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To:	Ms Thérèse BLANCHET, Secretary-General of the Council of the European Union
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Subject:	ANNEX 2 to the Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions State of the Energy Union Report 2023 (pursuant to Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action)

Delegations will find attached document COM(2023) 650 final - ANNEX 2.

Encl.: COM(2023) 650 final - ANNEX 2

EUROPEAN
COMMISSION

Brussels, 24.10.2023
COM(2023) 650 final

ANNEX 2

Report on renovation of the national stock of residential and non-residential buildings and on nearly zero-energy buildings

ANNEX

to the

Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions

State of the Energy Union Report 2023

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

{SWD(2023) 646 final}

1. Introduction and background

The building sector plays a key role in the long-term strategy on the reduction of greenhouse gas (GHG) emissions for the European Union (EU) as well as to achieve other objectives of the European Green Deal, such as zero-pollution or resource efficiency. The main pathways to an EU decarbonised building stock are designed under the Energy Performance of Building Directive 2010/31/EU (EPBD) and focus on setting cost-optimal minimum energy performance requirements, promoting high energy efficient buildings and developing long-term renovation strategies with the view of mobilising energy efficiency investments in the buildings sector.

As of 2021, all new buildings must be Nearly Zero-Energy Buildings (NZEBs). The broad NZEB definition is given in the EPBD, blending energy efficiency and renewable energy through the cost-optimal framework; NZEB indicators vary widely across the Member States, reflecting national, regional, or local conditions. The European Commission's Joint Research Centre (JRC) assessed the status of NZEBs definitions in Member States and the latest updates related to the definition, its implementation as well as the common features and main differences among NZEBs definitions in place.

To improve the energy performance of existing buildings, the EPBD requires Member States to develop Long-Term Renovation Strategies (LTRSs) for the renovation of the national stock of residential and non-residential buildings. The strategies must include roadmaps with indicative milestones for 2030, 2040 and 2050, measurable indicators, expected energy savings and wider benefits of energy renovation. The strategies must also include a solid financial component. The JRC assessed the compliance of LTRSs with EPBD requirements.

In the framework of the integrated National Energy and Climate Progress reporting (NECPR)[1], Member States are tasked to update, every two years, among others, targets, milestones, and progress indicators of the long-term strategy for the renovation of the national stock of residential and non-residential buildings. Updates on NZEBs are also included in the information to be submitted under the NECPR. Despite all Member States have submitted data and information under the NECPR[2], on average, completeness of the reported data appears to be limited in most of the building-related topics and indicators.

This report, starting from the assessment of data coming from the first NECPR exercise by the JRC[3] and other available sources, fulfils the obligation, introduced at the Article 35 of the Governance Regulation 2018/1999, for the Commission to submit to the European Parliament and to the Council, as part of the State of the Energy Union Report, the following elements:

- biennially, an overall progress report on the **renovation of the national stock of residential and non-residential buildings, both public and private**, in line with the roadmaps set out in the long-term renovation strategies that each Member State shall establish in accordance with Article 2a of Directive 2010/31/EU.
- every four years, an overall progress report on Member States' **increase in the number of nearly zero-energy buildings** in accordance with Article 9(5) of Directive 2010/31/EU.

Finally, the report provides an update on the progress made in executing the Ecodesign and Energy Labelling Working Plan 2022-2024, on which the Commission is called to inform the European Parliament and the Council annually.

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1 Introduced by the by the Governance regulation (EU)2018/1999.

2 This report is based on NECPR, integrations, and updates submitted by 12th September 2023. At this date twenty-six Member States submitted a full NECPR including all dataflows, while for one country one dataflow is pending.

3 Paci D., Tsemekidi-Tzeiranaki, S., Clementi, E. L. (2023), Assessment of the 2023 NECP Reports: Monitoring Member States' progress in their energy and climate plans – Summary Report, JRC Technical Report, Publications Office of the European Union, Luxembourg, 2023 (under publication).

2. Main Findings on building-related elements of NECPR

The 2023 integrated national and energy progress reporting exercise (**NECPR**) represented a first-of-its-kind exercise to track the implementation and progress of the **2020 national Long Term Renovation Strategies (LTRSs)**, including a series of indicators and milestones to be reported by Member States (mostly non-mandatory) describing the **state and evolution of the EU building stock**. The main building-related indicators and data Member States were requested to report relate to **energy consumption, GHG emissions, renovation rates** and number of **nearly zero-energy buildings**[4].

On average, **completeness of the reported data appears to be limited** in most of the building-related topics and indicators except for the only mandatory field reporting on the contribution of buildings to the Union's overall energy efficiency target. Therefore, it is **difficult to assess**, especially at an aggregated level:

- the progress of Member States towards their targets and
- the **trajectory of the EU building stock** to reach carbon neutrality by 2050, also considering the increased intermediary ambition set by the "Fit-for-55 package".

This situation underlines the need to improve the tracking of the implementation and progress of the 2020 LTRSs, as for example proposed in the EPBD recast proposal[5].

An additional element of complexity is the **diversity of definitions** as regards some indicators (e.g., worst-performing buildings, renovation rates) and/or reference years. This was already identified during the assessment of the 2020 LTRSs.

The reported data under the NECPR allow to take out the following preliminary findings:

- **Energy use:** the level of reporting is generally low especially for primary energy. In general, energy consumption in the building stock has increased between 2020 and 2021 for most of the thirteen Member States reporting in this area (with some exceptions in some countries, depending on the specific sector). This may reflect that 2021 was too soon to measure tangible impacts of the implementation of LTRSs.
- **GHG emissions**: figures on building emissions are also relatively incomplete and scattered. GHG emissions on average increases between 2020 and 2021 (for the eleven Member States reporting some data). Furthermore, several countries record some progress towards their 2030 emissions targets.
- **Renovation**: data on number of buildings, square meter or renovation rates are highly incomplete and scattered across Member States, despite the relevance of renovation to decarbonize the building stock. Only eight Member States have reported sufficient renovation data and these showed some progress towards the 2030 building renovation targets set in the national LTRSs: the reported progress does not seem sufficient for the achievement of the targets in some Member States, but it is satisfactory in others.
- **Contribution to global energy efficiency targets**: this is the only mandatory elements of the NECPR in relation to buildings and therefore the one presenting the highest level of reporting (close to 100% of the reporting Member States). This requirement is open to descriptive and/or quantitative information and the responses show a variety of interpretation from Member States. In addition, in some cases, the responses fail to provide references to specific milestones or targets, leaving space for improvements.

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4 For technical and scientific support to this document: Paci D., D'Agostino, Maduta C. Tsemekidi-Tzeiranaki, S., Castellazzi L., Bertoldi P. (2023), Progress on building stock decarbonisation in the EU Member States by 2023, JRC Technical Report, Publications Office of the European Union, Luxembourg, 2023 (under publication).

5 Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings (recast) COM/2021/802 final.

– **Milestones and indicators**: the NECPR provides the possibility for Member States to set specific milestones and targets to update their 2020 LTRS ambition. Many Member States took this possibility and set targets related either to improvement of the building stock, energy consumption or GHG emissions. Most of the target are set for 2030. This would have to be assessed in conjunction with the draft NECP update also of 2023.

In relation to **NZEBs:**

– As of June 2023, all countries have in place an NZEB definition for new buildings transposing the EPBD. Most Member States also have a specific definition for NZEB renovation.

– Based on the national definitions, the NZEB performance level expressed in non-renewable primary energy demand (kWh/(m^2 y)) in Member States and averaged at EU level was estimated. The average non-renewable primary energy demand for new single-family houses varies from as low as 15 kWh/(m^2 y) to 95 kWh/(m^2 y) with an average at EU level of 52 kWh/(m^2 y).

– In most cases, the NZEB requirements for new buildings are stricter than those for NZEB renovation. On average, the **NZEB non-renewable primary energy demand of new buildings is about 30% lower than for renovated buildings.** A number of Member States have the same requirements for new and renovated NZEBs.

– Progress towards NZEBs is reported by sixteen countries, with a generally low level of completeness in their breakdown. For twelve Member States it is possible to compare 2021 and 2022 data: in six of these the total number of NZEBs more than doubled in the period considered[6]. The overall number of NZEBs, obtained by aggregating the data of the countries which reported for both years, increased by 12% from 2021 to 2022.

In addition to the above-introduced main findings, the first integrated national and energy progress reporting exercise highlighted a need to improve the tracking of the evolution of the building stock in Member States as well as the streamlining and harmonization of indicators and definitions. In this respect, the EPBD revision proposal[7] provides that LTRSs should evolve into national **Building Renovation Plans (BRPs)** providing a roadmap for the achievement of a highly energy efficient and decarbonised building stock by 2050. These are thought to better frame and further harmonise the planning and reporting to ensure comparability and a higher level of aggregation. In particular, the revised EPBD will provide a common template for the BRPs with clearer definition of mandatory and voluntary indicators. This would facilitate the presentation of information. In addition, the monitoring framework is strengthened by introducing an assessment of the BRPs by the Commission and the issuing of recommendations as part of the NECP process. Progress in implementation of the BRPs will still be reported as part of the biennial NECPR under the Governance Regulation, which would need to be further reinforced and made consistent with the evolution of the BRPs.

The **2023 major revamping and updating of the Building Stock Observatory**[8] is aimed to provide an additional contribution in this direction, e.g., for the harmonization of indicators and the tracking of progresses in the building stock. Furthermore, the EPBD revision proposal introduces provisions that task Member States to set up national databases for energy performance of buildings and to transfer yearly their data into the Building Stock Observatory.

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6 This sudden increase can be also explained by the fact that, by 31st December 2020, all new buildings have to be NZEBs (as stated in the EPBD recast 2010/31/EU).

7 Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings (recast) COM/2021/802 final.

8 EU Building Stock Observatory (europa.eu).

3. Assessment of the 2020 Long-Term Renovation Strategies

National long-term renovation strategies (LTRSs) are key policy and planning instruments intended to support the transformation towards a highly efficient and decarbonised building stock by 2050. The entry into force of the amended Energy Performance of Buildings Directive (EPBD) in 2018[9] implied transferring the provisions on long-term renovation strategies, formerly in Article 4 of the EED, to the new Article 2a in the amended EPBD. The provisions were also strengthened with several additional requirements. The assessment of the submitted 2020 LTRSs[10] indicated an overall increase in the level of quality of reporting, despite identifying some room for improvement.

Member States provided a reasonably detailed description of their building stock, with all strategies assessed as fully compliant for this specific item. The improvements identified between the LTRSs and previous strategies (under EED) underline the need for and importance of a more uniform approach, which should combine harmonised templates and strengthened guidelines. The experience of the 2020 Target Reports where all EU countries except two used the standard template, together with the e-platform submission, showed that it is possible to move towards win-win solutions where the reporting burden for Member States is reduced while comparability and a structured approach is reinforced, which help in the definition of more effective policy actions. The large majority of 2020 strategies include a good overview of policies to target all public buildings and provide a long-term vision towards a 2050 goal to decarbonise the building stock, with specific intermediate building stock milestones. Most LTRSs include milestones for 2030 and 2050, but not always for 2040.

As indicated in the Renovation Wave Communication, tackling energy poverty and worst-performing buildings is one of the areas that deserve specific attention. Member States seem to have recognised the importance of mitigating energy poverty and supporting energy poor households. In general, the actions and measures proposed appear adequate[11]. All but one of 2020 LTRSs include specific measures to address energy poverty. As regards worst-performing buildings, they have been identified by most countries, using a mixture of different approaches (e.g., energy class, age, consumption). Under the 2023 NECPR, 20 Member States mentioned that at least one of their policy measures or group of measures is either contributing among other objectives (e.g, building renovations programmes) or fully dedicated to energy poverty alleviation (in total 42). A specific section on energy poverty, reporting on measures, indicators, and definitions, can be found in the Commission SWD accompanying the 2023 SOEUR Assessment of progress towards the objectives of the Energy Union and Climate Action.

All 2020 LTRSs include a specific section about expected energy savings and wider benefits[12], such as those related to health, indoor air quality, and positive economic impacts. However, in half of the cases, Member States did not provide a quantification of these potential benefits[13].

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9 Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency was published in the EU Official Journal (L156) and entered into force on 9 July 2018. Member States had to transpose the directive into national law by 10/3/2020.

10 Tsemekidi Tzeiranaki, S., Paci, D., Clementi, E. and Gonzalez Torres, M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, EUR 31361 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-60605-5, doi:10.2760/27622, JRC131606.

11 An overview of how energy poverty was addressed in 2020 LTRSs is provided in: SWD(2021) 365 final/2: Analysis of the national long-term renovation strategies. A detailed list of all measures against energy poverty reported in the LTRSs is included in the Annex D of the JRC Report: Castellazzi L., Paci D., Zangheri, P., Maduta, C., Economidou, M., Riveiro Serrenho, T., Zancanella, P., Ringel, M.,Valentova, M., Tsemekidi Tzeiranaki, S., Assessment of the first long-term renovation strategies under the Energy Performance of Building Directive (Art. 2a), Publications Office of the European Union, Luxembourg, 2022, doi:10.2760/535845, JRC128067.

12 Shnapp, S., Paci, D., Bertoldi, P. (2020), Untapping multiple benefits: hidden values in environmental and building policies. EUR 30280 EN, Publications Office of the European Union, Luxembourg, JRC120683.

13 A JRC study investigated how Member States are coordinating building renovation with asbestos removal in the national LTRSs (https://publications.jrc.ec.europa.eu/repository/handle/JRC129218)

Strong LTRSs are expected to accelerate the cost-effective renovation of existing buildings, which are currently subject to a low renovation rate, and ensure an increase in deep renovations. As a final remark, however, it can be noted that **the level of ambition of LTRS is not always in line with the 2050 decarbonisation goals**[14].

3.1. Energy saving targets

The energy consumption indicative targets across the EU building stock for 2030, 2040 and 2050 and the energy savings compared to a reference year (reported by Member States in the LTRS roadmaps) are presented in Table 1. For consistency reasons, all measurement units have been converted to ktoe (kilo tonnes of equivalent oil).

Table 1. Energy consumption and saving targets for buildings reported in the 2020 LTRSs (Source*:* JRC elaboration based on Member State reporting, 2022)

Member State	Reference		Estimated energy consumption and energy saving targets					
	year	FEC/PEC (ktoe)	2030		2040		2050	
			consumption (ktoe)	savings (%)	consumption (ktoe)	savings (%)	consumption (ktoe)	savings (%)
AT	2017	9 235	9 235	0%	9 235	0%	9 235	0%
BE - Br	2015	1 230	n/a	-	n/a	-	n/a	-
BE - Fl	2020	3 353	2 580	-23%	1 806	-46%	946	-72%
BE – Wa	2017	3 543	2 416	-32%	1 591	-55%	1 479	-58%
BG	2020	n/a	-251	-	-560	-	-630	-
CY	2020	580	640	+10%	650	+12%	640	+10%
CZ	2020	8 909	8 240	-8%	7 548	-15%	6 903	-23%
DE	2018	78 819	47 807	-39%	n/a	-	n/a	-
DK	2020	4 247	n/a	-	n/a	-	n/a	-
EE	2020	1 006	n/a	-	n/a	-	413	-59%
EL	2015	6 010	5 530	-8%	4 566	-24%	3 964	-34%
ES	2020	26 163	22 426	-14%	18 562	-29%	16 572	-37%
FI	2020	6 096	4 772	-22%	3 878	-36%	3 130	-49%
FR	2015	n/a	n/a	-22%	n/a	-29%	n/a	-41%
HR	2017	3 177	3 250	+2%	2 940	-7%	2 513	-21%
HU	2018	5 828	4 681	-20%	559	-40%	373	-60%
IE	2018	4 215	n/a	-	n/a	-	n/a	-
IT	2020	47 700	42 000	-12%	n/a	-	24 000	-50%
LT	2020	3 510	2 989	-15%	2 226	-37%	1 390	-60%
LU	2020	902	673	-34%	553	-39%	453	-50%
LV	2018	1 910	1 480	-23%	n/a	-	n/a	-
MT	2018	n/a	n/a	-18%	n/a	-20%	n/a	-25%
NL	2020	13 925	12 062	-13%	n/a	-	n/a	-
PL	2018	27 000	26 000	-4%	n/a	-	n/a	-
PT	2018	n/a	n/a	-11%	n/a	-27%	n/a	-34%
RO	2017	9 520	8 690	-9%	6 200	-35%	3 380	-65%
SE	2020	4 346	4 043	-7%	3 914	-10%	3 848	-11%
SI	2020	1 531	1 268	-17%	1 186	-22%	1 190	-22%
SK	2016	4 067	3 431	-16%	2 889	-29%	2 433	-40%

Notes: FEC – final energy consumption, PEC – primary energy consumption; **Belgium-Flanders**: milestones only for residential buildings; **Germany**: milestone for PEC; **Denmark**: indicative milestones will be determined in connection with the climate action plan; **Greece:** average reduction values for 2040 and 2050; **Finland:** values representing the gross heating demand; **Hungary**: 2030 milestone for residential buildings (3917 ktoe) and public buildings (764 ktoe); 2040 and 2050 milestones only for public buildings; **Ireland:** NECP targets: PEC savings in residential sector: 2020: 8.44 TWh; 2030: 23.7 TWh; **Italy**: own calculation for 2030 milestone based on annual saving rate; **Lithuania:** milestones for PEC; **Latvia**: 2030 milestone from NECP; **Malta**: milestones only for residential buildings; **Portugal:** milestones for PEC; **Sweden**: milestones for purchased heat and electricity for apartment buildings, schools, offices

[14] SWD(2021) 365 final/2: Analysis of the national long-term renovation strategies.

3.2. GHG emission targets

The GHG emission targets for 2030, 2040 and 2050 reported by Member States in the 2020 LTRS are summarized in Table 2. For consistency reasons, all measurement units have been converted to $MtCO_2e$ (million tonnes of CO_2-equivalent). Most countries provided the absolute values of CO_2 or CO_2-equivalent emissions in buildings in 2030, 2040 and 2050 including a reference emissions value used to estimate the percentage savings. The reference year varies between 1990 and 2020 with year 2020 used by most countries as reference. Not all countries provided all emission milestones.

Table 2. GHG emission and saving targets for buildings reported in 2020 LTRSs (Source*:* JRC elaboration based on Member State reporting, 2022)

Member State	Reference		Estimated GHG emission and saving targets					
	year	value Mt CO_2e	2030		2040		2050	
			emissions (Mt CO_2e)	savings (%)	emissions (Mt CO_2e)	savings (%)	emissions (Mt CO_2e)	savings (%)
AT	2020	8.15	5.55	-31%	3.94	-52%	2.57	-68%
BE - Br	2020	4.20	2.80	-33%	1.80	-57%	0.90	-79%
BE - Fl	2018	12.20	9.40	-23%	5.90	-52%	2.30	-81%
BE - Wa	2018	7.60	3.90	-49%	1.90	-75%	1.00	-87%
BG	2020	n/a	-1.31	-	-2.89	-	-3.27	-
CY	2020	n/a	n/a	-24%	-	n/a	n/a	-
CZ	n/a	44.57	n/a	-	n/a	-	26.74	42%
DE	2020	118	70	-41%	n/a	-	n/a	-
DK	1990	n/a	n/a	-70%	n/a	-	n/a	-
EE	2020	4.43	n/a	-	n/a	-	0.48	-89%
EL	2015	n/a	n/a	-50%	n/a	-70%	n/a	-100%
ES	2020	28.42	18.56	-35%	6.58	-77%	0.21	-99%
FI	2020	7.81	2.87	-63%	1.47	-81%	0.65	-92%
FR	2018	82.00	45.00	-55%	25.00	70%	5.00	-94%
HR	2020	2.17	2.01	-7%	1.74	-20%	1.26	-42%
HU	2018-2020	n/a	n/a	-19%	n/a	-60%	n/a	-90%
IE	2019	13.50	7.43	-45%	n/a	-	n/a	-
IT	2020	61.10	43.60	-29%	n/a	-	0.60	-99%
LT	2020	5.29	4.00	-24%	2.11	-60%	0.02	-100%
LU	n/a	n/a	n/a	-62%	n/a	-96%	n/a	-
LV	2017	2.77	2.55	-8%	n/a	-	n/a	-
MT	2018	0.71	0.44	-38%	0.27	-61%	0.17	-76%
NL	2020	23.10	15.30	-34%	8.40	-64%	1.50	-94%
PL	2019	52.00	35.00	-33%	n/a	-	n/a	-
PT	2018	n/a	n/a	-15%	n/a	-47%	n/a	-77%
RO	2020	9.84	7.50	-24%	4.90	-50%	1.90	-81%
SE	2018	0.89	0.01	-99%	0.00	-100%	0.00	-100%
SI	2020	2.68	1.45	-46%	0.94	-65%	0.76	-72%
SK	2016	8.54	5.50	-36%	3.40	-60%	1.80	-79%

Notes: Italy: The 2050 milestone corresponds to non-residential buildings (residential buildings are carbon neutral); **Luxembourg:** milestones only for residential buildings; **Latvia**: 2030 milestone calculated based on the information provided in the strategy; **Sweden:** direct GHG emissions are low because the main source of heating is thermal energy and electricity; fossil fuels completely phased out by 2045

Generally, the **targeted GHG emission reductions appear ambitious across the EU**. By 2050, Greece, Italy, Lithuania, and Spain aim at fully decarbonised building stocks, while Sweden aims for this goal by 2045. Flanders region aims for zero emissions in public buildings by 2050. Finland, France, Hungary, and the Netherlands also target at significant GHG emission reductions (over 90% by 2050 with respect to the reference years).

3.3. Renovation targets

Table 3 summarizes the renovation targets in the building stock for 2030, 2040 and 2050 as reported by Member States in the 2020 LTRS.

Table 3. Completed and planned energy renovation of buildings reported in the 2020 LTRS (Source: JRC elaboration based on Member States reporting, 2022)

MS	Completed renovation	Planned renovation		
	2020	**2030**	**2040**	**2050**
AT	1.5% p.a.	1.5% p.a.	1.5% p.a.	1.5% p.a.
BE - Br	less than 1% p.a.		100% public buildings energy neutral	80% cumulative residential
BE - Fl	3.5% cumulative dwellings (105 000)	3% p.a. residential 32% cumulative dwellings (973 500)	3% p.a. residential 64% cumulative dwellings (1 923 500)	3% p.a. residential 96.5% cumulative dwellings (2 873 500)
BE - Wa		12% cumulative residential (194 571 buildings) 63 400 000 m^2 cumulative non-residential	51% cumulative residential (830 158 buildings) 114 000 000 m^2 cumulative non-residential	99% cumulative residential (1 605 485 buildings, 25% deep renovated) 114 000 000 m^2 cumulative non-residential
BG		8% (22 203 509 m^2) cumulative floor area	26% (71 774 177 m^2) cumulative floor area	46% (127 597 192 m^2) cumulative floor area
CY	1% cumulative buildings	1% p.a. 10% cumulative (43 000)	1% p.a.	1% p.a.
CZ	45% cumulative buildings with more than 25% shallow renovation	1.4% p.a. SFH; 0.79% p.a. MFH; 2% p.a. public buildings 55% cumulative	1.4% p.a. SFH; 0.79% p.a. MFH; 2% p.a. public buildings 60% cumulative	1.4% p.a. SFH, 0.79% p.a. MFH; 2% p.a. public buildings 70% cumulative
DE		1.3% to 2% p.a. SFH and 1.5% to 2% p.a. MFH for the period 2020-2030		
DK	80% renovated (55-60% light, 20-25% medium, 5% deep)			
EE	500 000 m^2 cumulative floor area	22% cumulative (11 880 000 m^2)	64% cumulative (34 560 000 m^2)	100% cumulative (54 000 000 m^2/ 141 000 buildings)
EL		23% residential; 9% non-residential	36-42% residential; 14-16% non-residential	45-49% residential; 19-20% non-residential
ES	56 017 cumulative dwellings	1 256 017 cumulative dwellings (300 000 dwellings/year)	4 756 017 cumulative dwellings	7 156 017 cumulative dwellings
FI	29 % cumulative buildings	54% cumulative	98% cumulative	100% cumulative
FR		1.5-3% p.a. over 2020-50		
HR	0.7% p.a. 5% cumulative buildings	2% p.a.	3.5% p.a. (4% p.a. buildings with cultural value) 60% cumulative NZEBs	4% p.a. 100% cumulative NZEBs
HU	1% p.a.	3% p.a. residential; 5% p.a. public buildings 20% cumulative NZEBs	3% p.a. residential; 5% p.a. public buildings 60% cumulative NZEBs	3% p.a. residential; 5% p.a. public buildings 90% cumulative NZEBs
IE		500 000 dwellings cumulative 100% public buildings 33% commercial buildings	1 000 000 dwellings cumulative 66% commercial buildings	1 500 000 dwellings cumulative 100% commercial buildings
IT	0.86% p.a.	1.9% residential; 2.8% non-residential	2.7% p.a. residential; 2.6% p.a. non-residential	2.7% p.a. residential; 2.6% p.a. non-residential
LT	8% cumulative buildings (58 774 units)	17% cumulative (99 281 units)	43% cumulative (225 421 units)	74% cumulative (436 008 units)
LU	10-14% cumulative residential buildings	3% p.a. residential (4500 dwellings/year)	3% p.a. residential (4500 dwellings/year)	3% p.a. residential (4 500 dwellings/year)
LV	3% p.a.	8 100 units MFH (30%) and 7 500 units SFH;	16 200 units MFH (60%) cumulative	All NZEBs

	678 460 m^2 cumulative public buildings	500 000 m^2 public buildings (2020-30)	3% p.a. public building	
MT	0.5% p.a. (0.7% p.a. 2025)	5-6% p.a. residential (0.6% deep renovation) from 2025	5-6% p.a. residential (0.6% deep renovation)	5-6% p.a. residential (0.6% deep renovation)
NL		1 500 000 dwellings		
PL		3.6% p.a. (236 000/year) 2 360 000 cumulative	4.1% p.a. (507 000/year) 5 070 000 cumulative	3.7% p.a. (751 000/year) 7 510 000 cumulative
PT		69% cumulative buildings (363 680 501 m^2)	99% cumulative buildings (635 637 685 m^2)	100% cumulative buildings (747 953 071 m^2)
RO	0.5% p.a., 6% cumulative floor area (32 352 000 m^2)	0.5% to 3.39% p.a. in 2030, 19% cumulative floor area	3.79% p.a. 57% cumulative floor area	4.33% p.a. 100% cumulative floor area
SE	2.5%-5% p.a. 2016-2019 10% p.a. after 2019			
SI	1 795 000 m^2 cumulative public buildings	29 733 000 m^2 cumulative	28 850 600 m^2 cumulative SFH; 12 778 700 m^2 cumulative MFH	32 549 000 m^2 cumulative SFH (74%); 13 924 700 m^2 cumulative MFH (91%)
SK		100% cumulative MFH	100% cumulative SFH	

Notes: Austria: 1.5% annual renovation rate used to estimate the energy and emissions savings targets; however, the strategy mentions a legislative programme 2020-2024 which has, inter alia, the scope to increase the renovation rate to 3%; **Belgium-Flanders**: 1.1% annual deep renovation rate of residential buildings between 2025 and 2050; **Cyprus**: 1% annual renovation rate considered in the realistic scenarios used to estimated energy and GHG emissions savings. For full building stock decarbonisation by 2050, the renovation rate should be tripled; **Czechia:** annual renovation rates and cumulative renovation based on the optimal scenario development of the building stock by 2050; **Greece:** only building envelope renovation milestone; milestones for energy system renovation provided in the LTRS; **Finland**: average milestone across building types in energy class C or above; by 2050, only 70% of the Finnish building stock will remain as the vacant buildings will be removed; **Ireland**: renovation to energy class B2 or cost optimal equivalent or carbon equivalent; **Lithuania**: 2020 indicator includes all new and renovated buildings in energy class B or above. Targets include buildings to be renovated from 2021 on.; **Poland:** 4.7 million deep energy renovation are estimated between 2021 and 2050**; Sweden**: every 10 years, the proportion of buildings in the A-C energy class should be higher than in the previous reference year, and the proportion of buildings in the E-F EPC class should be lower than in the previous reference year; **Slovenia**: milestones for the share of renovated non-residential buildings by type of building and of renovation (partial or comprehensive) are also given; **Slovakia:** shares of deep and NZEB renovation will increase from 5% (2020) to 50% (2050) while the light renovation will decrease from 50% (2020) to 10% (2050).

As observed, the target renovation indicators are not harmonised across the EU. A significant share of countries/regions (14) provided **absolute values for the number of renovated buildings/dwellings or renovated floor area** (in square meters), while thirteen countries/regions **expressed the renovation targets in terms of annual renovation rate**. Moreover, three countries provided only the cumulative share of renovated buildings.

Most countries/regions (19) covered both residential and non-residential buildings. However, some countries/regions focused only on the residential sector (Malta, Flanders, the Netherlands Germany, Spain, Luxembourg, Slovakia) or on specific segments within the non-residential sector, such as commercial buildings (Ireland) or public buildings (Czechia, Hungary, Latvia).

The annual renovation rate planned for the next decades varies from as low as 1% to 6%. Still, most countries aim at increasing the annual renovation on average from 1.5% to 3%[15].

Different approaches in the definition of renovation targets make difficult to compare renovation ambitions across the EU and to estimate an aggregate renovation target. However, based solely on the information reported in Table 3, renovation ambitions vary considerably across the EU: some countries aim to renovate the entire building stock by 2050, while other countries plan to renovate less than half of their building stock by 2050. Also, the energy renovation impact strongly depends on the renovation depth that in most cases is not clear.

[15] The renovation rate refers to the share of renovated floor area or renovated number of buildings in a given year from the total floor area or number of buildings available for renovation in the Member State' reference year.

4. Progress on the long-term building renovation strategies from NECPRs 2023

The NECPRs include specific reporting tables for Member States' milestones and progress indicators of the long-term strategy for the renovation of the national stock of residential and non-residential buildings (tables 2-5, Annex IV to the Implementing Regulation 2022/2299).

This section is based on NECPRs, integrations, and updates submitted before 12 September 2023. At this date twenty-six Member States submitted a full NECPR (i.e., NECPR including all dataflows)[16], while for one Member State (Romania) the dataflow 2 is pending. The process of submissions was, in some cases, fragmented and articulated with Member States releasing different dataflows, integrations and specifications whenever needed.

Reflecting the NECPR reporting template, data collected in this area are grouped in 11 indicators, organised into seven main topics. Table 4 below summarises the topics and indicators, while giving an overview of the completeness of the reporting in each of them.

Table 4. Completeness of NECPR reporting in the area of the LTRSs (Source: JRC elaboration on NECPRs 2023)

Topic	Indicator	Obligation	All	Completed	% Indicator	% Topic
Building Stock	Number of buildings	Mia	486	195	40.1%	39.1%
	Floor area	Mia	486	185	38.1%	
Energy Use	Primary energy use	Mia	486	102	21.0%	23.6%
	Final energy use	Mia	486	127	26.1%	
Emissions	Direct GHG	Mia	486	100	20.6%	19.4%
	Total GHG	Mia	486	89	18.3%	
Renovation	Renovations	Mia	3564	115	3.2%	3.2%
Milestones	Milestone indicators	Mia	216	136	63.0%	63.0%
Contribution to EU targets	Contribution to Union's targets	M	27	25	92.6%	92.6%
NZEBs	NZEB number of buildings	Mia	162	55	34.0%	32.7%
	NZEB floor area	Mia	162	51	31.5%	

Notes: Mia=Mandatory if available; M=Mandatory

Even if with some important differences in sub-indicators (e.g., residential *vs* non-residential building stock, or 2020 entries more complete than 2021 ones), on average, **completeness of the data appears to be an issue in most of the topics and indicators**. The only topic where almost all Member States reported information is the contribution to the Union's target, which is also the only mandatory field. All the remaining fields, flagged as "mandatory if available", show generally low completeness (in some cases below 3%) and have its maximum in the Milestones Indicators with nearly 63% of entries. Data on the building stock is reported with a completeness of nearly 40%, for NZEBs this is slightly more than 30%, while renovation is in general poorly covered, with only 3.2% of entries reported.

[16] Dataflow 1: "Integrated national policies and measures" – according to Governance Regulation 2018/1999 (GovReg), Articles 17(2)(a), (c) and (e); 18(1)(a); 20(b) and 21(b) and (c); and Implementing Regulation 2020/1208 Annex XXIV and Implementing Regulation 2022/2299 Annex IX-XIV. Dataflow 2: "Progress towards objectives, targets and contributions (Energy Efficiency)" – according to GovReg, Articles 4(2)(a) and 21(a) and Implementing Regulation 2022/2299 Annex IV. Dataflow 3: "Additional reporting obligations in the area of energy efficiency - according to GovReg, Article 21(c) and Implementing Regulation 2022/2299 Annex XVII. Dataflow N. 3 consists of six tables (Reasons, Article 5, Energy audits, National primary energy factor for electricity, NZEB, and Energy services); RO, EI and CY NECPRs missed this section, but they reported on other two dataflows.

4.1. Building stock

Residential

Member States reported data of the building stock with different degrees of completeness: data for residential buildings are the most complete, with 20 and 17 Member States reporting data on the number of buildings for 2020 and 2021 respectively. In terms of floor area, twenty-one Member States reported information for 2020 and twelve for 2021. Overall, among the countries that submitted their NECPRs only two did not report any data on their residential building stock.

Table 5. Residential building stock (Source: 2023 NECPR Reporting, JRC, 2023)

Member State	Number of buildings							
	2020			2021			Change 2020-2021	
	Total (thousands)	Worst performing (thousands)	Worst performing (%)	Total (thousands)	Worst performing (thousands)	Worst performing (%)	Total	Worst performing
BE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
BG	1,506	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
CZ	n.a.	n.a.	n.a.	1,640	n.a.	n.a.	n.a.	n.a.
DK	1,599	n.a.	n.a.	1,610	n.a.	n.a.	0.7%	n.a.
DE	19,273	n.a.	n.a.	19,376	n.a.	n.a.	0.5%	n.a.
EE	129	n.a.	n.a.	129	n.a.	n.a.	0.0%	n.a.
EL	3,370	1,112	33%	3,390	1,085	32%	0.6%	-2.4%
IE	1,825	n.a.	n.a.	1,842	n.a.	n.a.	0.9%	n.a.
ES	7,288	n.a.	n.a.	7,308	n.a.	n.a.	0.3%	n.a.
FR	29,571	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
HR	945	350	37%	956	342	36%	1.2%	-2.0%
IT	12,420	9,231	74%	n.a.	n.a.	n.a.	n.a.	n.a.
CY	466	438	94%	n.a.	n.a.	n.a.	n.a.	n.a.
LV	367	n.a.	n.a.	368	n.a.	n.a.	0.4%	n.a.
LT	571	342	60%	574	342	60%	0.5%	0.0%
LU	149	n.a.	n.a.	151	n.a.	n.a.	1.1%	n.a.
HU	2,400	1,400	58%	2,412	1,398	58%	0.5%	-0.1%
MT	198	n.a.	n.a.	208	n.a.	n.a.	4.8%	n.a.
NL	7,892	1,512	19%	7,966	n.a.	n.a.	0.9%	n.a.
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PL	15,015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PT	n.a.	n.a.	n.a.	3,629	n.a.	n.a.	n.a.	n.a.
RO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SI	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FI	1,293	78	6%	1,296	86	7%	0.2%	9.4%
SE	3,034	164	5%	3,046	148	5%	0.4%	-9.6%
EU	**109,310**	**14,627**	**43%**	**55,900**	**3,402**	**33%**	**1%**	**-1%**

Notes: n.a. = not available; n.v. = not validated; Worst-performing (%) and Change 2020-2021 are calculated values (not reported by Member States in NECPRs); EU row (calculated) indicates the sum of the reported data or the average of the calculated %

The number of buildings did not change significantly in the considered years with the highest increase being registered in Malta (4.8%). On average, the building stock grew by 1%, while the number of buildings in the worst-performing sector decreased by nearly 1%. In this latter

segment, however, higher variation emerged: ranging from +9.6% (Sweden) to -9.4% (Finland). Data on floor area complement the number of buildings for most of the countries which reported information on residential buildings, except for Austria and Slovenia (only floor area reported), and for Spain and Latvia (only number of buildings, with a % growth 2020-2021 of 0.3% and 0.4% respectively). Also in terms of floor area, almost all Member States had a small increase of their building stock (3% on average) except for Bulgaria where the increase was more than 18% in one year.

The fields on **worst-performing buildings** have generally a lower completeness in the NECPRs. In the case of residential buildings, nine countries reported on their number of worst-performing buildings for 2020, only 6 for 2021 (figures in terms of floor area are lower). Worst-performing buildings, represent, on average, 33%-43% of the reported building stock in terms of floor area, with important differences among Member States: Italy and Lithuania have the highest shares (74% and 62% in 2020), while the share is marginal in Finland (6%) and Sweden (5%).

Member States use different approaches to define their worst-performing stock: energy class, age, energy consumption, as resulted by the analysis of the last long term building renovation strategies. In terms of EPC class (chosen by seven countries plus Flanders and Wallonia regions of Belgium), the energy label threshold varied from energy label G (in case of Germany) to energy label C (in case of Croatia for coastal areas). It is difficult to compare between labels used across EU as the methodological approaches largely differ from country to country. Important variations are also observed in cases where worst performance was linked to the age of a building: for Estonia and Romania the threshold was set at 2000, while for Sweden buildings constructed between 1945-75 were deemed as worst performing. Six countries defined worst performance according the primary or final energy consumption in kWh/m^2, while no information was found in twelve other countries (including Brussels region).

The heterogeneity in their definition determines a wide range of shares representing the worst-performing segment of national building stock: looking at the total number of residential buildings, it is on average, 28-43% (the difference depends on the year and countries considered), but it ranges from 5-6% in Finland and Sweden to more than 90% in Cyprus. Where it is possible to compare, these shares remained almost stable in the last two years.

Non-Residential

As observed in previous reporting and studies, **data availability on non-residential buildings is generally lower than for residential buildings**. In fact, only eighteen countries reported some information on non-residential buildings stock in their NECPRs (fourteen Member States reported in terms of number of buildings and fourteen in terms floor area). Missing values are frequent, as visible in the following table.

Table 6. Non-residential building stock - floor area (Source: 2023 NECPR Reporting, JRC, 2023)

Member State	2020			2021			Change 2020-2021	
	Total (Million m2)	Worst performing (Million m2)	Worst performing (%)	Total (Million m2)	Worst performing (Million m2)	Worst performing (%)	Total	Worst performing
BE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
BG	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
CZ	104.9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
DK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
DE	n.a.	n.a.	n.a.	3,507.0	n.a.	n.a.	n.a.	n.a.
EE	n.a.	n.a.	n.a.	273.0	n.a.	n.a.	n.a.	n.a.
EL	17.0	n.a.	n.a.	17.0	n.a.	n.a.	0%	n.a.
IE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ES	95.6	15.3	16%	96.2	16.3	17%	1%	7%
FR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
HR	58.7	14.9	25%	60.2	14.2	24%	3%	-5%
IT	537.7	315.7	59%	n.a.	n.a.	n.a.	n.a.	n.a.
CY	7.0	5.8	83%	n.a.	n.a.	n.a.	n.a.	n.a.
LV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LT	46.6	35.4	76%	47.0	35.4	75%	1%	0%
LU	13.0	n.a.	n.a.	13.4	n.a.	n.a.	3%	n.a.
HU	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
MT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NL	416.9	n.a.	n.a.	419.9	n.a.	n.a.	1%	n.a.
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
RO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SI	23.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FI	109.9	15.4	14%	n.a.	n.a.	n.a.	n.a.	n.a.
SE	237.9	7.1	3%	n.a.	n.a.	n.a.	n.a.	n.a.
EU	**1,668.8**	**409.6**	**39%**	**4,433.7**	**65.9**	**39%**	**1%**	**1%**

Notes: n.a. = not available; Worst-performing (%) and Change 2020-2021 are calculated values (not reported by Member States in NECPRs); EU row (calculated) indicates the sum of the reported data or the average of the calculated %

Public Buildings

Regarding public buildings, Member States had lower data availability than non-residential, with twelve countries reporting some information in this field. In the case of public buildings shares of worst-performing buildings and change 2020-2021 are aligned with the ones discussed for non-residential (for Member States which reported both). Greece experienced an increase in the share of the worst-performing sector, both in terms of number of buildings and floor area, while Croatia reported a significant decrease.

Table 7. Public building stock - floor area (Source: 2023 NECPR Reporting, JRC, 2023)

Member State	2020			2021			Change 2020-2021	
	Total (Thousands m2)	Worst performing (Thousands m2)	Worst performing (%)	Total (Thousands m2)	Worst performing (Thousands m2)	Worst performing (%)	Total	Worst performing
BE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
BG	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
CZ	n.a.	n.a.	n.a.	76,000.0	n.a.	n.a.	n.a.	n.a.
DK	38,887.3	n.a.	n.a.	38,657.8	n.a.	n.a.	-0.6%	n.a.
DE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EE	5,000.0	n.a.	n.a.	5,000.0	n.a.	n.a.	0.0%	n.a.
EL	40,146.9	6,423.5	16.0%	40,392.3	6,866.7	17.0%	0.6%	6.9%
IE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ES	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FR	373,000.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
HR	16,099.5	5,634.8	35.0%	16,510.8	5,367.5	32.5%	2.6%	-4.7%
IT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
CY	2,000.0	1,660.0	83.0%	n.a.	n.a.	n.a.	n.a.	n.a.
LV	8,950.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LT	26,030.2	17,429.0	67.0%	26,177.4	17,429.0	66.6%	0.6%	0.0%
LU	3,084.0	n.a.	n.a.	3,096.0	n.a.	n.a.	0.4%	n.a.
HU	37,110.0	7,839.7	21.1%	n.a.	n.a.	n.a.	n.a.	n.a.
MT	n.a.	n.a.	n.a.	167.2	n.a.	n.a.	n.a.	n.a.
NL	n.a.	n.a.	n.a.	102,000.0	20,000.0	19.6%	n.a.	n.a.
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
RO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SI	9,707.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FI	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SE	n.a.	6,654.8	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EU	**560,014.9**	**45,641.9**	**44.4%**	**308,001.5**	**49,663.2**	**33.9%**	**0.6%**	**0.7%**

Notes: n.a. = not available; Worst-performing (%) and Change 2020-2021 are calculated values (not reported by Member States in NECPRs); EU row (calculated) indicates the sum of the reported data or the average of the calculated %

4.2. Energy Use

Primary and Final energy

The reporting rate for energy use in the building sector is generally low, only twelve countries reported information in this field for primary energy, with many missing data in the corresponding tables. Only two countries reported a full sectoral breakdown (residential, non-residential, and public buildings) including the share attributed to worst-performing buildings.

In all Member States that have data available for both years, the overall trend is a **slight increase in primary energy consumption from 2020 to 2021**. Member States show very different situations: the highest increases are observed in Finland, amounting to 12% and 19% in residential and non-residential sectors respectively. Looking at the overall building stock, primary energy consumption decreased in the residential sector in Ireland, Luxembourg, and Germany. If we consider the worst performing buildings, primary energy use decreased in Sweden, Croatia and Lithuania, but in Romania (only for public buildings) and Finland (only for residential buildings). It increased significantly (26%) for non-residential buildings in Finland.

Data on **final energy** (Table 8) are relatively more complete (nearly 60% of the Member States reported data at least on total final energy consumption in the residential sector in 2020), but the high number of missing data restricts the possibility to draw general conclusions at EU level. Also **in terms of final energy, the short-term evolution indicates a general increase with some exceptions**, such as the residential sector in Greece and Ireland and, in most instances, worst-performing buildings (which can be linked with renovation activities).

Table 8. Final energy use in building - Change 2020-2021 (Source: 2023 NECPR Reporting, JRC, 2023)

Member State	Change 2020-2021					
	Residential buildings		Non-Residential buildings		Public buildings	
	Total	Worst performing	Total	Worst performing	Total	Worst performing
BE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
BG	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
CZ	10%	n.a.	-1%	n.a.	n.a.	n.a.
DK	6%	n.a.	15%	n.a.	13%	n.a.
DE	1%	n.a.	4%	n.a.	n.a.	n.a.
EE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EL	-1%	n.a.	7%	n.a.	2%	n.a.
IE	-4%	n.a.	3%	n.a.	-1%	n.a.
ES	1%	n.a.	7%	n.a.	n.a.	n.a.
FR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
HR	1%	-2%	5%	-9%	5%	-9%
IT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
CY	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LV	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LU	-3%	n.a.	n.a.	n.a.	n.a.	n.a.
HU	7%	7%	n.a.	n.a.	2%	n.a.
MT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NL	2%	n.a.	-2%	n.a.	n.a.	n.a.
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
PL	5%	n.a.	n.a.	n.a.	n.a.	n.a.
PT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
RO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SI	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FI	10%	2%	19%	27%	n.a.	n.a.
SE	10%	-7%	9%	-10%	n.a.	n.a.
EU	**3%**	**0%**	**7%**	**2%**	**4%**	**-9%**

4.2.1. Progress monitoring of the energy use

Table 9 summarises the targets and milestones in energy use in buildings as reported by sixteen countries in their 2020 LTRS and 2023 NECPR. The table reports final energy use progress, however, For Germany, Lithuania and Portugal the values represent the primary energy use, since these countries expressed their LTRS targets and milestones in primary energy use (as also shown in Table 1). The progress towards the national targets has been monitored by most countries in terms of annual final energy consumption. Several countries reported other energy-related indicators, most frequently the specific energy use.

Specifically, the table provides from left to right:

- the reference years and values used by countries to set the 2030 targets.
- the final energy consumption (or energy savings in the case of Bulgaria) reported by the Member States for 2020 (by thirteen countries) and 2021 (by eleven countries).
- the 2030 targets set in the 2020 LTRS.
- the 2030 targets reported in the NECPR.

Table 9. Summary of targets and milestones for energy use in buildings reported in 2020 LTRSs, 2023 NECPR (Source: JRC elaboration based on Member State reporting, 2023)

Member State	Milestones				Targets	
	LTRS		NECPR		2030	
	Reference year	Value (ktoe)	2020 (ktoe)	2021 (ktoe)	LTRS (ktoe or %)	NECPR (ktoe or %)
Bulgaria	n.a.	n.a.	-175	-25	-215	-215
Croatia	2017	3 173	2 959	3 013	3 251	n.a.
Cyprus	2020	580	602	n.a.	640	640
Czechia	2020	8 909	10 226	10 914	8 240	n.a.
Denmark	2018	4 248	4 862	5 264	n.a.	n.a.
Finland	2020	6 096	5 586	6 240	4 772	3 130 (2050 target)
France	2020	n.a.	n.a.	n.a.	- 40%	-40%
Germany	2020	78 819	69 526	69 595	47 800	47 800
Greece	2015	6 014	5 790	5 894	5 530	5 530
Hungary	2018	5 830	6 735	7 188	4 681	n.a.
Ireland	2018	4 256	5 464	3 587	n.a.	n.a.
Lithuania	2020	3 510	3 510	3 522	2 989	2 989
Luxembourg	2020	554	446	433	396	396
Netherlands	2020	13 925	15 788	15 890	12 062	n.a.
Poland	2018	27 000	21 201	22 146	below 26 000	below 26 000
Portugal	2017	n.a.	n.a.	n.a.	-11%	-11%
Slovenia	2020	1 531	1 699	n.a.	1 268	-22%
Spain	2020	26 165	24 170	24 667	22 426	22 425
Sweden	2020	4 346	6 234	6 826	4 043	n.a.

Notes: **Bulgaria**: final energy savings, no reference value provided; **Finland**: gross heating demand, NECPR target for 2050; **France:** LTRS/NECPR targets cover only the services sector; **Germany**, **Lithuania**, and **Portugal:** primary energy use; **Luxembourg**: values only for residential; **Poland**: NECPR values cover only residential, thus not comparable with LTRS targets; **Slovenia:** LTRS and NECPR targets: weighted average of sector-specific values; **Sweden**: the LTRS reference value and 2030 target cover the energy use by apartment buildings, schools, and offices thus not directly comparable with the values reported in the NECPR.

It is notable that although the reference year is 2020 for more than half of the LTRS targets, these values slightly differ from those reported in the 2023 NECPR for 2020 most likely because in the LTRS these were only estimates. Overall, twelve countries (Bulgaria, Cyprus, Finland, France, Germany, Greece, Lithuania, Luxembourg, Poland, Portugal, Slovenia and Spain) reported targets for final or primary energy consumption in their NECPR. All are aligned with the targets reported in their 2020 LTRS. It appears that between 2020 and 2023, **none of these countries revised their ambition for final energy reduction**, based on the data from the 2023 NECPR compared to 2020 LTRS.

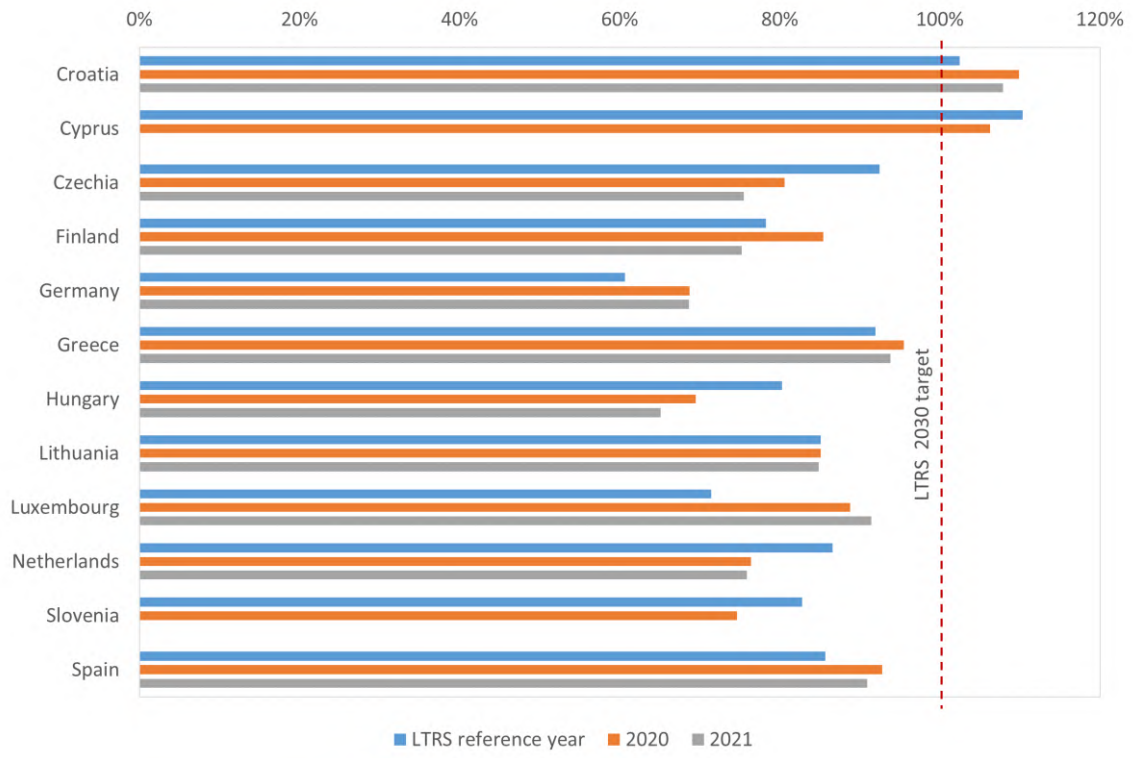
To assess the progress of the Member States towards their indicative targets, Figure 1 shows the 2030 target value set in the LTRS normalised with the energy use in years 2021, 2020, and in the LTRS reference year. **The lower the percentage, the further a country is from the 2030 target.** Values greater than 100% indicate that the 2030 target corresponds to a higher energy use than that of the specific year considered (reference, 2020 or 2021).

Among all countries, Croatia and Cyprus registered building energy use in years 2020 and 2021 below the 2030 target. However, both countries have set energy use targets higher than the LTRS reference values (Croatia +2%, Cyprus +10%; see Table 1).

In several countries (Czechia, Hungary, The Netherlands, and Slovenia), building energy use in 2020 was higher than the LTRS reference value, suggesting a slight deviation from the target. This trend is even more pronounced in 2021 with Finland and Lithuania also recording increased energy use compared to the LTRS reference year, alongside these nations.

Conversely, Greece, Germany, Luxembourg, and Spain demonstrate progress in achieving the LTRS energy use target in both 2020 and 2021, compared to the LTRS reference year.

Figure 1. Illustration of the national progress towards the 2030 energy use targets in buildings. Progress indicators are provided as the ratio of the 2030 target values to the values for each annotated year (Source: JRC elaboration based on Member State reporting, 2023)



4.3. GHG emissions

Figures on GHGs emissions in buildings are highly incomplete and scattered in the NECPRs.

Only ten Member States reported data on total GHG emissions. For nine of them it is possible to compare 2020 with 2021 and only in three cases (Croatia, Lithuania, Finland) the amount attributable to worst-performing buildings is indicated. Seven Member States specified the amount of direct GHGs emissions.

Extrapolating MSs which reported for both years, total GHG emissions increased, but this change is triggered by the increase in the emissions from Spain and Greece non-residential sectors. Emissions decreased in residential and public sector: this change is mainly attributable to a significant decrease in Denmark and Ireland (residential) sector and Ireland, Croatia, and Lithuania (public buildings).

Data show a general reduction in the emissions attributable to the worst-performing buildings. However, worst-performing buildings keep playing a key role, with a significant impact in GHG emissions (larger, on average, than in energy consumption), as they account for 35-36% in residential, 40-42% in non-residential, and 49-51% in the public sector.

In the residential sector, out of the eight Member States that have reported data for 2020 and 2021, data show an overall steady trend of GHG emissions between the two years (-0.1%).

4.3.1. Progress monitoring of GHG emissions

Table 10 summarises the targets and milestones in GHG emissions in buildings as reported by fourteen countries in their 2020 LTRS and 2023 NECPR. The progress towards the national targets is monitored in terms of tonnes of equivalent CO_2, covering either only direct emissions (from the use of fossil fuels in buildings) or total emissions (including indirect emissions from

electricity and heat used in buildings). Few countries reported both direct and total emissions (Spain, Finland, and Luxembourg).

Specifically, the table provides from left to right:

– reference years and values used by countries to set the 2030 targets.

– type of emissions reported (either direct or total).

– GHG emissions (or emission savings in the case of Bulgaria) reported by the Member States for 2020 (by twelve countries) and 2021 (by thirteen countries).

– 2030 targets set in the 2020 LTRS.

– 2030 targets reported in the 2023 NECPR.

Table 10. Summary of targets and milestones in GHG emissions ($MtCO_2$-eq) in buildings reported in 2020 LTRS and 2023 NECPR (Source: JRC elaboration based on Member States reporting, 2023)

Member State	Milestones					Targets	
	LTRS			NECPR		2030	
	Reference year	Value ($MtCO_2$-eq)	Emissions type	2020 ($MtCO_2$-eq)	2021 ($MtCO_2$-eq)	LTRS ($MtCO_2$-eq or %)	NECPR ($MtCO_2$-eq or %)
Austria	2020	8.15	Direct	n.a.	n.a.	5.60	5.60
Bulgaria	2020	n.a.	Total	n.a.	- 0.13	- 1.31	- 1.31
Denmark	1990	6.75	Total	1.68	1.52	2.03	n.a.
Germany	2020	118.00	Direct	122.40	117.00	70	n.a.
Greece	2015	6.09	Total	n/a	5.44	3.05	n.a.
Spain	2020	28.42	Direct	25.18	26.71	18.56	23.9 (2025)
Finland	2020	7.81	Total	6.94	7.81	2.87	0.65 (2050)
Croatia	2020	2.17	Direct/Total	7.21	7.36	2.01	n.a.
Hungary	2018-20	10.79	Direct	11.90	12.80	8.69	-18-20%
Ireland	2019	13.50	Total	8.89	8.41	7.43	n.a.
Lithuania	2020	5.29	Total	5.29	5.30	4.00	4.00
Luxembourg	2020	1.04	Direct	1.04	1.05	0.40	n.a.
Malta	2018	0.71	Total	2.58	2.69	0.44	n.a.
Netherlands	2020	23.10	Direct	23.30	23.40	15.30	n.a.
Poland	2019	52.00	Direct	n.a.	n.a.	35.00	35.00
Sweden	2018	0.89	Direct	0.59	0.56	0.01	0.01
Slovenia	2020	2.68	Direct	2.78	n.a.	1.45	-45-57%

Notes: **Bulgaria**: GHG emission savings; **Denmark, Greece, Luxembourg:** LTRS reference values are taken from European Environment Agency (EEA); **Spain**: NECPR target for 2025 (also reported in the 2020 LTRS); **Finland**: NECPR target for 2050 (also reported in the 2020 LTRS); **Croatia**: Direct emissions in the LTRS, total emissions in the NECPR, comparison not possible; **Hungary**: 18% reduction in public buildings, 20% reduction in residential, (also reported in LTRS); LTRS reference value is average of EEA 2018-2020 GHG emissions; **Malta**: relevant differences between the LTRS and NECPR values, comparison may be misleading because of possible inconsistency or errors in reporting.

Nine countries reported emission targets in the NECPR, and all are aligned with the 2020 LTRS, thus **no country revised the ambition** in term of GHG emissions reduction from 2020 to 2023.

It can be observed that several countries record progress towards the 2030 target in 2020 (Denmark, Spain, Finland, Ireland, Romania, and Sweden) and in 2021 (Germany, Denmark, Greece, Spain, Finland, Ireland, and Sweden) compared to the LTRS reference year. On the opposite side, Hungary and Slovenia appear slightly off track, while Lithuania, the Netherlands, and Luxembourg show a stable trend.

4.4. Building Renovation

Despite the central role of renovation in energy and climate policies and the fact that some Member States have set renovation milestones, data on renovation rates in NECPR are highly incomplete, with only eight Member States reporting in this field. Data are also scattered across countries, years, depth of renovation (light/medium/deep), building use (residential/non-

residential/public), and unit measure (building units/floor area). This makes it very difficult to have a complete overview, perform comparisons, and draw general conclusions at EU level.

In the following tables are the data available in the dataset collected for each Member State that submitted information on the number of buildings renovated in 2020 and 2021.

Table 11. Renovation of the building stock: number of buildings renovated in 2020 (Source: NECPR, JRC, 2023)

MS	Renovation type	Number of buildings					
		Residential buildings		Non-Residential buildings		Public	
		Total	Worst performing	Total	Worst performing	Total	Worst performing
EE	**TOTAL**	**235**	**n.a.**	**n.a.**	**n.a.**	**13**	**n.a.**
IE	**TOTAL**	**16,694**	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
HR	**TOTAL**	**3,192**	**2,685**	**195**	**103**	**122**	**103**
LT	LIGHT	405	n.a.	n.a.	n.a.	n.a.	n.a.
	MEDIUM	752	n.a.	n.a.	n.a.	25	n.a.
LU	LIGHT	5,060	n.a.	n.a.	n.a.	n.a.	n.a.
	MEDIUM	1,603	n.a.	n.a.	n.a.	n.a.	n.a.
	DEEP	267	n.a.	n.a.	n.a.	n.a.	n.a.
	TOTAL	**6,930**	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**n.a.**

Table 12. Renovation of the building stock: number of buildings renovated in 2021 (Source: NECPR, JRC, 2023)

MS	Renovation type	Number of buildings					
		Residential buildings		Non-Residential buildings		Public	
		Total	Worst performing	Total	Worst performing	Total	Worst performing
BG	**TOTAL**	**13**	**13**	**147**	**n.a.**	**n.a.**	**n.a.**
CZ	LIGHT	4,901	n.a.	567	567	n.a.	n.a.
	MEDIUM	3,446	n.a.	726	n.a.	n.a.	n.a.
	DEEP	3,094	n.a.	571	571	n.a.	n.a.
	TOTAL	**11,441**	**n.a.**	**1,864**	**n.a.**	**n.a.**	**n.a.**
EE	**TOTAL**	**306**	**n.a.**	**n.a.**	**n.a.**	**9**	**n.a.**
IE	**TOTAL**	**14,331**	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
HR	LIGHT	3,101	2,594	92	n.a.	19	n.a.
	MEDIUM	91	91	103	103	103	103
	TOTAL	**3,192**	**2,685**	**195**	**103**	**122**	**103**
LT	LIGHT	405	n.a.	n.a.	n.a.	n.a.	n.a.
	MEDIUM	752	n.a.	n.a.	n.a.	25	n.a.
LU	LIGHT	2,979	n.a.	n.a.	n.a.	n.a.	n.a.
	MEDIUM	944	n.a.	n.a.	n.a.	n.a.	n.a.
	DEEP	157	n.a.	n.a.	n.a.	5	n.a.
	TOTAL	**4,080**	**85,263**	**0**	**0**	**5**	**n.a.**
HU	DEEP	478	n.a.	110	n.a.	174	n.a.

Eight Member States reported data on renovated number of buildings in 2021, but only five countries reported comparable data for 2020, at least for the residential sector. The comparison highlighted a reduction in the number of renovated buildings in Luxembourg and Ireland, and an increase in Estonia. The same number of renovated buildings are reported for 2020 and 2021 by Croatia and Lithuania. Two countries (Italy and Austria) reported data only in terms of floor area. According to what reported, in both Member States the renovated area for residential sector increased in 2021 compared to 2020, in particular in Italy where it almost doubled.

The only data reported on renovation rates are from Ireland, Lithuania, Luxembourg, Hungary.

Ireland reported a renovation rate of 0.83% for the residential sector in 2021 (0.93% in 2020).

Lithuania indicated the following rates for 2020: 0.8% light renovation rate (residential); 0.52% medium renovation rate (residential) and 0.21% medium renovation rate (public). In addition, it reported a 0.16% (deep-equivalent renovation rate for residential and a 0.08% deep-equivalent rate in the public sector). The rates were very similar in 2021: the only change was in the deep-equivalent renovation rates, i.e. 0.37% for residential and 0.05% in the public sector.

Hungary reported data for 2021: 0.02% renovation rate in the residential sector, and 0.73% renovation rate in the public sector.

Luxembourg indicated low rates of renovations in residential sector (0.011% for deep, 0.064% for medium, and 0.18% for light renovation in 2021, slightly lower than in 2020). Higher values are reported for non-residential (1.37% medium) and public buildings (0.8% deep) in 2021.

Additional information on renovations can be retrieved in the milestone indicators. For instance, as progress toward its targets, Italy indicated for 2020 and 2021 a virtual (deep-equivalent) renovation rate of 2.4% (2020) and 3.1% (2021).

4.4.1. Progress monitoring of building renovation

This section provides on overview on the Member States progress towards the 2030 target set for building renovation in the 2020 LTRS, using progress indicators provided in the 2023 NECPR. Following is a summary of milestones and targets solely on building renovation.

Table 13. Summary of milestones and targets for building renovation reported in 2020 LTRS and 2023 NECPR (Source: JRC elaboration based on Member States reporting, 2023)

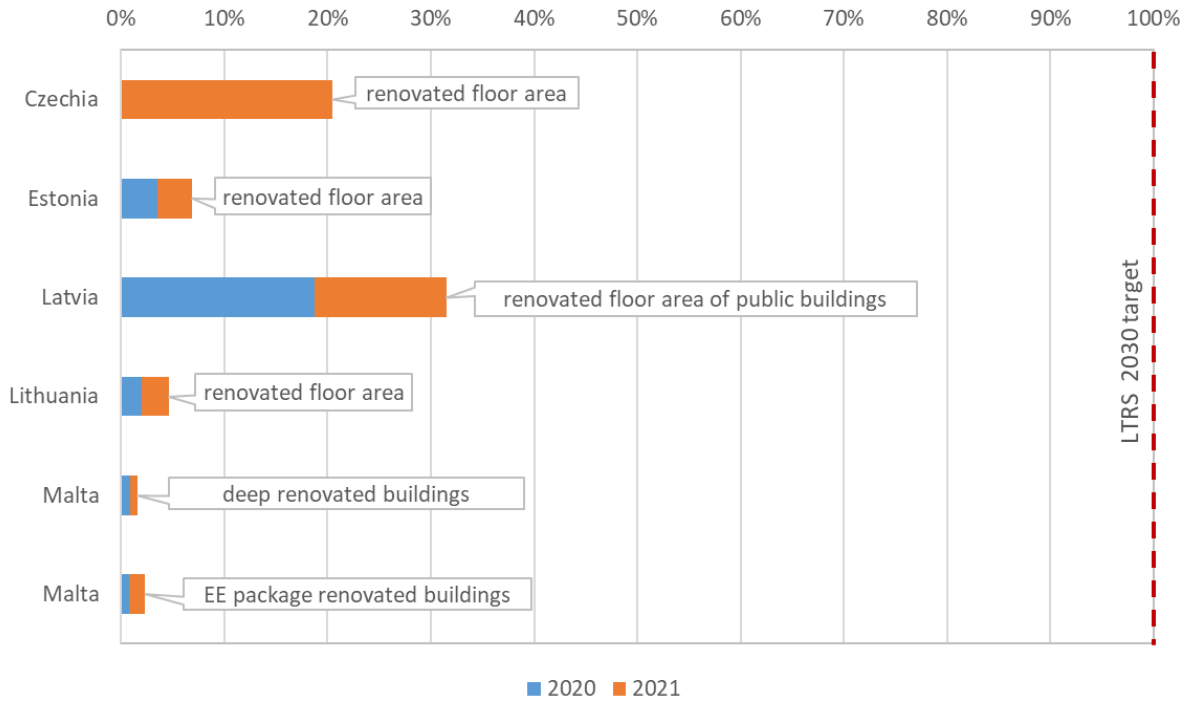
MS	Milestones			Targets	
	LTRS	NECPR		2030	
	Ref. 2020	2020	2021	LTRS	NECPR
AT	1.5% p.a.	3 414 000 m^2	3 887 000 m^2	1.5% p.a.	n.a.
BG	n.a.	n.a.	61 672 m^2	22 203 509 m^2 (8%)	22 203 509 m^2
HR	0.7% p.a. 5.0% cumulative	3 509 units	3 406 units	2.0% p.a. 30 838 830 m^2 (18%)	n.a.
CZ	45% cumulative (269 768 577 m^2)	n.a.	12 245 115 m^2 (13 305 units)	55% cumulative (329 715 928 m^2)	n.a.
EE	500 000 m^2 cumulative	401 470 m^2 (248 units)	374 499 m^2 (315 units)	11 880 000 m^2	54 000 000 m^2 by 2050
EL	n.a.	n.a.	n.a.	23% cumulative res.; 9% cumulative non-residential	12-15% cumulative
HU	1.0% p.a.	n.a.	347 353 m^2 (762 units)	3% p.a. residential. 5% p.a. public buildings 20% cumulative NZEBs	20% cumulative NZEBs
IE	n.a.	2 283 237 m^2 (16 694 units)	2 032 831 m^2 (14 331 units)	500 000 dwellings cumulative 100% public buildings 33% commercial buildings	500 000 dwellings cumulative 100% public buildings 33% commercial buildings
IT	0.86% p.a.	8 559 693 m^2 2.4% p.a. res. 0.4% p.a. non-res.	16 754 527 m^2 3.1% p.a. res. 0.3% p.a. non-res.	1.9% p.a. residential; 2.8% p.a. non-residential	1.9% residential. 2.8% non-residential. 3 200 000 m^2 cumulative public buildings
LV	3.0% p.a. (678 460 m^2) cumulative public buildings	96 739 m^2 public buildings	63 769 m^2 public buildings	8 100 units MFH (30%) and 7 500 units SFH 500 000 m^2 public buildings	500 000 m^2 public buildings
LT	29 471 000 m^2 cumulative (58 774 units)	29 471 000 m^2 cumulative (58 774 units)	30 204 000 m^2 cumulative (59 551 units)	17% cumulative (49 782 000 m^2; 99 281 units)	17% cumulative (49 782 000 m^2; 99 281 units)
LU	10-14% cumulative residential buildings	85 093 m^2 (6 930 units)	85 263 m^2 (4 080 units)	3% p.a. residential (4 500 units/year)	3% p.a. residential
MT	0.5% p.a. (0.7% p.a. 2025)	79 units deep renovated. 329 units with EE package	65 units deep renovated. 654 units with EE package	5-6% p.a. residential 8 950 deep renovated. 42 600 units with EE package	400-450 p.a. deep renovation by 2024, 1 800 units p.a. with EE package in by 2023
NL	n.a.	n.a.	n.a.	1 500 000 dwellings	1.5 mil owner-occupied and 1 mil rented dwellings. 15% worst-performing non-residential building label G to C by 2027; 15% worst-performing non-residential label F to C by 2030
PL	n.a.	n.a.	n.a.	3.6% p.a. (236 000/year) 2 360 000 cumulative	2 400 000 cumulative units (500 000 deep renovation)
PT	n.a.	n.a.	n.a.	69% cumulative buildings (363 680 501 m^2	363 680 501 m^2
SI	1 795 000 m^2 cumulative public buildings	n.a.	n.a.	29 733 000 m^2 cumulative (23 333 000 m^2 cumulative residential)	23 279 000 m^2 cumulative residential

Notes: **Austria, Bulgaria, Malta**: NECPR values only for residential buildings; **Czechia**: own calculation of the renovation floor area by 2020 based on the 2020 LTRS; **Ireland**: NECPR values only for residential buildings; **Italy**: NECPR absolute values (floor area) only for residential buildings. The renovation rate is calculated as the share of renovated floor area in a given year from the total floor area of existing buildings in 2020.

Comparing the 2020 LTRS with the 2023 NECPR building renovation targets, it appears that **only the Netherlands revised its ambition by including additional targets**, such as phasing out worst-performing non-residential buildings (however, it does not report any progress indicators). On the opposite side, the Greek targets do not seem aligned; however, the LTRS target refers only to envelope upgrades, whereas the NECPR target refers to a wider energy efficiency upgrading.

To provide a better overview on how countries are progressing towards the 2030 building renovation target, Figure 2 shows the 2020 and 2021 NECPR values normalised with the 2030 LTRS target. Due to inconsistencies in reporting observed in Table 13, only for five countries such analysis was possible (two indicators are included for Malta in the figure below). For comparability reasons, the graph considers year 2020 as the baseline while the achievements before this year are not considered.

Figure 2. Illustration of the national progress towards the 2030 targets in building renovation. Progress indicators are given as the ratio of values for each annotated year to 2030 target (Source: JRC elaboration based on Member State reporting, 2023)



Czechia, Estonia, and Lithuania monitor the renovated floor area across all building categories, while Latvia focuses on renovated floor area of public buildings. Malta tracks the number of buildings undergoing deep renovation as well as buildings renovated with an Energy Efficiency package previously defined in the LTRS.

It can be observed that **all countries that reported on this are showing some progress towards the 2030 target** (the higher the percentage, the closer to achieving the target). Latvia and Czechia registered the highest progress; however, Latvia focuses only on public building renovation for which the renovation rate is at least 3% as required in Article 5 of EED (Article 6 of the revised EED 2023/1791). Czechia already reported 45% renovated floor area by 2020 and set the target to 55% by 2030 but about 30% is light renovation, while deep renovation only 5% in 2030. On the opposite side, Malta registered the lowest progress. It has planned to carry out deep renovation on 8 950 buildings between 2021-2030 and EE renovation on 42 600

buildings over the same period. Malta's targets appear highly ambitious considering that only around 1.5% is achieved by 2022, whereas the indicative estimated value was around 15% by 2022 in the LTRS.

4.5. Milestone indicators

With a good level of completeness, NECPRs show a wide variety of specific milestones and indicators set by Member States. It is difficult to summarise all entries. Table 14 gives an outline of the information available: in eleven cases, target(s) and progress are all clearly specified and quantified while in the remaining 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. In some cases, they set also intermediate targets or forward-looking goals (2040, 2050). Three Member States (Estonia, Slovakia, Finland) reported only 2050 targets.

Table 14. Overview of milestones and target indicators (Source: 2023 NECPR Reporting, JRC, 2023)

Member State	Number of milestone indicators	Target quantification	Progress quantification	Target year
BE	n.a.	n.a.	n.a.	n.a.
BG	3	yes	yes	2030
CZ	1	yes	yes	2030
DK	4	yes	yes	Multiple (2030; 2040; 2050)
DE	1	yes	yes	2030
EE	1	yes	no	2050
EL	2	yes	partly	2030
IE	8	partly	no	2030
ES	8	partly	yes	Multiple (2030; 2025)
FR	1	yes	yes	2030
HR	n.a.	n.a.	n.a.	n.a.
IT	3	yes	partly	2030
CY	3	yes	partly	Multiple (2030; 2040)
LV	1	yes	yes	2030
LT	13	yes	yes	2030
LU	3	yes	yes	Multiple (2030; 2040)
HU	5	yes	yes	2030
MT	3	yes	yes	Multiple (2030; 2024; 2023)
NL	6	yes	no	Multiple (2030; 2027; 2023)
AT	15	yes	no	Multiple (2030; 2040; 2050)
PL	6	yes	yes	Multiple (2030; 2040)
PT	6	yes	yes	Multiple (2030; 2040; 2050)
RO	n.a.	n.a.	n.a.	n.a.
SI	19	yes	yes	2030
SK	1	yes	no	2050
FI	2	yes	partly	2050
SE	66	partly	yes	2030

It is possible to group milestones and targets in three main categories:

– **Improvement of the building stock:** 36% of the milestones reported is related to the improvement of the building stock, most frequently indicated. Sixteen Member States reported at least one target or milestone within this objective, with a variety of approaches and indicators: from the indication of a renovation rate (e.g., Greece, Lithuania, Luxembourg, Italy), to a target floor area/number of buildings to be renovated (e.g., Bulgaria, the Netherlands, Latvia, Lithuania), to a specific increase in the share of NZEBs (e.g., Hungary, Slovenia), to an increase in the share of buildings in high energy classes (e.g., Lithuania, Sweden), to the phasing-out of the worst-performing buildings (e.g., the Netherlands, Lithuania). One country (Ireland) has set a specific target for social housing, while some countries indicated specific renovation targets for state-owned or central government buildings (e.g., Italy, the Netherlands). Among the Member States that indicated a renovation rate: Greece reported its target renovation rate as 12-15%, with no further specifications, and Lithuania indicated a

17% renovation rate to be achieved by 2030 with additional targets expressed in terms of number of buildings and floor area to be renovated. Italy set a target of 1.9%/year as average deep renovation (virtual or deep-equivalent) rate in residential sector compared to the total m^2 of existing residential building stock in 2020. Luxembourg indicated an annual building envelope renovation rate of 3% of the total number of residential units built before 1991.

- **Reduction in energy consumption:** Eighteen Member States indicated at least one target or milestone related to reducing energy consumption.
- **Reduction in GHG emissions:** Ten Member States reported at least one target or milestone related to reducing CO_2 or GHG emissions. This objective represents 10% of the total number of targets and milestones reported and it is mostly linked here with the reduction of non-renewable energy use[17]. Some countries address, in the cross-sectoral policies and measures reported under NECPRs as well as, in fewer cases, in those in the building sector, aspects of resource efficiency and circularity, but they do not seem to have in place a system of milestones and indicators to specifically account for progress in this area.

Other targets indicated include technical systems (e.g., Ireland, Sweden), installation of PV panels (e.g., Malta); information, advice, energy audits to SMEs and citizens (e.g., Hungary).

4.6. Contribution to Union's target

NECPR obligations require Member States to describe how progress towards the milestones in the long-term renovation strategy contributed to achieving the Union's energy efficiency targets in accordance with Directive 2012/27/EU. This requirement is open to descriptive and/or quantitative information and the responses show a variety of interpretation from Member States and, being this one mandatory element, the reporting rate in this field is close to 100% of the submitted NECPRs. However, in some cases, the responses failed to provide references to specific milestones or targets, leaving space for improvements and additional specifications.

In the Commission's evaluation, five Member States did not provide a satisfactory level of elaboration and details. Nine Member States have reported significant information but not completely aligned with the request: in most of the cases they specify their progress towards national milestones and targets, without mentioning EU targets. Eleven Member States replied to the request either qualitatively or quantitatively even if in some cases more details and reference to indicators may help in giving a comprehensive picture of the contribution of the progress.

5. Nearly Zero-Energy Buildings

5.1. NZEB performance level

The EPBD requires nearly zero-energy buildings (NZEBs) as the new building target in Member States as of the end of 2020. This report assesses the progress in NZEBs implementation in terms of established definitions and uptake across Member States.

As of June 2023, all countries have in place an NZEB definition for new buildings, while only a few do not have a specific definition for NZEB renovation. Countries without an NZEB renovation definition reported either a major renovation definition, requirements for building

[17] However, as stated in the Renovation Wave Communication, applying circularity principles to renovation reduces materials-related GHG emissions for buildings Among the mandatory indicators in the Building Renovation Plans (BRPs), introduced in the EPBD Recast Proposal, are policies and measures with regard to: the reduction of whole life-cycle GHG emissions for the construction, renovation, operation and end of life of buildings, and the uptake of carbon removals; prevention and high-quality treatment of construction and demolition waste in line with Directive 2008/98/EC, notably as regards the waste hierarchy, and the objectives of the circular economy.

components undergoing renovation (e.g., U-value), or the NZEB definition for new buildings. The most common approach is the energy balance over a year at building level including on-site, nearby, and off-site renewables, using as indicator the primary energy demand for heating, cooling, ventilation, domestic hot water, built-in lighting, and auxiliary energy[18].

The renewable energy requirement is quantified in almost 70% of the NZEB definitions for new buildings (provided either as % or absolute value in kWh/(m^2y)) and in over 40% for existing buildings undergoing NZEB renovation. The minimum RES share for new buildings ranges between 20% and 60%. Solar thermal, PV, biomass, and wind energy are the renewable energy technologies indicated as more frequently implemented in Member States.

Many definitions rely on the comparison with national reference buildings or on a formula involving additional indicators rather than a fixed energy indicator. In addition, several countries have varying performance values based on building types, geometry (heated/cooled floor area), climate zone and other parameters. As such, estimations and assumptions were necessary to derive comparable NZEB performance values[19]. The focus is on the maximum allowed non-renewable primary energy demand, which is framed by most definitions. When the Member States refer to total primary energy, the non-renewable energy share was calculated considering the renewable energy requirements[20].

Based on the national definitions, the **NZEB performance level** expressed in non-renewable primary energy demand (kWh/(m^2y)) in Member States and averaged at EU level was estimated. The average non-renewable primary energy demand for new single-family houses varies from as low as 15 kWh/(m^2y) to 95 kWh/(m^2y) with an average at EU level of 52 kWh/(m^2y) (Figure 3). For new offices, the estimated performance level ranges between 20 and 220 kWh/(m^2y) with an EU average of 76 kWh/(m^2y) (

[18] D'Agostino, D., Tsemekidi-Tzeiranaki, S., Zangheri, P. and Bertoldi, P., Assessing Nearly Zero-Energy Buildings (NZEBs) development in Europe, ENERGY STRATEGY REVIEWS, ISSN 2211-467X, 36, 2021, JRC123143.

[19] The following assumption were considered to derive harmonised NZEB performance indicators in Member States: **Austria**: NZEB levels for new buildings are sourced from CA EPBD database. **Brussels**: NZEB levels of offices equals the upper boundary of energy class B for new buildings and of class C for renovated. **Croatia**: NZEB levels are averaged across the two climatic zones (continental and coastal). **Czechia**: NZEB levels are calculated using the reference buildings for new buildings defined in the 2018 cost-optimal report. **Denmark**: NZEB levels are calculated using the reference buildings defined in the 2023 cost-optimal report. **Finland**: A share of 15% is subtracted from the Member State values to eliminate appliances and user equipment energy demand. The NZEB levels are calculated using the reference buildings defined in the 2023 cost-optimal report. **France**: NZEB levels for new buildings are sourced from CA EPBD database. The NZEB level of renovated SFH is calculated using average values for coefficients a and b according to CA EPBD database. The NZEB level of renovated office is calculated based on the reference office building defined in the 2018 cost-optimal report. **Germany**: NZEB levels are calculated using the reference buildings for new buildings defined in 2018 cost-optimal report. **Latvia**: NZEB levels are sourced from CA EPBD database. **Poland**: NZEB levels of offices include primary energy for cooling and lighting according to the CA EPBD database. **Romania**: NZEB levels corresponds to climatic zone 2, reported as representative for Romania. **Portugal**: NZEB levels are calculated using the reference buildings for new buildings defined in 2018 cost-optimal report.

[20] For those cases providing the total primary energy and not quantifying the share of renewable energy, the non-renewable energy demand was considered equal with the total primary energy demand.

Figure 4).

Figure 3. NZEB energy performance in new residential buildings (single family houses) expressed in non-renewable primary energy demand kWh/(m^{2}y), (Source: JRC estimation based on Member States reporting, 2023)

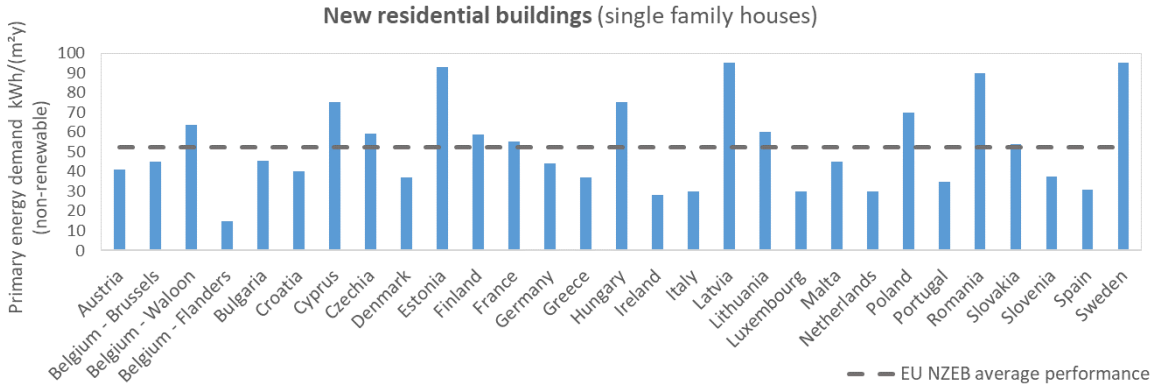
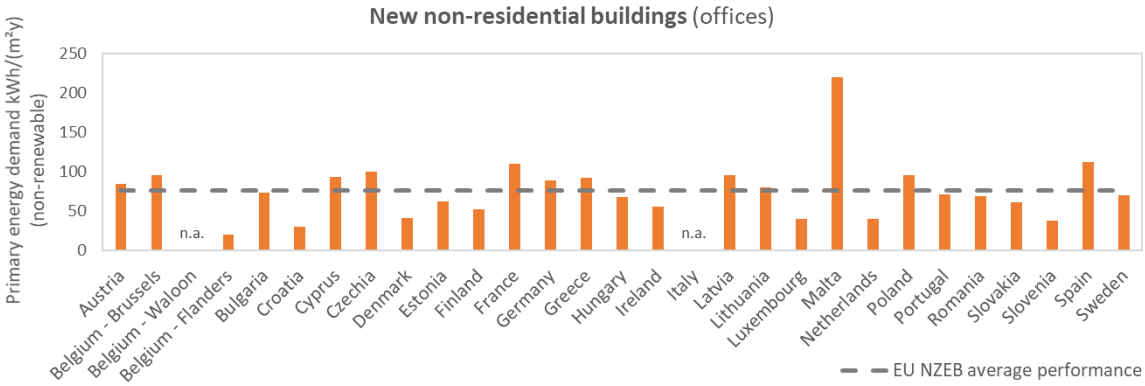


Figure 4. NZEB energy performance in new non-residential buildings (offices) expressed in non-renewable primary energy demand kWh/(m²y), (Source: JRC estimation based on Member States reporting, 2023)



For existing buildings undergoing renovation to NZEB level, the average non-renewable primary energy demand varies between 35 kWh/(m²y) and 125 kWh/(m²y) with an average at EU level of 70 kWh/(m²y) for single family houses (Figure 5), while for offices it ranges between 30 and 270 kWh/(m²y) with a EU average of 100 kWh/(m²y) (Figure 6**Figure 6**).

Figure 5. NZEB energy performance in renovated residential buildings (single family houses) expressed in non-renewable primary energy demand kWh/(m²y), (Source: JRC estimation based on Member States reporting, 2023)

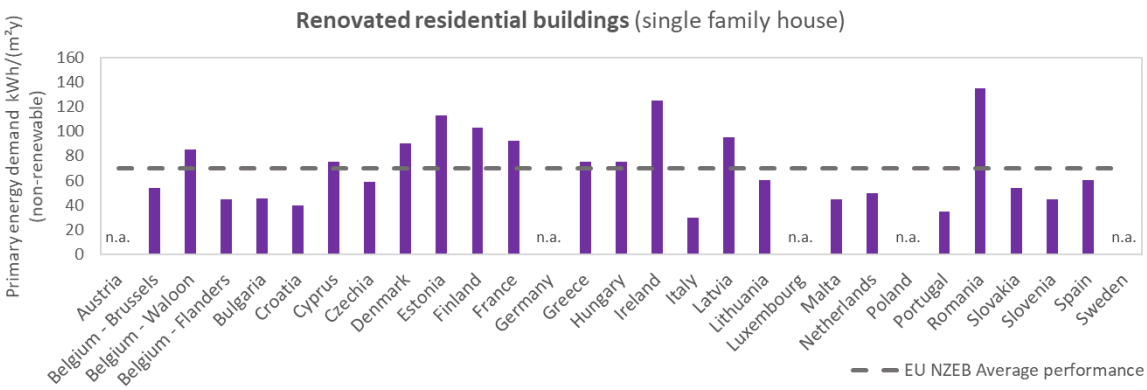
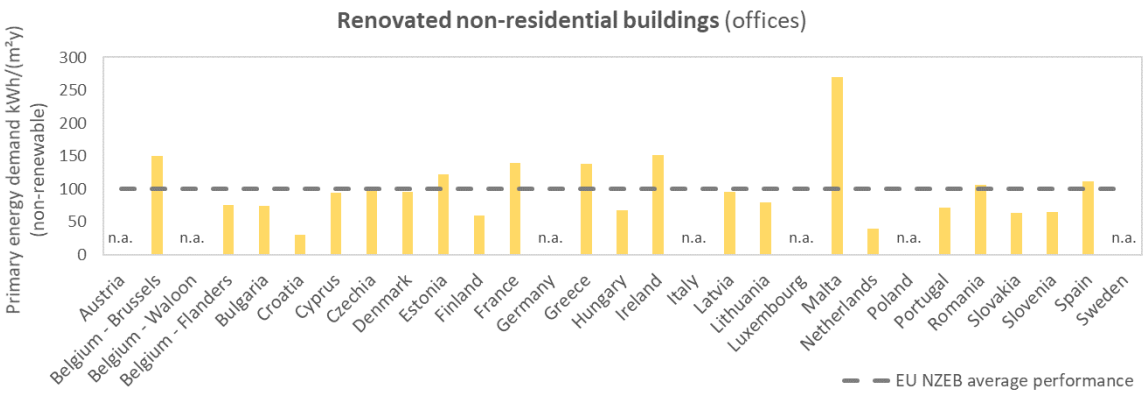


Figure 6. NZEB energy performance in renovated non-residential buildings (offices) expressed in non-renewable primary energy demand kWh/(m²y), (Source: JRC estimation based on Member States reporting, 2023)



In most cases, the NZEB requirements for new buildings are stricter than those for NZEB renovation. On average, the **NZEB non-renewable primary energy demand of new buildings is about 30% lower than for renovated buildings**. This may also be explained by the fact that the renewable energy requirements are more common and stringent in new buildings compared to existing buildings.

Regarding the envelope, thermal transmittance (U-value, expressed in W/m²K) requirements for both new and existing NZEB buildings are provided in about 80-85% of current NZEB definitions. Values range between 0.09-0.49 W/m²K for roofs and 0.13-1.57 W/m²K for walls.

Most common NZEBs technologies include both passive solutions (e.g., sunshade, natural ventilation and lighting, night cooling), and active solutions (e.g., mechanical ventilation with heat recovery, heat pumps in combination with efficient lighting, appliances, and envelope). Several Member States also established cooling systems and lighting specifications.

5.2. NZEB uptake

In the available 2023 NECPR, progress towards Nearly Zero-Energy Buildings is reported by 15 countries, with a generally low level of completeness in their breakdown.

In terms of number of buildings, sixteen countries reported information on NZEB, but only for twelve of them it is possible to compare 2021 and 2022 data. In these cases, with the only exception of Romania and renovated NZEB in Hungary, the number of new and renovated NZEBs increased significantly from 2022 to 2021. In six countries the total number of NZEBs more than doubled in the period considered. Aggregating the MSs which reported data for both years, the overall number of NZEBs increased by 12%.

Table 15. New and renovated NZEB – Number of buildings (Source: NECPR 2023, NZEB data collection, JRC, 2023)

	2022			2021			Years (if different than 2021, 2022)				
	Total	New	Renov.	Total	New	Renov.	Total	New	Renov.	Year	Source
AT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	56 604	n.a.	2021-2022	NZEB data collection
BE-WA	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	9 300 building units	7 000 building units***	Jan'23 (new residential), Jan '22 (new non-residential), to date (renov) NZEB tables	NZEB data collection
BE-FL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	413 000	3 000 000 ***	Since 2006 (new), since 2015 (renov)	NZEB data collection
CZ	n.a.	n.a.	1 297	n.a.	n.a.	n.a.	n.a.	797 222	n.a.	Since 2020	NZEB data collection, NECPR
CY	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	19 227	16 798	2479	n.a.	NZEB data collection
DK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	69 381	17 307	n.a.	NZEB data collection
EE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3 052	4 000	2020-2023 (new), n.a. (renov)	LTRS2020, Building Registry
EL	18 614	1 281	17 333	12 721	493	12 228					NECPR
HR	3 346	3 048	298	1 361	1 193	168					NECPR
FR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
DE	n.a.	n.a.	n.a.	n.a.	125313	n.a.					NZEB data collection
IE	20 305	19 898	407	9 133	8 773	360	n.a.	64 534***	27 281***	By Q1 2023 (new), to date (renov)	NZEB data collection, NECPR
IT	10 830	8 863	1 967	7 307	6 603	704					NECPR
LT	186	183	3	81	79	2					NECPR
LU	7 630	7 630	n.a.	3 680	3 680	n.a.					NECPR
HU	12 212	11 436	1 083	7 258	6 491	1 284					NECPR
MT	4 747	n.a.	n.a.	4 615	n.a.	n.a.	32 077			n.a.	NZEB data collection, NECPR
NL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	146 500 building units	4 800***	Jan '23 (new), 2015-2020 (renov)	NZEB data collection

PT	553	535	18	11	11	0					NECPR
RO	50 565	n.a.	n.a.	58 728	n.a.	n.a.					NECPR
SI	n.a.	n.a.	n.a.	165	156	9					NECPR
SK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	21 940	3 390	Status: April 2023	NZEB data collection, Inforeg
FI	171 452*	n.a.	n.a.	163 843	n.a.	n.a.	n.a.	50 053	28 000**	2.3.2023 (new), n.a. (renov)	NECPR, energiatodistusrekisteri.fi
SE	25 007	n.a.	n.a.	21 770	n.a.	n.a.					NECPR

* Data reported for some countries in NECPR may indicate the total cumulative values and not only referring the ones created (built or renovated) in the MS a given year. This information is not specified in the NECPR
** Estimation based on energy certificate industry
***Only residential.

Fifteen Member States reported NZEBs progress in terms of floor areas and the details are shown in Table 16**Table 16.** New and renovated NZEB – Floor area (m^2) (Source: NECPR, JRC, 2023). Also measured in terms of floor area, data reported shows an overall increase in the uptake of NZEBs over the last two years. However, as in other sections of the NECPRs, the scarcity and dispersion of the data available hardly allow for general conclusions.

Table 16. New and renovated NZEB – Floor area (m^2) (Source: NECPR, JRC, 2023)

MS	2022			2021		
	Total	New	Renovated	Total	New	Renovated
DE	n.a.	n.a.	n.a.	n.a.	32 622 000.0	n.a.
EL	3 153 786.0	552 438.0	2 601 348.4	2 358 141.0	236 198.0	2 121 942.0
IE	3 323 271.0	3 135 115.0	188 156.0	1 693 395.0	1 636 632.0	56 763.0
FR	n.a.	n.a.	n.a.	n.a.	52 821 414	n.a
HR	1 782 998.5	1 608 124.7	174 873.7	781 875.2	671 734.5	110 140.8
IT	1 309 068.0	990 388.0	318 680.0	1 046 771.0	823 754.0	223 017.0
LT	334 650.0	331 831.0	2 818.0	773 593.0	201 378.0	2 623.0
LU	920046.0	920046.0	0	1919019.0	1919019.0	0
HU	4 422 995.0	3 937 395.0	562 101.0	3 143 370.0	2 778 994.0	487 395.0
MT	620 515.0	n.a.	n.a.	645 116.0	n.a.	n.a.
PT	129 983.0	118 306.0	11 677.0	1 700.0	1 700.0	0
RO	15 233 996.0	n.a.	n.a.	15 396 972.0	n.a.	n.a.
SI	n.a.	n.a.	n.a.	61 837.0	60 067.0	1 770.0
FI	49 694 834.0	n.a.	n.a.	46 798 291.0	n.a.	n.a.
SE	18 570 000.0	n.a.	n.a.	16 100 000.0	n.a.	n.a.

Notes: Data reported for some countries in NECPR may indicate the total cumulative values and not only referring the ones created (built or renovated) in the MS a given year. This information is not specified in NECPR. In bold are calculated values

In relation to information on NZEBs reported in the draft NECPs submitted until July 2023, some countries reported specific measures for NZEBs. The type of instrument of these measures is in most cases regulatory/economic (Cyprus, Estonia, Spain, Finland, Italy, Luxembourg, the Netherlands, Portugal), followed by information/education (Spain, Croatia, Portugal) and planning (Lithuania).

The EPBD recast proposal introduces the new definition of Zero-Emission Buildings (ZEBs) that will become the new standard for buildings of new construction or undergoing deep renovation and lead towards the 2050 vision of a decarbonised building stock. The ZEB concept will also address circularity and resource efficiency aspects, e.g., through the calculation of the

life-cycle Global Warming Potential. This will become a mandatory indicator to be calculated and disclosed in the Energy Performance Certificates for all new buildings, as of 2030.

6. Progress made in the implementation of the Ecodesign and Energy Labelling Working Plan 2022-2024

As regards the uptake of more **energy efficient and sustainable appliances and products**, progress has been made in executing the Ecodesign and Energy Labelling Working Plan 2022-2024[21], adopted on 30 March 2022.

New rules have been finalised for standby consumption of electrical appliances, for smartphones/tablets, for tumble dryers and for local space heaters, and several other reviews will be completed or launched by the end 2024. A Code of Conduct for Energy Smart Appliances is being finalised with the aim of mobilising the flexibility potential of appliances through interoperable solutions.

In parallel, new actions to facilitate compliance and market surveillance have been undertaken and public access to the European Product Registry for Energy Labelling (EPREL)[22] database was launched together with REPowerEU, giving citizens and public procurers a ground-breaking new tool to find efficient products among all those available on the EU single market. A new web portal giving easier access to targeted information about these policies for citizens, industry and authorities is being prepared and expected to launch by early 2024.

An overview of the status and progress of individual items of the working plan can found in Table 17.

Table 17. Overview of the status and progress of individual items of Ecodesign and Energy Labelling working plan

Product group[23]	Type(s) of measure[24]			Relevant acts/ legislation[25]	Deadline for evaluations, reviews and/or rescaling[26]	Status/ Next steps
	ED	EL	VA			
Heating and cooling						
Space and combination heaters	X			Regulation (EU) 813/2013 Council Directive 92/42/EEC	2018-09-26	Planned: Link to Have-Your-Say portal Publication for feedback 2024-Q1
		X		Regulation (EU) 811/2013	2018-09-16 2025-08-02	Planned: Link to Have-Your-Say portal Publication for feedback 2024-Q1
Water heaters/storage tanks + solar devices	X			Regulation (EU) 814/2013	2018-09-26	Planned: Link to Have-Your-Say portal Publication for feedback 2024-Q1
		X		Regulation (EU) 812/2013	2018-09-26 2025-08-02	Planned: Link to Have-Your-Say portal Publication for feedback 2024-Q1
Local Space Heaters (labelling in same regulation)	X			Regulation (EU) 2015/1188	2018-01-01	Planned: Link to Have-Your-Say portal
		X		Regulation (EU) 2015/1186	2023-08-02	Planned: Link to Have-Your-Say portal
Solid fuel local space heaters	X			Regulation (EU) 2015/1185	2024-01-01	Planned: Link to Have-Your-Say portal

21 Ecodesign and Energy Labelling Working Plan 2022-2024.
22 European Product Registry for Energy Labelling (EPREL).
23 NB. The short titles do not necessarily reflect full scope of products covered.
24 ED: Ecodesign rules, EL: Energy labelling rules (including tyre labelling), VA: Voluntary agreements.
25 Only basic act listed (not subsequent amendments).
26 For implementing regulations and delegated acts, the deadlines are for presenting the review to the Consultation Forum as specified in the review clause. For energy labels yet to be rescaled, also the deadline for this is as laid down in the framework regulation is mentioned. For the evaluations of the latter and of the tyre labelling regulation, the deadlines are those laid down by the co-legislators.

Air conditioners (incl. air to air heat pumps)	X			Regulation (EU) 206/2012	2017-03-30	Planned: Link to Have-Your-Say portal Publication for feedback 2024-Q1
		X		Regulation (EU) 626/2011	2016-07-26 2023-08-02	Planned: Link to Have-Your-Say portal Publication for feedback 2024-Q1
Solid fuel boilers	X			Regulation (EU) 2015/1189	2022-01-01	Planned: Link to Have-Your-Say portal
		X		Regulation (EU) 2015/1187	2022-01-01	To be initiated Link to Have-Your-Say portal
Air heating/cooling products	X			Regulation (EU) 2016/2281	2022-01-01	Planned: Link to Have-Your-Say portal
Other product groups with energy labels up for rescaling						
Ventilation units (labelling for residential only)	X			Regulation (EU) 1253/2014	2020-01-01	Planned: Link to Have-Your-Say portal
		X		Regulation (EU) 1254/2014	2020-01-01	Planned: Link to Have-Your-Say portal
Tumble driers	X			Regulation (EU) 932/2012	2017-11-02	Planned: Link to Have-Your-Say portal Adopted – awaiting objection period before publication in OJ Link to Transparency Register
		X		Regulation (EU) 392/2012	2017-05-29 2023-08-02	Planned: Link to Have-Your-Say portal Transmitted for scrutiny before adoption and publication in OJ Link to Reg.Com.
Vacuum cleaners	X	*		Regulation (EU) 666/2013	2018-08-02	Planned: Link to info on Have-Your-Say portal *(New EL: Link to info on Have-Your-Say portal)
Domestic cooking appliances: ovens, range hoods, hubs (NB: no label for hubs)	X			Regulation (EU) 66/2014	2021-02-20	Planned: Link to Have-Your-Say portal
		X		Regulation (EU) 65/2014	2023-08-02	Planned: Link to Have-Your-Say portal
Other priority reviews						
Horizontal: Standby / off mode consumption	X			Regulation (EC) 1275 /2008	2016-01-07	Adopted and published in OJ
Water pumps	X			Regulation (EU) 547/2012	2016-07-15	Planned: Link to info on Have-Your-Say portal
Industrial fans	X			Regulation (EU) 327/2011	2015-04-26	ISC
Circulators	X			Regulation (EC) 641/2009	2017-01-01	
External power supplies	X			Regulation (EU) 2019/1782	2022-11-14	Planned: Link to info on Have-Your-Say portal
Computers	X	*		Regulation (EU) 617/2013	2017-01-17	Planned: Link to info on Have-Your-Say portal *(New EL: Link to info on Have-Your-Say portal)
Simple set-top boxes	X			Regulation (EU) 107/2009	2014-2-25	Repealed
Tyres		X[27]		Regulation (EU) 2020/740	2025-06-01	To be initiated.
Other reviews						
Servers and data storage products	X			Regulation (EU) 2019/424	2022-03-31	To be initiated
Horizontal: energy labelling framework legislation		X		Regulation (EU) 2017/1369	2025-08-02	To be initiated
Welding equipment	X			Regulation (EU) 2019/1784	2024-11-14	To be initiated
Power transformers	X			Regulation (EU) 548/2014	2023-07-01	To be initiated

[27] Adopted by Council and Parliament through ordinary legislative procedure.

Electric motors + var. speed drives	X			Regulation (EU) 2019/1781	2023-11-14	To be initiated
Professional refrigeration equipment	X			Regulation (EU) 2015/1095	2020-05-25	Planned: Link to info on Have-Your-Say portal
		X		Regulation (EU) 2015/1094	2020-05-25	Planned: Link to info on Have-Your-Say portal
TVs/Electronic displays	X			Regulation (EU) 2019/2021	2022-12-25	Planned: Link to Have-Your-Say portal
		X		Regulation (EU) 2019/2013	2022-12-25	Planned: Link to Have-Your-Say portal
Light sources and (only for ecodesign) separate control gears	X			Regulation (EU) 2019/2020	2024-12-25	To be initiated
		X		Regulation (EU) 2019/2015	2024-12-25	To be initiated
Household dishwashers	X			Regulation (EU) 2019/2022	2025-12-25	To be initiated
		X		Regulation (EU) 2019/2017	2025-12-25	To be initiated
Household washing machines + washer-dryers	X			Regulation (EU) 2019/2023	2025-12-25	To be initiated
		X		Regulation (EU) 2019/2014	2025-12-25	To be initiated
Refrigerating appliances (including Household fridges and freezers)	X			Regulation (EU) 2019/2019	2025-12-25	To be initiated
		X		Regulation (EU) 2019/2016	2021-01-01 2025-12-25	To be initiated
Refrigerating appliances w. a sales function	X			Regulation (EU) 2019/2024	2023-12-25	To be initiated
		X		Regulation (EU) 2019/2018	2023-12-25	To be initiated
		X		Regulation (EU) 2015/1187	2022-01-01 2025-08-02	To be initiated
Imaging equipment			X	COM (2013) 23	n.a.	Consultation Forum Q4
Game consoles			X	COM(2015) 178	n.a.	Consultation Forum Q4
Newly regulated products						
Smartphones, mobile phones other than smartphones, cordless phones and slate tablets	X			Regulation (EU) 2023/1670	n.a.	Adopted and published in OJ
		X		Regulation (EU) 2023/1669	n.a.	Adopted and published in OJ
Photovoltaics panels	X					Planned : Link to Have-Your-Say portal
		X				Planned: Link to Have-Your-Say portal
Low temperature emitters		X			n.a.	To be initiated
EV charing boxes	X	X			n.a.	To be initiated
Professional laundry	X	X			n.a.	To be initiated
Professional dishwashers	X	X			n.a.	To be initiated
Horizontal activities						
Key actions on EPREL (legal basis: Regulation (EU) 2017/1369 on Energy Labelling). Ongoing						
Key actions on market surveillance (legal basis: Regulation (EU) 2019/1020 on Market Surveillance). Ongoing						
Progress on standards (legal basis: ecodesign Directive and enegry labelling Regulaiton and Regulation (EU) No 1025/2012 on European standardisation). Ongoing.						
Total: 33 specific product groups, excl. standby, incl initiated new products	**31**	**17**	**2**	**54**	**38**	

APPENDIX A

Table A1. Summary of LTRS definitions used to define "worst-performing buildings"

Type of indicator	Frequency	Countries/regions that used this indicator	Definitions*
Energy class	9	BE (Flanders, Wallonia), BG, DE, FR, HR, LT, SE, SI	Buildings with EPC class: **C or below** (HR - coastal), **D or below** (HR - continental, LT), **E or below** (BG), **F or below** (BE, FR, SE, SI), **G** (DE)
Age	7	AT, EE, IT, RO, SE, SK, SI	Buildings built before: **1976** (IT), **1980** (AT, SI), **1983** (SK), **2000** (EE, RO); Buildings built between: **1945-1975** (SE)
Energy consumption	6	BG, DE, HU, LV, MT, RO	Buildings with annual consumption of more than: 76 kWh/m^2 (MT - delivered energy), 200 kWh/m^2 (DE, LV), 262 kWh/m^2 (MT - primary energy), 300 kWh/m^2 (HU, R0), 340 kWh/m^2 (BG)
No definition	12	BE-BCR, CZ, DK, EL, ES, FI, IE, LU, NL, PL, PT	-

*In some countries, the definition is based on the combination of these indicators.

Table A2. Definition of worst-performing residential buildings and associated share of building stock as identified in the long-term renovation strategies (countries with no definition are not included in the table)

	Definition
BE	Energy classes F or lower
BG	Energy classes E, F, G
DE	Energy class G or H (>200 kWh/m²)
EE	Built before 2000
FR	Buildings constructed before 1974 (OR building with class F or G)
HR	Buildings in energy class D or below for continental Croatia and class C or below for coastal Croatia (energy classes defined based on heating need)
IT	Buildings constructed before 1976
LV	Buildings with a consumption that over the last three calendar years exceeds 200 kWh/m^2 per annum or 150 kWh/m^2 per annum, where the heat is used exclusively for residential heating.
LT	Building in energy class D or lower
LU	(i) conditionally rehabilitable buildings (buildings under protection as historical monuments or listed groups of buildings); (ii) buildings that are not under protection as historical monuments or listed groups of buildings and that have the highest average energy consumption; (iii) underoccupied buildings; and (iv) social housing
HU	Buildings consuming more than 300 kWh/m^2.y
MT	Buildings that consume more than 76 kWh/m^2 per year of delivered energy (262 kWh/m^2 of primary energy)
AT	Styria region: all buildings built before 1980 are identified as worst-performing (in 1883 the first energy regulation was introduced)
PT	The strategy until 2030 is to tackle first the buildings prior to 1990. 65% of housing buildings pre 1990 will be subject to "some renovation" to improve comfort according to their needs. Portugal has defined in its LTRS that due to the features of the building stock, the totality of the stock is to be renovated until 2050 because that by then the present energy efficient buildings will be needing renovation too.
RO	Buildings constructed before 2000 with the final energy use above 300 kWh/m²/year and heating energy use above 200 kWh/m²/year and well connected to transport and communication systems and core public services (health, education, social protection) to avoid investments in buildings that are more likely to be abandoned
SI	Buildings in energy class F and G
SK	Buildings built before 1983
FI	Buildings in energy class F and G
SE	Energy class F and G, usually older public housing erected in 1945 to 1975