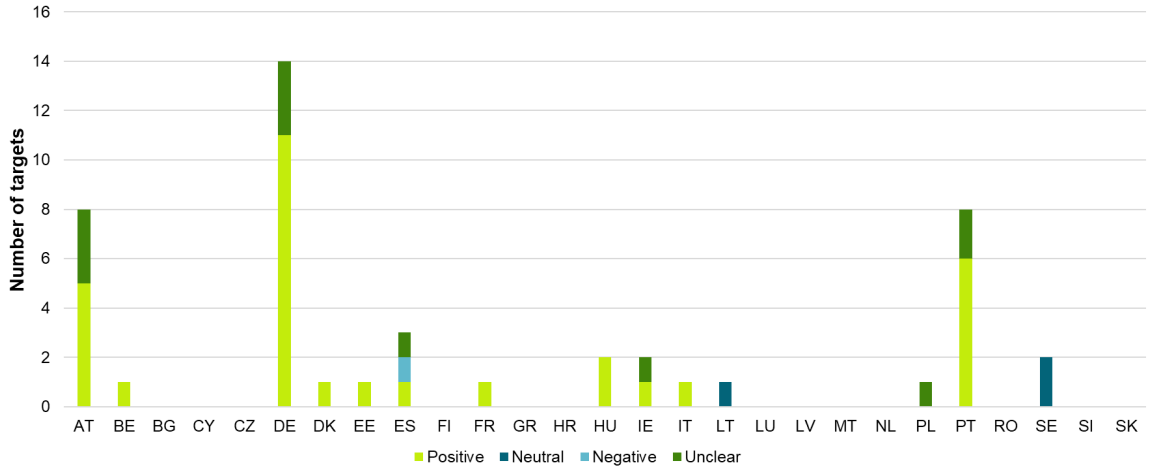
14 Member States have reported a total of 46 national targets and objectives for the deployment of technologies for decarbonizing energy- and carbon-intensive industrial sectors and, where applicable, for related carbon transport, use, and storage infrastructure (Figure 44). Of these targets, 31 received a positive rating, three a neutral rating and one a negative rating. For 11 targets the progress is less clearly defined.

The targets reported for this topic are generally well defined with clear scope for which progress can be assessed. Two repeatedly reported types of measures are the participation in or creation of industry decarbonization projects (national projects or projects with international collaboration) and infrastructure development support (either as number of supported projects or as investment value).

As the SET Plan objective technologies includes CCUS, targets supporting the technology in reporting in NECPR Annex VII, Table 1 create potential synergies with this topic. CCUS as SET Plan technology is supported by seven targets of six countries (Belgium, Czechia, Denmark, Hungary, Latvia, Romania). Of these six countries, Belgium, Denmark and Hungary are making effective use of the potential for synergies by also setting targets in NECPR Annex VII, Table 4. These targets on CCS formulated by

Germany and Hungary are commendable for their clear scope and association with indicators. Also, Austria and Portugal formulated targets with a similar clarity in scope but could improve reporting on the associated indicators.

Figure 44. Number of targets for the deployment of technologies for decarbonising energy- and carbon-intensive industrial sectors and CCUS for each MS.



Source: elaboration on NECPR, Annex VII, table 4

2.5.4 Competitiveness

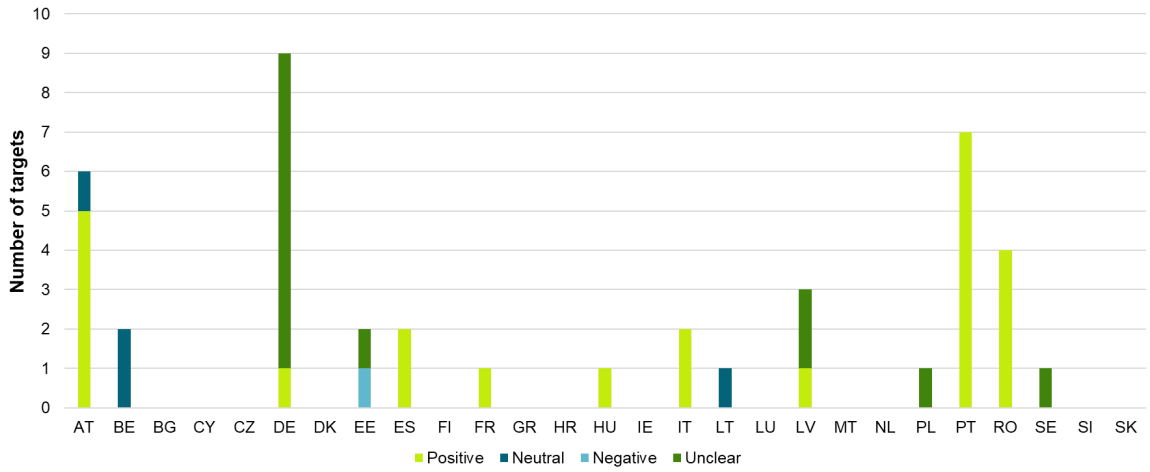
Competitiveness has been at the core of the Draghi report accompanying the Clean Industrial Deal. It is being redefined, as not only, the output of R&I in terms of projects' results or patents, but also integrating other aspects of industrial and energy policies and sustainability aspects, for example taking into consideration the economy security dimension, the implementation of the non price criteria in certain auctions and public procurement in the context of the Net Zero Industry Act and horizontal aspects such as policies on skills necessary for the green and digital transition.

14 Member States have reported a total of 42 national targets and objectives for competitiveness (Figure 45). Of these targets, 24 received a positive rating, four a neutral rating and one a negative rating. For 13 targets the progress couldn't be defined and are therefore rated as less clearly defined.

There are some similarities between the countries in their target setting. Some countries have set similar targets and are using similar indicators. Targets defined as the number of patents received, or as the number of start-ups and small to medium sized enterprises (SMEs) that are created, or that received government funding or support are two examples. The target setting of Austria, Romania and Portugal is notable as they leverage international programmes, initiatives, and policy frameworks—such as the Important Projects of Common European Interest, EU Resilience and Recovery Facility, and Horizon Europe—to help achieve their competitiveness targets and counting participation in these efforts toward progress. In contrast, Hungary and Latvia set broad targets, such as achieving high rankings in global competitiveness indexes.[80]

[80] For more information on the methodology used for the ranking please consult the study supporting the Commission in progress reporting under the State of the Energy Union.

Figure 45. Number of targets with regard to competitiveness for each MS.



Source: elaboration on NECPR, Annex VII, table 5

2.6 Energy Subsidies

Energy subsidies were stable until 2021, increased dramatically in 2022 following the energy crisis, and then moderately decreased in 2023. Total energy subsidies in the EU jumped from EUR 213 billion in 2021 to EUR 397 billion in 2022 and decreased by 11% to EUR 354 billion in 2023[81].

Energy subsidies linked to national crisis measures to protect EU consumers from the high prices accounted for an estimated EUR 145 bn in 2023 (down from EUR 187 bn in 2022). Across the EU, at least 270 national measures were created to address the energy price crisis. Households were the main direct beneficiaries of these crisis measures (receiving EUR 121 bn in 2021-2023), followed by industry and the transport sector (EUR 30 bn and 28 bn, respectively, over the same period). Cross-sectoral support to all energy consumers reached EUR 125 bn in the same period.

Fossil fuel subsidies increased from EUR 60 bn in 2021 to EUR 136 bn in 2022 in response to the crisis and then decreased to EUR 111 bn in 2023. Fossil fuel subsidies accounted for 34% of total energy subsidies in 2023 and were allocated to all sectors. The biggest beneficiaries were industry (EUR 37 bn, 33%), household (EUR 25 bn, 22.5%) and transport (EUR 16 bn, 13.5%, while around on fifth of the subsidies (EUR 21 bn 18.9%) were allocated cross sectors. Fossil fuel subsidies further declined to EUR 73 bn in 2024.[82]

Renewable energy subsidies decreased in 2021 to EUR 83 bn - the first decrease since 2015 - and further to EUR 68 bn in 2022 and 61 bn in 2023. The decrease was mainly due to high prices on the wholesale electricity market that reduced the need for financial support from dynamic market-based support instruments as renewables became more competitive, demonstrating their role in lowering energy prices. Accordingly, renewable energy sources received only 17% of energy subsidies in 2023 (down from 40% in 2021 and 22% in 2022).

[81] Study on energy subsidies and other government interventions in the European Union; 2024 Edition, available at : Study on energy subsidies and other government interventions in the European Union - Publications Office of the EU

[82] Preliminary data. Updated figures on energy subsidies in general and fossil fuel subsidies in particular will be published in the 2025 Commission report on Energy subsidies in the EU by the end of 2025.

Support to energy-efficiency measures, for example energy renovations of buildings, increased from EUR 23 bn in 2021 to EUR 34 bn by 2022 and to EUR 44 bn in 2023 helping to reduce energy bills.

The overwhelming majority of energy subsidies (EUR 247 bn or 62% in 2022 and EUR 213 bn or 60% in 2023) were still dedicated to supporting energy consumption and this share was even higher in fossil fuel subsidies (73% in 2022 and 82% in 2023). Only eight Member States

(Belgium, France, Germany, Italy, Latvia, Lithuania, Luxembourg and Portugal) expressed an intention or made plans for an economy-wide phase-out of fossil fuel subsidies in 2023.

In 2023, the majority of energy subsidies (EUR 218 bn or 62%) were assessed as environmentally not harmful. The total amount of environmentally harmful energy subsidies in 2023 amounted to EUR 136 bn (or 38%).

2.7 Energy poverty

Energy poverty remains a persistent challenge across the European Union, particularly following the recent energy crisis in 2021 and 2022, affecting millions of households and disproportionately impacting vulnerable populations.[83] The National Energy and Climate Plans (NECPs) are a central mechanism through which Member States articulate their strategies to combat this issue.

Following the energy prices and living costs crisis, energy poverty is now comprehensively covered in the EU legal framework, notably in the Governance Regulation, Energy Efficiency Directive, Energy Performance of Buildings Directive, Electricity Directive, Gas Directive and Social Climate Fund. These acts are largely still being transposed and implemented, which means that drawing conclusions on the progress of addressing energy poverty is still somewhat premature.

2.7.1 Progress on Energy Poverty across the EU

While Member States report on energy poverty, the reporting is unclear on what definitions Member States used. The following comparison should be treated with caution. **Error! Reference source not found.** Overall, the self-reported data by Member States show an increasing trend on households affected by energy poverty between 2023 and 2025. The three countries with the highest shares of energy poor in 2025 are Ireland (29,4%), Romania (25%), Belgium (21,8%) according to the national definitions, whereasthe countries with the lowest shares are Denmark (0,2%), Finland (0,2%), Austria (1,6%). In Ireland, the share of households in energy poverty remained stable since the previous submission. Several countries also managed to decrease the share of households in energy poverty.

The Governance Regulation obliges Member States to develop an objective to reduce energy poverty if the level of households in energy poverty is significant. National Energy and Climate Plans are an instrument that encourage Member States to set national targets to reduce energy poverty, but the nature and ambition of these targets vary considerably between Member States, which does not allow to compare them. In total, 42 national targets of both qualitative and quantitative nature have been reported by 17 countries. Such targets include specific measures that can impact energy poverty or are of financial nature, such as support to heating costs or electricity prices. Other targets are more general. In this vein, Member States like Lithuania, Denmark, Ireland, and Romania aim broadly to “reduce energy poverty in the population”. A few Member States, such as Luxembourg, do not define explicit targets but still report on national indicators to track progress.

[83] In October 2025, retail electricity prices for households were still 35% higher compared to pre-crisis (first half of 2021, from January to June, average) level, and gas prices were 63% higher compared to pre-crisis level.

All in all, a growing number of Member States are using national indicators to monitor energy poverty. In the Netherlands, these indicators include a low income household combined with a house of poor energy quality, limited financial capacity for energy investments or renovations, or a high percentage of income spent on energy costs. Luxembourg reports on the average housing and transport expenditures, and the share of energy expenditures in total housing and transport expenditures.

While some countries align these indicators closely with their national targets, such as France, others use them more as general monitoring tools without direct links to specific policy objectives.

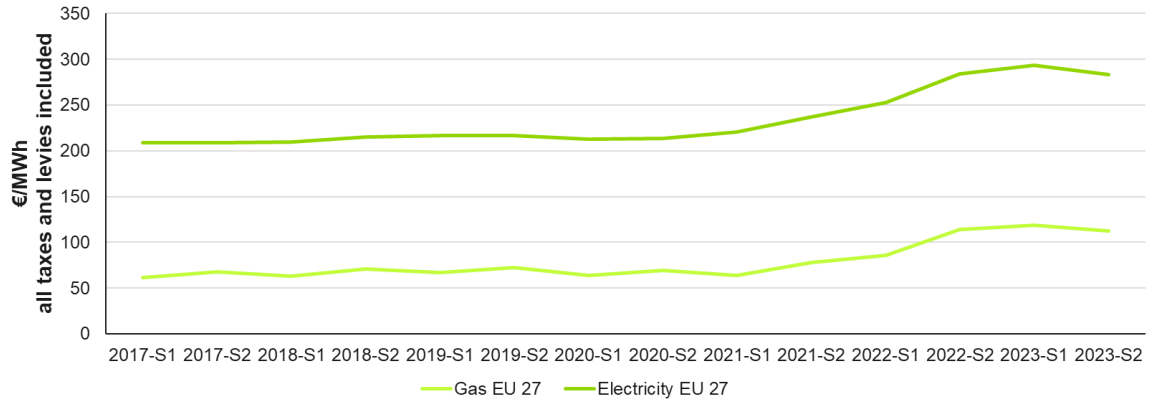
In 2023, for example, 20% of Lithuania's population was unable to keep their homes adequately warm, an increase of 2.5 percentage points compared to 2022. The average figure for the EU was 10.6%. Member States have adopted a range of support mechanisms, including social policy measures, social tariffs and direct payments as well as heating subsidies (e.g. in Denmark), renovation grants (in France), or support for energy communities (in Latvia). Luxembourg has implemented a targeted action programme for households in fuel poverty. Following the complete transposition of ETS2, Member States can also address the impact of energy poverty on vulnerable households through their Social Climate Plans. However, in some countries, earlier efforts to tackle gender inequality and energy poverty are notably absent from the current NECPs.**Error! Reference source not found.Error! Reference source not found.**

2.7.2 Trends in Energy Prices

The period from 2022 to 2025 has been marked by significant volatility in energy prices for household consumers, which has had a direct impact on energy poverty levels. Electricity prices spiked sharply in the second half of 2022, driven by broader energy market disruptions. Although prices began to decline in early 2023, they remainws above pre-crisis levels in some countries like Ireland, Estonia, and Belgium. Interestingly, Czechia diverged from this trend, showing a dip in electricity prices in late 2022, followed by an increase in 2023.

Gas prices exhibited more varied patterns across the EU. In Belgium, prices dipped in late 2022 and early 2023 before rising again to early 2022 levels. Romania and Sweden experienced a spike in late 2022, followed by a decline. Estonia and Lithuania saw a steady decrease in gas prices, while Poland, Portugal, and Slovenia reported continuous increases. These fluctuations have had a direct bearing on household energy costs and, by extension, on energy poverty. Figure 46 below illustrates the development of the gas and electricity prices across the EU between 2017 and 2023.

Figure 46. Trends in gas and electricity prices



Source: Eurostat[84] [85]

2.8 Just transition

To date, 26 Member States submitted their dataflow on just transition, the promotion of both human right and gender equality and addressing inequalities in energy poverty. However, 13 submitted an empty submission and eight Member States submitted partial data.

The reporting progress in the NECPRs compared to the 2023 submissions remains limited, also due to the fact that Member States may contribute voluntarily. In many cases, Member States have reused content from their 2023 submissions without providing meaningful updates or new information on implementation progress. For example, while countries like Estonia and France are active in advancing just transition measures, others, like Estonia, which has already allocated all its Just Transition Fund (JTF) resources, do not always reflect this progress in the reporting. On the other hand, several countries have demonstrated improved transparency and detail in their updates, notably Czechia, Romania, Latvia, and Italy. Czechia for example reported detailed information compared to the previous submission where no data was submitted.

The information reported on the contribution of the implementation of the NECPs on just transition, in the sense that it is fair, inclusive, and equitable, varies significantly across Member States, reflecting differences in national contexts, employment structures, and regional dependencies on fossil fuel industries.

Short-term impacts from the energy transition can be negative, especially for displaced workers and regions undergoing structural changes. Job losses and economic uncertainty may disproportionately affect vulnerable communities, exacerbating existing inequalities.

Long-term impacts, however, are projected to be more positive. Through mechanisms such as worker reskilling, sectoral re-alignment and development, and the strategic use of EU funds, including the Just Transition Fund (JTF) and the Social Climate Fund (SCF), that can facilitate a more equitable

[84] Source gas prices: Eurostat, 'Gas prices for household consumers - bi-annual data (from 2007 onwards) - [nrg_pc_202]', Eurostat data browser, accessed 31 July 2025, https://ec.europa.eu/eurostat/databrowser/view/nrg_pc_202__custom_17634125/default/table

[85] Source electricity prices: Eurostat, 'Electricity prices for household consumers - bi-annual data (from 2007 onwards) – [nrg_pc_204], Eurostat data browser, accessed 31 July 2025, https://ec.europa.eu/eurostat/databrowser/view/nrg_pc_204__custom_17634134/default/table

redistribution of opportunities for workers and regions. These funding instruments are designed to support affected regions and populations, helping to mitigate adverse effects and promote social cohesion. Positive expected impacts are for example reported by countries such as Spain and Romania, where the JTF is actively supporting transition efforts. Ireland also anticipates positive outcomes, leveraging both the EU-level JTF and its own national Just Transition Fund set up to support the transition.

On the impacts of implementation of the NECPs on jobs, workers, and regions, the information reported shows that impacts are uneven across Europe. 13 Member States reported specific territorial impacts of the transition, mostly in regions phasing out of fossil fuels. While some countries and sectors anticipate positive outcomes, such as job creation and economic revitalisation, others, particularly those with economies heavily reliant on fossil fuels and carbon-intensive industries, face substantial challenges. These include potential job losses, economic disruption, industry upheaval and social dislocation in affected regions.

In terms of welfare impacts, NECPs are largely seen as beneficial, primarily due to the anticipated transition to RES, leading to a reduction in pollution and associated health benefits. Cleaner air and improved environmental conditions contribute to broader societal well-being, especially in urban and industrial areas.

These divergent trajectories underscore the importance of tailored, context-sensitive approaches within the NECP framework. Ensuring that no one is left behind requires not only financial support but also inclusive governance, stakeholder engagement, and alignment with broader human rights and gender equality objectives.

Through their biennial NECPR Member States should also report information on how the implementation of their integrated national energy and climate plans contributes to the promotion of both human rights and gender equality.The Paris Agreement reaffirms that the Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights and gender equality.

The contributionsof the implementation of the NECPs on the promotion of human rights, gender equality, and the reduction of energy poverty vary across Member States.

While human rights are often embedded within broader policy frameworks, such as participation in UNFCCC processes, NECP consultations, or the appointment of National Gender and Climate Change Focal Points, targeted measures remain limited. Ireland demonstrates active engagement in this area through its International Climate Finance Roadmap which focuses on the principle of leaving no one behind and gender-sensitive and locally led climate action.

In terms of gender equality, the energy transition continues to pose challenges. Women remain underrepresented in the energy sector, as seen in Lithuania, where they make up only 23% of the workforce. Nonetheless, some countries have introduced targeted legislation and initiatives. Denmark enforces equal treatment and pay through its Equal Treatment Act and mandates gender balance in leadership roles. Czechia adopted a Gender Equality Strategy 2021–2030, and Spain supports women's reskilling in green sectors via the Just Transition Fund. In contrast, countries like France address gender equality more generally through labour law, without specific climate-related measures.

2.9 Links with the European Semester

The European Semester is part of the European Union's economic governance framework. This annual exercise, in which Member States align their budgetary and economic policies with rules agreed at EU level, shows strong synergies with the governance mechanism provided by the Governance Regulation.

This is reflected in the annual country-specific recommendations adopted under the European Semester. Since 2019, these recommendations have been clearly aligned with the NECPs set out at the end of 2019 and subsequently updated in 2024. They provide most Member States with targeted guidance on challenges identified in their NECPs as applicable, notably in the areas of renewable energy, energy efficiency, and supporting energy infrastructure.

The 2024 and 2025 European Semester cycles have placed greater emphasis on the role of energy in enhancing the EU's economic competitiveness, alongside decarbonisation and energy security - maintaining a strong focus on accelerating renewable energy deployment and improving energy efficiency, with particular attention to their impact on energy prices. In line with the NECP framework, the European Semester country-specific recommendations also address key energy challenges such as Member States' reliance on fossil fuels, interconnectivity and grid reinforcement needs, non-fossil flexibility (e.g. demand-side response, storage, access to wholesale markets), energy poverty, district heating decarbonisation, dependency on Russian fossil fuels, and the phase-out of fossil fuel subsidies.

3 Policy and measures to achieve the objectives

3.1 Progress in implementing policies and measures

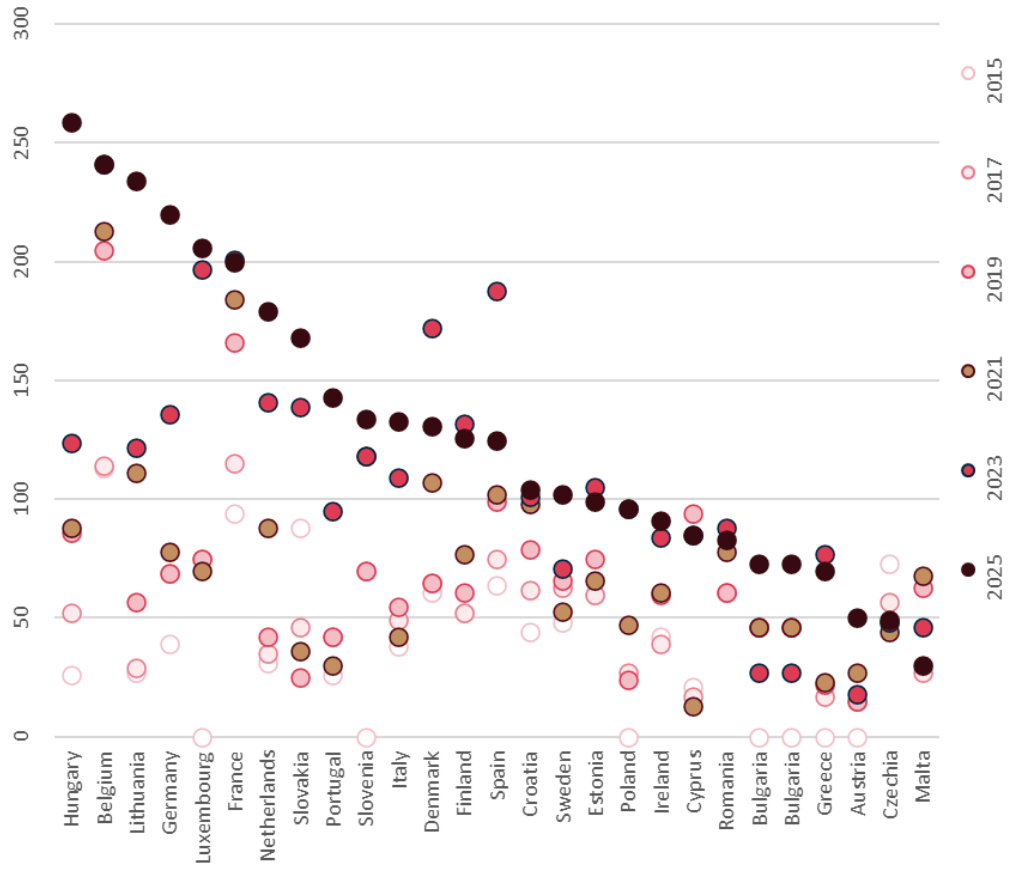
Member States have been reporting their greenhouse gas policies and measures in the EEA database since 2015. In 2023, this reporting has been expanded to include policies and measures covering all 5 dimensions of the Energy Union in an integrated manner.

The total number of single PaMs reported increased from 3039 in 2023 to 3504 in 2025. There are on average 130 single PaMs per Member State. This is a 15% increase compared to 2023.

Although the number of PaMs has increased, there are still significant differences among Member States in the number of reported PaMs. Hungary, Belgium, Lithuania and Germany reported the most individual measures and Greece, Austria, Czechia and Malta the least (Figure 47). A main reason is that some Member States report their PaMs at a highly disaggregated level, while other Member States report their PaMs in a more aggregated level.

Compared to the previous reporting exercise (2023), Hungary and Lithuania substantially increased the number of reported PaMs (followed by Germany, Portugal, Bulgaria, Netherlands and Austria), while Spain, Denmark and Malta decreased significantly.

Figure 47. Number of single[86] policies and measures reported by Member States[87] in different reporting years.

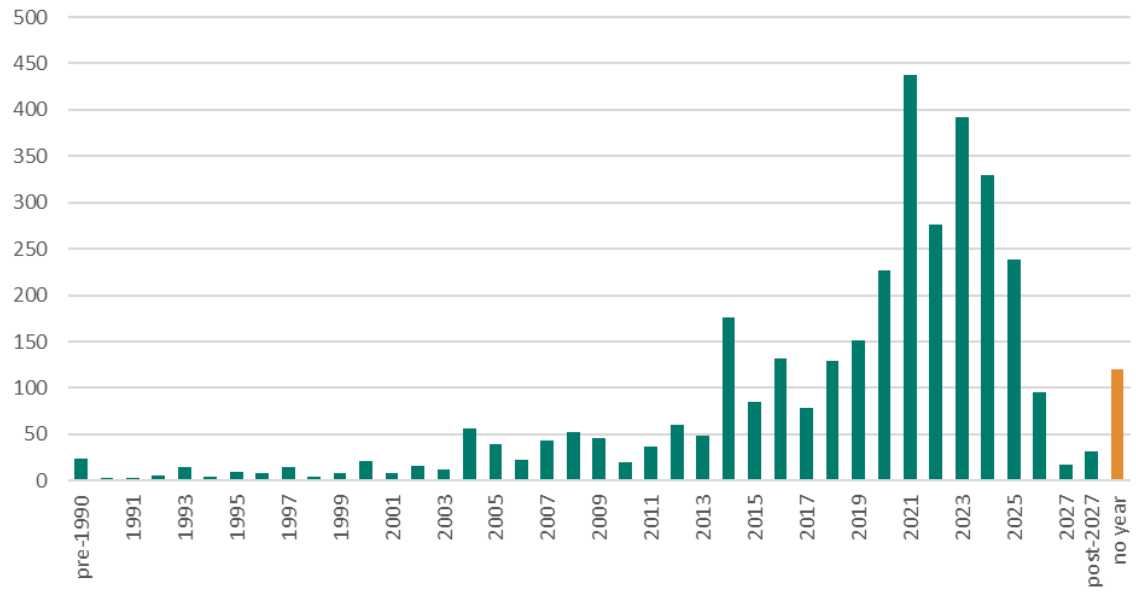


Source: Reportnet 3, Integrated PaMs reporting

Looking at the starting year of these reported PaMs (Figure 48), we see that there is a large increase of newly implemented PaMs, i.e. those put in place during or after 2023 (1107 new PaMs, around 32% of the total).[88] This increase in PaMs might reflect that many Member States have and will have to implement new policies and measures to meet their 2030 climate and energy objectives and the increased ambitions of their updated NECPs.

[86] All PaMs have to be reported as single PaMs. If information on the impacts and costs is not available on the single policy level, but is available for a group of policies, it is possible to group single PaMs.
[87] Reporting takes into account all data reported up until 1 September 2025. Data from Belgium and Poland refer to their reported data from 2023, as no data had been reported by this time in 2025.
[88] As determined by implementation period start

Figure 48. Number of single policies and measures reported by EU Member States per start year.



Source: Reportnet 3, Integrated PaMs reporting

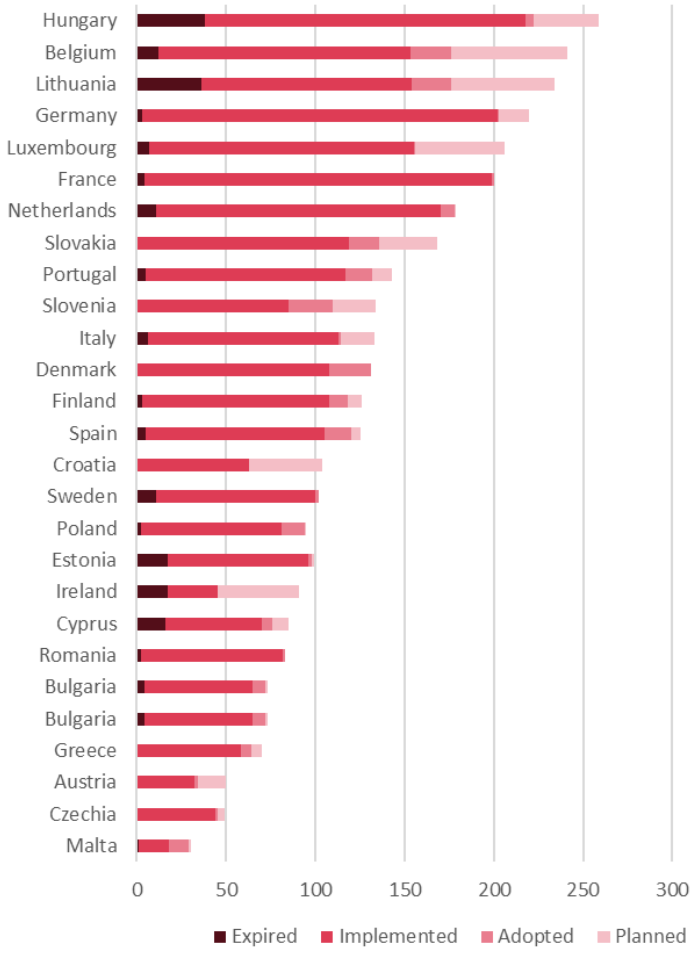
When we look at the status of PaMs, 454 (13%) are planned, 224 (6%) are adopted, 2621 (75%) are implemented, and 204 (6%) expired showing that additional action is being taken.

With respect to sectors, most PaMs target energy consumption (33% of PaMs), energy surply (31%) and transport (22%).

With respect to the instrument type, most PaMs are economic (43% of PaMs), regulatory (36%) and planning (13%) instruments. Member States report on far fewer educational (5% of PaMs), voluntary/negotiated agreements (5% of PaMs), or research (4% of PaMs) instruments.

Regarding geographical scope of PaMs, the vast majority are national (90%), with only a small number being regional, local, or covering two or more countries.

Figure 49. Number of expired, implemented, adopted, and planned single policies and measures.



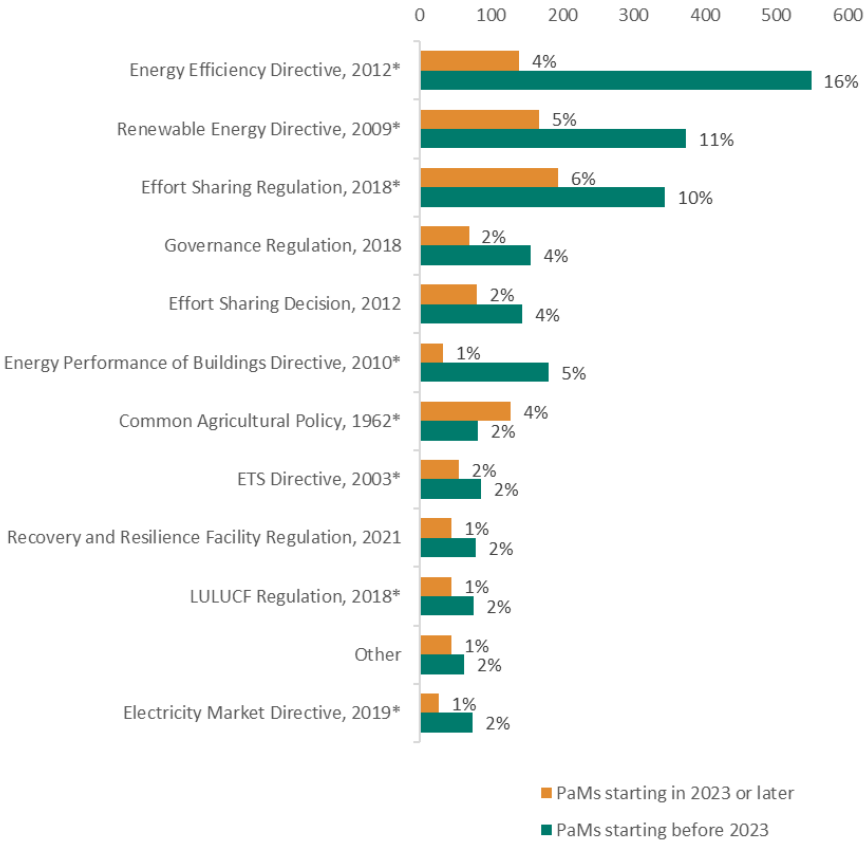
Source: Reportnet 3, Integrated PaMs reporting

2873 PaMs were reported to contribute to GHG emissions and removals (reported by 27 MS), 841 to renewables (26 MS), 1060 to energy efficiency (27 MS), 432 to energy security (23 MS), 336 to the internal energy market (22 MS) and 190 to research, innovation and competitiveness (22 MS).[89] This distribution reflects that with regard to certain areas, i.e. GHG emissions and removals and energy efficiency, structured reporting on policies and measures has been in place before on which the integrated reporting builds. The completeness of reporting across dimensions has considerably improved since the 2023 reporting cycle, with only two MS reporting fewer than 20 PaMs related to other dimensions than GHG emissions and removals.

Most single national policies and measures are implemented in response to one or more Union policies. Measures were reported to be implemented in response to 59 listed policies, the most mentioned ones are shown in the figure below. It can be noted that Member States also report PaMs against new Union policies such as the Recovery and Resilience Facility Regulation (123 PaMs), the European Climate Law (65 PaMs), the Regulation on risk-preparedness in the electricity sector (17 PaMs), and the Regulation on coordinated demand-reduction measures for gas (7 PaMs).

[89] One PaM can report multiple dimensions.

Figure 50. Share of new single policies and measures reported by Member States linked to the 12 most common Union policies.



Source: NECPR, integrated PaMs reporting

3.2 Financing policies and measures

In the NECPR, 22 Member States submitted information on financing policies and measures, while Belgium, Cyprus, Denmark, Greece and Poland did not submit any information. It should be noted that factors inherent to the nature of investment planning limit the comparability and interpretation of the reported data. For example, the reported actual and planned investments often diverge from initial investment assumptions due to evolving circumstances, even though all values are adjusted for inflation. In some cases, the initial investment assumption is reported as zero, making it difficult to assess progress or compare across countries.

Based on the aggregated data for EU27 countries in Table 10 below, the Energy efficiency dimension has received the most financing up to and including 2023, with €92.3 billion invested. This represents 95% of its initial investment assumption (€97 billion), indicating strong early commitment. The same dimension also shows the largest growth potential going forward, with an additional €310.6 billion still to be implemented – over three times the original assumption. This may suggest a scaling-up of ambition in energy efficiency measures across the EU, although data quality may also play a role. For the dimension decarbonization: GHG emissions and removal, the initial investment assumptions were the highest among all categories, yet actual investments have remained significantly lower, suggesting a gap between the assumption and the implementation. In contrast, energy security, while

representing a smaller share in absolute terms, has seen actual investments far exceed initial assumptions, indicating a heightened prioritization in practice.

The decarbonisation: Renewable Energy dimension shows a more modest investment trajectory, with only €10.8 billion invested so far— just 13% of the initial €83.6 billion assumption and €23.4 billion still to be implemented (28% of the assumption). The Internal energy market dimension has seen limited progress, with only €711 million invested (18% of the €3.9 billion assumption). The €3.1 billion (79%) that remains to be implemented suggests this area is still in relatively early stages of execution. Last, the research, innovation and competitiveness dimension has achieved relatively strong progress, with €3.3 billion invested (85% of the €3.9 billion assumption) and €2.0 billion (approximately 51%) still to be implemented, indicating ongoing support for innovation in the energy sector.

Table 10. Progress towards financing per Energy Union Dimension for the EU27 [in millions of Euros, amounts are adjusted for inflation and normalised to base year 2015].

Energy Union Dimension	Initial investment assumption	Actual investments up to and including 2023	Actual investments still to be implemented	Proportion of initial assumption invested	Proportion of initial assumption to be implemented
Decarbonisation: GHG emissions and removals	484,116	80,591	56,633	17%	12%
Decarbonisation: Renewable energy	83,559	10,833	23,373	13%	28%
Energy efficiency	96,966	92,267	310,566	95%	320%
Energy security	7,714	31,116	4,556	403%	59%
Internal energy market	3,941	711	3,112	18%	79%
Research, innovation and competitiveness	3,890	3,288	1,991	85%	51%
Total	680,185	218,806	400,231	32%	59%

Source: NECPR, integrated PaMs reporting

In addition to the breakdown by energy union dimensions, the sectoral view in Table11 reveals that Energy Consumption has attracted the highest level of financing up to and including 2023, with €131.3 billion invested, compared to its initial investment assumption of €336.4 billion, achieving only 39% of the expected funding. Meanwhile, Energy Supply – though having received less so far (€49.7 billion) – shows the most significant growth potential, with €273.2 billion still to be implemented,

representing 330% of its original assumption. This indicates a major upcoming shift in investment focus toward energy supply infrastructure. Smaller sectors like Waste Management have already surpassed initial assumptions, with 71% of the initial assumption already invested and 128% still to come.

Table 11. Progress towards financing per Sector for the EU27 [in millions of Euros, amounts are adjusted for inflation and normalised to base year 2015].

Sector	Initial investment assumption	Actual investments up to and including 2023	Actual investments still to be implemented	Proportion of initial assumption invested	Proportion of initial assumption to be implemented
Energy supply	82,734	49,700	273,155	60%	330%
Energy consumption	336,353	131,338	96,957	39%	29%
Transport	39,646	22,197	14,332	56%	36%
Industrial processes	17,095	7,379	8,584	43%	50%
Waste Management /waste	1,253	891	1,610	71%	128%
Agriculture	4,530	2,578	3,191	57%	70%
LULUCF	191,488	1,380	582	1%	0%
Other	6,959	3,304	1,776	47%	26%
Total	680,058	218,767	400,187	32%	59%

Source: NECPR, integrated PaMs reporting

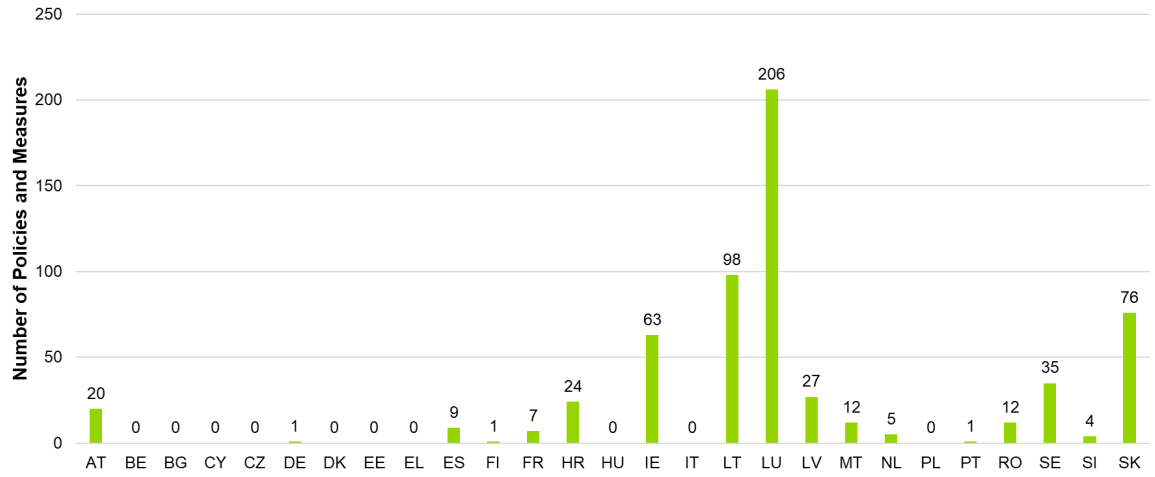
3.3 Policies and measures on air quality and emissions of air pollutants

In the NECPR, information on PaMs on air quality and emissions of air pollutants is reported in Annex XIV. This includes, as required under Article 17(2)(e) of the Governance Regulation, the quantified impact – where possible – of PaMs on five key pollutants: sulphur dioxide (SO2), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC), ammonia (NH3), and particulate matter with a diameter of 2.5 micrometers or less (PM2.5). Other pollutants may also be indicated under the 'other' category if relevant. 17 Member States submitted data, while Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Greece, Hungary, Italy and Poland did not submit any information.

The quality and form of the reported data varied significantly across Member States. Seven countries (Germany, Spain, Finland, Ireland, Malta, the Netherlands, and Slovenia) provided quantitative data for all reported PaMs, enabling a more robust analysis. France and Latvia submitted a mix of quantitative and qualitative data depending on the policy or measure, while Austria, Lithuania, Luxembourg, Sweden, and Slovakia reported only qualitative information, limiting the comparability of their submissions. In most of these cases, the qualitative information provided was relatively limited, further constraining the depth of analysis possible.

Among the countries that submitted data, the number of reported PaMs on air quality and emissions of air pollutants varied widely, as can be seen on Figure 51. Luxembourg reported the highest number with 206 entries, followed by Lithuania (98), Slovakia (76), Ireland (63) and Sweden (35). At the other end of the spectrum, the lowest numbers were reported by Germany (1), Finland (1), Portugal (1), Slovenia (4) and the Netherlands (5). This variation highlights differing levels of reporting detail and engagement across Member States.

Figure 51. The number of policies and measures for which data was reported on air quality and emissions of air pollutants, per MS.



Source: NECPR, integrated PaMs reporting

Table 12 gives an overview per pollutant of the number of Member States that expected an impact. For SO2, 5 MS anticipate reductions, while 1 (Malta) expects an increase and for 3 others (Lithuania, Luxembourg and Slovakia) the impact remains unclear due to the qualitative nature of reporting. NOx shows the most widespread expected decrease, with 10 MS reporting reductions, 1 increase (Malta), and again 3 unclear impacts for Lithuania, Luxembourg and Slovakia. For NMVOC, 9 MS expect decreases, with no increases reported and the same 3 unclear cases. NH3 reductions are expected by 7 MS, with 1 increase in Malta and 3 unclear cases. PM2.5 sees expected reductions in 9 MS, with 1 increase expected in Slovenia, and 3 unclear impacts. Lastly, for other pollutants, only 2 MS (Germany, Finland) report expected decreases, while the impact for Luxembourg and Slovakia remains unclear. Among the other pollutants reported are: PM10, black carbon, CO2, CO and CH4.

Table 12. Expected impact on pollutants by number of Member States.

Pollutant	Total number of MS	Decrease expected	Increase expected	Unclear impact
SO2	9	5 (DE, ES, FI, IE, NL)	1 (MT)	3 (LT, LU, SK)
NOx	14	10 (AT, DE, ES, FI, FR, IE, LV, NL, SE, SI)	1 (MT)	3 (LT, LU, SK)
NMVOC	12	9 (AT, DE, ES, FI, FR, IE, MT, NL, SI)	0	3 (LT, LU, SK)
NH3	11	7 (AT, DE, FI, FR, IE, NL, SE)	1 (MT)	3 (LT, LU, SK)
PM2.5	13	9 (AT, DE, ES, FI, FR, IE, LV, MT, NL)	1 (SI)	3 (LT, LU, SK)
Other	4	2 (DE, FI)	0	2 (LU, SK)

Source: NECPR, integrated PaMs reporting

Table 13 below gives an overview of the quantitative data submitted. Only two Member States (Germany and Ireland) provided data for all years from 2025 to 2050, allowing for a more complete assessment of long-term trends. Most other countries reported data only for selected years, with several limiting their submissions to 2030. France stands out with the largest expected reductions, particularly for NOx (up to -1,204 kt/year by 2050) and NMVOC (-755 kt/year), while Germany also reports substantial reductions across all pollutants, including SO_2 (-147.3 kt/year) and NMVOC (-548.3 kt/year). In contrast, countries like Finland and Spain submitted more limited datasets, focusing only on 2030, and reporting smaller reductions. Notably, Slovenia and Malta reported increases for some pollutants, highlighting significant differences in expected impacts across Member States. Furthermore, many Member States only provided quantitative data for a low number of PaMs, which likely makes the data less representative of the actual impact to be expected. For instance, Germany, France, and Finland each reported quantified expected impacts for just one PaM, despite covering multiple pollutants and years.

Table 13. Quantified expected impact on the emission of reported pollutants (kt/yr) for the MS with quantitative data.

Member States	Pollutants	2025	2030	2035	2040	2045	2050
Finland (1 PaM)	**SO2**		-5.1				
	NOx		-24.9				
	NMVOC		-2.8				
	NH3		-2.6				
	PM2.5		-3.5				
	other		-0.9				
France	**NOx**	-973.0	-1092.0				-1204.0

(1 PaM)	**NMVOC**	-681.0	-707.0				-755.0
	NH3	-47.0	-50.0				-74.0
	PM2.5	-151.0	-163.0				-166.0
Germany (1 PaM)	**SO2**	-43.4	-117.1	-134.3	-147.3	-148.2	-147.3
	NOx	10.4	-5.0	-13.8	-20.1	-20.7	-17.2
	NMVOC	-129.6	-331.1	-437.9	-499.2	-530.0	-548.3
	NH3	-56.9	-78.3	-91.3	-96.0	-96.5	-96.5
	PM2.5	-4.9	-8.8	-11.1	-13.6	-14.5	-14.9
	other	-18.1	-35.1	-44.4	-53.7	-57.8	-59.9
Ireland (63 PaMs)	**SO2**	-1.2	-1.5	-1.7	-1.9	-2.0	-2.0
	NOx	-10.6	-17.6	-21.8	-26.5	-30.4	-34.4
	NMVOC	-1.2	-2.3	-3.0	-3.7	-3.6	-2.6
	NH3	-11.2	-13.1	-11.7	-11.8	-11.9	-11.8
	PM2.5	-0.6	-0.9	-1.2	-1.4	-1.6	-1.7
Latvia (90) (16 PaMs)	**NOx**	-0.2	-0.7	-1.1	-1.2		
	PM2.5	-0.1	-0.4	-0.5	-0.5		
Malta (12 PaMs)	**SO2**	-0.001	0.057				
	NOx	-0.054	0.013				
	NMVOC	-0.009	-0.015				
	NH3	-0.001	0.003				
	PM2.5	-0.003	-0.003				
Netherlands (5 PaMs)	**SO2**	0.3	-2.9	-4.4	-4.7		
	NOx	-13.9	-44.1	-67.3	-79.6		
	NMVOC	2.4	-0.8	-6.5	-11.1		
	NH3	-2.1	-19.8	-23.6	-27.6		
	PM2.5	-0.5	-1.7	-2.5	-2.9		
Slovenia (4 PaMs)	**NOx**		-2.1	-2.0	-3.1		
	NMVOC		0.2	-0.9	-0.9		
	PM2.5		0.2	0.5	0.5		
Spain (9 PaMs)	**SO2**		-5.3				
	NOx		-20.9				
	NMVOC		-2.5				
	PM2.5		-2.5				

Source: NECPR, integrated PaMs reporting

(90) All quantitative values reported by Latvia for Annex XIV initially suggested increases in emissions. As this was inconsistent with Latvia's NECP and other publicly available information, the data was corrected (by adding a minus sign to every number). This issue was flagged to Latvia by the EEA and Latvia is expected to provide clarifications.

When it comes to the qualitative data reported, substantial differences can be noticed among the Member States. Austria and Lithuania, for instance, provided minimal detail, typically just indicating the expected direction of impact without further elaboration. Sweden, on the other hand, stood out by including brief explanations for each PaM. For 6 PaMs, Sweden indicated that they could either reduce or increase emissions depending on the types of investments made in the future, leading to an unclear impact rating for now. Furthermore, Luxembourg and Slovakia frequently deviated from the reporting template, presenting information on all pollutants in a single in-text format. Latvia also had several PaMs for which only links to external websites were provided, making it impossible to effectively assess the expected impacts of the measures in question.

4 Regional cooperation

In the NECPR, on regional cooperation, 24 Member States submitted data. Cyprus submitted partial data, while Greece, Romania and Bulgaria did not submit any data on the progress towards regional cooperation.

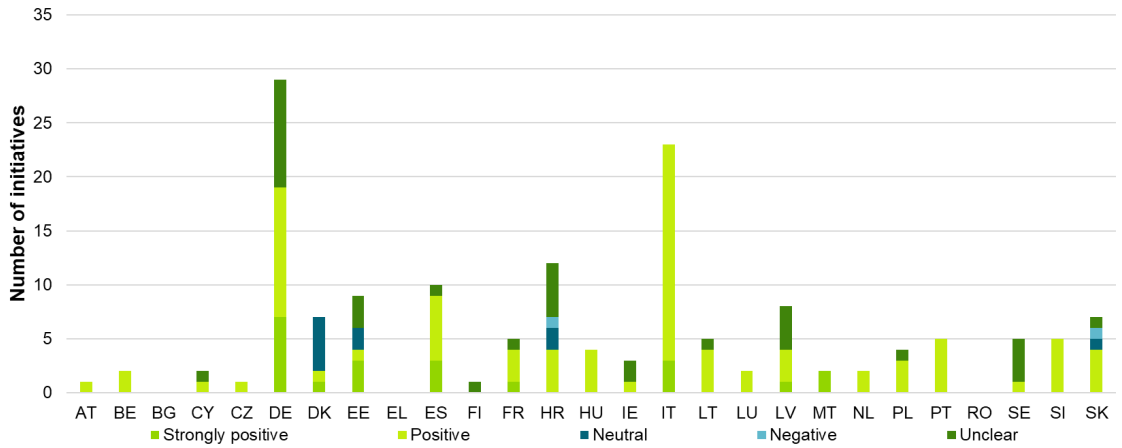
4.1 Reporting progress compared to 2023 submission

When comparing the 2025 submissions to those from 2023, it is evident that many Member States have not provided substantial updated data or information on the progress of initiatives compared to 2023 data. However, some countries, such as Italy and Spain, have introduced new initiatives, demonstrating active development in regional cooperation. In contrast, others, like Belgium, primarily report on established frameworks, such as the Pentalateral Energy Forum, with limited new cooperations.

4.2 Implementation progress

Overall, 24 Member States reported on 154 regional cooperation initiatives. Progress for the reported regional cooperation projects or initiatives varies significantly across MS. Figure 52 illustrates the number of initiatives reported and their progress rating. Germany reports the greatest number of initiatives (30 initiatives), followed by Italy (20 initiatives) and Denmark (15 initiatives). Italy's initiatives all show positive or strongly positive progress, while the progress of initiatives reported by Germany and Denmark is more mixed, including both positive and unclear ratings. Unclear progress is often attributed to insufficient or outdated data compared to previous submissions. On the other end of the spectrum, several countries reported fewer than five initiatives: Austria, Czechia, and Finland each reported one initiative; Cyprus, Belgium, the Netherlands, and Luxembourg reported two; Ireland reported three; and Hungary, Poland, and Sweden each reported four. For those countries with little initiatives, progress was predominantly positive, except for Finland, Sweden and Cyprus where progress is partially unclear.

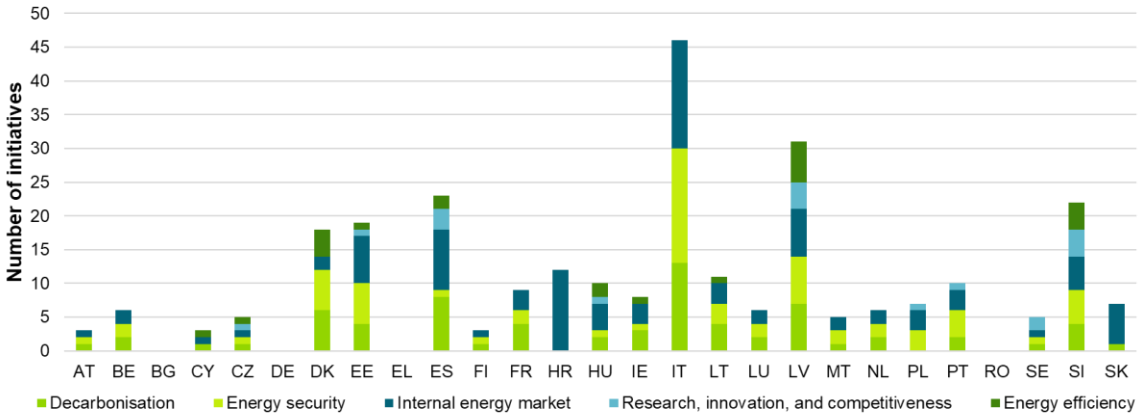
Figure 52. Progress rating across number of regional cooperation initiatives and Member States.



Source: elaboration on NECPR, Annex XXI

The reported initiatives span across the five Union dimensions. Figure 53 illustrates that most reported projects relate to more than one dimension. The majority focus on internal energy market (96 times), decarbonisation (70 times), and energy security (68 times). Fewer projects or initiatives related to energy efficiency and research, innovation, and competitiveness. This is a similar trend as observed in the 2023 submissions. Some Member States, such as Croatia, report cooperation only in one dimension, while six Member States report cooperation in all five dimensions (Czechia, Estonia, Hungary, Latvia, Slovenia, Spain).

Figure 53. Regional cooperation initiatives split by Union dimension.



Source: elaboration on NECPR, Annex XXI

The most common types of regional cooperation reported include participation in regional forums and bilateral collaborations. Among the regional forums, the Pentalateral Energy Forum, North Seas Energy Cooperation, and Baltic Energy Market Interconnection Plan stand out as the most frequently cited cooperation frameworks. These initiatives have progressed positively, demonstrated by regular developments, progress meetings, or new targets that have been set between 2022 and 2025. Bilateral collaborations are mostly related to cross-border cooperation and PCI projects.

Aside from cooperations between Member States, several Member States also engage with non-EU countries in their regional efforts. For example, Croatia reports cooperation with Albania, Bosnia and Montenegro; Hungary with Azerbaijan and Georgia; Slovakia with Ukraine, and Italy with Tunesia.

5 Multilevel climate and energy dialogues

As part of the governance framework under the Regulation on the Governance of the Energy Union and Climate Action, Member States are required to establish multilevel climate and energy dialogues to engage a broad range of stakeholders in the development and implementation of national energy and climate policies and to discuss the achievement of the Union's climate-neutrality objective. This section provides an overview of the current state of these dialogues across the EU, based on the information submitted in the latest reporting cycle. In the NECPR, progress on the multilevel climate and energy dialogue is reported in Annex XXIII. To date, all Member States except Bulgaria submitted data on the topic.

Compared to the latest reporting cycle, significant progress is being made on dialogues across the EU (91). Nine countries showed strongly positive progress, namely Germany, Croatia, Ireland, Italy, Latvia, Netherlands, Portugal, Romania, and Slovenia. These countries stood out not only for the maturity and frequency of their engagement processes but also for the breadth of actors involved and the integration of public feedback into national planning. For example, Portugal has significantly expanded the scope and frequency of its dialogues, introducing new mechanisms for engaging local authorities and youth organisations. In addition, 14 countries have shown generally positive developments, representing the majority of Member States. However, three countries (Austria, Cyprus and Luxembourg) have shown no progress, reporting identical or nearly identical information to the submissions from 2023.

In terms of continuity, most countries appear to be building on previous efforts: 16 countries demonstrated progress on initiatives already reported in 2023, while 9 countries, such as Germany and Italy, presented a mix of new and continuing initiatives. Czechia was the only country to report solely entirely new initiatives, which is largely the result of the limited reporting it provided in 2023.

Various levels of maturity of the dialogue initiatives can be identified across the 2025 submissions. 13 countries showed significantly more mature dialogues compared to their 2023 submissions. For instance, France by embedding the energy and climate dialogues into systemic ecological planning and establishing regional energy committees to coordinate local engagement. Another good example is Latvia, where since 2023 sectoral engagement was significantly deepened through working groups focused on energy, land use, waste and circular economy, transport, industry, and construction. 10 other Member States demonstrated moderate improvements. For 3 countries - Austria, Cyprus, and Luxembourg no significant change in this regard can be described, due to the lack of new information in their 2025 submissions. Notably, no countries explicitly reported having discontinued initiatives.

The analysis of the 2025 submissions also highlights changes in the periodicity of dialogue activities. 14 countries appear to have increased the frequency of their dialogues compared to 2023, suggesting a stronger institutionalisation or prioritisation of these processes. Ireland, for example, increased the frequency of its dialogue through annual Climate Conversations and recurring stakeholder and youth

[91] To note, the contribution of the NECPlatform LIFE Project that supported six EU Member States (Bulgaria, Croatia, France, Italy, Portugal, and Romania) in setting up and managing permanent multi-level Climate and Energy Dialogue Platforms.

engagement events. 11 countries maintained the same level of engagement, while no countries reported a decrease in frequency in meetings and activities. For Czechia, the change in periodicity could not be determined due to the aforementioned lack of specific information in the 2023 submission.

Compared to the 2023 assessment, where many Member States limited the scope of multilevel climate and energy dialogues to the development of their NECPs, the 2025 submissions indicate a notable shift. While NECP development remains a central focus in several countries (Cyprus, Czechia, Greece, Sweden, and Slovakia), the scope of dialogue has broadened in many cases. 21 countries now demonstrate a more comprehensive approach, aligning more closely with the Regulation's intent to cover broader energy and climate policy scenarios, including long-term perspectives.

Certain actor types emerge as consistently central to the dialogue processes. The most frequently involved actors are civil society organisations, mentioned in 22 country submissions; the business community cited 21 times; and academia, experts and research institutions, appear in 18 cases. The broader public is also often involved through public consultation and is mentioned by 18 Member States. Furthermore, the inclusion of local authorities, and youth is on the rise, respectively, appearing in 17, and 13 submissions. The data also reveals that some actors are notably less frequently mentioned. Regional authorities are involved in only 8 submissions, while trade unions and investors appear just 5 times each. Finland was the only country that mentioned including indigenous communities into their dialogue initiatives, aiming to integrate indigenous perspectives and rights into national climate policymaking. Cyprus and Sweden both reported only public sector actors to be included in their initiatives ('authorities' in the case of Sweden, and a range of different ministries and government experts for Cyprus), possibly indicating a lack of broader societal engagement.

The reported outcomes of the dialogue initiatives remain relatively vague in many cases, with limited detail on their tangible impact. Quantitative outcomes are often absent; around half of the countries do not mention any measurable results. Where such data is provided, it tends to be restricted to metrics such as the number of participants, consultations, round tables, working groups, or events held, as well as the number of recommendations, contributions, or responses received. What is done with the suggestions received is often not detailed. Spain stands out as one of the few countries that specifies that 60 of the received comments were in fact integrated into the NECP update. Similarly, qualitative outcomes are frequently described in general terms, focusing on the types of initiatives and formats used, and the actors involved. When outcomes are mentioned, they typically refer to the dialogue feeding into policymaking (most notably the NECPs) fostering increased cooperation, knowledge sharing, and public trust or awareness. Other outcomes are often the creation of additional dialogue forums or transparency initiatives.

6 Conclusion and lessons learnt

- **Progress towards the Union's 2030 targets for energy and climate**

Overall, the EU is on track to achieve the 2030 target. The latest Member State's GHG projections from March 2025, when existing and additional policies are taken into account, show a gap close to 1 percentage point to the EU 2030 reduction target of -55%, in line with the recent assessment of national climate and energy plans. However, achieving the EU target relies on the full implementation of EU and Member States' existing and additional policies and measures.

Projections based only on current policies and measures continue to fall short by around 8 percentage points. With only five years left until the interim target to climate neutrality, these findings highlight the critical importance of close monitoring, sustained action and sufficient investment to meet the 2030 target.92

The 2025 NECPR showed that more Member States are committing to become climate neutral by 2050 or earlier, increase the ambition of national GHG targets, and implementing new additional policies and measures to achieve climate goals.

In 2023, the EU reached a share of 24.6% of renewable energy in final energy consumption, an increase of 1.5 percentage points compared to 2022. In absolute terms, the consumption of renewable energy rose from 209.5 Mtoe in 2020 to 234.6 Mtoe in 2023, while total final energy consumption declined over the same period due to lower electricity consumption and reduced heating and cooling demand. By contrast, energy consumption in the transport sector strongly increased. The Commission will support and closely monitor the implementation of the final plans with the Member States, in particular those that have not yet reached their 2022 reference point, and will assess if further measures are needed to ensure the collective achievement of the renewable energy target, including the aspirational target of 45%, are necessary.

Overall, the EU has made steady progress in improving energy efficiency, with final and primary energy consumption continuing their downward trajectory in 2022–2023 despite the rebound from the COVID-19 crisis. Significant reductions were recorded in the residential and industrial sectors, supported by intensity improvements and favourable weather conditions, while transport and services showed more mixed results. Member States reported increasing annual and cumulative savings under the energy savings obligation, exceeding the minimum required levels, though the short lifetime of some measures and the higher post-2024 savings rates pose challenges ahead. At the same time, progress under obligations for public buildings and audits remains uneven, with several Member States falling behind on implementation and reporting. Taken together, the latest data demonstrate that energy efficiency is delivering tangible results across the EU economy, but accelerated efforts and consistent compliance will be essential to put the Union on track to meet its more ambitious 2030 targets.

Based on the ENTSO-E Winter Outlook 2024-2025 data93**,** in 2025, 11 Member States 94 were below the 2030 interconnection target, out of which 5 (BE, DE, PT, RO, SE) were above and 6 (EL, ES, FR, IT, NL, PL) also below the 2020 interconnection target. Overall, little progress has been achieved by Member States concerned in recent years but the efforts to increase cross-border capacity are on-going and the completion of various Projects of Common Interest in the near future should improve the interconnectivity levels. Consequently, timely delivery of these projects is key to reach the 2030 targets, but more efforts are required to further increase and maintain the interconnectivity levels in the context of growing generation capacity from renweable energy sources.

Overall, while the assessment shows continued progress, substantial ambition and implementing efforts are still needed to deliver on the 2030 Union's objectives.

[92] For a more detailed assessment on the EU and Member States' progress towards climate objectives, refer to the Climate Action Progress Report 2025 and its accompanying technical annex.
[93] Member States reported data was not used as a basis for calculation due to inconsistences.
[94] Cyprus and Ireland currently have no electricity interconnection with other EU Member States.

- **The reporting, review, and assessment process**

2025 was the second time in which the progress on the implementation of the national energy and climate plans was **reported and assessed in an integrated manner.** The continued use of the e-platform as well as the templates of reporting, and the clear gained experience of MS reporters with using them, have clearly shown to **simplify the reporting process and increase the comparability** of data, facilitating the subsequent review and assessment.

At the same time, still more can be done to further improve the comparability and understanding of the reported data to strengthen the subsequent assessment, e.g., by further aligning with other data collection processes, refining and simplifying the reporting templates, further improving reporting guidelines, and exchanging good practices.

For climate change adaptation, the 2025 reporting under Article 17 of the Governance Regulation reveals a mixed picture of Member States' efforts. In many cases, the level of detail provided is limited, making it difficult to understand the progress made in implementing adaptation goals set in the NECPs, or other documents cross-referenced in the NECPs containing adaptation goals. Fortunately, this is not the whole picture of adaptation efforts in the Member States, as they report on adaptation progress with more detail under Article 19 of the Governance Regulation. With a focus on national adaptation planning, implementation, monitoring and evaluation of adaptation policies and actions, Member States are progressing in building their adaptation policies. Thus, for adaptation, the current reporting round underlines the need for improved clarity, clearer guidance and a more harmonized approach.

This work should be picked up in the preparation for the next reporting cycle in 2027, for which it is planned (95) to revise the implementing regulation to align it with the evolved energy and climate acquis which resulted from the Fit for 55 package and the relevant REPowerEU initiatives (96) and the up-coming European integrated framework for climate resilience, with the continued assistance of the European Environmental Agency and in consultation with the Energy Union Committee and Climate Change Committee and their working groups related to reporting.

The Commission will also consider further streamlining in the planned revision of the Governance Regulation.

[95] Energy reporting – amended templates to reflect European Green Deal outcomes and simplification

[96] Commission Implementing Regulation (EU) 2022/2299 of 15 November 2022 laying down rules for the application of Regulation (EU) 2018/1999 of the European Parliament and of the Council as regards the structure, format, technical details and process for the integrated national energy and climate progress reports.

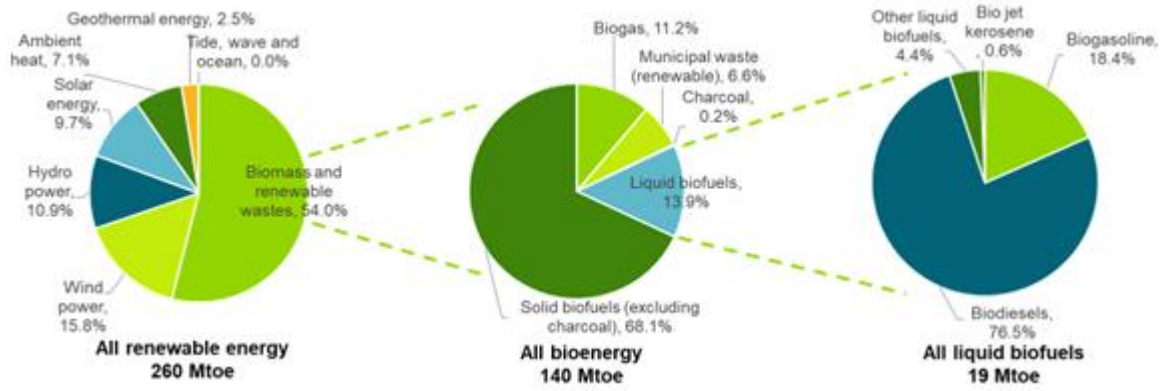
Annex 1 – Assessment of the sustainability of bioenergy in the Union

I. Introduction

Article 35 of Regulation (EU) 2018/199997, the "Governance Regulation", provides that by October 31st each year, the Commission must present a State of the Energy Union report to the European Parliament and the Council. Starting in 2023, this report must biennially include a report on Union bioenergy sustainability, containing the information specified in Annex X of the Regulation. This report fulfils this reporting requirement, having been developed primarily from the data supplied by Member States in their integrated National Energy and Climate Progress Reports (NECPRs), as stipulated in Article 17 of the Governance Regulation. Additionally, the report incorporates data from Eurostat's SHARES and Energy Balances98. Member States have to report in accordance with the rules set in the Renewable Energy Directive, taking into account the sustainability and greenhouse gas (GHG) emissions saving criteria included therein, as well as the relevant calculation rules.

In 2023, bioenergy derived from agricultural, forestry, and organic waste feedstocks represented 54% of the total renewable energy consumption in the Union, according to data reported on Eurostat, as illustrated in **Error! Reference source not found.**1. In 2023, primary solid biofuels continue to represent the largest share of all bioenergy consumption, accounting for 68.1%. Liquid biofuels made up 13.9%, and biogas/biomethane accounted for 11.2%, showing an increase compared to 2021. The renewable share of municipal waste remains consistent at 6.6%.

Error! Reference source not found.**Figure 1. Gross EU consumption of renewable energy per type (2023, % and Mtoe).**



Source: Eurostat NRG_BAL_C

[97] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, OJ Regulation (EU) 2018/1999, (OJ L 328, 21.12.2018, pp. 1–77, ELI: http://data.europa.eu/eli/reg/2018/1999/oj)

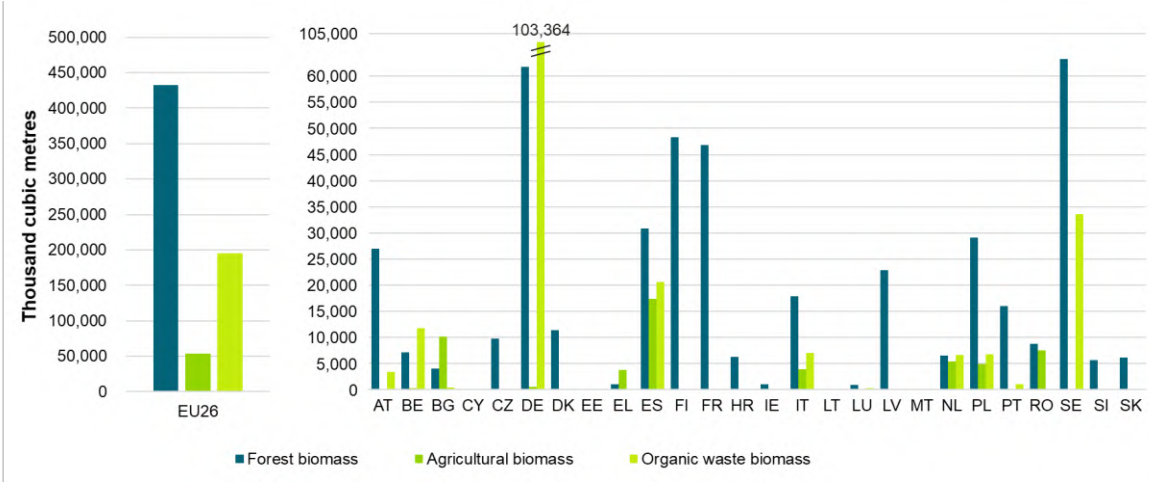
[98] Additional data - Energy - Eurostat

II. Current and projected biomass availability and demand

Biomass supply

For 2023, twenty-four[99] Member States reported their data on biomass supply. As shown in **Error! Reference source not found.**, forest biomass[100] was the largest biomass category used for energy production, constituting 63% of the total indigenous solid biomass supply. Biomass from organic waste followed with 29%, and agricultural biomass made up 8%. On the Member State level, Germany significantly led in organic waste biomass production with 103,364 thousand cubic meters. Sweden was the top producer of forest biomass at 63,283 thousand cubic meters, followed by Germany at 61,884 thousand cubic meters. Spain recorded the highest volumes in agricultural biomass production, at 17,330 thousand cubic meters. While most Member States provided comprehensive data in their reports, still some inconsistencies have been identified. Simple data gaps have been addressed in the analysis, but a few inconsistencies remain unresolved where the underlying causes were not clear.

Figure 21. Primary supply of solid biomass in 1000 m³ for energy production, indigenous production in 2023[101].



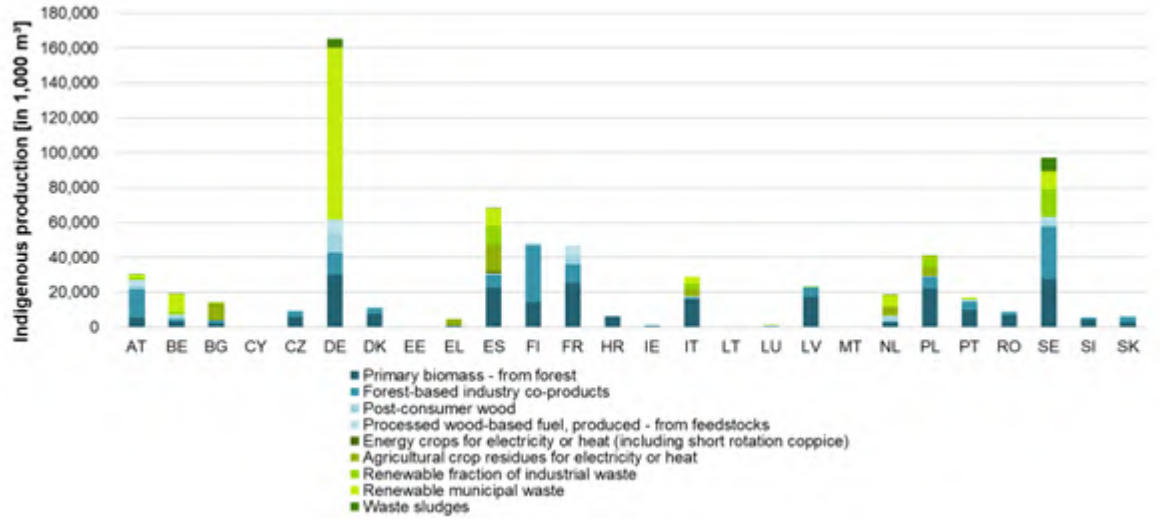
Source: Eurostat Supply of biomass - annual data (NRG_CB_BM)

A more detailed overview of the reported indigenous production of solid biomass per Member State in 2023 can be found in **Error! Reference source not found.**. Across the Union, 'primary biomass from forest,' has a dominant role, comprising 35% of the total biomass used. Germany, Sweden, France, Spain, and Poland are those Member States whose indigenous energy production mainly constitutes of biomass originating from this category. The next largest category across the Union is 'forest-based industry co-products,' accounting for 22% of the total indigenous productions, with Finland and Sweden mainly reporting production from this category. Renewable municipal waste represents 21.1% of the biomass used, with Germany, Belgium, and Sweden reporting large volumes in this category. Collectively, these three categories, 'primary biomass from forest,' 'forest-based industry co-products,' and 'renewable municipal waste', constitute nearly 78% of the total solid biomass used for indigenous energy production.

[99] All Member States with the exception of Estonia, Lithuania and Malta

[100] Please note that forest biomass is defined in Article 2(26) of Directive (EU)2018/2001 (the Renewable Energy Directive), as follows: *'forest biomass' means biomass produced from forestry'*

Figure 32. Detailed overview of the reported indigenous production of solid biomass per Member State in 2023, excluding black liquor.



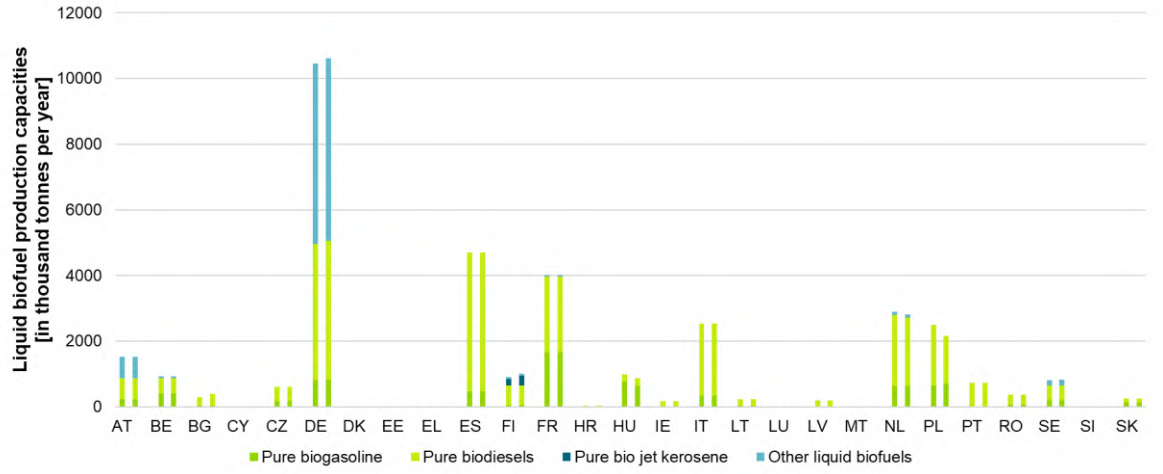
Source: Eurostat Supply of biomass annual data (NRG_CB_BM)

For 2022 and 2023, **Error! Reference source not found.** shows that Germany had the highest liquid biofuel production capacity among the Member States, with capacities over 10,000 kton each year (29.8%/10,458 kton in 2022 and 30.3%/10,625 kton in 2023). This production capacity was more than double that of the second biggest reported producer, Spain (13.4% or 4,701 kton in both years). Six Member States[102] reported no production capacity, whereas Denmark and Croatia had a production capacity of less than 100 kton per year. When it comes to the different types of biofuels, in 2022 and 2023, Germany had significant production capacities for various types of biofuels. It had a production capacity of 5,502 kton of 'other liquid fuels' in 2022 and 2,262 kton of 'other liquid biofuels' in 2023 as seen in **Error! Reference source not found.**, with Austria being the only other Member State with a capacity over 200 kton for this category, at 646 kton in both years. For pure biodiesel, Spain's production capacity was the highest among Member States at 4,237 kton in both years. Germany's capacity was the second largest, at 4,151 kton in 2022 and 4,241 kton in 2023. Almost all Member States had production capacity for pure biodiesel, except for the six Member States mentioned above that don't have any production capacity, and Denmark. Pure bio jet kerosene was mainly produced in Finland, with 200 kton in 2022 and 300 kton in 2023, and only minor production in France and Austria. For pure biogasoline, most Member States had production capacity, but France had the largest, maintaining 1,655 kton for both

years.

[102] Cyprus, Estonia, Greece, Luxembourg, Malta, Slovenia

Figure 43. Liquid biofuel production capacities in 2022 (left bar) and 2023 (right bar) per MS[103].

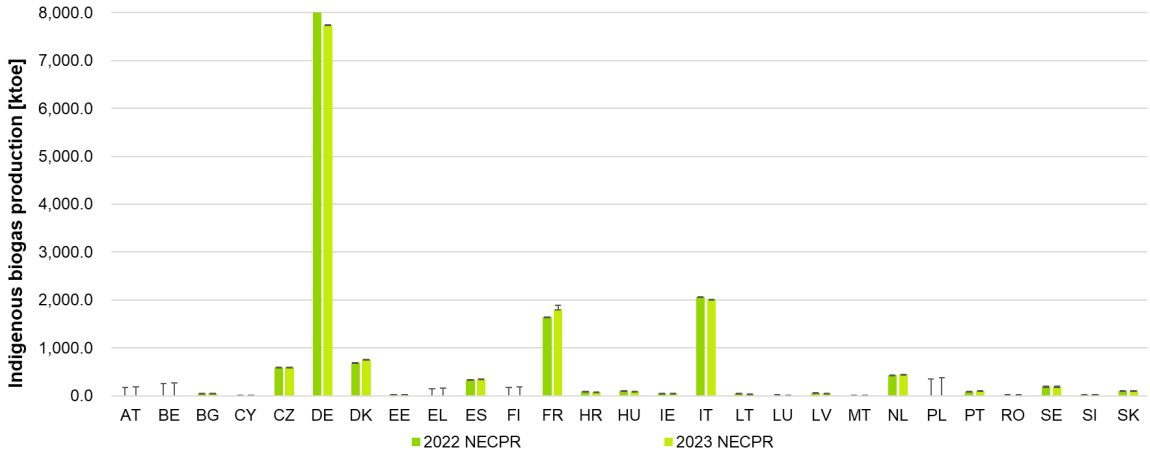


Source: Eurostat

Data on indigenous biogas production in the Union is reported by Member States in the NECPRs. While 24 Member States[104] submitted their NECPR data, some discrepancies have been observed, which suggest that reporting was made in different units. These discrepancies highlight the need for careful data interpretation and were corrected for the purposes of the below assessment. The NECPR data was then supplemented and compared with the available data from Eurostat. The indigenous production of biogas per Member State as reported in the NECPR in 2022 and 2023 is shown in **Error! Reference source not found.** and includes the error bars to indicate the data from the Eurostat Energy Balances. Based on the Eurostat data, Germany was the largest producer of biogas in both 2022 and 2023, contributing to almost half of Europe's total production (8,095 ktoe in 2022 which corresponded to 51.2% of the total, and 7,743 ktoe in 2023, which corresponded to 49.0%). Italy (with 2,071 ktoe in 2022 and 2,012 ktoe in 2023), France (with 1,624 ktoe in 2022 and 1,890 ktoe in 2023), and Denmark (with 691 ktoe in 2022 and 758 ktoe in 2023), were also significant producers of biogas. Between 2022 and 2023, biogas production capacities grew in some countries, like France and Denmark, while it slightly declined in others, such as Germany and Italy. Even so, Germany and Italy are still the two largest producers in the Union in 2023 as described above and illustrated in **Error! Reference source not found.**. Overall, the total biogas production in the Union has remained stable, at 15,813 ktoe (18.82 bcm) in 2022 and 15,789 ktoe (18.80 bcm) in 2023 yet with a shift in quality of that biogas: more production of upgraded biogas (biomethane) and less biogas for combined heat and power.

[103] Liquid biofuel production capacities in 2022 (left bar) and 2023 (right bar) per MS.
[104] All except for Finland, Belgium and Poland

Figure 54. Indigenous biogas production in 2022 (left bar) and 2023 (right bar) per MS as reported in Annex II Table 1 of the NECPRs. The error bars visualise the difference with the values as reported in the Eurostat energy balances

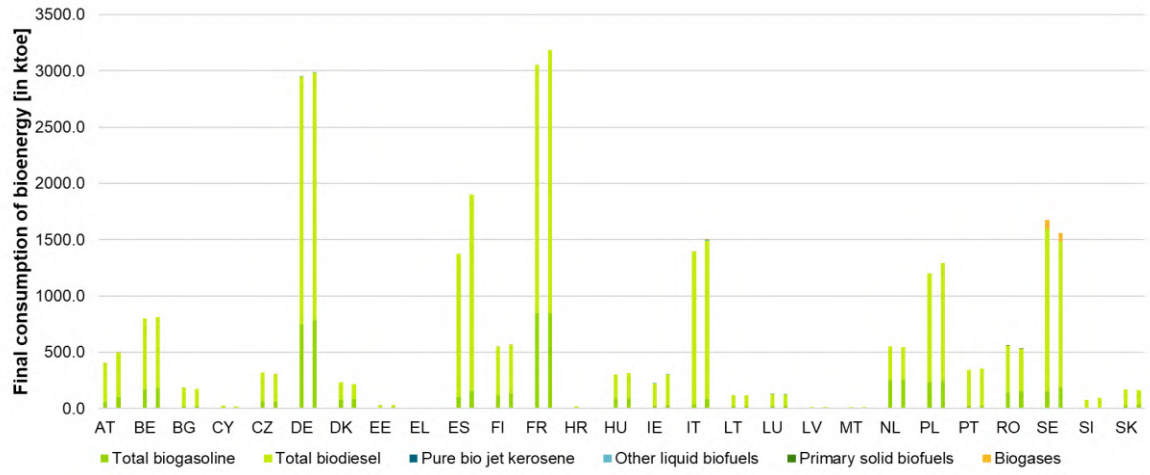


Source: NECPRs and Eurostat NRG_BAL_C

Biomass demand per sector

For the **transport** sector, **Error! Reference source not found.**, illustrates that France and Germany are the largest biofuel consumers in the Union, accounting together for 35.1% of the total consumption of biofuels in the transport sector in 2023. Along with Spain (10.8%), Sweden (8.7%), Italy (8.5%), Poland (7.3%), Belgium (4.6%), Finland (3.2%), the Netherlands (3.1%), and Romania (3.0%), these countries make up 84.3% of the Union's biofuel consumption in the transport sector. Biodiesel is widely consumed across the Union, except in Greece, with France and Germany leading, although Spain saw a significant increase of 38% in consumption. Biogasoline follows as the second most consumed liquid fuel across the Union, with France as the main consumer, despite a slight decrease, and significant growth observed in Italy (+143%), Austria (+94%), and Spain (+52%). Other biofuels are less prevalent, with no EU country reporting pure bio jet kerosene use in 2023. Biogases are slightly more common, led by Sweden's 75.48 ktoe consumption.

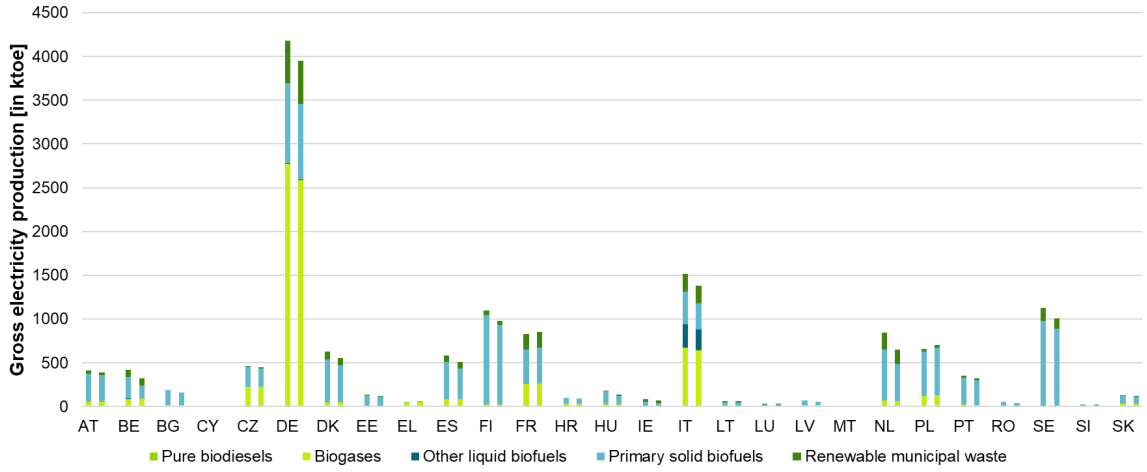
Figure 65. Final consumption of biofuels in the transport sector in 2023 per EU MS. Note that biogasoline and biodiesel include pure fuels as well as shares in blend fuels[105]



Source: Eurostat table NRG_BAL_C

In 2023, the Union produced 13.0 Mtoe of gross **electricity** from biomass fuels and bioliquids. This accounted for 12.3% of the renewable electricity generation in the Union. Among these types of fuels, solid biomass (referred to as 'Primary solid biofuels' in the legend) is the most widely used, making up 51.7%, followed by biogases at 34.1%. Renewable municipal waste contributes with a share of 12.3%, while bioliquids (listed as 'Other liquid biofuels' and 'Biodiesel' in the legend) constitute 1.9%. Belgium, Italy, and Slovenia are the only Member States that utilize minor amounts of biodiesel for electricity generation, resulting in a combined total of 2.0 ktoe of gross electricity. Germany is the largest user of biomass fuels for electricity generation purposes in both 2022 and 2023. Alone, it accounts for 29.4% and 30.3% respectively of the electricity produced from biomass fuels and bioliquids in the Union and for 59.2% and 58.1% respectively of the electricity produced from biogas in the Union. Finland is the largest user of solid biomass (in legend see 'Primary solid biofuels') (13.5% in 2022 and 13.6% in 2023 of EU total) for electricity generation, followed by Sweden (12.8% in 2022 and 13.1% in 2023 of EU total).

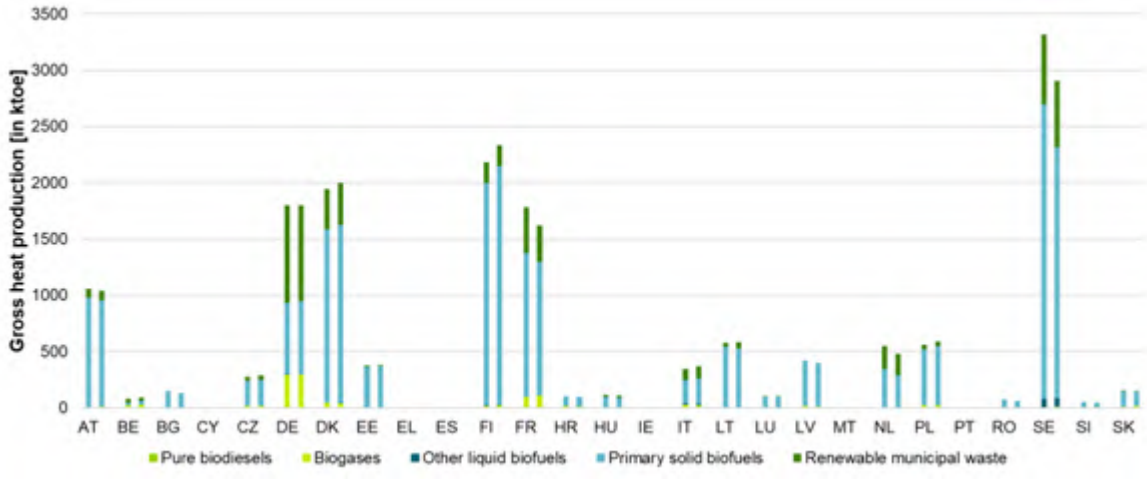
Figure 76. Gross electricity produced from biomass fuels and bioliquids in 2022 and 2023 per Member State



Source: Eurostat Energy Balances table NRG_BAL_C

In 2023, 15.6 Mtoe of gross **heat** from biomass fuels and bioliquids was produced in the Union, accounting for about 14% of renewable energy for heat, according to Eurostat data. Solid biomass, labelled as 'Primary solid biofuels' in the legend, is the main type of biomass used for heating. It accounts for a significant 76.6% of the total heat production derived from biomass fuels and bioliquids within the EU in 2023. Renewable municipal waste contributes 18.7%, and biogases come in third, making up 4.1% of the total heat production from biomass fuels and bioliquids. Sweden was the largest producer of heating using biomass, at 18.6% of the Union total, despite a significant decrease in solid biomass use from 2022 to 2023. Finland (15.0%), Denmark (12.8%), Germany (11.6%), and France (10.4%) were also large producers of heating from biomass, while some countries reported no usage of biomass for heating. Belgium, Finland, Italy, and Poland saw increases in biomass and bioliquids use for heat production in 2023.

Figure 87. Gross heat production from biomass fuels and bioliquids in 2022 and 2023 per EU MS

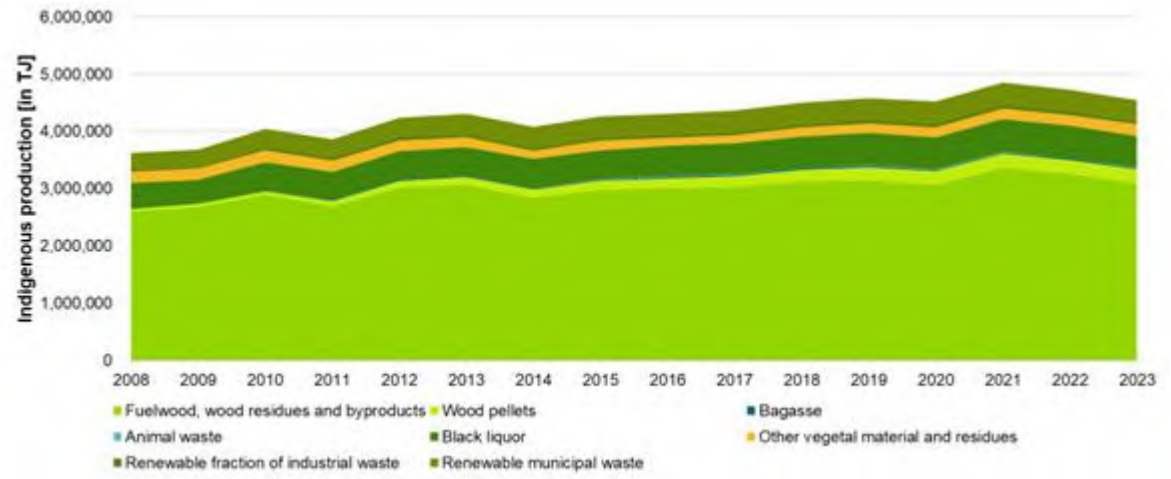


Source : Eurostat Energy Balances table NRG_BAL_C

Trends since 2008

Error! Reference source not found. illustrates the Union's solid biomass production by volume from 2008 to 2023. The data shows a general increase of 26% over this period, rising from 3,625,753 TJ in 2008 to 4,552,247 TJ in 2023, with slight fluctuations. Notably, there was a 6.3% overall decrease from peak production in 2021, with reductions of 2.6% in 2022 and 3.8% in 2023. Fuelwood, wood residues, and by-products remain the largest source, followed by black liquor. Among solid biomass types, wood pellets experienced the most significant growth of 418% since 2008. Other categories such as animal waste, industrial and municipal renewable waste, and black liquor also showed varying degrees of growth, whereas other vegetal material and residues increased by 1.1%. Despite slow growth initially, production of these materials has surged by 42% since 2016. Bagasse production has seen a 23% increase since 2011, with no data available for earlier years.

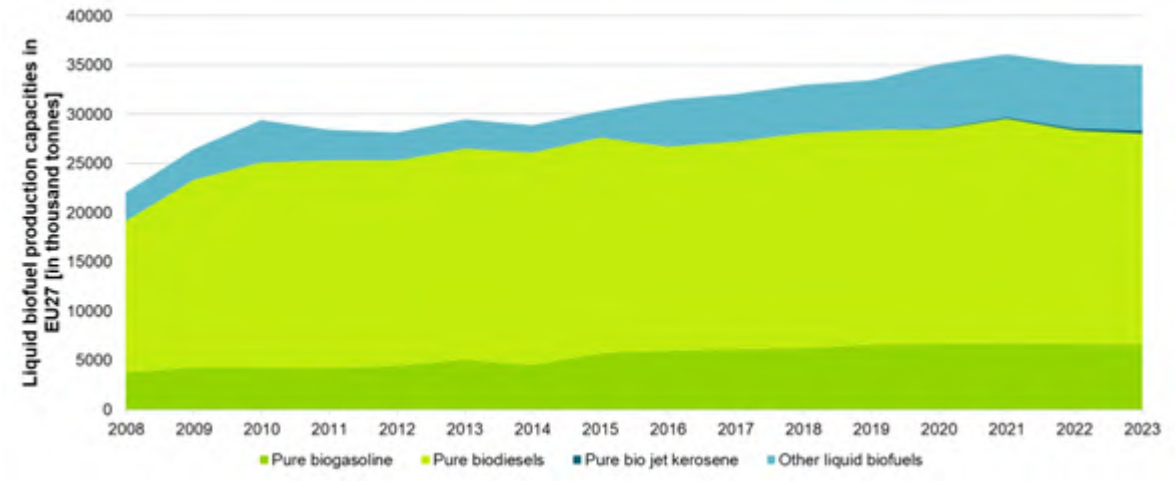
Figure 98. Total EU-27 solid biomass production (in TJ)



Source: Eurostat table NRG_CB_RW

Error! Reference source not found. depicts the Union's liquid biofuel production capacity trends. Between 2008 and 2021, the Union's production capacity increased significantly: 39.5% for biodiesel, 73.7% for biogasoline, and 114.5% for other liquid biofuels. Bio jet kerosene production capacity began in 2011 and reached 313 kton by 2023, but represents only 0.9% of the total. Biodiesel held the largest share at 61.2% (21,409 kton) in 2023, with biogasoline and other liquid biofuels at 18.9% (6,629 kton) and 19.0% (6,660 kton), respectively, reaching a total of 35,011 kton. Despite an observed overall growth of 58.4% from 2008 to 2023, a slight decrease of 3.1% has been observed in the total production capacity of liquid biofuels in 2023 compared to its peak in 2021.

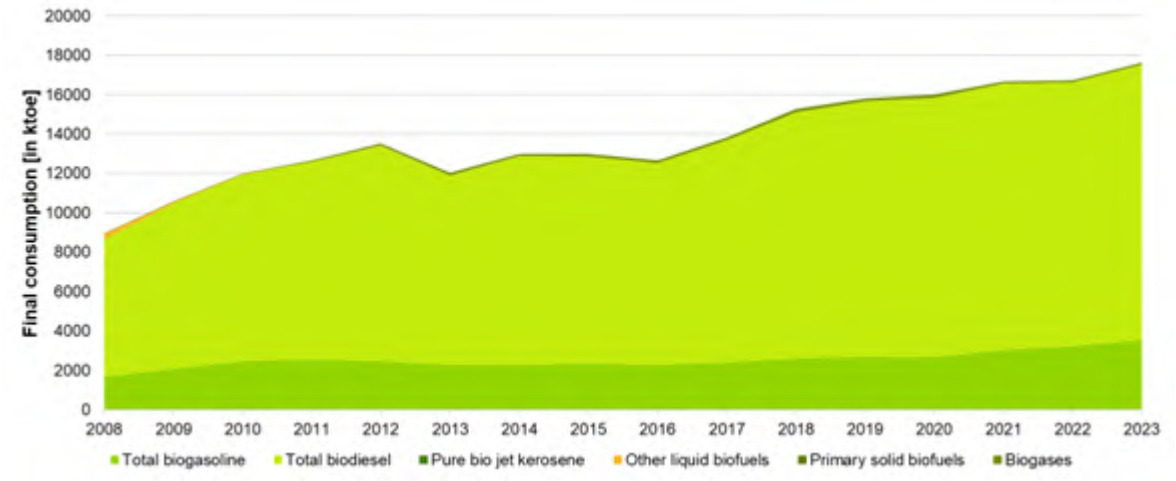
Figure 109. Total EU-27 liquid biofuel production capacity.



Source : Eurostat Energy Balances table NRG_BAL

In 2023, 17.6 Mtoe of biofuels were consumed in the Union in the transport sector, with biodiesel comprising 79.3% and biogasoline 20.1%. Biogases, other liquid biofuels, and solid biomass collectively accounted for less than 1.0%. From 2008 to 2023, biofuel consumption in the Union grew by 97%, while a consistent annual increase has been observed since 2016. Biodiesel was mainly responsible for this growth in absolute terms, although, in relative terms, biogasoline usage grew slightly faster statistically, at 110% compared to biodiesel's 101%. Despite a 387% rise in biogas consumption, it remains at 0.5% of total consumption. Other liquid biofuels and solid biomass usage continues to decrease over the years, with each category accounting for under 0.1% of the total consumption in 2023.

Figure 1110. Final consumption of biofuels in the transport sector for EU-27 from 2008 to 2023. Note that biogasoline and biodiesel include pure fuels as well as shares in blend fuels

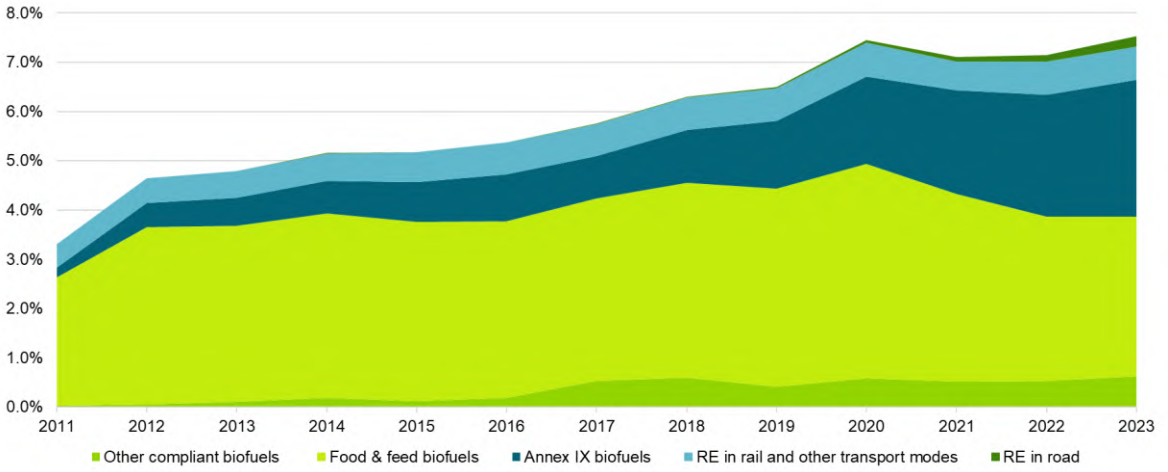


Source : Eurostat table NRG_BAL_C

As seen in **Error! Reference source not found.**, the overall share of biofuels (food and feed, Annex IX, and other compliant biofuels) continues to play an important role in the transport sector, accounting for 9.5% of the total energy used in transport in the Union including multipliers and 6.6% excluding them. Annex IX biofuels represent 2.8% of renewable energy in transport, while food and feed biofuels

reach a share of 3.2%. Renewable electricity is making significant progress in road transport, with impressive growth in 2023 marked by a substantial 53% increase from 2022, reaching 579 ktoe, primarily due to efforts in Germany, France, Sweden, and the Netherlands. While its share is currently at 0.9% with multipliers, this upward trend is encouraging and points to a key role of renewable electricity in the decarbonisation of the sector.

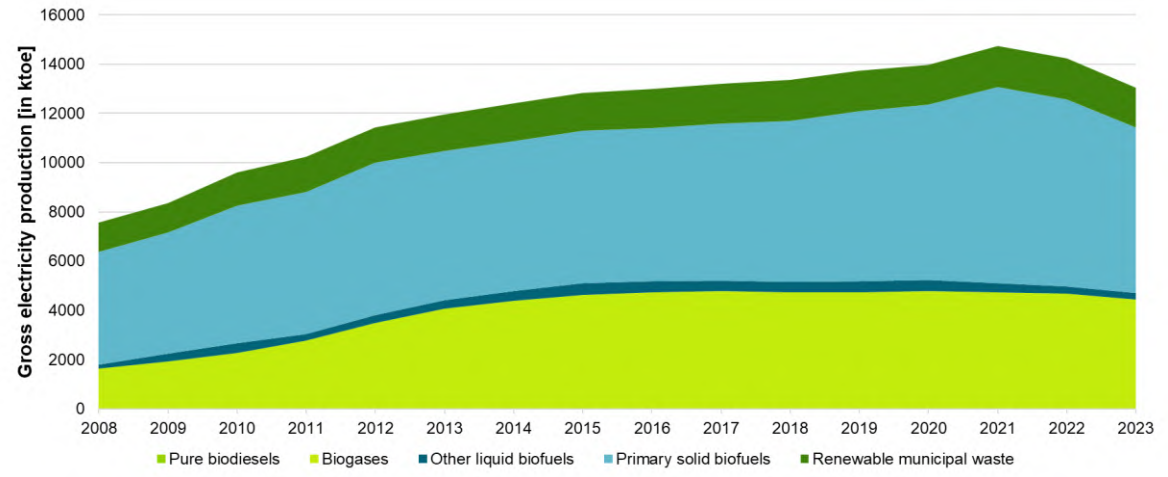
Figure 1112. Historical overview of renewable energy in transport for EU-27 (excluding multipliers)



Source: Eurostat SHARES database

Error! Reference source not found. shows that use of biomass fuels and bioliquids in electricity generation has been rising steadily since 2008. From 2021 to 2023 a slight drop has been observed. In 2022, the production of electricity from biomass fuels and bioliquids increased by 87.9% compared to 2008. In 2023, production of electricity through biomass fuels and bioliquids increased by 72.2% compared to 2008. The use of solid biomass (in legend see 'Primary solid biofuels') for electricity production was the main driver for this growth. Electricity production from solid biomass in 2022 increased by 66.2% compared to 2008, and in 2023 by 72.2% since 2008. In contrast, since 2017 the use of biogases for electricity production reached a plateau and a slight drop was even observed.

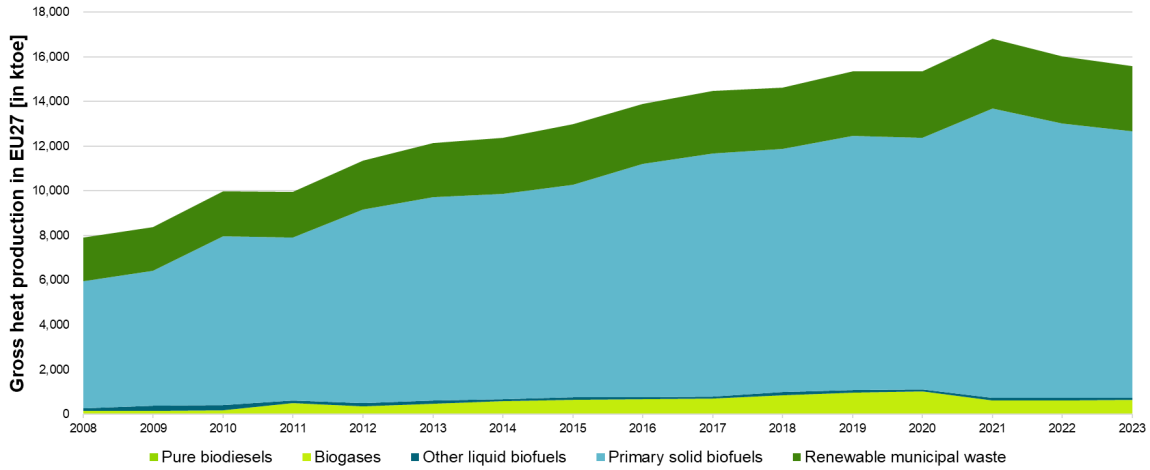
Figure 1312. Gross electricity production from biomass fuels and bioliquids for EU-27 from 2008 to 2023



Source: Eurostat Energy Balances table NRG_BAL_C

Similarly to the electricity sector, **Error! Reference source not found.** shows that heat production based on biomass fuels and bioliquids has seen an increase over the last decade, although a decrease after 2021. Especially 'Other liquid biofuels' saw a large decline of 26% between 2021 and 2023. Biogases experienced a slight increase between those years of 6%.

Figure 1413. Gross heat production from biomass fuels and bioliquids for EU-27 from 2008 to 2023



Source: Eurostat Energy Balances table NRG_BAL_C

Projections to 2030

In their NECPRs, Member States reported on the projected impacts and developments in bioenergy supply up to 2030. In the reporting of the projections to 2030, Member States had to also take into account the new –strengthened- rules included in the Renewable Energy Directive. Two[106] Member States reported that the field was not applicable, while twelve[107] Some Member States reported that bioenergy developments at national level are not expected to significantly impact their national targets, while others reported potential impacts that bioenergy developments might have at national level.

For example, Latvia noted an increased reliance on domestic biomass and an increase in domestic production in 2022 and 2023 caused by import disruptions due to the Union's sanctions against Russia following Russia's war of aggression against Ukraine. Lithuania and Estonia reported that they expect limited biomethane potential, whereas Ireland anticipates doubling wood fiber availability by 2030. The Netherlands reported that although there was a subsidy stop for low-temperature heat from biomass and that the contribution of woody biomass in heat production has been limited, it would not affect the overall trajectory towards 2030. Slovakia reported that the use of woody biomass from forest land has been decreasing since 2016 as a result of legislative restrictions. The current energy use of forest biomass is at 50% of its usable potential, which negatively impacts the health of the forests and overall quality of the forests. Slovenia reported a projection of 15% biomass use reduction by 2030 compared to 2020, to balance energy needs with environmental sustainability, yet it anticipates increased energy production from wood biomass, in line with the NECP projections. Croatia reported that the absence of domestic production and limited supply of advanced biofuels has a negative impact on the renewable energy trajectories. Sweden reported that the increase of the price of bioenergy has a negative impact on the overall trajectory. Luxembourg reported that it

[106] Bulgaria, Portugal
[107] Finland, Estonia, Belgium, Poland, Ireland, France, the Netherlands, Czechia, Hungary, Italy, Cyprus and Denmark

expects biomass supply to be impacted, considering the installation of a large CHP which will mainly use waste wood, but did not provide further information on the impact.

When it comes to projections on bioenergy demand, Member States provided some information in the NECPRs for the transport sector. For example, Estonia estimated that general biofuel use will decline in the long term, although it anticipates biomethane becoming increasingly important. Spain reported that it is focusing its efforts on the promotion of advanced biofuels and renewable fuels of non-biological origin (RFNBOs) to meet the 2030 renewables targets, with a special focus on the maritime and aviation sectors. in connection with sector specific Regulations such as FuelEU Maritime and ReFuelEU Aviation. Luxembourg mentioned that it expects a notable increase in advanced biofuels, which are important for decarbonizing transport. It further reported a projected growth of renewables in transport, especially through biomethane and biofuel injection obligations.

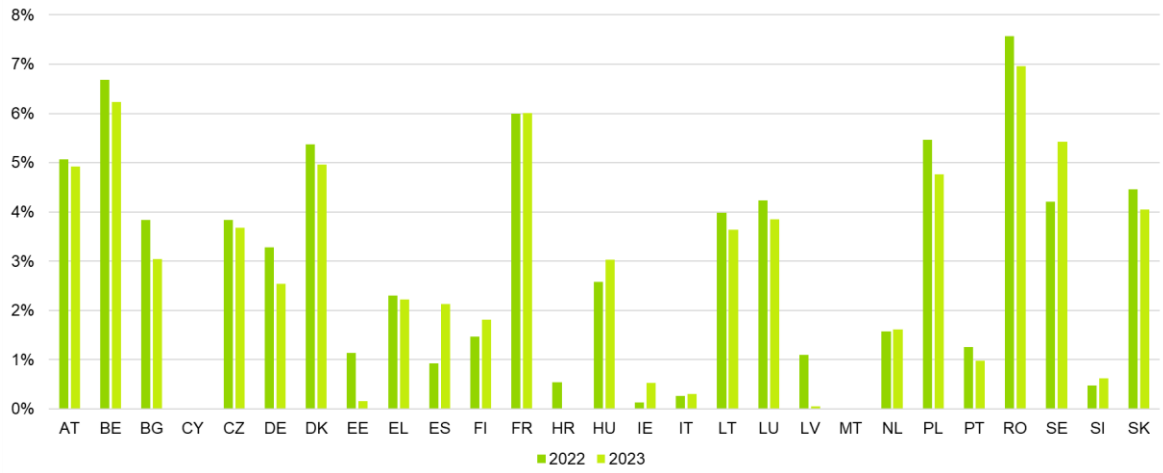
III. Environmental Perspectives and security of supply for bioenergy: Domestic Production and Import Perspectives

Sustainably sourced biomass for bioenergy will be needed to reach the Union's 2030 climate and energy targets, as well as climate neutrality by 2050. Sustainable bioenergy has the potential to achieve significant greenhouse gas (GHG) emission savings compared to fossil fuels and can contribute to the Union's decarbonisation. However, the scale of these savings depends on the type of feedstock used for the production of bioenergy, production practices, and supply chain characteristics. For example, advanced biofuels and biofuels, bioliquids and biomass fuels derived from wastes and residues typically achieve the highest savings. In contrast, biofuels produced from food and feed crops may deliver lower net benefits due to the risk of indirect land-use change (ILUC) and are not recognised to count for the renewable targets of certain regulatory frameworks (e.g. ReFuelEU Aviation). Recognising these differences, the Renewable Energy Directive has introduced sustainability and greenhouse gas emissions saving criteria, limits on biofuels, bioliquids and biomass fuels produced from feed and food feedstocks, specific rules on phasing out biofuels, bioliquids and biomass fuels produced from high-ILUC-risk feedstocks, and incentives for low-ILUC-risk fuels to ensure that only bioenergy delivering climate benefits is promoted.

In 2022 and 2023, food and feed biofuels, bioliquids and biomass fuels, made from crops like cereals, sugars, and oils, continued to be part of renewable energy used in transport across Member States. In accordance with Article 26 of the Renewable Energy Directive, the share of these food and feed derived biofuels, bioliquids, and biomass fuels consumed in transport shall be no more than one percentage point higher than the share of such fuels in the final consumption of energy in the transport sector in 2020 in a given Member State, with a maximum of 7 % of final consumption of energy in the transport sector in that Member State.

Figure 15 shows that, in 2023, France, Germany, and Poland were the largest users of food and feed biofuels by volume, but Romania and Belgium had the highest proportional shares. Romania had the largest share of 7.0% consumption of food and feed biofuels, while Belgium followed with 6.2%. Bulgaria had the greatest drop in the consumption of such fuels, from 3.8% to 3% between 2022 and 2023. The shares of feed and food biofuels in Estonia, Croatia, and Latvia nearly halved compared to 2022, and dropped below 0.2% in 2023 for all those Member States. In contrast, the shares of food and feed fuels doubled in Spain and Ireland in 2023, while Sweden saw the biggest percentage point change going from 4.2% to 5.4% year-on-year.

Figure 1514. Share of food and feed biofuels in transport per MS in 2022 and 2023 (including multipliers)



Source: Eurostat SHARES database

Environmental impacts of biofuel, bioliquids, and biomass fuels in relation to air, water, soil quality, and biodiversity

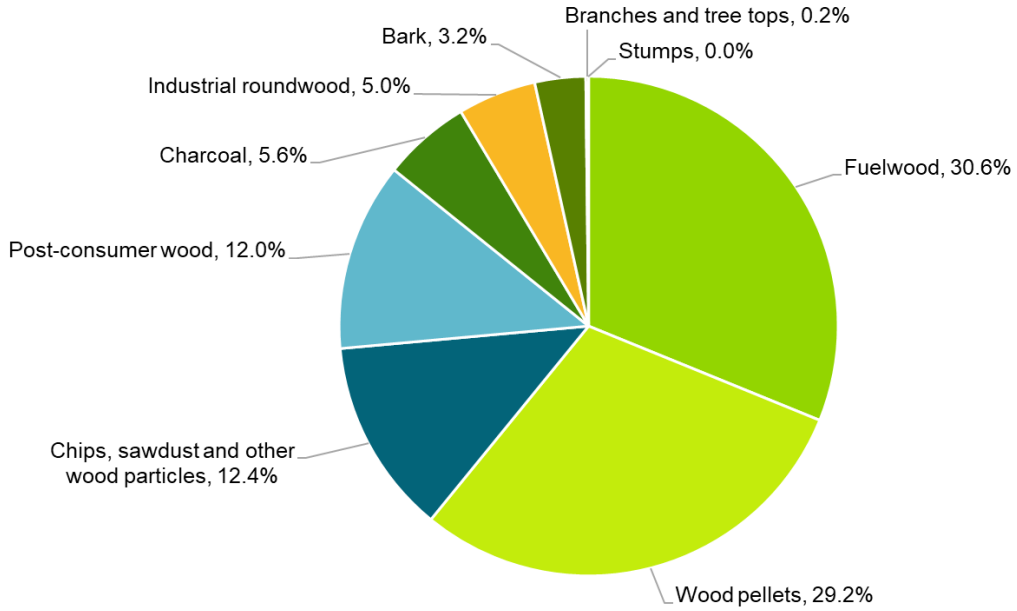
Most Member States did not provide any detailed data on the environmental impacts of biofuels, bioliquids, and biomass fuels, with Germany being the only exception. Germany's report highlighted the greenhouse gas emissions caused by bioenergy production and noted indirect risks to agricultural bioenergy crops due to eutrophication, pesticide application, and habitat loss. The lack of reporting from other Member States has made it challenging to assess the environmental impacts of biofuel, bioliquid and biomass fuel production, particularly in relation to air, water, soil quality, and biodiversity.

Imports and security of supply

In 2023, net imports of biomass for energy comprised 5% of total biomass consumption, amounting to 6,180 ktoe. This highlights bioenergy's role in enhancing energy security and storage without dependence on imports. Within specific bioenergy categories, biofuels experienced the most significant international trade activity, representing 11% or 3,316 ktoe. Solid biomass had net imports of 2% or 2,094 ktoe. Municipal waste was the least traded bioenergy category, with 5% of its total energy supply, or 470 ktoe, involved in trade. Biogases are entirely produced from domestic sources.

Error! Reference source not found. provides an overview of the feedstocks within the forest biomass category that Member States imported for energy production in 2023.

Figure 1615. Feedstocks within the forest biomass category imported for energy production as reported by Member States



Source: Eurostat Supply of biomass - annual data (NRG_CB_BM)

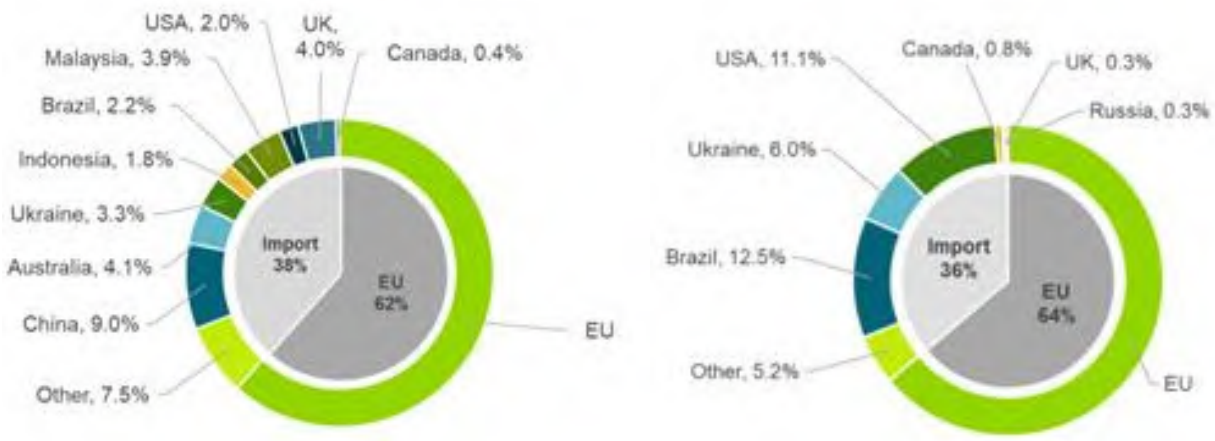
The geographic origin of feedstocks for biodiesel and bioethanol in the Union is illustrated in **Error! Reference source not found.**. The underpinning analysis was made using data on the feedstocks used for biodiesel and biogasoline[108], import data of those feedstocks[109], and total consumption and domestic production of biodiesel and biogasoline[110]. In 2023, about 62% of biodiesel and 64% of bioethanol consumed in the Union are produced domestically, reaching a total of 11,372 ktoe. The remaining 6,965 ktoe is imported, with China (9%), and Australia, the UK, and Malaysia (each 4%) as key biodiesel exporters to the EU. Bioethanol feedstocks are mainly imported from Brazil (12.5%) and the U.S. (11.1%), with Ukraine at 6.0%. In contrast to 2021, when Indonesia and Malaysia were the main exporters of biodiesel feedstock to the Union, reaching 17% of the total, in 2023 their share dropped to 5.8%.

Figure 1716. Geographic origin of feedstock for biodiesel (left) and bioethanol (right) for the EU in 2023

[108] U.S. Department of Agriculture (USDA) and Global Agricultural Information Network (GAIN), *Biofuels Annual - European Union*, USDA Foreign Agricultural Service, 2024, https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Biofuels%20Annual_The%20Hague_European%20Union_E42024-0024.pdf

[109] European Commission, Eurostat, 'EU trade since 1988 by HS2-4-6 and CN', Publications Office of the European Union, https://ec.europa.eu/eurostat/databrowser/product/page/DS-045409__custom_6871621

[110] European Commission, Eurostat, 'Complete energy balances' (NRG_BAL_C), Publications Office of the European Union, https://ec.europa.eu/eurostat/databrowser/view/nrg_bal_c/default/table?lang=en



Source: Guidehouse analysis

IV. Sustainability and verification of compliance

The Renewable Energy Directive has introduced sustainability and greenhouse gas emission saving criteria that must be taken into account when counting bioenergy towards the renewable targets and for receiving subsidies. The criteria have been further expanded in the subsequent recast and amended versions of the Directive, to include more types of fuels and sectors. The sustainability criteria also became stricter and, after the latest amendment by Directive (EU)2023/2413, they now include strengthened rules especially when it comes to forest biomass. This illustrates that sustainability is a key consideration in the implementation of bioenergy measures across Member States. This illustrates that sustainability is a key consideration in the implementation of bioenergy measures across Member States. This illustrates that sustainability is a key consideration in the implementation of bioenergy measures across Member States. This illustrates that sustainability is a key consideration in the implementation of bioenergy measures across Member States.

In the NECPRs, many Member States reported policies and measures related to the implementation of the Directive. Along these, they also reported national regulations, certification systems, and strategic frameworks to ensure that bioenergy development aligns with environmental protection goals. In general, the majority of Member States reported on the sustainability criteria indirectly by mentioning the implementation of the Renewable Energy Directive.

Verification of compliance with the sustainability criteria, for example via voluntary or national schemes, is also an important element to ensure the sustainability of bioenergy. At the same time, the Commission has recognized several voluntary schemes and one national scheme for compliance with the rules of the Renewable Energy Directive. Schemes recognized by the Commission help verify compliance with sustainability criteria for biofuels, bioliquids and biomass fuels, whether produced in the Union or abroad, supporting a level playing field and striving to promote good practices globally. Those schemes cover a range of fuels and feedstocks. The full list of the Commission recognized schemes can be found on the voluntary schemes' webpage[111]. It is worth mentioning that in 2024, the Commission also recognized three schemes for certification of renewable fuels of non-biological origin (RFNBOs) and recycled carbon fuels.

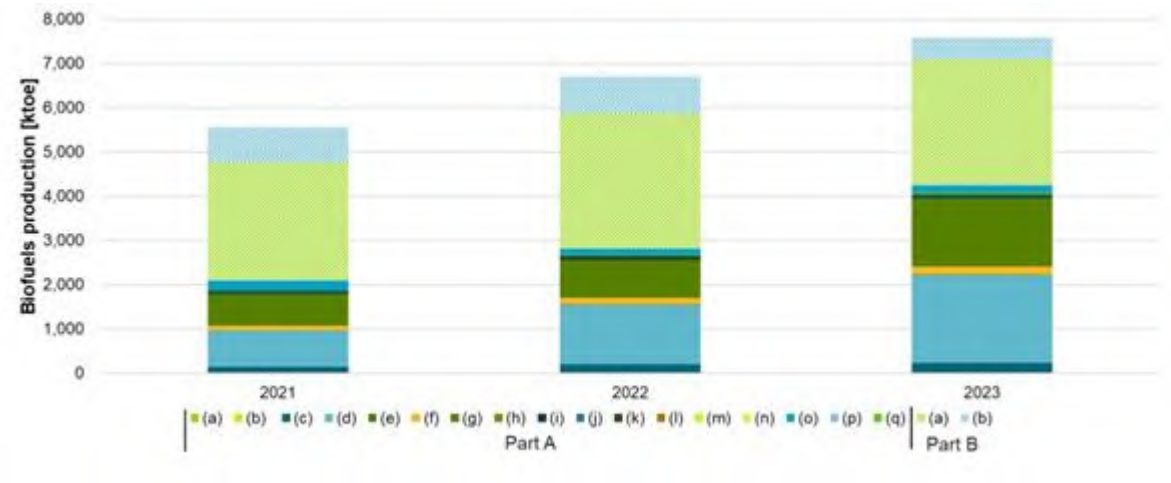
[111] https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en

V. Annex IX feedstocks for biofuels and biogas for transport - technological Development and Deployment

Annex IX of the Renewable Energy Directive includes a list of feedstocks which can be used for the production of biofuels and biogas for the transport sector. Advanced biofuels are produced from feedstocks listed in Part A of Annex IX to the Renewable Energy Directive, whereas Part B lists feedstocks to produce biofuels and biogas for transport (together referred to in this section as "Annex IX biofuels"). The list of feedstocks was extended by Delegated Directive (EU) 2024/1405. Currently no further additions are planned.

Fluctuations in the demand for Annex IX biofuels per feedstock from 2021 to 2023 are shown in **Error! Reference source not found.**. Annex IX biofuel use has increased from 5,558 ktoe in 2021 to 7,583 ktoe in 2023. For 2021 and 2022, the consumption of Annex IX Part B biofuels is significantly higher than for Annex IX Part A biofuels. However, this is reversed in 2023, with Part A biofuels reaching 4,259 ktoe and Part B biofuels standing at 3,324 ktoe. The total consumption of Annex IX Part B feedstocks decreased between 2022 and 2023. This was mainly due to a large decrease that was reported by three countries: Germany saw a decrease of 306.1 ktoe, Italy saw a decrease of 287.1 ktoe and Sweden saw a decrease of 235.7 ktoe.

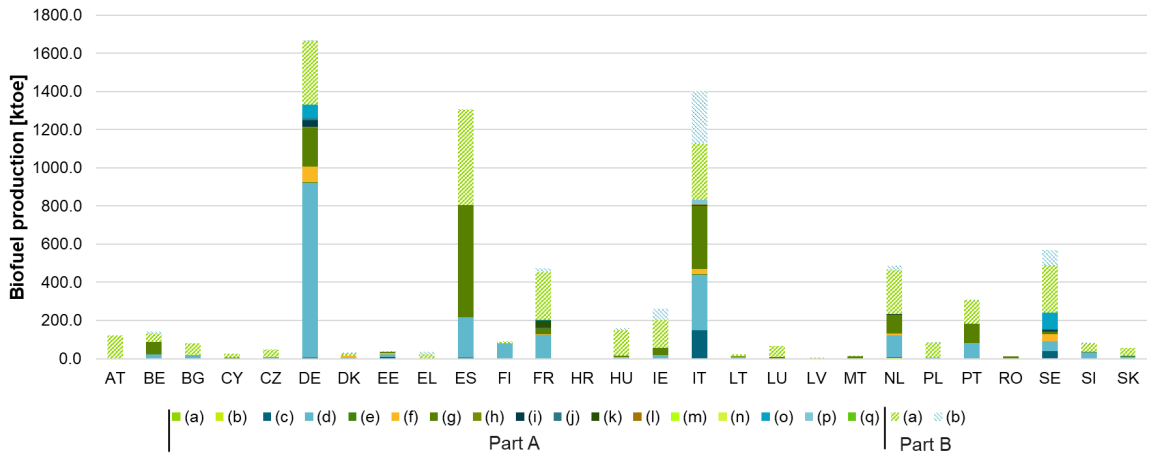
Figure 18. Annex IX biofuel demand for EU-27 from 2021 to 2023



Source: Eurostat SHARES database

The consumption of Annex IX biofuels per feedstock in 2023 is shown in **Error! Reference source not found.**. Within the various feedstock types of the Annex IX biofuels, there are differences regarding their level of use. Consumption of biofuels produced from used cooking oil, listed in Annex IX Part B (a), is the largest of all Annex IX feedstocks in all years to date. Within Annex IX Part A, consumption of biofuels produced from 'biomass fraction of industrial waste not fit for use in the food or feed chain', listed in Annex IX, Part A, point (d), and from 'palm oil mill effluent and empty palm fruit bunches', listed in Annex IX, Part A, point (g), is the highest among the feedstocks listed in that Annex. Both feedstocks have seen a significant increase since 2021. In contrast, biofuels produced from the following feedstocks are not used at all or used less than 1 ktoe throughout the Union: (a) 'algae if cultivated on land in ponds or photobioreactors'; (l) 'nut shells'; (m) 'husks'; (q) 'other ligno-cellulosic material except saw logs and veneer logs'.

Figure 1917. Split of Annex IX biofuel consumption per feedstock for each MS in 2023



Source: Eurostat SHARES database

When it comes to technological developments, several Member States, including Austria, Finland, France, Italy, Netherlands, Poland, Portugal, Spain, and Sweden have reported that they are investing in biorefineries to produce Annex IX biofuels. Companies such as OMV, TotalEnergies, Eni, Neste, and Repsol are taking the lead, using feedstocks like waste and residues, agricultural residues, and non-food biomass to produce renewable diesel, bioethanol, and sustainable aviation fuel (SAF). These projects aim to increase the production of renewable fuels, reducing dependence on fossil fuels and contributing to the decarbonisation efforts.

VI. The Union Database and fraud prevention

Article 31a of the Renewable Energy Directive mandates the creation of a Union database (UDB), with the aim to enable the tracing of liquid and gaseous renewable fuels and recycled carbon fuels. The UDB will be used to monitor the entire supply chain, from first gathering point for agricultural or forestry raw materials (if used for biofuels production), or collection points for waste and residues, to the point of consumption. Auditors are responsible for verifying that the information entered into the UDB is accurate and aligns with audited data. The 2023 Union Bioenergy Sustainability report provided information on the pilot tests for liquid fuels and the onboarding status of economic operators for voluntary and national schemes. Since then, over 31,000 individually certified economic operators have been registered. At the time of drafting this report, all voluntary schemes, except one RFNBO scheme, have been onboarded, while the process of uploading the relevant certificates is ongoing.

The UDB has been operational for liquid fuel registration since January 2024. Although no legal deadline for economic operators to mandatorily register data in the Union Database has been established, discussions are ongoing with Member States. Once such a date is established, economic operators certified under a national scheme of an EU Member State or under a Commission recognized voluntary scheme will have to register all raw materials or fuel volumes, regardless of whether they are destined to be consumed within the EU or for third countries. Liquid renewable and recycled carbon fuels exported to third countries need to still be recorded in the UDB and then booked out of the UDB traceability system.

When it comes to gaseous renewable fuels, the UDB is available since 21 November 2024, in line with the deadline set by Article 31a(1) of the Renewable Energy Directive. Economic operators can register, cancel, or inject gas volumes into the UDB, with a pilot group currently testing the system's full functionality. This includes testing data validation via Transmission System Operators (TSOs), with one

TSO actively testing this feature. Efforts to integrate Member State databases, Guarantee of Origin (GO) registries, and third countries are ongoing, with the Commission collaborating with Member States and GO registries.

When it comes to fraud prevention, earlier this year the Commission concluded its examination into allegations of fraud involving biodiesel imports from China pursuant to Article 30 of the Renewable Energy Directive. The examination request was submitted by the German competent authorities in 2023. The Commission did not find sufficient evidence to confirm any fraud. At the same time, the Commission identified some irregularities in the sustainability certification audit processes. The implementing decision concluding the case was adopted on 18 July 2025[112]. The German authorities retain the option to further examine the fraud allegations.

To strengthen the integrity of the biofuels sector, and in parallel with the full deployment of the UDB, the Commission is taking several measures, including the upcoming amendment of Implementing Regulation (EU) 2022/996[113] on sustainability certification.

VII. Conclusions and Outlook

This report shows that bioenergy plays an important role in the Union's renewable energy, highlighting its contributions to the electricity, heating, and transport sectors as well as to energy security, storability and independence on imported technology. Solid biomass remains the main source of bioenergy in the Union. At the same time, the increasing use of biogases and advanced biofuels reflects a shift towards sustainable solutions to decarbonize the economy and achieve the climate goals. The data also reveals the complexities of the relation between domestic production and imports, particularly in light of geopolitical challenges. To meet the Union's 2030 climate and energy goals, bioenergy technologies will remain important, while working in synergy with other renewable energy sources.

Looking ahead, the Commission will closely monitor the implementation of the Renewable Energy Directive, and in particular, those Member States that were below the 2022 reference point for reneawable energy, and that should cover the gap. The Renewable Energy Directive was amended in 2023 to include stricter sustainability criteria. By 21 May 2025, all Member States were expected to have transposed these new provisions into national law. Speedy and correct implementation will be necessary to ensure that we can stay on track to meet our collective climate and energy goals for 2030. For forest biomass, the stricter rules will ensure that the most sustainable pathways are used for energy production. In parallel, the full deployment of the Union Database will play a crucial role in ensuring traceability of renewable fuels and feedstocks and preventing fraud. At the same time, alignment with, and coherence across, relevant EU legislation should be maintained to guarantee correct implementation of the rules while minimizing administrative burden

[112] https://energy.ec.europa.eu/news/commission-concludes-examination-potential-chinese-biofuel-imports-fraud-2025-07-18_en

[113] Commission Implementing Regulation (EU) 2022/996 of 14 June 2022 on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria , (OJ L 168, 27.6.2022, pp. 1–62, ELI: http://data.europa.eu/eli/reg_impl/2022/996/oj)