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Assessment of the National Energy Efficiency Action Plans 2017 under the Energy Efficiency Directive

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ABSTRACT

The European Union (EU) has adopted a 2020 energy efficiency target, which is defined as energy consumption reduction by 20% compared to a BaU scenario by 2020 at EU level and is equivalent to energy consumption of no more than 1483 Mtoe in terms of primary energy or 1086 Mtoe in terms of final energy in 2020 (EED Article 3(1)(a)). The Energy Efficiency Directive, adopted in 2012, introduced a requirement for Member States (MSs) to establish indicative targets for 2020 taking into account the EU target and implement a set of binding measures in various sectors of the economy at national level. In compliance with the Directive's provisions, 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. This paper, which analyses the 2017 plans submitted by Member States, provides an overview of the national energy efficiency targets, outlines the various policies and measures and evaluates the progress made so far. The paper highlights the importance of good and complete NEEAPs and argues that a "strategic" and well-designed NEEAP, with detailed assessment of the energy savings, is an important enabler for MSs in reaching their targets and helps in predicting the energy consumption trajectory towards the EU 2020 target. The paper shows the main conclusions from the NEEAP 2017 assessment, identifying and presenting best practice policies, gaps, and national energy savings evaluation tools (e.g. bottom up or top down).

Introduction

Directive 2012/27/EU on energy efficiency (the EED or the Directive), adopted in 2012, laid down the foundation for more actions to be taken in order to keep the EU on track to reach the 2020 EE target. The Directive, which is a key part of the EU's overall climate and energy legislative package, requires 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 are 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 Directive's requirements, Member States are required to present the progress and efforts made in the so-called National Energy Efficiency Action Plans (NEEAPs) every three years, starting from 2014. To assist with the drafting of the plans, the European Commission published a template established under the Implementing Decision 2013/242/EU. The NEEAPs are regarded as strategic national policy documents, placing energy efficiency at the heart of energy policy (Broc, et al.,

2013; Economidou et al., 2015). They outline the energy efficiency targets set by each Member State and detail actions put in place to ensure that energy savings are generated in all sectors of the economy. Member States have had a long experience in drafting NEEAPs as these were first introduced in 2007 with the adoption of the Energy Services Directive 2006/32/EC (ESD). The first NEEAPs under the EED were submitted in 2014 (hereafter NEEAP 2014), replacing the final round of the NEEAPs under the ESD due to the overlap in the submission dates. It is expected that the current round of NEEAPs (NEEAP 2017) will be the final one as in the future; these will be replaced by the Integrated Energy and Climate Plans under the proposed Regulation on the Governance of the Energy Union[1].

As per the Directive's requirements, the European Commission's responsibilities include evaluating the plans and assessing the extent to which Member States have made progress towards the achievement of the national indicative energy efficiency targets and towards the implementation of the Energy Efficiency Directive in general. As with the analysis of previous NEEAPs, the Joint Research Centre[2] has undertaken the task of evaluating the second National Energy Efficiency Action Plans of the EED (NEEAP 2017) and the results of this work are presented in this paper.

The paper first discusses the implementation of the energy efficiency targets at Member State level and provides an overview of revisions presented by Member States in the latest round of NEEAPs. A review of the ambition level of the targets is carried as well as the progress made so far. An overview of policies measures at end-use and energy supply levels is then carried out, highlighting new elements identified in this round of NEEAPs. Recommendations are drawn in the Conclusions section.

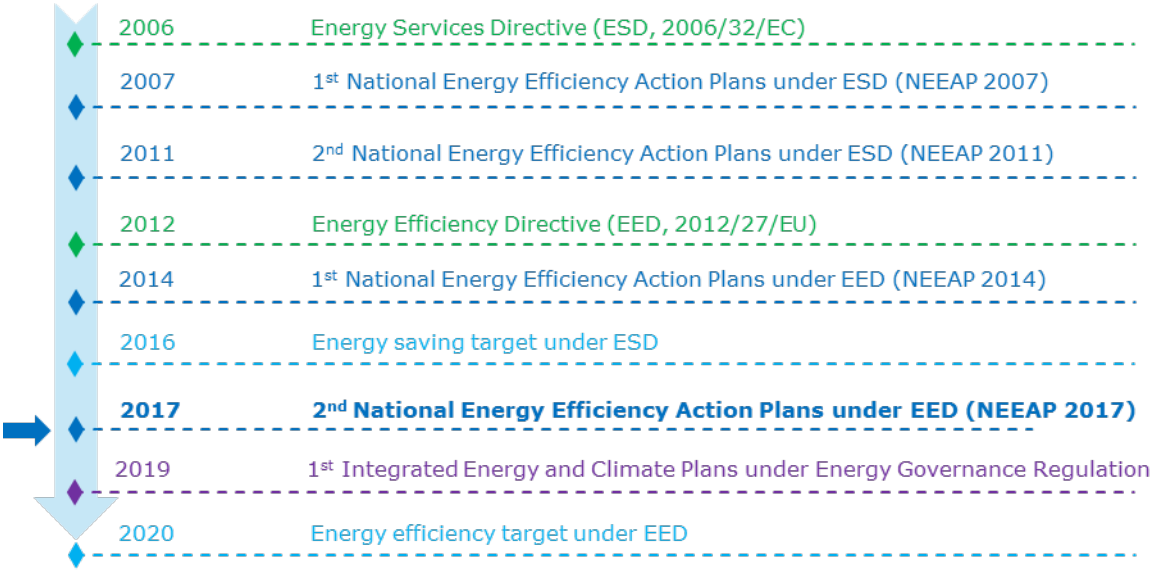

Figure 1. Timeline of NEEAPs

Energy efficiency targets

In accordance with Article 3, Member States had to set indicative energy efficiency targets – based on either primary or final energy savings, primary or final energy consumption or energy intensity – in view of reaching the overall EU target of 20% reduction in primary (PEC) or final energy (FEC) consumption

[1] The regulation, which was proposed by the Commission on 30 November 2016, is still under discussion http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2016:759:REV1.

[2] The Joint Research Centre (JRC) is the European Commission's science and knowledge service, supporting EU policies with independent scientific evidence throughout the whole policy cycle.

by 2020. Based on previous notifications made by Member States in 2013-2016[3], the collective MS target efforts summed to 1526 Mtoe in terms of primary energy – corresponding to a target of 17.6% at EU level compared to PRIMES 2007 reference scenario (Capros et. al, 2008) – and 1086 Mtoe in terms of final energy (corresponding to a target of 20.6%). With the NEEAP 2017 submissions, some Member States notified revisions to their targets and the sum of indicative targets now stands at 1527[4] Mtoe in terms of primary energy and 1080 Mtoe in terms of final energy; this corresponds to 17.6% of primary and 20.5% and final energy reduction, respectively.

Table 1 summarises the breakdown of the indicative final and primary energy consumption targets by Member State as presented in the latest NEEAPs. In total, 10 Member States revised their previously set targets: Czech Republic, Ireland, Spain, Cyprus, Malta made "upward" revisions – in other words target consumption levels for 2020 are now set at a higher level than before, while Croatia, Italy, Denmark, Sweden, Lithuania and the Netherlands revised their targets downwards. For countries without any specific target notifications in their NEEAPs, it was assumed that no changes to the target have been made.

The updates stemmed from various modelling revisions recently carried out by national authorities. Table 1 gives an overview of the latest changes/updates in targets. Examples include Spain, which raised its 2020 consumption target due to "the most recent macroeconomic forecasts". Specifically, gross domestic product (GDP) grew in 2015 by 3.2%, well above the 1.4% of the previous year, confirming recovery of the drive the country had sustained until the beginning of the financial crisis in 2008. The new revised 2020 target is still considered ambitious, as it represents a 24.7% reduction compared to the PRIMES 2007 reference scenario. Sweden adjusted its energy intensity for the base year of 2008 from 164 to 156 Wh/SEK[5] due to changes implemented by Eurostat on how to report GDP values. The Swedish energy efficiency target of 20% reduction in energy intensity means that the target is adjusted to 125 Wh/SEK by 2020 instead of the previously notified 131 Wh/SEK. Ireland revised its baseline and policy scenarios in 2020: primary energy has been raised up to 175,636 GWh under the baseline scenario and 173,326 GWh under the energy efficiency scenario compared to 167,821 GWh (baseline) and 157,110 GWh (energy efficiency). The trends to 2020 are influenced by macro-economic variables (changes in projected energy prices, GDP growth rates etc.) together with the estimated impact of energy efficiency policies and measures. New projections of final and primary energy consumption were also prepared by Croatia. The new final and primary energy consumption projections were harmonized with the Low Carbon Development Strategy of the Republic of Croatia by 2030 with an outlook to 2050. These included data on energy consumption from the revised energy balances following a survey carried in 2015. This survey led to a correction of consumption of biomass energy for the period between 1990 and 2015. While before the Czech Republic previously used the IEA methodology to calculate its target, it now uses the Eurostat methodology, leading to an increased target.

Given the variation of assumptions and input parameters used by Member States to define national reference scenarios, direct comparability of the percentage reduction applied to deduce national targets across the EU cannot be made. While the EU target was set in accordance to the PRIMES 2007 scenario, Member States were only required to take into account that the Union's 2020 energy consumption target (EED Article 3(1)(a)) and were free to determine their own national contributions towards the EU target, both in terms of ambition level, use of reference scenario and methodological approach. To create a common benchmark and examine the ambition level of the national targets on a "level playing field", a comparison of the energy consumption targets set by Member States in Table 2 is made with: (1) the national projected 2020 baseline consumption as set by the PRIMES 2007 model and

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

[4] These will be updated once all NEEAPs are submitted.

[5] 1 Swedish Krona equals 0.098 Euro

(2) historical consumption levels in 2005[6]. Table 2 shows the percentage reduction in 2020 derived by comparing PEC and FEC[7] targets against the national BAU values estimated by the Primes 2007 model and against the national historical consumption levels. According to the Primes 2007 comparison, the savings vary greatly, from -33% to +16% in terms of primary energy and from -4% to -34% in terms of final energy. The 2005 consumption comparison reveals ranges from -20% to +21% of primary energy savings and -21% to +66% of final energy savings. Positive savings depict cases where the target consumption is larger than the reference value: these stem from differences in approach adopted by Member States in defining their baseline scenarios compared to the PRIMES model in the case of Primes 2007 comparison and substantial economic growth experienced by some EU Member States over the last decade in case of the historical consumption comparison. Based on the Primes 2007 analysis, the most ambitious targets are set by Lithuania, Greece, Italy, Portugal and Spain (in terms of primary energy) and Croatia, Hungary, Slovakia, Bulgaria and Lithuania (in terms of final energy). In terms of the historical consumption comparison, the top 5 countries in terms of 2020 ambition are the UK, Lithuania, Greece, Netherlands, and Belgium for primary energy target and Slovakia, France, Hungary, the UK and Bulgaria for the final energy target.

Table 1. Updated Article 3 target consumption levels reported in NEEAPs 2017 (Values in red indicates cases where target consumption has increased with respect to previously notified target)

	Primary Energy Consumption Target [Mtoe]		Final Energy Consumption Target [Mtoe]	
Source	**NEEAP 2014, etc.***	**NEEAP 2017**	**NEEAP 2014, etc.***	**NEEAP 2017**
BE	43.7	"	32.5	"
BG	16.9	"	8.6	"
CZ	39.6	44.3	25.3	"
DK	17.4	17.2	14.4	"
DE	276.6	"	194.3	"
EE	6.5	"	2.8	"
IE	13.9	14.9	11.7	12.8
EL	24.7	"	18.4	"
ES	119.8	122.6	80.1	87.2
FR	219.9	"	131.4	"
HR	11.1	10.71	7	6.96
IT	158	153.6	124	118.0
CY	2.2	2.2	1.8	1.9
LV	5.4	"	4.5	"
LT	6.5	Not disclosed	4.3	4.2
LU	4.5	"	4.2	"
HU	24.1	"	14.4	"
MT	0.7	0.8	0.5	0.6
NL	60.7	58.2	52.2	Not disclosed
AT	31.5	"	25.1	"
PL	96.4	"	71.6	"
PT	22.5	"	17.4	Not disclosed

[6] This reference period was chosen for the following reasons: (1) the period was before the 2008 financial crisis, meaning that this baseline is not affected by the substantial drop of consumption experienced due to lower economic activity and (2) alignment with the five-year reference period used to calculate the savings under the ESD approach by most Member States.

[7] PEC: Primary Energy Consumption; FEC: Final Energy Consumption

RO	43.0	"	30.3	"
SI	7.1	"	5.1	"
SK	16.4	"	9.2	"
FI	35.9	"	26.7	"
SE	43.4	Not disclosed	30.3	Not disclosed
UK	177.6	Not disclosed	129.2	"
Total	**1526**	**1527.1**	**1077**	**1079.6**

Footnotes:
* : In addition to the NEEAPs 2014, this information may stem from notifications sent by Member States in 2013, annual reports or separate notifications to the European commission in 2015 and 2016
" : Same as before, no updates to the target are reported in NEEAPs 2017

At EU level, the final energy consumption based on the latest Eurostat data for 2015 stands at 1083 Mtoe in final and 1531 Mtoe in primary energy. The 2015 levels were therefore below the final energy target of 2020 by -3 Mtoe and slightly above the primary target by +48 Mtoe. The progress at Member State level varied from country to country. In 2015 19 Member States already reached or were below their 2020 targets in terms of primary energy and 17 Member States in terms of final energy. These countries must continue on-going efforts to ensure consumption levels remain below their 2020 targets in the near future. Poland, Romania, Belgium, registered the largest absolute drop in final energy consumption with respect to their 2020 targets, while Poland, Spain, Italy, and Romania in terms of primary energy. In relative terms, Romania, Latvia, Cyprus had the largest drops with respect to their final energy targets (-28%, -16% and -13%, respectively), and Romania, Croatia, and Latvia with respect to their primary energy targets (-27%, -25%, and -21%, respectively). On the other end of the spectrum, France, Germany, the UK, Netherlands, Belgium, Bulgaria, the Czech Republic, Sweden and Ireland were still away from their 2020 targets in 2015, with France, Germany and the UK registering the largest absolute gap with respect to their national targets. In relative terms, the Netherlands, France, and Germany are associated with largest gap, which stand at +11%, +9% and 6% of the 2020 primary energy target, respectively. In terms of final energy, France and Germany have the largest absolute gap between actual consumption in 2015 and 2020 target. In relative terms, Lithuania and Hungary are the most distant from their target, with a gap of +13% and +20%, respectively.

Table 2. Comparison of EE national targets with projected consumption levels estimated by PRIMES 2007 baseline model in 2020 and historical 2005 consumption data

	PEC savings against …		**FEC savings against …**	
	PRIMES 2007 projections	**Historical 2005 data**	**PRIMES 2007 projections**	**Historical 2005 data**
BE	-18%	-15%	-18%	-11%
BG	-22%	-11%	-33%	-16%
CZ	-3%	+4%	-20%	-4%
DK	-14%	-11%	-14%	-7%
DE	-8%	-13%	-15%	-11%
EE	+16%	+21%	-26%	-1%
IE	-20%	+1%	-15%	+1%
EL	-31%	-19%	-29%	-12%
ES	-25%	-10%	-29%	-11%
FR	-20%	-16%	-25%	-18%
HR	-3%	+18%	-30%	-4%

IT	-26%	-15%	-27%	-14%
CY	-19%	-9%	-11%	+5%
LV	-21%	+20%	-27%	+12%
LT	-33%	-19%	-34%	-11%
LU	-20%	-6%	-20%	-5%
HU	-19%	-5%	-34%	-21%
MT	-11%	-14%	-12%	+66%
NL	-23%	-15%	-9%	-4%
AT	-13%	-3%	-21%	-10%
PL	-12%	+10%	-8%	+22%
PT	-25%	-10%	-25%	-8%
RO	-14%	+17%	-16%	+23%
SI	-19%	+2%	-24%	+5%
SK	-19%	-8%	-32%	-20%
FI	-4%	+8%	-4%	+6%
SE	-22%	-11%	-21%	-10%
UK	-17%	-20%	-18%	-15%

Note: The above percentage reductions depict either: the difference between the PRIMES 2007 (reference scenario) consumption values in 2020 and 2020 target values set by each Member State (see Table 1) divided by the PRIMES 2007 values or the difference between the average historical consumption in 2005 and 2020 target divided by the average historical consumption in 2005. Negative values translate to energy savings; that is, target consumption is lower than reference scenario consumption. Conversely, positive values mean that target consumption is larger than the reference value

Policy measures[8]

Various policy measures are reported in the NEEAPs targeting each sector of the economy, individually or in a horizontal manner. This includes both existing measures – that is, measures that have already been mentioned in previous NEEAPs – and new measures. Reported measures fell under one or more different policy types: regulations, standards, funds, financial & fiscal measures (including taxation and incentives), market-based instruments and measures on information, knowledge & advice as well as education, qualification & training. Other measures included voluntary agreements, initiatives, plans, roadmaps, competitions, public investments, market surveillance etc. Measures targeted all sectors of the economy: residential, services, industry, transport and energy supply sector[9]. Some measures, e.g. fuel/electricity taxes in Austria, Denmark, Estonia, Germany, the Netherlands and Sweden, are applied at cross-sectoral level. The EED has also been a driver of the implementation of energy efficiency obligation schemes (EEOSs) across many EU countries (Fawcett et al., 2017). The measures described below are mainly new or updated measures identified in the NEEAPs 2017.

Residential and services sectors

The residential and service sectors benefit from a wide range of policy measures. Regulatory measures were mostly composed of requirements related to Energy Performance of Buildings Directive and Eco-design Directives[10]. Examples include minimum energy performance requirements for

[8] At the time of writing this paper, some NEEAPs were not available for analysis.

[9] Whilst this is not a requirement of the EED, some Member States (e.g. the Netherlands, Finland, Czech Republic, Denmark and Belgium) reported measures covering the agriculture sector.

[10] The EED is complemented by other directives, and it is expected that some measures stemming from these directives will contribute to the EU energy efficiency target

new/existing buildings, inspections of water boilers and air conditioning systems and energy efficiency standards for appliances & equipment. Such measures were mentioned by Denmark, Ireland, France, Cyprus, Luxembourg, Hungary, the Netherlands, Slovakia and Finland. A few regulatory measures enacted with the aim to address the issue of split incentives were also mentioned: the Housing Valuation System in the Netherlands now appraises energy performance – on the basis of the energy label – to promote energy efficiency investments, while a new bill was adopted on 17 May 2016 stipulating that landlords renovating their properties at nearly zero- energy or zero-energy levels can charge an energy performance surcharge to their tenants so as to earn back part of their investment costs. France also removed some legal barriers in relation to split incentives by amending the rules on decisions on work in the Construction and Housing Code and enabling financial contribution by tenants after owners carry out energy efficiency upgrades. In France, the Law No 2015-992 of 17 August 2015 on the energy transition in support of green growth (LTECV) sets ambitious objectives for the building sector, including the requirement of 'low consumption standard' renovations of all buildings by 2050, energy efficiency upgrades of 500,000 homes per year from 2017 (at least half of which must be low-income households), the requirement of all private residential buildings with primary energy consumption of more than 330 kWh/m^2 to undergo energy efficiency upgrades by 2025 and more stringent obligations regarding upgrading work in the non-residential sector every 10 years. Specific regulatory measures for the services sector include the Luxembourgish scheme on improvement of lighting in non-residential buildings, introducing specific energy efficiency requirements for lighting in new non-residential buildings and the Dutch Environmental Management Act for non-residential buildings which places a legal obligation to take energy efficiency measures with a payback time of less than 5 years in large or medium-sized companies with energy consumption of more than 50,000 kWh and 25,000 m^3 gas as well as offices, healthcare institutions and schools.

All Member States have reported financial and fiscal measures supporting energy efficiency improvements in these sectors. These included grants, low-interest loans and fiscal incentives. Some new measures include the national programme for energy efficiency of multi-family buildings in Bulgaria, providing both financial and organisational support to homeowner associations registered under the Condominium Management Act for energy efficiency upgrades of the buildings they live in. In Germany, two new measures were identified: the Heating Optimisation Funding Programme, which provides funding for low-investment measures to optimise existing heating systems and the initiative 'EnEff.Building.2050' which provides funding for model projects demonstrating ambitious energy concepts for buildings/districts with the aim to encourage their widespread adoption. Ireland has recently launched two pilot schemes: the expansion of the Warmer Homes scheme to homes of private tenants who are in receipt of the Housing Assistance Payment and the Deep Retrofit Pilot Scheme, a new scheme to provide financial support (50% funding of the total capital costs and project management (including design, costs) for substantial upgrades in residential buildings that achieve a building energy rating of A3 (<50 kWh/m^2) or a minimum uplift of 150 kWh/m^2 yearly, equivalent to zero energy requirements or a significant reduction in the energy required within a building. With the Federal Act, Austria brought about the establishment of a housing construction investment bank (WBIB). The housing construction investment bank is intended to provide commercial and non-profit property developers with long-term and inexpensive loans to be used for financing affordable living space. Other measures include the new Slovakian Single-family Building Insulation Support Programme announced in 2016, with an allocated budget EUR 30 million and 'I save-I upgrade' Scheme in Cyprus.

Various measures on information and awareness-raising have been mentioned for residential and service sectors. In France, 450 Renovation Information Service Points (PRIS) have been set in the country with the aim to help owners make decisions through the implementation of a national one-stop approach and a local network for the energy renovation of private dwellings. This is a local public service, which provides independent technical, financial, fiscal and regulatory information and gives advice, free of

charge and objectively, to the enquiring home-owner on the design of the energy renovation project. Since 2016, the 'Deutschland macht's effizient [Germany Makes It Efficient]' campaign has provided information on energy efficiency potentials and sources of funding to those involved in the energy transition, with a particular focus on the buildings sector. In Ireland, the Technical Bureau was set up in 2017, with the objective to provide tailored advice and support to schools and the Department of Education and Science and identify/take advantage of opportunities to reduce energy use and improve energy performance in school building fabric. The Netherlands launched the Energy Saving Expertise Centre in 2015 and its new 'Save energy now' campaign in October 2016. The latter focuses on homeowners of a label C or lower residence who are considering energy-saving measures but have not yet implemented them because of, for example, the expense, the investigation required or the mess created.

Industry

All Member States have enacted new or revised existing legislation that puts into effect the mandatory requirement of energy audits in enterprises that are not SMEs (EED Article 8). According to the EED, the definition of micro, small and medium-sized enterprises is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. Most Member States adopted this definition in their enacting legislation.

Beyond mandatory audits, voluntary agreements in industry are a common policy instrument in many Member States. Belgium (Flanders), Denmark, Croatia, Finland, Ireland, Luxembourg, the Netherlands, Portugal, Sweden and the UK have established such agreements with industry actors, with the aim to engage various enterprises in energy efficiency measures. In Denmark, the Danish Energy Agency entered into energy efficiency agreements with large, energy-intensive enterprises since 1996. Long-term agreements with industry, transport, agriculture and services sectors have also been in place in the Netherlands since 1992. In Finland, medium-sized industrial companies and energy intensive industries can enter into an agreement, which allows them to receive subsidies of up to 25% of the investment costs of energy-efficient measures. In projects involving ESCOs, subsidies can go up to 30% of the costs. In Ireland, over 3,000 Irish SMEs are engaged in voluntary agreements, receiving strategic support, training funding and advice for energy projects. In Sweden, the Programme for improving energy efficiency (PFE) is one of the main measures towards the improvement of energy efficiency in the industry sector, which has been in place since 2004. In Croatia, the new Industrial Energy Efficiency Network (IEEN) to be implemented in 2017-2025 includes a series of activities, aimed at promoting energy efficiency in industry such as establishing a list of experts competent for the field of energy efficiency in the commercial sector, proposing pilot projects, promotion of best practice projects, education and training and implementing/monitoring plans on an annual level in terms of spent resources and achieved savings of energy and CO_2 emissions. The Czech Republic and Slovakia have notified intentions of putting in place voluntary agreements with industrial enterprises.

Various financial incentives are offered to industry actors. Some long-standing measures include, the Energy Audits programme in Finland, launched in 1992, which granted EUR 1.2-3.4 million year between 2003 and 2015, with an average of EUR 1.7 million per year, however since the transposition of EED, subsidies are no longer available for large companies. Subsidies for energy audits have also been mentioned for France, Wallonia, Greece (to start in 2015) and Lithuania. The promotion of energy audits for SMEs in the Bratislava Region, Slovakia is also now made available. In Croatia, two new measures were mentioned in the industry sector: a grant scheme for manufacturing industry focusing on promotion of energy efficiency and development of infrastructure for renewable energy sources in industrial production, including the transition from conventional to alternative energy sources (RES) such as solar collectors, heat pumps, highly efficient co-generation, transition to more efficient fuels with less footprint.

In Portugal, the on-going SGCIE - Management System of Intensive Energy Consumption – programme has the objective to promote energy efficiency and monitor energy consumption for intensive consuming installations (>500 toe). In Belgium (Flanders), grants through the Ecology Grant Plus and Strategic Ecology Aid programmes are offered to enterprises as of 2012 to encourage a more energy efficient organization of their production processes. In addition, since 2012, green guarantees have been available for entrepreneurs to finance energy saving investments with a maximum payback time of 10 years. Grant support through the Accelerated Capital Allowance is also provided for energy efficient equipment in Ireland. For the Latvian industry, a grant scheme for renovation of Industrial buildings and Industrial processes, using Structural funds and CCFI funds is indicated; for 2014-2020, € 32.56 million of structural funds have been allocated to facilitate the efficient use of energy and reduce energy consumption in the manufacturing industry. France also offers subsidised loans for energy efficiency investments, in particular for SMEs. In Denmark, a fund of DKK 3.75 billion (equivalent to 503 million EUR) has been allocated from 2013 to 2020 inclusive to support enterprises, in the form of grants, that replace fossil fuels with renewable energy in their production processes or switch to district heating.

Transport

Various measures targeting both the private and public transport sectors are reported in the NEEAPs. These measures include support for low-emission vehicles, measures to shift the transport towards cleaner modes (modal shift), measures to promote electro-mobility, actions to promote behavioural change (e.g. through eco-driving training) and efficiency improvements/upgrades in the public transport fleet. Many of the measures mentioned in the NEEAPs are a continuation of existing policies already in place, while others are new. Various transport-related measures stem from existing EU regulations: e.g. Regulation (EU) No 333/2014 on CO_2 emissions from new passenger cars and Directive 2014/94/EU on the deployment of alternative fuels infrastructure. Emission performance standards for new light commercial vehicles and passenger cars were mentioned by Finland, France, Italy, Ireland, Portugal and the UK, while alternative fuels infrastructure by Italy, Ireland and Croatia.

Transport plans and strategies, laying out an umbrella framework with long-term strategic objectives and measures covering the transport sector are also reported in the NEEAPs. Existing transport plans and strategies include the “Overall transport plan for Austria” which sets a target of reducing CO_2 emissions by 19% and energy consumption by 12.5% by 2025 compared to 2010, the Mobility and Fuel Strategy (MKS) in Germany, the Mobility Regional Plan in Brussels, Finland's Environmental Strategy for Transport 2013-2020 and Estonia's Transport Development Plan 2014-2020. Planned or new strategies were also identified. In the Czech Republic, the National Action Plan for Clean Mobility was approved at a meeting of the Czech Government 20 November 2015 and lays down requirements for the construction of filling and charging stations between 2020 and 2030. In Slovakia, a new transport development plan to 2030 was adopted in 2017. In Cyprus, new traffic studies concerning various cities are expected to be launched in the form of an "Integrated Urban Transport Plan", with emphasis on public transport. Malta opened up consultations for a National Master Plan, which will set out the framework and overall priorities to guide air, sea and land transport sector investments.

Various measures targeting upgrades in the public transport are identified. The Brussels region plans to gradually introduce electric buses as of 2019 with the aim to reach an entirely electric bus fleet in 2030, while the Flanders plan to purchase alternative fuel (hybrid, electric, hydrogen, etc.) public buses. In Latvia, the public transport fleet is continuously upgraded, and new buses now meet the latest Euro Standards. The use of electric or hybrid buses are also mentioned in Austria, UK and Slovakia. Rail infrastructure investments including electrification are mentioned by Bulgaria, Czech Republic, Denmark, Latvia, and UK, while metro extension by Bulgaria, Czech Republic, Denmark, Greece and Italy. As part of road infrastructure improvements, the introduction/extension of special lanes for buses and bicycles are

undertaken by Bulgaria, Spain, Hungary, Malta and Belgium. Efforts to improve modal shift are mentioned in various countries, including France, Ireland, Latvia and Slovakia.

Actions aimed at promoting modal shift in personal mobility and freight transport towards modes which consume less energy are also included in various NEEAPs. The set-up of new intermodal connections for passengers in Sofia was reported in the Bulgarian NEEAP, while the Spain NEEAP mentioned an aid programme for modal shift and more efficient use of transport modes provided incentives to promote energy efficiency and CO_2 emission reduction projects via measures to trigger a modal shift and more efficient use of transport modes. In France, modal shift encouragement is mainly achieved through the long-term improvement of rail networks, together with the continuation of infrastructure projects in the context of realistic and financially sustainable programming. Four high-speed railway lines have just been brought into service or are under construction and will be brought into service shortly. In Ireland modal shift is promoted through the provision of funding for infrastructure, behavioural change programmes and through taxation incentives such as the Cycle to Work Scheme and the Tax-saver Scheme. Under the Capital Plan, €100 million has been committed to Smarter Travel Programmes and carbon reduction measures, to improve access to alternatives to the private car through the availability of public transport links and routes that are cycle and walking-friendly. In Belgium, fiscal incentives for company employees and administrations of public services are available, aiming at stimulating bicycle use for home-work commuting. Flanders Synchro-modal[11], a promotional and project agency dedicated to a modal shift towards inland shipping and rail transport, plans to increase the share of inland shipping in the modal shift, with support measures for pallet transport, among other things.

Training of vehicle drivers for fuel-efficient driving is mentioned by Bulgaria, Austria, Czech Republic, Denmark, the Netherlands, Croatia, Spain, Finland, France, Ireland and Belgium. In addition, promotion of electro-mobility and specifically electric vehicles is provided in different forms. This includes special incentives for electric vehicles, public investments supporting the growth of recharging station networks and access to information on electro-mobility. Various measures are reported by Greece, Denmark, Austria, Croatia, Spain, Slovakia, Hungary, France, Latvia, Ireland and the UK. Under the Provincial environmental fund of the province of Styria, Austria, new funding opportunities are available for electric vehicles since 2016, including cargo/folding bikes, e-bikes and e-charging stations. The development of infrastructure through, inter-alia, the provision of e-charging stations and plug-in spots is promoted in Croatia through its Development of alternative fuels infrastructure programme. In Spain, the 2014 MOVELE Programme formed part of Spain's Comprehensive Electric Vehicle Stimulus Strategy for 2010-2014, which consisted of a series of measures to provide strong incentives for the introduction of electric vehicles, support of electric vehicle technology mass-production and R&D, and development of electricity infrastructure to provide charging facilities. This was extended to 2015 as well. To support the development of electro-mobility in France, it is planned to roll out one million recharging points for electric vehicles (private and public) by 2020. The implementation of the support measures for the development of electric vehicles or plug-in hybrid and electric vehicles in France is estimated to generate annual final energy savings of 0.15 Mtoe in 2020 and 0.65 Mtoe in 2030. In Hungary, measures supporting the growth of electric cars range from free parking provisions, VAT refund as well as registration/motor vehicle tax relief. In Ireland, a zero emissions band for electric vehicles was introduced for motor tax purposes only and in Flanders electric vehicles and vehicles powered by hydrogen are exempt from CO_2 emission taxes from January 2016. Slovakia launched a new grant scheme for electric passenger vehicles in transport, offering EUR 5,000 grant per vehicle to natural persons.

[11] Synchro-modal planning is a form of multimodal planning in which the best possible combination of transport modes is selected for every transport order.

Conclusions

The NEEAPs submitted by Member States under the EED typically represent the most comprehensive national strategies on energy efficiency at national level, laying out adopted targets and an inventory of policies and measures. The EED offers a good frame that complements other EU directives, including the Energy Performance of Buildings Directive (Directives 2010/31/EU, 2002/91/EC), Ecodesign and Energy Labelling Directives (Directives 2009/125/EC, 2005/32/EC, 2010/30/EU), Regulation (EU) No 333/2014 on CO_2 emissions from new passenger cars, Internal Market for Electricity (2009/72/EC) and Gas (2009/73/EC) Directives and the Emission Trading Scheme (Directive 2003/87/EC). The previous experience gained through the submission of NEEAPs under the Energy Services Directive 2006/32/EC (ESD)[12] has provided a strong foundation upon which Member States have continued to develop and strengthen their energy efficiency policy strategies. In addition, the publication of the NEEAP template resulted in more homogeneous reporting among Member States compared to past NEEAPs submitted under the ESD.

The NEEAPs contain information on a plethora of energy efficiency policies and measures. While the majority of the measures presented in the NEEAPs are existing measures[13], the EED has also been a driver for new measures in many Member States. In addition to the establishment of EEOSs, new or updated policy measures in the area of financing, information exchange, regulations as well as transport-related measures have been identified. It should be noted that in most cases the impact of the policies has been expressed in terms of energy savings, and rarely in other indicators such as job creation, greenhouse gas emissions reduction or improved air quality. Moreover, the energy savings generated by each measure has not always been quantified in the NEEAPs (Broc et al., 2017). The evaluation of the ambition of the overall national policy framework against the national targets is therefore not possible in a quantitative way. For certain cases, the share of the savings to be achieved in 2020 by each sector or policy measure is presented, demonstrating how each sector or measure contributes towards the achievement of the target.

While the NEEAP is a key tool for the presentation of the plan and for the monitoring of the energy savings already achieved and expected in the future, a more systematic approach towards reporting of measures is generally recommended for future reporting exercises. This is especially true in the context of the new Integrated Energy and Climate Plans (IECPs) under the proposed Energy Governance Regulation. Given that energy efficiency will constitute one of the 5 dimensions of the new IECPs, a structured framework which ensures a harmonised reporting and the provision of minimum set of information across all Member States is of crucial importance. The reporting template developed by the European Commission can be further developed to enable tracking of important implementation details such as breakdown of savings by policy measure, calculation methodology of energy savings, use of exceptions etc. An e-reporting platform to collect national data can further facilitate this implementation monitoring process and at the same time create a more efficient system of reporting while reducing administrative burden for national experts. The issue of data gaps in current reporting formats could also be addressed by ensuring that the platform requests a mandatory set of minimum information to be reported by each Member State. Data consistency and other checks can also be embedded in the platform to ensure sufficient data quality. In the new proposed Proposal for a Regulation on the Governance of the Energy Union published by the Commission, the establishment of such a reporting platform is indeed envisaged and is expected to streamline all reporting obligations in the area of energy and climate in an integrated way (Commission, 2016/0375 (COD)).

[12] In compliance with the ESD, the first and second ESD NEEAP were due in 2007 (a year after the entry into force of the ESD) and 2011.

[13] This is expected for MSs with successful long lasting measures.

The review of the implementation of the Energy Efficiency Directive has also pointed out some important implementation lessons as we move forward to the revised EED and new timeline to 2030 (Commission, 2016/0376 (COD)). The positive experience gained in the EU through the NEEAPs and lessons learned could be also used to other jurisdictions outside Europe to help prepare national energy efficiency strategies.

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