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National Energy and Climate Plans for 2021-2030 under the EU Energy Union

Assessment of the Energy Efficiency Dimension

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Contents

Abstract

The Energy Union strategy —built on the dimensions of energy security, internal energy market, energy efficiency, decarbonisation, research, competitiveness and innovation— aims to ensure secure, sustainable, affordable and competitive energy for all its citizens and businesses in the midst of the ongoing energy transition. The 2030 climate and energy framework sets targets for cutting greenhouse gas emissions, increasing the share of renewable energy and improving energy efficiency. Under the Energy Union Governance Regulation, Member States were required to adopt integrated national energy and climate plans (NECPs) for the period 2021-2030, laying out their national contributions to the EU targets as well as their plans of accompanying policies and measures. This report represents the first of the series of reports assessing the energy efficiency dimension of the national energy and climate plans of EU Member States submitted under the Energy Union Governance. Building on past JRC assessments on energy efficiency in the frame of the 2020 policy, the report provides an evaluation of the national contributions towards the EU energy efficiency target in 2030 and presents an overview of all relevant policies and measures reported by the Member States in their plans. The implementation of key provisions of EU directives based on the information found in the NECPs is discussed, and recommendations on how to improve the future policy and reporting framework are provided. Whilst several positive developments have been identified in this analysis, the assessment has also highlighted the need to step up the ambition set by Member States, including the need to provide more robust evidence of the impact of proposed policies and actions against the various energy efficiency targets and requirements set in the context of EU directives.

Acknowledgements

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Executive summary

Policy context

The Energy Union strategy —built on the dimensions of energy security, internal energy market, energy efficiency, decarbonisation, research, competitiveness and innovation— aims to ensure secure, sustainable, affordable and competitive energy for all its citizens and businesses in the midst of the ongoing energy transition. The 2030 climate and energy framework sets targets for cutting greenhouse gas emissions, increasing the share of renewable energy and improving energy efficiency by the year 2030. Under the Energy Union Governance Regulation, Member States were required to adopt integrated national energy and climate plans (NECPs) for the period 2021-2030, laying out their national contributions to the EU targets as well as their accompanying policies and measures.

Key conclusions

The national contributions to the EU target, as reported in the final NECPs, stand short of the existing 32.5% ambition, with current ambition levels being equivalent to a 29.6% primary and 29.4% final energy reduction in 2030 compared to PRIMES 2007 projections. The assessment of the NECPs has identified a mixture of various types of policies and measures targeting all sectors of the economy from buildings to transport, and industry to energy supply. Intensified efforts in the transport and building sector have been identified, with several countries setting specific targets or milestones for these sectors. Several improvements have been found in the final NECPs, both in terms of the details provided and set ambition, reflecting the additional efforts put in place by the Member States following the recommendations issued by the European Commission on the draft plans. Despite this, just less than a half of the EU Member States have notified sufficient cumulative energy savings of measures in line with the EED Article 7 energy saving requirements. Moreover, it is not possible to assess whether the various proposed policy packages will be sufficient to meet the ambition stipulated in EED Article 5, EPBD Article 2a or indeed EED Article 3. Beyond this, several overlaps in measures reported under the EED Articles 5, 7 and EPBD Article 2a are identified, lowering the aggregated ambition to be achieved by these provisions. In light of the recent Commission proposal for increased ambition by 2030 and the shortcomings identified in this report, it is therefore imperative to intensity efforts and align national ambitions with EU goals as well as to demonstrate the importance of energy efficiency in the clean energy transition and the Paris agreement goals. In doing so, more transparency should be established at identifying the level of ambition of additional measures to attain the overall energy efficiency ambition under the various provisions of EU energy efficiency law, including the EED Article 3. This would enable a more thorough examination of the ambition of each national policy framework against targets, thereby laying out the foundation for a more robust assessment of the overall energy efficiency dimension in the future. Finally, the implications of the COVID-19 crisis on the energy and climate package should be further explored, including the role of energy efficiency dimension in the post-COVID 19 recovery.

Main findings

The analysis has shown a gap of 2.8% in the ambition of the 2030 national contributions with respect to the EU target in terms of primary energy and 3.1% in final energy. In particular, the collective contributions amount to 1128 Mtoe in terms of primary energy consumption and 885 Mtoe in terms of final energy. A comparison of the national contributions with the PRIMES baseline projections of each Member State has revealed that only 9 Member States are associated with an ambition of 32.5% or higher in terms of primary energy and 21 Member States in terms of final energy. On the other hand, the expected consumption levels in 2030 under the current EED Article 3 ambition levels are lower than the respective 2020 national targets in the majority of the Member States over this period. Exceptions include Bulgaria, Denmark, Cyprus, Hungary and Malta where the expected 2030 primary energy consumption is higher than the 2020 consumption and Belgium, Bulgaria, Denmark, Estonia, Cyprus, Lithuania, Hungary, Malta, Austria and Slovakia where final energy consumption in 2030 is higher than that of 2020. As in the case of 2020, the 2030 contributions were based on either primary or final energy savings, primary or final energy consumption or energy intensity. Whilst the majority of the countries chose to set their 2030 contributions in absolute consumption levels as with their 2020 contributions, more Member States now opted for an energy intensity target.

Nearly 1400 policy and measures (PAMs) on energy efficiency have been identified in the NECPs. This vast number of PAMs cover all major policy types such as economic, education, fiscal, information, planning, regulatory, research, voluntary measures as well as sectors (residential, services, industry, transport, public, agriculture, energy supply). Just over a third of all PAMs reported in the NECPs were specified as "planned",

confirming the existence of several new efforts. Moreover only a third of the total PAMs were found to have a direct link with measures reported in the National Energy Efficiency Action Plans of 2017. Important interactions between energy efficiency with other Energy Union dimensions were identified, with nearly half of the reported energy efficiency measures being associated with the decarbonisation dimension, reflecting the strong interaction between these 2 dimensions. Interactions with other dimensions were also found, but were shown to be of lesser importance.

The assessment of the NECPs highlights important findings in the context of the implementation of the Energy Efficiency Directive and the Energy Performance Directive. In total, 6 countries opted for milestones expressed as a share or number of buildings to be renovated or to meet a certain energy class, 5 countries in energy savings, 4 in CO_2 or GHG emission reduction, 3 in absolute energy consumption, and 2 in terms of renovation rates. Just over half of the Member States included some information regarding their long-term renovation strategies (LTRSs) in the NECPs due to the submission of NECPs preceding the submission deadline of the LTRSs. Even though many measures target the building sector, not all building-related measures identified in the NECPs were directly associated with the long-term renovation strategies, with just over 200 national policies and measures reported in the context of the long term renovation strategies, either notified in Section 3.2.ii or in the voluntary PAM templates as an annex to the NECP. It is preliminary to make any observations on the impact of these measures on the reported milestones.

In terms of the central government renovations, no major changes were identified in the implementation approach opted for the 2021-2030 compared to the one in 2014-2020. Countries opting for the alternative approach in the context of the EED Article 5 in the period 2021-2030 presented a mixture of regulatory, economic and information measures. These measures may support mandatory renovations, promote energy services or the use ESCOs and energy performance contracts in the public sector and stimulate the installation of energy management systems. Based on the information found in the NECPs, it is not possible to assess whether these measures would be enough to meet the EED Article 5 requirements.

A few notable differences in the new implementation period 2021-2030 with respect to the preceding period of 2014-2020 were identified in the context of the EED Article 7. In total, 14 Member States plan to use energy efficiency obligations in 2021-2030 to deliver their Article 7 savings. New obligation schemes have been recently set up or are planned to be set up in Croatia, Cyprus and Hungary, while others were ceased or ended (Denmark, Malta and Luxembourg). France is now the only country which plans to meet the future Article 7 requirements exclusively through its energy efficiency obligation scheme. The policy mix adopted by countries with alternative measures in 2021-2030 is fairly diverse, as in the preceding period. All but 8 Member States reported the expected impact of the measures under Article 7 in energy savings and, only 13 Member States have notified cumulative impact of measures to be sufficient to meet the Article 7 requirement.

Finally, an important limitation is linked to the fact the ambition of each national policy framework against each national contribution towards the EU target is not possible to assess in a quantitative way for most countries. This is attributed to the fact that energy savings generated by each measure or group of measures are seldom quantified in the context of the overall contribution to the EU target. In a few cases, the share of the savings to be achieved in 2030 by each sector is presented, demonstrating the ambition of each sector.

Related and future JRC work

This report represents the first of the series of reports assessing the energy efficiency dimension of the national energy and climate plans of EU Member States submitted under the Energy Union Governance. It builds on previous work done by the JRC on the assessment of national energy efficiency action plans under the Energy Efficiency Directive (Economidou et al. 2018, 2014). The JRC regularly assesses the implementation of national and EU policies on energy efficiency as part of its scientific and technical support in the implementation of EU law in the field of energy efficiency. Related work includes the assessment of national progress reports (Tsemekidi-Tzeiranaki, S. et al. 2019, 2018) and reports focusing on specific policy themes such as long-term renovation strategies (Castellazzi, L. et al. 2018, 2016), energy performance contracting and ESCOs (Boza-Kiss & Bertoldi, 2018, Boza-Kiss et al. 2017), split incentives (Economidou & Serrenho 2019, Castellazzi et al. 2017), financing (Economidou et al. 2019, Economidou & Bertoldi 2014), etc. In the future, this report will be updated to reflect new changes, and important developments as notified by the European Commission and the EU Member States in line with the EU policy cycle.

1 Introduction

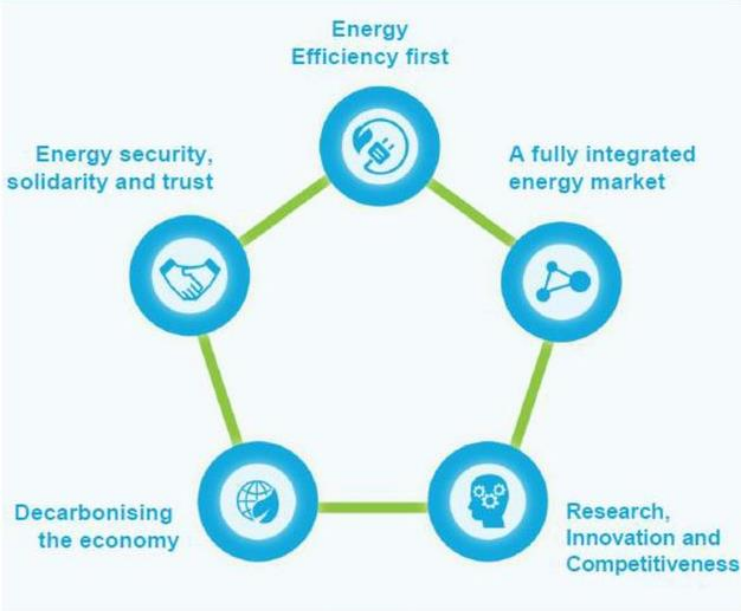
The Energy Union strategy (COM/2015/080), published as a key Commission priority on 25 February 2015, aims to build an Energy Union that provides secure, sustainable, competitive and affordable energy to EU consumers, households and businesses. It is built on 5 dimensions striving to integrate Europe's energy markets, ensure energy security, improve energy efficiency, decarbonise the economy and prioritise research and innovation to drive the energy transition (Figure 1).

An integral part of the strategy is the 2030 climate and energy framework, which sets targets for cutting greenhouse gas emissions and increasing the share of renewable energy and energy efficiency. Under the current ambition, these targets translate to a minimum 40% greenhouse gas emissions reduction (from 1990 levels), a minimum 32% share for renewable energy and an improvement of at least 32.5% in energy efficiency. As part of the European Green Deal, the Commission proposed to raise the 2030 greenhouse gas emission reduction target in September 2020, to at least 55% compared to 1990. The new ambition will require intensified actions across all sectors, including increased energy efficiency and renewable energy. The Commission is currently in the process of making detailed legislative proposals to implement and achieve the increased ambition.

Since the launch of the Energy Union in 2015, the European Commission has published several packages of measures and initiatives to ensure effective enforcement of the Energy Union strategy. To streamline processes and the implementation of the Energy Union, it adopted the Regulation on the governance of the Energy Union and climate action (EU) 2018/1999 in the framework of the clean energy for all Europeans package, which entered into force on 24 December 2018. The regulation aims to develop a transparent and dynamic governance process, which will help deliver on the 2030 climate and energy targets in an efficient and coherent manner. In particular, the regulation emphasises the importance of meeting the EU's 2030 energy and climate targets and sets out how EU countries and the Commission should work together, and how individual countries should cooperate to achieve the Energy Union's goals.

Under the Governance Regulation, Member States must develop integrated national energy and climate plans, covering the five dimensions of the Energy Union based on a common template. Member States were required to adopt integrated national energy and climate plans (NECPs) for the period 2021-2030, with their draft plans due by the end 2018 and final plans by the end of 2019 (Figure 2). By 30 June 2024 the Member States shall provide updates of the plans, in line with the 5-yearly ambition cycle of the Paris climate agreement, giving them the opportunity to adapt to significant changing circumstances. As part of these updates, Member States should make efforts to mitigate any adverse environmental impacts that become apparent and notify modifications in objectives, targets and contributions reflecting changes in the overall ambition as regards the 2030 targets for energy and climate.

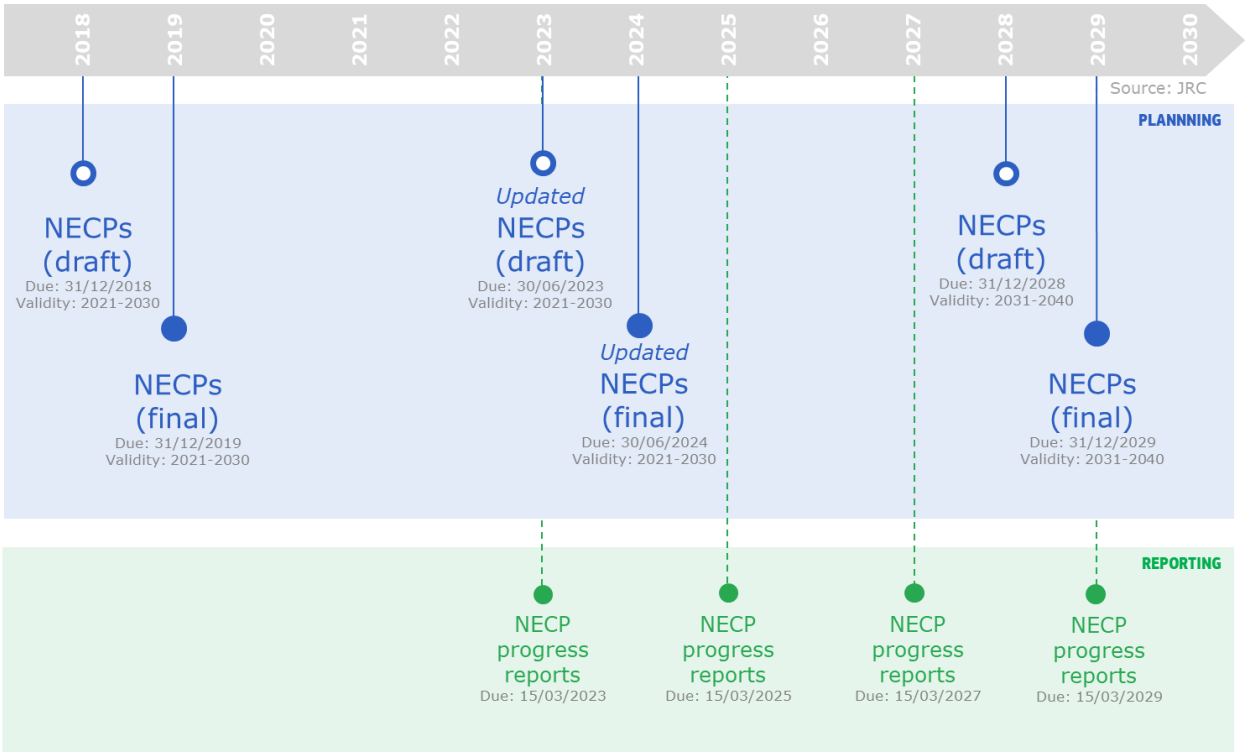
Figure 1. The interlinked and mutually supporting dimensions of the Energy Union



In light of the need for consistent progress towards the 2030 climate and energy targets and its international commitments under the Paris Agreement, the EU has adopted integrated monitoring and reporting rules. Based on the Commission's strong commitment to better regulation, the Governance Regulation should thus result in a significant reduction of administrative burden and complexity for the Member States and all relevant stakeholders. It should also help to ensure transparency, coherence and adequacy of policies and measures at Union and national level with regard to the transformation of the energy system towards a sustainable low-carbon economy. To this end, the mandatory NECP template outlined in Annex I of Regulation 2018/1999 aims to ensure that all national plans are sufficiently comprehensive, thereby facilitating comparison and aggregation of national plans. In addition, it provides sufficient flexibility for Member States to set out the details of national plans and reflect national preferences and specificities. To strike the right balance between the need to ensure a proper follow-up of the implementation of the plans and the need to reduce administrative complexity, Member States should also establish biennial progress reports on the implementation of the plans and other developments in the energy system. The Energy Union planning and reporting framework relevant to the dimension of energy efficiency is outlined in Figure 2.

In compliance with Article 13 of the Energy Union Regulation, the Commission published on 18 June 2019 its assessment of the draft plans (European Commission, 2019). The draft plans were analysed by the Commission with an overall assessment and country-specific recommendations published in June 2019. Taking these recommendations into account, Member States submitted their final NECPs, which were assessed in the detailed EU-wide report published by the Commission on 17 September 2020 (European Commission, 2020). The Joint Research Centre of the European Commission provided scientific and technical support in the assessment of the energy efficiency dimension of the plans. Building on its past experience of the JRC C2 Unit on energy efficiency policy analysis (Economidou et al., 2016, 2018), the JRC delivered country-specific sheets assessing the targets and policies presented by the Member States in their draft and final plans and provided recommendations to DG ENERGY. To provide a continuation of the JRC scientific contribution in this field, this report summarises the new energy efficiency developments of EU Member States as presented in their latest plans and assesses the ambitions of the targets and policies in relation the 2030 timeline.

Figure 2. Energy Union governance regulation framework outlining the planning and reporting requirements with relevance to the dimension of energy efficiency (Regulation (EU) 2018/1999 Articles 9, 14 and 17)



Source: JRC

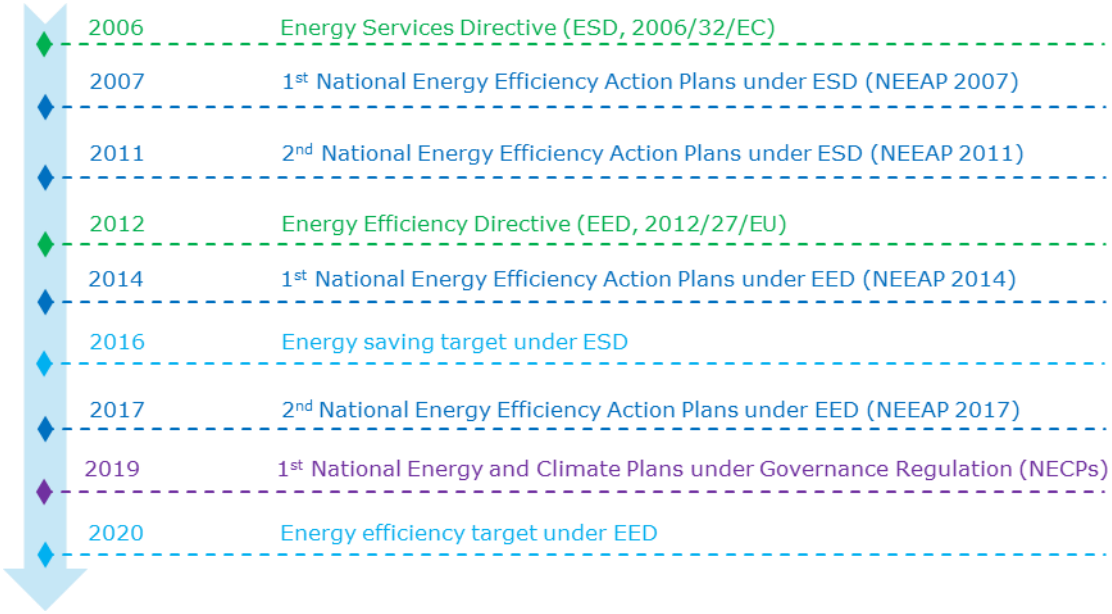
The structure of the report is as follows. Section 2 sets the background by providing the historical framework on energy efficiency policy and the main elements of the new national energy and climate plans under the Energy Union Governance Regulation. A brief overview of the main updates identified in the final plans with respect to the draft plans is presented in Section 3. Section 4 presents the national contributions of Member States towards the EU energy efficiency target, and discusses the main methodological approaches adopted by Member States in setting the ambition of their contributions. Section 5 focuses on the energy efficiency policies under the NECPs, providing an overview of sectoral and policy coverage (5.1), contribution towards EU target (5.2), a summary of new measures (5.3) and interaction with other dimensions (5.4). The measures by sector are outlined in Section 5.5. The implementation of key energy efficiency provisions in EU directives is discussed in Section 6. Conclusions and policy recommendations are drawn in Section 7, and country-based assessments are summarised in the Annex.

2 Background

National reporting requirements on energy efficiency policy dates back to 2006, with the adoption of the Energy Services Directive 2006/32/EC (ESD)(Economidou et al., 2020). The history of planning and reporting framework on energy efficiency policy in the EU is outlined in Figure 3. Under the ESD, Member States were required to adopt and achieve an indicative energy saving target of 9 % by 2016 in the framework of a national energy efficiency action plan (NEEAP). The NEEAPs, which were due every 3 years, included information on the indicative national targets as well as details on the incentives and the institutional, financial and legal frameworks each Member State had set up to eliminate market barriers preventing efficient end use of energy.

With the adoption of the Energy Efficiency Directive (Directive 2012/27/EU, the EED) in 2012, the foundation for more actions was laid down in order to enhance national efforts in the area of energy efficiency. The Directive, a key part of the EU's overall climate and energy legislative package, required EU Member States to set indicative national energy efficiency targets and legally binding measures to help the EU reach its 20% energy efficiency target by 2020. In particular, all EU Member States were required to implement policy measures that improve energy efficiency at all stages of the energy chain from production to final consumption. In compliance with the EED requirements, Member States were required to present the progress and efforts made in the so-called National Energy Efficiency Action Plans (NEEAPs) every three years, starting from 2014. Due to conflicting deadlines of the final NEEAPs under the ESD and the first NEEAPs under the EED, Member States were asked to combine the two reporting requirements, focusing on the new EED provisions, while at the same time summarising the final progress and any relevant updates on the ESD. The previous experience gained through the submission of NEEAPs under the Energy Services Directive 2006/32/EC (ESD) provided a strong foundation upon which Member States continued to develop and strengthen their energy efficiency policy strategies (Economidou et al., 2018). To assist with the reporting, the Commission published a NEEAP template[1] which resulted in more homogeneous reporting among Member States compared to past NEEAPs submitted under the ESD. In terms of progress reports, the annual reports referred to in Article 24(1) of the EED provided a basis for the monitoring of the progress towards national 2020 targets (Tsemekidi-Tzeiranaki et al., 2019).

Figure 3. History of planning framework on energy efficiency policy in the EU



As discussed in the introduction, the Governance regulation provided a valuable opportunity to streamline the reporting process, create synergies, improve coherence and facilitate comparisons. With this intention in mind, it developed a common template for all 5 dimensions of the Energy Union (). The template of the 2030 climate

[1] Commission, 2013. Staff Working Document "Guidance for National Energy Efficiency Action Plans" Accompanying the document the Commission Implementing Decision establishing a template for National Energy Efficiency Action Plans under Directive 2012/27/EU of the European Parliament and the Council SWD(2013) 180 final

and energy plans consists of two sections: Section A presents the national plan and Section B provides the analytical basis. Under each dimension, the Member States are required to cover 4 key areas:

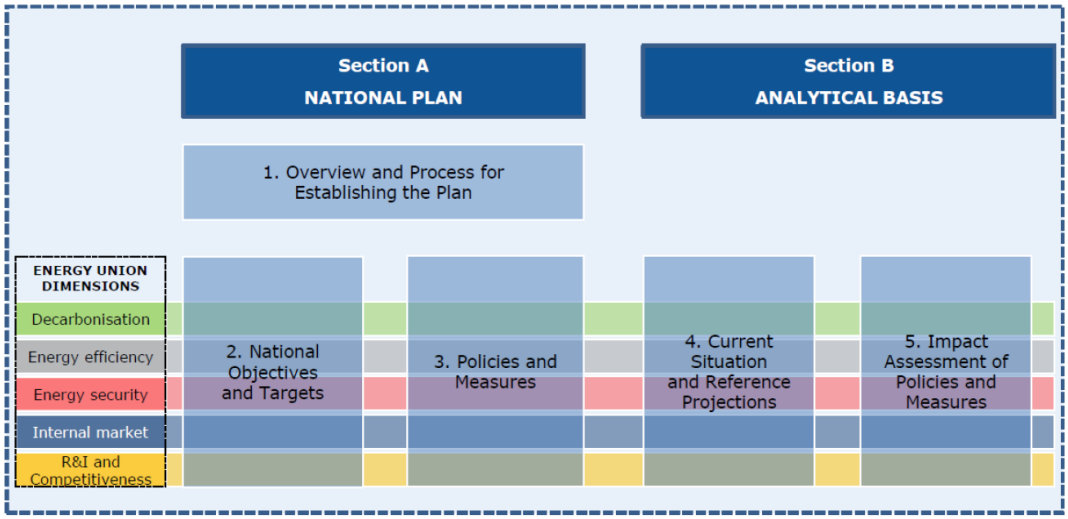
- National objective and targets
- Policies and measures (PaMs)
- Current situation and reference projections
- Impact assessment of policies and measures

The energy efficiency related elements included in each area are presented in Annex 1.

The Commission has also developed a template for reporting policies and measures which Member States were encouraged to use on a voluntary basis. The main information collected by the voluntary template included:

- Name of policy or measure
- NECP template, PAM number, Relevant Energy Union dimension, relevant Union policy
- Main objective, quantified objective, scenario in which the PAM is included
- Short description, sectors affected, type of policy instrument, planned budget
- Implementation status, implementation period, entities responsible for implementation
- Reference to assessments and underpinning technical reports

Figure 4. Structure of NECPs according to Regulation (EU) 2018/1999 Annex I



3 Updates with respect to 2019

As indicated in Table 1, Member States had to submit their draft NECPs for the period 2021-2030 to the Commission by 31 December 2018. The plans were analysed by the Commission and an overall assessment and country-specific recommendations were published in June 2019. Taking these recommendations into account, Member States were then required to submit their final NECPs by 31 December 2019.

With the final submissions, some Member States notified revisions to their expected contributions to the EU 2030 target, together with other updates including new policy objectives and implementation details. Table 1 provides a summary of the "level" of updates identified in the JRC assessment with respect to 2019 draft plans. To facilitate the comparison of the two versions of the NECPs, the JRC identified whether there have been any improvements in various segments of the plans which were characterised as "major improvements", "minor or moderate improvements" and "no changes/improvements". In certain cases, "negative changes" have were found. The level of the identified

A summary of these updates for the three main NECP elements ((1) targets, (2) policies and measures and (3) important EU directive articles) is presented in Table 1 and discussed below. The voluntary PAM template was filled in by Bulgaria, Denmark, Cyprus, Czechia, Estonia, Greece, France, Croatia, Hungary, Ireland, Luxembourg, Malta, Slovenia and Slovakia.

3.1.1.1 National contributions to 2030 targets

With the submissions of the final NECPs, some Member States notified revisions to their expected 2030 contribution to the EU energy efficiency target. A few countries raised the ambition of their contribution. These included Bulgaria, the Netherlands, Slovakia, Slovenia, Denmark, Ireland, Greece, Cyprus, Luxembourg, Malta and Romania. France lowered its primary energy consumption to be reached in 2030, but increased its final energy contribution. Both changes however were minor and can be explained through the updated scenarios. In total, 20 countries provided more complete information on the calculation of their WAM and/or WEM projections, but only a few countries gave more implementation/monitoring details. In terms of targets beyond EU obligations, some positive observations were noted in Ireland, Greece, Lithuania, Austria, Bulgaria, Croatia, Cyprus, Latvia, Romania and Sweden

3.1.1.2 Policies and measures

Most countries provided more information on their policies and measures, raising the ambition of the reported measures, increasing their number or disclosing more details about their implementation and design features. On the other hand, no significant changes have been notified in terms of quantified impact of policies and measures. The exceptions are Czechia, Germany, Italy, Croatia, Malta, Slovakia, Sweden, Finland, Lithuania and Greece as they reported energy savings of some of their measures. In the Hungarian and Irish NECPs, information on the impact of some measures were removed in the final version.

Some changes are identified in terms of funding and investment needs of measures. In Slovakia, most measures have been associated with investment needs and funding sources, and in Denmark the final NECP now includes budget information for some economic/fiscal measures. In Poland, investment needs are specified in EE scenario and in Austria investment needs are clearly specified, notably for building renovations. In Italy and Czechia, the investment needs have been quantified for almost all main measures under Article 7. In France, investment needs have been established, however only at sectorial and macroeconomic level and not per instrument.

3.1.1.3 Important articles

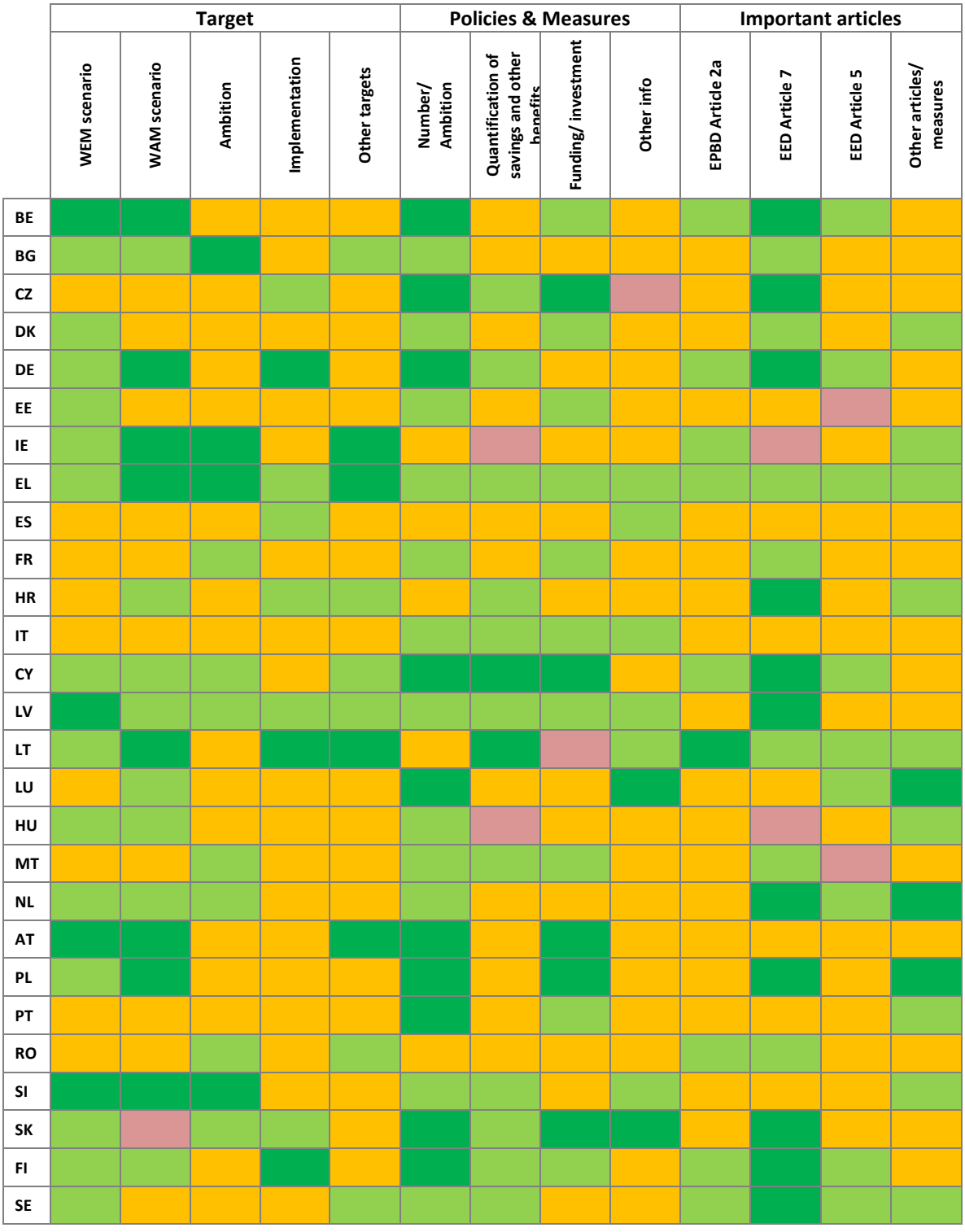
Some additional information regarding the long term renovation strategies have been identified in certain final NECPs in relation to their draft versions. Cyprus, Finland, Romania and Germany included information on their renovations milestones, while Ireland and Greece increased the ambition of their previously communicated milestones. Lithuania and Belgium significantly improved the amount of information given on policies and measures targeting buildings.

In terms of the EED Article 7, Poland, Belgium, Finland and Romania disclosed more information on their energy saving requirements, while the ambition of the previously communicated energy savings requirement was raised in Cyprus and Croatia. More information on the policies and measures were noted in Germany, France, Lithuania, Malta, Czechia, Latvia, the Netherlands, Poland, Slovakia, Finland and Croatia. Quantification of the impact of measures in relation to the EED Article 7 requirement was added in the final NECPs of Greece, Cyprus,

Latvia, Finland and Sweden. Monitoring and verification systems were specified in the NECPs of Latvia, the Netherlands, Slovakia and Croatia. On the other hand, the list of EED Article 7 measures previously given in the draft plan is now missing, possibly linked to the fact that the Article 7 process was subject to ongoing consultation in Ireland at the time of the publication of the final NECP.. Moreover, the Irish energy savings requirement was lowered from 5202 ktoe to 5180 ktoe.

The addition of more measures or more details regarding the measures associated with the requirement of central government renovations was noted in Belgium, Germany, Lithuania, Luxembourg and Sweden. Greece and Finland gave more details on the actual requirements. Negative changes were noted in the NECP of Malta where some figures concerning central government in the draft plan have been removed in the final. NECP and Ireland where the total floor area of public body buildings to be renovated over the period 2021-2030 (170,000 m^2) is lower than the one declared in the final NECP (290,000 m^2).

Table 1. Updates identified in the JRC assessment with respect to 2019 draft plans



Source: JRC

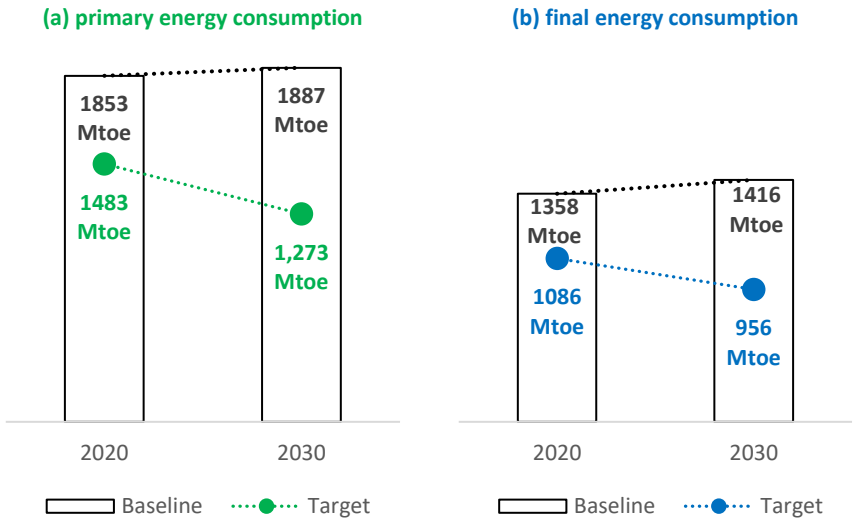
4 Targets

In accordance with the amended EED (Directive (EU) 2018/2002), Member States had to set indicative energy efficiency contributions in view of reaching the overall EU target of 32.5% reduction in primary or final energy consumption by 2020 (Figure 5). At the EU level, this reduction translates to 1273 Mtoe (1128 Mtoe without the UK) in terms of absolute primary energy consumption and 956 Mtoe (846 Mtoe without the UK) in final energy consumption.

The collective contributions without the UK amount to 1128 Mtoe in terms of primary energy consumption —corresponding to a reduction of -29.6% at EU level compared to PRIMES 2007 reference scenario— and 884.7 Mtoe in terms of final energy (corresponding to a reduction of -29.4%). This means that there is a gap in the ambition of the 2030 national contributions with respect to the EU target of 2.8% in terms of primary energy and 3.1% in final energy. It should be noted that the ambition of the 2020 national contributions is also not in line with the 20% EU target. With the latest notifications made by Member States in 20172, the collective 2020 national contributions amount to 1543 Mtoe in terms of primary energy —that is, a reduction of 16.7% at EU level and a gap of 3.3% to reach the required 20% level— and 1096 Mtoe in terms of final energy (reduction of 19.3% and gap of 0.7%).

As in the case of 2020, Member States were free to set their 2030 EED Article 3 contributions on either primary or final energy savings, primary or final energy consumption or energy intensity. The methodological approach used by each Member State, together with the actual contributions and an analysis of their 2030 ambition is shown in Table 2. Czechia, Lithuania, Hungary, Sweden and Malta expressed their contributions in energy intensity, while Portugal, Slovenia, Estonia, Ireland and Latvia in energy savings. It is interesting to note that in the 2020 framework, only Sweden had set an energy intensity target. All other countries provided their values in absolute energy consumption. Belgium, Germany, Spain, Malta, Austria, Poland, Portugal and Sweden expressed their contributions in primary energy, Czechia, Luxembourg, Hungary and Slovenia in final energy and all other countries in both primary and final energy. As per the requirements of the Directive, all countries ultimately translated their contributions in both absolute primary and final energy consumption except Luxembourg which did not provide a primary energy consumption value. All countries set their 2030 Article 3 contributions to match their WAM projections, except Germany, Italy, Malta, the Netherlands, Austria, Poland and Slovakia whose Article 3 contributions are more ambitious than the WAM projections, and Slovakia and Latvia[3] where the opposite is true. Croatia, Portugal and Sweden did not present any WAM projections so a link with the EED Article 3 contributions cannot be made. In Denmark, the 2030 ambition is based on the WEM projections; a similar approach was also taken in setting the Danish 2020 target (i.e. using baseline projections).

Figure 5. EU28 target as stipulated in the Council Directive 2013/12/EU of 13 May 2013 and Directive (EU) 2018/2002. Without the UK, the target corresponds to 1128 Mtoe and 846 Mtoe in primary and final energy, respectively.



[2] These include the original notifications by Member States to comply with Article 24(1) in 2013 and follow-up notifications to the European Commission up until 2016.

[3] Only in primary energy

Table 2. National contributions to the EU target in 2030

Ambition with respect to 2005: Reduction (%) in energy consumption based on the reported national contributions in 2030 in relation to 2005 historical consumption levels. Negative values represent reduction in consumption (i.e. savings), while positive values denote increase in consumption. Green-coloured values represent reduction and red-coloured values increase in consumption.

Trend with respect to 2020 contribution: Comparison of national contributions of 2020 and 2030. Upward pointing arrows (in **red**) depict cases where 2030 values are higher than those of 2020; downward pointing arrows (in **green**) depict cases where 2030 values are lower than the 2020 ones.

	Methodological approach		National contributions to EU target		Ambition with respect to 2005 historical values		Trend with respect to 2020 ambition	
	Savings, absolute consumption, intensity?	**Primary, final energy or both?**	**PEC**	**FEC**	**PEC**	**FEC**	**PEC**	**FEC**
BE	Absolute	Primary	42.7	35.2	-17%	-4%	↓	↑
BG	Absolute	Both	17.5	10.3	-9%	2%	↑	↑
CZ	Intensity, absolute	Final	41.4	23.6	-3%	-10%	↓	↓
DK	Absolute	Both	18.3	15.8	-6%	2%	↓	↑
DE	Absolute	Primary	216.0	185.0	-33%	-16%	↓	↓
EE	Savings, absolute	Both	5.5	2.9	9%	0%	↓	↑
IE	Savings, absolute	Both	13.7	11.2	-8%	-11%	↓	↓
EL	Absolute	Both	20.6	16.5	-32%	-21%	↓	↓
ES	Absolute	Primary	98.5	73.6	-28%	-25%	↓	↓
FR	Absolute	Both	202.2	120.9	-23%	-24%	↓	↓
HR	Absolute consumption	Both	8.2	6.9	-10%	-5%	↓	↓
IT	Absolute	Both	125.1	103.8	-31%	-24%	↓	↓
CY	Absolute	Both	2.4	2.0	-3%	9%	↑	↑
LV	Absolute, savings	Both	4.1	3.6	-10%	-11%	↓	↓
LT	Intensity (and savings)	Both	5.4	4.5	-33%	-4%	↓	↑
LU	Absolute	Final	3.6[+]	3.1	-24%	-32%	↓	↓
HU	Absolute, intensity	Final	30.7	18.7	16%	0%	↑	↑
MT	Intensity	Primary	1.1	0.8	15%	69%	↑	↑
NL	Absolute	Both	46.6	43.9	-34%	-19%	↓	↓
AT	Intensity	Primary	30.8	25.6	-6%	-8%	↓	↑
PL	Absolute	Primary	91.3	67.0	4%	15%	↓	↓
PT	Savings	Primary	21.5	14.9	-13%	-22%	↓	↓
RO	Absolute	Both	32.3	25.7	-11%	5%	↓	↓
SI	Savings	Final	6.4	4.7	-9%	-4%	↓	↓
SK	Absolute	Both	15.7	10.3	-10%	-11%	↓	↑
FI	Absolute	Both	34.8	24.9	4%	-1%	↓	↓
SE	Intensity	Primary	40.2*	29.7*	-18%	-11%	↓	↓
TOTAL (EU27)			1176	885	-21%	-15%		

[+] Provided as supplementary information in November 2020

*The figures were revised by the Swedish authorities to include international aviation, as required in the EED methodology.

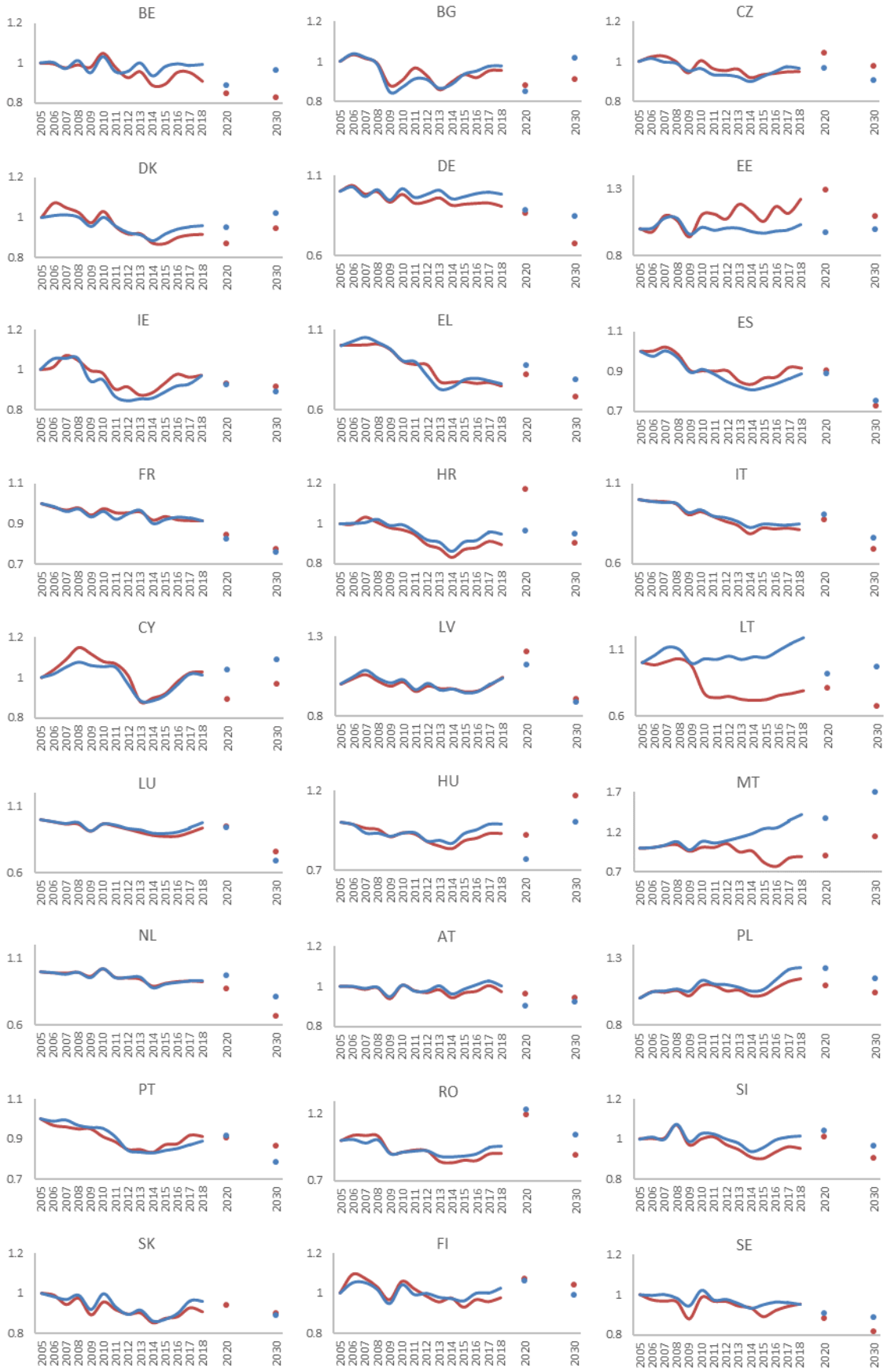
Source: JRC

The calculation of the ambition of the national contributions with respect to PRIMES baseline projections —calculated as reduction (%) in energy consumption based on the reported national contributions in 2030 in relation to PRIMES 2007 baseline projections— show that 9 Member States have the same or higher ambition than the EU-wide 32.5% primary energy target and 21 Member States higher than the final energy target. The countries with the highest ambition include Lithuania (-50.1%), Latvia (-47%) Romania (-46.1%) Greece (-43.9%) and Italy (-42.9%) in primary energy, while in final energy the most ambitious countries include Lithuania (-58.4%), Bulgaria (-57.4%), Romania (-45.1%), France (-55.1%) and Greece (-55.0%). On the other end of the spectrum, Belgium, Denmark, Cyprus, Malta and Finland fell short of the 32.5% EU ambition in both primary and final energy, while Bulgaria, Czechia, Estonia, Ireland, France, Sweden, Germany, Hungary, Poland, Slovenia, Slovakia in primary energy only.

The ambition of the national 2030 contributions was also assessed in relation to historical consumption trends. With respect to 2005 values, all countries expect a drop in energy consumption by 2030 except Malta, Hungary, Poland, Estonia and Finland (in primary energy) and Bulgaria, Denmark, Cyprus, Malta, Poland and Romania (in final energy). In Germany, Greece, Spain, France, Italy, Lithuania, Luxembourg and the Netherlands, the expected primary energy consumption drop of 2030 compared to 2005 is of larger magnitude than the EU-wide average of 21.5%. Except Lithuania, this group of countries (together with Portugal) is also expected to achieve a higher than the EU-wide average drop in final energy consumption of 15.0% of 2030 against the historical 2005 values. Figure 6 shows the primary and final energy index (2005=100%) in relation to the 2020 and 2030 ambition set by each Member State in the context of the EED Article 3. It shows the fluctuating nature of historical trends, and how these are set in the framework of 2020 and 2030 EED Article 3 contributions. While several countries (e.g. France, Germany) follow a clear downward trajectory —albeit in a fluctuating manner— towards their targets, the expected 2020 and 2030 values appear to be outside this trajectory for several countries. For example, historical consumption levels are significantly below the targeted levels (e.g. Romania, Croatia and Latvia in the context of 2020) or above them (e.g. Bulgaria, Cyprus and Belgium in the context of 2020 or Hungary for 2030).

Despite the need to accelerate energy efficiency improvements in the next decade, the 2030 ambition appear to be lower the 2020 in certain countries. A comparison between the 2020 and 2030 national contributions in the context of the EED Article 3 shows that consumption is expected to drop in the majority of the Member States over this period (Table 2 Column “Trend with respect to 2020 contribution”). In primary energy, this is the case for all countries except Bulgaria, Denmark, Cyprus, Hungary and Malta; for this latter group of countries, primary energy consumption is expected to rise in 2030 compared to 2020. Final energy consumption is expected to drop over this period for all countries except Belgium, Bulgaria, Denmark, Estonia, Cyprus, Lithuania, Hungary, Malta, Austria and Slovakia. These observations are also evident in Figure 6. Of the countries with a rising trend, the most pronounced primary energy increase is noted in Malta (+28%), Hungary (+27%), and Cyprus (+9%) and final energy increase in Hungary (+30%), Malta (+24%), Bulgaria (+20%). Conversely, the countries with the sharpest drops are Romania (-25%), Latvia (-25%), Netherlands (-23%) and Croatia (-23%) in primary energy and Luxembourg (-27%), Latvia (-21%), Italy (-16%) and Netherlands (-16%).

Figure 6. National 2020 and 2030 ambitions set in the context of the EED Article 3 in view of historical 14-year trends (2005=100%)



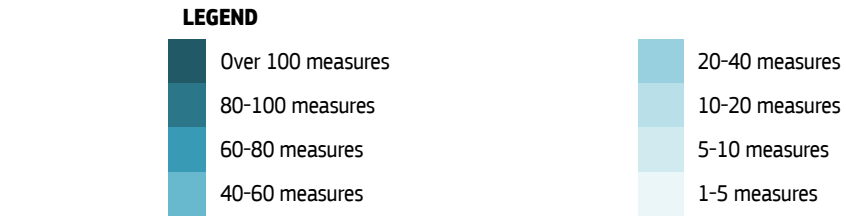
5 Policies and measures

5.1 Overview of sectoral and policy type coverage

As explained in Section 3, only 14 countries submitted the PAM template. The structured information provided in these templates greatly assisted with the analysis of PAMs. Using this information, together information that could be extracted from all other NECPs, we identified a total of 1394 energy efficiency measures. The measures are categorised according to policy type (economic, education, fiscal, information, planning, regulatory, research, voluntary, other and not specified) and sector (cross-sectoral, residential, services, buildings[4], industry, transport, public, agriculture, energy supply, other and not specified). An overview of the sectoral and policy type coverage of the reported NECP measures is shown in Figure 7. An overview of the sectors and policy types covered by the energy efficiency measures presented in all 27 NECPs. It should be noted that a given measure may be linked to more than one policy type and more than one sectors. For this reason, the sums of measures broken down by policy type or sector do not add up to the total number of measures.

Figure 7. An overview of the sectors and policy types covered by the energy efficiency measures presented in all 27 NECPs

	Economic	Education	Fiscal	Information	Planning	Regulatory	Research	Voluntary	Other	Not specified	TOTAL
Cross-sectoral											238
Residential											197
Services											161
Buildings											304
Industry											181
Transport											363
Public											148
Agriculture											78
Energy supply											180
Other											12
Not specified											5
TOTAL	495	36	144	197	191	332	56	28	99	12	1394



Source: JRC, 2020

[4] As explained in Section 5.5.1, it was not always possible to deduce whether a measure indicated as a "building" measure concerned both residential and services or one of these sectors. All residential, services and buildings measures are therefore discussed together.

As shown in Figure 7, the most frequent types of policy measures are economic measures, followed by regulatory, information, planning and fiscal measures. A wide coverage of sectors is also observed, with the largest number of measures concentrated on the transport sector followed by buildings, cross-sectoral, residential and services. If buildings, residential and services sectors are combined, these would in fact represent the most widely covered sector. The most common combinations of policy type and sector are economic-buildings, economic-transport, regulatory-buildings, regulatory-transport, and transport-planning.

5.2 Contribution of PAMs towards the EED Article 3

In general, it has not been possible to link the ambition of each national policy framework against each national contribution towards the EU target in a quantitative way. This is because energy savings generated by each measure or group of measures are seldom quantified in the context of the overall national contribution to the EU target for most countries. It should be noted that the quantification of the contribution of policies and measures towards the EED Article 3 is not required by the directive itself. Table 3 summarises information that could be extracted on the contribution of policies and measures towards the EED Article 3. While the majority of the reported policies and measures directly or indirectly support EED Article 3, this was not explicitly specified for most countries. Italy and Greece were exceptions as the article to which each PAM was associated with was specified in their reporting. A few countries also specified which measures fell under the WAM and WEM scenarios (e.g. Cyprus, Croatia, Estonia, Ireland, Greece and Finland). Finland provided a list of energy efficiency actions and their annual 2030 contributions towards the national energy efficiency target 2030; however it was not clear if the savings were in the context of EED Article 3, 7 or both. In some cases, the share of the savings to be achieved in 2030 by each sector was presented, demonstrating the ambition of each sector. In other cases, energy savings of measures were provided in cumulative terms, possibly in the context of EED Article 7 which requires Member States to compute their energy saving requirement and contribution of measures in cumulative terms. Even in cases where the contribution of policies and measures in energy savings was clearly reported, it was therefore not always clear whether the reported savings were in the context of the EED Article 3, Article 7, or indeed other provisions of EU legislation. All these observations point to the need of defining a clearer reporting framework which would enable a more robust analysis of the contribution of PAMs towards the EED Article 3 in the future. Such a reporting framework would require the calculation of energy savings of each PAM or group of PAMs by 2030 —considering double counting, additionality and other elements as in the case of EED Article 7— and the expression of the national EED Article 3 contribution in terms of energy savings, allowing thus a comparison of the ambition of the proposed policies against the national contributions towards the EU target.

5.3 New measures

Many countries presented new measures and actions in their NECPs, possibly pointing to national intentions of stepping up efforts to meet the new ambitions set in the 2030 framework. To identify these measures, an analysis based on the implementation status was conducted as well as a comparison of the NECP and NEEAP measures.

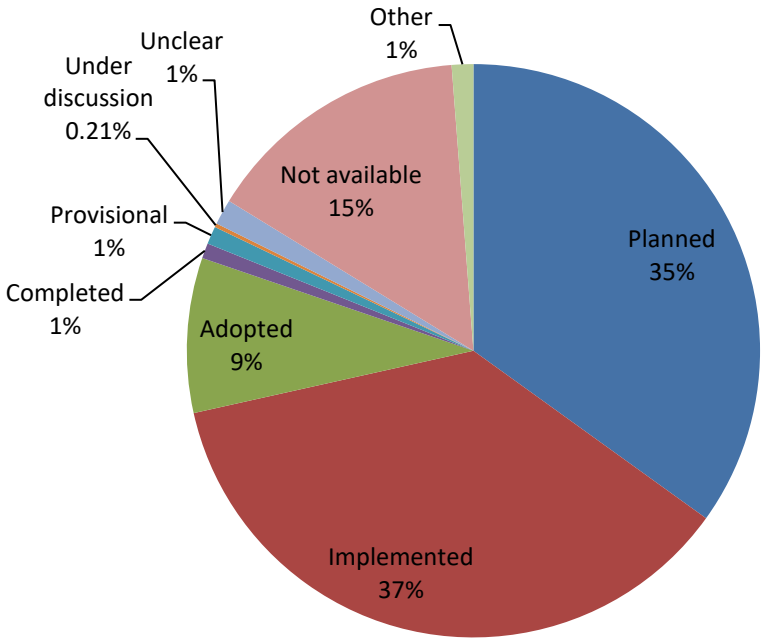
The distribution of the energy efficiency measures reported in the NECPs according to their implementation status (planned, implemented, adopted, completed, etc.) is shown in Table 3. Just over a third (35%) of all EE measures reported by the EU27 Member States in their NECPs were specified as "planned", confirming the existence of several new efforts. Together with a small minority of provisional measures and measures under discussion (1.21%), this group can be considered as new measures. In certain cases, it should be noted that they may simply reflect updates or revamps of existing measures. A remaining 37% of the measures were identified as implemented and another 9% of the measures were indicated as adopted. The implementation status was inconclusive for 17% of the measures either due to unavailable/unclear information or because their implementation status was specified as "other".

At MS level, the countries with the largest share of planned measures included Portugal (100%), followed by Luxembourg (71%), Romania (51%), France (50%) and Greece (48%). Conversely, countries with the largest share of implemented measures included Sweden (97%), Slovenia (80%), Czechia (67%), Finland (61%) and Denmark (60%).

Table 3. Contribution of policies and measures towards the EED Article 3

	IDENTIFICATION OF PAMS CONTRIBUTING TO ART. 3	QUANTIFICATION OF PAM IMPACT	COMPARISON OF PAM IMPACT AGAINST ART. 3 AMBITION	NOTES
BE	Unclear	No	Unclear	Policy measures are not attributed to EED Article 3
BG	Yes	No	Unclear	-
CZ	Yes	Unclear	Unclear	Only impact of EED Art. 7 measures is given
DK	Yes	No	Unclear	Impact is given only for some measures. Often a reference to combined effect
DE	Yes	Unclear	Unclear	Over-spanning PAMs cover the largest impact towards EED Art. 3. PaM impact only for Art.7.
EE	Yes	No	Unclear	General PAM list towards EED Art.3; distinction between existing & additional PAMs is made.
IE	Yes	Unclear	Unclear	Each PAM is indicated as to whether it contributes to WAM and WEM or both scenarios.
EL	Yes	Yes	Unclear	Most PAMs are accompanied with energy savings and indicated under baseline or EE scenarios
ES	Unclear	Unclear	Unclear	PAM impact towards EED Art.7 only
FR	Yes	No	Unclear	PAM list is given, but not directly associated with EED Article 3
HR	Yes	Yes	Unclear	Annual savings of PAMs in 2030 are given, but the link to EED Art. 3 is not clear
IT	Yes	Yes	Unclear	Savings are given in terms of final energy
CY	Unclear	Unclear	Unclear	List of PAMs contributing towards WAM/WEM scenario is given
LV	Yes	Unclear	Unclear	PAM impact towards EED Art.7 only
LT	Yes	Yes	Unclear	They are included in the discussion on both current policies and EE scenario
LU	Yes	No	Unclear	-
HU	Yes	Unclear	Unclear	-
MT	Unclear	No	Unclear	References towards EED Article 7 measures are only made
NL	Yes	Unclear	Unclear	List of policy measures in a separate PAM template
AT	Yes	No	Unclear	-
PL	Unclear	No	Unclear	Measures are not clearly attributed to support EED Article 3.
PT	No	No	Unclear	-
RO	No	No	Unclear	-
SI	Yes	Unclear	Unclear	Distinction between existing & additional PAMs is made
SK	Yes	Unclear	Unclear	Description of EED Art. 7 measures; less structured & detailed list of measures for EED Art. 3
FI	Yes	Yes	Unclear	Annual savings of PAMs in 2030 are given, but the link to EED Art. 3 is not clear
SE	Unclear	No	Unclear	List of EE policies, measures and programmes not clear how it contributes to EED Art. 3

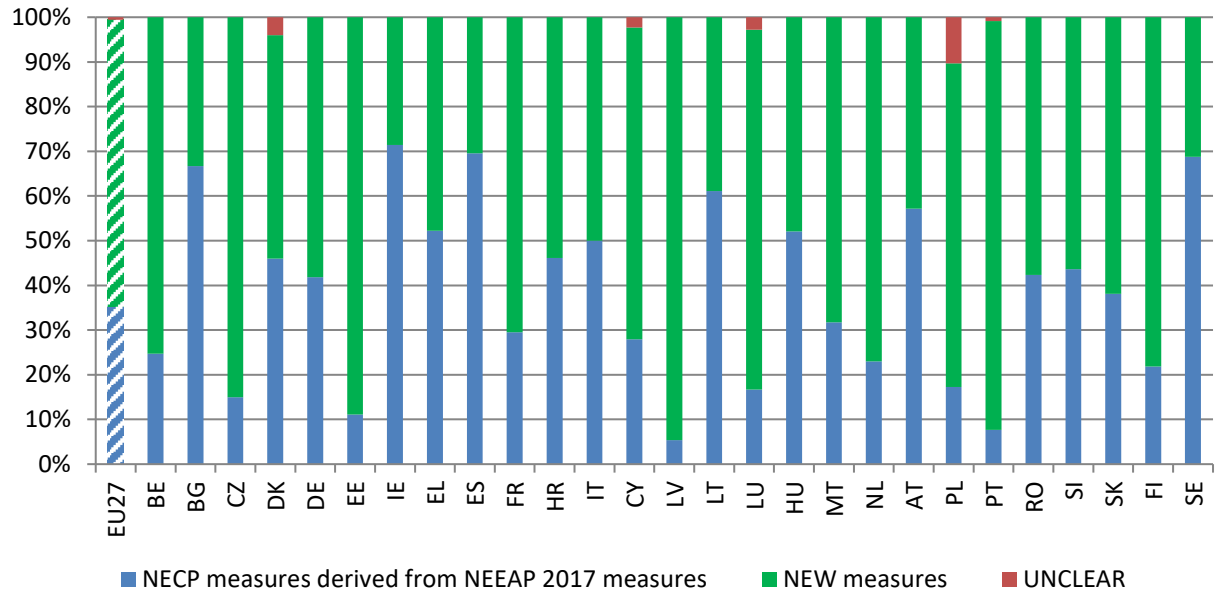
Figure 8. Distribution of all EU27 energy efficiency measures reported in the NECPs of 2020 according to their implementation status



Source: JRC, 2020

To provide a different angle in the discussion of "new" measures, a comparison was undertaken between the energy efficiency policies and measures stemming from the JRC database under the National Energy Efficiency Action Plans of 2017 and the measures under the NECPs of 2020. Figure 9 provides an overview of the share of NECP measures that could be traced back to the NEEAP 2017 and the remaining measures which can be considered new; the latter being defined as new due to their missing link with the NEEAPs. In total, 862 measures could be considered as "new", while the remaining 462 were found to have a direct link to NEEAPs. It should be noted that for some cases a link could not be made due to reporting- or linguistic-related complications. As a result, this should be flagged as a key limitation in this analysis. Nevertheless, , this analysis shows that Latvia, Portugal, Estonia, Poland, Luxembourg have the largest share of new measures, while Sweden, Bulgaria, Lithuania and Austria Ireland, Spain are the countries which rely the most on the continuation of existing measures, dating back to the NEEAPs of 2017.

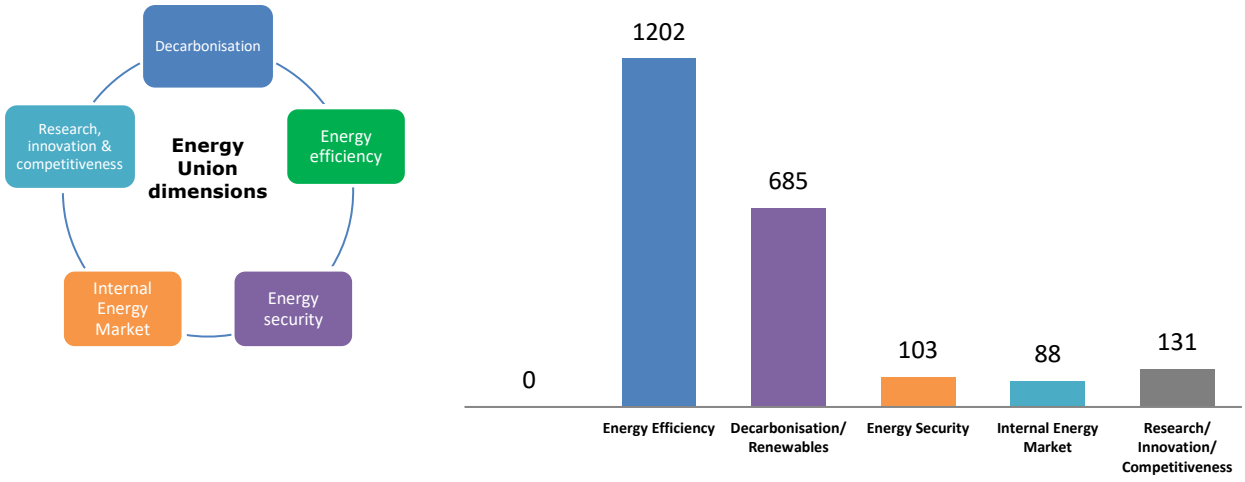
Figure 9. Distribution of energy efficiency measures in the NECPs according to whether they could be traced back to the NEEAPs of 2017



Source: JRC, 2020

5.4 Energy efficiency interaction with other Energy Union dimensions

Figure 10. Distribution of energy efficiency measures reported by EU27 Member states in the National Energy and Climate Plans according to one or more dimensions of the Energy Union



Source: JRC, 2020

As explained in the introduction, energy efficiency constitutes one of the 5 dimensions of the Energy Union. With the other dimensions falling under the fields of decarbonisation, energy security, internal energy market, research and innovation, synergies and interactions between the various dimensions are expected. Figure 10 provides an overview of the energy efficiency measures reported in all NECPs under the various dimensions of the Energy Union, thereby confirming the role of energy efficiency in all five dimensions.

Beyond the evident link with the energy efficiency dimension, nearly half of the reported energy efficiency measures (685 measures or 49% of total) were associated with the decarbonisation dimension, reflecting the strong interaction between these 2 dimensions. The countries with the strongest interaction between energy

efficiency and decarbonisation were Italy, Cyprus, Portugal and Estonia. For these countries, measures reported under the energy efficiency dimension were also reported under the decarbonisation dimension. This was also the case for Ireland, Croatia, Hungary, Denmark and Slovenia which all reported strong links between energy efficiency and decarbonisation dimension measures. In contrast, this link was not evident from the reporting of Belgium, Latvia, Bulgaria, Lithuania, Finland, Austria and Sweden.

As shown in Figure 10, interaction between energy efficiency and the other three dimensions, namely energy security, internal energy market and research, innovation & competitiveness, are also evident, but of lesser importance than the one with decarbonisation. In terms of energy security, many of the energy efficiency measures (56%) in Croatia were also linked to this dimension, followed by Estonia (39%) and Czechia (25%). The strongest links with internal energy market were observed again in Croatia (44%), Czechia (25%) and Estonia (19%). Similar trends are also noted for research and innovation and competiveness, with the largest share of energy efficiency measures impacting this dimension in Croatia (46%), Netherlands (28%), Portugal (27%) and Czechia (25%).

Unsurprisingly, a total of 1201 energy efficiency measures (corresponding to 86% of all EE measures) have been reported in the Energy Efficiency dimension. Of the remaining 14%, 128 (9% of total) were reported under "Not available" —that is, they were not linked to *any* dimension— and 64 (5%) were linked to a dimension other than the energy efficiency one. The latter 5% is likely to be associated with reporting errors.

5.5 Measures by sectors

A discussion of the measures identified by sector is presented in Sections 5.5.1-5.5.5.

5.5.1 Buildings

The building sector represents one of the most comprehensively covered sector in terms of policies and measures, benefiting from a wide range of actions (Table 4 and 5). Due to a reporting particularity, it was not always to deduce whether a measure indicated as a building measure concerned both residential and services sectors or one of these sectors alone. For this reason, the analysis was conducted for buildings as a whole (Table 4) and residential/services sectors alone (Table 5), based on the information submitted by the Member States themselves. In the future, this limitation can be overcome by not only specifying the sector (e.g. residential, services, industry and agriculture) but also the targeted activity (e.g. buildings, processes, user behaviour). The discussion below concerns all types of buildings, unless stated otherwise.

All Member States have reported economic and fiscal measures supporting energy efficiency improvements. These included grants, low-interest loans and fiscal incentives. Some new measures include the Funds and instruments to minimise ESCO projects risks as well as premiums for thermal retrofit measures in Belgium and the promotion of mass roll-out of renovations in Germany. In Croatia, ESI funds in the next programming period 2021-2027 will be allocated for grants amounting to 60% of eligible costs, with the maximum co-financing of energy audits, energy certificates, project documentation and technical assistance in the preparation and implementation of energy efficiency projects. In Czechia, information is provided about the successor programme to New Green Savings Programme as well as the Modernisation fund. In Germany, the Climate Programme 2030 introduces a comprehensive set of new measures for building renovation or upgrades of existing measures, which largely relate to more targeted combinations of information and funding. In Denmark, financial aid will be given to owners of buildings who have renovated their buildings in accordance with a specific list of energy savings belonging to the subsidy scheme. In Greece, financial programmes for the renovation of residential and tertiary buildings in the framework of the new programming period are planned as we as the use of fiscal and urban planning incentives for the implementation of energy-saving interventions in residential buildings and the tertiary sector (outside government). Poland plans to introduce Tax relief for expenditure on thermomodernisation of single-dwelling residential buildings through personal income tax. France plans to make the tax credit for the energy transition (CITE) more effective via a number of different actions as well as broadcast the recently simplified ecoPTZ which can now be applied to the flat-rate for individual works. Via ISCED and the SARE, it also plans to co-finance an energy audit for households with low income owners of thermal amenities (performance diagnostics F or G). Ireland plans to develop a smart finance initiative to offer guarantee-based products and expand salary incentive schemes within existing SEAI programmes. Slovenia notified the establishment of a guarantee scheme for the building sector.

Regulatory measures were mostly composed of requirements related to the Energy Performance of Buildings Directive and Eco-design regulations. Examples include minimum energy performance requirements for new/existing buildings, inspections of water boilers and air conditioning systems and energy efficiency

standards for appliances & equipment. Such measures were mentioned by Belgium, Bulgaria, Denmark, Ireland, France, Cyprus, Estonia, Luxembourg, Italy, Latvia, Hungary, the Netherlands, Slovakia and Finland. Luxembourg considers to introduce requirements for low and positive energy buildings by law in the case of apartment and special-purpose buildings as well as the introduction of an energy passport “plus”. Austria plans to establish a definition of "thermal retrofit rate" as basis for aim to double refurbishment rate 2020-2030. Reforming or updating the energy certification system for buildings was mentioned by Hungary, Cyprus, Italy, Sweden, Portugal and Greece. Romania also plans to introduce restrictions on sale or lease of buildings under lowest energy performance categories and France plans to introduce minimum building efficiency obligations for tertiary buildings. Renovation obligation for rented class F and G buildings is considered by Wallonia region of Belgium. Slovenia plans the restriction the use of fossil fuels (fuel oil) for heating in buildings as of 2021. In Cyprus, it is possible to increase the building rate by 5% for energy class A buildings in case of new buildings and buildings undergoing renovation, with the aim to incentivize the construction or renovation of buildings that go beyond NZEB requirements. Mandatory renovations of public buildings are mentioned by Belgium, Bulgaria, Germany, Greece, Luxembourg and Lithuania.

Various measures on information and awareness-raising have been mentioned in the NECPs. In Austria various information and awareness raising activities are planned as well as energy advice/consultancy programmes. Building Passports and information and support programs and networks to incite building refurbishment are mentioned in Belgium, including the installation of one-stop-shops at commune level. In Czechia, the role of state-guaranteed advice in the so-called Energy Consulting and Information Centres is planned as well as preparation of model projects for common types of buildings. In Denmark, “BetterHouses” is a scheme (voluntary and market-driven system) from the Danish Energy Agency focusing on energy renovation of buildings through “one stop shop” for energy renovation. In Croatia, there are promotional activities to ensure the correct implementation of legal building-related provisions, and to encourage energy renovation of buildings in line with the nZEB standard. These include dedicated workshops on nZEB, guidelines on nZEB and media campaigns for energy certification and promotion of nZEB standard. In the Netherlands, there will be a digital platform providing information to homeowners on preserving measures and related indicative energy savings. Slovenia plans to establish a portal for the energy performance of buildings based on all available, including emission, data, which will provide comprehensive spatial insight into the state of buildings and the issues of emissions and enable quality planning of measures. In Sweden, the National Renovation Centre works with businesses and academic institutions to improve knowledge and distribute information to operators in the building industry, to enable them to carry out renovations efficiently. The aim is to make existing buildings more environmentally, economically and socially sustainable from a life-cycle point of view, while improving or retaining their function so that they meet the requirements of users and the authorities. In addition, the Sustainable Building Information Centre was recently established with the aim to promote energy renovations and energy efficient buildings, through the collection and dissemination of information about sustainable buildings and specific target groups.

Table 4. Overview of building measures reported in the NECPs

	Total reported measures	Economic	Education	Fiscal	Information	Planning	Regulatory	Research	Voluntary	Other	Not specified
BE	19	✓		✓	✓	✓	✓				✓
BG	24	✓		✓		✓	✓	✓		✓	
CZ	11	✓			✓	✓	✓				
DK	4	✓		✓			✓				
DE	25	✓		✓	✓	✓	✓	✓			
EE	6	✓									
IE	7	✓					✓				
EL	27	✓		✓	✓		✓				
ES	-										
FR	10			✓	✓		✓				
HR	-										
IT	12	✓		✓	✓		✓			✓	✓
CY	7		✓		✓		✓				✓
LV	2						✓				
LT	2	✓				✓	✓				
LU	16			✓	✓	✓	✓				
HU	6	✓				✓	✓				
MT	-										
NL	47	✓		✓	✓	✓	✓	✓		✓	
AT	14	✓	✓	✓	✓		✓			✓	
PL	5			✓			✓				
PT	2							✓			
RO	22	✓	✓		✓	✓	✓	✓		✓	
SI	9	✓			✓	✓	✓			✓	
SK	5	✓					✓				
FI	14	✓		✓	✓	✓	✓			✓	
SE	13	✓	✓	✓	✓	✓	✓				

Source: JRC

Table 5. Overview of measures targeting the residential (RES) and services (SER) sectors, as reported in the NECPs

	Total reported measures		Economic		Fiscal		Info/ education		Planning		Regulatory		Research		Voluntary		Other	
	RES	SER	RES	SER	RES	SER	RES	SER	RES	SER	RES	SER	RES	SER	RES	SER	RES	SER
BE	34	13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓
BG	12	4	✓	✓	✓						✓	✓						
CZ	4	0			✓						✓				✓			
DK	9	2	✓	✓			✓				✓		✓					
DE	4	4	✓	✓	✓	✓	✓	✓										
EE	5	6	✓	✓							✓	✓						
IE	9	5	✓	✓	✓	✓					✓	✓						
EL	15	16	✓	✓	✓	✓	✓	✓			✓	✓					✓	
ES	2	2		✓			✓										✓	✓
FR	12	11	✓	✓	✓	✓	✓	✓			✓	✓						
HR	6	4	✓	✓		✓	✓	✓			✓	✓						
IT	1	4		✓		✓			✓	✓		✓						
CY	14	18	✓	✓	✓	✓	✓	✓		✓	✓	✓				✓		
LV	4	0	✓						✓		✓		✓					
LT	4	0	✓				✓											
LU	2	1			✓							✓						
HU	4	3	✓	✓							✓	✓						
MT	7	8	✓	✓			✓	✓			✓					✓		
NL	0	2								✓								
AT	1	0															✓	
PL	4	1	✓		✓		✓					✓						
PT	24	43	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	
RO	4	2	✓	✓			✓	✓	✓	✓	✓	✓					✓	
SI	7	0	✓						✓		✓							
SK	1	0					✓											
FI	5	3	✓	✓			✓	✓			✓	✓					✓	
SE	3	9	✓	✓			✓	✓				✓						

Source: JRC

5.5.2 Industry

Various measures targeting industry, including SMEs, are reported in the NECPs (Table 6). The majority of Member States reported economic measures (22 MSs), followed by regulatory (15 MSs), fiscal (9 MSs), voluntary (7 MSs), planning (5 MSs), education (4 MSs), research (3 MSs) and other (5 MSs). The countries with the highest number of industry related measures include the Netherlands, Portugal, followed by France, Cyprus and Germany.

Financial incentives, mainly in the form of grants and subsidies, for the implementation for energy efficiency measures and/or renewable energy systems in industry is available in Bulgaria, Germany, Greece, Spain, France, Italy, Cyprus, Czechia, Lithuania, Hungary, Malta, the Netherlands, Portugal, Slovenia, Sweden and Slovakia. The promotion of energy audits, mainly for SMEs, was reported by Finland, Slovakia and Greece, while Lithuania, Spain and Greece have additional dedicated programmes supporting companies in the implementation of actions as identified in energy audits. Spain plans to continue the provision of financial support (grants or soft loans) for investments in energy efficiency improvements and energy management systems (certified ISO 50001), focusing on industries not covered by the ETS. The Netherlands has in place a green projects scheme, a loan programme stimulating projects with positive impact on nature and the environment, but of low economic returns or high risk, which is supported by the government through a tax advantage to "green" savers and investors. In Germany, the MAP support has been strengthened through the introduction of the Energy Efficiency Incentive Programme (APEE), which includes three investment areas: 1) installation of ventilation systems (ventilation package) combined with a renovation on the building envelope in order to avoid construction damage (among others), (2) the replacement of inefficient heating through efficient heating (heating package), (3) the placing on the market of nuclear fuel cell heating in new buildings and existing buildings. The aid, which mainly targets industry, will be granted through a grant for stationary fuel cell heating with an electrical capacity of 0.25 to 5.0 kW through the KfW sample 'Energy-efficient construction and renovation — Grant Fuel Cell'. France plans to identify new support mechanisms for decarbonisation or efficiency actions energy in industry, as part of the work on the 2025 Productive Pact.

Regulatory measures mainly concerned the enactment of legislation that puts into effect the mandatory requirement of energy audits in enterprises that are not SMEs. Others included minimum performance standards and standards for industrial processes as well as the development of rules taking into account the relaxation of energy efficiency measures (flexiefficiency) in Romania, individual energy savings targets for owners of industrial systems and of state and municipal buildings in Bulgaria, and requirement of the employment of a policy officer in the field of energy in Hungary. In the latter case, undertakings that use more than 400000 KWh of electricity or 100000 m^3 of natural gas or 3400 GJ of heat are obliged to employ an independent energy officer every year as of 2017. In the Netherlands, the energy saving obligation under the Environmental Management Act contains rules on environmental management, including an obligation to generate energy savings. In establishments (with some exceptions) with an annual energy consumption of more than 50.000 kWh or 25.000 m^3 of natural gas (eq.) through actions applicable to buildings, facilities and processes. A few countries (Italy, Cyprus) target industrial energy efficiency through their energy efficiency obligation schemes, while the set-up of minimum requirements for nearly zero-energy buildings is reported to cover also industrial buildings in the case of Estonia. France plans to phase-out and ban of coal-fired power plants by 2022 and will no longer authorize new power stations to produce electricity from fuel oil.

Voluntary agreements include the Lean & Green Programme in Luxembourg, the SME Initiative Energy Transition and Climate Change in Germany, Energy Policy Agreements with Energy Intensive Industry as well as SMEs in the region of Wallonia in Belgium, and the "Business for climate" initiative in Cyprus. Other countries with long-standing tradition of voluntary agreements in industry such as the Netherlands, Ireland and Denmark continue to rely on these measures to generate energy savings in industry. In Czechia, the Industry 4.0 National Initiative aims to mobilise key departments and representatives of the industry to develop detailed action plans in the areas of political, economic and social life. Reduction of the energy and material intensity of production, productivity gains in production and optimization. Portugal aims to promote the development of a long-term plan for the digitalisation of the energy sector, while Cyprus promotes measures in the water sector (including production, cleaning, pumping, desalination etc.) that will achieve end use savings.

Table 6. Overview of industry measures reported in the NECPs

	Total reported measures	Economic	Education	Fiscal	Information	Planning	Regulatory	Research	Voluntary	Other
BE	5	✓							✓	
BG	8	✓					✓			
CZ	4	✓				✓				
DK	3	✓			✓		✓			
DE	10	✓	✓	✓	✓		✓		✓	
EE	6	✓					✓			
IE	4	✓		✓						
EL	8	✓					✓			
ES	2	✓								
FR	13	✓		✓	✓		✓	✓		
HR	2			✓			✓			
IT	4	✓		✓			✓			
CY	14	✓	✓	✓		✓	✓		✓	
LV	1						✓			
LT	2	✓								
LU	4				✓				✓	✓
HU	5	✓					✓			
MT	6	✓	✓		✓				✓	
NL	29	✓		✓		✓	✓	✓	✓	✓
AT	-									
PL	-									
PT	30	✓	✓	✓		✓	✓	✓		✓
RO	8	✓			✓	✓	✓			✓
SI	4	✓								
SK	5	✓			✓				✓	
FI	2	✓		✓	✓					✓
SE	2	✓					✓			

Source: JRC

5.5.3 Transport

An overview of transport measures stemming from the NECPs is shown in Table 7. As in the case with other sectors, the majority of Member States reported economic measures (24 MSs) followed by fiscal (21 MSs), planning (20 MSs), regulatory (18 MSs), education (6 MSs), research (3 MSs), voluntary (1 MSs) and other (11 MSs). Transport related measures support the deployment of low-emission vehicles, shift towards cleaner modes, multimodality, promotion of electro-mobility, behaviour change (e.g. through eco-driving training), etc.

Many countries have overarching strategies targeting exclusively the transport sector. These include the Hungarian National Mobility Strategy – Jedlik Ányos Plan 2.0, the regional mobility plan for Brussels central region, the national Clean Mobility Action Plan in Czechia, and others. As part of a long-term national mobility plan, Luxembourg adopted the Sustainable Mobility Strategy "MODU 2.0", which sets the strategic objective for 2025 to improve traffic flows at peak times, with 20% more passengers transported than in 2017, and desired

modal split on work paths consisting of 46% drivers, 19% passengers, 22% LPT, 9% pedestrians and 4% cyclists. Several countries focus on specific schemes and strategies promoting individual transport modes, e.g. cycling (e.g. Portugal, Malta, Latvia, France and Germany) and rail (Germany, Portugal and Romania) as well as electro-mobility (e.g. France, Slovakia, Poland and Malta), public transport (Cyprus, Czechia, Malta and Portugal), car sharing (France, Cyprus and Portugal, Malta), etc.

Regulatory measures range from the enforcement of existing EU emission standards for cars to plans for development of energy efficiency standards for electric vehicles. The latter measure has been included in the German NECP, based on the view that regulating energy efficiency standards will be conceptually developed over time. A sales ban for new vehicles emitting GHG gases by 2040, applied to both new passenger cars and light commercial vehicles, is planned in France.

Fiscal measures include the abolishment of tax advantages for non-freight use of diesel cars and taxation of diesel use in freight transport in France. Germany plans the reduction of VAT on long-distance rail journeys with the aim to make rail travel cheaper and plans to increase air transport tax. Estonia plans to introduce mileage-based road user charges for heavy-duty vehicles and Luxembourg will introduce a minimum CO2 price with the forthcoming tax reform, which will be continuously adapted in line with the objectives of the Paris Climate Agreement. France plans to reduce final energy consumption tax for power-driven water carriers.

Financial incentives to increase attractiveness of low emissions vehicles including electric cars are included in several NECPs. Grant aid for the purchase of electric vehicles is reported by Ireland, Spain, Croatia, Bulgaria, and Hungary. Promotion of electric charging infrastructure is reported by Greece, Spain, Czechia, Latvia, Hungary and Slovenia. Investment subsidies for the purchase of plug-in hybrid buses and battery buses are available in Germany and for alternative-fuel public transport vehicles with higher efficiency in Czechia. In Italy, "Marebonus" and "Ferrobonus" are incentives aimed at promoting the modal shift of goods from road to sea and from road to rail, respectively. In Slovenia, incentives are planned for the arrangement of infrastructure for public passenger transport, covering renovations, upgrades and new constructions in the areas of rail and bus systems, multi-modal passenger hubs with the inclusion of micro-mobility in 2022.

Behavioural change measures through eco-driving training are promoted in Croatia, Czechia and Hungary, Bulgaria, Denmark, Estonia and Slovenia. Portugal plans to promote cycling through changing mobility behaviour in school and/or university segments and Malta plans to increase the use of intelligent transport systems in traffic management.

Table 7. Overview of transport measures reported in the NECPs

	Total reported measures, of which:	Economic	Education	Fiscal	Information	Planning	Regulatory	Research	Voluntary	Other	Not specified
BE	2			✓		✓					
BG	4	✓			✓					✓	
CZ	11	✓	✓	✓		✓	✓				
DK	15	✓		✓	✓		✓				
DE	19	✓		✓		✓	✓				
EE	11	✓		✓	✓	✓	✓			✓	
IE	3	✓		✓							
EL	13	✓		✓			✓			✓	
ES	4	✓		✓						✓	
FR	21	✓		✓		✓	✓			✓	
HR	11	✓	✓			✓	✓				
IT	8	✓		✓	✓	✓					
CY	15	✓	✓	✓		✓	✓				
LV	13	✓		✓		✓	✓				
LT	6	✓		✓			✓				
LU	6			✓		✓					
HU	31	✓	✓	✓		✓	✓	✓		✓	
MT	23	✓			✓	✓	✓		✓		
NL	19	✓	✓	✓	✓	✓	✓	✓			
AT	7	✓		✓						✓	
PL	7			✓		✓				✓	✓
PT	54	✓	✓	✓	✓	✓	✓	✓		✓	
RO	13	✓				✓	✓			✓	
SI	24	✓		✓	✓	✓	✓			✓	
SK	10	✓				✓					
FI	10	✓		✓	✓	✓	✓				✓
SE	3	✓			✓	✓	✓				

Source: JRC

5.5.4 Agriculture

Whilst this is not a requirement of the EED, 10 Member States reported measures covering the agriculture sector (Table 8). Germany reported a financial support programme in agriculture and horticulture covering new construction, system optimisation, individual measures, energy advice, etc. as well as a bundle of different measures to reduce GHG measures in the agricultural sector. Estonia plans to conduct studies and pilot projects to assess the climate impact of different agricultural practices and technologies and the development of country-specific emission factors, a prerequisite for the efficient design and implementation of a number of agricultural measures, as well as of EU CAP measures. A prediction model could also be developed on the basis of an estimation of the number of animals in the agricultural sector and the use of fertiliser. Other relevant measures include investments to improve farm performance, investments for energy saving and renewable energy in greenhouses and vegetable storage buildings and grants promoting audits of nitrogen, phosphorus and CO2 on large farms. In Greece, financial tools with the aim of modernising water supply/sanitation and irrigation infrastructures (replacing networks, remote control/remote control, replacing pumps with new ones more energy efficient etc.) are expected to generate significant energy savings and at the same time reduce costs of water services. In addition, Greece reported actions to replace existing machinery and installations used in agriculture and farming with new energy efficient ones, giving priority to high energy consuming machinery and equipment. Information and professional training opportunities within the agricultural sector related to energy efficiency practices through specific tools like energy audits, certification and energy labelling schemes are also available. In Spain, financial incentives to improve energy efficiency of tractors, agricultural machineries

and farm buildings have been available since 2014 under the PIMA TIERRA programme as well as information and training activities about energy efficiency in irrigation systems.

Other measures which are specifically designed for the agricultural sector include the Dutch energy efficiency and renewable energy scheme (EHG) introduced in 2016, offering a 25% subsidy to companies in the glasshouse horticulture sector to increase energy efficiency, and the Market Deployment Scheme (MEI) which aims to accelerate the early market introduction of innovative energy systems in the glasshouse horticulture sector. In Sweden, the Rural Development Programme for 2014–2020, which is part of the EU's Common Agricultural Policy (CAP), includes investments for young entrepreneurs, capacity building, cooperation and innovation, and support for organic farming, environmental and climate measures, and animal welfare including measures designed to increase energy efficiency. Energy efficiency in the agricultural sector is also addressed by various economic measures, covering support to fresh grain silos (drying of grain avoided), investments to unheated cattle buildings and heat recovery from pig slurry, farm reparcelling leading to reduced farm traffic and subsidies for the preparation of farm energy plans and other energy advice.

Beyond the aforementioned measures, there are several other measures that cover agriculture among other sectors. These are not specifically designed to address energy efficiency in agriculture only.

Table 8. Overview of agricultural measures reported in the NECPs

	Total reported measures	Economic	Education	Fiscal	Information	Planning	Regulatory	Research	Voluntary	Other	Not specified
DE	2	✓								✓	
EE	6	✓					✓	✓			
EL	3	✓			✓						
ES	1	✓	✓								
FR	1	✓					✓				
CY	12	✓	✓	✓			✓		✓		
NL	30	✓	✓	✓		✓	✓	✓	✓	✓	
PT	14	✓			✓	✓	✓	✓		✓	
FI	5	✓			✓						✓
SE	1	✓									

Source: JRC

5.5.5 Cross-sectoral

Cross-sectoral measures are the most commonly reported measures after measures targeting the transport and building sectors. If measures covering multiple sectors (e.g. residential, services and industry or services, transport and agriculture) were to be included in the list of cross-sectoral measures, these measures would likely represent the most common type. Only measures declared as cross-sectoral in the NECPs by the Member States themselves are considered and discussed in this section even though this may cause consistency issues depending on what is perceived as "cross-sectoral" by national authorities.

As shown in Table 9, all Member States except Italy and Malta reported cross-sectoral measures. Taxation is one of the measures commonly applied in a horizontal way. Taxation on fuels and electricity is a measure used by several Member States, which, inter-alia, aim to curb the environmental impacts of energy consumption and improve cost-effectiveness of energy efficiency investments, including the promotion of more efficient use of energy through behavioural change. At cross-sectoral level, Denmark, Romania, Germany, Croatia and Sweden have all reported this type of measure.

Energy efficiency obligation schemes apply at cross-sectoral level in Greece, Ireland, Czechia, Luxembourg, Austria, Poland and Slovenia. In addition, various energy efficiency funds affect all sectors at horizontal level. These include the Energy Efficiency and Renewable Sources Fund in Bulgaria, the Czech Modernisation fund,

the Hungarian Green Economy and National Research, Development and Innovation Funds, the Climate and Energy Fund in Austria and the National Energy Efficiency Fund in Greece, Romania and Spain.

Many information and awareness raising measures are applied horizontally. These include public information campaigns such as the campaign on ESCOs in Belgium, the "Germany macht efficient" campaign in Germany, the "Now's the time to make energy savings" campaign in the Netherlands, and other campaigns in Romania, Slovakia, Croatia, the Netherlands, Poland and Czechia. Specific energy advice or consultation programmes are reported by Germany, Cyprus, Spain, Hungary, Austria, Slovakia, Finland and Sweden. The promotion of energy management systems in Germany, Cyprus and Austria is also considered to be applied across multiple sectors.

Table 9. Overview of cross-sectoral measures reported in the NECPs

	Total reported measures	Economic	Education	Fiscal	Information	Planning	Regulatory	Research	Voluntary	Other	Not specified
BE	10	✓	✓		✓						
BG	6	✓			✓		✓				
CZ	14	✓			✓	✓	✓		✓		
DK	12	✓		✓							✓
DE	27	✓		✓	✓	✓			✓	✓	
EE	1							✓			
IE	5					✓	✓	✓			
EL	8	✓					✓				
ES	8	✓	✓	✓	✓		✓			✓	
FR	1	✓					✓				
HR	21	✓	✓		✓	✓	✓	✓	✓	✓	
IT	-										
CY	2		✓		✓						
LV	9	✓					✓			✓	
LT	1						✓				
LU	1	✓									
HU	19	✓	✓	✓	✓	✓	✓	✓			
MT	-										
NL	3				✓				✓		
AT	16	✓	✓		✓	✓		✓		✓	
PL	3	✓		✓	✓						
PT	10	✓	✓		✓	✓		✓			
RO	16	✓	✓	✓	✓		✓				
SI	18	✓		✓	✓	✓	✓			✓	
SK	11		✓		✓	✓					
FI	7	✓			✓	✓	✓		✓		
SE	9	✓		✓	✓	✓	✓	✓			

Source: JRC

5.6 Energy poverty

Many countries reported measures aimed at addressing energy poverty. These were mainly reported in the context of the Internal Energy Market dimension. A few countries reported the development of dedicated strategies to combat energy poverty (e.g. Ireland and Portugal) and others mentioned the development of national systems for assessing and monitoring the evolution of energy poverty issues over time (e.g. Romania, Portugal, Poland, Austria).

An overview of energy poverty measures reported in the NECPs is illustrated in Table 10. These can be classified in three broad categories:

1. Measures aimed at improving **energy efficiency** either through financial incentives for energy renovations, awareness raising or other measures
2. Measures aimed at providing **energy supply assistance** in energy poor households either through favourable tariffs, flexible payment conditions or other protective mechanisms.
3. General **living support** measures e.g. through the provision of heating allowances, housing benefits, or other types of support

Financial incentives on energy efficiency improvements were reported by 18 Member States. Incentives specifically designed for vulnerable groups include the Irish Better Energy Warmer Homes Scheme and Social Housing Retrofit Programme, the Greek energy upgrade scheme for energy vulnerable households and Slovenian household energy efficiency aid scheme for vulnerable population groups. Lithuania, Latvia, France and Hungary target consumers affected by energy poverty through their energy efficiency obligation schemes. Other reported schemes support multi-family houses (Bulgaria, Croatia, Lithuania), while others are of more generic nature, targeting the entire residential sector. These include tax incentives, which are reported by France, Italy and Finland.

Information and awareness raising measures typically focus on the provision of energy advice. Notable examples include the programme supporting energy check-ups in energy poor households in Germany, the energy audit scheme for households in France and the provision of professional advice to vulnerable households in Malta. Lithuania reported agreements with energy suppliers on consumer education and consulting on energy issues as well as the inclusion of energy poverty and efficiency consultations in their social services catalogue. In Austria, large energy suppliers are obliged to set up contact and advice centres, which also cover problems relating to energy poverty.

Beyond energy efficiency, many countries reported measures aimed at improving access to energy for vulnerable groups (including energy poor households), either through social tariffs for electricity and gas (Belgium, Cyprus, Latvia, Slovakia) or flexible energy payment conditions (Belgium, Ireland, Austria, Romania, Slovakia). For instance, Belgium mentioned the establishment of staged payment method of bills for vulnerable groups and Romania the possibility of payment of electricity bills in instalments. Other measures include the safeguarding of the continuous supply of electricity during critical periods to vulnerable consumers in Cyprus and the extension of subscription based electricity connection scheme for households living in buildings that are deteriorated or unsuitable for renovation, ensuring the electric heating of at least one room for families with small children in Hungary. Austria reported that the green Electricity Act relieves low-income households of additional costs for green electricity production. Rules governing the Disconnection Policy for Small Consumers of Electricity and Gas were reported in the Netherlands.

The final group of measures provide relief for general living costs of low income households, including help with the cost of heating during the winter months. For example, Bulgaria envisages heating allowance for eligible recipients via the social assistance system throughout the heating period, and Lithuania includes the reimbursement of domestic heating costs in its measures to address energy poverty. General housing benefits in the form of housing subsidies and social housing allowances are reported by Slovenia, Slovakia, Estonia, Ireland and Denmark. Other living allowances are reported by Denmark (additional cash support), Lithuania (reimbursement of domestic hot water and general water supply) and Slovakia (aid in material need). As in the case of the energy supply assistance, this group of measures are not oriented towards energy efficiency improvements.

Table 10. Overview of energy poverty measures reported in the NECPs

	Total reported measures	Energy efficiency			Energy supply assistance			General living support		
		Financial incentives	Information/ awareness raising	Other	Preferential energy tariffs	Flexible payment conditions	General/other protective measures	Heating allowance	Housing allowance	General/other living allowance
BE	6	✓	✓		✓	✓				✓
BG	4	✓		✓			✓	✓		
CZ	-									
DK	3							✓	✓	✓
DE	2		✓							
EE	3	✓								✓
IE	4	✓				✓				✓
EL	2	✓								
ES	-									
FR	5	✓	✓	✓						
HR	2	✓	✓							
IT	4	✓								
CY	5	✓		✓	✓		✓			
LV	2			✓	✓					
LT	16	✓	✓	✓			✓	✓		✓
LU	2	✓				✓				
HU	5		✓	✓			✓			
MT	3	✓	✓							
NL	1						✓			
AT	5	✓	✓			✓	✓			✓
PL	3	✓	✓	✓						
PT	6		✓	✓			✓			
RO	3	✓		✓		✓				
SI	2	✓	✓							
SK	5	✓			✓	✓			✓	✓
FI	2	✓							✓	
SE	-									

Source: JRC

6 Implementation of key EU directives

6.1 Long-term renovation strategies

With the 31 December 2019 deadline of the NECP submissions preceding the one for the LTRSs (March 2020), only around 15 Member States included information regarding their long-term renovation strategies (LTRSs) in the NECPs. The analysis presented in this chapter is based solely on the partial LTRS information provided in the NECPs and a separate full analysis of the LTRS is currently being carried out, which will be made available in due course. The analysis presented herein should be therefore considered preliminary.

Just over half of the EU Member States communicated renovation milestones in the NECPs. A summary of the types of milestones selected by these Member States is shown in Table 11. A few countries chose multiple types of milestones (Bulgaria, Cyprus, Croatia, Finland, Ireland, Slovenia), while others only one (Germany, Estonia, Greece, Spain, France, Italy, Netherlands, Poland and Romania). Some countries opted for milestones expressed in energy savings (Bulgaria, France, Cyprus, Slovenia and Finland), others in CO2 or GHG emission reduction (Bulgaria, Ireland, Netherlands, Slovenia) and a few in absolute energy consumption (Germany, Cyprus, Finland). Romania and Italy expressed their milestones in terms of renovation rates, while Estonia, Ireland, Greece, Spain, Croatia and Poland in share or number of buildings to be renovated or to meet a certain energy class.

The countries which did not include any renovation milestones in the NECPs were Austria, Belgium, Czechia, Denmark, Latvia, Lithuania, Luxembourg, Hungary, Malta, Portugal, Slovakia and Sweden.

Table 11. Types of LTRS milestones reported by Member States in their National Energy and Climate Plans 2021-2030

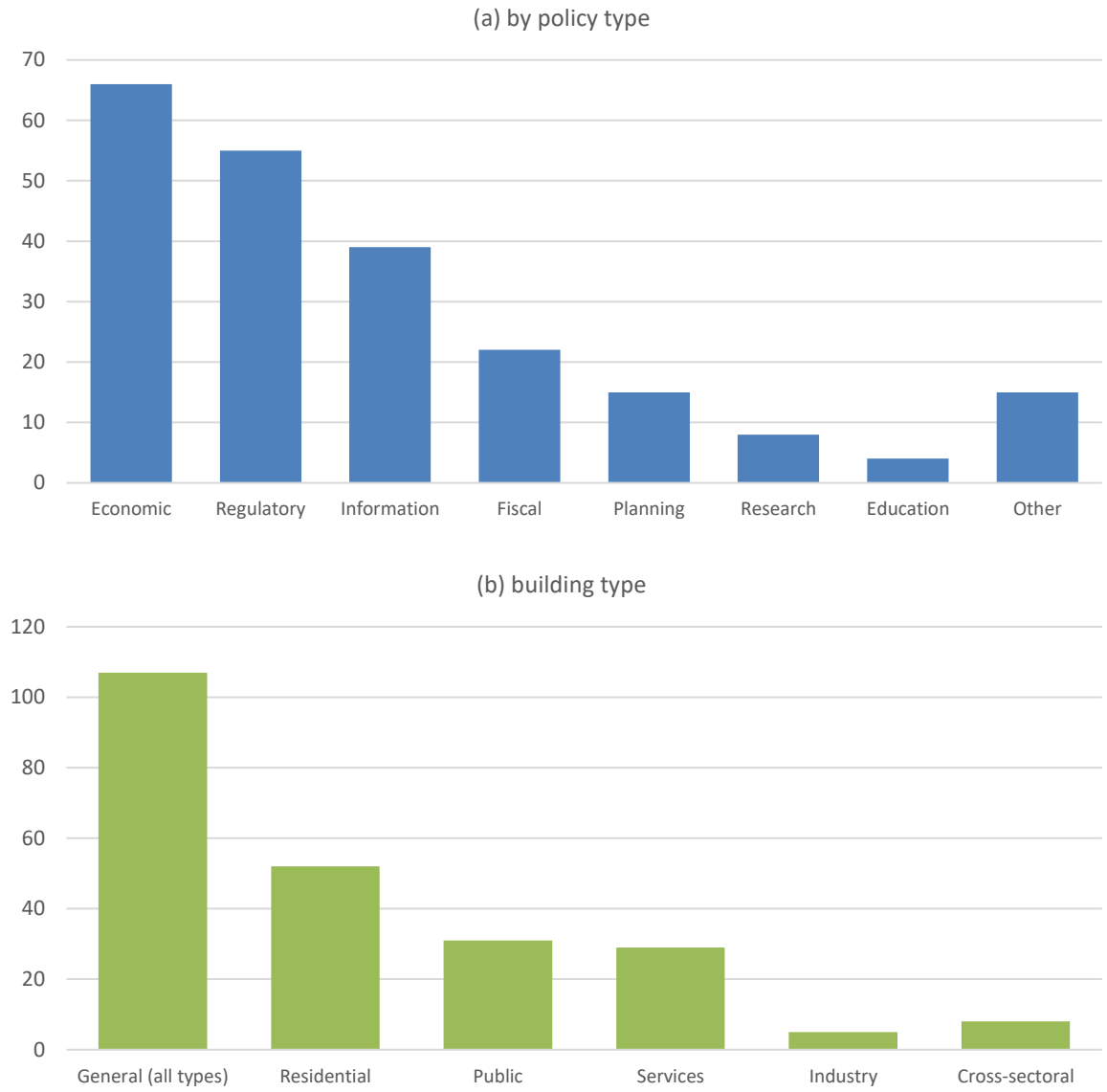
Type of milestones	**Countries reporting this type of milestone**
Energy savings	Bulgaria, France, Cyprus, Slovenia, Finland
Absolute energy consumption	Germany, Cyprus, Finland[5]
GHG/CO_2 reduction	Bulgaria, Ireland, Netherlands, Slovenia
Renovation rates	Italy, Romania
Share or number of buildings to be renovated or to meet a certain energy class	Estonia, Ireland, Greece, Spain, Croatia[6], Poland
Other	Ireland (net zero target by 2050)

Source: JRC

To identify measures linked to the long-term renovation strategies, both the PAM template and the information reported in Section 3.2.ii were reviewed. Even though many measures target the building sector, not all building-related measures identified in the NECPs are directly associated with the long-term renovation strategies. In total, 203 national policies and measures have been identified in the context of the long term renovation strategies, either reported in Section 3.2.ii or in the voluntary PAM templates as an annex to the NECP. The policies and measures range from regulatory, economic, fiscal, information and other type of measures and target all buildings or specific segments of the sectors (Figure 11).

[5] For heating only
[6] Croatia has also reported floor area

Figure 11. Overview of LTRS policies and measures by (a) policy type and (b) building type



Source: JRC, 2020

A country-by-country overview of LTRS policy reporting under the NECPs is provided in Table 12. For Cyprus, Malta and Estonia, it was not possible to identify any policies and measures linked to the strategies. All other countries plan to use a mixture of regulatory, economic, fiscal, information, planning and other measures.

The impact of the measures against these milestones was poorly reported in the NECPs. Some countries reported savings of building measures in the context of EED Article 7 (e.g. Czechia and Croatia). Bulgaria reported contributions by measure in the period 2014-2018 in the context of the 2020, corresponding to savings of 1526.3 GWh per year. While it is stated that the savings trend will continue for some measures, it is not known how these will be shaped for the 2030 timeline. Luxembourg reported cumulative savings of 28.6 TWh associated with building renovation measures in the period 2021-2030. Based on the NECP information, no observations can be made as to whether the measures proposed by the Member States would be sufficient to meet the envisioned national milestones.

Table 12. Overview of LTRS policy reporting under the NECPs

	TOTAL NUMBER OF MEASURES, OF WHICH:	REGULATORY	ECONOMIC	FISCAL	INFORMATION	PLANNING	OTHER	QUANTIFIED CONTRIBUTION?	SUFFICIENT TO MEET MILESTONES?	WIDER BENEFITS	ENERGY POVERTY MEASURES	REQUIRED BUDGETARY RESOURCES	EFFECTIVE MECHANISMS TO PROMOTE RENOVATIONS
BE	22	✓	✓	✓	✓	✓		No	Unclear	No	Yes	Partial	Yes
BG	10	✓	✓	✓		✓	✓	Yes	Unclear	Unclear	Yes	Unclear	Unclear
CZ	10	✓	✓		✓		✓	Partial	Unclear	No	No	Yes	Yes
DK	5	✓	✓		✓		✓	No	Unclear	No	Yes	Partial	Yes
DE	17	✓	✓	✓	✓	✓	✓	Unclear	Unclear	No	Yes	Partial	Yes
EE	-							Unclear	Unclear	No	Yes	No	Yes
IE	7	✓	✓	✓				No	Unclear	No	Yes	Partial	Yes
EL	8	✓	✓		✓			No	Unclear	Yes	Yes	Yes	Yes
ES	2						✓	Partial	Unclear	Partial	Unclear	yes	no
FR	16	✓	✓	✓	✓	✓		No	Unclear	No	Yes	No	Yes
HR	5		✓		✓			Partial	Unclear	Yes	Yes	Yes	Yes
IT	6	✓					✓	No	Unclear	Unclear	Yes	No	No
CY	-							No	Unclear	No	Yes	No	No
LV	2	✓	✓			✓	✓	Unclear	Unclear	Unclear	No	Unclear	Unclear
LT	3	✓	✓			✓		Unclear	Unclear	No	Yes	No	No
LU	7	✓		✓		✓		Yes	Unclear	No	Yes	No	Yes
HU	10	✓	✓			✓	✓	No	Unclear	No	Yes	No	Partial
MT	-							Unclear	Unclear	Unclear	Partial	No	No
NL	12	✓	✓	✓	✓		✓	No	Unclear	No	Yes	Unclear	Unclear
AT	6	✓	✓		✓		✓	No	Unclear	No	Yes	No	No
PL	2	✓		✓				No	Unclear	No	Yes	No	Yes
PT	5	✓	✓		✓	✓		No	Unclear	Unclear	Yes	Yes	Unclear
RO	11	✓	✓		✓		✓	No	Unclear	No	Yes	Yes	No
SI	19	✓	✓		✓	✓	✓	No	Unclear	Unclear	Yes	No	Yes
SK	4		✓					No	Unclear	No	Yes	Yes	Yes
FI	8	✓	✓		✓		✓	No	Unclear	No	Yes	No	No
SE	6	✓	✓	✓	✓			No	Unclear	No	No	Yes	No

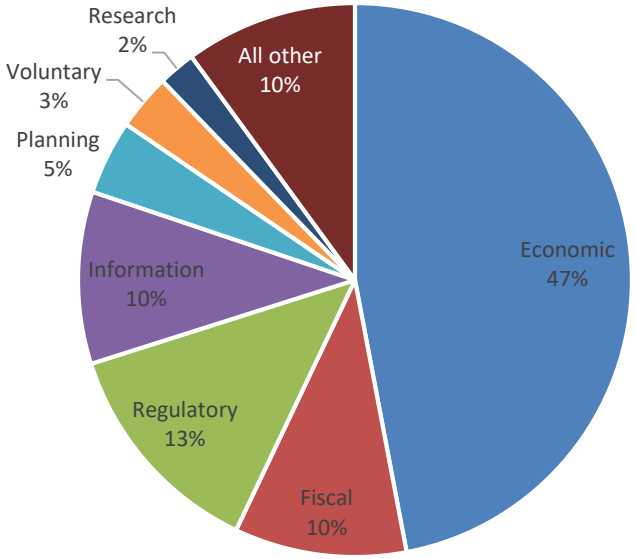
Source: JRC

6.2 Energy efficiency obligation schemes and alternative measures

A total of 372 national policies and measures have been identified in the context of the EED Article 7. This significant share of measures reflects the overall importance of this article and the efforts put in place by Member States to comply with the articles requirements. Figure 10 provides an EU-wide overview of the types of national policies and measures contributing to EED Article 7 in the period 2021-2030. Nearly half of all the reported measures (47%) are of economic nature, which range from investment aid schemes to subsidies and specialised funds. Fiscal measures, representing around 10% of the total share, either take the form of taxation (e.g. Sweden, Czechia, Germany, Cyprus, Finland, Lithuania and Slovenia) or tax relief measures (e.g. Italy, Hungary, Latvia and the Netherlands). Regulatory measures account for 13% of the overall mix in 2021-2030,

while information measures 10%. Measures of voluntary, research and planning nature are of less frequent use, while other measures represent measures which could not be identified under one of the main policy categories.

Figure 12. Types of policies and measures contributing to EED Article 7 in the period 2021-2030. Shares (%) are expressed in number of measures



Source: JRC, 2020

The assessment of whether these measures will be sufficient to meet the Article 7 requirement was not possible for all countries which reported energy savings. These include Germany, where the NECP reports cumulative savings as net savings (deducting overlaps and several rebound effects) which are below the required Article 7 savings and Belgium where the savings for the Flemish measures are only currently available. Poland provides cumulated savings only for the obligation scheme and annual savings for alternative measures (the latter are multiplied by 10 to derive the cumulative savings), which together would not be enough to reach the overall savings.

Table 13 provides a country-by-country overview of the Article 7 implementation according to the information found in the NECPs. It summarises the approach chosen by each Member State (i.e. the use of obligation scheme and/or alternative measures), total number of reported Article 7 measures, types of alternative measures chosen by each Member State and an assessment of whether these measures will be sufficient to meet the Article 7 requirement.

In terms of approach, there are a few notable differences with respect to the preceding period of 2014-2020. In total, 14 Member States plan to use energy efficiency obligations in 2021-2030 to deliver Article 7 savings. For Croatia, Cyprus and Hungary, the obligation scheme represents a new measure as this group of countries relied exclusively on alternative measures in 2014-2020 (Tsemekidi-Tzeiranaki, S. et al., 2020). On the other hand, Denmark, Malta and Luxembourg will no longer use energy efficiency obligations to meet the requirements of Article 7. While Denmark, France, Luxembourg, Poland used only energy efficiency obligation schemes in 2014-2020, France is now the only country which plans to meet the future Article 7 requirements exclusively through its energy efficiency obligation scheme.

Alternative measures will be used by 26 Member States in 2021-2030, as opposed to 23 Member States[7] in 2014-2020. Denmark and Malta have switched their approach from energy efficiency obligation scheme alone to the exclusive use of alternative measures, while Luxembourg will use both obligation scheme and alternative

[7] 24 Member States if the UK is included.

measures. Croatia, Cyprus and Hungary will continue to use alternative measures alongside the new obligation schemes.

As with the existing national obligation schemes (Fawcett, Rosenow & Bertoldi, 2019), the new obligations in Croatia, Cyprus and Hungary have their own unique characteristics and features. In Croatia, the Energy Efficiency Obligation System has been operational since 2019, with gradual requirements to entry for suppliers over time. In 2019, it was applicable to suppliers that delivered more than 300 GWh of energy to the market in 2017, in 2020 to suppliers who delivered more than 100 GWh in 2018 and from 2021 onwards to all suppliers who supplied more than 50 GWh in the previous year. The objective is to achieve 50% savings under Article 7 of the Energy Efficiency Directive and suppliers can fulfil their obligation by investing in energy efficiency improvements in immediate consumption; by buying savings from another obligated party or by paying contributions to the Environmental Protection and Energy Efficiency Fund. In Hungary, the energy efficiency obligation scheme is a new scheme and will allow suppliers and/or distributors to introduce programmes and implement measures resulting in evidenced energy savings for final customers in industry, households, public bodies or the services sector. The cost-effectiveness of the Hungarian obligation scheme is expected to be enhanced with ESCO-type financing solutions that simplify and extend access to funds in both the retail and corporate sectors. The Cypriot scheme will also give the opportunity for ESCOs to participate via an electronic platform that will offer trading system for energy savings. Although the structure of the small domestic energy market currently does not leave big room for competition among energy suppliers, the introduction of the energy efficiency obligation scheme is expected to foster and accelerate the establishment of a functioning national energy service market.

The policy mix adopted by countries with alternative measures in 2021-2030 is fairly diverse, as in the preceding period. As shown in Table 13, most countries opted for a wide range of alternative measures, with economic measures being prevalent in all countries except Luxembourg and Romania. Measures of regulatory nature are used by 17 Member States, information measures by 15, fiscal measures by 14 and voluntary measures by 7. Other measures include education, research, infrastructure investments, planning and any other measures which cannot be directly linked with one of the main policy categories.

All but 8 Member States reported the expected impact of the measures under Article 7 in energy savings. Of the countries reporting the impact of their measures, 13 reported in annual energy savings, 19 in cumulative energy savings and 13 in both. Austria, Estonia, Hungary, Ireland, Luxembourg, Netherlands, Portugal and Slovenia did not report any measure savings. The Netherlands provided cumulative energy savings 2021-2030 by sector rather than measure. Based on the information given in the NECPs, it can be concluded that Bulgaria, Czechia, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Malta, Finland and Sweden should be able to meet the Article 7 requirement based on the energy savings of the measures disclosed in their plans. This is because this group of countries will reach or exceed the required Article 7 savings according to the reported impact of their mix of measures. On the other hand, Denmark, Netherlands, Romania, and Slovakia are currently short of reaching their planned Article 7 savings. According to the Netherlands Environmental Assessment Agency, the Dutch expected cumulative energy savings of the policies for 2021-2030 (556-691 PJ) are insufficient to meet the mandatory energy saving of 925 PJ but these do not yet include all policies as the policies in the Climate Agreement were not announced in time to be included in the National Climate Energy Outlook, hence the expected energy savings are underestimated. Denmark is aware that the current measures fall short of reaching the energy saving obligations under article 7 of Directive 2012/27/EU. This is partly due to the use of a frozen policy scenario, wherein only measures from the period 2021-2024 are included. In Romania, the long-term renovation strategy is the only measure included in the list of Article 7 measures and is expected to generate cumulative savings of 3.4 Mtoe, while the savings requirement stands at 10.12 Mtoe. In Slovakia, For now and with the expected savings as quantified in the NECP, the measures with reported energy savings (460 GWh/year) contribute roughly to 50 % of the yearly and cumulative savings target (870.5 GWh/year). About a third of the measures (buildings, audits, GPP) currently lacks quantification of impacts which will be supplemented at later stage.

The assessment of whether these measures will be sufficient to meet the Article 7 requirement was not possible for all countries which reported energy savings. These include Germany, where the NECP reports cumulative savings as net savings (deducting overlaps and several rebound effects) which are below the required Article 7 savings[8] and Belgium where the savings for the Flemish measures are only currently available. Poland provides cumulated savings only for the obligation scheme and annual savings for alternative measures (the latter are

[8] The annual gross effects (not taking into account these effects) are considerably higher and would allow reaching the target/narrowing the gap towards the target.

multiplied by 10 to derive the cumulative savings), which together would not be enough to reach the overall savings.

Table 13. Overview of policies and measures reported by Member States under EED Article 7 in the period 2021-2030

	Total NUMBER OF MEASURES, of which:	EEOS	Alternative measures, OF WHICH:	Regulatory	Economic	Fiscal	Information	Voluntary	Other	Energy savings?	Sufficient to meet Art.7 requirement?
BE	14		✓	✓	✓	✓	✓		✓	Yes[9]	Unclear
BG	3	✓	✓		✓					Yes	Yes
CZ	25		✓	✓	✓	✓	✓	✓	✓	Yes	Yes
DK	4		✓	✓	✓					Yes	No
DE	27		✓	✓	✓	✓	✓	✓		Yes	Unclear
EE	13		✓	✓	✓		✓		✓	No	Unclear
IE	2	✓	✓		✓					No	Unclear
EL	10	✓	✓	✓	✓	✓			✓	Yes	Yes
ES	17	✓	✓	✓	✓	✓	✓		✓	Yes	Yes
FR	1	✓								Yes	Yes
HR	10	✓	✓	✓	✓				✓	Yes	Yes
IT	10	✓	✓		✓	✓	✓			Yes	Yes
CY	18	✓	✓	✓	✓	✓	✓	✓	✓	Yes	Yes
LV	8	✓	✓	✓	✓	✓	✓			Yes	Yes
LT	11		✓		✓	✓		✓		Yes	Yes
LU	6	✓	✓			✓	✓	✓	✓	No	Unclear
HU	47	✓	✓	✓	✓	✓	✓		✓	No	Unclear
MT	10		✓	✓	✓				✓	Yes	Yes
NL	50		✓	✓	✓	✓	✓	✓	✓	No[10]	No
AT	11	✓	✓	✓	✓	✓	✓		✓	No	Unclear
PL	5	✓	✓		✓					Yes	Unclear
PT	9		✓	✓	✓		✓			No	Unclear
RO	1		✓						✓	Yes	No
SI	31	✓	✓	✓	✓	✓	✓		✓	No	Unclear
SK	21		✓	✓	✓		✓	✓	✓	Yes	No
FI	3		✓		✓					Yes	Yes
SE	3		✓		✓					Yes	Yes

Source: JRC

[9] Available only for Flanders
[10] The breakdown of energy savings by sector instead of measures is given in the Dutch NECP

6.3 Central government building renovations

In accordance with Article 5(1) of Directive 2012/27/EU, Member States must ensure that, as from 1 January 2014, 3% of the total floor area of heated and/or cooled buildings owned and occupied by their central government which does not meet minimum energy requirements is renovated each year, to meet at least the minimum energy performance requirements (MEPS) that has been set in application of Article 4 of Directive 2010/31/EU. Alternatively, Member States may opt for an alternative approach (EED Article 5(6)), and achieve by 2020, energy savings which are equivalent or greater than those which would be achieved through the application of the provisions of EED Article 5(1) in the same building stock. With the adoption of the amended EED, Member States must continue to pursue energy efficiency upgrades in their central government building stock (EED Article 5(1)-(6)) and wider public sector in general (EED Article 5(7)).

Table 14 presents the implementation approach for the period 2021-2030 reported in the NECPs with regards to central government building renovations. In general, it can be seen that no changes are identified in the implementation approach opted for the 2021-2030 compared to the one in 2014-2020. For a number of countries (Germany, Ireland, Luxembourg, Hungary, Portugal, Romania, Slovakia, Wallonia and Brussels regions of Belgium), no sufficient information is disclosed, so no conclusions can be made as to whether this group of countries plan to continue following the past implementation approach. This group of countries, together with Slovenia, Malta and Denmark, have not included information regarding their Article 5 objective in their NECPs. All other countries communicated their central government objectives either in terms of renovated floor area (Bulgaria, Estonia, Greece, Spain, Italy, Lithuania and Latvia) or energy savings (Austria, Flanders region of Belgium, Cyprus, Czechia, Finland, France, Croatia, the Netherlands, Poland and Sweden).

Table 14. Implementation approach opted by Member States in the period 2021-2030 to meet the central government building renovation requirement, as reported in the NECPs

Implementation approach	Countries opting for each approach in 2021-2030
Default	Bulgaria, Estonia, Greece, Italy, Latvia, Lithuania, Slovenia, Spain
Alternative	Austria, Belgium (Flanders), Croatia, Cyprus, Czechia, Denmark, Finland, France, Malta, Netherlands, Poland, Sweden
Unclear	Belgium (Wallonia, Brussels), Germany, Hungary, Ireland, Luxembourg, Portugal, Romania, Slovakia

Source: JRC

Table 15 provides an overview of the type of alternative measures (regulatory, economic, information and planning) and policy theme (strategies, mandatory renovations, etc.) notified by Member States in the context of Article 5. It should be noted that even though some countries (Germany, Slovakia) have not explicitly specified the adoption of the alternative approach, they have nevertheless reported various alternative measures. These countries have indeed followed this approach in the period 2014-2020, and are therefore likely to continue to do so in the next period.

Several countries have included regulatory measures. These include the Flanders region in Belgium which plans to impose an exemplary renovation obligation on all public buildings in case of extensive renovations and translate public exemplarity into energy neutrality by 2050 at the latest, following a phasing to be decided between central and local authorities. In particular, the Flemish authorities will target primarily administrative office buildings and schools, before extending to other types of public buildings. In Austria, the central government objective for 2014-2020, applied for buildings owned and used by the Federal government, is achieved through energy savings contracting (or energy performance contracting). For 2021-2030, the Austrian authorities will continue to meet the obligation through this approach but they will step up the efforts by raising the expected savings from 48.2 GWh (2014-2020) to 84.7 GWh for period 2021-2030. Cyprus also plans to undertake several deep renovations in their central government building stock together with individual target measures. Germany has the "Federal buildings - exemplary role of public buildings" programme, under which new federal buildings should meet at least EH 40 by 2022 and existing building stock will be subject to compulsory renovation targets for 2030 and 2050. France introduced in 2018 and 2019 an energy efficiency obligation of 40% in 2030 for tertiary buildings with a size of more than 1 000 m^2, whether public or private.

In addition, it banned the purchase or heavy repair of fuel oil boilers in Government buildings as of 2020, and plans the end of all fuel oil use in Government buildings (excluding operational issues) by 2029. France also plans to implement a building renovation plan for 39 administrative units in France. In the Netherlands, a sectoral roadmap of the central government real estate agency was introduced in the context of the Climate Agreement, outlining the route to achieve a low CO_2 real estate portfolio for central government by 2050. The forecasted savings of 1.3 PJ in 2030 associated with the Dutch central government roadmap are much higher than the expected savings of 0.2 PJ expected to be generated if 3% of the buildings with an area of use greater than 250 m^2 owned and used by central government are renovated annually.

In terms of economic measures, examples include loans to finance energy renovation in Denmark's municipalities and regions, which together own a total building mass of more than 36 million m^2. The energy agreement allocates DKK 100 million annually in the period 2021-2024 for loans to finance energy renovations in buildings owned or operated by municipalities and regions. In France, there are various financing tools for building renovation with regional authorities. As part of its 2018-2022 major investment plan, up to EUR 3 billion are available to local authorities for the renovation energy efficiency of their own buildings: EUR 2 billion in subsidized loans from Caisse des Dépôts, EUR 0.5 billion invested in equity by Caisse des Dépôts in various operations including the support of innovative economic models and EUR 0.5 billion from local investment support endowment (DSIL). Ireland adopted a Public Sector Energy Efficiency Strategy in January 2017 and a renewed ambition for the public sector with a new 50% efficiency target for 2030. The Irish Climate Action Plan envisions the leading role of the public sector in the decarbonisation of Ireland's economy and sets out actions to enable public bodies to go beyond the current policy framework and act as exemplars of best practice. Other national examples include the operational programme environment and modernisation fund in Czechia, the energy renovation programmes for public sector and heritage buildings in Croatia, and the Slovakian energy performance scheme in non-residential buildings.

Table 15. National alternative measures in the context of the EED Article 5 in the period 2021-2030 by (a) policy type and (b) policy theme/objective

(a) Policy type	
Regulatory	Austria, Belgium (Flanders), Cyprus, Germany, Denmark, Estonia, France, Netherlands, Poland, Slovakia
Economic	Croatia, Cyprus, Czechia, Denmark, Estonia, France Germany, Ireland, Slovakia
Information	Cyprus, Czechia, France, Germany, Croatia, Slovakia

(b) Policy theme/objective	
Overarching strategy, roadmap or target	France, Ireland, Netherlands
Mandatory renovations	Flanders (Belgium), France, Germany, Cyprus, Estonia
Promotion of energy services, ESCOs and energy performance contracts	Austria, Cyprus, Czechia, Germany, Slovakia
Energy management	Croatia, Slovakia

Source: JRC

With regards to information measures, several actions to promote energy services and energy performance contracting have been notified by Austria, Cyprus, Czechia, Germany and Slovakia. Germany plans to provide a platform for close cooperation in the field of energy performance contracting between Federal Government and federal state representatives. The project's aim is to eliminate obstacles to the implementation of energy performance contracting and to build regional capacities in this area. Measures to be implemented include annual plenary meetings and workshops, as well as a mentoring programme and exchanges of best practices. Within this framework, funding is also available for the concrete implementation of around 10-15 ambitious energy saving model contracting projects in prestigious properties in municipalities and at federal state level, with a view to exemplifying the potential of contracting and encouraging the establishment of a functioning energy saving contracting market in Germany. In Czechia, continued support for the use of the EPC method in

the public sector is foreseen. To this end, it is planned to remove EPC-related barriers for public bodies through training in the field of public procurement for complex services, the promotion of information centres of energy providers and the support of regional offices to promote the use of energy services. Other information-related measures include energy management in Croatia and Slovakia. Croatia plans to introduce energy management information systems (EMISs) in all public sector buildings, expand the whole system through integration of with other data bases and stipulate EMIS as a system for verifying real savings after building renovations. Slovakia also plans to support the deployment of energy management systems, environmental management and EMAS for public administrations and municipalities, including energy audits. It also plans to support the development of guaranteed energy services (GES) through a variety of actions including the creation of sample contracts, provision of technical assistance and combination of subsidy schemes with GES. Finally, France plans to release as open data the list and/or map of buildings belonging to the Government, including specifications of floor area and type of energy used for heating. All willing public bodies (local authorities, hospitals, etc.) could also be invited to join in this measure.

7 Conclusions and policy recommendations

The NECPs submitted under the Energy Union Governance regulation lay down the foundation of how EU Member States plan to meet the first phase of their transition towards climate neutrality in the period 2021–2030 across five areas: decarbonisation, energy efficiency, energy security, internal energy market, research and innovation and competitiveness. They aim to provide a clear signal of national ambitions on delivering climate neutrality in line with the European Green Deal and Europe's 2030 climate ambition.

Recognising the important role of energy efficiency, this report provided a detailed assessment of on various national targets and objectives of this dimension as well as related planned actions, policies and measures. The assessment of the final plans shows that the collective ambition amounts to a reduction of 29.6% for primary energy consumption and 29.4% for final energy consumption, which lags behind the existing 32.5% EU ambition. A comparison of the national contributions with the PRIMES baseline projections of each Member State has revealed that only 9 Member States are associated with an ambition of 32.5% or higher in terms of primary energy and 21 Member States in terms of final energy. Given the recent Commission proposal to raise the 2030 greenhouse gas emission reduction target to at least 55%, major additional efforts are needed to step up the EU energy efficiency target and national contributions of 2030.

The NECPs contain information on a plethora of policies and measures, with nearly 1400 identified policy and measures (PAMs) on energy efficiency. The assessment of the NECPs has identified a mixture of various types of policies and measures targeting all sectors of the economy from buildings to transport, and industry to energy supply. Intensified efforts in the transport and building sector have been identified, with several countries setting specific targets or milestones for these sectors. These may be set in the form of certain share of renovated buildings or energy savings in the case of buildings (stemming from the EPBD Article 2a requirements) and penetration of zero emission vehicles or certain modal shares in transport. While some of the presented measures are successful longstanding measures which have been in place for several years, new or updated policy measures in the area of financing, information, education, planning and regulations have been identified. Just over a third of all PAMs reported in the NECPs were specified as "planned", confirming the existence of several new efforts. Moreover only a third of the total PAMs were found to have a direct link with measures reported in the National Energy Efficiency Action Plans of 2017.

Important interactions between energy efficiency with other Energy Union dimensions were identified, with nearly half of the reported energy efficiency measures being associated with the decarbonisation dimension, reflecting the strong interaction between these 2 dimensions. Interactions with other dimensions were also found, but were shown to be of lesser importance. Many countries reported measures aimed at addressing energy poverty under the internal energy market dimension, and others reported the development of dedicated strategies or targets aimed to address energy poverty.

The assessment of the NECPs highlights important findings in the context of the implementation of the Energy Efficiency Directive and the Energy Performance Directive. A few countries notified their ambition to set indicative renovation milestones expressed as a share or number of buildings to be renovated or to meet a certain energy class, energy savings, CO_2 or GHG emission reduction, absolute energy consumption, and renovation rates. Due to the submission of NECPs preceding the submission deadline of the LTRSs, information in this area was generally limited, with over 200 national policies and measures in the context of the long term renovation strategies, either reported in Section 3.2.ii or in the voluntary PAM templates as an annex to the NECP. It should be noted that even though many measures target the building sector, not all building-related measures identified in the NECPs were directly associated with the long-term renovation strategies.

No major changes were identified in the implementation approach opted for the central government renovation requirement under EED Article 5 in 2021-2030 compared to the previous reporting period of 2014-2020. Countries opting for the alternative approach in the context of the EED Article 5 in the period 2021-2030 presented a mixture of regulatory, economic and information measures. These measures may support mandatory renovations, promote energy services or the use ESCOs and energy performance contracts in the public sector and stimulate the installation of energy management systems.

A few notable differences in the new implementation period 2021-2030 with respect to the preceding period of 2014-2020 were identified in the context of the EED Article 7. New obligation schemes have been recently set up or are planned to be set up in Croatia, Cyprus and Hungary, while others were ceased or ended. The policy mix adopted by countries with alternative measures in 2021-2030 is fairly diverse, as in the preceding period. All but 8 Member States reported the expected impact of the measures under Article 7 in energy savings and only 13 Member States have notified cumulative impact of measures to be sufficient to meet the EED Article 7 requirement. Several measures reported in the context of the EED Article 7 are covered also under the EED

Article 5 and EPBD 2a, pointing to potential overlaps between key provisions of the EU directives. Whilst this is not prohibited by the Directives, it narrows down the potential of each provision in stimulating new energy savings and lowers the overall ambition.

Overall, the plans followed a comparable structure covering all energy and climate dimensions. However, the ambition of each national policy framework against each national contribution towards the EU target was not possible to assess in a quantitative way for most countries. This is attributed to the fact that energy savings generated by each measure or group of measures are seldom quantified in the context of the overall contribution to the EU target under the EED Article 3. This, however, does not generally apply to the EED Article 7 requirement, where Member States are obliged to report how the various measures contribute concretely towards the energy savings requirement. In a few cases, the share of the savings to be achieved in 2030 by each sector was presented, demonstrating the ambition of each sector against the EED Article 3 ambition. Buildings, transport and the public sector seem to have a critical role in reaching the overall energy efficiency ambition. For a complete analysis of the sufficiency of PAMs against the planned overall ambition, it is necessary for future reporting requirements to include the quantification of the impact of PAMs towards the national contributions under the EED Article 3.

In several cases, clarification of the underlying assumptions including policies and measures in the calculation of WAM and WEM scenarios was necessary to provide a more complete picture. In the future, the NECPs could be more transparent at identifying the difference in the level of ambition of implementation of additional measures to attain the overall energy efficiency ambition under the WAM scenario compared to the energy consumption set in the WEM scenario. Moreover, many policies and measures were duly described, but often information on their estimated impacts in energy savings, timelines and wider benefits as well as underlying funding sources was missing. This could be addressed by improving the reporting platform through which Member States submit their plans and to create a mandatory framework for reporting policies and measures. Overall, the NECPs did not sufficiently aim at the identification of wider economic and societal benefits of energy efficiency measures, which remain to be addressed in a more rigorous way in the future.

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List of abbreviations and definitions

EED	Energy Efficiency Directive
EPBD	Energy Performance of Buildings Directive
FEC	Final Energy Consumption
LTRS	Long term renovation strategy
NECP	National Energy Climate Plan
NEEAP	National Energy Efficiency Action Plan
PAM	Policy and measure
PEC	Primary Energy Consumption
WAM	With Additional Measures
WEM	With Existing Measures

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Annexes

Annex 1. Energy Efficiency Elements of Mandatory template on NECPs outlined in Annex I of Regulation 2018/1999

2. NATIONAL OBJECTIVES AND TARGETS

2.2. Dimension energy efficiency

i. The elements set out in point (b) of Article 4

ii. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term renovation strategies for the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU

iii. Where applicable, other national objectives, including long-term targets or strategies and sectoral targets, and national objectives in areas such as energy efficiency in the transport sector and with regard to heating and cooling

3. POLICIES AND MEASURES

3.2. Dimension energy efficiency

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of a financial nature) to promote the energy performance of buildings, in particular with regard to the following:

i. Energy efficiency obligation schemes and alternative policy measures under Articles 7a and 7b and Article 20(6) of Directive 2012/27/EU and to be prepared in accordance with Annex III to this Regulation

ii. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private ([4]), including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU

iii. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models ([5])

iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2 (for example measures to promote the exemplary role of public buildings and energy-efficient public procurement, measures to promote energy audits and energy management systems ([6]), consumer information and training measures ([7]), and other measures to promote energy efficiency ([8]))

v. Where applicable, a description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures in points i, ii, iii and iv

vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure ([9])

vii. Regional cooperation in this area, where applicable

viii. Financing measures, including Union support and the use of Union funds, in the area at national level

SECTION B: ANALYTICAL BASIS (1)

4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES (2) (3)

4.1. Projected evolution of main exogenous factors influencing energy system and GHG emission developments

i. Macroeconomic forecasts (GDP and population growth)

ii. Sectoral changes expected to impact the energy system and GHG emissions

iii. Global energy trends, international fossil fuel prices, EU ETS carbon price

iv. Technology cost developments

4.3. Dimension Energy efficiency

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling (4)

iii. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2.(ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030) (5)

iv. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU

5. IMPACT ASSESSMENT OF PLANNED POLICIES AND MEASURES (3)

5.1. Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4).

i. Projections of the development of the energy system and GHG emissions and removals as well as, where relevant of emissions of air pollutants in accordance with Directive (EU) 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures.

ii. Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply

iii. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures

5.2. Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

5.3. Overview of investment needs

i. existing investment flows and forward investment assumptions with regard to the planned policies and measures

ii. sector or market risk factors or barriers in the national or regional context

iii. analysis of additional public finance support or resources to fill identified gaps identified under point ii

5.4. Impacts of planned policies and measures described in section 3 on other Member States and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

i. Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

ii. Impacts on energy prices, utilities and energy market integration

iii. Where relevant, impacts on regional cooperation

Annex 2. Country reports

Austria

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Austria plans to improve its primary energy intensity by 25-30% compared to the reference year 2015. This translates to primary ad final energy consumption of 30.8 Mtoe and 25.6 Mtoe by 2030, respectively. This is set as part of the general framework #mission2030 whose ultimate aim is to reach carbon neutrality by 2050. The WEM and WAM scenarios are clearly defined and comprehensive information provided, including the sources (Umwelbundesamt 2018 and 2019). In the framework of #mission2030, a set of other national targets apply:

— Reduction in GHG emissions of transport

— Reduction in GHG emissions of buildings

— Long-term phase-out of oil heaters

— Fossil-free mobility by 2050

— Objective that all new light vehicles be zero emission by 2030

— Objective to double refurbishment rate in 2021-2030

- *Contribution of PAMs and sectors*

The final NECP introduces a comprehensive set of PaMs in the buildings and transport sector, which remain however not clearly described in terms of impact, implementation and timeline. As the impact of measures is not quantified, a clear contribution towards the target cannot be established.

Part 2: Policies and measures

- *Building renovation strategy*

The NECP does not put forward building renovation milestones as these are expected to be outlined in the long-term renovation strategy due on 10 March 2020. A comprehensive set of PaMs in the building sector are established, but not quantified. Measures include:

— Definition of "thermal retrofit rate" as basis for aim to double refurbishment rate 2020-2030.

— Targeted financial support (investment grants, fiscal measures) for comprehensive renovations or for partial renovations if part of a step-wise renovation plan.

— Regulatory requirements such as conditional renovation requirements and price signals (under discussion)

— information and awareness raising activities, energy advice/consultancy, upgrading the quality of Energy Performance Certificates

— Phase out of oil-fired heating systems

— Qualification of architects and planners to support refurbishment measures at high qualitative level

- *Energy Efficiency Obligation Schemes*

The 2030 saving requirement amounts to 11.878 ktoe, which is slightly higher than in the draft NECP. The savings are achieved by a combination of EEO and alternative measures. Article 7 measures are not clearly identified in the NECP. As measures are not quantified, it is impossible to establish the contribution towards the 2030 requirement.

- *Central government renovations*

Austria has chosen the alternative approach to comply with the EED Article 5 requirements. It has set a total saving obligation of 48.2 GWh by 2020, now updated to 84.7 GWh by 2030 for federal government buildings. As key measure for achieving the target, the savings obligation under Section 16 (1) of the Federal Energy Efficiency Act (2014) for Federal buildings is mentioned.

- *Energy poverty measures*

Energy poverty is addressed only broadly in section 3.4.4. Key measures are:

— Public retrofit support based on social criteria

— Consideration of information and further financial support (not specified)

- *Funding of PaMs and required investments*

The NECP does not provide information on the required budgets for the PaMs. Investment needs and funding sources are addressed in general terms. In particular, the NECP specifies the investment needs for building retrofits: EUR 16.260 million for thermal insulation and EUR 8.730 million for heating system replacement until 2030.

Part 3: Key update and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP clearly addresses the missing elements of the WEM and WAM scenarios. The gaps regarding estimates on impact and budget of PaMs remain. In terms of PaMs, a considerable list of measures has been added, including:

— Replacement of oil boilers (total replacement at latest 2050, interim target for 2030)

— Greening of the standard consumption tax (NoVA)

— Greening of engine-related insurance tax

— Modal shift concerning public transport, cycling, walking

— Refurbishment requirements

— Qualification for architechts, craftsmen and planners

— Information campaigns

— Adopted housing law with removed barriers

- *Main updates in relation to 2020 timeline*

The NECP confirms the draft NECP's statement that the 2020 will be likely missed due to an upward trend as of 2015 (mostly due to transport). New post-NEEAP measures include measures targeting the building sector (Updated Housing law, Refubishment requirements, Qualification for architects, craftsmen and planners, Replacement of oil boilers with a total replacement at latest 2050 and an interim target for 2030 as well as several Information campaigns) A strong focus is placed on research and innovation in the field of energy efficiency with two Energy Research Initiatives, Pilot projects on “energy efficient city” and “energy efficient village”, the Climate and energy model regions (KEM) programme as well as the "Free Space for Energy" (Energie.Frei.raum) programme. Taxes and tariffs are to be adjusted to take into account energy efficiency considerations (Adaptation of network tariff structure; Greening of the standard consumption tax (NoVA) and the engine-related insurance tax) and programmes are set up to encourage Model Shifts (walking, cycling, public transport, carpooling). Especially SMEs benefit from a Support programme for energy management systems.

Belgium

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The national 2030 contribution is reported both in terms of absolute final and primary energy consumption, expressed as 42.7 Mtoe and 35.3 Mtoe, respectively. Compared to PRIMES 2007 baseline projections of 50.1 Mtoe (PEC) and 39.9 (FEC), the Belgian contribution leads to primary energy savings of 7.4 Mtoe PEC (15% compared to PRIMES) and 4.7 Mtoe FEC (12% compared to PRIMES projections. Wallonia and Flanders present contributions of individual sectors (this is missing for Brussels). A comprehensive set of further targets is given, as was already presented in the regional and federal draft NECPs.

Part 2: Policies and measures

- *Building renovation strategy*

A systematic presentation of building renovation strategies and targets/milestones is not covered. However, the NECP mentions a considerable number of building-related PAMs.

— At federal level, Action plans to achieve zero emissions federal public buildings and related budget is committed;

— Update of Energy Performance Contract (EPC)

— Premiums encouraging replacement of electric boilers by heat pump boilers

— Building renovation is to be stepped by a bundle of measures, comprising regulatory instruments (Tightening of buildings minimum energy performance (MEPs) in case of major renovations; Renovation obligation for rented class F and G buildings), a One-stop shop for building refurbishment, Renovation Roadmaps and Building Passports as well as several fiscal support schemes combined with information (Review of premium schemes to prioritise roofs retrofits of class F and G houses, Information and support programs and networks to incite building refurbishment, Incentive to renovate buildings upon sale).

— Request for an audit to access premiums for energy efficiency

— Modulation of property tax, registration, inheritance and donation rights based on building energy performances

- *Energy Efficiency Obligation Schemes*

The total cumulative energy saving requirement by 2030 is 185 TWh. This figure is provisional as energy balance figures for 2018 are still missing and will be updated. The NECP lists a comprehensive set of measures to reach the requirement. Each region has a contribution towards the overall requirement. However, the regional contributions fall short of reaching the overall requirement:

— Flanders 84,02 TWh (underpinned by measures)

— Wallonia 53,35 TWh (no measures mentioned)

— Brussels 8,75 TWh (no measures mentioned)

- *Central government renovations*

Flanders clearly states opting for the alternative approach; no clear information is given for Wallonia and Brussels. The contributions are not clearly identified and quantitative information per measure is missing; in turn, the ambition/contribution of measures cannot be assessed.

- *Energy poverty measures*

Energy poverty is addressed in terms of objectives (section 2.4.4) and several PaMs are put in place. Key measures are:

Federal level

— Social tariffs for electricity and gas

— Support fund for most vulnerable persons (fonds Gaz et electricité)

— Staged payment of bills

— Online tariff calculator available with regulator to choose cheapest tariff

Flanders:

— Planned use of smart meters to support energy savings

— Support fund starting 2020 for refurbishing (loans of 25.000 EUR for energy-poor home owners)

- *Funding of PaMs and required investments*

Budget information is given only for some PaMs, but not regularly throughout the description. Funding is only discussed at a very generic level. Investment needs are established for some measures (e.g. public sector exemplary role with refurbishing investment needs for SNCB/Infrabel or the Federal army), but largely missing.

Part 3: Key updates, and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

— Overall the level of ambition is in line with the draft NECP. The EED Article 7 objective is clarified and underpinned by measures for one region (Flanders). A comprehensive set of additional measures have been included in comparison with the draft NECP. These include fostering fuel switches through legislation (coal, heating oil and gas) and banning multi-family buildings to use individual gas boiler for heating, several fiscal incentives such as Premium for thermal retrofit measures, Energy loans (prêts energie), VAT tax reduction for demolishing and rebuilding in energy-efficient manner or the Roof replacement premium to replace asbestos roofs. One stop shops are to facilitate renovation activities and inform about regulatory measures such as the Flemish decree on renting which legislates the sharing of refurbishment costs between landlord and tenant. Climate Roundtables and an Expert Pool on refurbishment are to facilitate energy efficiency actions. Public sector activities cover refurbishment of public buildings (régie des bâtiments, SNCB & Infrabel, Army) and lay a focus on school renovation and dedicated initiatives (Klimaatscholen 2050, SURE 2050 and others). The industry sector is covered by Voluntary agreements on energy audits, mobility is addressed in the Plan Good Move.

Bulgaria

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Bulgaria plans to achieve a decrease in the consumption of primary energy by 27.89% and a decrease by 31.67% in final energy consumption in 2030 compared to the PRIMES 2007 reference scenario. These translate to primary and final energy consumption equivalent to 17.5 Mtoe and 10.3 Mtoe, respectively. The projections are based on (B)EST modelling software used for long-term assessment of energy needs and energy planning, taking into account both existing measures to reduce GHG emissions and a number of additional measures. The additional measures contribute to a significant change of Bulgaria's energy system and reduce greenhouse gas emissions.

- *Contribution of PAMs and sectors*

The measures are relevant but their impacts and energy savings are not quantified in detail. Key measures refer to meeting the requirements of the EED Article 7 and EPBD Article 2a. Whilst new measures are not clearly indicated, there is an adaptation or extension of existing measures. Clearly marked as new or stepped up measures include:

— Preparation and launch of a digital platform for the Bulgarian construction sector

— Energy efficiency obligation scheme and national mechanism for financing energy efficiency 2021-2030

— National Ambient Air Quality Improvement Programme (phase-out of solid heating fuels 2021-2024)

— The component Operational Programme 'Innovation and Competitiveness 2014- 2020' (OPIC) for industries was already implemented. The component for environment is new.

Part 2: Policies and measures

- *Building renovation strategy*

The NECP includes interim milestones, disaggregated by building type (residential, non-residential). The provisions of the Directive are to be transposed into a national law by 10 March 2020. The strategy will envisage measures for the construction of new buildings and the conversion of existing buildings into nearly zero-energy buildings, improvement of the energy characteristics of residential and non-residential buildings and promotion of the introduction of smart technologies in buildings. Existing measures for 2020 target will be extended beyond 2021.

- *Energy Efficiency Obligation Schemes*

The cumulative savings requirement in 2021-2030 under EED Article 7 are 4357 ktoe. The energy savings to be achieved during the period 2021-2030 have been calculated on the basis of the average annual final energy consumption for the period 2016-2018. Bulgaria has put in place both the Energy Efficiency Obligation scheme and alternative measures.

- *Central government renovations*

Bulgaria has set a more ambitious target for renovation of buildings owned and used by the central administration than the EU requirement. According in Article 23(1) of the ZEE, measures shall be taken on an annual basis to improve the energy performance of at least 5 % of the total gross floor area of all heated and cooled state-owned buildings used by the public administration. No further details are included with regards to the EED Article 5.

- *Energy poverty measures*

Bulgaria implemented a support scheme for persons who meet certain income-tested and property-based criteria for poverty, which grants heating allowances to eligible recipients via the social assistance system throughout the heating period. It is also notified that the policy for full electricity market liberalisation will include measures guaranteeing a smooth and gradual transition for household customers. Full electricity liberalisation is currently in progress and it will be accomplished once a mechanism for protection of vulnerable households is in place.

In the long term, measures to improve the energy efficiency of the homes of energy poor consumers and in order to lower their energy costs and improve their living comfort will be implemented. These include:

— adequate protection of people at risk of energy poverty through the provision of heating allowances;

— mechanism for the protection of vulnerable consumers following full liberalisation of electricity prices for final consumers, including households

— upgrade of multi-family residential buildings through renovations to energy class C

— set of priority to improve energy efficiency for the benefit of vulnerable clients, including households affected by energy poverty and, when appropriate, in buildings used for social housing in EED Article 7 measures

- *Funding of PaMs and required investments*

Whilst the NECP does not directly address this aspect, it lists financing resources and measures, including Union support and the use of Union funds at national level in section 3.2.viii:

1. Structural funds for the period 2021-2027: During the period covered by the next Multi-annual financial framework (2021-2027) Bulgaria intends to make use of EU Structural Funds as an instrument to finance energy efficiency measures. In connection with this, the following investment priorities have been determined: (1) support for improvement of the energy efficiency of public, industrial and residential buildings through complete renovation and (2) support for the implementation of measures to improve the energy efficiency of small and medium enterprises, large enterprises and the local authorities.

2. Invest EU Programme;

3. Modernisation Fund;

4. Energy Efficiency and Renewable Sources Fund

5. National Programme for Energy Efficiency of Multi-Family Residential Buildings;

6. National Trust Eco Fund – Investment Climate Programme;

7. Renewable energy, energy efficiency, energy security programmes financed by the European Economic Area Financial Mechanism 2014–2021

Part 3: Key updates, and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The most important changes regard the target, that in the NECP has been further described, and the targets and measures regarding EED Article 7 and EPBD Article 2a. Other minor changes and updates are identified, but some issues are still present in the final NECP.

- *Main updates in relation to 2020 timeline*

The 2030 target will be achieved with existing and additional measures.

— EED Article 7: an energy savings obligation scheme and new alternative measures are going to be established to ensure the achievement of the total cumulative target for energy savings in final consumption for the period 1 January 2021 – 31 December 2030.

— EPBD Article 2a: Bulgarian strategy envisage measures for the construction of new buildings and the conversion of existing buildings into nearly zero-energy buildings, improvement of the energy characteristics of residential and non-residential buildings and promotion of the introduction of smart technologies in buildings. Existing measures planned until 2020 will be extended beyond 2021. Savings and contribution to the achievement of the target for 2020 are reported for every measure (total energy savings: 1526.3 GWh per year).

— EED Article 5: the exemplary role of public building is taken into high consideration. However, details on gross floor percentage renovation are not provided, with the exception of the aim to reach a more ambitious yearly target of 5% of the total gross floor area for energy performance of buildings owned and used by public administration, as included in Article 23(1) of the ZEE.

Croatia

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Croatia has set its energy efficiency contribution to the 2030 EU target in absolute primary and final energy consumption. In particular, the final energy consumption should not exceed 286.91 PJ, and primary energy consumption should not be higher than 344.38 PJ. The WAM and WEM scenarios are built bottom-up using the Model for Analysis of Energy Demand (MAED), forecasting structural changes in the area of energy use in the sectors (industry, households, services, transport), which are necessary to achieve the climate change mitigation goals. The main assumptions of the scenario are increasing energy efficiency in all parts of the energy chain, applying the energy efficiency first principle, switching as many activities as possible to the use of electricity (where technologically feasible and long-term cost-effective), and increasing profitability of investing in RES technologies. The measures falling under WAM are specified in the NECP. The additional measures (i.e. the WAM scenario) lead to 4% lower final energy consumption and 5 % lower primary energy consumption compared to the scenario with existing measures only.

The NECP further envisages a significant reduction in transport energy consumption by 2050. The total energy consumption will be reduced by 25 % compared to 2016. The NECP expects that in 2050, electricity will account for 20% and liquid fuel for 35% in the structure of energy-generating products.

- *Contribution of PAMs and sectors*

The NECP quantifies the impact of measures falling under Art. 7 of the EED. The impact of other measures is not quantified.

The expected savings of additional measures are enough to meet the Art. 3 target. The target energy savings (calculated as a difference between WAM and WEM) are 10.8 PJ (257 ktoe) in 2030, whereas the additional measures are expected to deliver 11.4 PJ (272 ktoe) of energy savings. Reaching the target is, however, largely dependent on the successful implementation of the newly introduced energy efficiency obligation scheme. The EEOS will start to be implemented in 2021 and is expected to bring 50 % of all the energy savings under Art. 3 target, and 44 % of all quantified savings. The proper implementation of the EEOS will, therefore, largely influence the overall success in reaching the Art. 3 target.

The rest of the new (additional) measures are mostly linked to ESI funds in the new multiannual financial framework 2021 - 2027 (renovation of residential and public buildings, and renovation of public lighting), and revenues from emission allowances (renovation of single-family houses), aiming at 52 % of the quantified savings. In industry, otherwise relying mostly on the EU ETS, fiscal incentives to introduce energy management will be introduced. In transport, the main energy efficiency measures are the combination of financial incentives for energy-efficient vehicles and eco-driving. Information and education measures (informative billing) and green public procurement will continue to be implemented.

Part 2: Policies and measures

- *Building renovation strategy*

The long-term renovation strategy has been under preparation during the submission of the final NECP. The NECP, therefore, does not contain information on the LTRS targets and milestones. The report “Analyses and backgrounds for preparation of the Energy Strategy of the Republic of Croatia", which was prepared in November 2018, expects 8,630,863 m2 of renovated buildings in the period from 2021 to 2030. The area of renovated buildings per year corresponds to the annual rate of renovation of 1.6%, with a gradual increase from 1% in 2021 to 3% in 2030. From 2031 to 2040, the area of newly-built residential buildings will amount to 14,721,602 m2, with 9,022,863 m2 of renovated residential buildings.

The measures that are related to building renovation combine information activities and financial incentives. The nearly-zero energy standards in (new) and renovated buildings will be promoted through workshops, guidelines, and media campaigns. Financial programmes using ESI funds and the revenues from the EU ETS will support renovation in residential and public buildings. The measures are expected to bring 5.1 PJ (120 ktoe) of energy savings in 2030, i.e. 48 % of the overall target and 44 % of all quantified savings.

- *Energy Efficiency Obligation Schemes*

Croatia has chosen a combination of energy efficiency obligation scheme and alternative measures to fulfil the obligations under Art. 7 of the Energy Efficiency Directive. Based on the Eurostat method, the cumulative final

energy consumption savings obligation for the period 2021 – 2030 equals 54 PJ (1,290 ktoe). It corresponds to annual energy savings of 1 PJ (23.5 ktoe), assuming a steady 0.8% annual savings and policy measures spanning over the entire period. The target was calculated based on final energy consumption in the years 2015 – 2017. It excluded transport and opted for the maximum allowable target reduction of 35%, referring to the exceptions stated in Art. 7 (2) and 4(b) to (g) of the EED.

The energy efficiency obligation scheme for suppliers will be implemented since 2021. The alternative measures include the renovation programmes for residential and public buildings, the introduction of energy management in the public sector buildings, public lighting renovation. Even though marked new (additional), the measures are a continuation of the existing programmes in the new multi-annual financial framework 2021 – 2027. In addition, the promotion of sustainable transport and eco-driving is envisaged, and the information and financial support programme for reducing energy poverty are included in the notified measures. The EEOS and the notified measures are expected to bring 64 PJ of cumulative energy savings, whereas the target is 54 PJ. Notably, 50 % of the target savings are to be reached by EEOS (a new measure to be started in 2021). Therefore, the proper implementation of this single measure will largely influence the likelihood of achieving the Art. 7 target.

- *Central government renovations*

In the period 2014 – 2020, Croatia has opted for the alternative approach to requirements under Art. 5 of the EED. It has set the target of 0.00489 PJ per year in equivalent savings. The NECP states that this approach will be applied in the period until 2030. The final NECP does not provide enough information to assess the strategy for central government renovation.

Additional measures are aiming at the public sector buildings. They mainly entail support for the renovation of public buildings and heritage buildings specifically. Energy management system in the public sector will be introduced and applied in all public buildings. The position of energy manager in public institutions should be gradually introduced. The NECP also envisages promoting the ESCO models. Their combination with deep renovation should be supported. In addition, publicly available documentation should be prepared to explain and encourage energy contracting, examples from practice, and a sample contract. The system of monitoring, measurement, and verification of energy savings (through respective legislation) is to be updated.

- *Energy poverty measures*

The NECP plans to adopt and implement the programme for energy poverty alleviation. The programme will include capacity building through local info centres, establish a system of measuring and monitoring energy poverty indicators at the national level, and co-financing of energy efficiency measures in energy-poor households. The Long-term Renovation Strategy will provide measures to combat energy poverty through the energy renovation of buildings, as well as criteria for identifying vulnerable groups of citizens at risk of energy poverty. These measures will be further elaborated in the Programme of Energy Renovation of Multifamily Housing 2021-2030 and the Programme of Energy Renovation of Family Houses 2021-2030. The plan for the use of funds obtained from the sale of emission allowances through auctions also includes co-financing of measures to eliminate energy poverty.

- *Funding of PaMs and required investments*

The NECP estimates that in 2021 – 2030, the total investment need in the period 2021 – 2030 for the whole plan will be HRK 141.47 billion (ca EUR 19 billion), of which the building sector is expected to require roughly 36 % (HRK 51.3 billion). The investment costs that are estimated for the specific measures (about a third of all energy efficiency-related measures) amount to HRK 27.2 billion. The other sources of investment (i.e. co-financing, private sources) of financing are not clearly marked in the NECP.

The NECP estimates the planned budget for individual measures notified under Art. 7 EED. The following table summarizes the expected budgetary needs. For the rest of the measures, the funding sources are specified, but not quantified.

Table 16. Overview of planned budget and funding sources of various measures in Croatia

Measures	**Planned budget**	**Funding source**
Financial incentives for energy-efficient vehicles	HRK 2.4 billion	EPEEF (revenues from emission allowances) special vehicle fee and from the special environmental fee for the marketing of biofuels, ESI funds

Training for drivers of road vehicles for eco-driving	HRK 0.085 billion	EPEEF (revenues from emission allowances) special vehicle fee and from the special environmental fee for the marketing of biofuels, ESI funds
Promotion of boat transport using alternative fuels	HRK 0.018 billion	EPEEF (revenues from the sale of emission allowances), ACLMT tenders, ESI funds, and other sources
Energy renovation programme for multi-apartment buildings	HRK 7.8 billion	ESI funds (max 60 % of eligible costs) *Private sources*
Energy renovation programme for single-family houses	HRK 5.25 billion	EPEEF (Sale of emission allowances) – max 60 % of the eligible costs *Private sources*
Energy renovation programme for public sector buildings	HRK 8.75 billion	ESI funds, EPEEF *Other public sources*
Energy renovation programme for public lighting	HRK 2.88 billion	ESI funds *Other public sources*

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The overall ambition of the NECP remained unchanged; the long-term renovation strategy is to be updated and submitted in 2020. The role of the central government should be specified. The target for Art. 7 of the EED has been updated (lowered from 80 PJ to 54 PJ). It is not clear how the calculations changed, as the draft also aimed at a 35 % target reduction. The level of detail of individual measures has increased substantially, including yearly energy savings, managing bodies, funding sources, and general monitoring methods. Wider benefits have not been detailed, but the relevance to other dimensions described. Annex 2 describes the monitoring of savings on a general level. An energy efficiency target for transport was added.

- *Main updates in relation to 2020 timeline*

Both contributions for 2020 and 2030 are expressed in absolute energy consumption, in terms of both primary and final energy consumption. The 2030 contribution for both final and primary energy would imply a (rounded up) reduction of 4% against the baseline scenario given in the NECP.

The 2020 PEC value was set at 6 % above the PRIMES2007 baseline, and the FEC value was set 16 % below the PRIMES 2007 baseline. The 2030 contribution is set at 24 % below the PRIMES 2007 baseline both for primary and final energy consumption. The level of ambition has, therefore, seemingly increased, even though it is still below the overall 2030 target.

The NECP mainly newly introduces the EEOS scheme to be implemented from 2021. The other measures are mostly a continuation of the existing measures, which rely on ESI funds (and are expected to continue in 2021 – 2027) and the sale of emission allowances. It also builds on and expands fiscal measures in the transport sector, and continues the cross-cutting measures, such as informative billing and green public procurement. The NECP remains rather modest in encouraging energy efficiency in the industry (relying on EU ETS) and omits tertiary sector. Energy supply mostly aims at promotion of energy-efficient district heating and increasing efficiency of the transmission and distribution grid.

There is little information about Art. 5 and Art 2a. Art. 7 builds in the combination of EEOS and alternative measures.

Cyprus

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The Cypriot 2030 national contribution towards the EU target has been defined as absolute energy consumption of 2.0 Mtoe and 2.4 Mtoe in final and primary energy, respectively. These represent a percentage reduction of 8% (primary) and 6% (final) reduction compared to the WEM scenario projections for 2030. In comparison to the PRIMES projections, the NECP reports a reduction of 17%[11] and 13% for 2030.

The WEM and WAM projections have been calculated using the OSeMOSYS model, an optimisation energy system model. Under the WEM scenario, legislation and actions that are already in place are only considered, 37 of which focus on energy efficiency. Of the 54 planned and provisional measures listed under "With Additional Measures", a total of 10 measures focus on energy efficiency.

In terms of other national targets, the final NECP presents the national strategy for energy efficiency in the transport sector and national strategy for energy efficiency in the heating and cooling sectors. Each of these strategies describe a list of measures with no quantitative targets attached to them.

- *Contribution of PAMs and sectors*

The Cypriot NECP presents 37 adopted or implemented measures and 10 planned or provisional measures on energy efficiency. The list of planned /provisional measures includes the uptake of energy performance contracts in the public sector, measures in the defence and water sectors, green tax reforms for environmental taxes, tram infrastructure, floor space “allowance” for highly efficient new and renovated buildings, etc. In addition to the new focus on transport, tax-related measures also represent a new type of instrument considered by the Cypriot authorities. The contribution of PaMs is only given in the context of the EED Article 7 on energy efficiency obligations. For Article 3, this information is missing.

Part 2: Policies and measures

- *Building renovation strategies*

The Cypriot long term renovation strategy will be finalised by April 2020. The indicative milestones in the building sector are expressed as 56 ktoe of energy savings by 2030, 112 ktoe by 2040 and 163 ktoe by 2050. Given that the full list of measures to comply with the LTRS is not explicitly given in the NECP, it is not possible to review how the various PaMs will contribute towards these milestones. While the NECP includes energy savings for several building-related measures, these savings are estimated in view of Article 7 (in cumulative terms) and cannot be hence translated to contribution to the long-renovation target. Moreover, many of the measures concern multiple sectors and is therefore not possible to isolate the impact of the buildings sector.

- *Energy Efficiency Obligation Schemes*

The total cumulative savings requirement in 2021-2030 under Article 7 is 243.04 ktoe. Given that no official data from Eurostat is available for the national final energy consumption of the year 2018, the Cypriot NECP states that the national cumulative target of the period 2021-2030 will be recalculated and submitted to the Commission in the update of the NECP by 30 June 2023, pursuant to Article 14(1) of the Regulation. The total energy savings of the Article 7 PaMs reported in the final NECP are equal to 587.67 ktoe, thus far exceeding the Article 7 savings of 243.04 ktoe. Cyprus plans to achieve the Article 7 requirement through an energy efficiency obligation scheme (100 ktoe)as well as several alternative measures including soft loans for energy efficiency, excise tax on road transport fuels exceeding the minimum levels as required in Directive 2003/96/EC and energy consumption fee applied on electricity.

- *Central government renovations*

The same approach (i.e. alternative approach) will be followed for the period 2021 – 2030 to meet the central government renovation obligation. The annual energy saving obligation that has been recalculated based on the modifications of public building stock and is estimated to amount to annual savings of 1.31 GWh. The 2021 – 2030 obligation s to be fulfilled through the following measures:

[11] In reality this number corresponds to 13% if all decimal places are taken into account

— Deep renovations: Proposal to secure funds from European Cohesion and Development Funds, for the period 2021 – 2027

— Individual target measures: Measures identified as cost optimum as well as measures combined with maintenance works will be undertaken by the Department of Public Works and the Department of Electromechanical Services mainly funded by national funds.

— Behavioural measures: The Energy Saving Officer appointed in every public building is entitled to record energy consumption and promote energy efficiency mainly with soft measures. He/she plays a central role in change occupants' habits towards a more rational use of energy.

- *Energy poverty measures*

The Order (no. K.D.P. 289/2015) on energy poverty defines the categories of vulnerable customers of electricity and the measures to be taken to protect such customers. The following measures are taken in accordance with Order K.D.P. 289-2015:

Reduced prices on electricity tariffs (special electricity tariff 08) which is based on a Ministerial Decision (no. K.D.P. 286/2016).

Financial incentives for installing a net-metering Photovoltaic system.

Financial incentives for upgrading the energy efficiency of their houses.

Safeguarding the continuous supply of electricity, during critical periods, to those vulnerable consumers that uninterrupted power supply is essential for reasons related to their health.

- *Funding of PaMs and required investments*

Overall, major investments have been planned and scheduled in renewable energy, in the transformation of the network, the introduction of smart meters in power distribution, transmission networks, in importing and using natural gas for increasing energy efficiency in power generation, in the energy efficiency in households, businesses, public sector and water sector, in transport infrastructures and sustainable mobility as well as in technological research. For the Article 7 measures, a total investment of around EUR 800 million is reported, including private contributions. For the transport sector, the cost of implementing the action plan is estimated at EUR 1.4 billion and includes both capital and operational costs for the 2020-2030 period. The NECP also states that in addition to the sustainable transport investments of EUR 1.4 billion, about 400 million Euros for renovations in buildings and industrial plants will have to be funded from the government budget, or from EU funds. Despite these figures, cumulative additional investment needs in the period 2020-2030 to implement the PPM scenario is lower by 46 million in comparison to the WEM scenario.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP now includes more detailed information on the definition and explanation behind the rationale of WEM and WAM scenarios. The final NECP presents all main measures contributing to the WEM and WAM scenarios. New information is given also estimated investments needs and expected savings of measures contributing towards Article 7 target. Moreover, there has an increase in ambition of 7.7% for the PEC target and 9.1% for the FEC target previously set in the draft NECP (PEC: 2.6 and FEC: 2.2 under draft NECP). The NECP also presents milestones set for 2030, 2040 and 2050 as part of the long term renovation strategy.

- *Main updates in relation to 2020 timeline*

The 2030 national contribution represents a 17% (primary energy) reduction and 13% (final energy) reduction against PRIMES 2007 projections (even though without rounding up the primary energy reduction equals to 13%). In contrast, the 2020 national contribution (as revised in 2017) represents a 19% (primary energy) and 11% (final energy) reduction against the PRIMES 2007 projections for 2020[12]. Beyond the milestones set for 2030, 2040 and 2050 as part of the long term renovation strategy, no other major changes have been attained in terms of implementation updates in relation to EED Articles 5 & 7 and EPBD Article 2a.

[12] Based on the latest modelling results presented in the final NECP, the anticipated level of national primary energy consumption in 2020 is estimated to be about 2.5 Mtoe, instead of 2.2 Mtoe. The national NEEAP 2017 projection for final energy consumption of 1.9 Mtoe in 2020 can, however, be achieved.

Czechia

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Czechia has set its contribution in energy intensity (to GDP and GVA), which was then translated to primary and final energy consumption levels as shown in Table 17. The Ministry of Industry and Trade calculated the target (and underlying scenarios), using the PRIMES model. The calculations are based on information from the statistical office, and underlying assumptions on the developments in each sector (industry, transport, households and services). The baseline (WEM) scenario has not been explicitly described, but can be inferred from figures on the development of energy consumption in individual sectors. The NECP states that the energy efficiency scenario (WAM) represents the maximum potential for reducing energy consumption in individual sectors of the economy; on the border of final energy consumption that Czechia can realistically achieve. The potential reflects the effect of the planned strategies, policies and measures to be implemented by 2030. The 2030 contribution means a decrease of final energy consumption by 9.3 % compared to the BAU in 2030 (101 PJ).

Table 17. National 2030 indicative energy efficiency target for Czechia

Energy intensity (GDP)	Energy intensity (GVA)	Primary energy consumption	Final Energy Consumption
0.157 CZK/MJ	0.174 CZK/MJ	1,735 PJ	990 PJ

- *Contribution of PAMs and sectors*

The energy efficiency policies and measures represent a diverse portfolio of instruments covering all sectors. The main sectors are buildings, industry, public sector, and transport. Financial measures (grants and other financial instruments) are expected to contribute 40 % of the annual energy savings, voluntary agreements 24 %, fiscal measures with 20 %, and regulatory and information/behavioural measures with 16 %.

The impact is reported for measures to be notified under Article 7 of the EED. The contribution of the rest of the measures remains mostly unquantified. The methodology to calculate energy savings, including monitoring and verification system is well described and robust, and complies with the recommended methodology. The measures under Article 7 of the EED seem to be nearly level with the overall target (as quantified by the authors). The current estimates of impacts of individual measures under Article 7 amount to 94 PJ, which is enough to meet the Article 7 target (84 PJ), and just below the overall Article 3 target of roughly 101 PJ[13]. There are additional measures envisaged to be launched and notified, but currently without estimated savings under Article 7, and additional measures outside Article 7, without quantified impacts.

The impact of several measures notified under Article 7 may have to be evaluated with caution. Specifically, potential overlaps between fiscal measures and other programmes have to be carefully monitored. Savings from the voluntary scheme are currently estimated at the level of theoretical potential declared by the entities concerned and assume engagement of all major relevant market actors. Additionally, due to the foreseen late start of the Operational Programmes, the savings are expected to be generated from 2022 at the earliest.

Part 2: Policies and measures

- *Building renovation strategies*

Czechia has prepared an Updated Building Renovation Strategy in 2017. Given the new requirements for the Long-term Building Renovation Strategy under EPBD, the Strategy from 2017 no longer applies. In early 2019, a revision of the existing building renovation strategy was launched to meet all new requirements. However, as of October 2019, the update work was not completed. Therefore, the NECP does not contain the complete Long-term Building Renovation Strategy, but only partial, indicative outputs. The milestones will be added upon the approval and submission of the LTRS in March 2020.

The indicative outputs mainly depict two scenarios of the building renovation – business as usual, and realistic scenario. In the realistic scenario, the policies and measures contribute to a higher prevalence of deep renovations compared to BAU, leading to 6 PJ of additional savings compared to BAU (23 PJ compared to 29 PJ of savings), and cumulative investment needs of CZK 262 billion (instead of CZK 218 billion in BAU). The investment needs are all covered by funds and measures under Article 7.

[13] As calculated by the authors compared to BAU final energy consumption in 2030. It is not the official target of the Czech NECP.

The NECP does not envisage specific measures for implementing the Long-term Building Renovation Strategy. It indicates an overview of the possible measures for the decarbonisation of the building stock by 2030, which will be subject to discussions across the political spectrum and an assessment of the feasibility of their implementation.

- *Energy Efficiency Obligation Schemes*

Czechia has chosen the alternative scheme to fulfil the obligations under Article 7 of the Energy Efficiency Directive[14]. The yearly energy savings target was calculated based on average final energy consumption for three last-available consecutive years (2016 – 2018)[15], which leads to a requirement for 8.4 PJ of new yearly savings and total cumulative savings of 462 PJ in the period 2021 – 2030.

The current estimates of impacts of individual measures are enough to meet the target at the annual level (94 PJ estimated vs 84 PJ targeted), but not at cumulative level (368 PJ estimated vs 462 PJ targeted). There are additional measures envisaged to be launched and notified, but currently without estimated savings. Most measures under Article 7 are new and offer a more diverse portfolio of instruments, such as voluntary schemes, fiscal measures, and information measures. Roughly 75 % of estimated savings come from new measures, and 22 % from the continuation of existing operational programmes in the new financial framework. The rest are new savings from currently ongoing programmes.

- *Central government renovations*

Czechia has opted for the alternative implementation approach. Based on the Update of the reconstruction plan calculations, the obligation of annual energy savings was established at 12.4 TJ. However, the commitment under Article 5 is provisional and will be updated based on current data available in 2020.

There are measures envisioned to assist the public sector renovations (under Article 7). The NECP specifically highlights the promotion and facilitation of Energy Performance Contracting through, among others, removing the barriers for public institutions through education on public tenders on complex services, support of information centres and regional offices focusing on energy services.

The newly established Modernisation fund will also support public and state buildings. The currently running operational programmes (Environment) will continue in the new financial framework. Green Public Procurement for central government institutions is also new. The contributions, where quantified, do not specifically pertain to the central government.

- *Energy poverty measures*

Czechia does not currently have policies or measures specifically aimed at reducing energy poverty. This issue is primarily addressed by social policies, or in some cases by consumer protection policies. In 2015, a special working group on energy poverty was established within the National Action Plan for Smart Grids, which among others defined factors influencing energy poverty. A certified methodology will be finalised in 2020. It will help evaluate energy poverty and vulnerability of consumers.

- *Funding of PaMs and required investments*

In total, CZK 524,000 million (~EUR 20,500 million) of investment needs were identified for measures under Article 7, of which CZK 156,000 million (~EUR 6,118 million) is public support. That means that roughly 30 % of total investment needs will be covered through public support, and the rest from other public and private sources.

The main sources of public support funding are provided together with the quantified estimate. Most measures depend (at least partially) on the financing from European Structural and Investment Funds (ESIF), and EU ETS (main source of the financing for Modernisation Fund and Green Savings Programme). In the time of submitting the NECP, the negotiations about the level and structure of available funds for Czechia were still ongoing, and therefore bringing a certain degree of uncertainty as to the precise levels of funding sources for the policies and measures.

[14] The Draft NECP expected an introduction of the EEOs, and therefore lacked any substantial description of the measures. The Final NECP returned to alternative scheme and provided a detailed description of the notified measures, including a number of new and more diverse measures. The energy obligations scheme remained as an additional measure to be notified if deemed necessary.

[15] The year 2018 is a prediction. It will be specified in 2020 upon availability of data.

The remaining part of the investment (roughly 70 %) is covered by other national (public and private) sources, including state, regional, and municipal budgets, and most importantly the private sector (enterprises and households).

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The overall ambition of the NECP remained unchanged, the renovation strategy and central government role are to be updated and submitted in 2020. Compared to the draft NECP, the final NECP significantly improved in clearly describing policies and measures under Article 7. Upon submission of the draft NECP, Czechia was negotiating a launch of energy efficiency obligation scheme. The negotiations did not go through and, in the Final NECP, Czechia returned to the purely alternative scheme. Nonetheless, it added a component of a voluntary scheme for energy efficiency improvements. The stakeholders are energy distributors and retailers operating on the market for energy services in the electricity, gas and district heating sectors, and companies with significant energy consumption. This voluntary scheme is expected to contribute about 25 % of the new savings in 2021 – 2030. The energy efficiency obligation scheme remains one of the planned measures, which may be notified at a later stage if deemed necessary.

There are a set of new measures previewed under Article 7. Apart from the voluntary scheme, Czechia notified energy savings from fuel taxes, plans to launch the Modernisation Fund (financed from EU ETS), and establishment of government-supported information centres. Apart from the new measures, it builds on the continuation of various Operational programmes funded by European Structural and Investment Funds.

- *Main updates in relation to 2020 timeline*

The targeted primary energy consumption in 2030 is expected to decrease by 4.8 % compared to *estimated* 2020 consumption (from 1813.2 PJ to 1726.6 PJ). 2030 targeted final energy consumption is expected to decrease by 1.3 % compared to *estimated* 2020 consumption (from 1003.4 PJ to 990.1 PJ). The 2030 targeted final energy consumption is 7 % lower compared to the 2020 *target* (as set out in the Czech NEEAP)**.**

The NECP introduces new measures and schemes. It aims explicitly at substantially scaling-up voluntary agreements, which should contribute majorly to the overall energy savings, notifies on fiscal measures, and builds on support from ESIF and EU ETS, potentially stepping down from pure grant schemes towards a larger variety of financial instruments. The NECP further develops the support to guaranteed energy services (energy performance contracting) and plans to establish a network of regional information centres. Most measures in the transport sector are in the state of planning.

There is a much higher level of detail for measures notified under of Article 7, but little information for EED Article 5 and EPBD Art 2a (both to be submitted with the Long-Term Renovation Strategy). Many measures for EPBD Art 2a are expected to be covered by Article 7.

Denmark

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The indicative Danish contribution are based on the Danish Energy Agency's 2019 Energy and Climate Outlook published the 30th of August 2019. The indicative 2030 contribution, represented by the frozen policy scenario, correspond to 18.33 Mtoe in primary energy and 15.78 Mtoe in final energy. Consumption for non-energy purposes is not included. The data will be updated after the adoption of the forthcoming climate action plan.

Danish energy consumption is expected to increase slightly in the period 2021-2030 by app. 1 Mtoe in primary energy consumption and 0.5 Mtoe in final energy consumption. This is due to continuing economic growth and the construction of several datacentres. The effects of the existing measures as of May 2019 are included in the "with existing measures" greenhouse gas projection scenario, the so-called WEM-projection scenario. The methodological approach behind the national contribution is in line with the past. The measures included in the WEM and WAM scenarios have not been provided. No analysis has been made of the impacts of planned policies. Impact assessments of planned policies will be provided in progress reports.

In relation to GHG reduction, the new Climate Act (2019) aims at reducing Denmark's emissions of greenhouse gases by 70% in 2030, relative to 1990 levels.

- *Contribution of PAMs and sectors*

There are some new measures, some of which are subsidy schemes to fulfil the energy saving obligation (for which the contribution is indicated) (N36), funding for green transport (N29), HO-6 (new): Heat pumps as an energy service (N35). The list of PAMs is under the 3.1.1 (dimension of Decarbonisation) in the main text and the details and tables in Annex 8 are organised per sectors and not per dimension. It is not possible to give quantitative outcomes regarding the contribution of PAMs to the 2030 target. In particular, the quantification is given only for some measures, with a frequent reference to the combined effect of grouped measures. For the case where the impact is given, this is reported in kt CO2. On the contrary, the measures contributing to EED Article 7 are reported in detail, with reference to energy savings. However, the current measures fall short of reaching the energy saving obligations under Article 7 of Directive 2012/27/EU. This is reported to be in part due to the use of a frozen policy scenario with measures covering the period from 2021 to 2024.

Part 2: Policies and measures

- *Building renovation strategy*

There is no detailed information on the Danish building renovation strategy in the NECP. Denmark will submit its long-term renovation strategy separately, as soon as it is finished, but no later than the 10th of March 2020.

- *Energy Efficiency Obligation Schemes*

In the Energy Agreement of June 2018, it was agreed that the current Energy Savings Obligation scheme will end by 31 December 2020. The scheme will be replaced by competitive subsidy schemes related to private enterprises and buildings. Denmark will therefore fulfil the saving obligations under Article 7(1) in the EED by alternative policy measures (Article 7 b) from 2021-2030. The main measures to fulfil the saving obligation will be:

— A competitive subsidy scheme related to private enterprises: 300 million DKK per year in 2021-2024

— A competitive subsidy scheme related to buildings: 200 million DKK per year in 2021-2024

— Efficiency of existing buildings by other measures

— Subsidy scheme to replace oil burners with heat pumps in buildings outside the district heating and gas grids: DKK 20 million per year in 2021-2024

The current measures fall short of reaching the energy saving obligations under the EED Article 7. This is reported to be in part due to the use of a frozen policy scenario with measures covering a period from 2021 to 2024. The reported gap to be fulfilled is equivalent to 189.73 PJ of cumulative energy savings in 2021-2030.

Table 18. Article 7 measures and expected savings in Denmark

	Cumulative 2030 (PJ)	**Cumulative 2021-2030 (PJ)**
Subsidy scheme private enterprises	4,84	41,16
Subsidy scheme buildings	1,19	10,11
Efficiency of existing buildings by other measures	5,00	27,50
Subsidy scheme to replace oil burners with heat pumps in buildings	To be updated	To be updated
Danish target	48,8	268,5
Gap to be fulfilled	37,77	189,73

- *Central government renovations*

Denmark is currently implementing EED Article 5 in accordance with the alternative approach. Energy savings in accordance with the Article 5 requirements will be updated after the adoption of the climate action plans. The energy savings will be achieved through instruments, which are most cost effective in their particular circumstances, including deep renovations, behavioural measures etc. The Government is working on a plan for energy efficiency in government buildings in 2021- 2030, including a model for implementing the requirements in EED Article 5.

- *Energy poverty measures*

There is no reference to specific national objectives for the limitation of energy poverty. However, there are social policy instruments related to energy consumption. There are specific subsidies targeting energy efficiency, particularly in buildings. Low-income pensioners receive specific financial support for their heating bill.

- *Funding of PaMs and required investments*

Most of the initiatives and policies described in Denmark's integrated energy and climate plan, including all the measures in the Energy Agreement from June 2018, are funded through the state budget. There is a reference to the new energy labelling "Label2020" (2019-2022) which is funded by EU through Horizon2020. The final NECP now includes budget information for some economic/fiscal measures and gives an overview on the subsidy scheme allocation.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

While the methodological approach has not changed, the final NECP is based on the Danish Energy Agency's 2019 Energy and Climate Outlook published the 30th of August 2019 and includes initiatives in the most recent Energy Agreement of June 2018. The main change regards Article 7 of the EED. Starting from 2021 the scheme will be replaced by competitive subsidy schemes related to private enterprises and buildings. Other changes or updates are generally minor.

- *Main updates in relation to 2020 timeline*

The methodological approach is in line with the past approach. The measures included in the WEM and WAM scenarios are missing and no analysis has been made of the impacts of planned policies. Impact assessments of planned policies will be provided in progress reports. Moreover, the Danish energy consumption is expected to increase slightly in the period 2021-2030 by app. 1 Mtoe in primary energy consumption and 0.5 Mtoe in final energy consumption. This is due to continuing economic growth and the construction of several datacentres. Regarding EPBD Art 2a, a reference to the goal of reducing energy consumption in new buildings by 75% by 2020 relative to 2006 was made. Currently, there are no detailed information on the building renovation strategy, which will be released in spring 2020.

Estonia

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Estonia 2030 national contribution towards the EU target in terms of absolute primary and final energy consumption is forecasted to be ≤230 PJ for primary and 120 PJ for final energy. The plan also indicates a cumulative final energy saving target to be achieved over the period (2021-2030) of 14,422 GWh. The WEM projection scenario for primary and final energy consumption has been described in the NECP but can be further improved while the WAM projection scenario is missing.

Estonia also sets the following additional national targets, in the energy supply sector: a 2030 target for electric power of the cogeneration stations linked to the additional district heating network built over the period 2020-2030; reducing heat loss of the district heating network by 2030. In the transport sector: limiting the increase of demand in the use of passenger cars to ≤5% in 2030 compared to 2010 and decreasing fuel consumption of the transport fleet in 2030 in a way that it will not exceed the level of 2012.

- *Contribution of PAMs and sectors*

The final NECP includes a few new measures but almost all of them are a continuation of existing ones. The energy savings contribution of measures towards the 2030 target is not reported in the final NECP therefore it is unclear whether the policies and measures highlighted in the plan will be enough to meet the required 2030 target.

Part 2: Policies and measures

- *Building renovation strategies*

Estonia should submit a long-term renovation strategy with an overview of the building stock in 2020 and indicative targets for the years 2030, 2040 and 2050 by 10 March 2020. The final version of NECP only provides a table with the share of indicative renovation target for three different types of building and energy performance indicator. Among all the PAMs described, the plan highlights measures such as the renovation of public and commercial buildings, private residences and apartment buildings, which are directly linked to the building renovation strategy.

- *Energy Efficiency Obligation Scheme*

The total cumulative energy savings requirement in 2021-2030 declared in the NECP is 14667 GWh. The main alternative measures put in place by Estonia to meet the 2030 requirement are the following: reconstruction of private residences, apartment buildings, public sector and business buildings, increasing the fuel efficiency of the transport sector; promoting sustainable driving; spatial and land use measures in cities to increase the fuel-efficiency of transport and enhancement of the transportation system, developing a convenient and modern public transport, establishing road charges for heavy duty vehicles and planning the development of a railway infrastructure (incl. construction of Rail Baltic). Since no energy savings are quantified for the above measures, it is not possible to forecast whether their contribution will be enough to reach the 2030 requirement.

- *Central government renovations*

In order to meet the requirements of Art. 5 EED, Estonia continues to adopt the default approach. The NECP provides the total area to be renovated by 2030 which equals to 170,000 m2. Two main measures are expected to contribute to the 2030 requirement: reconstruction of public and commercial buildings and setting minimum requirements for nearly zero-energy buildings. Without quantifying the energy savings contribution, it is not possible to state whether these measures will be sufficient to reach the 2030 target.

- *Energy poverty measures*

Energy poverty is addressed by Estonia. Three energy efficiency policies and measures in building are foreseen to tackle energy poverty. A housing benefit for low income households to support the living conditions and to help paying the energy bills. A residential home reconstruction grant supporting the energy efficiency improvements of apartment houses to ensure energy savings. An investment aid to develop the local government building stock, improving the opportunities for socio-economically disadvantaged people to rent dwellings (that otherwise are unable to acquire or rent from the market).

- *Funding of PaMs and required investments*

The PAMs included in the NECP do not report information about the budget planned but a detailed section related to the investment needs is included in the plan. This section provides the cost demand of the public sector needed for implementing the NECP 2030 measures in each sector. For the 2021-2030 period, the NECP forecasts approx. €226 million per year to implement the PAMs in the following sectors: reconstruction of BUILDING stock (€1.046 billion), ENERGY (€347 million), TRANSPORT (€589 million), AGRICULTURE (€278.5 million). The plan also mentions that investments from the private sector and non-profit sector are additionally expected. In terms of funding, Estonia has directed approx. 796.1 million euros of structural and investment fund supports, including the promotion of energy efficiency, sustainable transport and energy and resource efficiency of companies for application of the measures that contribute to the targets of the climate and energy policy during the period 2014-2020.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP has only partially addressed the missing elements identified in the draft NECP and only minor improvements have been made. Estonia should better describe the underlying methodology used to calculate the national indicative 2030 energy efficiency target and define the baseline year used and the % reduction in relation to the baseline. Moreover, the WAM projections for 2030 have not been reported in the plan and most importantly, the energy savings contribution of all the measures towards the 2030 target is still missing.

No improvements have been made in terms of 2030 target ambition compared to the draft NECP. The description of PAMs included in Annex IV is structured but can be further improved by adding a higher level of details for each measure such as: quantitative objective, expected impact, planned budget and including the implementation period (start/end date) for all PAMs. Regarding other important Directive articles, no improvements have been made on the level of information provided in relation to how Estonia is addressing the provisions of Art. 5 Art. 7 and Art. 2a EPBD which do need to be addressed with further details.

- *Main updates in relation to 2020 timeline*

In the last NEEAP Estonia set an indicative national energy efficiency target for 2020 equals to 272 PJ for primary energy consumption and 137 PJ for final energy consumption, while in relation to the 2030 target according to the final NECP, the forecasted 2030 primary energy consumption in Estonia will be 230 PJ and 120PJ for final energy consumption. Therefore, compared to the 2020 target, the primary energy consumption target represents 18% less than 2020 target hence, considering other economic factors, the overall 2030 target contribution compared to the 2020 target seems ambitious.

Finland

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The overall 2030 national contribution towards the EU target is expected to be 405 TWh in terms of absolute primary energy consumption and 290 TWh in terms of absolute final energy consumption. The NECP describes the WAM and WEM scenarios and reports the primary and final energy consumption projections over the period 2018-2030, with the percentage reduction between WAM and WEM scenario being equivalent to 2% in primary energy and 1% in final energy. In addition to the targets in line with EU directives and regulations, Finland has set a very ambitious target to become carbon neutral by 2035. At sector specific level, Finland will aim to bring the number of electricity-powered cars to at least 250,000 and the number of gas-powered cars to 50,000 by 2030.

- *Contribution of PAMs and sectors*

A summary of the energy efficiency measures and their expected energy savings is reported in the final NECP. The PAM template provided as an Annex to the NECP includes the impact (savings or CO2 eq emission reduction) only for a few measures and not all the measures have energy efficiency as the main scope. It is unclear whether the expected energy savings contribution of the EE measures reported in Table 8 of the NECP, will be enough to meet the overall savings in part due to the missing underlying methodology.

Some new measures such as Waste heat, Energy Efficiency improvements of light and heavy duty vehicles, energy efficiency in agriculture, have been included. Only a few measures reported in the PAM template are associated with quantified energy savings/emission reduction.

Table 19. Energy efficiency actions and their contributions by 2030 in Finland

Energy Efficiency Measures	Savings 2030GWh/y
Energy Efficiency Agreements	25,770
Energy Efficiency Agreements / Customer Advice Services	83
Energy Efficiency Agreements Increasing the coverage	1,095
Energy Efficiency Agreements: Improved reporting	1,078
Energy Audit Programme	1,420
Energy Audit Programme: Increasing volumes	1,817
Waste heat project	1,600
Energy efficiency measures in agriculture sector	3,889
Energy efficiency measures in agriculture sector: farming land arrangement	278
Energy efficiency investments of farms	99
EU binding CO_2 thresholds: Cars	8,671
EU binding CO_2 thresholds: Light-duty vehicles	285
EU binding CO_2 thresholds: Heavy-duty vehicles	604
Campaign of wrecking old cars (2015 and 2018)	35
State aid for full electrical vehicles (until 2021)	0.1
Fuel tax for cars	1,236
Mass and measure modifications in truck transport	20
Implementation of eco-design directive	7,075
Heat pumps for detached and terraced houses	11,956
Building code, energy efficiency in new buildings	9,337
Building code, energy efficiency in renovation	3,810
Total	80,159

Part 2: Policies and measures

- *Building renovation strategy*

Finland is in the course of establishing a long-term renovation strategy with an overview of the building stock in 2020 and indicative targets for the years 2030, 2040 and 2050. The draft description of the strategy reported in the final NECP includes a summary of the 2020 building stock description as well as preliminary targets for

2030, 2040 and 2050 for heating consumption in buildings including the percentage of energy savings compared to the baseline year 2020. The heating consumption targets in buildings are set up as follow: 65 TWh in 2020, 54 TWh and 16% energy savings for 2030, 45 TWh and 30% energy savings for 2040 and 37 TWh and 42% energy savings for 2050. The NECP does not provide a description of PAMs that will achieve these targets but suggests that these reductions will be due to energy efficiency improvements and maintenance including building renovations, automation practices, changes in the heating sources (removal of oil fired heating boilers and installations of heat pumps, decarbonisation of centralised energy production (district heating and electricity).

- *Energy Efficiency Obligation Schemes*

The total cumulative savings requirement under the EED Article 7 in 2021-2030 is 105 TWh. The main alternative measures put in place by Finland to meet the 2030 requirement are the following: Energy Efficiency Agreements, Heat pumps for detached and terraced houses, Transport fuel taxation/car traffic, Energy audit Programme - SME and municipalities, Energy efficiency measure in the Agriculture sector, Energy efficiency agreements Customer advice services, Mass and measure modification in truck transport. The contribution of the above measures will be 153.06 TWh expected cum. energy savings for the period 2021-2030.

- *Central government renovations*

Finland continues to adopt the alternative approach, the amount of energy savings to be reached by 2030 is 17312 MWh and the methodology for calculating the energy savings delivered in line with the 3% renovation rate, remain unchanged. However, the NECP does not describe the measures put in place to achieve the 2030 requirement therefore it is not possible to evaluate whether the contribution of these measures will be enough to reach the 2030 target.

- *Energy poverty measures*

Energy poverty has been covered by the NECP but in Finland, the issue seems to affect a small proportion of households. Although the number of affected households is relatively small, the Government offers an aid to mitigate energy poverty through subsidies that reduce housing expenditures.

- *Funding of PaMs and required investments*

The PAMs included in the template do not report information about the planned budget. This may be due to the structure of R&D&I programs where funding cannot be given for 2030 or beyond since the Government planning consists of one year of budget plan and four-year action and implementation. Nevertheless, budgetary information has been disclosed in the NECP for some Energy Efficiency measures. In the Transport sector, EUR 3 million per year is reserved for the 2018-2021 period, to promote electric vehicles infrastructure and the use of biogas. A total, EUR 1.5 million has been earmarked to promote the infrastructure for EV in the residential sector. The Government has also reserved a budget equivalent to EUR 6 million p/y to incentivize the purchase of EV and/or gas or ethanol conversion in the 2018-2021 period and EUR 41 million for planning and extending walking and cycling areas. For energy efficiency investments, a budget of EUR 30-40 million is expected to be earmarked for the Energy Aid Scheme and EUR 90 million has been planned for the phase out of the use of coal in energy production. For R&D&I the Government has also allocated 100 million for investments in renewable energy and new technologies. A table summarizing the environmentally harmful energy subsidies 2018-2020 is reported below.

Regarding investment needs, the NECP does not include exhaustive details on the funding sources for energy efficiency. Nonetheless concerning the ban of coal in the city of Helsinki and Vaasa, EUR 34 million have been forecasted. The investment cost for the installation of renewable electricity production (wind power) is estimated to be EUR 600-750 million. Furthermore, for the centralized data exchange solution, there will be approx. EUR 36 million. For the production of biofuels, the cost of investing 400 ktoe in production capacity would be EUR 1300 million by 2030. Concerning the Energy Efficiency Dimension, the estimated investment for building public transport infrastructure for EVs would be EUR 413 million by 2030.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP only partially address the missing elements identified in the draft NECP. The underlying methodology used to calculate the national indicative 2030 EE target and clearly must be clearly explained including the baseline year used. In addition, the underlying methodology to calculate the energy savings

contribution for each measure should be reported in detail together with the funding sources and the implementation period.

Minor improvements have been made in terms of 2030 target ambition. The PAMs template was submitted and although can be further improved it provides a higher level of details compared to the Draft NECP. With regard to other important Directive articles, minor improvements have been made on the level information provided for Articles 5 and 7.

- *Main updates in relation to 2020 timeline*

The overall 2030 target contribution compared to 2020 in primary and final energy consumption is more ambitious. Finland has increased its ambition by decreasing the final energy consumption target from 305 TWh in 2020 to 290 TWh in 2030. Within the Energy Efficiency Dimension, some new PAMs have been introduced after the NEEAPs. These new measures include a more efficient use of waste heat and the overall efficiency of energy production within the scope of Voluntary Energy Efficiency Agreement and improving energy efficiency of vehicles, the transport system (enhanced measures) as well as Energy Efficiency activities on organic soils in the agricultural sector.

In relation to the EED Articles 5 & 7 and EPBD Article 2a, the main implementation updates are: for Art. 5 the achievement of 13240 MWh energy savings attained with the measures implemented in 2014-2017 compared to the central government energy saving target of 8225 MWh (2014-2020). For Article 7, the achievement of expected cumulative energy savings target of 49 TWh-cum (2014-2020) claiming 92.7 TWh-cum at the end of 2020.

France

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

France has set a clear national contribution expressed in terms of both primary and final reduction of absolute consumption of 202.2 Mtoe PEC and 120.9 Mtoe FEC. Against the national PRIMES 2007 baseline, this implies a reduction of -32.6% (PEC) and -24.2% (FEC). In comparison to the 2020 timeline, the 2030 contributions will again reduce absolute consumption (FEC by 13.8 Mtoe; PEC by 14.9 Mtoe[16]). These are derived from the WAM scenario.

The national 2015 Energy Transition for Green Growth Act and the 2019 Energy and Climate Act set a comprehensive set of sectorial targets for the years 2023 and 2028:

— Decrease in final energy consumption by 7 % in 2023 (compared to 2012), 20 % in 2030 and 50 % in 2050

— Reducing fossil energy primary energy consumption by 40 % in 2030 (compared to 2012) by setting that target by fossil energy on the basis of the greenhouse gas emission factor

— Reduction of final energy consumption in buildings, transport, industry and agriculture

— Reduction of primary energy consumption of fossil energy

- *Contribution of PAMs and sectors*

The NECP reports a comprehensive bundle of new measures, however without providing impact quantifications. The new measures include an updated EEO scheme, carbon pricing (including proposing a floor price for carbon harmonised at European level), phase-out and ban of coal-fired power plants, ban of oil-based power generation, building renovation plan, task force for school renovation and financing tool for building renovation with regional authorities. In addition, there are plans to ban use of oil boilers in government buildings, create an open data list of public buildings and city renovation plans finalise/apply new environmental regulations in buildings as well as set minimum building efficiency obligations. Others include measures to move away from coal heating, grant for buying less emitting vehicles (including electric vehicles and hybrids), sales ban for new vehicles emitting GHG gases (starting in 2040) and financial mechanisms to increase attractiveness of low emission vehicles.

Part 2: Policies and measures

- *Building renovation strategy*

A draft version of the LTRS is annexed to the NECP. It confirms the national renovation objectives for 2030 (-40% FEC consumption), 2040 (-50%) and 2050 (-60%). The NECP reports overall 15 measures to support the building renovation strategy, however without quantifying their impacts.

- *Energy Efficiency Obligation Schemes*

The 2030 energy savings requirement is 731 TWh or 1143.1 ktoe. Central measure to achieve the requirement is the updated EEO scheme, which is comprehensively described in the NECP. It is designed by definition to reach the 2030 requirement.

- *Central government renovations*

France has opted for the alternative approach. An annexed document gives further clarifications on the underlying calculations, which are largely based on estimates. The 2030 requirement amounts to savings of 7200 GWh by 2030 (619,088 ktoe). Measures to reach this requirement include the energy efficiency obligation scheme, financing tool for building renovation with regional authorities, ban use of oil boilers in government buildings, open data list of public buildings and city renovation plans.

- *Energy poverty measures*

The NECP reports a comprehensive package to address every poverty. There are plans to make the tax credit for the energy transition (CITE), and the successor premium, more effective via:

[16] Information given in draft NECP, which has not been retained for the final NECP

— a new flat rate in 2020, taking into account the energy efficiency of the actions;

— its disbursement by ANAH at the time of the works. The rate of aid will be subsidised for households with the lowest income, so that public aid is a real trigger for work to recover energy poverty;

— its enlargement to landlords/landlords in 2021, and the simplification of its call for joint work under joint ownership.

It is also planned to promote the recently simplified ecoPTZ which can now be applied to the flat-rate for individual works (for example: installation of a central heating heater powered by renewable energy, without a work package) and to co-finance an energy audit for households with low income owners of thermal amenities (performance diagnostics F or G) via ISCED and the SARE. The NECP mentions plans to deploy innovative solutions to industrialise renovation solutions with a scale effect as well as to mobilise energy saving certificates for the benefit of low-income households, both for reducing the consumption of buildings (strengthening and extending the boost of energy saving) and for mobility (support for car-pooling, developing cycling as a substitute for heating vehicles, dealing with the mobility needs of households in precarious situations). To strengthen the premium for the conversion of old vehicles for small households, France has increased its objective of replacing old vehicles, from 500 000 to 1 000 000 over the five-year period, with a double premium for very small households (as well as the large tax-free households), while working on loans which are of interest to finance the balance to be paid. Finally, actions to increase the supply of public transport, carpooling and, more generally, alternatives to the individual use of the car throughout the territory as soon as possible, target the most vulnerable groups.

- *Funding of PaMs and required investments*

Section 3.2.4 (pp. 121) of the NECP discusses budgetary issues. However, the numbers given there only relate to past expenses not planned budget or funding sources.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

— The figures for the overall target in terms of PEC and FEC have been adapted, but not in a significant manner.

— Some PAMs have been replaced with more precise policies. The overall focus on the buildings and transport sectors remains.

— Further clarifications and information have been given on articles 2a EPBD and 5 EED, but still some information is missing.

— The PaM impacts are not quantified with the exception of the updated EEO scheme.

- *Main updates in relation to 2020 timeline*

— 2030 target: Absolute consumption reduction is reported in relation to national PRIMES 2007 projections: -32.6% for PEC and -% for FEC. This ambition is line with the -32.5% EU objective. In contrast, the 2020 objectives were also formulated in both primary and final energy, but in TWh rather than Mtoe (""1528 TWh d'énergie finale (131,4 Mtep) et 2557 TWh (219,9 Mtep)"")

— Related to 2020 objective, the 2030 objectives will again reduce absolute conumption (FEC by 13,8 Mtoe; PEC by 14,9 Mtoe - information given in draft NECP)"

— Regarding Article 7 EED, France sticks to the present strategy of using an (updated) EEO scheme to achieve the required savings.

— For both Articles 5 and EPBD Article 2a, the national climate and energy strategy defines the framework for implementation.

Germany

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The NECP sets a reduction target of PEC of -30% against 2008 values. This implies savings in the amount of PEC 240 Mtoe, PEC-NEU 216 Mtoe and 185 Mtoe FEC. The difference between WEM and WAM scenario is 9.10% PEC and 7.23% FEC. When applying the figures for 2030 and 2008 presented in the NECP, this leads to a reduction of only 28%. Overall there is clarity on the definition of the WAM and WEM scenarios.

In terms of other national targets, a reduction of final energy consumption in transport by 10% by 2020 and 40% by 2050 compared to 2005 is foreseen. The objective of a climate-neutral building stock by 2050 which was put in the draft NECP is not retained in the final NECP. However, it is included in the long-term climate and energy strategies, notified as PaMs.

- *Contribution of PAMs and sectors*

The NECP does not report the expected PaM contribution towards the 2030 target, however 51 additional PaMs in comparison to the draft NECP are included. Many of them are new and have been put in place under the German Climate Plan as of end-2019. Many of these additional measures are updates of existing schemes.

The impact of measures is not quantified, with the exception of PaM counting into Article 7 EED.

Part 2: Policies and measures

- *Building renovation strategy*

The renovation milestone of reducing the present non-renewable PEC of 4400 PJ (2008) to 2000 PJ is presented for 2030. According to the NECP, the German government intends to qualify further milestones for 2040 and 2050 only in a qualitative manner in the outstanding LTRS. However, the wording on this is not fully clear, referring to missing national and European framing.

The NECP lists a comprehensive set of measures addressing building renovation. Largely these comprise fiscal support (subsidies and grants and newly introduced tax incentives), information and support by ESCOs. The impact for the measures is not quantified. These measures are:

— An overspanning Energy Efficiency Strategy for Buildings (ESG)

— Stepped up building standards for existing buildings in the new Buildings Energy Act (GEG)

— A large span of fiscal support programmes for building renovation of private and public sector (covering overall refurbishment (KfW), components such as use of renewable energies (Market Incentives Programme MAP, and supporting heating optimisation as well as grants for the replacement of oil boilers.

— Complementary measures such as Energy consultancy for non-residential buildings of local/non-profit organisations or National heating label for heating systems.

— Urban energy renovation

— Expansion of support programmes for heat networks, heat storage and cross-cutting building investments

— Building Research Initiative Efficiency House Plus, Energy transition constructions ("Energiewendebauen")

— Urban development support (StBauF)

- *Energy Efficiency Obligation Schemes*

The 2030 savings requirement is 3 996.5 PJ or 95.46 Mtoe FEC. The requirement is to be reached by a set of alternative measures. Savings impacts are qualified as gross savings and net savings, the latter deducting rebounds, windfall savings and overlaps between measures. The NECP sums up the net savings as contribution towards the saving requirement. The net savings amount to 3371 PJ and as such are not enough to reach the requirement. The NECP presents a very comprehensive list of policy measures that cover all sectors and will be further developed in a 2050 Energy Efficiency Strategy. Notably, Carbon pricing for the heating and mobility sectors will be introduced. In the built environment, regulatory measures are consolidated and stepped up in the new Building Energy Law (GEG), and subsidy schemes are either stepped up or introduced, i.e. to promote mass roll-out of renovations. A second focus is laid on the mobility sector with a broad package of measures addressing various modes of transport (Environmental bonus Promotion of electromobility, Funding guidelines

for the purchase of electric buses for public transport, Support for electricity-based fuels (green fuels), HGV toll, Making rail travel cheaper). In addition, a package of measure addresses stepping up the market for energy services Energy consultancy services for private households and SMEs, Power-saving check-up, SME Initiative Energy Transition and Climate Action (MIE), or the Promotion of Energy Management- Systems

- *Central government renovations*

Information on article 5 EED is overall missing. The NECP lists the following PaMs addressing central (and other) government renovations:

— Federal buildings - exemplary role of public buildings

— Federal Government/Länder dialogue contracting

— Model projects contracting

— Information on standard contracts and guidelines

— Municipal energy efficiency and resource efficiency networks

— Energy-efficient procurement by public institutions

- *Energy poverty measures*

Energy poverty is largely addressed in section 2.4.4 of the NECP. In general, the measures taken are part of social aid support and energy market regulation (prohibiting suppliers to directly cut off customers for non-paid bills). A dedicated measures described is the energy check-up for energy poor households, i.e. dedicated advice on how to save energy in everyday live.

- *Funding of PaMs and required investments*

Funding of PaMs and required investments are only addressed in a very secondary manner, with no information given on the necessary investments. Overall funding source will be the federal government's budget.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The 2030 objective is clearly set, even though the numbers provided do not add up to the proposed -30% PEC. WEM and WAM scenarios are clearly presented. In addition, the list of PaMs has been considerably enriched, leading to a total of 89 national measures. Saving impacts, implementation periods and potential overlaps are however missing. In many cases, it is difficult to establish if the measures are updates of existing measures.

- *Main updates in relation to 2020 timeline*

The ambition against the 2020 target has clearly increased. In comparison to the 2030 PRIMES 2007 figures for Germany, the objective would lead to 27% reduction (GIC - NEU). The EED Article 7 is comprehensively addressed; a clear saving requirement is set, PaMs have been identified and quantified. However, the gap between expected savings and saving requirement is not addressed. Information of public sector renovation (EED Article 5) is overall missing and information on the EPBD Article 2a is very limited. Only a milestone for 2030 has been set.

A comprehensive set of measures have been directly mentioned in the NECP. It should be noted that many of these measures seem to be updates or tightening of existing PaMs or are in principal taken to reduce GHG (transport measures).

Greece

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Greece has set a contribution to the 2030 EU target equivalent to final energy consumption of 16.5 Mtoe in 2030 (without taking into account the contribution of ambient heat) and primary energy consumption of 21 Mtoe. Against the PRIMES2007 scenario, this is equivalent to energy consumption reduction of 38% in final energy and 43% in primary energy. The WEM and WAM scenarios have been clearly defined in the Greek NECP, with the calculated percentage reductions between WAM and WEM scenarios in 2030 corresponding to 7% for primary energy and 6% for final energy. Other national targets include the reduction of the energy poverty indicators by at least 50% by 2025 and by 75% in 2030 in comparison to the average 2016 values. In addition, the renovation of the 12-15% of the total housing stock in the period 2021-2030 is envisaged as well as the achievement of a share of up to 30 % of electric passenger cars by 2030.

- *Contribution of PAMs and sectors*

The expected impact of PaMs is reported in terms of annual energy savings for almost all the measures. In terms of cumulative energy savings for the period 2020-2030, savings for the measures defined under the EED Article 7 are given only. The calculation methodologies are described only for measures under Article 7. The measures defined under Article 7 should achieve a final energy saving of 7298.7 ktoe of cumulative savings in 2021-2030, and are thus sufficient to meet the target of 7299 ktoe. The measures under Article 3 have a total expected impact of 1912 ktoe, which is well above the Article 3 target savings of 1092 ktoe (calculated as the difference between WEM and WAM scenarios). Among the listed Energy Efficiency dimension measures with quantified impact, there are 15 new measures; that is, new measures planned for the period 2021-2030 but not yet implemented. Their contribution is calculated at around 30% of the target. It is not possible to calculate their exact contribution as in some cases the expected savings have been reported for group of measures and not per individual measure.

Part 2: Policies and measures

- *Building renovation strategy*

The final Greek NECP includes some information about Long Term Renovation Strategies, however more details and analysis will be presented in the LTRS by March 2020. It is estimated that the renovation rate will be increased in the next years as a result of the energy efficiency policies and measures, thereby going beyond the European average of 1% per year. The mentioned milestone concerns the renovation of 12-15% of all dwellings (600000 dwellings) in the period 2021-2030. The measures been given priority in the building renovation strategy include economic, regulatory and fiscal measures. Their impact is quantified in terms of savings (649 ktoe) and is therefore not possible to evaluate if they are sufficient to meet the renovation target. The new measures (post NEEAP 2017) listed in the final NECP are the following:

— Regulatory, fiscal and financial incentives to promotion of buildings above minimum energy requirements (nZEB)

— Financial and fiscal incentives for technology investments in energy savings

— Use fiscal and urban planning incentives for the implementation of energy-saving interventions in residential buildings and the tertiary sector (outside government).

— Energy upgrading of residential buildings and energy vulnerable households and promotion of RES installation for covering their energy needs

— Promoting innovative energy saving technologies

— Improving energy efficiency and energy management measures in tourist complexes

— Fiscal incentives for installations in residential and tertiary sector

- *Energy Efficiency Obligation Schemes*

The total cumulative savings requirement over the period 2021-2030 has been quantified as 7299 ktoe. The largest impact are attributed to EEOS (1459.7 ktoe) and Energy Upgrading of Residential Buildings (2877.5 ktoe). Alternative measures under Article 7 regard mainly energy upgrades, transport, energy managers and ESCOs. The total cumulative contribution of the Article 7 measures for the period 2021-2030 is 7298.7 ktoe,

i.e. sufficient to achieve the 2030 requirement. More specifically, the following measures of final NECP are under Article 7:

- Energy Efficiency Obligation Scheme
- Energy upgrading of residential buildings
- Energy upgrading of public buildings
- Energy upgrading of tertiary and industry sector buildings
- Energy efficiency improvements through ESCOs
- Energy managers in public buildings
- Energy upgrading of pumping stations
- Energy upgrading of street lighting
- Transport sector infrastructure development
- Promotion of alternative fuels in road transport

- *Central government renovations*

Greece has opted for the default approach and quantified the total floor area of 5400 m2 to be renovated every year. Measures under Article 5 included in final NECP are mainly of economic and regulatory nature. Their total contribution in savings is 861 ktoe. However, it is not clear if their contribution is enough to reach the 2030 requirement because the related information about the renovated m2 per measure is not provided. More specifically, the following final NECP measures are under Article 5:

- *Energy poverty measures*

In accordance with the final NECP, energy poverty indicators have to be reduced by at least 50% by 2025 and then 75% by 2030 vs. average values for 2016. In addition to the measures to help vulnerable households to pay their energy bills (e.g. social tariff), the final NECP mentions that targeted funding schemes will be designed to improve the energy efficiency of dwellings of vulnerable households. Considerations will be also made on how the EEO scheme could contribute to alleviate energy poverty. Especially for building sector, the energy poverty measures in the final NECP are the following: EE-M8 "Financial programmes for the renovation of residential buildings at the framework of the new programming period" and EM-M17"Energy upgrading of residential buildings and energy vulnerable households and promotion of RES installation for covering their energy needs"

- *Funding of PaMs and required investments*

Planned budget has been quantified for the major part of measures (or group of measures). Some funding sources have been mentioned like financial programme "Electra", blended/hybrid finance programmes, National Energy Efficiency Fund etc. However, it is not clear what funding sources correspond to each measure specifically. The total planned budget for Energy Efficiency Dimension measures accounts for around EUR 3541 Million.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP has addressed the major part of the missing elements identified in the draft NECP. These are the following:

- The definition of a WEM scenario and the data regarding what policy measures are part of each scenario.
- Clearer information for PAMs (energy savings, planned budget, responsible entity, implementation period) has been provided
- PAM template has been provided with the final NECP
- List of measures under Article 7 has been provided (with quantified impact in terms of savings)
- Choice of Article 5 approach is mentioned clearly in the final NECP, with quantified impact of contributing measures.

The overall ambition has slightly increased. The final energy target is now reduced from 18.7 Mtoe to 16.5 Mtoe while the primary energy target is reduced from 25 Mtoe to 21 Mtoe. In addition, the target of 10 % of electric passenger cars in draft NECP has increased to 30% in the final NECP, while the renovation or replacement of 10% (40000 homes on average per year) of the total housing stock by 2030 in the draft NECP has increased to 12-15% in the final NECP (60000 homes on average per year).

- *Main updates in relation to 2020 timeline*

The 2020 final energy consumption of 18.4 Mtoe is expected to be reached as final energy consumption is currently projected to be 16.9 Mtoe in 2020. The target for 2030 is 16.5 Mtoe of final energy consumption (10.3% lower than 2020 target). The scenario presented in the final NECP assumes a 22.3% increase in the GDP and a 3% decrease in the population between 2020 and 2030. The 2030 target would therefore represent a significant decoupling between economic growth and final energy consumption. It should be noted that the energy consumption trends over the past years were strongly affected by the severe economic recession faced by Greece. Despite an economic recovery from 2016 onwards, the final energy consumption is still well below the level of 2007. Obviously, the drop in energy consumption was firstly due to the economic crisis. It is quite difficult to assess to what extent EE policies have inhibited the increase in energy consumption when the Greek economy has started to recover.

The ambition of the Greek contribution to the EU target was above the target of 27.5% reduction (vs. PRIMES2007) initially set by the European Council in 2014 and above the target of 32.5% reduction now set in the EED recast. The final NECP includes quantitative data about the expected impacts of the policy measures that seem to be sufficient to meet the 2030 target. New measures introduced in NECP not presented in NEEAP regard mainly buildings, EPCs and other financial mechanisms, tendering procedures, energy audits, energy poverty and NZEB. Some transport and industrial measures included in final NECP were not included in NEEAP 2017. The contribution of these measures to the target achievement is calculated at around 20%.

The measures undertaken to implement the EED Article 7 in 2020s were all included in NEEAP 2017. Regarding Article 5, some new actions have been added after NEEAP 2017 like the Promotion of EPC in public sector, regulatory, fiscal and financial incentives for the promotion of NZEB and the creation of a database for of buildings and related energy saving projects. For the Long-Term Renovation Strategy, there are also some actions added after NEEAP and LTRS 2017 like new financial, fiscal and urban planning incentives, support of vulnerable households and promotion of innovative technologies.

Hungary

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

In 2030, Hungary aims to reach a final energy consumption level that does not exceed the value of 2005, i.e. 785 PJ. In addition, the final energy intensity of the GDP should not exceed 0.429 toe/HUF million in 2030. The NECP further states that if final energy consumption exceeds the level for 2005, such increase should exclusively derive from carbon-neutral energy resources. The additional measures (i.e. the WAM scenario) lead to 9% lower final energy consumption and 3 % lower primary energy consumption compared to the scenario with existing measures only. The PRIMES 2007 final energy consumption in 2030 to reach 32.5% energy savings would be 15,615 ktoe. The current target, therefore, falls short by 20% over the 32.5% overall energy efficiency target.

The WAM and WEM scenarios are built bottom-up, aggregating main end-uses for each (sub)sector based on the forecasted activity, and regression analysis based on energy consumption for the transport sector. The NECP explains in detail the assumptions of the scenarios. TIMES model has been (seemingly) used with the 2030 targets as a limit to the model in the WAM scenario.

The NECP further stipulates that "in the long run" all district heating in Hungary falls within the category of 'efficient district heating/district cooling'. In the mid-run, efficient district heating should be implemented in municipalities with the quantity of district heat supplied to the network reaching 100,000 GJ. In addition, the NECP aims at reducing the increase in energy consumption in transport. For instance, by 2030, only environmentally-friendly electric buses should be used in long-distance public transport. The target for the industry is of general nature, aiming at, e.g. "sustainable and climate-friendly energy management even by maintaining and further increasing industrial output."

- Contribution of PAMs and sectors

The energy consumption with additional measures in the residential sector is expected to decrease by 31% compared to WEM scenario. Similarly, the final energy consumption in the transport sector should decrease by 2.6% by 2030. In agriculture and tertiary sectors, the additional measures are not expected to bring any impact; the energy consumption is expected to increase in both WAM and WEM by 17% and 10% respectively between 2016 and 2030. The same applies to industry; in both scenarios, the final energy consumption is expected to increase by 50% from 2016 to 2030.

The planned measures are a combination of mostly regulatory measures and economic incentives. The economic measures combine direct incentives in the form of grants (through operational programmes and national programmes) and tax incentives. The regulatory measures aim at clarifying the energy performance of buildings related obligations (certifications, inspections, and other) and imposing requirements for public buildings and their implementation. Similarly, in the transport sector, regulatory measures, such as stricter compliance checks, are combined with economic incentives and educational measures. The NECP newly plans to introduce the energy efficiency obligation scheme, which may contribute substantially to reaching energy efficiency targets. The measures in the supply sector aim at district heating. Low-carbon, energy-efficient heating, in general, is a priority for the residential sector.

Most of the new, planned measures target the household sector, public buildings, and transport, which seems to be in line with the forecasted development of WAM scenario in the sectors described above. However, the sectoral distribution of expected savings is unclear; the expected impact of individual measures (or group of measures) has not been quantified in the final NECP.

Part 2: Policies and measures

- *Building renovation strategy*

In Hungary, 40% of primary energy is consumed in buildings, with residential buildings accounting for the largest share of about 60%. The renovation of residential buildings and non-residential buildings is therefore set as one of the priorities of the NECP. The long-term renovation strategy has been under preparation during the submission of the final NECP. The NECP, therefore, does not contain any information on the LTRS targets and milestones. The renewed survey of the national building stock, based on the updated building certification method, is expected to be carried out in 2020.

The NECP contains measures related to the renovation of residential and public buildings. They are mostly regulatory and legislative measures, aiming at clarification of the certification scheme, upgrade of inspections,

and building register. Stricter requirements for public buildings and municipal energy savings plans are envisaged. The regulatory measures are not noticeably complemented with other, e.g. economic, incentives and other measures to promote deep renovation.

The impact of measures has not been quantified in the NECP. Therefore, the contribution to reaching the overall targets cannot be assessed. Wider benefits of the measures are not evaluated. Nonetheless, many measures are cross-dimensional, mostly related to energy security. For instance, the NECP estimates, that "modernisation of the residential building stock aimed at improved energy efficiency and a growing transition to alternative heating methods can replace up to one quarter of natural gas imports" .

- *Energy Efficiency Obligation Schemes*

Hungary has chosen a combination of energy efficiency obligation scheme and alternative scheme to fulfil the obligations under Art. 7 of the Energy Efficiency Directive. Based on the Eurostat method, the cumulative final energy consumption savings obligation for the period 2021 – 2030 equals 331.23 PJ. It corresponds to annual energy savings of 7 PJ, assuming steady 0.8% annual savings and policy measures spanning over the entire period. The NECP does not specify the background period for the calculation of the annual savings. No reduction options in the calculation methodology were used.

The NECP states that to reach the Art. 7 targets in 2030, the energy savings need to double in 2020 - 2030 compared to the period of 2014 – 2020 (from 3- 4 PJ of yearly savings in 2014 – 2020 to 7 PJ in 2020 – 2030).

There are new measures envisaged in the NECP to reach the target. Most importantly, the NECP newly foresees the implementation of energy efficiency obligation scheme. However, the NECP lacks further details on the implementation and especially on the expected outcomes/impacts of the measure. Other new measures mostly focus on residential, public, and transport sectors. The new measures in the transport sector are a combination of economic incentives for energy-efficient vehicles, regulatory requirements, and information/education measures. The measures in residential and public sector buildings combine economic incentives for heat exchange/efficient district heating and regulation related to nZEB. In 2017, the National Network of Energy Engineers was set up to support the energy-efficient operation of public bodies (governmental and municipal).

The contribution of the measures to reaching the overall target is not quantified.

- *Central government renovations*

In the period 2014 – 2020, Hungary has opted for default approach for requirements under art. 5 EED. The final NECP does not provide enough information to assess the strategy for central government renovation. The general strategic target to renovate 3 % of the floor area of the central government building stock annually is not further detailed.

There are new measures aiming at the public sector buildings, including building register and stricter legal requirements for energy savings measures in public buildings. Energy auditors and "policy officers" are expected to help implement the measures. Promoting the "use of ESCO-type financing solutions" is one of the two principal instruments to trigger energy savings in the new period and save the use of public budgets. However, the NECP contains virtually no information on how this is going to be achieved, i.e. which instruments and measures will encourage the use of ESCOs (Energy Performance Contracting) in public and other sectors.

- *Energy poverty measures*

The energy poverty of vulnerable households is mainly tackled through various measures concerning energy tariffs. Among energy efficiency related actions, the energy efficiency obligation scheme is specifically expected to support vulnerable consumers. However, the NECP does not expand on the specific form of support.

The "increased use of decentralised heating solutions and electricity production penetration" are expected to help decrease energy poverty. Awareness-raising, information and consulting campaigns should promote low-cost energy efficiency investments that can be implemented by homeowners themselves, "resulting in substantial savings". These measures are not reflected in the energy efficiency policies and measures section.

- *Funding of PaMs and required investments*

Energy efficiency measures will continue to be co-financed through the European Structural and Investment Funds, and other funds and programmes (e.g. Connecting Europe Facility, Structural Reform Support Programme, InvestEU). The new financial framework is yet to be finalised and has not been fully reflected in the NECP. Other public financing sources include the revenues from EU emission allowances, the Modernisation

Fund and the Building Energy Performance Tender Programme. Parts of the funding sources will be devoted to energy efficiency. The NECP also expects a "substantial amount of private investment" to meet the 2030 targets. Expected budget and concretised sources of financing for individual measures are not provided in the final NECP.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP clearly states the overall national energy efficiency contribution and the target for annual energy savings under art. 7 of EED. The overall ambition of the NECP increased slightly in case of final energy consumption (from 7 % to 9 % decrease of WAM against WEM) but decreased in primary energy consumption (from 4.8 % to 3 % decrease of WAM against WEM).

The long-term renovation strategy and strategy for central government renovations are to be updated and submitted in 2020.

There are new, planned measures set out and described in the final NECP. The measures mostly focus on the residential sector (heating), public buildings renovation, and support for sustainable and efficient transport (incentives for EVs, modal shift, eco-driving, and other). Apart from the new measures, the NECP builds on existing operational programmes, tax schemes and financial support for green and efficient transport.

The main negative change in the final NECP is that all quantified estimates of impacts of the measures have been removed. There is a sectoral development in WAM scenario, which indicates the impacts of additional measures in sectors. However, the specific contribution of individual measures (or group of measures) cannot be assessed. Wider impacts of measures are not addressed, apart from the general contribution to energy security (and presumably lower energy imports).

- *Main updates in relation to 2020 timeline*

The 2020 target was set at 25% below the PRIMES2007 baseline final energy consumption. The 2030 target is set at 19% below the PRIMES baseline, therefore possibly decreasing the level of ambition.

The NECP introduces new measures and schemes. It aims explicitly at the introduction of energy efficiency obligations and promotion of ESCO services, even though without specific details on the measures. It also builds on and expands fiscal measures in the transport sector, and generally expands on the measures in the transport and residential sector. It remains rather modest in encouraging energy efficiency in industry and tertiary sectors. Energy supply mostly aims at promotion of energy-efficient district heating.

There is little information for Art. 5 and Art 2a (both to be submitted with the Long-Term Renovation Strategy). Art. 7 measures lack quantification and in some cases the necessary level of detail (e.g. EEOS and promotion of ESCOs).

Ireland

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Ireland's 2030 energy efficiency commitment, expressed as primary energy savings of 62,171GWh by 2030, is set out in the Climate Action Plan (2019). According to the WAM scenario presented in the NECP, this commitment is translated to primary and final energy consumption of 159 146 and 130 493 GWh by 2030, respectively. This corresponds to a difference of 18% (in primary energy) and 19% (in final energy) between WAM and WEM scenario projections for 2030. It should be noted that these are significantly larger than the 5.9%-8.6% in primary energy and 2.4%-2.8% in final energy drops previously reported in the draft NECP. In comparison to the Primes 2007 projections, the final NECP WAM values represent a drop of 28% (in primary) and 29% (in final energy) in 2030.

Beyond this overarching commitment, the Irish authorities have also communicated the following objectives that cover the heating, transport, public, agricultural and electricity generation sectors:

— A shift to alternative heating sources, with targets of 600,000 heat pumps installed over the period 2021-2030

— Effectively ban the installation of oil boilers from 2022 and the installation of gas boilers from 2025 in all new dwellings through the introduction of new regulatory standards for home heating systems. Progressively phase out oil and gas boilers in existing dwellings through a combination of incentives, information and regulatory measures

— Phase 2 of the social housing retrofit programme to bring dwellings more than 40 years old (30% of the social housing stock) to a B2 equivalent BER"

— Actions to accelerate the penetration of electric vehicles into sales of cars and vans on the route to reach 100% of new vehicle sales by 2030, so that 936,000 electric vehicles will be on the road by 2030;

— Commitment to make growth less transport intensive through better planning, remote and home-working and modal shift to public transport

— Increase of renewable biofuel content of motor fuels

— Targets set for the conversion of public transport fleets to zero carbon alternatives"

— Adoption of a specified range of improvements in farming practice

— Reliance increase on renewables from 30% to 70% adding 12GW of renewable energy capacity (with peat and coal plants closing)

- *Contribution of PAMs and sectors*

The reported 18% divergence in primary energy demand is reported to be mostly driven by the increase in the carbon tax in 2020 from €20 per tonne to €26 per tonne, and an annual year-on-year increase of €6 per tonne until a price of €80 per tonne is reached in 2030. The reported final energy demand drop of 19% in the WAM scenario relative to the WEM is explained by:

— The increase in the carbon tax in the WAM scenario, which accounts for two-thirds of the difference between the scenarios

— All energy efficiency grant programmes in all sectors continue to the end of 2040 in the WAM scenario compared with to the end of 2022 in the WEM scenario

— Greater roll out of low carbon technologies such as electricity vehicles, heat pumps and smart meters in the WAM scenario

— A higher proportion of renewable energy in the WAM scenario

Many of the reported PaMs are a continuation or revision of measures reported in the NEEAP 2017. However, some PaMs appear to be new or planned. These include Low Emission Vehicles Task Force, Home Renovation Incentive (HRI), Support for heat pumps and roof solar, the Energy Poverty strategy and Investment in energy efficiency of existing commercial building stock. Furthermore, the final NECP makes reference to a smart meters rollout, more stringent building regulations, national policy framework for district heating, and interactive online training platform for businesses.

Part 2: Policies and measures

- *Building renovation strategies*

Ireland has communicated the following 2030 building-related objectives:

— 500,000 homes retrofitted to a B2 Building Energy Rating or cost optimal by 2030

— Public sector buildings to have a B Building Energy Rating (or carbon equivalent) by 2030

— One third of all commercial buildings to have a B Building Energy Rating (or carbon equivalent gains) by 2030

— By 2050, the following objectives shall apply according to the final NECP:

— 80% reduction in CO2eq emissions by 2050 compared to 1990 levels for the electricity generation, built environment, and transport sectors

— Adoption of a net zero target by 2050 at EU level as stated in the Climate Action Plan

The aforementioned milestones will be met through existing measures and a set of new actions. The main measures include: Better Energy Programme, Home Renovation Incentive, Social Housing Retrofit Programme, LIEN (Large Industry Energy Network),EXEED (Excellence in Energy Efficient Design), Accelerated Capital Allowance (ACA), Energy Efficiency Obligation Scheme, the Public Sector Energy Efficiency Strategy and Sustainable Energy Communities. New actions also include the creation of a new retrofitting delivery model to achieve economies of scale, upgrade of Local Authorities housing stock and development of smart finance initiative to offer guarantee-based products among others. The quantified impact of the policies and measures in energy savings is not covered in the plan.

- *Energy Efficiency Obligation Schemes*

According to the final NECP, Ireland will apply an 0.8% annual savings rate based on EED Article 7(1)(b). Ireland's cumulative Article 7 target will be approximately 5,180 ktoe over the period 2021-2030 which will be achieved through a combination of an obligation scheme on energy suppliers and distributors and a range of alternative measures. The Irish NECP states that this process is subject to ongoing consultation. No further information is available at this stage.

- *Central government renovations*

The final NECP does not discuss the implementation approach that Ireland intends to adopt in relation to the EED Article 5 provisions. However, it outlines the Public Sector Energy Efficiency Strategy and its associated support programmes. These are designed to assist public bodies in achieving the national energy efficiency targets of 33% 2020 and 50% by 2030. The link between the renovation requirement of central government floor area and the target savings is not elaborated in the plan. Since 2009 the public sector has improved its energy efficiency by 27%.

- *Energy poverty measures*

Policies and measures to protect energy poor consumers are provided under the Strategy to Combat Energy Poverty, which is due to be reviewed this year. The strategy includes housing upgrade energy efficiency measures (e.g. the Better Energy Warmer Homes Scheme) and social protection measures (e.g. the Household Benefits Package and the National Fuel Scheme). The Social Housing Retrofit Programme under which the social housing stock is expected to undergo significant energy efficiency renovations is also a key policy designed to address energy poverty in Ireland. Under Phase 2 of this programme, it is planned to retrofit social dwellings more than 40 years old (30% of the social housing stock) to a B2 equivalent BER. To begin with, a defined area of social housing will be identified as the core of a pilot approach and will seek to include private households to make greater use of non-Exchequer funds. This approach will be trialled in the Midlands in 2020.

- *Funding of PaMs and required investments*

The National Development Plan has indicated funding of EUR 4.5 billion to fund energy efficiency improvements across the residential and public sector. The Irish Government has committed to increasing the price of carbon to €80 per tonne by 2030. All revenues raised by the carbon tax increase will be ring-fenced to support climate action and protect those most vulnerable. Over the next decade this will raise more than €6bn to be used in this way. The planned budget information of each policy is not specified in the final NECP.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

More clarity is now given in the definition of the Irish 2030 commitment. A key improvement in the final plan is associated with the fact that the Irish 2030 consumption values are lower (i.e. more ambitious) than those presented in the draft plan. The difference between WAM and WEM scenarios is significantly improved as the % reduction of WAM against WEM scenario in the draft NECP was around 5.9%-8.6% in primary energy and 2.4%-2.8% in final energy. The WEM-WAM gap now stands at around 18%-19%. Several issues however remain including the impact of individual measures in terms of energy savings and the measures that will contribute to the EED Article 5 and 7 requirements. The policies and measures discussed in the final plan have largely remained the same as with the draft plan.

- *Main updates in relation to 2020 timeline*

The new indicative national energy efficiency contribution for 2030 represents a substantial intensification over and above the significant scale of effort already in place (with the scale previously in place projected to deliver 16% energy efficiency improvement by end 2020). It is not clear what baseline was used to derive the reported 2030 savings (e.g. by using the average 2001-2005 consumption as in the case of the 2020 target or through a different approach). Many of the reported PaMs are a continuation or revision of measures reported in the NEEAP 2017. However, some PaMs appear to be new or planned. These include Low Emission Vehicles Task Force, Home Renovation Incentive (HRI), Support for heat pumps and roof solar, the Energy Poverty strategy and Investment in energy efficiency of existing commercial building stock. In addition, new measures include Smart meters rollout, more stringent building regulations, National policy framework for district heating, Interactive Online Training Platform for businesses. Ireland currently intends to deliver the energy savings required by Article 7 through a combination of an obligation scheme and alternative measures. This is subject to ongoing consultation.

Italy

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The definition of the final energy contribution is based on the achievement of the mandatory savings defined in Article 7 of the EED Directive, considering a reduction target of 0.8 % per year in the period 2021-2030 (calculated on the basis of the three-year period 2016-2018). The consequent primary energy contribution leads to an indicative saving rate of 43% respect the reference scenario of PRIMES 2007 and to a reduction of final energy consumption of 12.6 ktoe respect the 2020 level. The WEM and WAM scenarios were introduced, but it is not completely clear how they were differentiated in terms of implemented policies. Other national targets (formally adopted) were not mentioned.

- *Contribution of PAMs and sectors*

The expected impact of PaM is reported in terms of cumulative energy savings over the period 2021-2030 and annual savings in 2030 for the measures defined under the EED Article 7. The calculation methodologies are discussed in the Article 7 notification delivered as a separate document. In general, the approaches used appear consistent. The measures defined under Article 7 should achieve a final energy saving of 9.5 Mtoe in 2030, which represents 102% of the total target under EED Article 3. Almost all measures considered under the WAM scenario are an update/upgrade of the existing ones. Some new actions (covering the 3% of the total savings) are included under the Energy Efficiency measures programme promoted by the cohesion policies 2021-2027 financed by the EU.

Part 2: Policies and measures

- *Building renovation strategies*

The final NECP includes only few elements (about the existing building stock) of the long-term building renovation strategy. About the 2030 milestone, it is mentioned that the annual deep renovation rate will be increased from the current low level (0.26%) to 0.7% for residential and 2.9% for non-residential. A list of measures is available, but without a quantification of specific impacts and budgets. More details and analysis will be presented in the official LTRS by March 10, 2020.

- *Energy Efficiency Obligation Schemes*

The total cumulative savings requirement over the period 2021-2030 has been quantified as 51.4 Mtoe. The largest impacts are attributed to the tax deduction mechanism for building renovation (18 Mtoe) and to the EEOS (12 Mtoe). In addition, the measures affecting the transport sector will have an important role: 13 Mtoe of savings are associated with the modal shift in the transport of goods.

- *Central government renovations*

Italy opted for the default approach and quantified the total floor area to be renovated annually in 400 000 m2. In accordance with this annual rate, 6.4 millions of m2 will be renovated by the end of 2030.

- *Energy poverty measures*

Italy is adapting and coordinating some existing measures to combat energy poverty. The following measures should have a significant role: tax deduction for building renovation, Conto termico, National Fund for Energy Efficiency and cohesion policies 2021-2027. In particular, ecological incentives for social housing and building in seismic areas are expected, as well as the "Credit transfer" mechanism (to suppliers, building enterprises, and lenders) in case of insolvent subjects and occupants of social houses. This will reduce the investment costs in energy efficiency measures for these vulnerable categories.

- *Funding of PaMs and required investments*

The final Italian NECP includes planned budget estimations for almost all PaMs. The total budget accounts for almost EUR 70 billion over the period 2021-2030. The funding sources are public (national budget), but other details were not provided.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP does not present significant improvements respect to the draft NECP, but additional details are available in the Article 7 notification, accompanying the plan. The overall ambition slightly increased, since the primary energy target in 2030 has been reduced from 132 to 125.1 Mtoe.

- *Main updates in relation to 2020 timeline*

The approach adopted to define the target seems in line with the previous one used for the 2020 targets. Nevertheless, the level of ambition has not increased, since the annual (final) energy savings will pass from 15.5 to 9.5 Mtoe, according with Italian estimations. The actions undertaken to implement the EED Articles 5 and 7 in 2010s are confirmed with minor changes. The main elements of the new long-term renovation strategy (EPBD Article 2a) were not discussed.

Latvia

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The Latvian national contribution towards the EU 2030 target in terms of final energy savings is forecasted to be 1.7 Mtoe. For primary and final energy consumption in 2030, Latvia sets a target of 3.9-4 Mtoe and 3.4-3.5 Mtoe respectively. According to the NECP, the WAM projections scenario is 6% more ambitious than the WEM scenario for primary and 4% more ambitious than WEM scenario for final energy consumption. The baseline scenario and the target energy efficiency (WAM) scenario are based on the MARKAL-Latvia, 2018 model[17] and are described in the plan. The energy efficiency scenario is based on a "scenario with additional measures" and includes an assumption that the measures implemented in 2018 are also implemented in the period after 2021. Latvia also sets an additional national target to reduce energy poverty by <7.5% of Latvian population by 2030[18].

- Contribution of PAMs and sectors

The contribution of measures in terms of energy savings are only reported for the EEOS and alternative measures addressing Article 7 requirements. Latvia's mandatory energy efficiency target is determined by Article 7 of Directive 2012/27/EU. According to the NECP, the total contribution of the alternative measures will be able to meet the energy savings target of 1.7 Mtoe. In addition to the description of alternative measures, the separate Annexes also include a method for calculating monitoring and verifying annual and cumulative energy savings for each alternative measure. There are new measures reported in the Final version of the NECP however, the impact and energy savings contribution of the overall policies and measures towards the target cannot be assessed but can only be based on the impact of the alternative measures.

Part 2: Policies and measures

- *Building renovation strategies*

Latvian Long-Term Renovation Strategy is not included in the NECP and will be submitted within the time limit laid down by Directive 2010/31/EU. Therefore, a long-term renovation strategy with an overview of the building stock in 2020 and indicative targets for the years 2030, 2040 and 2050 should be submitted by 10 March 2020. Among all the PAMs described in the NECP and in Annex 4, some new measures are directly linked to the building renovation strategy, i.e.: continue supporting the implementation of energy performance; improvement measures in municipal public buildings; develop a long-term solution for improvement of energy efficiency of the Latvian residential stock; attraction of investments for energy efficiency measures for buildings also to avoid shortcomings in the ESCO market. However, since most of these measures do not report their energy saving contribution and no target has been declared in the plan it is not possible to assess what is the impact and the energy contribution of the above measures.

- *Energy efficiency obligation scheme*

Total cumulative energy savings requirement for the period 2021-2030 declared in the NECP is 73.72 PJ (1.76 Mtoe). This cumulative final energy savings target means that new and additional energy savings of 1.34 PJ should be achieved every year. Apart from the EEOs, the main alternative measures put in place by Latvia to meet the 2030 requirement are: the improvement of tax system for energy efficiency and RES technologies; energy efficiency improvements in industry; energy efficiency improvements in residential buildings and in public sector buildings (municipal and governmental); information campaign for energy consumers on energy efficiency; spatial and land use measures in cities to increase the fuel-efficiency of transport and enhancement of the transportation system, supporting for low emission vehicles and electrification of the Latvian railway network. According to the information provided in the Annexes for Art. 7 EEOS and alternative measures, the energy savings quantified for the above measures, are enough to reach the target.

- *Central government renovations*

In order to meet the requirements of Art. 5 EED, Latvia adopts the default approach. The final NECP provides the total area to be renovated by 2030 which equals to 500,000 m^2. Three main measures are expected to contribute to the 2030 requirement (energy efficiency improvements in public sector buildings (municipal and governmental), supporting the implementation of energy performance improvement measures in municipal

[17] MARKAL-Latvia model is a Bottom-up Demand driven dynamic optimisation model.
[18] In 2017 the % of energy poverty in Latvia was 7.5%.

public buildings, amendments to the respective National laws to address and improve the requirements of EED Art. 4, Art. 5, EPBD Art. 2a Long Term renovation strategy. However, without quantifying the energy savings contribution of all the policies measures addressing Art. 5 EED, it is not possible to state whether the implementation of these measures will be sufficient to reach the 2030 target.

- *Energy poverty measures*

Energy poverty is partially addressed by Latvia. In 2018, 7.5% of the Latvia population could not afford heating in their dwellings and some solutions to tackle energy poverty have been implemented. One measure to develop solutions for reducing energy poverty and two projects have being addressing the issue: "Energy project" that evaluate and identify the social groups at risk and supports these "protected users" through the State budget helping them with the payment of electricity bills and the "STEP" project, which define energy poverty criteria based on experiences in other countries, trying to find solutions to prevent energy poverty among Latvian population.

- *Funding of PaMs and required investments*

The amount of the total investments needed for the next 10 years to implement the measures described in Annex 4 (Planned policies and measures) includes both, the continuation of measures already in place and any additional necessary investments. The required investment plan is divided in the following action lines: H. Horizontal measures – EUR 418.22 million, 1. improving energy performance of buildings – EUR 1,730.04 million. 2. improving energy efficiency and promoting the use of RES technologies in heating and cooling and industry – EUR 1663.43 million; 5. Improving energy efficiency, promoting the use of alternative fuels and RES technologies in transport – EUR 988.77 million; 11. 'Greening' of the tax system and improvement of friendliness to energy efficiency and RES technologies – EUR 25 million; 12. Informing, education and awareness-raising of the public – EUR 1.57 million. Regarding the potential funding sources, the NECP indicates that State budget funding should be partially used to support the performance of energy efficiency improvement measures however, since the conditions for allocating the EU structural funds for the period after 2021 have not yet been approved, the funding amount is indicative. Other sources of funding are the income from the auctioning of emission allowances (ETS 2013–2020): EUR 197 million. And EUR 120 million related to the period after 2021. Over 600 million EUR could also be available in the EAAI for the period until 2030 and finally additional funding will come from the municipal budget, since municipalities also have the right to grant tax reliefs. In Latvia, many municipalities plan funding in their budgets for implementing energy efficiency measures, including energy management systems, both in their properties and as support for the performance of energy efficiency improvement measures. The majority of the PAMs included in the NECP do not report information about the budget planned but a detailed section related to the financial impact of the plan provides an overview on the funding of PAMs and the investments required.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The Final version of NECP has improved compared to the NECP 2019 and partially addressed the missing elements identified in the draft NECP. Latvia mandatory energy savings contribution towards 2030 target has been defined and according to the final NECP will be achieved. The energy savings contributions of all measures reported under the WAM energy efficiency projections for 2030 should be reported in the next NECP revision. Compared to the NECPs 2019, the ambition of the primary energy consumption 2030 target has increased slightly (from 4.33 Mtoe target declared in the DRAFT NECP to 3.94 – 4.06 Mtoe indicated in the FINAL NECP. The scope of the target has remained the same and further details have been added in the methodology applied to calculate and verify the energy savings contribution of Art. 7 alternative measures.

The description of PAMs included in Annex IV needs to be improved by adding a higher level of details such as: quantitative objective, specifying the Energy Union dimension, sectors affected, expected impact, planned budget status of the implementation including the implementation period (start/end date) for each PAM. Regarding other important Directive articles, improvements have been made on the level of information provided in relation to how Latvia is addressing the provisions of Art. 7, but Art. 5 (for which 2030 target has now been defined) and Art. 2a EPBD, do need to be addressed with further details in the next NECP revision.

- *Main updates in relation to 2020 timeline*

In the last NEEAP Latvia set an indicative 2020 national energy efficiency target equals to 5.4 Mtoe for primary energy consumption and 4.47 Mtoe for final energy consumption, while for the 2030 target according to the final NECP, the forecasted PEC will be approx. 4 Mtoe and 3.46-3.55 Mtoe for FEC. In terms of final energy

savings target in the NEEAP 2017, Latvia declared 0.85 Mtoe for 2020 target versus 1.76 Mtoe energy savings in 2030 indicated in the final NECP. Therefore, by reducing approx. 26% PEC and 20% FEC compared to 2020, considering other economic factors, the indicative 2030 energy consumption target compared to 2020 seems ambitious. New PAMs have been included in the NECP since the last NEEAP. Some of the most relevant ones are represented by the introduction of regulatory measures to support energy efficiency in Transport, Households, Residential and Public buildings, and an information and awareness campaign. Also some horizontal measures such as improving the energy savings accounting system, monitoring and reporting of measures, the introduction of the "energy efficiency first" principle into Latvian planning system laws and energy and climate policy laws, and enlarging the EEOS to large energy suppliers (natural gas, transport fuel and district heat sales companies), have been added to the plan.

Lithuania

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The Republic of Lithuania set its energy efficiency contribution in terms of energy intensity: 2030 value should be 1.5 times less, compared to 2017 level, both in terms of primary energy and final energy. This contribution is translated in terms of savings as a 5.4 Mtoe reduction in primary energy consumption and a 4.5 Mtoe reduction in final energy consumption. The NECP does not include information on the model used for projections, nor sufficient details on the underlying assumption used. Nonetheless, calculations and results compare two different scenarios (baseline or WEM vs energy efficiency or WAM) and detailed information on the measures included in each of them is provided. The WAM scenario realistically reflects the impact of the planned strategies, policies and measures to be implemented by 2030.

Other targets currently in place include a) a 2020 target of 11.67 TWh energy savings, and b) a binding provision that no less than 0.38% of the country's GDP is allocated for the implementation of updated short-term climate change mitigation targets. However, no further details are provided on these additional targets.

- *Contribution of PAMs and sectors*

The main sectors of energy efficiency policies and measures are buildings, industry, public sector, and transport. The impact is reported for measures to be notified under Article 7 of the EED, but the methodology to calculate energy savings is not described. The current estimates of impacts of individual measures listed under Article 7, appears to be sufficient to meet the Article 7 target. Monitoring and verification systems and processes are not indicated in the NECP.

Part 2: Policies and measures

- *Building renovation strategy*

The NECP does not contain the complete Long-term Building Renovation Strategy, but it reports some measures on building renovations, their targets and expected impact. The most important ones include economic incentives for renovation and modernization (to class C minimum) nearly 500 multi-apartment buildings per year, which is expected to deliver up to 5.5 TWh cumulative savings in energy consumption in 2030. The NECP does not identify wider benefits and does not provide an outline of budgetary resources to support the implementation of the building renovation strategy.

- *Energy Efficiency Obligation Schemes*

Total cumulative savings requirement in 2021-2030 is 27.279 TWh. It is assumed to be expressed in final energy but the NECP does not state it clearly. The expected contribution of each measure (alternative measures) towards the target is quantified and it is expected to be enough to meet the 2030 requirement.

— Among the most important measures indicated are:

— Higher excise duties and taxes on fuel consumption

— Renovation/modernisation of multi-apartment buildings

— Agreements with energy suppliers on consumer education and counselling

— Energy saving agreements with energy companies

— Replacing boilers with more efficient technologies

— Improving energy efficiency in enterprises

- *Central government renovations*

The NECP indicates the plan to renovate the target floor area of 960,000 m2 of public buildings, (around 510,000 m2 of central government public buildings, the rest being municipal public buildings) by 2030. According to the plan, public buildings must reach a minimum class C after renovation. Around 10 GWh of energy is expected to be saved annually. No further details are reported on the measure and the monitoring and implementation, however the target appears reachable.

- *Energy poverty measures*

The current National Progress Programme 2021–2030 indicates energy poverty objectives indicated in the table below. In order to achieve theses, Lithuania is taking a set of integrated measures, described in specific sections of the NECP, covering the areas of energy efficiency, household income, energy prices and consumer information. Lithuania, and another eight EU countries, launched the EU-funded Horizon 2020 project 'STEP – Solutions to Tackle Energy Poverty in 2019'. The main objective of STEP is to alleviate energy poverty by encouraging changes in consumer behaviour. The measures of the project and the national measures to address energy poverty take into account financial support (reimbursement of deprived people for part of the costs of heating and water in housing, public support for renovation/modernisation of multi-apartment buildings by reimbursing credit and interest payments), improve the energy performance of buildings and equipment and raise consumer awareness.

Table 20. Energy poverty targets in Lithuania

Impact indicator	Initial situation (year)	Target value for 2030
Share of the population unable to keep home adequately warm	28% (2018)	17%
Share of households spending a large share of income on energy	17.1% (2016)	10%

- *Funding of PaMs and required investments*

Overall financial needs to implement the planned policies and measures described in NECP amount to about EUR 14.1 billion, of which, the indicative amount of public funding would be around EUR 9.8 billion. For energy efficiency measures alone, the total funding need would amount to EUR 2605 million, of which the need for public funding would account for EUR 976 million. This should be considered as a preliminary assessment of the financing needs, which will be revised when NECP measures will be transferred to strategic planning documents.

The main sources of public funds for 2021-2030 will be the 2021-2027 investments of EU funds (the European Regional Development Fund and the Cohesion Fund), electricity and heat tariffs, national budget (the Climate Change Programme and the Waste Management Programme, etc.) and municipal budgets, the Modernisation Fund, the Innovation Fund, the Connecting Europe Facility, and the Life Programme.

The NECP specifies the ambition to mobilise more (or additional) private investments to support the planned measures during the implementation phase, however no specific information on mechanisms are detailed.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP addressed most of the missing elements identified in the draft NECP. The final NECP provides an indicative quantification of the target, and describes the scenario analysis (Baseline against EE scenario(s)). The details reported for each measure (scope, summary description) improved, and they include also a quantification of their individual impact.

The inclusion of specific target and measures addressing energy poverty is an important improvement and added value of the final NECP. The improvements refers to increasing details and information provided. No significant change in ambition and scope is found, comparing the draft and the final NECP.

- *Main updates in relation to 2020 timeline*

Primary energy consumption is expected to decrease from 6559 Ktoe in 2020 to 5461 ktoe in 2030, while final energy consumption would decrease from 5570 Ktoe to 4526 Ktoe. Policies and measures indicated in the NECP were already planned in the NEEAPs. However most of them will be implemented in the coming years and are explicitly considered as new in the current NECP: fragmented information on these aspects makes difficult to assess the real implementation stage of each measure.

Luxembourg

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The overall national contribution is expressed as a range: 40 to 44% reduction against PRIMES 2007 values for 2030: FEC savings of 14.5 TWh in case of 44%. The WAM scenario is based on the 44%. This leads to a decrease from the projected 4342 ktoe to 3058 ktoe. PEC values are not established.

The WEM and WAM scenarios are better explained than in the earlier draft. However key information is still missing, such as the attribution of measures to the scenarios or impact estimates for the individual measures. Only sectors are modelled in terms of annual and cumulated FEC, PEC values are overall missing. The NECP mentions Luxembourg's article 3 EED target as additional national target.

- *Contribution of PAMs and sectors*

— With an updated EEO scheme (see below) and a minimum CO2 price, the NECP applies two cross-sectoral instruments as basis for national energy efficiency policies. A focus of the NECP is laid on the building sector, where a comprehensive set of new measures are introduced. These measures address new building (Low and positive energy buildings by law in the case of apartments and special-purpose buildings), and a comprehensive bundle of regulatory, fiscal and information measures addressing building renovation. Here the update Climate bonus programme applies, combined with a reduced VAT rate of 3% for renovation measures. In addition non-residential buildings are addressed by raised construction standards. Resource and health concerns are included in the package with Circular Economy in New Buildings and the Sustainable and Health construction programme. An energy passport "plus" in the building stock (housing and functional buildings) will be introduced Several PaMs address the inclusion of buildings in the larger concept of settlement structures (Spatial Planning 2035 strategy, Urban densification and Sustainable Neighbourghoods-eco-Quartiers made in Luxembourg). The existing pacte lodgement will be stepped up as a Pacte Logement 2.0, A Heat cadastral and solar cadastre will be developed. Taxation of fuel oil and natural gas is foreseen.

The exemplary role of the public sector will be demonstrated i.a. at the Luxembourg City airport, ultra-efficient public buildings, the Luxembourg LED 2025 initiative, and the Climate friendly schools programme.

A second focus is laid on the transport sector, where another yet again a comprehensive bundle of measures applies, based on the overall Mobility strategy MoDu 2.0 strategy:

— Massive development of public transport

— Rapid development of electro-mobility in passenger cars; and Transporters (premiums, development of a nationwide Fast-charging network)

— Reduction of diesel sales to transit trucks

Further measures include:

— Strengthening the 'accord volontaire' with industry; andits development for SMEs

— Energy audits transparency platform

— Lean & Green Programme

— Green data centres

The expected PaM contribution in energy savings is not reported. Hence, an assessment is not possible whether they are sufficient to meet the overall savings.

The methodology to estimate energy savings is not addressed in the NECP. While the NECP presents a very comprehensive set of potentially very interesting PaMs, their contribution towards the target is not addressed.

Part 2: Policies and measures

- *Building renovation strategies*

The NECP does not provide targets/milestones, but refers to the LTRS, which is in development. PaMs are not quantified, but a large bundle of new measures is put forward. The measures put one focus on building

renovation and the implementation of the national renovation strategy. Notably, the renovation of functional buildings is addressed. Regarding financial incentives, the Climate bonus programme will be stepped up and a reduced VAT rate of 3% be applied for renovation measures. In addition, an energy passport "plus" for the building stock (housing and functional buildings) will be introduced.

- *Energy Efficiency Obligation Schemes*

The NECP clarifies that the 2030 savings requirement will be met by a continued EEO scheme and several alternative measures. No saving objective is specified at present, but announced to be set at 1.2 to 1.5 % per year of final energy savings for the period 2021-2030, covering all sectors. The measures are not quantified. Alternative measures include:

— New instruments in the field of energy saving for industry, small and medium-sized enterprises and large office buildings (de-risking financial instrument, transparency platform for audits, exemplary role of public buildings)

— Strengthening the 'accord volontaire' with industry; andits development for SMEs

— Energy audits transparency platform

— De-risking

— Lean & Green Programme

- *Central government renovations*

The implementation approach is not clearly specified in the NECP and measures contributing towards Art. 5 EED are not quantified. Instead, the NECP mentions a broad bundle of measures, among other the Exemplary role of the State and municipalities in, their Buildings and lighting (Luxembourg LED 2025 Programme).

- *Energy poverty measures*

Special focus is given to energy poverty. The measures to underpin this are however the existing energy law pointing to social welfare benefits in case of energy poverty. Further measures are under development, notably in the framework of building renovation/affordable renting and living.

- *Funding of PaMs and required investments*

The PaMs are not underpinned by planned budgets, with the exception of estimates for material costs for tram expansion. Investment needs for additional energy efficiency investments are estimated in a graph to amount to 546.870.848 EUR. Funding sources are only broadly mentioned, but not in a systematic manner.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

Some of the missing elements and clarifications identified in the draft NECPs have been addressed. However, there are still a number of missing elements. These concern:

— PEC values are still missing.

— Saving contributions is still not provided.

— Impact in terms of energy savings and budgetary commitments are still missing.

— Objective and contribution of measues are still missing.

— Some further information can be extracted from the NECP, but overall the information is still missing.

— Clear measures provided. Saving objectives etc. still need to be established.

The present version of the NECP is clearly more organised and presents a comprehensive and overall ambitious set of PaMs. However, the contribution to key directive articles is still largely not clarified.

- *Main updates in relation to 2020 timeline*

The 2030 target contribution is clearly more ambitious compared to the FEC values for the 2020 targets. In addition, a very comprehensive post-NEEAP set of measures is planned and successful measures are to be continued. The implementation updates on EED Articles 5 & 7 and EPBD Article 2a remain patchy at best. Overall, no clear feedback is provided.

Malta

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Malta's indicative energy efficiency contribution to the 2030 target is expressed in terms of primary energy intensity level of 0.07 toe/€2005, as compared to a level of 0.15 toe/€2005 in 2005 and the level of 0.09 toe/€2005 in 2030 from projections PRIMES 2007. The WEM and WAM scenarios were defined in a clear way, but the detailed indicator trends were provided only for the second one. Other national targets were not mentioned.

- *Contribution of PAMs and sectors*

The expected impact of PaMs by 2030 is reported in terms of energy savings for the measures under the EED Article 7. The measures defined under Article 7 should achieve a final energy saving of 13 ktoe in 2030, which represents about 70% of the total target under EED Article 3. It should be noted that Malta is now considering also the action "Financial support schemes for Solar PV" as a measure contributing to the EED targets (Articles 7 and 3). The majority of measures considered under the WAM scenario are indicated as new (i.e. planned after 2021). In a 10-year time framework, they should generate almost the same cumulative savings achieved over the period 2014-2020 with the existing measures. The level of ambition is not so high, but it seems consistent with the ambition of the target.

Part 2: Policies and measures

- *Building renovation strategy*

The NECP does not include information on the long-term building renovation strategy. Malta is aware of its commitments to develop a long-term renovation strategy in accordance with Article 2a of Directive 2010/31/EU and in In line with these obligations, it is expected to submit the first long-term renovation strategy by 10 March 2020.

- *Energy Efficiency Obligation Schemes*

The provisional average final energy consumption for the period 2016-2018 amounts to 622.7 ktoe. This translates to an average of 1.5 ktoe of new savings required each year (based on an indicative linear trajectory) from 1 January 2021 to 31 December 2030, reaching 82.2 ktoe of cumulative energy savings by end 2030. The largest impacts will be generated by the industry and service sectors and the development of solar PV plants. All planned measures should achieve a cumulative saving of 97.6 ktoe (equal to the 119% of the Article 7 target).

- *Central government renovations*

The total floor area to be renovated or equivalent annual energy savings to be achieved from 2021 to 2030 under Article 5 on the exemplary role of public bodies' buildings of Directive 2012/27/EU is not available.

- *Energy poverty measures*

Malta does not have a significant number of households facing energy poverty issues and therefore national objectives in this area have not been set. Nevertheless, Malta will continue to assess potential measures focusing on the alleviation of energy poverty and vulnerable groups of consumers. Within the PaM table, three measures specifically address this issue: the energy benefit scheme, the provision of professional advice to vulnerable households and the replacement of Appliances in Households Scheme.

- *Funding of PaMs and required investments*

The PaM table include information about the planned budget for all main WAM measures. The total budget accounts for EUR 435 Million over the period 2021-2030. The funding sources are public, but additional details were not provided.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP does not present significant improvements respect the draft NECP, but additional details are available in the Article 7 notification, accompanying the plan. The overall ambition increased, since the energy intensity target was reduced from 0.08 to 0.07 toe per Euro. However, the choice to consider a scheme focused

on renewable energy to contribute to the energy efficiency targets should be discussed to a greater extent. Moreover, many details about important directive articles are still missing.

- *Main updates in relation to 2020 timeline*

The ambition of the new target does not appear very high but the Maltese NECP argues that there are a number of national-based peculiarities including the fact that Malta is the EU Member State with the lowest annual energy consumption per capita. In addition, the average consumption per dwelling (adjusted to EU climate) is very low, if compared to other EU countries. The plans defined to address EED Article 7 satisfy the requirements, but not much else is expected. Given that relevant information about EED Article 5 and EPBD Article 2a are missing, no conclusions can be made on the nature of the updates with regards to these articles.

Netherlands

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The overall 2030 national contribution towards the EU target in terms of absolute primary and final energy consumption is forecasted to be 1 950 PJ and 1 837 PJ, respectively. According to the NECP, the WEM projections scenario based on adopted measures is actually slightly more ambitious (1%) than the WAM scenario which is based on proposed policies, both for primary and final energy consumption. The National Climate and Energy Outlook (KEV) 2019 has been used as baseline scenario (WEM) to forecast energy and greenhouse gas emissions up to and including 2030. The energy efficiency scenario (WAM) is based on a "scenario with proposed measures" which include adopted policies as well as planned measures. The difference between the two scenarios is minimal and the description, details and PAMs contribution of both scenarios need to be improved. Netherlands also sets an additional national target to reduce 95% CO2 emissions by 2050 compared to 1990 with a challenge to transform more than 7 million homes and 570,000 non-residential buildings into well-insulated properties that are heated with renewable heat and in which clean electricity is consumed/generated by 2050.

- *Contribution of PAMs and sectors*

Energy savings contribution of measures are not reported in the NECP. The Art. 7 energy savings contribution is only reported by sector (556-691 PJ). Although new energy efficiency measures have been added compared to the 2017 NEEAP, it is not possible to assess the impact of these PAMs towards the 2030 national contribution. According to the NECP, the total contribution of the alternative measures will not be able to meet the energy savings target of 925 PJ. Appendix 3 also include a method for calculating monitoring and verifying annual and cumulative energy savings for the alternative measure avoiding possible double counting.

Part 2: Policies and measures

- *Building renovation strategies*

Although there is a strong focus on the Building sector and the National Plan for promoting nearly-zero energy buildings, Netherlands Long-Term Renovation Strategy is not included in the NECP and will be submitted within the time limit laid down by Directive 2010/31/EU. Therefore, a long-term renovation strategy with an overview of the building stock in 2020 and indicative targets for the years 2030, 2040 and 2050 should be submitted by 10 March 2020. Among the PAMs described in the NECP, some new measures are directly linked to the building renovation strategy, i.e.: Standards and target values of dwellings; supporting the implementation of energy performance requirement in offices (Label C); accelerating energy renovations in the built environment; supporting sustainable heat (and cold) in the built environment; reduced rate for insulation through fiscal measure (VAT), heat fund and building related finance. However, since none of these measures report their energy saving contribution and no target for Art. 2a EPBD has been defined in the plan, it is not possible to assess the impact of the measures that are linked to the building renovation strategy.

- *Energy Efficiency Obligation Scheme*

Total cumulative energy savings requirement for the period 2021-2030 declared in the NECP is 925 PJ (22,098 ktoe) which correspond to 16.8 PJ annual energy savings. Since no energy savings contribution are reported for the alternative measures, it is not possible to assess what are the most relevant PAMs contributing to Art. 7 target however, a mix of existing and additional measures in the built environment, industry, agriculture and land use sector will be put in place by Netherlands in order to meet Art. 7 2030 requirement. Some of these measures will continue after 2020: the energy savings obligations for companies and institutions, the energy tax (on electricity and gas consumption) in all sectors, the tax deduction for energy efficiency investments. In addition to these, the proposed policy measures will also contribute to the 2030 energy savings target: adjusting energy tax to create greater incentives for increased sustainability; financing instruments such as the Heat Fund, Investment Grant for Sustainable Energy (ISDE); Subsidy for Energy Savings at Home (SEEH); reduced VAT (from 21% to 6%) for glass insulation and material; promoting district-oriented approach, implementing the Starter motor connecting 100,000 homes to heat grids or heat pumps; energy savings requirements in industry; energy agreements in agriculture to achieve more sustainable horticulture. According to the information provided in Appendix 3 for Art. 7, the expected energy savings to be obtained will range between (556-691 PJ), therefore they are not enough to reach the cumulative final energy savings target (925 PJ).

It should be noted that according to the NECP the expected energy savings declared "do not yet include the effects of all the policies and if the annual KEV shows that the climate target is not within reach, the government

will take additional measures to bring the goal within reach. In doing so, the Netherlands expects to be able to fulfil the mandatory energy savings according to Article 7.1(b)".

- *Central government renovations*

In order to meet the requirements of Art. 5 EED, Netherlands adopts the alternative approach. An equivalent annual energy savings 2030 target to address Art. 5 requirement using the alternative approach is not clearly reported however, the NECP states that the energy savings expected from the measure "Sectoral Road Map of the Central Government Real Estate Agency" (1.3 PJ) will be enough to meet the target which should correspond to expected savings of 0.2 PJ if 3% of the buildings with an area of use greater than 250 m^2 owned and used by central government are renovated annually. If the calculation of Art. 5 target is correct, it seems that implementing the above measure, will be enough to reach the 2030 target. This however, needs to be verified in the next NECP revision.

- *Energy poverty measures*

Energy poverty has been covered by the NECP but in the Netherlands, the issue seems to affect a very small proportion of households compared to the rest of Europe. Households in the Netherlands are far less likely to experience financial problems in this area. Although there is no specific policy in the field of energy poverty, there is a scheme that prevents people who cannot pay their energy bill (or pay it on time) from being disconnected (Rules Governing the Disconnection Policy for Small Consumers of Electricity and Gas).

- *Funding of PaMs and required investments*

None of the PAMs included in Annex 4 report information about the budget planned and no specific analysis is available for investments needed to meet the 2030 targets however, within section 3.2 of NECP under the Energy efficiency dimension, a description of funds allocated by the Government is provided for the following measures: 50-80 million euros annually up to 2030 to implement the Heat Fund and building-related financing; 425 million euros for Energy taxation and energy bills; 90 million euros is available for 2019 and 2020 through the Subsidy for Energy Savings at Home (SEEH); 93 million euros allocated to the Programme for small-scale energy-saving measures; 400 million euros is earmarked for leading municipalities in the Natural Gas-Free Districts Programme; 200 million euros will be made available for the period 2020-2023 inclusive to housing associations for connecting 100,000 homes to more sustainable heating (heat grids or heat pumps). In addition to this, an analysis of the draft Climate Agreement conducted by PBL[19] (2019) provides detailed insight of the expected national costs and investments as shown in Table 2 below. Due to certain uncertainties in the structure of the policies instruments proposed in the Climate Agreement, cumulative investments between 2019 and 2030 range between 56 billion to 75 billion euros and investments in the electricity sector account for almost half of this. Overall national costs are mainly led by the cost of measures in the electricity sector. Interesting to note the costs of expanding and increasing the sustainability of heat grids (50 to 350 million euros by 2030), additional costs in mobility due to blending new type of biofuels on one side and boosting electric transport on the other which, with lower energy and maintenance costs, will be able to net benefit in 2030. Additional costs in Industry 90 to 430 million euros. Also a risk factors of the sector/market concerned, and an analysis of additional financial government aid or public funds needed to counterbalance possible shortcomings is presented in the plan.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

The Final version of NECP has certainly improved compared to the previous one and partially addressed the missing elements identified in the draft NECP. Netherlands indicative primary and final energy consumption towards 2030 target and Art. 7 cumulative energy savings requirement have been defined but according to the data reported in the final NECP will not be achieved. This is possibly due to underestimation of energy savings contribution and missing impact of some proposed measures. The effects of all the policy measures adopted and proposed should be integrated in the next NECP revision as well as all their energy savings contributions. The WAM and WEM projection scenario should be better described and more ambitious. Compared to the NECPs 2019, while the ambition of primary energy consumption 2030 target has remained the same, the ambition for final energy consumption 2030 target has increased slightly (from 1 854 PJ declared in the DRAFT NECP to 1 837 PJ indicated in the FINAL NECP. The scope of the target has remained the same.

Key energy efficiency measures in all sectors have been described but a clear distinction should be made between those contributing to the WEM and WAM scenario. A PAM template has been provided without

[19] Netherlands Environmental Assessment Agency

indicating the energy savings contribution as well as other information such as affected Energy Union dimension, budget sources, Union policy which resulted in the implementation of the PAM. Regarding other important Directive articles, improvements have been made to the level of information provided in relation to how Netherlands is addressing the provisions of Art. 7, but Art. 5 (for which 2030 target calculation and description of contributing measure(s) should be better explained) and Art. 2a EPBD, do need to be addressed with further details in the next NECP revision.

- *Main updates in relation to 2020 timeline*

According to the target set in the last NEEAP, Netherlands estimated 2,438 PJ as primary energy consumption in 2020 compared to 1,950 PJ primary energy consumption target declared in the final NECP for 2030. Therefore, the 2030 PEC target compared to 2020, has increased its ambition (25%). New PAMs have been included in the NECP since the last NEEAP. Although their energy savings are not provided, they cover all the sectors and they are represented by a mix of new economic and fiscal measures, (taxes, incentives), regulatory and voluntary measures (new standards for tertiary buildings, energy agreements) and information and awareness and research programmes. Among others some of the new PAMs are represented by the introduction of new tax measure, a minimum price for CO2 emissions in electricity production in the Energy supply sector, min. energy performance requirements in offices (label C), accelerating energy renovations in the built environment, energy performance standards for buildings, a digital platform providing useful information on energy savings to homeowners, a heat fund offering attractive pre-financing to home owners, improving the housing stock with the starter motor initiative by connecting 100.000 dwellings to heat (heat networks or heat pumps), in the built environment. An obligation to provide information on energy savings according to the Environmental Management Act, regional industrial cooperation aiming at CO2 reduction and sustainability at raw material and a national tax on CO2 emission in the Industry sector. Promoting the use of more efficient vehicles, green hydrogen, biofuels and electric transport and national charging infrastructure in the Transport sector.

In relation to Art. 5 & 7 EED and Article 2a EPBD, the main updates are: for Art. 5 the implementation of the "Sectoral Road Map of the Central Government Real Estate Agency" which according to the NECP, will be able to attain 1.3 PJ energy savings and overachieve the Art. 5 2030 target. For Art. 7, a 2030 energy savings target has been defined however, according to the NECP, the energy savings contribution (556-691 PJ) provided by sector, is not enough to meet the mandatory cumulative energy savings target of 925 PJ set for the period 2021-2030.[20] For Art. 2a EPBD although is a strong focus on the building sector and the National Plan for promoting nearly-zero energy building, the long-term renovation strategy has not been included in the NECP and will be presented to the European Commission by 9 March 2020 at the latest.

[20] NECP states that this is because the policies in the Climate Agreement were not announced in time to be included in the KEV. Therefore, the expected energy savings are possibly underestimated.

Poland

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The NECP establishes an energy efficiency improvement of 23% for primary energy consumption by 2030 compared to the PRIMES 2007 forecast. This leads to a 2030 PEC level of 91.3 Mtoe, or a reduction of primary energy consumption by approx. 27.3 Mtoe compared to the PRIMES 2007 forecast. The reduction in terms of WEM/WAM scenarios is 12% for PEC and 15% for FEC. The overall description of both WEM and WAM are very comprehensive and clear. The attribution of measures to the WAM scenario is however not sufficiently clear. Impacts per measure are not specified.

Poland has set two additional targets beyond the ones stipulated by EU legislation:

— Development of environment-friendly and efficient district heating systems

— Development of heat production in cogeneration processes

- *Contribution of PAMs and sectors*

The NECP does not report impact figures for PaM contributions towards the 2030 target; therefore the ambition cannot be assessed. The methodology for establishing the impacts is not provided. An exception is the set-up of (cumulative) savings under article 7 EED, where quantified impacts and baselines are provided (see below).

Part 2: Policies and measures

- *Building renovation strategies*

The NECP states that the LTRS will be provided separately. Accordingly, it delivers only very few information and no targets/milestones for 2020 onwards. A renovation share (70% of all buildings of the housing stock thermally insulated) is provided for 2030, but it remains unclear if this is supposed to act as target or not. The NECP lists a number of measure to reach the renovation objective. However, their contribution is not quantified:

— Several fiscal support programmes

— Use of energy services for renovation

— Anti-smog tariff to switch heating to electricity

— Promoting low-energy buildings, including at the design, construction and redevelopment stages, in a manner ensuring their energy efficiency, and improvement of the availability of renewable energy in new and existing buildings

- *Energy Efficiency Obligation Schemes*

The 2030 saving requirement amounts to 30,635 ktoe. This is to be reached largely by an EEO scheme covering 24,500 Ktoe cumulative savings and supplementary alternative measures. Major alternative measures include (calculations in brackets are calculated in a different manner, hence no adding up with the EEO savings is possible):

— Thermo-modernisation and Renovation Fund: 700 ktoe (70 ktoe per annum)

— Tax relief for expenditure on thermo-modernisation of single-dwelling residential buildings: 2000 ktoe (200 ktoe per annum)

— Development of public transport in cities: 1350 ktoe (135 ktoe per annum)

— Support for companies operating in the energy efficiency and RES sectors, with priority being given to the suppliers of energy services (under the ESCO scheme): No impacts quantified.

- *Central government renovations*

Poland has opted for an alternative approach. The expected 2021-2030 target energy savings achievable as a result of measures improving the energy performance of buildings should amount to 43 440.1 MWh. Central government renovations are dealt with in combination with the missing LTRS and hence information is overall missing.

Apart from the 2016 Energy Efficiency Act, which stipulates energy efficiency requirements for the public sector, there is no clear attribution of measures to article 5 EED. It remains unclear if the enlisted PaMs also cover central government renovation. Impacts are not quantified.

- *Energy poverty measures*

The NECP sets a special focus on energy poverty measures in section 3.4.4. This comprises the following measures:

— Awareness actions targeted at electricity and gas consumers

— Monitoring the number of households affected by energy poverty

— Continuation of publicly (including EU) funded programmes and their possible adaptation to the needs of energy poor consumers, in particular loan programmes intended to finance modernisation measures aimed at improving energy efficiency

— Construction, expansion and upgrading of district heating networks

— Monitoring the protection of vulnerable consumers of electricity and gaseous fuels

— Anti-smog tariff for switching to electrical heating systems.

- *Funding of PaMs and required investments*

Clear funding and budget is not attributed to the PaMs. Investment needs are established overall in the WAM scenario (Investment needs are specified in EE scenario - section 5, pp. 135), but only overall per sector (households, industry, transport, services, agriculture) and not per measures. Overall, funding sources are not included in detail.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

Article 3 EED target is clearly established now; a clear relation of the WEM/WAM scenario to the PRIMES 2007 scenario is however not clearly established. Quantification of PaM impacts are still widely missing, apart from the contributions towards article 7 EED.

Objectives and details regarding articles 2a EPBD and 5 EED are still largely missing and are supposed to be provided with the LTRS. The NECP provides a clearly more comprehensive set of PaMs (30 overall) in comparison to the draft NECPs, where only generic measures had been mentioned. The description of the PaMs is overall very comprehensive; however, clear impacts and related budgets are not provided.

- *Main updates in relation to 2020 timeline*

Regarding target contribution and relation 2020/2030 objectives, a different methodology is applied:

— For 2020, PL opted for an absolute saving target in primary energy (minus 13.6 Mtoe in 2010-2020). This leads to consumption levels of 96.4 Mtoe (PEC) and 71.6 Mtoe (FEC).

— The 2030 objective is set as primary energy reduction of 23% against the 2030 baseline (GIC-NEU) given by PRIMES 2007. This would lead to 91.3 Mtoe (PEC) or 67.0 Mtoe (FEC).

If the 2020 target is reformulated as savings against the PRIMES projections for 2020 (GIC: 117,108 Mtoe minus NEU: 7279 Mtoe, leading to 109,829 Mtoe), this would imply a reduction by about 12%. In this sense, the 2030 target is much stronger in ambition.

The NECP sets out a comprehensive bundle of new PaMs, covering all sectors: These include white certificates/energy efficiency obligation, development of public transport in cities, improvement of housing conditions, technical condition of housing stock and enhancement of energy efficiency, promotion of low-energy buildings, including at the design, construction and redevelopment stages, in a manner ensuring their energy efficiency, and improvement of the availability of renewable energy in new and existing buildings, act on energy efficiency of 20 May 2016 (Journal of Laws 2016, item 831, as amended) defining the energy efficiency duties of public sector units.

Other measures include: improving energy efficiency in the transport sector, development of energy efficient low-carbon transport, anti-smog tariff, financial support for measures to improve energy efficiency in gas transmission and distribution and in underground gas storage (UGS) facilities.

Portugal

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Portugal has defined a 35% energy efficiency contribution for 2030, as presented in the NECP document. Instead of pre-determined absolute consumption levels by 2030, the NECP presents a range of values of 21.5 ktoe – 15.6 ktoe for primary energy and 14.4 ktoe – 14.9 ktoe for final energy. The methodology to calculate these values was through the estimation of a baseline using the PRIMES 2007 model. These are to be achieved through the adoption of alternative measures under Article 7 of the EED, taking into account a reduction target of 0.8% per year for the 2021-2030 period. Regarding the definition of the WEM and WAM scenarios, the Portuguese NECP outlines a general strategy, divided by sector and energy source, although not connecting this path with concrete existing or additional measures. Besides the contribution to the EU target, the Portuguese NECP refers a target of carbon neutrality by 2050.

- *Contribution of PAMs and sectors*

The Portuguese NECP has presented a big array of new policies and measures for all sectors, providing a brief description of each measure, the entities responsible for implementation and necessary financial sources. No quantification of the impact of the measures has been presented, thus making it difficult to evaluate whether these will be sufficient to meet the overall savings. No reference to existing policies was made, although some of the proposed measures for the 2020-2030 period are the continuation of existing ones from the 2014 and 2017 NEEAPs.

Part 2: Policies and measures

- *Building renovation strategy*

The Portuguese government has indicated ongoing preparations of its Long Term Renovation Strategy (LTRS) which is due to deliver it by 31st March 2020. While the milestones are not communicated in the NECP, several buildings measures are mentioned including the update the energy certification system for buildings, the development of a new version of the energy performance certificate, the review of energy efficiency regulations in housing and services buildings (public and private) and the promotion of NZEBs.

- *Energy Efficiency Obligation Schemes*

The Portuguese government aims to reach 0.8 yearly savings to meet the Article 7 requirement in the period of 2021-2030, which will reach a value of 6 739 682 toe. The Actions to reach this target include the promotion of more efficient equipment, improvement of management of energy consumption in the various sectors of the economy, adoption of more efficient agricultural and forestry practices in energy and water and promotion of energy and resource efficiency. Under these "umbrella" actions, there are several other individual measures, which should presumably be added to the ones already implemented in the last two NEEAPs. Since there is no indication of the potential energy savings for each measure, it is not possible to assess whether these are ambitious enough for the Portuguese intentions.

- *Central government renovations*

The Portuguese NECP does not include information on the Central Government renovations, stating that this is being prepared and will be delivered by the end of March 2020 along with the Long Term Renovation Strategy.

- *Energy poverty measures*

For the first time since the first NEEAP under the EED, Portugal has presented measures to tackle energy poverty. Some of the NECP measures within the Internal Market Dimension (3.4) include: 1. Elaboration of a Strategy for a Just Transition; 2. Promotion of a long-term strategy to combat energy poverty; 3. Establishment of National System for evaluating and monitoring energy poverty (including the number of families in energy poverty); 4. Continuation of protection mechanisms for vulnerable consumers and 5. Development of support programmes for energy efficiency and the integration of renewables for the mitigation of energy poverty. Portugal also plans to promote local strategies in the combat for energy poverty and disseminate information for the mitigation of energy poverty.

- *Funding of PaMs and required investments*

The NECP provides information on the financing sources for each of the proposed umbrella actions covering several measures. The majority of the actions are to be financed by the FEE (Energy Efficiency Fund), Cohesion Funds, Regional Funds or the Government Budget. No indication of the actual budget for the measures is given.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

Overall, there have been major improvements in the final NECP compared with the draft one, mainly in terms of the information on the proposed measures including details such as the funding sources or the entities responsible to control them. Other improvements include new information on the WEM and WAM scenarios and the introduction of Energy Poverty and NZEB measures. It would be interesting to have a connection between individual measures (or umbrella actions) with the targets. The targets have remained unchanged in relation to the draft NECP.

- *Main updates in relation to 2020 timeline*

The approach to define the 2030 target seems in line with the methodology used before for the 2020 targets. Overall, many new Policies and Measures have been introduced in the new NECP, some of which follow the approach adopted in previous strategies, while others are completely new. Interestingly, no old measures have been presented and there is therefore no indication on the progress made up to now.

Romania

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The Romanian 2030 national contribution towards the EU target has been defined as absolute energy consumption of 25.7 Mtoe and 32.3 Mtoe in final and primary energy, respectively. These represent a percentage reduction of 40.4% (final) and 45.1% (primary) reduction compared to the PRIMES 2007 projections in 2030. In comparison to the WEM scenario projections for 2030, the Romanian 2030 values translate to a reduction of 9.5% in primary energy and an increase of 8.5% in final energy by 2030.

In terms of other national targets, the final NECP presents the milestones set as part of the Romanian Long-term Renovation strategy 2020-2050, which, under the recommended scenario, are expected to yield a reduction of final consumption in 2030 of 0.83 Mtoe compared to the baseline scenario.

- *Contribution of PAMs and sectors*

The Romanian NECP presents a list of 12 current and 40 planned PaMs. Planned PaMs include building renovation passports, restrictions on the sale or lease of buildings in the lowest energy performance classes, energy or CO2 taxes and transport fleet renewal programmes. Many of the planned PaMs focus on the building sector, but some measures also target transport, industry and the supply sector. The NECP does not give any detailed descriptions of their PaMs (e.g. type of policy, sector, implementation period, status, description, etc.). In terms of future PaMs, the information is even more limited, with only general actions rather than concrete and well defined measures. The contribution of PaMs in terms of energy savings is not covered in the NECP.

Part 2: Policies and measures

- *Building renovation strategy*

The NECP summarises the main results of a scenario analysis, in which 3 scenarios (Scenarios 1, 2 and 3) are confronted against a baseline scenario. The analysis is based on 3 renovation packages (minimum, medium, maximum) for buildings located in 3 climate zones and calculates the renovation rates under each scenario in three periods: 2021-2030, 2031-2040, 2041-2040. Based on scenario 2 (recommended scenario), annual renovation rates will increase to 3.39 % in 2021-2030 (3.79% in 2031-2040 and 4.33% in 2041-2050). This is expected to bring a reduction of final consumption in 2030 of 0.83 Mtoe and cumulative GHG emission reduction of 2.34 million tonnes in 2021-2030. Given that the full list of measures to comply with the LTRS is not disclosed in the NECP, it is not possible to evaluate how the various PaMs will actually contribute towards these milestones, and hence review how realistic and achievable these milestones are.

- *Energy Efficiency Obligation Schemes*

Romania has stated that it will achieve cumulative new energy savings equivalent to 10.12 Mtoe in the period 2021-2030 to meet the Article 7 requirement. In the process of drawing up the National Energy Efficiency Action Plan, the introduction of an obligation scheme was not considered optimal in Romania, as the conditions are not met for such schemes, e.g. compliance with the certification requirements of energy savings achieved and the economic justification of the conditions imposed. Romania presented its long-term renovation strategy as the way to achieve the Article 7 requirement. The strategy does not present any concrete measures (see previous section) but the estimated cumulative savings of 3.4 Mtoe expected to be reached by 2030 through this strategy will not be enough to meet the Article 7 savings requirement, highlighting the need of further actions. .

- *Central government renovations*

The NECP does not provide any new information with regards to Article 5 on central government renovations and does not include the total floor area to be renovated or equivalent annual energy savings to be achieved 2021-2030. This could be due to the fact that Romania plans to continue to meet Article 5 requirements through the default approach (as it did so in the period 2014-2020), but this is not explicitly stated in the NECP. Despite this, Annex II includes "P8 Energy efficiency in government buildings and public services" in the list of current measures. It is not clear if the measure will continue beyond 2020, and if Romania will indeed carry on with the default approach for the period 2020-2030.

- *Energy poverty measures*

Various measures are presented under the dimension of Internal Energy Market, with the aim to reach the national objective of reducing energy poverty and protecting vulnerable consumers, having in mind the achievement of the average energy poverty level at EU level in 2015. The main measures include:

— Regulation on definition of vulnerable consumers and ways of financing

— Provision of non-financial support to low-income vulnerable consumers through the possibility of payment by instalments (payment of electricity bills in instalments)

— Implementation of the National Social Assistance Information System

— Grant relief for domestic heating under Government Emergency Ordinance No 70/2011, repealed and replaced by Law No 196/2016 (taking effect on 1 April 2021)

- *Funding of PaMs and required investments*

Cumulative investments needed over the period 2021-2030 to meet the proposed objectives (WAM scenario) are estimated to be around EUR 150 billion.

In terms of the building sector, it is estimated that investments of EUR 12.8 billion will be necessary according to Scenario 2 under the Romanian Long Term Renovation Strategy. An estimated EUR 1 million should be committed to cover technical assistance costs and investments should stem from various sources:

— EUR 3 million from grants from the State budget or EU funds

— EUR 6-8 billion financed through repayable financial mechanisms including repayable grants

— EUR 1.8 billion secured by own funds of building owners participating in co-financing schemes.

Part 3: Key updates and improvements

- *Main changes and improvements in relation to draft NECPs 2019*

One of the most notable improvements in the final NECP is the increase in the ambition of the Romanian contribution towards the EU target by lowering the primary energy consumption in 2030 from 36.7 Mtoe to 32.3 Mtoe. New information is given also on Article 7 saving requirement and indicative milestones for 2030, 2040 and 2050 set in compliance with the Long Term Renovation Strategy, as well as estimates on investments needs and expected savings.

- *Main updates in relation to 2020 timeline*

In light of the assumptions and calculations used by Romanian authorities, primary energy consumption is expected to reach 32.3 Mtoe in 2030, compared to 32.1 Mtoe in 2020. The 2030 target represents a 45.1% (primary) and 40.4% (final) reduction against PRIMES 2007 projection, while the 2020 target represents 36.0% of primary and 31.1% of final energy reduction against the PRIMES 2007 projections for 2020. Primary and final energy consumption trajectories indicate a slower reduction over the period 2020-2025, with a drop of 2.4 % for primary consumption and 2.9 % for final consumption.

Slovakia

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Slovakia has set two possible scenarios of their national contribution to the overall EU energy efficiency target. The realistic scenario targets 28.36 % energy efficiency in 2030, while the ambitious scenario aims at 30.32% by 2030 compared to the 2007 levels. The difference between *realistic* target and scenario, and *ambitious* target and scenario is unclear. The two scenarios are not further described, and the NECP does not attribute individual measures to the respective scenarios. The NECP states that "in order to achieve the established national targets for 2030 (...) it is necessary to ensure the consistent implementation of all energy efficiency measures identified in this Plan".

The scenarios have been modelled using the Compact-PRIMES model for Slovakia (CPS)[21]. Even though the reference scenario for energy efficiency is not described directly, the description of the reference scenario for GHG emissions implies the contents of the baseline scenario for energy efficiency. The baseline scenario (WEM) for GHG emissions is in line with the EU 2016 Reference Scenario. It includes policies and measures adopted and implemented at EU and national level by the end of 2016 (including measures needed to achieve the renewable energy and energy efficiency targets in 2020) and is described in detail in the underlying report: Study of low-carbon development for Slovakia[22].

There are no other national targets set beyond the targets stipulated by EU regulations and directives.

- *Contribution of PAMs and sectors*

The NECP mostly builds on existing policies and measures. They include economic measures (investment subsidies, loans in the building sector, and in industry), support to guaranteed energy services (GES), especially in public sector, and information measures (including support to audits and energy management systems). The policies and measures cover sectors of buildings (residential and non-residential), public sector, industry, and transport. The beginning and duration of the measures is largely missing.

The main new measures entail the introduction of regional (sustainable) energy centres, significant scale-up of voluntary agreements and guaranteed energy services, and introduction of a competitive format for supporting enterprises in implementing energy efficiency measures. The last measure, together with voluntary agreements, is expected to bring almost half of the energy savings currently quantified under the EED Article 7.

The methodology to calculate energy savings, including monitoring and verification system, is well described and robust. The Slovak Innovation and Energy Agency (SIEA) runs the monitoring and verification system and collects and evaluates the data for reporting purposes. The SIEA continuously updates and improves the system.

The NECP quantifies the impact of about half of all the policies and measures, mostly the measures notified under Article 7 of EED. The impact of measures in buildings remains to be quantified upon submission of the Long-Term Renovation Strategy. Buildings are expected to contribute about 20 % of the overall energy efficiency target.

Keeping in mind the current state of quantification of impacts (specifically missing impacts of building measures, and other), the measures are presently not sufficient to meet the Art 7 target. The quantified impacts reach about 53 % of targeted energy savings.

Even though the contribution of measures to reaching the overall Article 3 target is not explicitly assessed, it may require both substantial efforts in implementing the currently planned measures and their scale-up, and potentially take-up of new measures. The NECP states that "achieving the 32.5 % target by 2030 is very optimistic for Slovakia", and "it is necessary to ensure the consistent implementation of all energy efficiency measures identified in this Plan".

Part 2: Policies and measures

- *Building renovation strategy*

[21] The energy model for Slovakia captures the details of energy supply and demand that are critical for the proposal for a low carbon road. The country-specific energy model, called 'Compact- PRIMES for Slovakia' (CPS), provides a bottom-up analysis of technology for key elements of the energy sector and was designed to evaluate low-carbon options for the energy sector. The CPS is a partial equilibrium model for one country for the energy sector, balancing the energy supply and demand.

[22] https://www.minzp.sk/files/iep/2019_01_low-carbon-study_sk.pdf (in Slovak).

The renovation targets will be specified in the Long-term Renovation Strategy, to be submitted by 10 March 2020. The NECP stipulates that at the current renovation rate, all occupied family houses will be renovated by 2043, and multi-apartment buildings by 2030. The NECP also expects that some of the already renovated buildings will have to undergo a renewed, deep renovation. The NECP does not specifically differentiate between existing and new measures. It seems that most measures in buildings are a continuation of existing measures, potentially scaled-up. The energy efficiency measures in buildings will contribute 20 % of the overall expected savings in 2021 - 2030.

- *Energy Efficiency Obligation Schemes*

Slovakia has chosen the alternative scheme to fulfil the obligations under Article 7 of the Energy Efficiency Directive. The yearly energy savings target was calculated based on average final energy consumption for three last-available consecutive years (2015 – 2017), which leads to a requirement for 870.5 GWh of new yearly savings and cumulative savings of 47,877 GWh in the period 2021 – 2030.

While economic measures (including investment subsidies, loans in the building sector, and in industry) largely prevail among the notified policies and measures, they are complemented with a wider variety of policy schemes. Slovakia introduces an interesting competitive format to support energy efficiency measures in the industry. Guaranteed energy services (GES) continue to be strongly supported, especially in the public sector. Voluntary agreements are expected to bring substantial energy savings and efficiency improvements. The newly established Regional (Sustainable) Energy Centres will help to build the capacity for quality strategic energy planning. There are also several measures in transport, including electro mobility, efficient vehicles and infrastructure and modal shift. However, the impacts are not quantified.

The quantified impacts of measures amount to 460 GWh/year and 25,300 GWh cumulatively. Therefore, with the currently quantified expected savings in the NECP, the measures contribute roughly to 50 % of the savings target. About a third of the measures under Article 7, including measures in buildings, currently lacks quantification and will be supplemented at a later stage, either with the Long-term Renovation Strategy (buildings) or upon implementation of the measure (e.g. energy audits).

- *Central government renovations*

Provisions under Article 5 of EED will be part of the long-term strategy for the renovation of residential and non-residential buildings in Slovakia, which remains to be submitted.

There are measures envisioned to assist the public sector renovations (under Article 7). The NECP specifically highlights the promotion and facilitation of guaranteed energy services through, among others, including updated legislation to allow for GES in public sector, model contract, and technical assistance, which should help to identify potential projects in public sector. The NECP further highlights the need for effective setting of the subsidy programmes, ideally supporting a combination of investment grants and loans.

- *Energy poverty measures*

The NECP (section 3.4.4) covers energy poverty-related measures. However, only a few are related to energy efficiency. Act No 443/2013 on the State Housing Development Fund is targeting energy efficiency in buildings. Other acts are targeted generally at provision and financing of housing, such as Act No 443/2010 on housing and social housing subsidies providing subsidies for the removal of system failures in multi-apartment buildings, Act No 417/2013 on aid in material need, and decrees on energy prices.

The other measures included in the section are focused on poverty and social issues in more general, rather than energy poverty specifically (such as procedures for payment schemes in case of inability of the household to pay for energy, an update of housing benefits, and other).

- *Funding of PaMs and required investments*

The overall investment needs are estimated at EUR 11.8 billion for the period 2021 – 2030. About half of the measures lacks quantification of the investment needs.

Sources of funding are provided together with the quantified estimate. Most measures depend (at least partially) on funding from European Structural and Investment Funds (ESIF). In the time of submitting the NECP, the negotiations about the level and structure of available funds for Slovakia were still ongoing, and therefore bringing a certain degree of uncertainty as to the funding sources for the policies and measures. Apart from the ESIF, the Modernisation fund, Slovak Investment Holding, and other national (public and private) sources will cover the investment need.

Part 3: Key updates, improvements and conclusions

- *Main changes and improvements in relation to draft NECPs 2019*

Two sets of scenarios and targets

There are two sets of scenarios and targets in the final NECP, with different level of ambition levels. The draft NECP included only the now-called realistic scenario. The final NECP added the so-called ambitious scenario, which aims at reaching 30.32 % of savings, compared to 28.36% of savings of the realistic scenario. Therefore, there is a hint of increased ambition in the Final NECP.

However, at the same time, the two sets of scenarios add to the confusion, because it is not clear why they have been established. Underlying assumptions (and corresponding measures) for the two scenarios are not described.

There is a higher level of detail in describing the baseline scenario for energy efficiency dimension. Conversely to the draft NECP, the final NECP does not depict reference scenario in figure (or table), therefore making it difficult to assess the ambition of the targets.

New structure of the policies and measures with more detail

General legibility and clarity of the policies and measures in the final NECP compared to the draft NECP have increased. The description of policies and measures in the final NECP has been restructured. The measures in the draft were classified as to sources. By contrast, they are stratified as to themes in the Final NECP. The measures were renumbered and unified (bundled) compared to the Draft.

While there are new measures added to the final NECP (e.g. Regional energy centres), it seems that overall the policies and measures build on the basis set out in the draft NECP. However, the restructuring (and also renumbering) of the measures makes it difficult to assess the overlaps between the two versions of NECP directly.

On major improvements, the measures under Article 7 are described in a much higher level of detail. Compared to the draft, most measures under Article 7 include quantified impacts, expected investment levels and sources of funding, and responsible bodies. However, the rest of the measures (roughly half of all measures) lacks detailed information, including quantification of impacts and others. The system of monitoring and evaluation of energy savings is in place and duly described.

- *Main updates in relation to 2020 timeline*

The 2030 targeted primary and final energy consumption in the realistic scenario remains unchanged compared to targeted 2020 consumption. In the case of the ambitious scenario, primary and final energy consumption are expected to decrease by 3% and 1 % respectively.

The baseline scenario (with existing measures) would presumably lead to a 24% energy savings compared to 2007 levels , the realistic scenario aims at 28 %, and the ambitious scenario at 30%.

The NECP builds on existing measures and schemes introduced in the NEEAPs. It aims explicitly at substantially scaling-up voluntary agreements, which should contribute majorly to the overall energy savings. It further develops the support to guaranteed energy services and plans to establish a network of regional (sustainable) energy centres. It introduces support to electro mobility.

There is a much higher level of detail for measures notified under of Article 7, but no information for Article 5 and Art 2a (both to be submitted with the Long-Term Renovation Strategy).

Slovenia

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

The Slovenian contribution towards the EU target is to improve energy efficiency by 2030 by at least 35 % compared to the PRIMES 2007 reference scenario. It means that in 2030 the final energy consumption in Slovenia should not exceed 54.9 TWh (4,717 ktoe), i.e. 73.9 TWh (6,356 ktoe) of primary energy consumption. The scenarios were built under the Reference Energy and environmental model of Slovenia (REES-SLO)[23]. The baseline (WEM) scenario incorporates all measures adopted or implemented by 1 October 2018. The WAM scenario[24] then covers all planned measures and takes into account the more demanding implementation of the additional measures in all sectors (Table 21).

Table 21 Primary and final energy consumption in 2030 in WAM, WEM, and PRIMES 2007 reference scenarios for Slovenia

	WEM [ktoe]	WAM [ktoe]	PRIMES 2007 reference [ktoe][25]
Primary energy consumption	6,917	6,117	9,779
Final energy consumption	5,132	4,565	7,257

The additional measures should bring 12 % energy savings compared to the scenario with existing measures. The overall energy efficiency target is set 8 % below the WEM scenario. The energy efficiency target is therefore set below the WAM scenario by four percentage points (one third) in energy savings. The WAM scenario requires "ambitious" implementation of additional measures. By definition, the overall energy efficiency target aspires below this ambition.

Additionally, the NECP aims at improving energy and material efficiency in all sectors (and therefore reducing the use of and other natural resources) and reducing final energy use in buildings by 20% and ensure a reduction of GHG emissions in buildings by at least 70 % by 2030 compared to 2005.

- *Contribution of PAMs and sectors*

The NECP mostly builds on existing measures, which should be actively improved and upgraded to ensure their better implementation. The NECP provides a deadline for each of the activities. The measures combine economic incentives, regulatory measures and support, organizational, information, and education measures (including the energy advisors' network). The economic incentives entail non-refundable grants and loans. New models of financing and model projects will be sought in the building sector. Energy (performance) contracting is to be further developed and extended from the public to other sectors. In transport, the economic incentives should support modal shifts, upgrades in the railway network, and fiscal incentives to more efficient vehicles, combined with regulatory measures and eco-driving.

Most new measures are to be introduced in buildings and transport. The measures are typically identified as "economic", but they cover a much broader range of instruments, which support the core of the measure. For instance, an economic incentive would be complemented with organizational mechanisms, technical support, and information platforms.

The NECP states that by implementing the ambitious additional measures in the WAM scenario, the total additional final energy savings compared to the WEM scenario would attain 566 ktoe by 2030. The energy savings in transport would be 337 ktoe, 120 ktoe in industry, and 109 ktoe in widespread use. The expected impact of the individual measures (or groups of measures) has not been quantified in the NECP. Given the difference between the overall target and the WAM scenario in 2030, the description of the measures is not explicit about what constitutes the difference between the "ambitious" and "regular" implementation.

Part 2: Policies and measures

[23] The REES-SLO is created in the MESAP environment in the form of a linear network model of processes and interconnections. The model combines the characteristics of the specific and general models, and thus enables modelling of energy use based on energy service needs and an assessment of the sectoral, energy, economic and environmental effects.

[24] Labelled "AMA scenario" (additional measures – ambitious) or "NECP scenario" in the National Energy and Climate Plan of Slovenia.

[25] https://ec.europa.eu/energy/sites/ener/files/documents/trends_to_2030_update_2007.pdf

- *Building renovation strategies*

The long-term renovation strategy has been under preparation during the submission of the final NECP. The NECP, therefore, does not contain any information on the LTRS targets and milestones. The NECP sets an overall target to reduce final energy use in buildings by 20% and GHG emissions in buildings by at least 70% by 2030 compared to 2005.

The renovation of residential and public buildings is mostly supported through economic, regulatory, and information measures. The existing measures will be (significantly) improved and upgraded. The plan for the update of the existing measures is very detailed and contains specific deadlines for each activity. The supporting activities entail reducing the administrative burden, smoothing the procedures and tenders (specifically in the public sector), raising awareness and promoting the programmes, and supporting monitoring and evaluation of the instruments. A financing plan for the sustainable renovation of buildings and a portal of energy properties of buildings will be newly developed.

The NECP supports the promotion of energy (performance) contracting through design of appropriate financial products, training, additional expert and technical assistance, quality assurance programme, and preparation of tools for evaluation of the projects. The NECP also envisages the promotion and provision of one-stop (shop) assistance, and the development of new business models for the energy renovation of residential buildings, such as the complete renovation of neighbourhoods.

The impact of measures has not been quantified in the NECP. Therefore, the contribution to reaching the overall targets cannot be assessed.

- *Energy Efficiency Obligation Schemes*

Slovenia has chosen a combination of energy efficiency obligation scheme and alternative measures to fulfil the obligations under Art. 7 of the Energy Efficiency Directive.

The cumulative final energy consumption savings obligation for the period 2021 – 2030 equals 25.23 TWh (2,169 ktoe). It corresponds to annual energy savings of 458 GWh. The NECP does not specify the background period for the calculation of the yearly savings and the use of reduction options in the calculation methodology.

The alternative measures entail "implementing the ECO Fund programmes and tax mechanisms". The individual policies and measures are not directly attributed to the alternative scheme; i.e., it is not clear which of the listed measures would be notified under Art. 7.

Based on the list of measures notified in the NEEAP 2017, the transport sector and buildings sector measures are the most represented. The measures in transport promote the modal switch and sustainability in freight transport through a set of economic incentives, including, among others, incentives and subsidies for passengers to use public transport, incentives for public transport, cycling, and railway infrastructure, and improving the efficiency of road freight transport. Fiscal incentives are introduced to support efficient, low-emission vehicles.

Apart from the measures mentioned above for residential and public buildings, the NECP plans to restrict the use of fossil fuels for heating. In the industry sector, energy efficiency measures are supported through grants and loans; the introduction of energy management systems is promoted. Even though expected to contribute substantially to energy savings in the energy efficiency (WAM scenario), 20% of all new savings, includes no new measures in the NECP. Additionally, the NECP also envisages promoting and supporting electricity generation from CHP and encouraging the development of district heating microsystems through economic incentives and developing the heating and cooling strategy.

There is no indication of the quantified impact of individual measures (or group of measures). The energy savings expected from the EEOS are not estimated. For many of the measures, the duration of implementation (effect) is not specified.

- *Central government renovations*

In the period 2014 – 2020, Slovenia has opted for the default approach for requirements under Art. 5 of the EED. The final NECP does not provide enough information to assess the strategy for central government renovation. A general target for the energy consumption and GHG emission reduction of buildings has been set.

The NECP plans to upgrade existing measures for public buildings and introduces new measures for buildings in general. Economic incentives in the form of grants and return schemes are complemented with organizational, information, and education measures. The project office for energy renovation of public buildings will upscale its work mainly through intensified preparation of energy renovation projects, targeted calls and additional incentives. The system for building renovation quality assurance will be upgraded through certification of

contractors and processes, education and training of stakeholders, and implementation of a quality system in public sector building renovation projects.

The "energy contracting" will also continue to be promoted in the public sector through the design of financial products for ESCOs, training and technical assistance in project preparation, and preparation of tools to evaluate the projects.

- *Energy poverty measures*

Slovenia does not rank among countries with high energy poverty rates. Nevertheless, the NECP sees the energy poverty through the lens of possible inequalities arising from the low-carbon transition and access to GHG mitigation measures, mainly due to "insufficient resources, information and lack of competencies" of the vulnerable parts of the population.

Household energy efficiency aid scheme for vulnerable population groups will continue to be implemented in the 2020 - 2030 period. It promotes energy efficiency measures in low-income households, and, in the new period, mainly aims at developing criteria for selecting the beneficiaries of the financial incentives, creating a comprehensive energy efficiency improvements scheme, and monitoring of the effects. On a more general note, energy poverty should be included in the housing policy scheme. The heating and cooling strategy will entail an information platform that should "significantly contribute (..) to the reduction of energy poverty" .

- *Funding of PaMs and required investments*

The implementation of the WAM (NECP) scenario will require the total investment of EUR 28 billion. The building sector shares 50 % of the total investment, the transport represents around 23 % of the total investment, the remaining for industry (4%) and the supply sector.

Private financial resources will cover the most substantial part of the investment need. The financing gaps will be covered by the combination of EU funds and EU and national financial instruments. The NECP estimates that public funds` need to achieve the RES and EE targets will amount to nearly EUR 2.5 billion for the period 2021-2030. Of this, just over 0.9 billion is required for renovation of buildings, EUR 0.4 billion in industry, EUR 0.74 billion for sustainable mobility (replacement of vehicles), and around EUR 1.1 billion in the supply sector (RES and CHP).

The funds include mainly cohesion funds, ECO fund, and other resources, such as contributions from the RES scheme for electricity generation, EE contribution, and other national sources. The financial instruments (loans, guarantees and equity contributions) include, among others, the InvestEU Guarantee, European Green Deal Investment Plan, Just Transition Fund, EIB instruments, and national budgetary resources.

Funding sources and investment needs per measure (a group of measures) are not identified.

Part 3: Key updates, improvements and conclusions

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP clearly states the overall national energy efficiency contribution and the target for annual energy savings under Art. 7 of EED. The overall energy efficiency target is more ambitious than the EU target (35 % compared to 32.5 % by 2030). It is in line with Slovenia's levels of ambition; the 2020 target was set at 24 % below the PRIMES baseline scenario compared to the required 20% target.

The WAM and WEM scenarios have been developed and described in detail, the WAM requiring the ambitious implementation of additional measures. The long-term renovation strategy and strategy for central government renovations are to be updated and submitted in 2020.

The final NECP provides a detailed description of existing and additional measures. The actions to improve and upgrade the existing measures in the coming period are specified with concrete deadlines for each activity.

Wider impacts of the WAM scenario have been identified, covering economic, environmental, societal impacts. The NECP also addresses energy poverty with several specific energy efficiency measures.

- *Main updates in relation to 2020 timeline*

The 2020 target was set at 24 % below the PRIMES2007 baseline final energy consumption; the 2030 target is 35 % below the baseline. Both targets are more ambitious than the EU targets. The 2020 target is likely to be met.

New measures have been introduced, mainly in transport and buildings sector. The existing measures will continue to be improved and upgraded.

There is little information about Art. 5 and Art 2a (both to be submitted with the Long-term Renovation Strategy). While Slovenia remains using the combination of EEOS and alternative measures, the specific (alternative) measures notified under Art. 7 are not clearly identified in the final NECP. All measures lack quantification of expected impacts.

Spain

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Spain set an ambitious Energy Efficiency contribution expressed as absolute primary energy consumption at 98.5 Mtoe in 2030. The NECP reports a percentage reduction both against WAM scenario (22% reduction) and PRIMES2007 baseline (39.5% reduction). The calculations result from the simulation of the WEM scenario, based on the expected impacts from the measures presented in the NECP. The measures included in the scenario analysis are described in detail.

The NECP reports detailed information also on the models and methodology used: they include both energy system modelling (TIMES-SINERGIA), economic model (DENIO), electricity market and air quality models. This is one key element and value added of the Spanish NECP, that can assess multiple and wider impacts of the overall strategy, including macro-economic impacts (GDP, employment, distributive effects), as well as impacts on air quality and related health issues.

Contribution of PAMs and sectors

A wide set of measures, listed under the energy efficiency dimension, are assumed to contribute to the Art. 3 target. However, the NECPs only specifies that the measures indicated are contributing to Art.7. Their impact is mainly quantified in cumulative final energy savings over 2021-2030 period Expected savings are indicated for each of the sectoral measures listed for Article 7 , but it is not sufficiently clear if and how the resulting aggregate impact (36809.1 ktoe final energy savings cumulated over the period 2021-2030 - 669 ktoe per year), is comparable with the Art. 3 target and it is impossible to assess the contribution of the measures to this target.

While the impact of all measure is quantified, the methodology used to calculate the expected savings from each measure is not reported.

Promoting energy efficient cogeneration is the only completely new measure in the NECP (compared to NEEAPS), however most of the actions reported include existing and implemented elements as well as new measures.

Part 2: Policies and measures

- *Building renovation strategies*

The NECP does not include the complete Long-term Building Renovation Strategy, and does not provides information on the key elements, targets and milestones that will be addressed in that specific document to be submitted by March 2020. Nonetheless, it reports two measures on building renovations, their targets and expected impact: a) improving energy efficiency in existing residential buildings and b) Improving energy efficiency in existing tertiary buildings.

The first one includes the continuation of PAREER and other new elements / sub-measures and has the ambitious objective of insulating of building envelope for 1.2 million dwellings over 2021-2030 (from 30000 per year in 2017 to 300000 per year in 2030 and replacing or improving heating systems in 300000 dwellings each year.

The second one comprises a wide set of actions including measures for public buildings (extension of the renovation obligation (Art. 5) to regional and local administrations, energy efficiency improvement of HVAC, lighting, and continuation of renovation measures of PAREER for commercial buildings.

- *Energy Efficiency Obligation Schemes*

In accordance with the provisions of EED Article 7, the total 2030 cumulative savings requirement is 36809 ktoe; this target equals new annual energy savings of 669 ktoe/year each year over 2021-2030. Savings are consistently expressed in final energy. The Spanish NECP adopts a mixed approach, including both an Energy Efficiency Obligation Scheme and alternative measures.

The expected contribution of each measure (alternative measures) towards the target is quantified and it is expected to be sufficient to meet the 2030 requirement.

Among the most important measures (actions) indicated are in the transport sector: (The establishment of Low-emission zones and important modal shift measures, vehicle fleet renewal plans and measures to boost electric vehicles) and in the building sector (Energy efficiency in existing buildings in the residential sector, Energy efficiency in tertiary sector construction).

The NECP specifies the expected impact for each of the measure, which is in line with the overall target; however the methodology to calculate these expected savings is not reported.

- *Central government renovations*

Spain opted, in line with 2014-2020 period, for the default approach for implementing Article 5 provisions. According to the latest revision of the inventory (2018), Spain should commit to renovate 222000 m^2/year of central government buildings (equivalent to a Renovation rate of 3% per year). However the NECP, taking into account the results of 2014-2017, (with a 105% achievement of the target for that period), sets a more ambitious target to 300000 m^2/year.

Additionally, an extension of the 3% annual renovation target to the regional and local administrations is foreseen.

Taken into account the positive results already obtained, the target seems achievable.

However it is not possible to assess clearly the contribution to Art 5 target of the measures put in place, as there are reported together with interventions on commercial buildings and other elements (training, lighting, etc.): the contribution of central government building renovation is not clearly quantifiable.

- *Energy poverty measures*

As regards energy poverty, the NECP takes into account the National Energy Poverty Strategy adopted by the Council of Ministers (5 April 2019). This strategy, in line with the approach and methodology of the European Observatory on Energy Poverty, is the instrument to tackle the phenomenon of energy poverty from a holistic, medium- and long-term vision.

The description of the measures listed for Art. 7 under the energy efficiency dimension includes a small section on how the measure addresses energy poverty (when relevant). At operational level, this is mostly obtained by including social criteria to define the grant rates for building renovation.

A specific and detailed framework for actions to tackle Energy Poverty is presented under the Action 4.11 (Internal Energy Market Dimension). This include also the establishment of specific targets for energy poverty reduction (calculated on four official indicators of the European Energy Poverty Observatory):

— Disproportionate expenditure (2M): percentage of households whose energy expenditure relative to their income is more than double the national median, should be reduced from 17.3% (2017) to 8.6% (2025);

— Energy poverty hidden (HEP): percentage of households whose absolute energy expenditure is less than half the national median, should be lowered from 11.5 % (2017) to 5.7% (2025);

— Inability to keep the dwelling at an appropriate temperature: percentage of the population that cannot keep their house at an appropriate temperature, should decrease from 8% to 4% (2017-2025);

— Late payment of invoices: percentage of population who have a delay in the payment of bills for housing supplies should be reduced from 7,4% (2017) to 3.7% (2025)

Moreover, the NECP includes an assessment of the distributive effects of the WAM scenario. This is an additional and important way to take into account energy poverty as the impact (cost and benefits) of the strategy is evaluated on households differentiated by income.

- *Funding of PaMs and required investments*

Financial needs of each of the PAMs listed in the Energy Efficiency Dimension is quantified and includes a distinction between public and private budget. This is not the case for all measures in other dimensions (demand side management, increase self-consumption) or cross sectoral measures.

Detailed information on the established Energy Efficiency Fund is provided. The FNEE, managed by the IDAE, aims to finance economic support mechanisms, financial, technical assistance, training, information or other measures to increase energy efficiency in the different end-use sectors to achieve the target of EED art.7.

It is primarily funded by the contributions from the obligated parties. It can also receive funding from the State Budget, and European Funds (ERDF).

The estimates of the total investments needed for energy efficiency indicates more than 86 billion Euros over 2021-2030 - of which nearly 30 billion Euros of public funding).

The NECP therefore highlights the importance to mobilize a large amount of private investments to achieve the expected results. For this challenging objective, the Spanish strategy relies on the leverage effect of the National Fund for Energy Efficiency and other public funds, particularly European funds, as well as on information and training activities for financial actors and the promotion of ESCOs.

Part 3: Key updates, improvements and conclusions

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP is aligned with the draft NECP in terms of ambition and scope (already high in the draft version), no significant changes have been made in this respect. The main improvements introduced in the final version refers to the details of information provided on the measures, and on the methodology (scenario analysis) which allows to clarify some of the unclear points highlighted in the draft NECP.

- *Main updates in relation to 2020 timeline*

The WAM scenario includes an intermediate milestone, expressed in primary energy consumption, in 2020 that is slightly higher than the Spanish 2020 target presented in the NEEAP2017:

The target, as defined in the NEEAP2017: is 122.6 Mtoe, while PEC target for 2020 as simulated in the WAM scenario NECP is 123.4 Mtoe

Looking at the 2030 target, the WAM scenario indicates a 22% PEC reduction compared to the WEM scenario, which is significant and ambitious.

The final NECP does not introduce or specify significant implementation updates or changes, nor completely new measures, moving from 2020 to 2030 timeline: The largest majority of the actions indicated were already included in the NEEAP2017 and are a continuation of existing measures.

Sweden

Part 1: EU target contribution

- *National contribution towards 2030 EU target*

Sweden plans to achieve 50% reduction in energy intensity in 2030 compared to 2005. Assuming that the economy will grow by 2% per year, the respective values for primary and final energy will be 461TWh and 339 TWh in 2030. The WEM scenario has been defined as the Swedish Energy Agency's Reference EU scenario, with energy and climate policies up to 01/07/2018. According to this scenario, Sweden's primary and final energy consumption will be 516 TWh and 384 TWh respectively in 2030 without additional policies and measures. The WAM scenario is not defined in final NECP. Instead of this, a dialogue between Swedish Energy Agency and other relevant authorities to design cost-effective strategies for the achievement of 2030 Energy Efficiency target is mentioned.

The national targets mentioned in the final NECP are the following:

- Sweden must cut its net greenhouse gas emissions to zero by 2045 and then achieve negative emissions. A maximum of 15% of emission reductions should come from additional measures.

- Sweden must achieve a 70% reduction compared to 1990 in emissions in the transport sector by 2030.

- Sweden must achieve a 75% reduction in emissions compared to 1990 from sectors outside the European Union's Emission Trading System (EU ETS) by 2040. A maximum of 2% can be generated from additional measures. Sweden must achieve a 63% reduction compared to 1990 in emissions from sectors outside the EU ETS by 2030. A maximum of 8% can be generated from additional measures. Sweden must achieve a 40% reduction compared to 1990 in emissions from sectors outside the EU ETS by 2020. A maximum of 13% can be generated from additional measures.

Beyond these targets, the Swedish Energy Agency has identified five sectors and has defined the following strategic areas with the relevant operators: fossil-free transport, world-class production, a flexible and robust energy system, future trade and consumption and resource-efficient buildings.

- *Contribution of PAMs and sectors*

The expected impact of PaMs in terms of energy savings is not reported in the final NECP with the exception of the main measure under Article 7 (Energy and Carbon Tax). The calculation methodology is also described only for Energy and Carbon Tax. This measure is expected to achieve cumulative final energy savings of 172.2 TWh in 2021-2030, and are thus sufficient to meet the target of 163 TWh. The contribution of the measures towards the Article 3 target is not reported. It's not clear which measures are new. It's mentioned that polices and measures up to 01/07/2018 are included in the Reference Scenario. The measures implemented after 2018 are the following: "Information Centre for Sustainable Building", "Development of local and regional capacity, including sustainable transport solutions".

Part 2: Policies and measures

- *Building renovation strategies*

The renovation strategy milestones are not mentioned in the final NECP. Sweden will eport its long-term renovation strategy, including indicative milestones, to the Commission by 10 March 2020. Some current renovation strategy measures are reported but without quantified savings. These include:

— National Board of Housing, Building and Planning Building Regulations (BBR)

— Support for renovation and energy efficiency measures in rented properties

— The renovation, conversion and extension deduction

— The National Renovation Centre (NRC)

— The Sustainable Building Information Centre

— Renoveringsinfo.se information website

From them, "The Sustainable Building Information Centre" is new measure (implemented after 2018).

- *Energy Efficiency Obligation Schemes*

The total cumulative savings requirement over the period 2021-2030 has been quantified as 163 TWh or 14015.5 ktoe. To note that this is a provisional total savings obligation based on Eurostat data for 2015-2017. The final energy savings obligation will be determined including the 2018 energy statistics. The main measure reported under Article 7 is the Energy and Carbon Tax. It's considered as an alternative measure. It's expected that Energy and Carbon Tax will generate cumulative energy savings equal to 172.2 TWh (14806.5 ktoe) in the period 2021-2030. This seems sufficient to achieve the 2030 requirement.

- *Central government renovations*

Sweden has opted for the alternative approach. No measures under Article 5 have been reported in the final NECP. The cumulative savings obligation for 2021–2030 is 28.6 GWh. It's mentioned that Fortifications Agency and National Property Board of Sweden will have to share the savings under Article 5.

- *Energy poverty measures*

No energy poverty measures are included in the final NECP. Sweden makes no distinction between energy poverty and poverty in general. As a result, the term energy poverty is not used, and there are no targeted policies to deal with it. The issue is addressed within social policy.

- *Funding of PaMs and required investments*

Planned budget has been quantified for some measures only. Some funding sources are also reported like the state budget, the Energy Efficiency Finance Facility (EEFF), the EU, the county councils and the regional associations.

Part 3: Key updates, improvements and conclusions

- *Main changes and improvements in relation to draft NECPs 2019*

The final NECP has addressed a few of the missing elements identified in the draft NECP, which include:
- Article 5: Some information on savings obligation under Article 5 has been provided. Sweden has opted for the alternative approach.
- Article 7: Expected energy savings of Energy and Carbon tax and provisional energy savings obligation 2021-2030 have been provided.

The overall ambition has remained the same. The 2030 target for 50% reduction in energy intensity compared to year 2005 remains the same as in the draft NECP. Primary and final energy values that can fulfil the 2030 target assuming that the economy will grow by 2% per year are also reported in the 2020 NECP. The energy saving obligations under Article 5 and 7 were missing from draft NECP and they have been provided in the final one.

- *Main updates in relation to 2020 timeline*

The same methodological approach is used for both 2020 and 2030 targets, through a linear progression of the country's energy intensity from 2015 onwards in order to reach 2020 (20% reduction compared to 2008) and 2030 (50% reduction compared to 2005). The 2020 target include fuels for non-energy purposes while the 2030 target not.
There are 10 measures included in final NECP and not mentioned to NEEAP 2017 (8 from Energy Efficiency Dimension). These are: 2 measures under Buildings Renovation Strategy, 2 measures for SMEs and industries, 3 cross-sectoral measures and 1 measure for Energy Supply. More specifically:

— The regulatory model for grid operators

— Sectoral energy efficiency strategies

— Energy step programme

— Energy mapping support

— Support for introduction to market, technology development and innovation clusters

— Development of local and regional capacity, including sustainable transport solutions

— The National Renovation Centre (NRC)

— Renoveringsinfo.se information website

The main measure under Article 7 (Energy and Carbon Tax) was also included in NEEAP 2017. It's mentioned that the actions under this measure adopted in and after 2021 will generate energy savings even beyond 2030. For the Renovation Strategy, there are also some actions introduced after NEEAP or implemented after 2018. These are mainly information initiatives (Information Centre for Sustainable Building, NRC, renoveringsinfo.se). Regarding Article 5, no specific implementation policies have been included in the final NECP.

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