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REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

2022 report on the achievement of the 2020 energy efficiency targets

2022 report on the achievement of the 2020 energy efficiency targets

1. Introduction and overview

The Energy Efficiency Directive 2012/27/EU (EED) and the Energy Performance of Buildings Directive 2010/31/EU (EPBD), both respectively amended by Directive (EU) 2018/2002 and Directive (EU) 2018/844, form a key part of the European Union (EU) climate and energy legislation, setting the EU's energy efficiency targets and laying the foundation for measures to realise the full energy efficiency potential of the EU economy.

The EED requires all EU Member States to implement policy measures to improve energy efficiency throughout the different stages of the energy chain, from production to final consumption. These efforts are key to achieve the EU's energy efficiency targets and an essential contribution to the decarbonisation of the EU economy by 2050. The EU's energy efficiency target for 2020 (Article 3 of the EED) corresponds to a 20% reduction in the EU's primary and final energy consumption by 2020 compared to the energy consumption projected in the 2007 PRIMES scenario for 2020. In terms of primary energy consumption (PEC) this target results in a consumption level of 1312 Mtoe and for final energy consumption (FEC) it amounts to 959 Mtoe.

The EPBD contains a broad range of policies and supportive measures aiming to increase the currently low renovation rates of the existing building stock. In particular, Article 2a of the EPBD requires Member States to establish comprehensive long-term renovation strategies to mobilise investment for the decarbonisation of national building stocks by 2050 (with indicative milestones for 2030, 2040 and 2050); and to support the transformation towards a highly efficient and decarbonised building stock by 2050. Article 5 requires the Member States to set cost-optimal minimum energy performance requirements for new buildings and for existing buildings undergoing major renovation. Article 9 states that all new buildings must be nearly zero-energy buildings (NZEBs) by 31 December 2020 (and after 31 December 2018 for all new public buildings).

Article 27 of Regulation 2018/1999 on the Governance of the Energy Union and Climate Action (Governance Regulation), requires Member States to report to the Commission, by the 30 April 2022, the information set out in Part 2 of Annex IX of this Regulation. As regards the EED, this includes the progress towards Article 3 on the energy efficiency targets, Article 5 on the exemplary role of public bodies' buildings, Article 7 on energy savings obligation and Article 8 on energy audits. Additionally, as regards the EPBD reporting is required under Article 9 on new and renovated nearly zero-energy buildings. In addition, Article 21 of Regulation 2018/1999 requires that the integrated national energy and climate plans (NECPs) progress reports include the indicative milestones of the long-term renovation strategy and specify how they contribute to achieving the EU's energy efficiency targets, as well as the relevant policies and measures presented in the long-term renovation strategies. Information is required on cost-optimal levels of minimum energy performance standards resulting from national calculations, in accordance

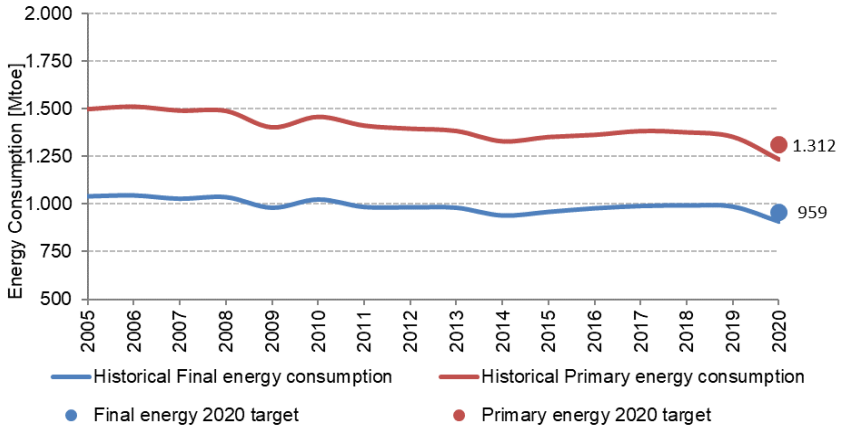
with Annex I, Section B of Regulation 2018/1999 and the number and floor area of new and renovated NZEBs, in accordance with Annex IX of Regulation 2018/1999.

This report analyses the information provided by the Member States in their reports and complements it with Eurostat data. Additionally, it analyses the assessment of the national long-term renovation strategies and the cost-optimal reports submitted by Member States to the Commission. For the 2022 reporting obligation, all 27 Member States submitted their reports. However, the report from Hungary does not contain any information on energy efficiency and the reports from Romania and Croatia are considered very incomplete.

2. Progress towards the 2020 energy efficiency targets – Article 3 of the EED

In the period from 2005 to 2020, the EU energy consumption has followed a general downward trend, as shown in Figure 1. This decrease in energy consumption was accompanied by an overall drop in energy intensity and energy consumption per capita. In 2020, the EU targets for PEC and FEC were overachieved, amounting to 1 236 Mtoe and 907 Mtoe respectively. It should be noted that the 2020 PEC and FEC values were significantly influenced by the COVID-19 crisis and the lockdown measures imposed by national authorities, which significantly restricted overall activity and consequently reduced the energy demand[1]. Nevertheless, the 2019 values (i.e. before the impact of COVID-19 pandemic in the EU) already indicated a decreasing trend in energy consumption despite the fact that 2019 PEC and FEC values were above the 2020 target, 1 354 Mtoe and 986 Mtoe respectively.

Figure 1: Final and primary energy consumption trends of the EU27 (the line represents the trajectory between 2005 consumption and the 2020 consumption and the dots represent the 2020 PEC and FEC targets)



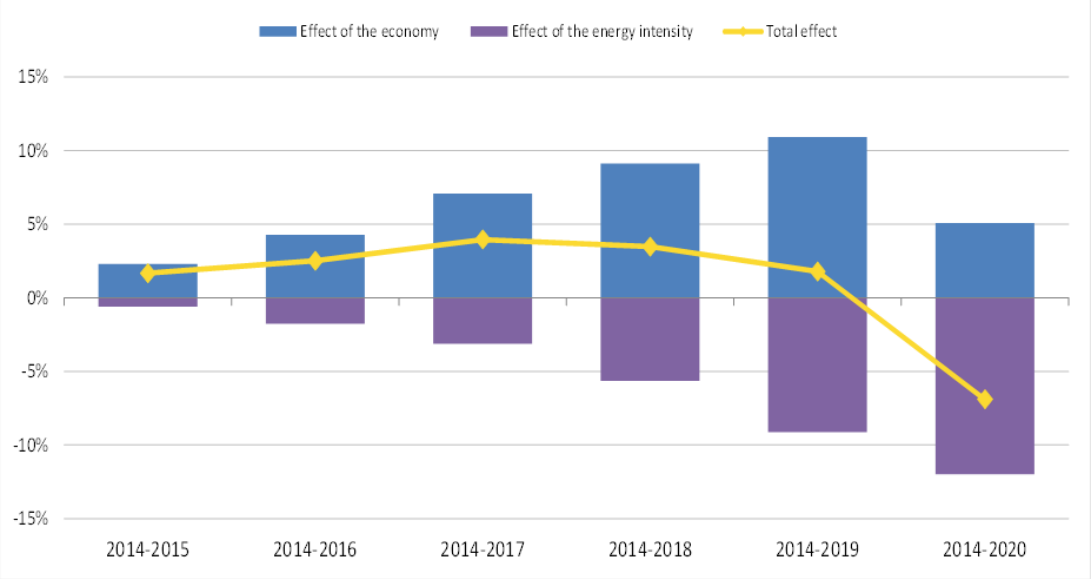
Source: Joint Research Centre (JRC) based on Eurostat data, Dataset of April 2022. [2]

1 10 Member States explicitly mentioned COVID-19 as one of the factors influencing the achievement of the 2020 targets in their Article 3 notifications.

2 Tsemekidi-Tzeiranaki S., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

Figure 2 identifies the drivers that allowed compliance with the 2020 PEC target through an additive decomposition of the 2014-2020 changes in the EU27. After a period of slight rebound in energy consumption in 2014-2017, primary energy intensity started to compensate economic growth in 2018. However, consumption only decreased below 2013 figures in 2020 – due to the combined effect of the economy drop (6%) caused by the pandemic crisis and the continuous improvement in primary energy intensity (3%), which reflects the impacts of EU energy and climate policies and legislation.

Figure 2: Contribution of different effects to the variation in PEC in the EU27 in 2014-2020



Source: JRC based on Eurostat data, Dataset of April 2022. 3

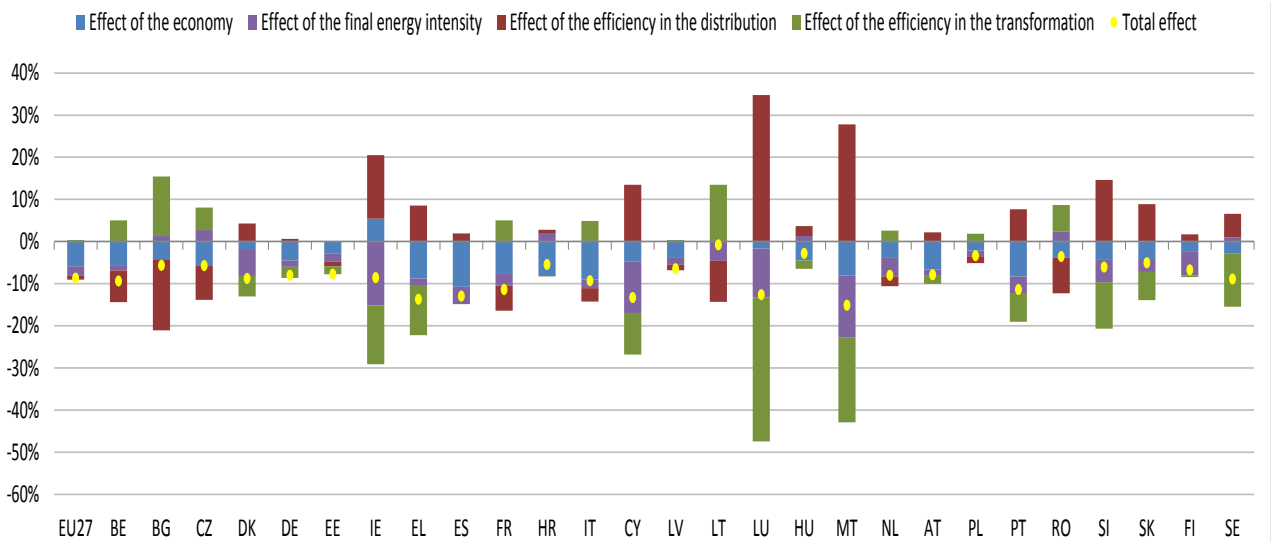
The pandemic crisis provoked a decrease in PEC and FEC in every Member State in 2020. Drops in PEC ranged from 15% (Malta) to 1% (Lithuania). Figure 3 shows the contribution of different effects to the variation in PEC in the EU27 and Member States from 2019 to 2020. In this period, the exceptional drop of the economy was a determinant factor for energy consumption reduction, in all but two Member States, Ireland and Lithuania.

Improvements in final energy intensity[4] also contributed to reduce PEC by approximately 2% in the EU27 collectively and in most Member States. In Ireland and Malta, improvements in final energy intensity contributed to a decrease in energy consumption of 15%. However, there were exceptions in Bulgaria, Czechia, Croatia, Romania, Hungary and Sweden, where it increased by up to 3%. A warmer winter in 2020 than in 2019 also slightly reduced demand.

3 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

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

Figure 3: Contribution of different effects to the variation of PEC in the EU27 and individual Member States in 2019-2020



Source: JRC based on Eurostat data, Dataset of April 2022. [5]

As regards FEC, variations in trends are appreciated by sector. Overall FEC fell by 8.0% between 2019 and 2020, after a consistent increase in 2014-2018. In 2020 all the Member States had a decrease in FEC in the transport sector and a stable (change within the range of ±1%) or downward FEC in the service sector. As depicted in Table 1, the FEC pattern for industry and households varied between the Member States.

Table 1: Trends in consumption in key sectors at national level in 2019-2020

MS	Final Energy				
	Total	Industry	Transport	Households	Services
BE	↘	↘	↘	→	↘
BG	↘	↘	↘	↗	↘
CZ	↘	→	↘	↗	↘
DK	↘	↗	↘	↘	↘
DE	↘	↘	↘	→	↘
EE	↘	↘	↘	→	→
IE	↘	↘	↘	↗	→
EL	↘	↘	↘	→	↘
ES	↘	↘	↘	→	↘
FR	↘	↘	↘	↘	↘
HR	↘	→	↘	↗	↘
IT	↘	↘	↘	↘	↘
CY	↘	↗	↘	→	↘
LV	↘	↗	↘	↘	↘

5 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

LT	↘	↘	↘	→	↘
LU	↘	↘	↘	↗	↘
HU	↘	→	↘	↗	↘
MT	↘	↗	↘	↗	↘
NL	↘	→	↘	↘	↘
AT	↘	↘	↘	→	↘
PL	↘	↘	↘	→	↘
PT	↘	↘	↘	↗	↘
RO	↘	→	↘	↗	↘
SI	↘	↘	↘	↗	↘
SK	↘	↘	↘	↗	↘
FI	↘	↘	↘	↘	↘
SE	↘	↗	↘	↘	→
EU	↘	↘	↘	→	↘

Source: JRC based on Eurostat data, Dataset of April 2022. [6]

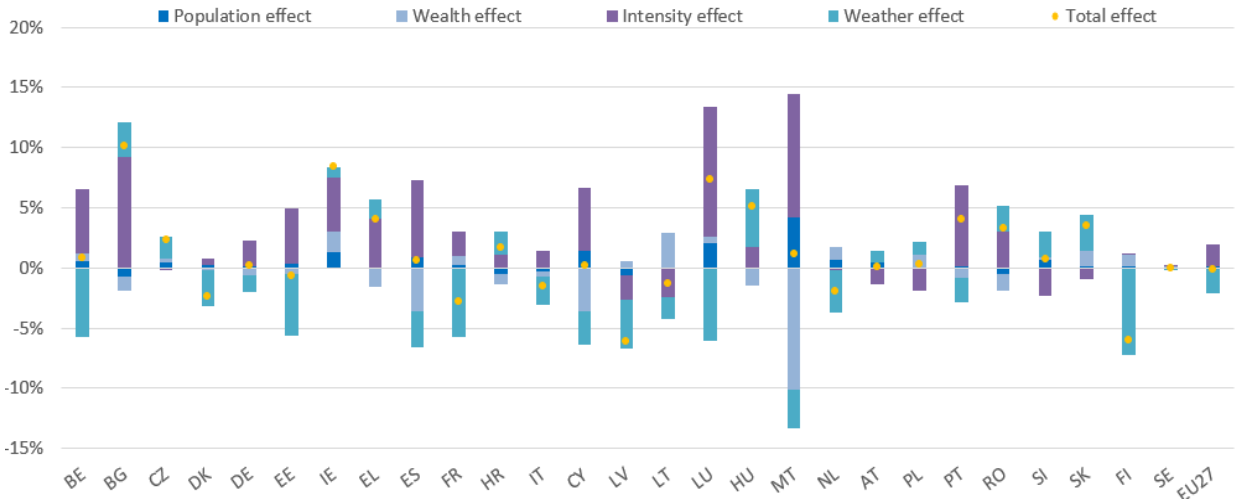
For the residential sector, the exceptional situation of the pandemic crisis led to a slight increase in the FEC, due to lockdowns and teleworking. Figure 4 shows that the combined impact of weather and wealth effects[7] offset both the overall positive population and intensity effects at EU level in the residential sector. Warmer winter conditions in 2020 (compared to 2019) limited consumption in all Member States except in Bulgaria, Czechia, Ireland, Croatia, Hungary, Slovenia, Slovakia, Poland, Greece, Austria and Romania. The wealth effects linked to growth of per capita floor area and disposable income exerted an opposite force in half of the Member States, driving consumption up in Belgium, Czechia, France, Ireland, Lithuania, Latvia, Luxembourg, The Netherlands, Austria, Poland, Slovenia, Slovakia, Finland, and Sweden. Intensity[8] gains drove up consumption in all Member States except Czechia, Latvia, Austria, Poland and Slovakia.

6 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

7 It reflects changes in energy consumption due to changes in the wealth represented the total floor area of dwellings (TFA) per capita for the heating end use and gross disposable income in purchasing power standard (GDI) per capita for all other end uses.

8 The intensity is calculated as the ratio between final energy consumption and total floor area (TFA) divided by the gross disposable income (GDI) of the residential sector.

Figure 4: Contribution of different effects to the variation of residential FEC in 2019-2020



Source: Eurostat, JRC and Odyssee-Mure, 2022. [9]

The increase in FEC in the residential sector was significantly offset by a decrease in FEC in the transport sector. For the transport sector, the decrease in FEC was driven by the activity effect, mainly as a result of transport restrictions due to the pandemic, which significantly reduced passenger transport volumes.

As depicted in Figure 5, for the industry and service sectors, the employment effect and the number of hours worked drove the decrease of FEC for the EU in 2020. With the employment effect being the most important driver behind the decrease in the Member States' energy consumption. By contrast, the intensity factor contributed to an increase in FEC in the productive sectors. These results can be explained by the exceptional circumstances of COVID-19 pandemic crisis. Even if the Member States handled the COVID-19 crisis in relatively different ways, it remains possible that lockdowns led to a drastic reduction in working hours as well as an increase in unemployment, even if only temporarily. The structural effect results highlight a shift from sub-sectors of higher energy intensity towards sub-sectors of lower intensity in eight Member States, Bulgaria, Czechia, Estonia, France, Italy, Cyprus, Luxembourg and Slovakia. Finally, the intensity effect inhibited FEC for nine Member States, Belgium, Denmark, Estonia, Greece, Luxembourg, the Netherlands, Poland, Romania and Finland. By contrast, the other Member States experienced an increase in FEC per value added in monetary terms.

9 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

Figure 5: Contribution of different effects to the variation of the productive sectors FEC in 2019-2020

Source: Eurostat, JRC, Dataset of April 2022. [10]

3. Progress towards the 2030 energy efficiency targets

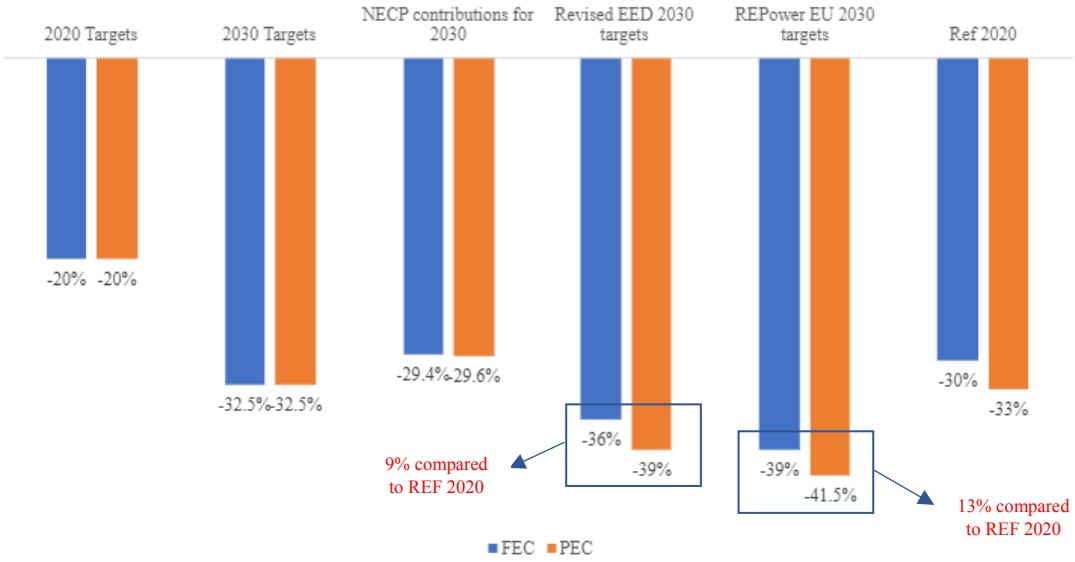
When analysing the progress towards the 2030 targets, the EU FEC and PEC in 2020 were 7.2% and 9.6% above the 2030 target levels, respectively. The 2030 target level represents a reduction of 32.5% compared to the 2007 Reference Scenario. In 2020, the pace of decline towards the 2030 targets appeared to be sufficient for both PEC and FEC, mainly due to the contingent situation caused by the COVID-19 pandemic. Far more efforts are needed in order to achieve a structural reduction in energy consumption and to avoid rebound effects following the phasing out of the COVID-19 pandemic's effects on national economies.

As Figure 6 shows, the Commission proposed an EU target for 2030 of 9% reduction compared to the 2020 reference scenario as part of its July 2021 proposal for a recast of the EED[11]. This is equivalent to a reduction of 36% for FEC and 39% for PEC compared to the 2007 reference scenario, and this in turn equates to 1 023 Mtoe for PEC and 787 Mtoe for FEC. This target was further increased to 13% by the REPowerEU package, adopted in May 2022, which would correspond to a maximum energy consumption in the EU of 980 Mtoe for PEC and 750 Mtoe for FEC.

10 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

11 COM(2021) 558 final.

Figure 6: Reduction of PEC and FEC compared to REF2007 scenario projections



Source: European Commission, Directorate-General for Energy, 2022.

4. Achievement of the 2020 energy efficiency targets per Member State

Table 2 provides an overview of PEC and FEC targets. 24 out of the 27 Member States achieved their 2020 PEC target, while 21 achieved their 2020 FEC target. The magnitude of the underachievement was in general low. Only Bulgaria and Belgium missed their PEC or FEC targets. Excluding Lithuania, which underachieved FEC by 19%, the underachievement is on average 0.9% for missed PEC target and 6.7% for FEC.

Table 2: Achievement of FEC and PEC targets per Member State

MS	PEC	PEC Target	% Achieved PEC	FEC	FEC Target	% Achieved FEC
BE	43.9	43.7	99.6%	33.3	32.5	97.6%
BG	17.2	16.9	98.1%	9.5	8.6	90.6%
CZ	37.5	44.3	118.2%	24.5	25.3	103.4%
DK	15.3	17.5	114.3%	13.1	15.2	115.4%
DE	262.3	276.6	105.4%	201.7	194.3	96.4%
EE	4.3	5.5	127.5%	2.8	2.9	105.4%
IE	13.4	13.9	103.5%	11.2	11.7	104.7%
EL	19.2	24.7	128.4%	14.5	18.4	127.3%
ES	105.0	123.4	117.5%	73.8	86.3	117.0%
FR	208.4	226.40	108.6%	130.1	137.9	106.0%
HR	7.8	10.7	137.9%	6.5	7.0	107.6%
IT	132.3	158.0	119.4%	102.7	124.0	120.7%

CY	2.2	2.2	101.6%	1.6	1.9	121.8%
LV	4.3	5.4	126.0%	3.9	4.5	115.9%
LT	6.2	6.5	104.4%	5.3	4.3	81.0%
LU	3.9	4.5	113.9%	3.8	4.2	111.2%
HU	23.9	26.6	111.4%	18.0	18.2	101.1%
MT	0.7	0.8	111.1%	0.5	0.6	116.4%
NL	58.4	60.7	103.9%	45.5	52.2	114.7%
AT	29.7	31.5	106.1%	26.1	25.1	96.2%
PL	96.9	96.4	99.5%	71.1	71.6	100.6%
PT	19.5	22.5	115.1%	15.0	17.4	115.8%
RO	30.9	43.0	139.1%	23.5	30.3	128.9%
SI	6.1	7.1	115.8%	4.4	5.1	116.6%
SK	15.2	16.4	108,0%	10.4	10.4	100.2%
FI	29.9	35.9	120,0%	23.3	26.7	114.5%
SE	41,7	43,4	104,1%	30.9	30.3	97.8%

Source: JRC based on Member States' reporting, Eurostat, Dataset April 2022.[12]

5. Exemplary role of public bodies' buildings – Article 5 of the EED

Article 5(1) of the EED requires Member States to ensure yearly renovations, as from 1 January 2014, of 3% of the total floor area of heated and/or cooled buildings owned and occupied by their central government and not in compliance with minimum energy requirements. The aim is for Member States to at least meet the minimum energy performance (MEPS) set by Article 4 of the EPBD. Alternatively, Member States may opt for an alternative approach (under Article 5(6) of the EED) and by 2020 achieve energy savings that are equivalent to or greater than those that Article 5(1) requires for the same building stock. Tables 3 and 4 provide a summary of the latest progress made by the Member States in connection with Article 5(1), for the default and the alternative approach, respectively.

12 For France both PEC and FEC targets were adjusted to include international aviation, with an estimation 6.5 Mtoe.

Table 3: Implementation status of Article 5 of the EED by Member States which chose the default approach [13] [14] [15] [16][17]

Member State	Central government buildings with floor area > 250 m2 in 1 January 2021		Article 5. annual requirement	Article 5 progress in 2020				
	All [m2]	Non-compliant with MEPS [m2]	Floor area renovation obligation [m2]	Renovated floor area [m2]	Annual obligation achieved in 2020 in terms of floor area [%]	Sum of savings in 2014-2020	Total renovated floor area over the period 2014-2020	Total obligation achieved in 2014-2020 in terms of floor area [%]
BG	2 571 112	1 761 062	54 903	91 796	167.2%	n.a.	480 595	59.3%
EE	1 386 400	853 951	26 600	9 471	35.6%	n.a.	209 041	105.4%
EL	212 725	200 725	6 030	0	0.0%	0,25	12 000	27.7%
ES	11 273 677	9 198 323	279 902	304 763	108.9%	n.a.	1 930 977	95.7%
HU	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
IT	16 485 850	13 401 778	404 023	89 180	22.1%	n.a.	3 107 612	99.6%
LT	n.a.	1 996 799	62 541	2 720	4.3%	n.a.	504 249	113.8%
LU	126 253	61 050	1 832	0	0.0%	n.a.	23 013	148.9%
LV	1 862 320	1 862 320	53 550	98 102	183.2%	n.a.	409 659	91.9%
PT	4 478 805	849 415	24 967	3 107	12.4%	n.a.	28 034	27.2%
RO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SI	957 014	890 992	24 822	2 528	10.2%	0.33	59 717	n.a.

Source: JRC based on Member States' reporting, Eurostat, Dataset April 2022. [18]

Table 4: Implementation status of Article 5 of the EED by Member States which chose the alternative approach[19][20][21][22] [23][24]

13 Spain's report: 'The total building floor area [m2] of buildings renovated in 2020 in connection with Article 5(6) was 304 763 m2. This equates to a 109% fulfilment of the target of 279 944 m2 (calculated as 3% of the 9 331 465 m2 total building floor area [m2] of those buildings which did not meet the Article 5(1) energy performance requirements on 1 January 2020). Taking into account the 1 930 977 m2 of building floor area renovated in 2014-2020, 96% of the target of 2 016 921 m2 has been fulfilled..

Italy's report: 'The difference with respect to the total value of the surface referred to in the upper row indicates the total surface of the heated and/or cooled buildings owned and occupied by the central public administration and with a total useful floor area of over 250 m2, which have been redeveloped or whose redevelopment was scheduled during the year'.

14 Unless otherwise stated, the annual renovation obligation is calculated by multiplying the previous year's reported non-compliance with MEPS for the floor area by 3%.

15 Luxembourg: the overall objective for the whole period has been more than achieved. No additional buildings were therefore renovated in 2020.

16 Portugal: the report concerned the first year of application of the default approach. It was not possible to assess the cumulative achievement because the renovated area was only reported in 2019 and 2020.

17 Slovenia: data for the years 2015 and 2016 is missing, therefore the Total obligation achieved in 2014-2020 in terms of floor area [%] is not available.

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19 Malta: data for the years 2014-2020 is missing, therefore the Total obligation achieved in 2014-2020 in terms of floor area [%] is not available

20 Cyprus: hospitals and health centres were removed from the list in 2020 because they had fallen under the administration of the State Health Services Organisation (SHSO) instead of the Ministry of Health. The SHSO is independent of the central government and was established as part of the recent public health sector reform. The new annual energy-saving target based on the 2021-2030 long-term renovation strategy is 1.31 GWh. The target for 2020 will therefore be 1.31 GWh instead of 3.316 GWh.

21From the report for Croatia: 'The 2020 target has not been met. 205 energy renovation projects in the public building sector were completed in 2020, but none of the buildings were owned and occupied by central government. Please note that 2020 was particularly problematic

Member State	Central government buildings with floor area > 250 m2 in 1 January 2021		Article 5. annual requirement	Article 5 progress in 2020				
	All [m2]	Non-compliant with MEPS [m2]	Annual energy savings obligation [ktoe]	Savings achieved [ktoe]	Annual obligation achieved in 2020 in terms of energy savings [%]	Sum of savings in 2014-2020	Total renovated floor area over the period 2014-2020	Total obligation achieved in 2014-2020 in terms of floor area [%]
AT	n.a.	750 000	0.15	0.89	593.3%	4.90	n.a.	478.9%
BE	n.a.	n.a.	0.11	1.13	1054.8%	8.42	n.a.	1119.2%
CY	n.a.	n.a.	0.11	0.17	153.3%	1.78	n.a.	97.8%
CZ	2 405 077	1 599 209	0.49	0.60	121.4%	7.60	n.a.	219.6%
DE	2 900 000 (2019)	n.a.	0.61 (2019)	5.58 (2019)	909% (2019)	83.996 (2014-2019)	n.a.	2128% (2014-2019)
DK	n.a.	988 782	0.38	0.80	210.5%	4.20	n.a.	157.9%
FI	n.a.	2 195 943	0.09	0.14	156.4%	1.55	n.a.	206.1%
FR	n.a.	22 200 000	35.55	98.02	275.7%	764.40	n.a.	307.2%
HR	n.a.	n.a.	0.12	0.00	0.0%	4.07	n.a.	497.9%
IE	n.a.	335 954	0.16	0.77	478.8%	4.24	n.a.	378.2%
MT	167 166	49 715	n.a.	0.02	n.a.	0.04	n.a.	n.a.
NL	n.a.	n.a.	4.18	1.87	44.7%	185.90	n.a.	635.4%
PL	n.a.	n.a.	0.37	0.58	155.3%	3.22	n.a.	123.2%
SE	n.a.	86 871	0.24	-3.71	0.0%	1.57	n.a.	83.7%
SK	n.a.	1 339 616.22	4.49	10.63	236.9%	43.22	n.a.	160.6%

Source: JRC based on the reports by Member States, 2022 [25]

6. Energy savings obligation – Article 7 of the EED

Article 7 of the EED refers to Member States' obligation to, inter alia, provide the cumulative amount of energy savings achieved in 2019 and 2020 in order to assess whether their energy savings obligation for the 2014-2020 period have been fulfilled.

because, in the midst of the COVID-19 pandemic, the Republic of Croatia was hit by terrible earthquakes, which have significantly slowed down the renovation of buildings and postponed renovation deadlines'.

22 The Netherlands: the cumulative savings in energy (gas, heat and electricity) consumed by buildings owned and occupied by the central government was 227 ktoe in 2014-2021. This equates to a 5% average annual reduction in energy consumption (2021:-0.2 ktoe of energy savings, 2014-2021: 226.7 ktoe of energy savings).

23 Ireland's annual target was notified in additional information that it provided in 2018. It is assumed that the target has remained the same throughout the period in question.

24 Primary energy savings: Belgium, Denmark, Germany, Ireland, Cyprus and Poland. Final energy savings: Czechia, Spain, France, Croatia, Malta, the Netherlands, Austria, Slovenia and Finland. Not clear if primary or final: Italy, Slovakia and Sweden.

25 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

As Table 5 shows, the cumulative energy savings in 2014-2020 in 24 Member States[26] amounted to 197.4 Mtoe – i.e. 103% of the sum of the cumulative end-use energy savings obligations for 2014-2020 (191.7 Mtoe) for those 24 Member States. This is equivalent to 97.5% of the sum of the cumulative end-use energy savings obligations for the 2014-2020 period (202.5 Mtoe) for the 27 Member States. Depending on the final figures for the remaining three Member States, the total cumulative savings target for the 27 Member States as a whole could have been met[27].

Out of the 24 Member States that submitted data[28] regarding their final achievement, 14 Member States met their energy savings obligation. Seven Member States – Austria, Cyprus, Denmark, Estonia, Finland, Ireland, and the Netherlands – overachieved their energy savings obligation by more than 20%, with Austria, Denmark and Finland overachieving it by more than 50%. Six Member States – France, Latvia, Lithuania, Malta, Slovakia and Sweden – overachieved their energy savings obligation by 5 to 18%. Belgium met its energy savings obligation with a margin of about 1%.

Ten Member States have not met their energy savings obligation, with four, Bulgaria, Italy, Slovenia and Spain, missing their energy savings obligation by less than 10%. Germany missed its energy savings obligation by about 12%. Four Member States – Czech Republic, Greece, Poland and Portugal – missed their energy savings obligation by 25 to 30%. Luxembourg missed its energy savings obligation by about 48%.

Table 5: Cumulative energy savings over 2014-2020 reported by the Member States – compared to the amount of cumulative energy savings required in 2014-2020 under Article 7 of the EED (in ktoe)

	REPORTED cumulative energy savings over 2014-2020	REQUIRED cumulative energy savings over 2014-2020	% of achievement
Austria	10 309	5 200	198%
Belgium	6 815	6 759	101%
Bulgaria	1 785	1 942	92%
Croatia		1 296	
Cyprus	325	242	134%
Czech Republic	3 459	4 882	71%
Denmark	5 821	3 841	151%
Estonia	790	610	130%
Finland	7 831	4 213	186%
France	35 757	31 384	114%
Germany	36 812	41 989	88%

26 Data is not available for Croatia, Hungary and Romania.

27 The data reported by the Member States are still under evaluation and the Member States have been providing additional clarifications. The results presented in this report may therefore be subject to further change.

28 The data reported and referred to does not consider potential concerns about eligibility, additionality and materiality, or inconsistencies or possible mistakes in the data reported.

Greece	2 450	3 333	73%
Hungary		4 001	
Ireland	2 627	2 164	121%
Italy	23 239	25 502	91%
Latvia	898	851	106%
Lithuania	1 115	1 004	111%
Luxembourg	267	515	52%
Malta	78	67	116%
Netherlands	16 043	11 512	139%
Poland	10 473	14 818	71%
Portugal	1 885	2 532	74%
Romania		5 511	
Slovakia	2 550	2 284	112%
Slovenia	913	945	97%
Spain	15 207	15 979	95%
Sweden	9 940	9 114	109%
TOTAL	**197 389 ***	**202 489**	**97.5% ***

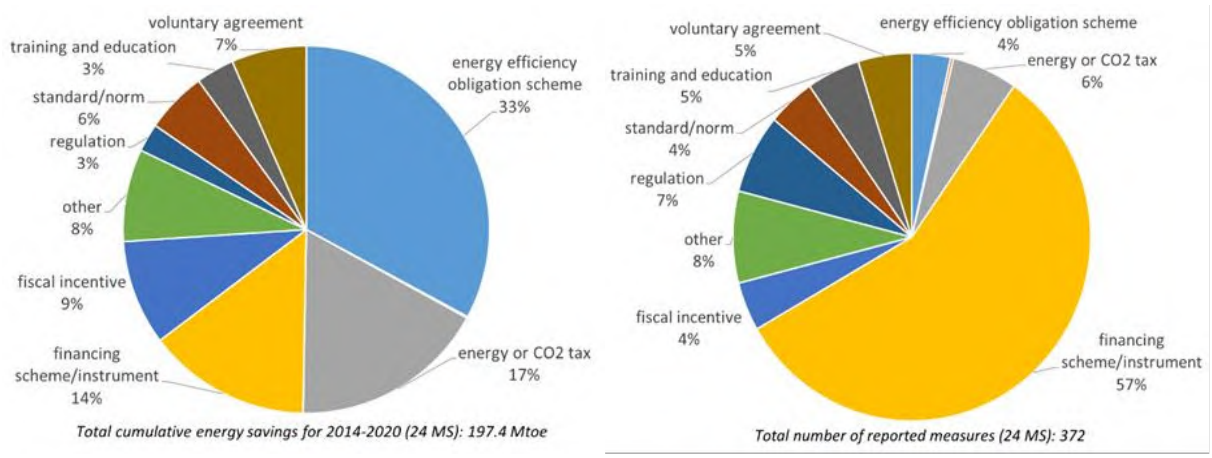
* Total for 24 Member States

Source: information reported by Member States and supplemented by the Commission's calculations and estimates where necessary. [29]

It is important to underline that energy efficiency obligation systems (EEOS) contribute around 33% of the energy savings achieved by each type of implemented policy measure, whereas financing schemes contribute around 14%. Taxes on energy and CO2 account for 17% of total achieved energy savings (see Figure 7 below).

Figure 7: Share of reported cumulative energy savings by type of policy measure (left) and distribution of the number of policy measures per type of policy measure (right) at EU level

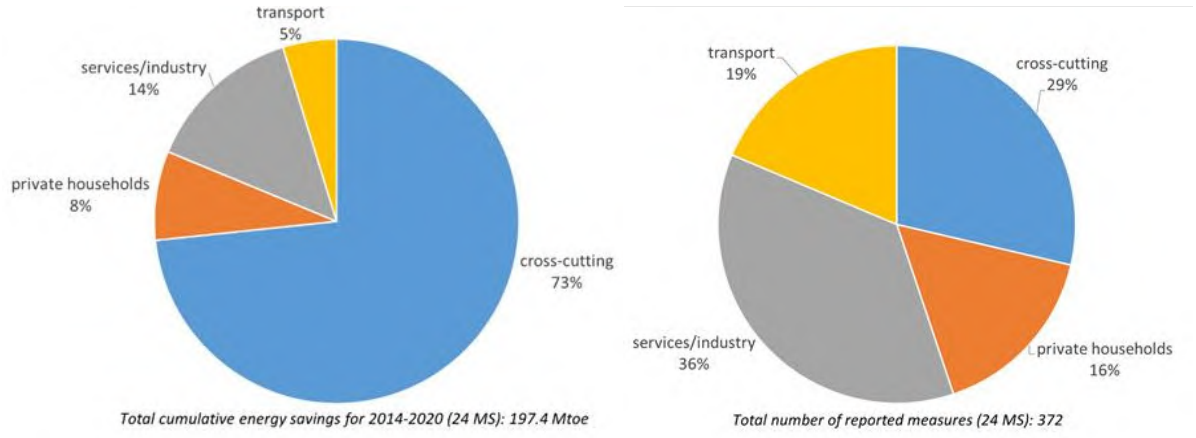
29 The analysis is in line with the data reported in the reporting template. The data might be reviewed if further clarifications are provided by Member States.



Source: European Commission (Directorate-General for Energy) calculations based on the data submitted by the Member States in 2022 on the policy measures reported under Article 7(1) EED for 2014-2020 and the cumulative energy savings reported for 2014-2020 (data available for 24 Member States).

On the sectors targeted by the implemented policy measures under Article 7 of the EED, the largest share of energy savings reported by Member States results from cross-cutting measures, which cannot be attributed to a single sector, as observed in Figure 9. Most policy measures, by count of policy measures reported under Article 7(1) of the EED, target services and industry (which cover most companies, except for transport companies) and the public sector (except for the housing owned by public bodies, which is included in the private households sector).

Figure 8: Share of reported cumulative energy savings by sector at EU level (data for 24 Member States)



Source: European Commission (Directorate-General for Energy) calculations based on the data submitted by the Member States in 2022 on the cumulative energy savings reported for 2014-2020 (data available for 24 Member States).

Table 6, provides the list of the top 3 measures per Member State, showing which policy measures brought the largest shares of cumulative energy savings for each Member State. In their reporting, Member States submitted updated lists of the policy measures they reported

under Article 7(1) of the EED for the 2014-2020 period. In total, 498 measures were reported[30], of which 40 were reported for the first time[31]. It is worth nothing that new EEOS were not reported, although some are planned for the 2021-2030 period.

Table 6: Overview of the top three measures per Member State (based on the cumulative energy savings in 2014-2020 reported for each policy measure)[32]

Member State*	**Top 3 policy measures per Member State** (per decreasing order of cumulative savings)	**Cumulative energy savings 2014-2020**	**% of the Member State's cumulative savings**
Austria	Energy taxation	3809	37%
	Energy efficiency obligation scheme for energy suppliers	3068	30%
	Provincial support for housing construction, energy support and environmental support, and private sector renovation vouchers	1440	14%
Belgium	Flanders: Energy policy agreements with companies	2950	43%
	Flanders: Public service obligations for rational energy use imposed on network operators (REG)	1184	17%
	Wallonia: Branch agreements 2 (AdB)	1116	16%
Bulgaria	Energy Efficiency Obligation Schemes from Derogation on article 7 (8) of the EED - previous scheme for obligations in the period 2011-2013	780	44%
	Energy Efficiency Obligation Schemes	451	25%
	National Program for energy efficiency in multifamily residential buildings (2016-2020)	271	15%
Cyprus	Transport fuel taxes	278	85%
	Minimum energy performance requirements in buildings prior to the transposition of Directive 2010/31/EU.	19	6%
	Grant Scheme «Saving Energy – Upgrading of Households».	13	4%
Czech Republic	Sustainable Development Strategic Framework – Improvement of technological processes	1371	40%
	New Green Savings Programme 2014-2020 (MoE)	320	9%
	Operational Programme for Entrepreneurship and Innovation 2007-2013 (MIT)	298	9%

30 Energy savings were reported for only 422 of the 498 measures either because some of the notified measures were not implemented or because no energy savings were reported from them.

31 The new measures implemented by the Member States as part of their Recovery and Resilience Plan or to face the current energy crisis are not included in this report because it deals with the 2014-2020 obligation period.

32 Not all the Member States have reported 3 policy measures

Denmark	Energy efficiency obligation scheme	5821	100%
Estonia	Excise and value added tax of diesel fuel and light fuel oil	169	21%
	Renewable energy fee	94	12%
	Excise and value added tax of gasoline	86	11%
Finland	Energy Efficiency Agreements	2868	37%
	Transport fuel taxation/car traffic	1761	22%
	Heat pumps for detached and terraced houses	923	12%
France	White certificates scheme (CEE)	35757	100%
Germany	Energy and electricity tax	12205	33%
	Energy Savings Ordinance (existing buildings)	7543	20%
	KfW support programmes for energy-efficient construction and renovation	4140	11%
Greece	Energy Efficiency Obligation Schemes	578	24%
	Oil products specific consumption tax	536	22%
	Replacing old private passenger vehicles	463	19%
Ireland	EEOS	1185	45%
	2005 / 2008 Building Regulations - Buildings other than dwellings	402	15%
	VRT/Motor tax aligned with emissions	240	9%
Italy	Tax reductions	10394	45%
	White Certificates	8392	36%
	Enterprise 4.0 Plan	1830	8%
Latvia	Energy taxes	359	40%
	Implementation of measures identified as a result of energy audits of large companies and major electricity consumers	168	19%
	Climate change financial instrument project competitions	116	13%
Lithuania	Transport fuel taxation	473	42%
	Programme for the renovation (modernisation) of multi-apartment buildings	251	22%
	Agreements with energy companies	162	15%
Luxembourg	Energy Efficiency Obligation Scheme	267	100%

Malta	Financing schemes and instruments and fiscal incentives	45	58%
	Regulations and Voluntary Agreements	25	32%
	Progressiveness of the domestic residential household tariff system and the eco-reduction mechanism.	4	5%
Netherlands	Policies targeted at households	6794	42%
	Energy Investment Allowance (EIA)	5238	33%
	Long Term Agreement big industry (MEE), excl. Refineries	2892	18%
Poland	White certificates scheme	9159	87%
	Thermomodernisation Fund	662	6%
	Fuel tax	355	3%
Portugal	NEEAP measures not reported separately	864	46%
	SGCIE - Management System of Intensive Energy Consumption	362	19%
	Programme to support the use of public transport.	210	11%
Slovakia	Voluntary Energy Saving Agreement, Contractual relationship with the Ministry of Economy of the Slovak Republic, Own resources	653	25%
	Improvement of the thermal and technical properties of buildings (EHB), Apartment buildings, Own resources	524	20%
	Application of legislative measures, Mandatory energy audits in industrial enterprises, including management	164	6%
Slovenia	EEO scheme: the obligation on energy suppliers to provide proof of energy-saving operations	512	56%
	Energy efficiency measures financed from the supplement to energy price payed by all final energy users (financed through the Slovenian ECO Fund - Eko sklad)	401	44%
Spain[33]	Law 15/2012 on taxation measures for energy sustainability	2947	19%
	Programmes implemented by the Autonomous Communities (MENAE)	2534	17%
	Programme to promote industrial competitiveness	1613	11%
Sweden	Energy and CO_2 tax	9940	100%

* Croatia, Hungary and Romania are not included in this table because they have not reported the cumulative savings they made in 2014-2020.

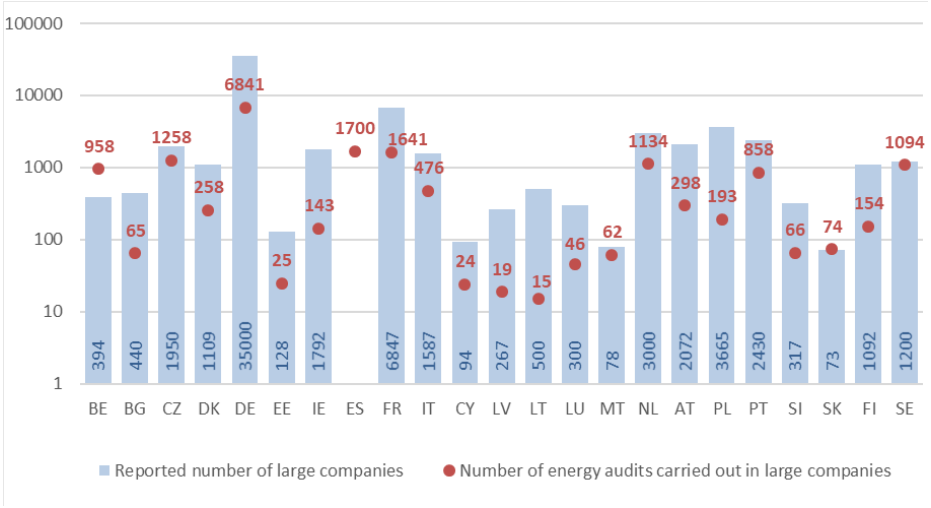
Source: information reported by Member States and supplemented by Commission's calculations and estimates where necessary.

33 The analysis is in line with the data reported in the reporting template. The data might be reviewed if further clarifications are provided by Member States.

7. Energy audits and energy management systems – Article 8 of the EED

Article 8 of the EED requires companies that are not small or medium enterprises to carry out an energy audit or to implement an energy management system at least once every four years. In their 2022 reporting, Member States were required to state the total estimated number of large companies in their territory to which Article 8(4) of the EED is applicable and the number of energy audits carried out in those enterprises. Figure 9 provides an overview of the 2020 notifications submitted by 23 Member States[34].

Figure 9: Energy audits carried out in large companies in 2020[35]



Source: information reported by Member States. [36]

The reported number of large companies differs from the number of energy audits on large companies, because such energy audits are not required every year, but only once every four years as a minimum. In addition, given the circumstances of the COVID-19 pandemic, several companies postponed their energy audits[37].

8. Long-Term Renovation Strategies (LTRS)

34 Greece, Croatia, Hungary and Romania did not report the number of large companies or the number of energy audits carried out in those companies.

35 The graph's vertical axis uses a logarithmic scale for presentational reasons. Malta and Spain did not report the number of large companies in 2020. For Malta, the 2019 data is assumed for 2020

36 Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

37 This is explicitly mentioned by some Member States, for example NL and LV.

Article 2a of the EPBD requires Member States to submit their LTRS by March 2020[38]. The Commission has analysed the national strategies[39] with a view to sharing best practices between the Member States. The national strategies and the Commission's assessment were a key contribution to the national Recovery and Resilience Plans in which energy-efficient buildings renovation features prominently.

The great majority of 2020 strategies include a good overview of policies targeting public buildings and provide a long-term roadmap towards the 2050 goal of decarbonising the building stock. Most of these roadmaps include specific intermediate milestones for 2030 and 2050, and to a lesser extent for 2040.

As the Renovation Wave Communication[40] indicates, policies and measures tackling energy poverty and worst performing buildings deserve specific attention. A majority of Member States have recognised the importance of the issue and in general presented several actions and measures to tackle energy poverty. Different approaches have been chosen to identify worst performing buildings to be targeted (e.g. energy class, age and energy consumption).

All 2020 LTRS contain a specific section presenting expected energy savings, wider benefits related to health and indoor air quality and positive economic impacts. However, half of the Member States did not quantify these potential benefits.

The strategies generally comply with the requirements of the EPBD[41], but the Commission's analysis highlights the fact that not every LTRS is sufficiently ambitious towards the 2050 decarbonisation goals. The Commission's analysis of the 2020 LTRS recognises that since the first round of LTRS (first submission in 2014 followed by updates in 2017), the quality of the strategies has improved, but underlines the need for a more uniform approach, supported by guidelines and harmonised templates.

The differences in Member States' approaches when setting national milestones make it difficult to assess the ambition at EU level. Most Member States provided absolute values for CO_2 emissions in buildings in 2030, 2040 and 2050, including a reference emissions value used to estimate the relative reduction. However, inconsistencies between the Member States suggest that a direct comparison of their greenhouse gas reduction ambitions may be misleading.

Table 7 summarises the indicative renovation milestones for the buildings stock for 2030, 2040 and 2050 as reported by the Member States in the 2020 LTRSs[42].

38 Given the circumstances of the Covid-19 pandemic, a certain number of Member States delayed the submission of their long-term renovation strategies.

39 SWD(2021) 365 final/2: Analysis of the national long-term renovation strategies (to be noted that the final version of the SWD is to be published soon).

40 COM(2020) 662 final.

41 Castellazzi L., Paci D., et al. (2022), Assessment of the first long-term renovation strategies under the Energy Performance of Building Directive, Publications Office of the European Union, Luxembourg (forthcoming).

42 JRC's own calculation based on Member States reporting, 2022. See:

- Maduta, C., Economidou, M., Castellazzi, L., D'Agostino, D., Paci, D., Tsemekidi Tzeiranaki, S. and Bertoldi, P., *Progress of the Member States in implementing the Energy Performance of Building Directive - 2021 assessment*, Publications Office of the European Union, Luxembourg (forthcoming); and

Table 7: Renovation rates reported in national long-term renovation strategies

Member State	Completed renovation	Planned renovation		
	2020	2030	2040	2050
Austria	1.5% p.a.	1.5% p.a.	1.5% p.a.	1.5% p.a.
Belgium – Brussels	less than 1% p.a.		100% public buildings energy neutral	80% cumulative residential
Belgium – Flanders	3.5% p.a. residential 105 000 dwellings	3% p.a. residential 32% cumulative 973 500 dwellings	3% p.a. residential 64% cumulative 1 923 500 dwellings	3% p.a. residential 96.5% cumulative 2 873 500 dwellings
Belgium – Wallonia		12% cumulative residential (194 571 buildings) 63 400 000 m^2 cumulative non-residential	51% cumulative residential (830 158 buildings) 114 000 000 m^2 cumulative non-residential	99% cumulative residential (1 605 485 buildings) (25% deep renovated 399 103) 114 000 000 m^2 cumulative non-residential
Bulgaria		8% (22 203 509 m^2) cumulative floor area	26% (71 774 177 m^2) cumulative floor area	46% (127 597 192 m^2) cumulative floor area
Cyprus	1% cumulative buildings	1% p.a. 10% cumulative (43 000)	1% p.a.	1% p.a.
Czechia	45% cumulative buildings with more than 25% shallow renovation	1.4% p.a. SFH, 0.79% p.a. MFH; 2% p.a. public buildings 55% cumulative	1.4% p.a. SFH, 0.79% p.a. MFH; 2% p.a. public buildings 60% cumulative	1.4% p.a. SFH, 0.79% p.a. MFH; 2% p.a. public buildings 70% cumulative
Germany		1.3% to 2% p.a. SFH and 1.5% to 2% p.a. MFH for the period 2020-2030		
Denmark	80% renovated (55-60% light, 20-25%			

- Castellazzi L., Paci D. et al., *Assessment of the first long-term renovation strategies under the Energy Performance of Building Directive*, Publications Office of the European Union, Luxembourg, 2022 (forthcoming).

	medium, 5% deep)			
Estonia	500 000 m^2 cumulative floor area	22% cumulative (11 880 000 m^2)	64% cumulative (34 560 000 m^2)	100% cumulative (54 000 000 m^2/ 141 000 buildings)
Greece		23% residential 9% non-residential	36-42% residential; 14-16% non-residential	45-49% residential; 19-20% non-residential;
Spain	56 017 cumulative dwellings	1 256 017 cumulative dwellings (300 000 dwellings/year)	4 756 017 cumulative dwellings	7 156 017 cumulative dwellings
Finland	29% cumulative buildings	54% cumulative	98% cumulative	100% cumulative
France		1.5% to 3% p.a. over 2020-2050		
Croatia	0.7% p.a. 5% cumulative buildings	3% p.a.	3.5% p.a. (4% p.a. buildings with cultural value) 60% cumulative NZEBs	4% p.a. 100% cumulative NZEBs
Hungary	1% p.a.	3% p.a. residential; 5% p.a. public buildings 20% cumulative NZEBs	3% p.a. residential; 5% p.a. public buildings 60% cumulative NZEBs	3% p.a. residential; 5% p.a. public buildings 90% cumulative NZEBs
Ireland		500 000 dwellings cumulative 100% public buildings 33% commercial buildings	1 000 000 dwellings cumulative 66% commercial buildings	1 500 000 dwellings cumulative 100% commercial buildings
Italy	0.86% p.a.	1.9% p.a. residential; 2.8% p.a. non-residential	2.7% p.a. residential; 2.6% p.a. non-residential	2.7% p.a. residential; 2.6% p.a. non-residential
Lithuania	8% cumulative buildings	17% cumulative (99 281 units)	43% cumulative (225 421 units)	74% cumulative (436 008 units)
Luxembourg	10-14% cumulative residential buildings	3% p.a. residential	3% p.a. residential (4 500	3% p.a. residential

		(4 500 dwellings/year)	dwellings/year)	(4 500 dwellings/year)
Latvia	3% (678 460 m^2) cumulative public buildings	8 100 units MFH (30%) and 7 500 units SFH 500 000 m^2 public buildings	16 200 units MFH (60%) cumulative 3% per year public building	All NZEBs
Malta	0.5% p.a. (0.7% p.a. 2025)	5-6% p.a. residential (0.6% deep renovation) from 2025	5-6% p.a. residential (0.6% deep renovation)	5-6% p.a. residential (0.6% deep renovation)
Netherlands		1 500 000 dwellings		
Poland		3.6% p.a. 236 000 cumulative buildings	4.1% p.a. 507 000 cumulative buildings	3.7% p.a. 751 000 cumulative buildings
Portugal		69% cumulative buildings (363 680 501 m^2)	99% cumulative buildings (635 637 685 m^2)	100% cumulative buildings (747 953 071 m^2)
Romania	0.5% p.a. 6% cumulative floor area (32 352 000 m^2)	from 0.5% to 3.39% p.a. in 2030 19% cumulative floor area	3.79% p.a. 57% cumulative floor area	4.33% p.a. 100% cumulative floor area
Sweden	2.5%- 5% p.a. 2016-2019 10% p.a. after 2019			
Slovenia	1 795 000 m^2 cumulative public buildings	29 733 000 m^2 cumulative	28 850 600 m^2 cumulative SFH 12 778 700 m^2 cumulative MFH	32 549 000 m^2 cumulative SFH (74%) 13 924 700 m^2 cumulative MFH (91%)
Slovakia		100% cumulative MFH	100% cumulative SFH	

Source: JRC 2022 based on information reported by Member States.

As Table 7 shows, renovation target indicators are not standardised across the EU. 14 Member States provided absolute values for the number of planned renovations of buildings/dwellings or for renovated floor area (in square metres). By contrast, 13 Member States expressed the renovation targets in terms of annual renovation rate. Three Member States provided only the cumulative share of renovated buildings. 19 Member States covered both the residential and the

non-residential sector, but some Member States focused on the residential sector or on specific segments within the non-residential sector (e.g. commercial buildings or public buildings).

The annual renovation rate planned for the next decades varies from as low as 1% to 6%. Some Member States (Estonia, Croatia, Latvia, Portugal, Romania and Finland) aim to renovate their entire building stock by 2050, while other Member States (Bulgaria, Greece, Cyprus and Austria) plan to renovate less than half of their building stock by 2050. It is also important to recall that the impact of energy renovations is heavily dependent on the depth of the renovation and this is often not comparable or is not specified in the national strategies. Nonetheless, the available information is sufficient to conclude that most Member States are aiming to increase their annual building stock renovation rate by an average of 1.5% to 3%.

The Commission's analysis reveals that not every LTRS is sufficiently ambitious towards the 2050 decarbonisation goals and that more efforts, resources and sustainable solutions will be necessary in order to prepare for climate change and contribute to climate neutrality in line with the European Green Deal[43].

9. Nearly Zero-Energy Buildings [44]

In accordance with Article 9 of the EPBD, NZEBs became the new building standard in the Member States by 31 December 2020 (and after 31 December 2018 for all new public buildings)[45]. NZEB performance requirements have progressively increased over the last decade and make an important contribution to the decarbonisation of the EU's building stock[46].

The Member States have established national NZEB definitions and provided numerical indicators for primary energy use expressed in kWh/(m^2y) that appear on average less ambitious than the benchmarks presented in the Commission's 2016 Recommendation[47], noting that a direct comparison of national definitions is not always possible[48] because the Member States' approaches vary due to differences in their specific climate, market, energy mix, construction traditions and other local conditions.

43 These would include R&I solutions, in line with Horizon Europe Cities Mission on Climate Neutral and Smart Cities, by 2030.

44 This session complements the relevant session on NZEBs in the 2020 assessment of the progress made by the Member States in implementing the EED and in meeting the NZEB and cost-optimal minimum energy performance requirements of the EPBD. The aim is to reflect further analysis by the Commission.

45 The circumstances of the Covid-19 pandemic meant that the actual implementation of the NZEB requirements was delayed for a short period of time in some Member States.

46 Economidou, M., Todeschi, V., Bertoldi, P., D'Agostino, D., Zangheri, P. and Castellazzi, L., 'Review of 50 years of energy policies for buildings', Energy and Buildings, Vol. 225, 2020.

47 Commission Recommendation 2016/1318 of 29 July 2016 on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings.

48 D'Agostino, D. and Mazzarella, L., 'What is a Nearly zero energy building? Overview, implementation and comparison of definitions', Journal of Building Engineering, Vol. 21, 2019, pp. 200-212.

The average renewable share is estimated at between 20% and 50% of overall building energy needs and is projected to increase due to the need to accelerate the phasing out of fossil fuels in accordance with the Renovation Wave and the REPowerEU[49].

More than half of the Member States have an energy performance class corresponding to the NZEB level. Some Member States draw a distinction in the energy performance level between residential and non-residential NZEBs, but others distinguish between new and existing NZEBs.

Table 8: Number and floor area of new and renovated NZEBs

	Number and floor area of new NZEBs				**Number and floor area of renovated NZEBs**			
	Number		**Floor area (m^2)**		**Number**		**Floor area (m^2)**	
	2019	**2020**	**2019**	**2020**	**2019**	**2020**	**2019**	**2020**
TOTAL	330 704	585 340	77 316 865.46	141 013 006	165 130	203 394	62 180 459	73 600 197

Source: JRC 2022 based on information reported by Member States.

The reported data form a scattered picture of the uptake of NZEBs in different Member States. A few Member States appear to be front runners and report very high numbers for both new and renovated NZEBs.[50]

10. Cost-optimal levels of minimum energy performance requirements for buildings[51]

The implementation of the cost-optimality methodology required by Article 5 of the EPBD marks a novel approach in the establishment of minimum energy performance requirements for new and existing buildings. Since 2013 and every five years thereafter, Member States have had to carry out cost-optimality calculations and update their national requirements accordingly.

Based on the Joint Research Centre's assessment of the Member States cost-optimal reports[52], the average cost-optimal level for new buildings is around 80 kWh/(m^2y) for residential buildings and 140 kWh/(m^2y) for non-residential buildings. For existing buildings undergoing major renovation, the average cost-optimal level is around 130 kWh/(m^2y) for residential buildings and 180 kWh/(m^2y) for non-residential buildings.

49 REPowerEU Plan, COM(2022) 230 final, https://eur-lex.europa.eu/resource.html?uri=cellar:fc930f14-d7ae-11ec-a95f-01aa75ed71a1.0001.02/DOC_1&format=PDF.

50 For disaggregated data, see Tsemekidi-Tzeiranaki S.., Paci D., Clementi E., Gonzales Torres M., Analysis of the Reports on 2020 Targets under Article 27 of the Governance Regulation – Energy Efficiency, 2022

51 This section complements the relevant sections in the 2020 assessment of the progress made by Member States in implementing the EED and in meeting the NZEB and cost-optimal MEPS requirements of the EPBD. The aim is to reflect progress in implementation by the Member States and further analysis by the Commission.

52 The Member States' results are not fully comparable because they were free to choose the macroeconomic or financial basis for calculating cost-optimal levels and to apply their own individual national standards and methodologies when calculating the energy performance of buildings. Other differences relating to investment costs and other factors reflect national market conditions.

A comparison of the cost-optimal levels for 2013 and 2018 shows a reduction of primary energy demand was observed for almost all building types in the Member States, with average values reduced by 21% and 11% for new residential and office buildings respectively, and by 14% and 12% for existing residential and office buildings respectively.

Member States have used the cost-optimality methodology to set minimum requirements for the energy performance of new and existing buildings, including for NZEBs. Regardless of the differences between Member States in relation to building types, markets and climates, renewable energy solutions, the cost-optimal minimum energy performance requirements are usually worse than the NZEB requirements (in some Member States cost-optimal and NZEB requirements are similar).

11. Conclusion

Highly influenced by COVID-19 pandemic, in 2020 both primary and final energy consumption targets were overachieved. All Member States achieved their 2020 national contributions, except Belgium, Bulgaria, and Poland for primary energy consumption, and Belgium, Bulgaria, Germany Lithuania, Austria, and Sweden for final energy consumption.

Regarding progress towards the 2030 targets of 32.5% compared to the 2007 Reference Scenario, the EU FEC and PEC in 2020 were 7.2% and 9.6% above the 2030 target levels, respectively. Far more efforts are needed if the EU aims to achieve a structural reduction in energy consumption and meet the new target of 13% proposed by the Commission in REPowerEU.

For Article 7 of the EED, the cumulative energy savings over 2014-2020, available from 24 Member States, amounted to 197.4 Mtoe, which is equivalent to 103% of the sum of the cumulative end-use energy savings obligations for 2014-2020 (191.7 Mtoe) and 97.5% (202.5 Mtoe) for 27 Member States. Depending on the final achievements by the three missing Member States, the sum of cumulative savings required for the 27 Member States could be met. Out of the 24 Member States that submitted the complete data regarding their final achievement, 14 Member States fulfilled their energy savings obligation, whereas ten Member States did not meet their energy savings obligation.

The information gaps in Article 5 of the EED as well as the different approaches in reporting between Member States, do not allow to understand the level of target achievement at EU level. Nevertheless, the majority of the Member States have achieved either the annual obligation in 2020 or the 2014-2020 total obligation.

To meet the 2030 climate and energy targets, energy efficiency needs to be prioritised. To step up its efforts, the Commission put forward in July 2021 a proposal for a recast directive of the EED. The proposal sets new targets and scopes for the aforementioned articles with an increase

in ambition. Therefore, it is crucial that the reporting of Member States in the upcoming national integrated energy and climate progress reports (Article 17 of the Governance Regulation) and in the NECPs is complete and consistent in order to allow both the Commission and Member States to assess the progress towards the energy efficiency targets and identify the possible need for new policy measures.

For the Renovation Wave it is important to keep the momentum and deliver clear and ambitious measures and mechanisms that can ensure that buildings will be renovated at higher rate and exploiting much more than today their energy efficacy potential, so as to contribute to the achievement of the energy efficiency target, to the reduction of energy demand and energy bills for citizens.

Long-term strategies aim to accelerate the cost-effective renovation of existing buildings, and ensure an increase in deep renovations. The differences in national approaches to setting renovation targets make it difficult to compare them directly and estimate an aggregate EU target. The Commission's analysis highlights the fact that some Member States' efforts will not be sufficient to fully decarbonise their building stock by 2050, and therefore further actions and higher ambition will be needed. The Commission's proposal to revise the EPBD strengthens and streamlines the requirements for LTRS (which would be renamed as national Building Renovation Plans) so that they would become strategic planning and reporting tools that would be more focused on measures with clear, quantified, comparable and verifiable objectives, milestones and resources.

NZEBs became the new building standard in the Member States by 31 December 2020, which has proved to set a 'future-proof' vision for the construction sector and mobilise stakeholders accordingly. NZEBs share in the building stock is still low but it is expected that the number of NZEBs will increase in the coming years, paving the way to zero-emission buildings, as proposed in the Commission's proposal to revise the EPBD.

Moreover, for both new and existing buildings, the choice of a cost-optimal methodology to steer existing national energy performance requirements towards cost-efficient levels has proved to be an efficient approach. The minimum energy performance requirements have progressively improved over the last decade and made an important contribution to the improvement of the EU's building stock. The recent Commission's review of the EPBD has highlighted the need to update the cost-optimality framework in order to take better account of the costs of GHG emissions and the effects of environmental and health externalities.