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Updates on the Energy Performance of Buildings Directive implementation in the EU Member States

2023 assessment

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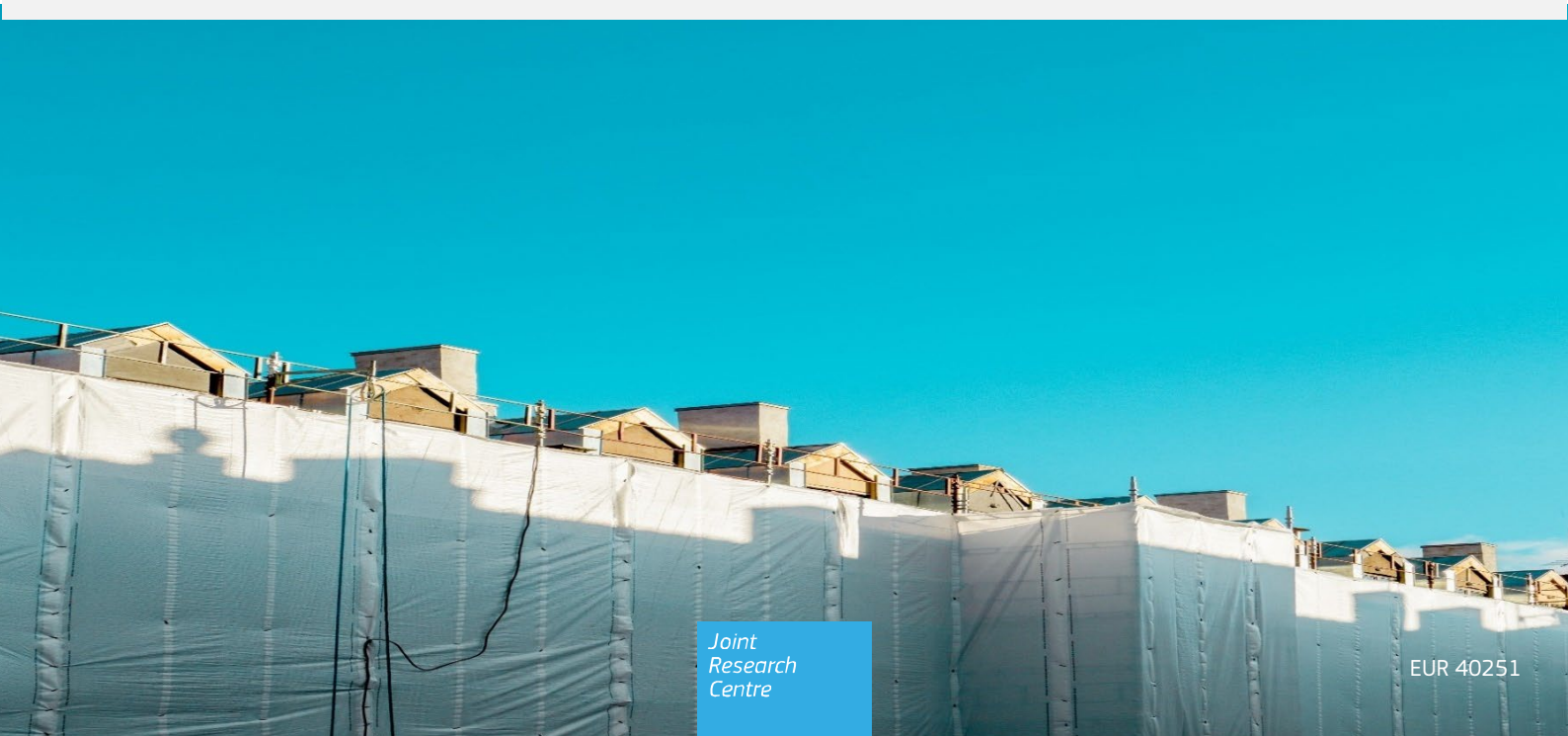

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Contents

Abstract

The building sector plays a crucial role in European Union (EU) policies due to its substantial potential for reducing energy consumption and greenhouse gas (GHG) emissions. The Energy Performance of Buildings Directive (EPBD) serves as the key legislative tool for advancing the energy efficiency of EU buildings.

This report outlines the current status of Member States in enhancing building energy performance and offers projections for future energy savings and GHG emission reductions. It relies on national strategies and plans developed by countries, such as Long-Term Renovation Strategies, integrated National Energy and Climate Progress Reports, Energy Performance Certificate schemes, and equivalence reports for technical building system inspections and EU databases.

Results reveal decreasing trends in final energy consumption within the residential and services sectors over recent decades. Projections indicate that, by 2030, the building sector could achieve a 14% reduction in final energy consumption and a 35% decrease in direct GHG emissions compared to 2019 levels. However, these figures fall short of the Climate Target Plan and the new energy efficiency targets. Data from 2020 and 2021 reveal varying progress among Member States towards their 2030 targets, with some requiring additional efforts to meet their goals. The forthcoming National Building Renovation Plans are anticipated to feature updated targets aligning with the EU's enhanced objectives.

The 2024 recast EPBD aims to accelerate energy efficiency upgrades and promote sustainable building practices, targeting a decarbonized building stock by 2050. The report highlights the importance of updating and strengthening policies and targets across Member States to meet the EU's energy and climate targets for 2030 and beyond.

Acknowledgements

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Executive summary

Policy context

The Energy Performance of Buildings Directive (EPBD) is a crucial component of the European Union's (EU) strategy to achieve a fully decarbonized building stock by 2050. It works in synergy with other EU climate and energy policies, including the Energy Efficiency Directive, the Renewable Energy Directive, and the Governance Regulation, to guide improvements in building energy performance. The 2024 recast EPBD aims to ensure that buildings align with the EU's ambitious targets under the European Green Deal and the Climate Target Plan.

Main findings

This report details the current progress of Member States in improving building energy efficiency and provides insights into future energy savings and emission reductions. It draws on national strategies and plans, such as Long-Term Renovation Strategies (LTRSs), integrated National Energy and Climate Progress Reports (NECPRs), Energy Performance Certificate (EPC) schemes, equivalence reports for technical building system inspection, as well as databases such as Eurostat and European Environment Agency.

From 2005 to 2022, the EU's overall residential energy consumption decreased by 23.9 Mtoe, representing a 9.0% reduction. After a notable increase in 2021, there was a decline of 17.7 Mtoe in 2022, likely due to milder winters. Residential energy consumption per capita (climatic corrected) remained relatively stable during the studied period, showing an annual average decrease of 0.03%. In the EU services sector, energy consumption decreased by 6.3 Mtoe from 2005 to 2022. At the same time, in 2022, the energy consumption was 7.7 Mtoe lower compared to 2021, representing a 6.1% decrease. The services sector energy intensity showed improvements for the period 2005-2022, with an annual average reduction of 1.38% at the EU level. The increase in energy prices (electricity and gas) and the EU's 'Save Energy' communication, which aims at reducing reliance on fossil fuels, may also have affected the decreasing annual trends.

The EU building stock holds the potential for substantial savings in final energy consumption and direct greenhouse gas (GHG) emission reductions. Indicative LTRS targets project final energy savings of 14% and a 35% reduction in direct GHG emissions by 2030, compared to 2019 levels. Further reductions of 41% (energy) and 94% (emissions) by 2050 are projected. When compared to 2015 GHG emission levels, the 2020 LTRS targets for 2030 fall 38% lower, which is below the 60% reduction goal set by the Climate Target Plan. However, it is worth noting that the LTRS targets were set prior to the establishment of these EU targets, and in this analysis, the LTRS GHG emission values only account for direct emissions.

The analysis of countries' progress toward their 2030 LTRS energy and emissions targets, based on 2023 NECPR data for the years 2020 and 2021, is incomplete. The assessment is only possible for 17 countries regarding final energy and 14 countries regarding GHG emissions. While some Member States are making progresses, others are maintaining stable trends but may require additional efforts to meet their goals.

The report also reviews national EPC schemes and identifies three main approaches to energy class design: (i) based on energy indicators, (ii) comparison with a reference building, and (iii) other methods. Most schemes (70%) use energy indicators, with wide variations in boundaries. Some countries introduce additional energy classes based on specific end-uses or indicators, such as GHG emissions and renewable energy consumption.

Moreover, the report includes an assessment of equivalence reports from countries that have implemented alternative measures instead of regular inspection schemes for building systems. By 2023, about 20% of the Member States are implementing alternative measures. Most countries use a combination of advisory, regulatory, and financial measures, with advice and informational campaigns being the most common. However, the impact is quantified for only 38% of the implemented measures. This could imply that (i) alternative measures might offer greater benefits than those estimated in equivalence reports, and (ii) countries face challenges in quantifying the impacts of alternative measures, particularly advisory measures.

Efforts should focus on aligning existing building targets with more ambitious energy efficiency and decarbonisation goals for 2030, 2040, and 2050. Ambitious and appropriate policies and measures are essential to sustain progress towards achieving these targets. The recast EPBD introduces requirements to support energy and climate targets, including the submission of draft and final National Building Renovation Plans by December 2025 and 2026, respectively. It emphasizes increasing energy efficiency upgrades, deploying renewable energy, and phasing out fossil fuels in buildings. Additionally, it calls for a harmonized energy performance assessment and a comprehensive approach to building efficiency, considering life-cycle environmental impacts and benefits, such as improved health and reduced air pollution.

Related and future JRC work

The research was conducted by the JRC as part of its ongoing task to monitor Member States' implementation of EPBD provisions, within the framework of the administrative arrangement between DG JRC and DG ENER. Its aim is to offer updated insights into overall progress and provide evidence for future Directive amendments. Drawing on past JRC analyses, including evaluations of Long-Term Renovation Strategies, National Energy and Climate Plans and Progress Reports, Energy Performance Certificate schemes, and more, the report provides a comprehensive overview of several key requirements. It is anticipated that the study will be updated regularly to reflect ongoing efforts by Member States to improve building energy performance.

Quick guide

Following the introduction in Chapter 1, Chapter 2 evaluates the current trajectory of final energy consumption in both residential and service buildings. Subsequently, Chapter 3 outlines potential trends in final and primary energy savings and emissions reductions at both the Member States' and EU levels. Chapter 4 discusses recent developments in Energy Performance Certificate schemes, focusing on energy class design and the included end-uses. Chapter 5 examines the alternative measures that Member States are implementing instead of regular inspections of technical building systems (heating and cooling). Chapter 6 provides key takeaway messages.

1 Introduction

In the EU, the Energy Performance of Buildings Directive (EPBD) is identified as the main legal tool to enhance the energy efficiency of buildings. The Directive was adopted in 2002 as a major step towards improving the energy performance of buildings, and it has since played a crucial role in shaping EU energy policy in the building sector (European Commission, 2002). It introduced an energy performance calculation methodology for buildings, minimum requirements for new and large buildings undergoing major renovation, provisions for setting Energy Performance Certificates (EPC) schemes and conditions for the regular inspection of heating and cooling systems. The Directive was revised in 2010 to reinforce existing requirements and to introduce new ones, including a common framework for calculating cost-optimal energy performance levels, the concept of Nearly Zero-Energy Buildings (NZEBs), energy performance requirements for technical building systems, reinforced provisions for EPCs and inspection schemes, as well as requirements for national financial measures to improve the energy efficiency of buildings (European Commission, 2010). In 2018, the EPBD was amended to introduce new provisions for building renovation, electro-mobility, and smart technologies (European Commission, 2018a).

In 2024, the recast EPBD was adopted to meet the new EU objective of a minimum 55% reduction in GHG emissions by 2030, set by the EU Climate Law (European Commission, 2021a, 2024a). The recast Directive will contribute to reducing GHG emissions, final energy consumption, and energy consumption for heating and cooling in the building sector by at least 60%, 14%, and 18%, respectively, by 2030, compared to 2015 levels. It sets out how the EU can achieve a zero-emission building stock by 2050 by introducing minimum energy performance standards and progressive trajectories for building renovation to phase out worst-performing buildings, a definition of Zero-Emission Buildings - proposed to become the new building standard as of 2030 for all new buildings - and a definition for deep renovation. Additionally, it introduces strengthened EPC schemes and National Building Renovation Plans (NBRPs), as well as measures to phase out fossil fuel-powered boilers, promote solar technologies, and establish one-stop-shops for renovations. The recast EPBD also promotes the use of building renovation passports and requires the modernisation of building systems, aiming to increase electric vehicle charging points and bike parking, and to improve data collection and sharing on building stock and energy consumption.

This report assesses the Member States' targets and progress towards reducing final energy consumption and direct GHG emissions in the building sector by analysing data submitted through national strategies and plans, as required by EU policies. A key such plan is the national Long-Term Renovation Strategy (LTRS), as outlined in Article 2a of the 2018 amended EPBD, which has been updated to NBRPs in the 2024 recast EPBD (Article 3). The strategies include roadmaps with indicative milestones for 2030, 2040 and 2050, measurable indicators, such as expected energy and emission savings, renovation rates and wider benefits of energy efficiency upgrades (Castellazzi et al., 2022; European Commission, 2021b). The progress towards the national targets is assessed through data reported by Member States in the National Energy and Climate Progress Reports (NECPRs), which were submitted in 2023. Additionally, the report provides a comparison between projected energy savings based on Member States' targets and the energy saving share of residential buildings needed to meet the new energy efficiency target framed by the recast Energy Efficiency Directive (European Commission, 2023). It also investigates the potential reduction in primary energy consumption by 2030.

Moreover, a strong tool framed by the EPBD is the Energy Performance Certificate (EPC), formerly article 11, now article 19, which is mandatory for all buildings involved in real estate transactions. The Directive allowed Member States to use their own methodologies for energy performance

calculation and to design energy labels, which has resulted in differences in implementation details across the EU. The JRC conducted a survey to evaluate Member States' progress, and this report includes an analysis of energy class design and the end-uses included in the calculation of EPC labels (Ruggieri et al., 2023).

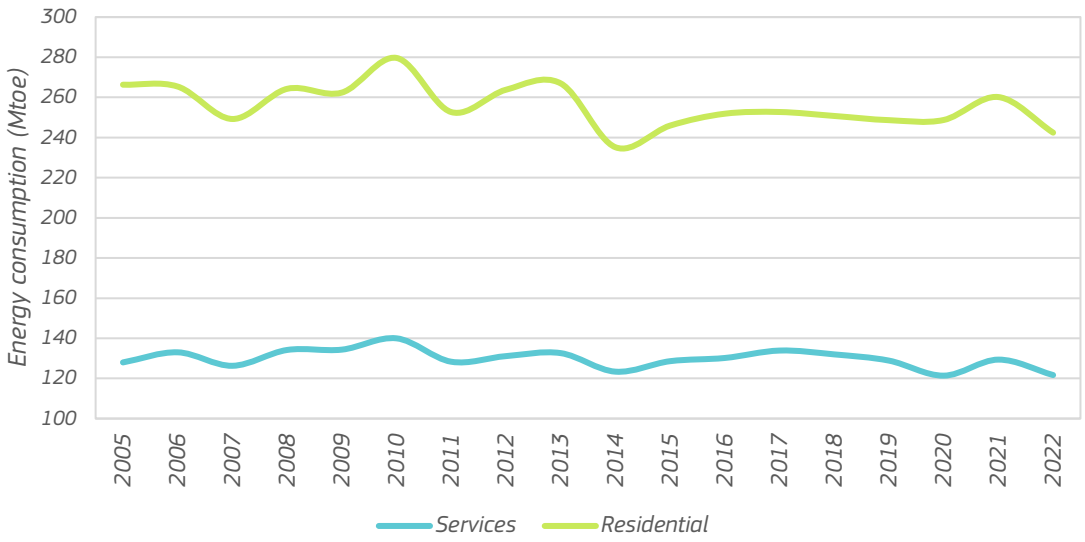
Another key requirement of the EPBD is the regular inspection schemes of technical building systems, aiming to promote the efficient use of these systems and reduce energy consumption and GHG emissions. Previously governed by Articles 14 and 15, which covered heating and air-conditioning systems, respectively, these requirements are now laid down in Article 23 of the recast EPBD. The report provides a comprehensive analysis of alternative measures that Member States are implementing instead of inspection schemes for technical building systems (Maduta et al., 2023). The assessment relies on the equivalence reports submitted by Member States together with the 2023 draft National Energy and Climate Plans (NECPs) (European Commission, 2024b).

2 Energy trends in the building sector

This chapter examines energy efficiency trends in the EU building sector from 2005 to 2022, the most recent year for which data was available at the time of analysis.

Between 2005 and 2022, the EU residential sector's final energy consumption declined by approximately 23.9 Mtoe, a 9.0% reduction compared to the 2005 baseline (Figure 1). A further decrease of 17.7 Mtoe was observed in 2022 compared to the previous year. In the EU services sector, final energy consumption decreased by 6.3 Mtoe over the 2005-2022 period, with a notable drop of 7.7 Mtoe between 2021 and 2022.

Figure 1. Final energy consumption in the EU27 residential and services sector, 2005-2022



Source: JRC elaboration based on Eurostat data, 2025

Energy consumption trends are influenced by a range of factors beyond energy efficiency, including economic activity, demographic changes, shifts in lifestyle, weather conditions, and extraordinary events such as the COVID-19 pandemic (Román-Collado and Economidou, 2021). According to their 2023 NECPRs, Member States identified the primary reasons for the increase in final energy consumption by sector in 2021. To further quantify the impact of these factors on energy consumption trends, an Index Decomposition Analysis was applied to the residential and service sectors. This analysis utilizes statistical data from Eurostat's energy balance statistics (Eurostat, 2024).

2.1 Residential

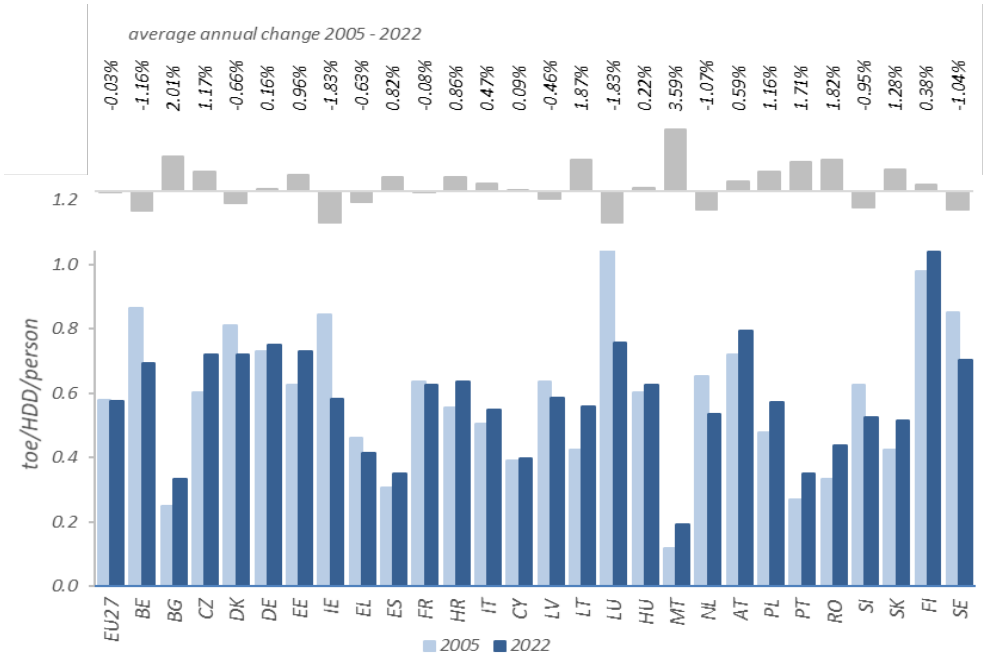
In 2022, the residential energy consumption decreased in 17 Member States compared to 2005. Considering population and climatic conditions (Heating Degree-Days)[1], the EU final energy

[1] A degree-day is defined as the difference in temperature between the outdoor mean temperature over a 24-hour period and a given base temperature. In this analysis, the climate correction is based on the average Heating Degree Day (HDD) for the period 2005-2022, retrieved from Eurostat.

consumption per capita (climatic corrected) decreased on an annual average by 0.03% (Figure 2). The highest average annual reductions in energy consumption are registered by Ireland and Luxembourg (-1.8% both of them) and Belgium (-1.2%). On the other hand, Malta (+3.5%), Romania (+1.8%) and Portugal (+1.7%) registered the highest increases in terms of annual average residential energy consumption per capita (climatic corrected) rates.

According to Member States' reporting, the increase in population and households, the worsening of winter/summer conditions as well as the increase in disposable income of households, were among the main reasons for increasing residential energy consumption in 2021. At the same time, decomposition analysis showed that at the EU level, the combined impact of weather and wealth effects offset both the overall positive population and intensity effects.

Figure 2. Climate-normalised residential final energy consumption per capita and average annual change in 2005-2022



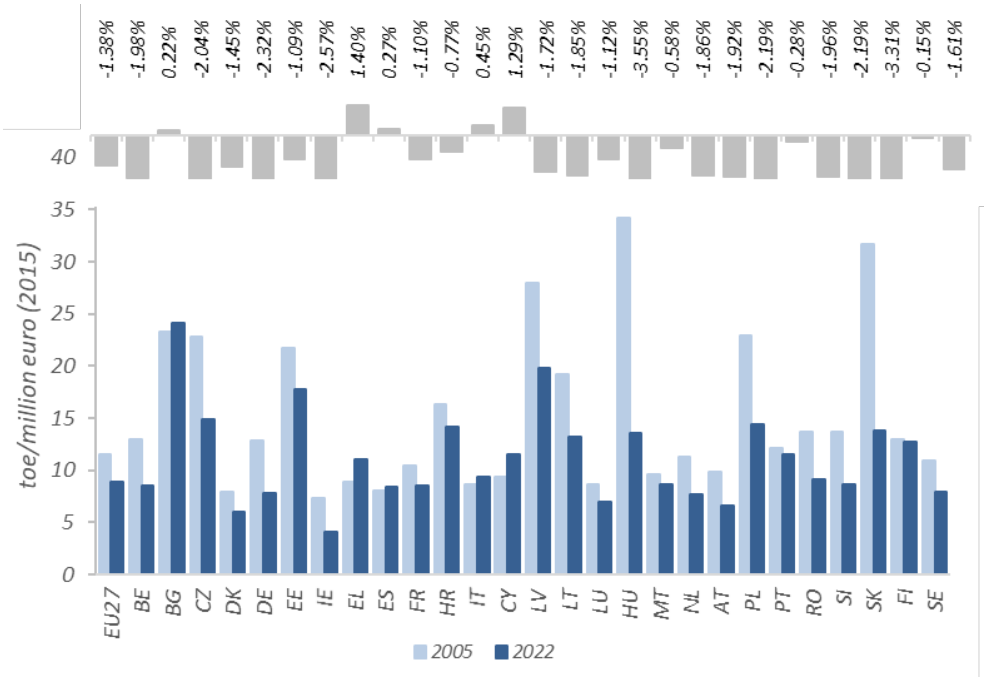
Source: JRC elaboration on Eurostat data, 2025

2.2 Services

The final energy consumption in the service sector declined by 6.1% from 2021 to 2022. A portion of this decrease may be attributed to the warmer winter of 2022, which led to reduced energy use for space heating in service buildings. At the national level, energy intensity in the services sector decreased in all but five Member States between 2005 and 2022, with Hungary (-3.6%), Slovakia (-3.3%), and Ireland (-2.3%) achieving the most significant reductions (Figure 3). Conversely, Greece (+1.4%), Cyprus (+1.3%), and Italy (+0.5%) recorded increases in their annual average energy intensity rates.

Member States that reported an increase in energy use attributed this trend to several key factors, including economic growth, worsening winter climatic conditions compared to the previous year, an increase in services' Gross Value Added, and rising employment levels. A decomposition analysis of the productive sector (which includes the service sector) revealed that the employment effect is the most significant driver of national energy consumption.

Figure 3. Final energy intensity in the services sector and average annual change in 2005-2022



Source: JRC elaboration based on Eurostat data, 2025

3 Energy and emission targets

This section provides insights into the targets set by Member States for final energy consumption and greenhouse gas (GHG) emissions in buildings, as outlined in the 2020 Long-Term Renovation Strategy (LTRS) roadmaps.

3.1 Energy targets

Table 1 presents the indicative targets for energy consumption across the EU building stock for 2030, 2040, and 2050, along with the corresponding energy savings compared to a reference year, as reported by Member States in the LTRS roadmap. To ensure consistency, all measurement units have been converted to ktoe (thousand tonnes of oil equivalent).

Table 1. Energy consumption and saving targets for buildings reported in the 2020 LTRSs

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 (%)
Austria	2017	9 235	9 235	0%	9 235	0%	9 235	0%
Brussels	2015	1 230	n/a	-	n/a	-	n/a	-
Flanders	2020	3 353	2 580	-23%	1 806	-46%	946	-72%
Wallonia	2017	3 543	2 416	-32%	1 591	-55%	1 479	-58%
Bulgaria	2020	n/a	-251	-	-560	-	-630	-
Cyprus	2020	580	640	+10%	650	+12%	640	+10%
Czechia	2020	8 909	8 240	-8%	7 548	-15%	6 903	-23%
Germany	2018	78 819	47 807	-39%	n/a	-	n/a	-
Denmark	2020	4 247	n/a	-	n/a	-	n/a	-
Estonia	2020	1 006	n/a	-	n/a	-	413	-59%
Greece	2015	6 010	5 530	-8%	4 566	-24%	3 964	-34%
Spain	2020	26 163	22 426	-14%	18 562	-29%	16 572	-37%
Finland	2020	6 096	4 772	-22%	3 878	-36%	3 130	-49%
France	2015	n/a	n/a	-22%	n/a	-29%	n/a	-41%
Croatia	2017	3 177	3 250	+2%	2 940	-7%	2 513	-21%
Hungary	2018	5 828	4 681	-20%	559	-40%	373	-60%
Ireland	2018	4 215	n/a	-	n/a	-	n/a	-
Italy	2020	47 700	42 000	-12%	n/a	-	24 000	-50%
Lithuania	2020	3 510	2 989	-15%	2 226	-37%	1 390	-60%
Luxembourg	2020	902	673	-34%	553	-39%	453	-50%
Latvia	2018	1 910	1 480	-23%	n/a	-	n/a	-
Malta	2018	n/a	n/a	-18%	n/a	-20%	n/a	-25%
Netherland	2020	13 925	12 062	-13%	n/a	-	n/a	-
Poland	2018	27 000	26 000	-4%	n/a	-	n/a	-
Portugal	2018	n/a	n/a	-11%	n/a	-27%	n/a	-34%
Romania	2020	9 520	8 690	-9%	6 200	-35%	3 380	-65%
Sweden	2020	4 346	4 043	-7%	3 914	-10%	3 848	-11%
Slovenia	2020	1 531	1 268	-17%	1 186	-22%	1 190	-22%
Slovakia	2016	4 067	3 431	-16%	2 889	-29%	2 433	-40%

Notes: FEC – final energy consumption, PEC - primary energy consumption; **Flanders**: targets only for residential buildings; **Germany**: targets for PEC; **Denmark**: indicative targets 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 target for residential buildings (3917 ktoe) and public buildings (764 ktoe); 2040 and 2050 targtes only for public buildings; **Italy**: own calculation for 2030 target based on annual saving rate; **Lithuania**: targes for PEC; **Latvia**: 2030 targets from NECP; **Malta**: targets only for residential buildings; **Portugal**: targets for PEC; **Sweden**: heat and electricity targets for apartment buildings, schools, offices.

Source: JRC elaboration based on Member States reporting, 2025

The majority of countries used final energy consumption (FEC) to establish their targets, except for Germany, Lithuania, and Portugal, which referenced primary energy consumption (PEC). The reference year among countries ranges from 2015 to 2020, with 2020 being the most prevalent. It

is evident that energy-saving goals differ significantly across the EU, with some countries expecting a modest increase (Cyprus) or maintaining steady consumption (Austria), while others aim to reduce energy consumption in the building sector by 60-70% over the next 30 years (Flanders, Hungary, Latvia, and Romania).

3.2 Emission targets

The GHG emission targets for 2030, 2040 and 2050, as reported by Member States in the 2020 LTRSs are summarized in Table 2. To ensure consistency, all measurement units have been converted to $MtCO_2e$ (million tonnes of CO_2-equivalent).

Table 2. GHG emission and saving targets for buildings reported in the 2020 LTRSs

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 (%)
Austria	2020	8.15	5.55	-31%	3.94	-52%	2.57	-68%
Brussels	2020	4.20	2.80	-33%	1.80	-57%	0.90	-79%
Flanders	2018	12.20	9.40	-23%	5.90	-52%	2.30	-81%
Wallonia	2018	7.60	3.90	-49%	1.90	-75%	1.00	-87%
Bulgaria	2020	n/a	-1.31	-	-2.89	-	-3.27	-
Cyprus	2020	n/a	n/a	-24%	-	n/a	n/a	-
Czechia	n/a	44.57	n/a	-	n/a	-	26.74	42%
Germany	2020	118	70	-41%	n/a	-	n/a	-
Denmark	1990	n/a	n/a	-70%	n/a	-	n/a	-
Estonia	2020	4.43	n/a	-	n/a	-	0.48	-89%
Greece	2015	n/a	n/a	-50%	n/a	-70%	n/a	-100%
Spain	2020	28.42	18.56	-35%	6.58	-77%	0.21	-99%
Finland	2020	7.81	2.87	-63%	1.47	-81%	0.65	-92%
France	2018	82.00	45.00	-55%	25.00	70%	5.00	-94%
Croatia	2020	2.17	2.01	-7%	1.74	-20%	1.26	-42%
Hungary	2018-2020	n/a	n/a	19%	n/a	60%	n/a	-90%
Ireland	2019	13.50	7.43	-45%	n/a	-	n/a	-
Italy	2020	61.10	43.60	-29%	n/a	-	0.60	-99%
Lithuania	2020	5.29	4.00	-24%	2.11	-60%	0.02	-100%
Luxembourg	n/a	n/a	n/a	-62%	n/a	-96%	n/a	-
Latvia	2017	2.77	2.55	-8%	n/a	-	n/a	-
Malta	2018	0.71	0.44	-38%	0.27	-61%	0.17	-76%
Netherland	2020	23.10	15.30	-34%	8.40	-64%	1.50	-94%
Poland	2019	52.00	35.00	-33%	n/a	-	n/a	-
Portugal	2018	n/a	n/a	-15%	n/a	-47%	n/a	-77%
Romania	2020	9.84	7.50	-24%	4.90	-50%	1.90	-81%
Sweden	2018	0.89	0.01	-99%	0.00	-100%	0.00	-100%
Slovenia	2020	2.68	1.45	-46%	0.94	-65%	0.76	-72%
Slovakia	2016	8.54	5.50	-36%	3.40	-60%	1.80	-79%

Notes: **Denmark:** target across all sectors; **Luxembourg**: targets only for residential buildings; **Latvia**: 2030 target calculated based on the information provided in the strategy; **Sweden**: fossil fuels phased out entirely by 2045.

Source: JRC elaboration based on Member States reporting, 2025

Most Member States have provided absolute values of CO_2 or CO_2-equivalent emissions in buildings for 2030, 2040, and 2050, along with a reference emissions value used to estimate the percentage savings. The reference year varies between 1990 and 2020, with 2020 being the most common. Overall, the targeted GHG emission reductions appear ambitious across the EU. By 2050, Greece, Italy, Lithuania, and Spain aim to achieve fully decarbonized building stocks, while Sweden targets this goal by 2045. The Flanders region aims for zero emissions in public buildings by 2050. Additionally, Finland, France, Hungary, the Netherlands, and Slovenia are also targeting significant GHG emission reductions, aiming for over a 90% reduction by 2050 compared to their reference years.

3.3 Progress towards the targets

The subsequent sections offer an initial analysis of countries' progress toward their 2030 energy and emissions targets, using data extracted from the 2023 National Energy and Climate Progress Reports (NECPRs) covering the years 2020 and 2021.

3.3.1 Energy

Table 3 outlines the final energy consumption targets and milestones outlined by 17 countries in their 2020 LTRSs and 2023 NECPRs (countries not included in the table have not provided values in the NECPRs). The majority of countries have monitored their progress towards these targets based on annual final energy consumption, with some also reporting additional energy-related indicators, such as specific energy use.

Specifically, the table provides from left to right:

- Reference years and values used by countries to set targets in the LTRSs.
- Energy consumption (or energy savings in the case of Bulgaria) reported by the Member States for 2020 (by 17 countries) and 2021 (by 16 countries).
- 2030 targets set in the 2020 LTRSs.
- 2030 targets reported in the 2023 NECPRs.

Table 3. Summary of targets and milestones for building energy use reported in 2020 LTRSs and 2023 NECPRs

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%
Romania	2017	9 520	12 629	13 429	8 690	n/a
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

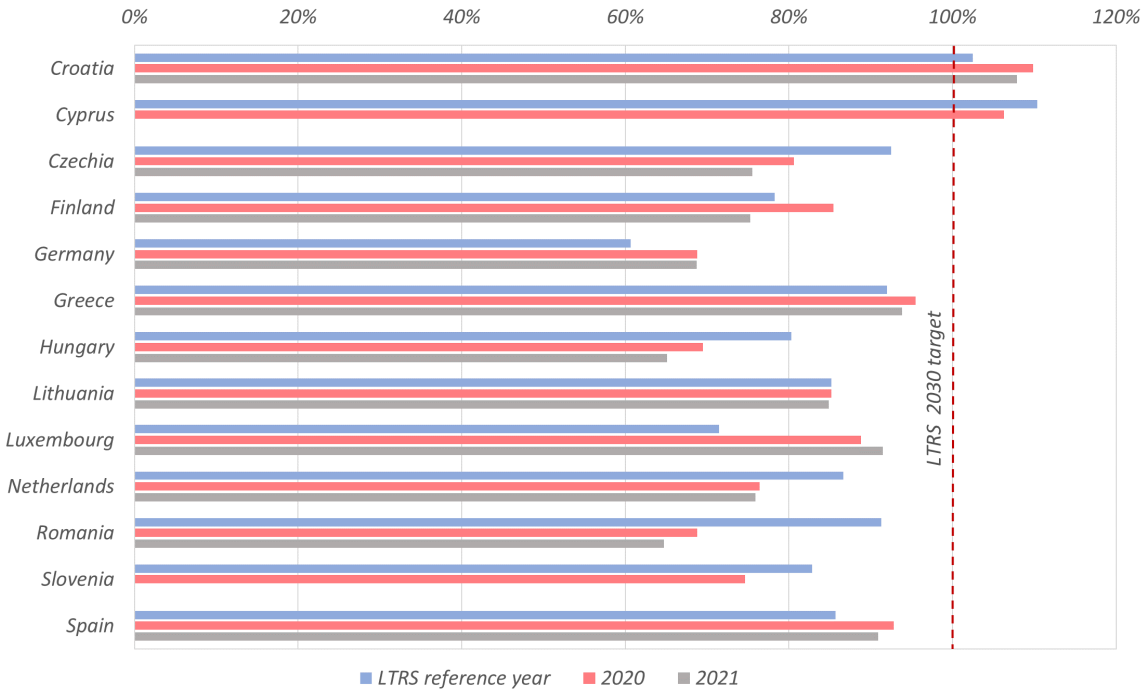
Notes: **Bulgaria**: final energy savings, no reference value provided; **Finland**: gross heating demand, NECPR target for 2050; **France:** LTRS/NECPR targets cover only the services sector. **Germany** and **Lithuania**: primary energy use; **Luxembourg**: values only for residential; **Poland**: 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.

Source: JRC elaboration based on Member States reporting, 2025

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 NECPRs for 2020, most likely because in the

LTRSs, these were only estimates. Nine countries (Bulgaria, Cyprus, Finland, France, Greece, Luxembourg, Poland, Slovenia and Spain) reported targets for final energy consumption and three countries (Germany, Lithuania and Portugal) reported primary energy targets in their NECPRs. All are aligned with the targets reported in their 2020 LTRSs. It appears that between 2020 and 2023, none of these countries revised their ambition for energy reduction, based on the data from the 2023 NECPRs compared to the 2020 LTRSs.

Figure 4. 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, 2025

To evaluate Member States' progress towards their indicative targets, Figure 4 illustrates the normalization of the 2030 target values established in the LTRS with energy consumption in 2021, 2020, and the LTRS reference year. A lower percentage indicates a greater deviation from the 2030 target. Values exceeding 100% suggest that the 2030 target surpasses the energy consumption value for the specific year considered (reference year, 2020, or 2021).

Among all countries, Croatia and Cyprus demonstrated energy consumption below the 2030 target in 2020 and 2021. However, both nations have set energy consumption targets higher than their respective LTRS reference values (Croatia +2%, Cyprus +10%; refer to Table 1). Conversely, in several countries (Czechia, Hungary, the Netherlands, Romania, and Slovenia), energy consumption in 2020 surpassed the LTRS reference value, indicating a deviation from the target. This trend is further accentuated in 2021, with Finland and Lithuania also reporting increased energy use compared to the LTRS reference year, aligning with these nations. In contrast, Greece, Germany, Luxembourg, and Spain show progress in achieving the LTRS energy use target in both 2020 and 2021, compared to the LTRS reference year.

3.3.2 GHG emissions

Figures on GHG emissions in buildings are highly incomplete and scattered in the NECPRs. Table 4 summarises the targets and milestones in GHG emissions in buildings as reported by 17 countries in their 2020 LTRSs and 2023 NECPRs (countries not included in the table have not provided values in the NECPRs). 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 - scope 1) or total emissions (including indirect emissions from electricity and heat used in buildings - scope 2). 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 targets in the LTRSs.
- 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 13 countries) and 2021 (by 14 countries).
- 2030 targets set in the 2020 LTRSs.
- 2030 targets reported in the 2023 NECPRs.

Table 4. Summary of targets and milestones for GHG emissions in buildings reported in 2020 LTRSs and 2023 NECPRs

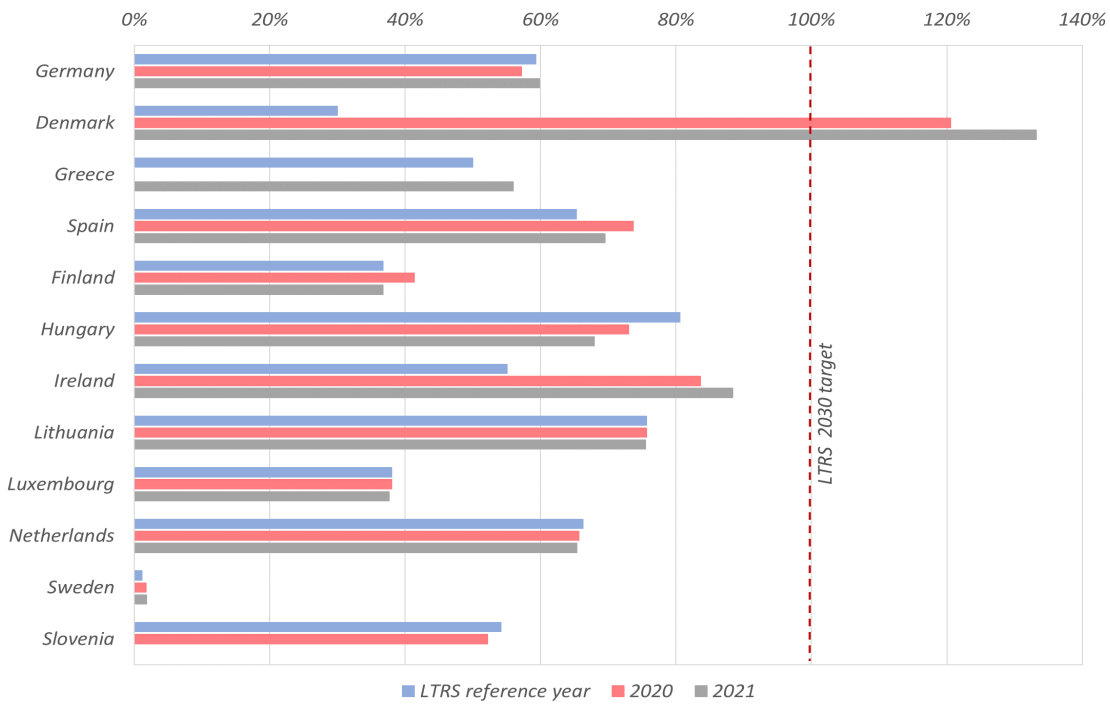
Member State	Milestones					Targets	
	LTRS		Emissions type	NECPR		2030	
	Reference year	Value ($MtCO_2$-eq)		2020 ($MtCO_2$-eq)	2021 ($MtCO_2$-eq)	LTRS ($MtCO_2$-eq or %)	NECPR ($MtCO_2$-eq or %)
Austria	2020	8.15	Direct	n/a	n/a.	5.60	5.60
Bulgaria	2020	n/a	Total	n/a	- 0.13	- 1.31	- 1.31
Denmark	1990	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	2018-2020	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.

Source: JRC elaboration based on Member States reporting, 2025

Nine countries reported emission targets in the NECPRs, and all are aligned with the 2020 LTRSs, thus no country revised the ambition in terms of GHG emissions reduction between 2020 and 2023.

Figure 5. Illustration of the national progress towards the 2030 GHG emission 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, 2025

To provide a better overview of how countries are progressing towards the 2030 GHG emission target, Figure 5 shows the 2030 target value set in the LTRSs normalised with the GHG emission values in 2021, 2020, and the LTRS reference year. The lower the percentage, the further a country is from the 2030 target. To note that although Sweden shows very low progress (2%), the country has set the highest ambition of nearly carbon free building stock by 2030 (0.01 $MtCO_2$-eq). Values greater than 100% indicate that the country has already attained its 2030 target (Denmark).

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

3.3.3 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 the NECPRs are highly incomplete, with only eight countries reporting in this field. Data are also scattered across countries, years, depth of renovation (light, medium, and deep), building use (residential, non-residential, and public), and unit of measure (building units and floor area). This makes it very difficult to obtain a complete overview, perform comparisons, and draw general conclusions at the EU level

This section provides an overview of the Member States' progress towards the 2030 target set for building renovation in the 2020 LTRSs, using progress indicators provided in the 2023 NECPRs. The following is a summary of milestones and targets solely for building renovation (Table 5).

Table 5. Summary of milestones and targets for building renovation in 2020 LTRSs and 2023 NECPRs

Member States	Milestones			Targets	
	LTRS	NECPR		2030	
	Ref. 2020	2020	2021	LTRS	NECPR
Austria	1.5% p.a.	3 414 000 m^2	3 887 000 m^2	1.5% p.a.	n.a.
Bulgaria	n.a.	n.a.	61 672 m^2	22 203 509 m^2 (8%)	22 203 509 m^2
Croatia	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.
Czechia	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.
Estonia	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
Greece	n.a.	n.a.	n.a.	23% cumulative res.; 9% cumulative non-residential	12-15% cumulative
Hungary	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
Ireland	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
Italy	0.86% p.a.	8 559 693 m^2 2.4% p.a. residential. 0.4% p.a. non-res.	16 754 527 m^2 3.1% p.a. residential 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
Latvia	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
Luxembourg	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
Lithuania	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
Malta	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
Netherlands	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 buildings label G to C by 2027; 15% worst-performing non-residential label F to C by 2030
Poland	n.a.	n.a.	n.a.	3.6% p.a. (236 000/year) 2 360 000 cumulative	2 400 000 units cumulative (500 000 deep renovation)
Portugal	n.a.	n.a.	n.a.	69% cumulative buildings (363 680 501 m^2	363 680 501 m^2
Romania	0.5% p.a., 6% cumulative floor area 32 352 000 m^2	40 495 units	26 801 units	0.5% to 3.39% p.a. in 2030, 19% cumulative floor area 339 726 cumulative units	0.5% to 3.39% p.a. in 2030

Member States	Milestones			Targets	
	LTRS	NECPR		2030	
	Ref. 2020	2020	2021	LTRS	NECPR
Slovenia	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.

Source: JRC elaboration based on Member States reporting, 2025

Comparing the 2020 LTRSs with the 2023 NECPRs 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 upgrade.

3.4 Estimated 2030 target at EU level

This section elaborates on the indicative targets reported by Member States in the national 2020 LTRSs to derive an EU figure of the final energy and corresponding emission savings in buildings. Adjustments are applied to the data provided by Member States, in relation to the reference value, end-uses and building categories. The methodologies are presented in Box 1 (energy savings) and Box 2 (GHG emission reduction).

Box 1. Methodology to derive an aggregated EU target for energy savings in building based on the LTRSs

(1) Reference value

In the LTRSs, the reference values of energy consumption correspond to different years. Additionally, some countries have not provided a reference value or have used primary energy consumption instead of final energy consumption (FEC) as an indicator. Here, the FEC in 2019, sourced from Eurostat[2]) was used as a reference value to calculate relative reductions.

(2) End-uses and building categories

The reference value covers FEC in households, commercial, and public services and includes: space heating, space cooling, water heating, lighting, appliances, cooking, and other minor end-uses. The 2030 target was derived from the reference value by applying the target relative energy reductions provided by the Member States, even when some countries did not consider all end-uses or all building categories.

(3) Missing milestones

The missing milestones were estimated as follows: (i) linear interpolation or extrapolation of given milestones, or (ii) adopting the average relative reduction at the EU level, calculated with the available target values. The same approach was adopted for countries that provided milestones in terms of primary energy consumption (PEC).

[2] https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_S__custom_2733739/default/table?lang=en

Box 2. Methodology to derive an aggregated EU target for direct GHG emission savings in buildings based on the LTRSs

(1) Reference value

In the LTRSs, the GHG emissions coming from various sources (consequently, corresponding to different years). Also, some countries have not provided a reference value. Here, one source with the same year values was used, namely the values reported by the European Energy Agency (EEA), for year 2019[3]. The relative reduction was calculated using the 2019 EEA dataset as reference, including the countries that have not provided a reference value.

(2) Emissions type

The reference values cover 1A4a (Residential) and 1A4b (Commercial and Institutional) sectors, which include direct emissions from fossil fuels used in households, commercial, and institutional buildings, and exclude indirect emissions linked to the use of electricity and district heating in buildings. As such, the indirect emissions were eliminated from the targets based on the information provided in the strategies of the countries under discussion.

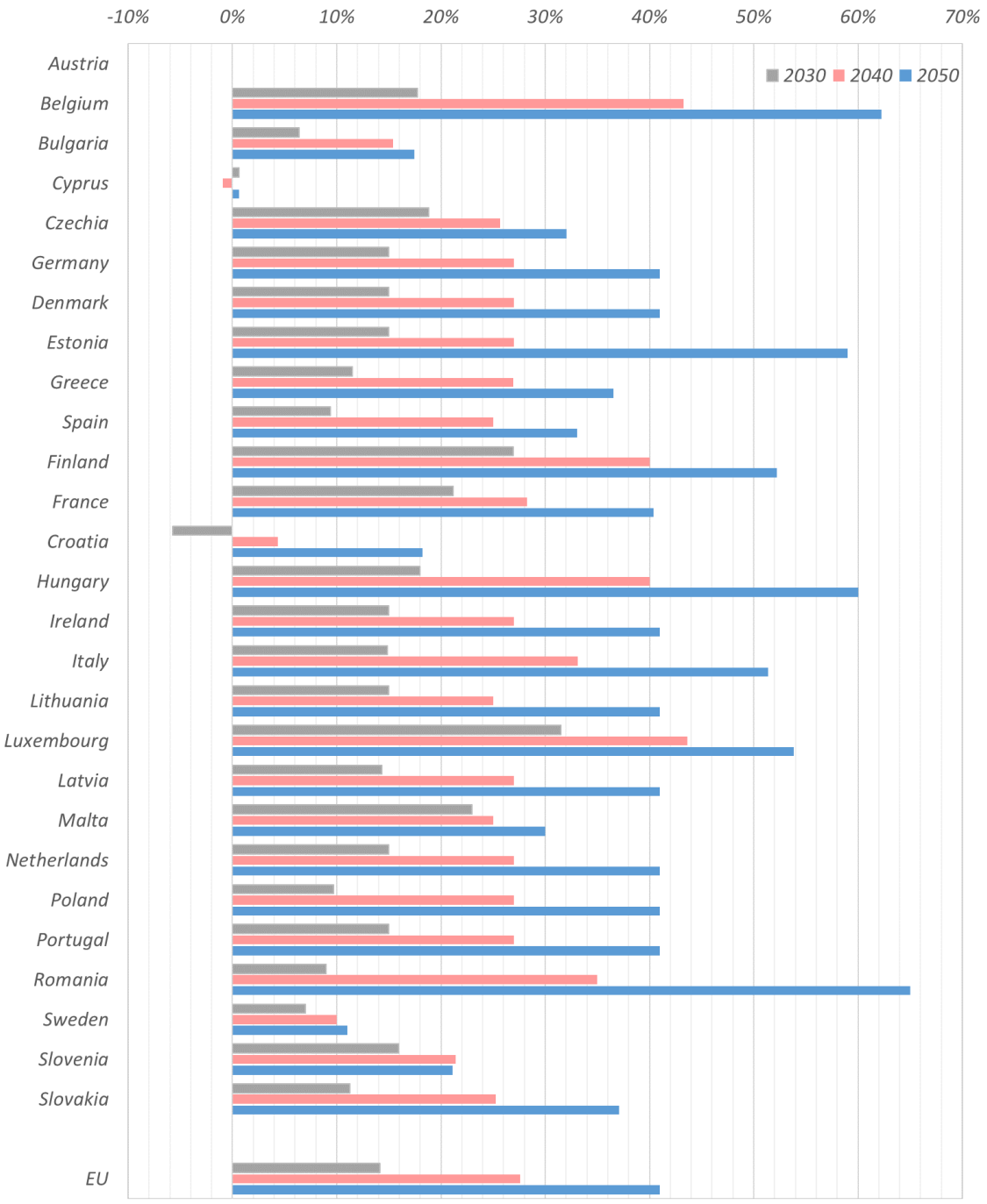
(3) Missing milestones

The missing milestones were estimated as follows: (i) based on the contextual information provided in the LTRSs, where available or (ii) linear interpolation/extrapolation of given milestones, or (iii) adopting the average relative reduction at EU level calculated with the available target values when none of the first two options could be applied.

Employing the methodology detailed in Box 1, Figure 6 shows the estimated energy savings by 2030, 2040, and 2050 compared to 2019 for each country and at the EU level. If Member States follow their indicative renovation roadmaps, the following energy savings in the EU building stock are estimated: 14% by 2030, 28% by 2040, and 41% by 2050 compared to the 2019 final energy consumption.

[3] https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer

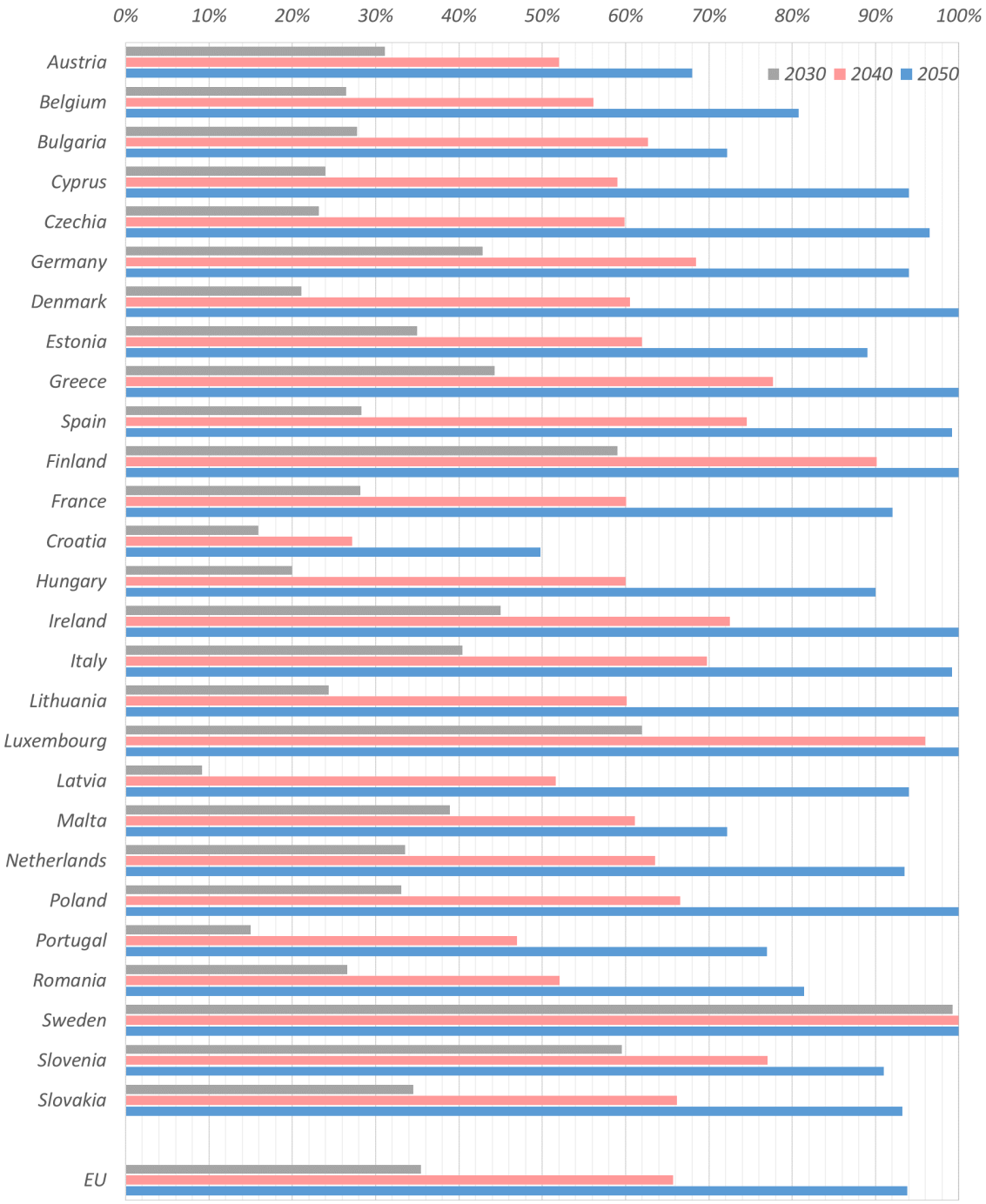
Figure 6. Final energy savings in buildings by 2030, 2040, and 2050 compared to 2019 ESTAT dataset based on 2020 LTRS targets



Source: JRC elaboration. 2025

Figure 7 shows that direct GHG emissions can drop by 35% by 2030, reaching a reduction of 66% by 2040, compared to 2019 levels. By 2050, the EU building stock can phase out fossil fuels almost entirely, with a reduction of 94% in direct GHG emissions compared to 2019 (-96% compared to 1990 levels).

Figure 7. GHG emission savings (direct emissions) in buildings by 2030, 2040, and 2050 compared to 2019 EEA dataset based on 2020 LTRS targets



Source: JRC elaboration. 2025

Other studies confirm these potential achievements in building stock renovation. One study found that EU building energy consumption could decrease by 15% by 2030 and by 48% by 2050, while direct carbon emissions could decrease by 40% by 2030 and by 75% by 2040, assuming an average annual renovation rate of 2.5%, encompassing building envelope upgrades and technical system replacements (Nijs et al., 2021). Another study suggested that carbon emissions could be reduced by approximately 30% by 2030 if building envelopes are renovated at a rate of 3% per year, based on a case study of 20 European cities (Pohoryles et al., 2020). Upgrading the energy

efficiency of external walls alone could lead to a 20% reduction in carbon emissions from heating and cooling use across the EU by 2050 (Gulotta et al., 2021). Moreover, (Zangheri et al., 2020) indicated that the residential sector could potentially save approximately 130 Mtoe of primary energy by 2030, compared to 2020. This projection is based on an annual renovation rate of 2.6% and the renovation of approximately 80% of existing residential buildings to 2018 national cost-optimal levels of energy performance.

These findings highlight the high potential of building renovation initiatives in contributing to energy efficiency and decarbonisation goals. However, achieving these goals require renovation rates more than double the annual rate[4] in 2020 which was at only 1%) and involve performance levels at least equal to, or exceeding, the current national requirements. Yet, the planned renovation rates reported by Member States in their LTRSs vary from 1% to 6%, with most aiming for an annual renovation rate between 1.5% and 3.0%. This may indicate that not all renovation strategies are ambitious enough to sustain the decarbonisation goal.

According to the Climate Target Plan, achieving the overall 55% reduction in GHG emissions by 2030 will require the EU building sector to make significant strides. Specifically, the sector must reduce its GHG emissions by 60%, final energy consumption by 14%, and energy consumption for heating and cooling by 18%, compared to 2015 levels (European Commission, 2020). In comparison to 2015 levels of GHG emissions (European Environment Agency, 2024), the 2020 LTRS targets for 2030 are 38% lower, while representing a 54% decrease compared to 1990 levels. It is essential to note that these values only account for direct GHG emissions. Regarding final energy consumption, the estimated 2030 target is about 14% lower than the 2015 levels (Eurostat, 2024).

Moreover, it is crucial to note that the 2020 LTRS targets were established before the introduction of the Climate Target Plan. Therefore, the draft NBRPs, due by 2025, are expected to provide updated targets that align with the more ambitious climate targets for 2030 and beyond.

3.5 Estimated primary energy savings by 2030

Since primary energy is a key indicator advocated by the EPBD, this section explores the projected primary energy consumption of buildings in 2030 using the indicative target for final energy consumption. The approach relies on the fuel mix in households and services, and the primary energy factor (PEF) for the main fuels considered in the national cost-optimal calculation for setting energy performance levels in buildings[5] (European Commission, 2024c). Total PEFs are collected for the following fuels: natural gas, electricity, solid biofuels, solid fossil fuels, heat, solar thermal, liquefied petroleum gases, ambient heat, and kerosene and reported in Table 6 (in alignment with the disaggregation by fuel type provided by Eurostat). When values were not available in the national report, additional literature was consulted (Latõšov et al., 2017; Mikučionienė et al., 2023). Finally, ISO 52000-1:2017 recommendations for total PEF were used when no reliable data at national level was found (values coloured in purple) (EN ISO 52000-1, 2017).

[4] Here, the renovation rate refers to the ratio between the floor area renovated annually and the total floor area of the building stock for renovation.

[5] The calculation of cost-optimal levels for minimum energy performance requirements is outlined in Article 6 of the recast EPBD (formerly Article 5 in the previous EPBD). The common methodology was introduced in 2012 through Delegated Act 244/2012, with the first round of calculations carried out by Member States in 2013 and subsequent rounds conducted every five years (2018 and 2023).

EU average represents the average PEF across Member States' national values. Primary energy consumption in buildings, year 2019 (Table 7), is calculated by multiplying the final energy consumption, year 2019, by fuel type (Eurostat, 2024), with its corresponding PEF (Table 6).

Table 6. Total primary energy factors (PEF) reported in the national cost-optimal calculation (2023 and 2018)

Member States	Electricity	Natural gas	Solid fossil fuels	Oil and petroleum	Solid biofuels	Heat	Solar thermal	Ambient heat
Austria	1.91	1.17	1.10	1.10	1.08	1.27	1.00	1.00
Belgium	2.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bulgaria	3.00	1.10	1.25	1.10	1.05	1.30	1.00	1.00
Cyprus	2.70	1.10	1.10	1.10	1.00	1.00	1.00	1.00
Czechia	2.60	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Germany	2.50	1.10	1.20	1.40	1.10	1.30	1.00	1.00
Denmark	2.18	1.10	1.00	1.00	1.00	0.91	1.00	1.00
Estonia	2.00	1.10	1.00	1.00	0.80	0.75	1.00	1.00
Greece	2.50	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Spain	2.35	1.20	1.03	1.00	1.20	1.30	1.00	1.00
Finland	1.20	1.00	1.00	1.00	1.20	0.50	1.00	1.00
France	2.30	1.00	1.00	1.00	1.20	1.00	1.00	1.00
Croatia	2.20	1.10	1.10	1.13	1.20	1.49	1.00	1.00
Hungary	2.50	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Ireland	2.50	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Italy	2.42	1.05	1.10	1.05	1.00	1.50	1.00	1.00
Lithuania	2.50	1.10	1.10	1.10	1.20	0.91	1.00	1.00
Luxembourg	2.60	1.10	1.10	1.10	1.20	0.65	1.00	1.00
Latvia	2.50	1.10	1.10	1.10	1.20	1.05	1.00	1.00
Malta	3.45	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Netherland	2.56	1.00	1.10	1.10	1.20	1.30	1.00	1.00
Poland	3.00	1.10	1.10	1.10	1.20	1.25	1.00	1.00
Portugal	2.50	1.00	1.10	1.00	1.00	1.00	1.00	1.00
Romania	2.50	1.17	1.20	1.50	1.08	0.92	1.00	1.00
Sweden	1.80	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Slovenia	2.50	1.10	1.10	1.10	1.20	1.30	1.00	1.00
Slovakia	2.50	1.10	1.10	1.10	1.20	0.70	1.00	1.00
EU average	**2.38**	**1.07**	**1.10**	**1.19**	**1.13**	**1.16**	**1.00**	**1.00**

Notes: EU average represents the average PEF across Member States national values.

Source: JRC elaboration, 2025

For 2030 estimates, the fuel mix is drawn from the LTRSs for Austria, Greece, Spain, Finland, Netherlands, Sweden, and Slovakia. For the other countries, the Fit-for-55 modelling scenario (including 2022 updates) is used (European Commission, 2021c). However, the Fit-for-55 model encompasses all sectors, potentially overlooking particularities of their building sectors' energy mix. Fuels are grouped into four categories: 1) fossil fuel, 2) electricity, 3) district heating, and 4) renewable sources. By applying national fuel mix shares and using the estimated final energy in 2030 (LTRSs), the amount of energy of each fuel is calculated. Then, the primary energy consumption in 2030 is calculated using the final energy by fuel type and the corresponding total PEF in 2030 (Table 7).

Assumptions are made for the 2030 PEF. Fossil fuels are assigned a total PEF of 1.1, while renewable energy maintains a total PEF of 1.0 across all Member States. Attention is particularly directed towards electricity and district heating due to their varied PEFs across countries and over time. A 15% reduction is applied to electricity PEF, aiming for an average PEF of 2.00 in 2030 (compared to 2.38 in 2019) (Esser and Sensfuss, 2016; Industry Association, 2018; SEAI, 2023). For district heating, a 10% reduction is applied, setting the EU average at 1.00 in 2030 (compared to 1.16 in 2020) (Esser and Sensfuss, 2016).

Table 7 shows the baseline (2019) and 2030 estimates. The primary energy consumption in buildings shows potential for a 20% decrease in 2030 compared to 2019 (456 Mtoe compared to 572 Mtoe), indicating a shift towards less carbon-intensive fuels. This method anticipates an overall reduction in PEF from 1.52 in 2019 to 1.41 in 2030, marking a 7% decrease.

All countries show reductions in primary energy consumption, however, the variations are wide, i.e., from 7% in Croatia and Romania, to 44% in Finland. These results are significantly influenced by the considered fuel mix and PEF adjustments in 2030.

Table 7. Final energy consumption (ktoe) and primary energy consumption (ktoe) in 2019 and 2030 and estimated savings (%) using building-related primary energy factors (PEF)

Member State	2019			2030			2030 compared to 2019	
	FEC (ktoe)	Average PEF (-)	PEC (ktoe)	FEC (ktoe)	Average PEF (-)	PEC (ktoe)	FEC change (%)	PEC change (%)
Austria	9 325	1.36	12 679	9 325	1.16	10 862	0%	- 14%
Belgium	12 464	1.41	17 538	10 255	1.38	14 137	-18%	- 19%
Bulgaria	3 430	2.04	7 013	3 211	1.61	5 160	-6%	- 26%
Cyprus	644	1.91	1 233	640	1.53	981	-1%	- 20%
Czechia	10 155	1.54	15 648	8 240	1.39	11 445	-19%	- 27%
Germany	85 277	1.52	129 604	74 191	1.48	109 968	-13%	- 15%
Denmark	6 309	1.30	8 185	5 426	1.21	6 551	-14%	- 20%
Estonia	1 418	1.17	1 660	1 219	1.16	1 408	-14%	- 15%
Greece	6 249	1.77	11 062	5 530	1.70	9 511	-12%	- 14%
Spain	24 758	1.75	43 235	22 426	1.53	34 359	-9%	- 21%
Finland	8 646	1.01	8 744	6 317	0.77	4 883	-27%	- 44%
France	61 530	1.57	96 703	48 507	1.34	64 981	-21%	- 33%
Croatia	3 074	1.52	4 685	3 251	1.34	4 371	+6%	- 7%
Hungary	7 727	1.44	11 165	6 336	1.35	8 555	-18%	- 23%
Ireland	4 699	1.62	7 589	4 041	1.35	5 457	-14%	- 28%
Italy	49 331	1.42	70 117	42 000	1.38	58 029	-15%	- 17%
Lithuania	2 074	1.53	3 176	1 763	1.53	2 700	-15%	- 15%
Luxembourg	981	1.49	1 457	672	1.37	918	-31%	- 37%
Latvia	1 757	1.41	2 486	1 505	1.27	1 905	-14%	- 23%
Malta	231	2.78	642	178	2.09	373	-23%	- 42%
Netherland	16 232	1.48	24 063	13 960	1.44	20 097	-14%	- 16%
Poland	28 802	1.58	45 649	26 000	1.47	38 217	-10%	- 16%
Portugal	5 251	1.73	9 105	4 463	1.82	8 103	-15%	- 11%
Romania	9 715	1.37	13 357	8 841	1.40	12 383	-9%	- 7%
Sweden	11 389	1.54	17 483	10 592	1.33	14 040	-7%	- 20%
Slovenia	1 509	1.69	2 554	1 268	1.42	1 805	-16%	- 29%
Slovakia	3 866	1.35	5 238	3 431	1.36	4 682	-11%	- 11%
EU	**376 843**	**1.52**	**572 070**	**323 588**	**1.41**	**455 879**	**-14%**	**- 20%**

Source: JRC elaboration, 2025

3.6 Focus on residential buildings

This section focuses on the residential building stock, given that households account for roughly 25% of final energy consumption in the EU, with approximately 65% attributed to space heating. The section presents the targets established by Member States to renovate residential buildings and reduce their energy consumption and GHG emissions by 2030. It also discusses whether and how these targets align with the new provisions introduced by the 2023 recast EED (energy efficiency target) and 2024 recast EPBD (national trajectories for progressive renovation of residential buildings).

Table 8 shows the targets that Member States set for their residential buildings in terms of energy consumption and GHG emissions and savings by 2030.

As energy indicator, most countries monitor the final energy consumption in addition to other indicators. However, Lithuania and Portugal focus on primary energy demand, while Germany on

non-renewable primary energy demand. Moreover, some countries address specific end-uses (energy for heating in Finland and Denmark) or fuels (gas and electricity in the Netherlands) or a combination (heat and electricity for apartments in Sweden). Regarding decarbonisation, most countries are monitoring the direct CO_2-equivalent emissions. Some countries refer to all (direct + indirect) emissions.

Table 8. Energy and emission reference values and 2030 targets for residential buildings reported by Member States in the 2020 LTRSs

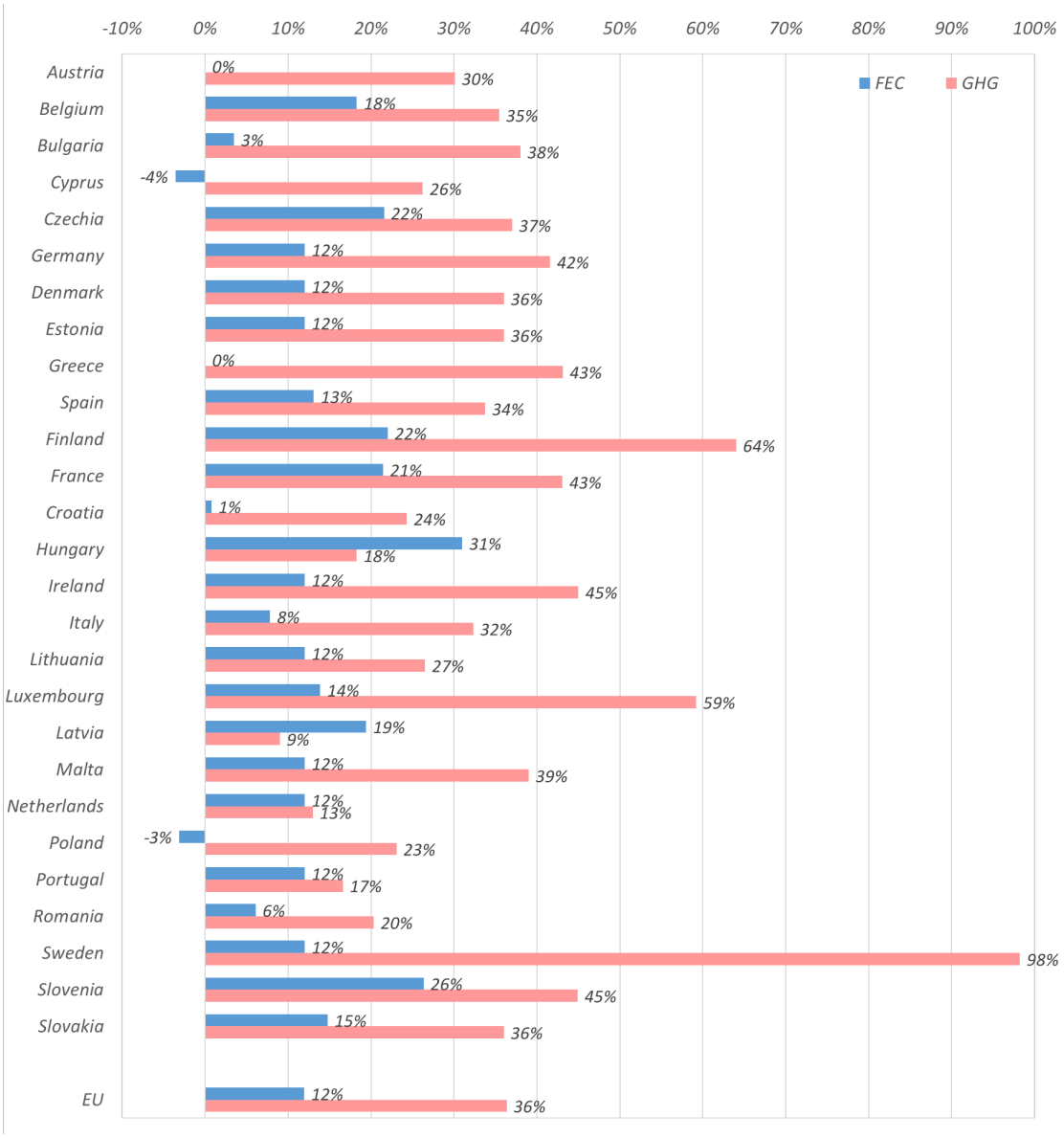
Member State	Reference value			2030 targets			
	year	FEC or PEC (ktoe)	Emissions (Mt CO_2e)	FEC or PEC (ktoe)	Energy savings (%)	Emissions (Mt CO_2e)	Emissions reduction (%)
Austria	2017	6 604	6.21	6 604	0%	4.69	25%
Brussels	2015	629	-	-	-	-	33%
Flanders	2018	4 703	8.90	3 574	24%	6.90	22%
Wallonia	2017	2 648	6.10	1 831	31%	3.00	51%
Bulgaria	2017	2 300	-	-213	-	-1.07	-
Cyprus	2020	380	-	373	2%	-	24%
Czechia	2020	5 947	-	5 541	7%	-	-
Germany	2018	40 600	-	24 766	39%	-	41%
Denmark	2020	3 242	-	-	-	-	-
Estonia	2020	602	2.60	-	-	-	-
Greece	2015	4 401	-	4 049	8%	-	50%
Spain	2020	14 825	16.87	12 556	15%	10.62	37%
Finland	2020	4 519	4.91	3 537	22%	1.75	64%
France	2015	39 911	-	31 131	22%	-	49%
Croatia	2017	2 353	1.53	2 214	6%	1.37	10%
Hungary	2018	4 986	-	3 917	21%	-	20%
Ireland	2018	2 749	5.78	-	-	3.18	45%
Italy	2020	32 000	44.10	28 700	10%	32.70	26%
Lithuania	2020	2 217	-	1 884	15%	-	24%
Luxembourg	2020	554	-	399	28%	-	62%
Latvia	2020	1 146	-	955	17%	-	-
Malta	2018	-	-	-	18%	-	39%
Netherlands	2020	8 169	15.90	7 285	11%	14.10	11%
Poland	2018	22 530	-	21 629	4%	-	33%
Portugal	2018	-	-	-	11%	-	15%
Romania	2020	7 989	-	7 270	9%	-	24%
Sweden	2020	3 006	0.89	2 781	7%	0.01	99%
Slovenia	2020	1 033	2.45	779	25%	1.35	45%
Slovakia	2016	2 683	5.43	2 253	16%	3.48	36%

Notes: FEC - Final energy consumption, PEC – Primary energy consumption. **Germany**: Non-renewable primary energy demand. **Finland**: Heating energy consumption. **Lithuania**: Primary energy demand. Netherland: Gas and electricity consumption. **Sweden**: heat and electricity in apartments.

Source: JRC elaboration, 2025

Employing the methodologies presented in Box 1 and Box 2, the targets expressed as energy saving and direct emission reduction by 2030, compared with 2019 are shown in Figure 8. The aggregated EU target is obtained as a sum of Member State targets recalculated as compared to 2019 national values for FEC (ESTAT) and direct GHG emissions (EEA).

Figure 8. Final energy savings and direct GHG emission reduction in residential buildings by 2030, compared to 2019



Source: JRC elaboration, 2025

As per the cumulative LTRS targets, residential buildings are projected to achieve a 12% reduction in final energy consumption and a 36% decrease in GHG emissions by 2030 across the EU, compared to the levels observed in 2019. This translates to approximately 30 Mtoe saved in final energy consumption and a reduction of 117 $MtCO_2$-eq in direct GHG emissions by the year 2030.

- Recast EED: 2030 Energy efficiency target

The 2023 recast EED aims for an 11.7% reduction in final energy consumption by 2030 compared to the 2020 reference scenario.

To offer perspectives on the actions required to enhance the energy efficiency of residential buildings in order to meet the new 2030 energy efficiency target, the target is translated into specific final energy consumption figures for space heating, space cooling, and domestic hot water

for every Member State. The calculation resulted in 71 Mtoe savings in final energy consumption of households that Member States have to reach all together in 2030 to reach the overall EED target.

Comparing the results with the 2020 LTRS estimated projections, the gap between the target (71 Mtoe) and projected final energy savings in the residential sector (30 Mtoe) is estimated at 41 Mtoe, corresponding to a percentage gap of 58%. This highlights that Member States are likely to revise their building stock targets to align with more ambitious climate and energy goals, as part of the NBRP draft, which is due by December 2025.

However, it should be stressed that both estimates (LTRS projections and EED sectoral target) are based on various assumptions for aggregation and harmonization, and the final energy saving target for residential buildings as well as the LTRS efforts may vary. A relevant assumption for comparison purposes is that the potential LTRS reduction will primarily occur in the energy use for heating, cooling, and hot water. Moreover, the 2020 LTRSs were designed considering the previous EU energy efficiency target aiming for a reduction of 32.5% final energy consumption by 2030 (relative to the 2007 reference scenario).

- Recast EPBD: National trajectories for progressive renovation of residential buildings

The 2024 recast EPBD introduced requirements for trajectories for the progressive renovation of residential buildings. The indicator is the reduction of primary energy use, expressed in kWh/(m^2y). Countries must set targets starting with 2030 and 2035, and every 5 years thereafter, with the aim of achieving a zero-emission building stock by 2050. The binding target for 2030 is a reduction of at least 16%, followed by 20-22% by 2035.

However, as highlighted in previous assessments of the 2020 LTRSs (Castellazzi et al., 2022; Maduta et al., 2023), final energy consumption (absolute values across the building stock) is the main indicator and very limited information is provided in additional indicators, such as specific primary energy consumption.

To provide a perspective on how closely Member States' 2020 targets align with the new EPBD requirements, the final energy use of residential buildings was translated into primary energy (in absolute values), using the methodology explained in Section 3.5 It was observed that most countries already have a higher share of renewable energy in residential buildings than projected in the Fit-for-55 model, and also lower shares of fossil fuels. This makes the 2030 energy mix targets of the model less suitable for the residential building stock. However, by adjusting only those countries where these shares were not compliant and applying the same PEF assumptions as in Section 3.5 an overall EU reduction of 17% in PEC by 2030 was projected. However, the targets vary widely across Member States, ranging from 3% to 41%. This suggests that several countries may need to revise their targets in accordance with Article 9 requirements to ensure that residential buildings achieve the binding targets for 2030 and 2035.

There are, however, limitations to these findings. The absolute values of primary energy use are used as a proxy for specific primary energy use, which does not accurately account for changes in floor area by 2030 (such as new constructions or demolitions). Additionally, the primary energy targets are estimated based on final energy targets set before the introduction of more ambitious EU requirements. The actual primary energy reductions will depend not only on the reduction in final energy use but also on the energy mix in the residential sector by 2030 and the decarbonisation of primary energy sources, particularly electricity and heat. Finally, the comparison is made using 2019 as the baseline year, rather than 2020, to ensure consistency with previous assessments. However, residential buildings across the EU showed similar energy use in both 2019 and 2020 (Tsemekidi-Tzeiranaki et al., 2022).

4 Energy performance certificates

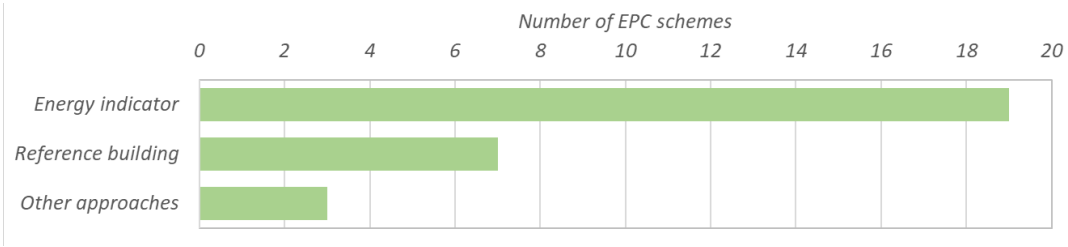
The Energy Performance Certificate indicates the energy performance of a building or a building unit calculated according to a methodology adopted based on the EPBD prescriptions, formerly outlined in Article 11. The 2024 recast EPBD introduces strengthened requirements for the EPC scheme, detailed in Article 19 and Annex V, while Articles 20 and 21 provide the framework for the issuance and display of EPCs, respectively. An EPC must be issued for buildings when constructed, renovated or involved in real estate transactions. Before the recast, the Directive allowed Member States to use their own methodologies to design energy labels. Consequently, implementation details differ across the EU resulting in incomparable schemes due to important inconsistencies related to calculation methodologies and energy label design.

The JRC assessed the progress of Member States in implementing the EPC scheme using data obtained through a survey conducted between July 2022 and February 2023. The focus was on how the energy classes and the energy indicators are defined, how climate zones are considered, how the floor area is defined, which end-uses are included in the calculation, if different building categories are assessed according to different approaches, and how the NZEB level is captured in the energy classes. The results are thoroughly discussed in (Ruggieri et al., 2023).

This section focuses on the main differences in the energy classes and energy indicators used to define energy classes and end-uses included in the calculation. The analyses rely on the JRC data collection further consolidated specific country information (Cohen et al., 2016; Concerted Actions EPBD, 2020; Gibbons and Javed, 2022; Ministry of Environment and Energy, 2017; OiB, 2019).

Regarding energy class design, three main approaches have been identified: (1) use of energy indicator, (ii) comparison with reference building, and (iii) other approaches. Figure 9 groups the existing national EPC schemes under these three approaches.

Figure 9. Energy class approach in EPC schemes



Source: JRC elaboration, 2025

In almost 70% of the EPC schemes (18 schemes), the energy classes are defined based on an energy indicator expressed in kWh/(m^{2}y). The boundaries vary greatly between countries according to the end-uses included in the calculation, whether expressed in final or primary energy, building type, and other parameters. The upper limit for class A may range between 0 and almost 300 kWh/(m^{2}y), while the lower limit for class G may range between 200 and 1005 kWh/(m^{2}y). For instance, in Finland energy class A for apartment blocks corresponds to primary energy consumption for heating, cooling, hot water, ventilation, lighting and equipment of a maximum of 75 kWh/(m^{2}y), while in Latvia energy class A denotes the primary energy consumption for heating of maximum 40 and 45 kWh/(m^{2}y) for residential and non-residential buildings, respectively. Moreover, in a few cases, the bands' boundaries vary with the building size (Denmark, Estonia, and Finland).

Countries defining energy classes based on the reference building use various indicators to make the comparison (e.g. total/non-renewable primary energy, U-values). Generally, the reference building has the energy performance according to current regulation, i.e., the national NZEB performance level, meaning that the comparison shows how the building in question performs compared to its NZEB counterpart.

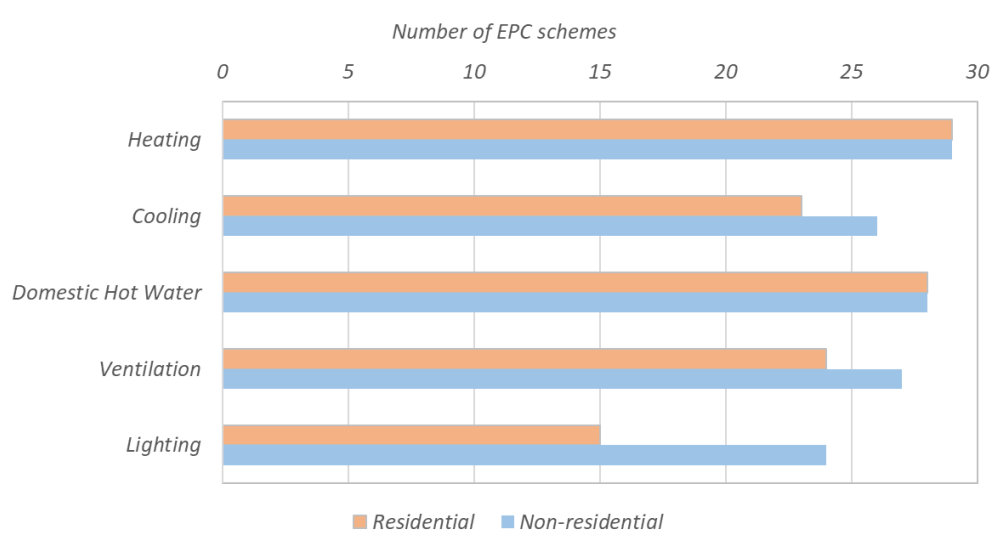
Besides energy indicator and comparison with reference building, a distinct approach to design energy classes was identified in Lithuania which uses a combination of various requirements (including non-renewable primary energy, envelope U-values and airtightness, heat recovery efficiency, etc.) for different energy classes (the higher the class, the more stringent the requirements). Finally, two countries (Malta, Poland) have not defined energy classes but use a coloured band from green to red on which the energy demand (in kWh/(m^2y) is shown. However, Poland has introduced indicative classes in the 2020 LTRS and planned to adopt energy class boundaries in the EPC in 2023.

The results show that Member States have implemented a different number of classes, from 6 (Latvia) to 15 (Ireland), thus making direct comparison very challenging. The energy classes range from A (or A++, A2020, AA++, A0, A1, A4, etc.), i.e. the most energy efficient, to J (or F, G, H, I, JJ, etc.), i.e. the least energy efficient energy class. Due to the various approaches, the energy labels are not directly comparable among Member States.

Moreover, one relevant inconsistency relates to the end-uses included in the calculation.

Figure 10 illustrates the main five end-uses and how many EPC schemes include them for residential and non-residential buildings. All EPC schemes, for both residential and non-residential buildings, cover the energy for heating, while only two schemes do not assess the energy for DHW preparation (to note that these two schemes define the energy label exclusively on the heating use). Among the five end-uses, the energy for lighting and cooling is the least addressed. Overall, the EPC schemes for non-residential buildings are more inclusive regarding the end-uses assessed with large differences regarding energy for lighting (16 schemes in residential vs 24 in non-residential).

Figure 10. Number of energy classes under EPC schemes across EU



Source: JRC elaboration, 2025

Several countries use additional energy classes defined based on different end-uses (distinct energy classes for heating, cooling, DHW, ventilation, and lighting energy demand), CO_2 emissions, final

energy, non-renewable primary energy, and others. All schemes, except four, report the renewable energy consumption. However, in some EPC schemes, this information is limited (i.e., if renewables are present or not) or reported indirectly (i.e., providing total and non-renewable energy demand). Moreover, all EPC schemes, except six, report the CO_2 emissions. Some schemes also show the possible CO_2 reduction if the recommendations provided in the EPC are implemented.

The 2024 recast EPBD (article 19) introduces measures promoting the harmonisation of EPC schemes across the EU. By May 2026[6] Member States will have to adopt the template provided in the recast Directive which provides a list of mandatory indicators, such as: energy class, primary and final energy use, energy needs, operational CO_2e emissions, life-cycle Global Warming Potential (if available), on-site renewable energy production, and share in the energy use, and other mandatory and optional elements. Moreover, the EPC schemes will also feature a closed scale using only letters from A to G. Letter A corresponds to the new concept of ZEB, while G covers the worst performing share of the national building stock. These changes are anticipated to enhance the consistency and harmonization of building energy ratings, making it easier for users to understand the energy performance of buildings.

[6] Member States that have rescaled their EPC classes between January 2019 and before 28 May 2024, may postpone the rescaling of their energy performance classes until 31 December 2029.

5 Inspection of building systems

Heating and cooling represents the biggest energy end-use sector and is responsible for half of the EU's final energy consumption. More than 75% of heating and cooling in buildings is supplied from fossil fuels through old and obsolete technical building systems. Article 23 in the recast EPBD lays down the requirements for inspections of heating, ventilation and cooling systems, including any combination thereof with an effective rated output of over 70 kW. Article 24 provides the framework for inspection reports. Before the recast, the inspection of heating and cooling systems was governed by Articles 14 and 15, respectively.

The inspection scheme shall include an assessment of the generators, circulation pumps and, where appropriate, components of ventilation systems, air and water distribution systems, hydronic balancing systems and control systems. The inspection shall cover the assessment of technical system efficiency and capacity (in relation to the building's energy requirements for heating and cooling) and consider the capabilities of the system to optimise its performance under typical operation conditions. This is important as such optimisation can achieve fast energy savings of around 30% with a short pay-back period (Schramm et al., 2017). Where relevant, the inspection shall include a basic assessment of possibilities to reduce the on-site use of fossil fuels, include renewable energy, change energy source or upgrade or replace existing system.

The assessment of system sizing is deemed unnecessary for repetition if post-inspection there are no modifications to either the systems or the building's energy requirements.

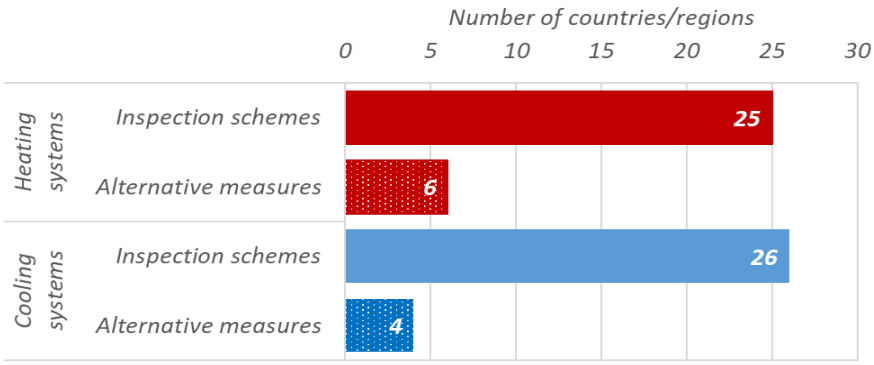
As an alternative to regular inspection, Member States may implement alternative measures, such as user advice concerning the system replacement or other modifications, as long as the overall energy efficiency impact is equivalent.

The recast EPBD asks countries to submit an analysis of inspections schemes and their results together with the NBRP, while countries optioning for alternative measures shall include a summarised analysis and results of the alternative measures.

By 2023, over 80% of the Member States are implementing inspection schemes for both heating and cooling systems, while the others are using alternative measures (Figure 11)[7]. Denmark, Finland, Germany, and Ireland have in place alternative measures instead of heating system inspection, while Denmark, Finland, Ireland, and Malta implement alternative measures instead of cooling system inspection. Belgium-Flanders and France adopted a combination of alternative measures and regular inspections (Flanders for both heating/cooling systems, while France only for heating systems). It is important to note that Sweden changed from alternative measures to inspection schemes as of 2021.

[7] In this assessment, the EU includes 26 Member States and three regions in Belgium resulting in 29 countries/regions. In some countries both inspection schemes and alternative measures are implemented, therefore, in Figure 18 the sum of schemes and alternative measure is higher than the number of countries/regions.

Figure 11. Inspection schemes and alternative measures for heating and cooling systems in the EU Member States



Source: JRC elaboration, 2025

An objective of regular inspection is to provide the building owner or tenant with a report, as outlined in Article 24 of the recast EPBD (previously Article 16). This inspection report is intended to communicate the findings and suggest cost-effective measures for enhancing the performance of the system. However, there is no obligation to oversee the actions of the owner or tenant in implementing the recommendations.

In most Member States, the impact of regular inspections has not been assessed so far (Concerted Actions EPBD, 2020). A common difficulty in assessing both the impact and the cost-effectiveness of the schemes was identified, as these actions are closely linked to the actions of users in applying the inspection recommendations. In Cyprus, it was estimated that the impact on energy savings would be around 10% if owners implement the recommendations. However, in Bulgaria, only a limited share of the carried-out inspections resulted in measures that eventually led to lower energy consumption. Malta reported that many building users were not aware of how to operate the technical systems effectively, so the main cost-effective recommendations relate to the operation and maintenance of such systems.

Regarding alternative measures, they should be implemented only after demonstrating the equivalence of their energy efficiency impact. In accordance with the 2018 amended EPBD, each Member State must submit an equivalence report as part of its National Energy and Climate Plan (NECP), as referred to in Article 3 of the EU Governance Regulation (European Commission, 2018b). However, Article 23 of the 2024 recast EPBD requires Member States to include a summarised analysis in the NBRP. The following sections delve into the analysis of equivalence reports submitted by Member States by 2023, examining the types of measures, the calculation methods used to validate their effectiveness, and the overall assessment.

5.1 Alternative measures

Since the equivalence reports submitted by Member States date prior to the publication of the recast EPBD, this assessment follows the requirements of the previous version of the Directive (Articles 14 and 15).

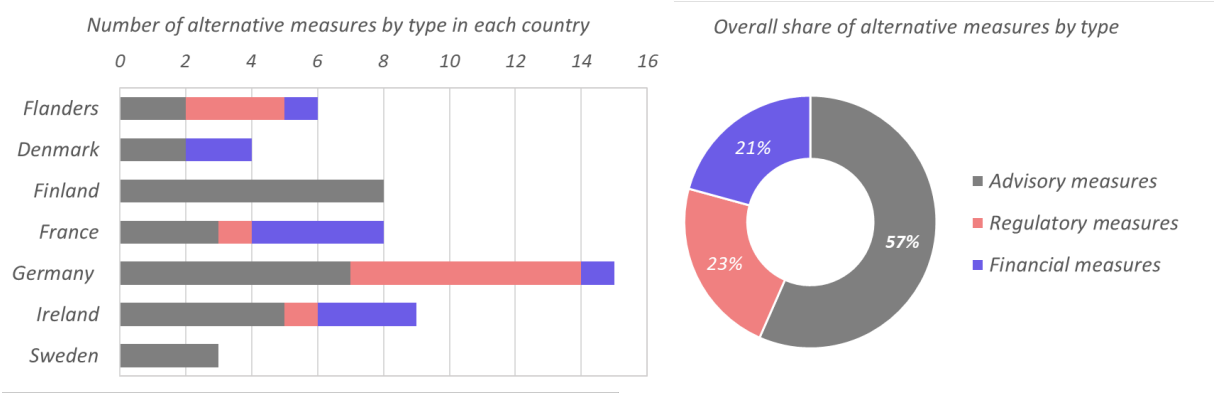
While some countries have been doing this exercise for several years, in some cases, the alternative measures followed the 2018 EPBD amendment. For instance, Belgium-Flanders introduced alternative measures for heat pumps complementary to inspection schemes already in place for other systems. Among countries opting for alternative measures instead of both inspection schemes for heating and cooling systems, only Ireland covered in two separate reports article 14 and article

15, respectively. Sweden initially implemented alternative measures from the time the requirement came into force until 2021, at which point it adopted regular inspection schemes. However, this analysis also covers the equivalence report of Sweden.

5.1.1 Type of measures

Over 50 measures (for both heating and air-conditioning systems) were extracted from the most recent equivalence reports (Figure 12). Germany leads with 15 measures, followed by Ireland with nine and France and Finland with eight. The complete list is included in Annex 1. Most countries use a combination of advisory, regulatory, and financial measures, where advice and informational campaigns represent almost 60% across all countries adopting alternative measures. Notably, Finland and Sweden exclusively implement advisory measures.

Figure 12. Type and number of alternative measures



Source: JRC elaboration, 2025

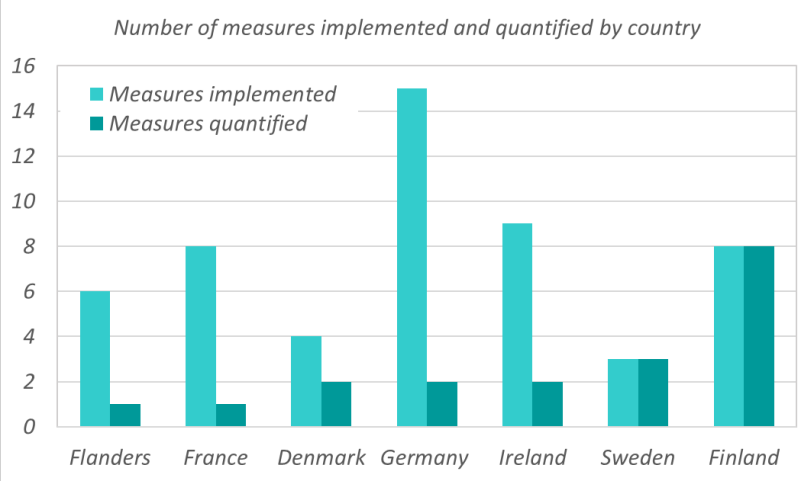
Frequently, countries practice personalized advice for system users to enhance energy efficiency and provide information on options and costs for upgrading, repairing, or replacing obsolete systems. In some cases, online tools are promoted to increase awareness of environmental impacts. Additionally, platforms for knowledge gathering and dissemination, expert training, and networking are reported.

Regarding regulatory measures, these are often linked with national regulations on boilers and other technical systems. Within this context, several reports highlight mandatory checks for certain systems or components (such as combustion boilers, refrigeration leaks, and the state of the heating pipes), along with corresponding maintenance tasks performed by qualified professionals. Moreover, some reports indicate the existence of minimum performance standards for new systems or the overall building, including Building Automation and Control Systems (BACS) and a ban on obsolete combustion boilers.

As financial measures, the equivalence report most frequently mentions subsidies and grants to modernise or replace obsolete heating/cooling systems with a particular interest in heat pumps. In addition, reduced taxes and grants for building renovation and deployment of energy communities, vouchers for voluntary energy audits and prize for excellence in energy efficient design are also reported.

However, while several alternative measures are reported by each country, ranging from three in Sweden to 15 in Germany, it is noted that only a few measures are included in the calculation to prove the effectiveness of the alternative measures approach (Figure 13).

Figure 13. Number of alternative measures implemented and quantified



Source: JRC elaboration, 2025

Apart from Finland and Sweden, which quantify the impact of all measures implemented, other countries rely on one or two measures to demonstrate that alternative measures bring similar or greater energy savings than hypothetical inspections. Interestingly, Finland and Sweden are also the countries that implement exclusively advisory measures. The other countries rely on regulatory measures (Flanders, France, and Germany), financial measures (Ireland), or a combination of regulatory and financial measures (Denmark).

5.1.2 Calculation method

To validate the effectiveness of alternative measures, countries conduct a comparative analysis, comparing the impacts resulting from these measures with those that would arise from hypothetical inspection schemes. Sweden takes a distinctive approach by comparing the anticipated impacts with the estimated impacts of alternative measures during a specified timeframe.

All countries evaluate the impact of measures in terms of energy savings, expressed in savings in a year or over a calculation period (Table 9). Moreover, some countries assess the impact of measures in terms of GHG emission reduction (Finland, Germany and Ireland). Additionally, Finland compares the impact of alternative measures with hypothetical inspection schemes in terms of costs.

Table 9. Indicators and calculation period to estimate impacts of alternative measures

Member State/ region	Energy savings	Emission reduction	Cost-effectiveness	Calculation period
Flanders	yes	no	no	Every 5 years
Denmark	yes	no	no	2020-2023
Finland	yes	yes	yes	Yearly
France	yes	no	no	2020-2023
Germany	yes	yes	no	2018-2024
Ireland	yes	yes	no	2020-2029
Sweden	yes	no	no	2014-2019

Source: JRC elaboration, 2025

Concerning the calculation timeframe, there is a diverse range of durations, extending from assessing the impact over a year (Finland) to provide 10-year projections (Ireland). Some countries focus on periods beyond 2020 (such as 2020-2024, 2020-2029, and 2018-2024), while Sweden

has conducted impact assessments for the years 2014-2019 to compare the outcomes with the initially projected impacts to prove its case.

5.1.3 Impacts

The impacts of alternative measures in terms of energy savings (GWh) and emission reduction (kt CO_2eq) as well as the relative savings compared to potential impacts triggered by a hypothetical inspection scheme are reported in Table 10. Flanders and Denmark make no distinction between heating and cooling systems in terms of alternative measures implemented. In contrast, Ireland, Finland, and Sweden conduct separate analyses (France and Germany implement alternative measures only for heating systems).

Table 10. Energy and emissions savings of alternative measures and relative savings compared to hypothetical inspection schemes

Member State	Energy savings (GWh)	Emission reduction (kt CO_2eq)	Energy savings (%)	Emission reduction (%)	Calculation period
Heating systems					
Finland	990	190	1 145%	1 503%	every year
France	62 000	-	224%	-	2020-2023
Germany	2 915	529	225%	152%	2018-2014
Ireland	1 518	374	26%	26%	2020-2029
Sweden	59	-	-	-	2014-2019
Cooling systems					
Finland	12	2	93%	99%	every year
Ireland	722	296	16%	16%	2020-2029
Sweden	6	-	-	-	2014-2019
Both heating and cooling systems					
Flanders	3	-	-3%	-	every 5 years
Denmark	5	-	190%	-	2020-2023

Source: JRC elaboration, 2025

Large variations are observed in terms of both absolute and relative savings. For instance, annual energy savings in heating systems vary from 11.8 GWh/year Sweden, 169 GWh/y Ireland, 729 GWh/y Germany, 990 GWh/y Finland and 20 667 GWh/year in France. For cooling systems, annual energy savings vary from 1.2 GWh/y in Sweden, 12 GWh/y in Finland, and 80 GWh/y in Ireland. In terms of relative energy savings as compared with hypothetical inspection schemes, energy savings of alternative measures range from -3% (Flanders) to Finland (1 145%).

These variations are due to the number and type of alternative measures applied and quantified for savings, their application scope, as well as the assumptions for hypothetical inspections. Generally, alternative measures have a wider application, while inspection schemes have clear (and limited) targets. Alternative measures are more varied in terms of actions (covering regulatory, financial, and advisory measures) and stakeholders involved, which results in a higher implementation rate assumption than those actions taken after hypothetical inspections. Also, given the limited information on actions taken after inspections, countries use a conservative approach for estimating energy savings of hypothetical inspections. Finally, the differences are also linked to how many measures are actually quantified. Some countries quantify all measures reported (e.g., Finland, Sweden), while others quantify only one measure (e.g., Flanders, France), although they implement much more. Quantifying more or fewer measures will change the figures in Table 10.

For instance, in Finland, the relatively high energy savings of alternative measures (over 1 000% compared to inspection schemes) are linked to the quantification of all eight alternative measures implemented (as observed in Figure 13), which have a much wider application than regular inspection schemes would have. These measures are seen as having higher participation and implementation rates, being more cost-effective, and focusing on education and engagement in

energy-saving approaches. On the other hand, Flanders, which shows the lowest energy savings of alternative measures (-3% compared to hypothetical inspection schemes), has six measures reported, but only one is quantified (Figure 13). However, in Flanders, alternative measures are complementary to regular inspections and apply only to heat pumps.

Looking at countries that implement distinct measures for heating and cooling systems (Finland, Ireland and Sweden), it is evident that alternative measures in heating systems result in greater savings (both in absolute and relative value compared to theoretical inspections) than those applied to cooling systems. This is likely attributed to the limited use of cooling systems in these countries, and therefore lower energy savings as compared to heating systems.

5.2 Assessment and future steps

All countries (regions) that implement alternative measures demonstrate that alternative measures yield more benefits than hypothetical inspections. However, despite 50 measures are reported across these countries, the impact is calculated for only 19 (38%) measures. Advisory measures, though prevalent, are quantified solely by countries exclusively employing advisory measures (Finland and Sweden). Other countries rely on one-two regulatory or financial measures to prove the effectiveness of alternative measures.

This may suggest that (1) alternative measures could offer greater benefits than those estimated in equivalence reports (2) countries have challenges in quantifying the impacts of alternative measures, particularly those related to information and advice.

Overall, countries effectively conveyed their objectives, aligning their reports with the EPBD requirements. The reports are well structured and enough details are provided to understand the measures implemented and the calculation methodology used to estimate impacts. However, variations exist, with certain countries presenting comprehensive reports grounded in years of experience in implementing and quantifying the impact of alternative measures, also informed by empirical data. In contrast, some countries submitted more concise studies, also reflecting their relatively new engagement in this exercise.

The recast EPBD introduces changes for the inspections of technical systems and alternative measures (Article 23). For instance, the maximum inspection frequency is 5 years for most systems and 3 years for larger systems, i.e., above 290 kW, that are not covered by other obligations. Member States may set different inspection frequencies, also considering the cost of intervention (measures adopted) and the cost of triggered energy savings.

These changes will not only affect how regular inspections are carried out, but might also influence the calculation for alternative measures, given the approach of comparing the savings with those from regular inspection schemes. In addition, besides energy savings, countries need to assess the environmental impact of alternative measures in terms of GHG emission savings. All these require better documentation of the possible measures to be adopted and empirical data on intervention costs and energy savings and related GHG emission reduction.

The approach in the equivalence reports, largely based on assumptions, might follow a systematic sequence of steps:

1. Estimation of the quantities of systems that would be subject to regular inspections as required by the EPBD:
    - Consider the distribution of building types and system installations (fuel type, effective output rate) across the country (or region).

- Use data from existing building stock, EPC databases, energy audits, or previous inspection programmes to inform estimates.

2. Identification of potential actions to be taken following inspections, along with associated costs:
    - Consider the system type, output rate, and age (year of installation) to draw potential actions for improvements in energy use.
    - Consult market data on replacements, repair, and maintenance costs depending on the actions identified. Input data for cost-optimal calculations can be consulted as well.
3. Estimation of energy and emission savings resulting from these actions, drawing on empirical data:
    - Consult industry experts on the expected energy savings of the various possible actions identified at point 2.
    - Derive figures from EPC recommendations or energy audits related to measures on building systems.
    - Consider the impact of occupant behaviour and usage patterns on energy savings.
    - Evaluate the expected GHG emission reduction from the implemented actions and related energy savings. This can be done using energy savings data and emissions factors.
4. Estimation of inspection frequency and the likelihood of successful implementation of the actions after inspection:
    - Consider the inspection frequency requirements set by the EPBD, which is maximum 5 years for most systems and maximum 3 years for very large systems (≥ 290 kW)
    - Inform on the implementation rate from other similar programmes if available (for instance, the implementation rate of EPC recommendations)
    - Consider the role of enforcement mechanisms, incentives, and education in driving compliance.
5. Estimation of the duration of the benefits derived from the implemented actions.
    - Consider the expected lifespan of adopted measures and the maximum period of inspection as required by the EPBD (for instance, measures adopted after a regular inspection may trigger no action or minimal action in the subsequent regular inspection).
    - Account for potential degradation or decrease in performance over time of implemented measures.

These are general indications, and countries may refine and expand upon these, by introducing additional steps and further data sources and analyses. Moreover, systematically monitoring regular inspections and the follow-up actions in countries that implement them is crucial. This will enhance the quantification of regular inspection schemes, improve understanding of their impact on driving energy and emission savings in the building sector, and provide a more robust framework for calculating the effectiveness of alternative measures for countries adopting such approaches.

6 Conclusions

The building sector holds a key position in EU policies due to its significant potential to reduce energy consumption and greenhouse gas (GHG) emissions. The Energy Performance of Buildings Directive (EPBD) stands as the cornerstone legislative instrument for advancing the energy efficiency of European Union (EU) buildings. The Directive covers regulations aimed at both new buildings and the renovation of existing buildings, promoting the "energy efficiency first" principle. It works in synergy with other EU climate policies, such as the Energy Efficiency Directive, and the Governance Regulation.

This report outlines the current status of Member States in enhancing building energy performance and offers projections for future energy savings and emission reductions. It relies on national strategies and plans developed by countries, such as Long-Term Renovation Strategies (LTRSs), integrated National Energy and Climate Progress Reports (NECPRs), Energy Performance Certificate (EPC) schemes, and equivalence reports for technical building system inspections.

Between 2005 and 2022, the residential sector's energy consumption in the EU decreased by approximately 23.9 Mtoe, representing a 9.0% reduction compared to 2005 levels. Following a significant increase in 2021 relative to 2020, energy consumption in the residential sector declined by 17.7 Mtoe in 2022, likely due to a decrease in heating degree days. After adjusting for climate and population, residential energy consumption exhibited minor annual changes over the years. In the EU services sector, final energy consumption declined by 6.3 Mtoe between 2005 and 2022, with an additional decrease of 7.7 Mtoe from 2021 to 2022, likely attributed to milder winters and reduced demand for space heating in service buildings. The energy intensity of the services sector also showed improvements over time at the EU level.

Looking ahead, the 2020 LTRSs suggest that by 2030, the building sector could achieve a 14% reduction in final energy use and a 35% decrease in direct greenhouse gas (GHG) emissions compared to 2019 levels. However, compared to 2015 GHG emission levels, the 2020 LTRS targets for 2030 fall 38% lower, which is below the 60% reduction goal set by the Climate Target Plan.

Data from 2020 and 2021, as reported in the 2023 NECPRs, show varied progress among countries toward their 2030 energy and emissions targets in the building sector. While some Member States are making significant strides, others are maintaining stable trends but may require additional efforts to meet their goals.

Moreover, focusing on the residential sector, there is a notable 58% gap between the projected final energy savings by 2030 and the sectoral target needed to meet the recast Energy Efficiency Directive's overall goal of an 11.7% reduction in final energy consumption compared to the 2020 reference scenario. However, it is worth noting that the 2020 LTRS targets were set before the adoption of the more ambitious climate and energy objectives. Therefore, the forthcoming draft NBRPs, due by 2025, are expected to feature updated targets that align with the EU's enhanced objectives for 2030 and beyond.

The report also reviews national Energy Performance Certificate schemes and identifies three main approaches to energy class design: (i) based on energy indicators, (ii) comparison with a reference building, and (iii) other methods. Most schemes (70%) use energy indicators, with wide variations in boundaries. Additionally, discrepancies exist in the end-uses included. Heating is universally assessed, but lighting and cooling are less addressed, especially in residential buildings. Some countries introduce additional energy classes based on specific end-uses or indicators, such as GHG emissions and renewable energy

The report also includes an assessment of the equivalence reports from countries implementing alternative measures instead of regular inspection schemes for building systems. By 2023, over 80% of Member States have implemented inspection schemes for heating and cooling systems, while others have adopted alternative measures. These countries submitted equivalence reports alongside draft updates of their NECP in 2023. Most use a combination of advisory, regulatory, and financial measures, with advice and informational campaigns making up nearly 60% of the alternative measures. However, although 50 measures are reported across these countries, the impact is calculated for only 19 (38%) measures. This could imply that: (1) alternative measures might offer greater benefits than those estimated in equivalence reports, and (2) countries face challenges in quantifying the impacts of alternative measures, particularly advisory measures.

Overall, the report shows progress toward a decarbonised building stock and significant potential for advancement by 2030. Future efforts should focus on aligning existing building targets with newer, more ambitious energy efficiency and decarbonisation goals for 2030, 2040, and 2050. Next, ambitious and appropriate policies and measures need to be developed to sustain the progress towards achieving the targets. This process has started already; indeed, in the 2023 draft NECP, the Netherlands and Greece reported more ambitious milestones regarding building renovation.

The recast EPBD introduces a series of requirements meant to support the achievement of energy and climate targets. Increasing the rate and depth of energy efficiency upgrades and deploying renewable technologies in buildings across the EU, while at the same time supporting/encouraging the phasing out fossil fuels in buildings, will be among the main priorities. The focus will be on gradually eliminating worst-performing buildings. Building decarbonisation is promoted also through introduction of legal basis for Member States to set fossil fuels ban in buildings and supported by the deployment of solar technologies. The new proposed building standard, Zero-Emission Building, aligns with these principles. The introduction of the life-cycle Global Warming Potential calculation for new buildings represent a first step in considering the life-cycle impact of buildings under the EPBD. The Directive also emphasizes the consideration of wider benefits such as improved health and reduced pollution when implementing energy efficiency measures, aiming to encourage the adoption of sustainable building practices.

References

Castellazzi, L., Paci, D., Zangheri, P., Maduta, C., Economidou, M., Riveiro Serrenho, T., Zancanella, P., Ringel, M., Valentova, M., Tsemekidi Tzeiranaki, S., 2022. Assessment of first long-term renovation strategies under the Energy Performance of Building Directive (Art. 2a), EUR 31309 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-58990-7, doi:10.2760/535845, JRC128067.

Cohen, R., Therburg, I., Bordass, W., Field, J., 2016. Implementation of EPBD Article 7.3 in Germany and the UK: Comparison of Methodologies and Procedures.

Concerted Actions EPBD, 2020. Concerted Action EPBD - Enabling the implementation of the Energy Performance of Buildings Directive, available at: https://epbd-ca.eu/database-of-outputs.

EN ISO 52000-1, 2017. Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures.

Esser, A., Sensfuss, F., 2016. Review of the default primary energy factor (PEF) reflecting the estimated average EU generation efficiency referred to in Annex IV of Directive 2012/27/EU and possible extension of the approach to other energy carriers.

European Commission, 2024a. Energy performance of buildings (recast). European Parliament legislative resolution of 12 March 2024 on the proposal for a directive of the European Parliament and of the Council on the energy performance of buildings (recast). Texts adopted.

European Commission, 2024b. National energy and climate plans: EU countries' 10-year national energy and climate plans for 2021-2030, available at: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en#final-necps.

European Commission, 2024c. EU countries' cost-optimal reports. Available at https://circabc.europa.eu/ui/group/092d1141-bdbc-4dbe-9740-aa72b045e8b3/library/30a6e0cd-055a-4623-95ab-e529c2a1b1be.

European Commission, 2023. Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast).

European Commission, 2021a. Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (European Climate Law).

European Commission, 2021b. European Commission - National long-term renovation strategies 2020, available at: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/long-term-renovation-strategies_en#national-long-term-renovation-strategies-2020 [WWW Document].

European Commission, 2021c. EU reference scenario 2020. Energy, transport and GHG emissions : trends to 2050. Available at: https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en.

European Commission, 2020. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Stepping

up Europe's 2030 climate ambition, Investing in a climate-neutral future for the benefit of our people.

European Commission, 2018a. 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.

European Commission, 2018b. Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action (L328/1).

European Commission, 2010. Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).

European Commission, 2002. Directive 2002/91/EC of the European Parliament and of the Council of 16 december 2002 on the energy performance of buildings (recast). L 1/65.

European Environment Agency, 2024. National emissions reported to the UNFCCC and to the EU under the Governance Regulation, doi.org/10.2909/6331f651-8863-4656-a911-669f2a332a1e. Available at: https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer.

Eurostat, 2024. Energy statistics - quantities, annual data. Energy balances, available at: https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_S__custom_2733739/default/table?lang=en.

Gibbons, L., Javed, S., 2022. A review of HVAC solution-sets and energy performace of nearly zero-energy multi-story apartment buildings in Nordic climates by statistical analysis of environmental performance certificates and literature review. Energy 238, 121709. https://doi.org/10.1016/j.energy.2021.121709

Gulotta, T.M., Cellura, M., Guarino, F., Longo, S., 2021. A bottom-up harmonized energy-environmental models for europe (BOHEEME): A case study on the thermal insulation of the EU-28 building stock. Energy and Buildings 231, 110584. https://doi.org/10.1016/j.enbuild.2020.110584

Industry Association, 2018. A forward looking Primary Energy Factor for a greener European Future. Industry Association position on PEF revision.

Latõšov, E., Volkova, A., Siirde, A., Kurnitski, J., Thalfeldt, M., 2017. Primary energy factor for district heating networks in European Union member states. Energy Procedia 116, 69–77. https://doi.org/10.1016/j.egypro.2017.05.056

Maduta, C., D'Agostino, D., Tsemekidi-Tzeiranaki, S., Castellazzi, L., Melica, G., Bertoldi, P., 2023. Towards climate neutrality within the European Union: Assessment of the Energy Performance of Buildings Directive implementation in Member States. Energy and Buildings 301, 113716. https://doi.org/10.1016/j.enbuild.2023.113716

Mikučionienė, R., Motuzienė, V., Džiugaitė – Tumėnienė, R., 2023. Methodology for determining 15% and 30% of the most energy efficient buildings in Lithuania. Vilnius Gediminas Technical University, Vilnius.

Ministry of Environment and Energy, 2017. Building Energy Efficiency Regulation in Greece (KENAK), available at: https://ypen.gov.gr/wp-content/uploads/2020/11/KENAK_FEK_B2367_2017.pdf.

Nijs, W., Tarvydas, D., Toleikyte, A., 2021. EU challenges of reducing fossil fuel use in buildings – The role of building insulation and low-carbon heating systems in 2030 and 2050. ISBN 978-92-76-

45223-2, doi:10.2760/85088, JRC127122 (No. EUR 30922 EN). Publications Office of the European Union, Luxembourg.

OiB, 2019. OiB-Richtlinie 6. Guidelines of the Austrian Institute of Building Technology. Energy savings and thermal insulation. Available at: https://www.oib.or.at/sites/default/files/richtlinie_6_12.04.19_1.pdf.

Pohoryles, D.A., Maduta, C., Bournas, D.A., Kouris, L.A., 2020. Energy performance of existing residential buildings in Europe: A novel approach combining energy with seismic retrofitting. Energy and Buildings 223, 110024. https://doi.org/10.1016/j.enbuild.2020.110024

Román-Collado, R., Economidou, M., 2021. The role of energy efficiency in assessing the progress towards the EU energy efficiency targets of 2020: Evidence from the European productive sectors. Energy Policy 156, 112441. https://doi.org/10.1016/j.enpol.2021.112441

Ruggieri, G., Maduta, C., Melica, G., 2023. Progress on the implementation of energy performance certificates in EU (doi:10.2760/522233, No. JRC135473). Publications Office of the European Union, Luxembourg.

Schramm, H., Osojnik, M., Therbo, J., Kolb, S., Chambris, A., Funder-Kristensen, T., 2017. Optimizing the control of energy use in technical building systems – why energy and climate policies should fill regulatory gaps 10.

SEAI, 2023. Sustainable Energy Authority of Ireland. Derivation of Primary Energy and CO2 Factors for Electricity in DEAP and NEAP.

Tsemekidi-Tzeiranaki, S., Bertoldi, P., Castellazzi, L., Gonzalez Torres, M., Clementi, E., Paci, D., 2022. Energy consumption and energy efficiency trends in the EU: 2000 2020. EUR 31266 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-58515-2, doi:10.2760/727548, JRC130732. Publications Office, LU.

Zangheri, P., Armani, R., Kakoulaki, G., Bavetta, M., Martirano, G., Pignatelli, F., Baranzelli, C., 2020. Building energy renovation for decarbonisation and Covid-19 recovery, EUR 30433 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-24766-1, doi:10.2760/08629, JRC122143.

List of abbreviations and definitions

Abbreviations	Definitions
DHW	Domestic Hot Water
EEA	European Environment Agency
EED	Energy Efficiency Directive
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
EU	European Union
FEC	Final Energy Consumption
GHG	Greenhouse gas emissions
JRC	Joint Research Centre
NBRP	National Building Renovation Plan
LTRS	Long-Term Renovation Strategy
NECP	National Energy and Climate Plan
NECPR	National Energy and Climate Progress Report
NZEB	Nearly Zero-Energy Building
PEC	Primary Energy Consumption
PEF	Primary Energy Factor
ktoe	Thousands tonnes of oil equivalent

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Annexes

Annex 1. List of alternative measures extracted from the national equivalence reports (*Source: JRC elaboration, 2025*)

Advice and Information campaigns		
1	Belgium-Flanders	Advice on the potential energy savings of HP in the inception statement (before EPC issuance) of new buildings
2		Advice on HP energy savings possibilities and replacement via website (www.energiesparen.be)
3	Denmark	Information and advice from SparEnergi.dk
4		Knowledge collecting and dissemination through the Danish Knowledge Centre for Energy Savings in Buildings
5	Finland	Energy performance contracts for oil and bio-oil heating boilers
6		Plane agreement (voluntary EE inspection of oil boilers)
7		Kutter agreement (guidelines on the choice of more energy efficiency bio oil systems)
8		Other advice and communication campaigns for oil, bio-oil and gas heaters and air-conditioning system (e.g. personalised energy efficiency advice on Facebook)
9		Heat pump advice
10		Electric heating advice
11		District heating advice
12		Combined ventilation and air conditioning systems advice
13	France	Communication on the annual maintenance of boilers
14		Advice to individuals from the Public Service for Energy Performance Housing
15		Communication campaigns on improving energy performance of the building as a whole and on possible financial or fiscal support
16	Germany	Info on energy efficiency on Energychange.de
17		Tools to help households save energy
18		Energy consultations by the Consumer - central
19		Information on content and costs of maintenance contracts
20		Measures to ensure energy security in Germany
21		Verification of optimal adjustment and efficiency of the entire heating system, supported by the BMWK
22		Brochure on energy saving measures with low investment needs
23	Ireland	Large Industrial Energy Network (200 large energy users that support members in increasing energy efficiency)
24		Energy Academy (experts' training),
25		Climate Toolkit 4 Business (for SMEs to estimate and reduce carbon footprint)
26		Public Sector Pathfinder programme

27		Sustainable energy communities (training, advice and networking to support energy communities, target of 1500 by 2030)
28	Sweden	Advice focusing on energy efficiency (the Energy Agency uses a web tool - Kontakt- to monitor the contacts made by advisers and the information provided)
29		Advice with a different focus (given by experts with other main task., mostly given in connection with EPC and mandatory ventilation checks)
30		Other information methods, such as website, brochures and information sheets, which are distributed on websites.
Regulatory measures		
1	Belgium-Flanders	Mandatory annual leakage check for heat pumps and refrigerators by an authorised technician
2		Energy savings through energy audits for large companies (20% target heating so a share will targets HP)
3		EPB requirements for new constructions
4	France	Mandatory annual maintenance for boilers between 4 and 400 kW and every 2 years for other systems with output rate between 4 and 70 kW (cleaning and adjustment of boiler and distribution pipes, assessment of boiler efficiency and labelling, use advice and potential benefits of repair and replacement, if needed)
5	Germany	Recurrent inspection of small and medium-sized boilers with the scope to control and comply with emission thresholds and to reduce air pollution.
6		Ban on boilers installed before 1991 or after 30 years of use
7		Regulation on energy security of supply
8		Requirements for maintenance of parts of heating, cooling, air conditioning and hot water systems and equipment
9		Requirements for heat supply reduction in central heating
10		Requirements for thermal insulation of heat and hot water pipes
11		Implementation rules for existing provisions
12	Ireland	The Building Regulation: all heating/air-conditioning systems rated above 70 kW are equipped with BACS
Financial measures		
1	Belgium-Flanders	Grants for HP installed in existing buildings if installer has the certificate of competence and falls under the regulation conditions
2	Denmark	Heat pump subsidies
3		Tax deduction for dwelling labour including the repair or replacement of gas based boilers (but not for installation), the installation and repair of alternative heating solutions such as heat pumps and solar heating systems
4	France	Grants for renovation MaPrimeRénov' (up to a ceiling of €20,000)
5		The Energy Saving Certificates scheme
6		Loans for major renovation works (Eco-PTZ)
7		VAT at a reduced rate (rate of 5.5% applied to works that upgrades energy efficiency of dwellings)
8	Germany	Financial support for heating systems modernisation/change
9	Ireland	Support scheme for voluntary energy audits (voucher of €2000) in addition to obligatory energy audit (EED)
10		Better Energy Communities (community grant programme to support energy efficiency projects)
11		Excellence in Energy Efficient Design

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