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Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

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II

(Non-legislative acts)

RECOMMENDATIONS

COMMISSION RECOMMENDATION (EU) 2019/1658

of 25 September 2019

on transposing the energy savings obligations under the Energy Efficiency Directive

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 292 thereof,

Whereas:

- (1) The Union is committed to developing a sustainable, competitive, secure and decarbonised energy system. The Energy Union Strategy established ambitious Union objectives. It notably aims to reduce greenhouse gas emissions by at least a further 40 % by 2030 compared with 1990, to increase the use of renewable energy to at least 32 %, and to make ambitious energy savings, improving energy security, competitiveness and sustainability. Directive 2012/27/EU of the European Parliament and of the Council ⁽¹⁾ (the 'Energy Efficiency Directive' (EED)), as amended by Directive (EU) 2018/2002 ⁽²⁾, establishes a headline target of at least 32,5 % energy savings at EU level by 2030.
- (2) Moderation of energy demand is one of the five dimensions of the Energy Union Strategy, as established in the Commission Communication of 25 February 2015 on 'A framework strategy for a resilient energy union with a forward-looking climate change policy'. The EU's achievement of its energy and climate goals depends on prioritising energy efficiency, applying the 'energy efficiency first' principle and considering the deployment of renewables.
- (3) The Communication on a European strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy ⁽³⁾ stresses that energy efficiency measures should play a central role in achieving a climate-neutral economy by 2050. Regulation (EU) 2018/1999 of the European Parliament and of the Council ⁽⁴⁾ (the 'Governance Regulation') requires Member States to uphold the 'energy efficiency first' principle.
- (4) In its impact assessment for the amended EED ⁽⁵⁾, the Commission estimated that the implementation of its Article 7 EED would deliver more than half of the energy savings Member States should achieve under the EED.
- (5) The EED as amended has an impact on both the current (2014-2020) and (mainly) the future obligation periods (2021-2030 and beyond). Member States should be supported in implementing new requirements (relevant for both obligation periods), in implementing existing requirements differently (relevant for both obligation periods), and in identifying which requirements have been clarified but not changed.

⁽¹⁾ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

⁽²⁾ Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (OJ L 328, 21.12.2018, p. 210).

⁽³⁾ Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank 'A Clean Planet for all — a European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy' COM(2018) 773 final.

⁽⁴⁾ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1).

⁽⁵⁾ SWD(2016) 402 final.

- (6) The EED as amended extends the energy savings obligation to the period from 1 January 2021 to 31 December 2030 and beyond (subject to review by the Commission). In each year of the 2021-2030 obligation period and beyond, Member States must achieve cumulative end-use energy savings equivalent to new savings of 0,8 % of final energy consumption in the period and beyond. As an exception, Cyprus and Malta are required to achieve cumulative end-use energy savings equivalent to new savings of only 0,24 % of final energy consumption in the period and beyond.
- (7) The EED as amended also provides clarifications on the calculation of the amount of energy savings. The changes clarify that energy efficiency obligations schemes and alternative policy measures are on equal footing and that they can be combined. Member States have a margin of discretion in designating obligated parties and accrediting the amounts of energy savings to be achieved by each party. The EED as amended provides flexibility to Member States to choose, from among various types of schemes, the system best suited to their particular situation and circumstances.
- (8) If the Member States are to achieve their energy savings obligation, it is important to raise public awareness and provide accurate information on the benefits of energy efficiency. This can be done by means of training or education programmes.
- (9) The changes explicitly allow Member States to take policy measures targeting particular sectors, for example buildings or the water sector.
- (10) The effective management of water can make a significant contribution to energy savings and Member States should explore the potential of further measures in this area. They are also encouraged to develop policy measures that simultaneously address other targets relating to the protection of the environment and natural resources.
- (11) To enhance efforts to alleviate energy poverty, Member States should implement some energy efficiency policy measures as a priority among vulnerable households and establish criteria for how they will address energy poverty.
- (12) The EED as amended contains clearer requirements regarding the lifetime of measures. When calculating the amount of energy savings, Member States should take into consideration how long a measure will continue to generate savings, but also the possibility of it generating fewer savings over time.
- (13) The amended EED clarifies that, when calculating energy savings, Member States should not take account of action that they would have taken in any event and that they can claim only savings that go beyond the minimum required under specific EU legislation. There is an exemption for energy savings from the renovation of buildings.
- (14) The amended EED emphasises the importance of monitoring and verification in ensuring that energy efficiency obligation schemes and alternative policy measures achieve their objectives. The guidance provided with this Recommendation Member States shows how Member States may establish effective measurement, control and verification systems.
- (15) Given the importance of energy generated on or in buildings from renewable energy technologies, the guidance provided with this Recommendation explains how Member States may count end-use energy savings stemming from policy measures promoting the installation of small-scale renewable energy technologies against their energy savings obligation.
- (16) Member States are to bring into force the laws, regulations and administrative provisions transposing the energy savings obligation by 25 June 2020. With the entry into force, the amendments to Article 7 EED have an impact on the implementation of the energy savings obligation for the obligation period 2014 to 2020. The guidance provided with this Recommendation will support Member States also in this regard.
- (17) The full transposition and effective implementation of the EED, as amended, is necessary if the EU is to achieve its 2030 energy efficiency targets and deliver on the commitment to put consumers at the heart of the Energy Union.
- (18) Member States have a margin of discretion to transpose and implement the amended requirements regarding their energy savings obligations in a way that is best suited to their national circumstances. This Recommendation explains the amended requirements and illustrates how the objectives of the Directive can be achieved. The aim in particular is to ensure a uniform understanding of the EED across Member States as they prepare their transposition measures.

- (19) The guidance provided with this Recommendation complements and partially supersedes the guidance previously issued by the Commission in relation to Article 7 of the EED ⁽⁶⁾. The impacts of the amending provisions on the obligation period from 2014 to 2020 should be highlighted. Feedback received by the Commission from Member States since the transposition of Directive 2012/27/EU on energy efficiency should be reflected.
- (20) This Recommendation does not alter the legal effects of the EED and is without prejudice to the binding interpretation of the EED as provided by the Court of Justice. It focuses on the provisions relating to the energy savings obligation and concerns Articles 7, 7a and 7b of, and Annex V to the EED.
- (21) The Annex to this Recommendation aims at supporting Member States, inter alia, in calculating the required energy savings, setting up eligible policy measures, and reporting correctly on achieved energy savings, and puts forward a set of clarifications and practical implementation solutions,

HAS ADOPTED THIS RECOMMENDATION:

Member States should follow the guidelines provided in the Annex to this Recommendation when transposing the requirements introduced by Directive (EU) 2018/2002 and set out in Articles 7, 7a and 7b of, and Annex V to Directive 2012/27/EU.

Done at Brussels, 25 September 2019.

For the Commission

Miguel ARIAS CAÑETE

Member of the Commission

⁽⁶⁾ COM(2013) 762 final and SWD(2013) 451 final, Brussels, 6 November 2013.

ANNEX

1. INTRODUCTION

This Recommendation states the views of the Commission only; does not alter the legal effects of the Directives and Regulations and is without prejudice to the binding interpretation by the Court of Justice of Articles 7, 7a and 7b and Annex V of the amended Directive 2012/27/EU on energy efficiency ('EED'). This recommendation builds on feedback the Commission has received from Member States since the transposition of Directive 2012/27/EU on energy efficiency and on what the Commission has learned from Member States' notifications and the assessment of the national energy efficiency action plans and annual reports ⁽¹⁾.

Summary: Major amendments to the Directive 2012/27/EU

1. Structure of energy savings obligation and related provisions

- Articles 7 (general rules on savings requirement), 7a (rules for energy efficiency obligation schemes (EEOs)) and 7b (rules for alternative policy measures);
- Annex V (common methods and principles of calculation); and
- planning and reporting obligations under the Governance Regulation.

2. Scope of energy savings obligation (2021-2030)

- a new energy savings obligation period 2021-2030 and extension of the obligation beyond 2030 with no end date, but subject to review by 2027 and every 10 years thereafter;
- an obligation to achieve cumulative end-use energy savings in 2021-2030 equivalent to new annual savings of at least 0,8 % of final energy consumption (except for Cyprus and Malta, which have to achieve new savings of 0,24 % of final energy consumption), i.e. a higher level than in the current period;
- options for Member States to calculate savings differently, as long as they achieve the required cumulative end-use energy savings; and
- a requirement of Member States to take account of the need to alleviate energy poverty when designing policy measures, in line with criteria that they are to establish.

3. Calculating the impact of policy measures

- Member States cannot claim energy savings resulting from the implementation of EU law, except where they relate to the renovation of buildings. By way of derogation and subject to certain conditions, they may count savings under national minimum requirements for new buildings towards the savings required for the first obligation period (2014-2020) only.

⁽¹⁾ See, inter alia, Economidou et al., 2018. Assessment of the Second National Energy Efficiency Action Plans under the Energy Efficiency Directive. EUR 29272 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-87946-3, doi:10.2760/780472, JRC110304 (report available at <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/assessment-second-national-energy-efficiency-action-plans-under-energy-efficiency-directive>) and Tsemekidi-Tzeiranaki et al., 2019. Analysis of the Annual Reports 2018 under the Energy Efficiency Directive. EUR 29667 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-79-00173-7, doi:10.2760/22313, JRC 115238 (report available at <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC115238/kjna29667enn.pdf>).

4. Clarifications

- EEOSs and alternative policy measures are equally valid means of transposing the EED;
- energy savings resulting from each kind of policy measure are to be calculated in accordance with common principles and methods in Annex V EED;
- clarification of the measurement and verification requirement and the importance of taking a representative sample of energy efficiency improvement measures;
- Member States can set up an energy-efficiency national fund (EENF) in accordance with Article 20(6) EED either as an alternative policy measure or as part of an EEOS requiring obligated parties to make all or some of their savings as a contribution to the fund;
- clarification of the additionality requirement (energy savings should be additional to those that would have been secured in any event without the activity of the obligated or participating party), including certain factors — free riders, market effects and the impact of existing policies;
- the calculation of energy savings must take account of the lifetime of the measures and the rate at which savings decline over time; and
- energy savings resulting from small-scale renewable technologies installed on or in buildings may be eligible, subject to compliance with Annex V.

2. CALCULATION OF ENERGY SAVINGS REQUIRED IN THE 2021-2030 OBLIGATION PERIOD

‘Article 7

Energy savings obligation

1. Member States shall achieve cumulative end-use energy savings at least equivalent to:

- (a) ...
- (b) new savings each year from 1 January 2021 to 31 December 2030 of 0,8 % of annual final energy consumption, averaged over the most recent three-year period prior to 1 January 2019. By way of derogation from that requirement, Cyprus and Malta shall achieve new savings each year from 1 January 2021 to 31 December 2030 equivalent to 0,24 % of annual final energy consumption, averaged over the most recent three-year period prior to 1 January 2019.’

Point (b) above requires Member States to achieve:

- cumulative end-use energy savings (i.e. total amount of energy savings) in 2021-2030; and
- new savings each year in that period (the amount of which is not specified).

While the rate of new annual energy savings in the first obligation period (2014-2020) is the same for all Member States (i.e. 1,5 %), this is not the case in the second period (2021-2030), as Cyprus and Malta have to achieve cumulative end-use savings equivalent to new savings of 0,24 % of final energy consumption ⁽²⁾.

Each Member State has to achieve the calculated amount of cumulative end-use energy savings (i.e. the total energy savings for 2021-2030) by 31 December 2030. Unlike in the first obligation period, that amount cannot be lowered as a result of any flexibility used by the Member State ⁽³⁾.

Member States do not have to achieve new savings equivalent to 0,8 % (0,24 % for Malta and Cyprus) of annual final energy consumption ⁽⁴⁾ in every year of the second obligation period. The current flexibility whereby they can spread the amount of new savings over the period still applies for the second and subsequent periods ⁽⁵⁾.

2.1. Calculation of cumulative end-use energy savings required in second obligation period

To calculate the amount of cumulative end-use energy savings required in the second obligation period, each Member State must first calculate average final energy consumption in the three years before 2019 (i.e. 2016-2018) ⁽⁶⁾.

The next step is to multiply that average by 0,8 % (0,24 % in the case of Cyprus and Malta) to establish the equivalent amount of 'new' annual savings.

Example

A Member State has an energy consumption of 102 million tonnes of oil equivalent (Mtoe) in 2016, 98 Mtoe in 2017 and 100 Mtoe in 2018 — giving a three-year average of 100 Mtoe.

For the calculation of the cumulative amount of end-use energy savings (2021-2030), the minimum amount of *new* savings *each year* is therefore 0,8 Mtoe ($100 \text{ Mtoe} \times 0,8 \%$).

Member States can then calculate the cumulative amount of end-use savings required for the whole obligation period.

Example

A Member State calculates its 2016-2018 average final energy consumption as 100 Mtoe. The total end-use savings in relation to 2021 would therefore be $(100 \times 0,8 \% \times 1) = 0,8 \text{ Mtoe}$.

Since it is required to achieve cumulative end-use energy savings at least equivalent to new savings *each year* from 2021 to 2030, the Member State has to calculate new savings for each subsequent year up to 2030.

The total amount calculated for 2022 would be $(100 \times 0,8 \% \times 2) =$ cumulative end-use energy savings of 1,6 Mtoe (including 0,8 Mtoe new savings in 2022 (marked in grey below)).

⁽²⁾ Article 2(3) EED defines 'final energy consumption' as 'all energy supplied to industry, transport, households, services and agriculture. It excludes deliveries to the energy transformation sector and the energy industries themselves'. 'End-use' is not defined in the EED and should therefore be interpreted in line with the rationale of the energy savings obligation. Point (b) in the first subparagraph of Article 7(1) is aimed at reducing final energy consumption by lowering the amount of energy for own end-use by a natural or legal person (unless otherwise provided). Specific conditions are laid down for energy savings from renewable energy generated on or in buildings (see recital 43 EED and section 7.5 of this document).

⁽³⁾ See section 3.

⁽⁴⁾ Averaged over 2016-2018 (see point (b) in the first subparagraph of Article 7(1)).

⁽⁵⁾ See also section 2.3.

⁽⁶⁾ By contrast, point (a) in the first subparagraph of Article 7(1) refers to energy sales to final customers as a basis for establishing the calculation baseline for 2014-2020 (see SWD (2013) 451 final, p. 3).

Amounts for each subsequent year up to 2030 can be calculated in the same way. The total amount of cumulative end-use energy savings required over the 10-year period is 44,0 Mtoe ($100 \times 0,8 \% \times 55$).

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
End-use energy savings (Mtoe)										0,8	Total cumulative end-use energy savings (by 2030)
									0,8	0,8	
								0,8	0,8	0,8	
							0,8	0,8	0,8	0,8	
						0,8	0,8	0,8	0,8	0,8	
					0,8	0,8	0,8	0,8	0,8	0,8	
				0,8	0,8	0,8	0,8	0,8	0,8	0,8	
			0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	
		0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	
	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	
Total (Mtoe)	0,8	1,6	2,4	3,2	4,0	4,8	5,6	6,4	7,2	8,0	44,0 ⁽¹⁾

⁽¹⁾ = $100 \times 0,8 \% \times 55$.

2.2. Statistical dataset

2.2.1. Use of Eurostat dataset

To establish the statistical datasets to be used for the 2021-2030 obligation period, Member States should use the Eurostat dataset, which is considered the default source for the calculation of required savings amounts (see Annex III(1)(c) to the Governance Regulation).

In 2019, Eurostat revised the energy balance on the basis of international recommendations for energy statistics published by the United Nations Statistical Commission ⁽⁷⁾. For Member States' energy efficiency contributions and energy savings obligations, it established a specific category 'final energy consumption (Europe 2020-2030)' ⁽⁸⁾ (code FEC2020-2030). This contains elements required under point (b) in the first subparagraph of Article 7(1) EED and Member States should use it for the purposes of the energy savings obligation ⁽⁹⁾.

The new category includes the following arithmetical definitions, based on the latest amendments to Regulation (EC) No 1099/2008 of the European Parliament and of the Council ⁽¹⁰⁾:

Final energy consumption (Europe 2020-2030) [All products total] =

Final energy consumption [All products total]

– Final energy consumption [Ambient heat (heat pumps)]

+ International aviation [All products total]

⁽⁷⁾ <https://unstats.un.org/unsd/energy/ires/>

⁽⁸⁾ <https://ec.europa.eu/eurostat/documents/10186/6246844/Eurobase-changes-energy.pdf> (see p. 25).

⁽⁹⁾ The revised Eurostat methodology is described at:

<https://ec.europa.eu/eurostat/documents/10186/6246844/Eurobase-changes-energy.pdf>

⁽¹⁰⁾ Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics (OJ L 304, 14.11.2008, p. 1).

- + Transformation input Blast furnaces [All products total]
- Transformation output Blast furnaces [All products total]
- + Energy sector Blast furnaces [Solid fossil fuels]
- + Energy sector Blast furnaces [Manufactured gases]
- + Energy sector Blast furnaces [Peat and peat products]
- + Energy sector Blast furnaces [Oil shale and oil sands]
- + Energy sector Blast furnaces [Oil and petroleum products]
- + Energy sector Blast furnaces [Natural gas]

2.2.2. *Use of alternative statistical sources and expert estimates*

Member States may use alternative statistical sources, but must explain and justify their use and any difference in the resulting quantities in their notification to the Commission (see Annex III(1)(c) to the Governance Regulation).

If the data for certain years are not available at the time Member States have to report, they may use expert estimates (again justifying these in the notification). If, when the official data become available, there are significant discrepancies between the estimated and the real figures, the amount of savings required must be adjusted to the latter.

It is recommended that Member States adjust the estimates to the official data as soon as possible under the governance mechanism, through the next submission or obligatory reporting under the Governance Regulation (e.g. in the update of the national energy and climate plan (NECP) by 30 June 2023, pursuant to Article 14(1) of the Regulation).

2.2.3. *Energy used in transport*

Without prejudice to Article 7(2)(b) EED ⁽¹⁾, Member States can no longer exclude final energy consumption in transport from their baseline calculation for the second and subsequent obligation periods.

2.2.4. *Energy generated for own end-use*

While the cumulative end-use energy savings in the first obligation period are based on ‘energy sales to final customers’, the EED deliberately changes the basis for the second and subsequent periods to ‘final energy consumption’.

As a result, Member States must include energy generated for own end-use (e.g. electricity generated by photovoltaic systems, heat generated by solar thermal collectors or the co-firing of waste in industry) in the baseline calculation for those periods.

The Eurostat category of ‘final energy consumption’ (code B 101700 ⁽²⁾), as applicable when the EED was negotiated and adopted, included certain renewables relevant for small-scale use on or in buildings (solar energy, including solar photovoltaic and solar thermal, wind energy, solid biomass, biogas and liquid biofuels ⁽³⁾). Ambient heat, e.g. as used in heat pumps, was not included in the category of ‘final energy consumption’. To ensure that the energy savings obligation under Article 7(1) EED as agreed by the co-legislators is not altered by the revision of energy balances, for the purposes of energy efficiency Eurostat established and publishes the specific category ‘final energy consumption (Europe 2020-2030)’ (code FEC2020-2030) which continues excluding ambient heat from this category until 2030 ⁽⁴⁾.

⁽¹⁾ See sections 3.2 and 3.4.

⁽²⁾ ‘Total energy consumption for all energy use’.

⁽³⁾ ‘Final energy consumption’, as defined in Regulation (EC) No 1099/2008.

⁽⁴⁾ See 2.2.1. The new Eurostat methodology is described at:

<https://ec.europa.eu/eurostat/documents/10186/6246844/Eurobase-changes-energy.pdf>

However, while Annex III(1)(c) to the Governance Regulation requires that the Eurostat dataset be used as a default source, Member States must take account of all available data at national level. Where these differ from Eurostat data, Member States must quote their national sources, if these are more accurate. They must include these in their calculation baseline and notify and explain in their NECP what data sources have been used, including any additional official or estimable volumes of final energy consumption that are not covered by the Eurostat dataset.

2.3. Spreading energy savings over the 2021-2030 period

The last subparagraph of Article 7(1) EED requires Member States to 'decide how to phase the calculated quantity of new savings over [each obligation period], provided that the required total cumulative end-use energy savings have been achieved by the end of each obligation period'.

Examples

One Member State might choose a linear increase of savings over time; another might decide to start later, but to require higher savings towards the middle/end of the second obligation period.

Another Member State may decide to spread the required amount of cumulative end-use energy savings (e.g. 44,0 Mtoe) as shown below, as long as the cumulative amount of required savings is achieved between 2021 and 2030 (assuming that all measures have lasting effects that provide savings every year at least until 2030):

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
End-use energy savings (Mtoe)										0,8	Total cumulative end-use energy savings (by 2030)
									1,1	1,1	
								0,5	0,6	0,6	
							0,7	0,7	0,7	0,7	
						0,6	0,6	0,6	0,6	0,6	
					0,8	0,8	0,8	0,8	0,8	0,8	
				1,0	1,0	1,0	1,0	1,0	1,0	1,0	
			1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	
		0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	
	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	
Total (Mtoe)	0,4	1,3	2,5	3,5	4,3	4,9	5,6	6,1	7,3	8,1	44

If a Member State establishes or maintains an energy efficiency obligation scheme (EEOS), it is not required to report how it will spread the effort over the obligation period. However, it is recommended that Member States do establish and report how they will do so. Under part 3.1(b) of Annex III to the Governance Regulation, Member States must notify the expected cumulative and annual amount of savings and the duration of their schemes.

Member States that establish or maintain alternative policy measures under Article 7b EED and/or an energy-efficiency national fund (EENF) under Article 20(6) EED have full discretion to spread the required cumulative end-use energy savings over the second obligation period. They may, but are not obliged to, introduce intermediate periods, which do not have to be of the same length. However, part 3.2(c) of Annex III to the Governance Regulation requires them to notify the 'expected total cumulative and annual amount of savings for each measure and/or amount of energy savings in relation to any intermediate periods'.

3. OTHER WAYS OF CALCULATING THE SAVINGS REQUIREMENTS

3.1. Ratio and scope

The options in Article 7(2) EED do not affect the energy savings obligation under point (b) in the first subparagraph of Article 7(1) EED. Article 7(2) and (4) EED allow Member States to use different calculation methods (e.g. to address certain national circumstances), but this must not lead to a reduction in the amount of energy savings required, i.e. Member States must ensure that the calculation by one or more of the methods in Article 7(2) EED results in the same cumulative minimum energy savings as required under point (b) in the first subparagraph of Article 7(1) EED.

Thus, regarding the obligation period 2021 to 2030, whether or not Member States use the options under Article 7(2) and (4) EED, they must ensure that the required amount of cumulative end-use energy savings equivalent to new annual savings of at least 0,8 % ⁽¹⁵⁾ is achieved by 31 December 2030. To ensure that the flexibilities applied in accordance with Article 7(2) and (4) EED do not reduce the calculated minimum net amount of new energy savings to be achieved in final energy consumption during the obligation period, Member States' own annual savings rates must therefore be higher than that required to achieve the cumulative energy savings provided in point (b) in the first subparagraph of Article 7(1) EED ⁽¹⁶⁾. Member States are not obliged to make use of the options in Article 7(2) EED.

3.2. Options under Article 7(2) EED

Article 7(2) EED allows Member States to calculate the required amount of energy savings by:

- applying an annual savings rate on energy sales to final customers or on final energy consumption, averaged over 2016-2018; and/or
- excluding from the calculation baseline, in whole or in part, energy used in transport; and/or
- making use of any of the options in Article 7(4) EED.

3.3. Own annual savings rate and calculation baseline

Where Member States make use of one or more of the options, Article 7(3) EED requires them to establish:

- their own annual savings rate — this is applied in the calculation of their cumulative end-use energy savings to ensure that the required savings are no less than those required under point (b) in the first subparagraph of Article 7(1) EED; and
- their own calculation baseline, which may exclude, in whole or in part, energy used in transport ⁽¹⁷⁾.

These are in addition ⁽¹⁸⁾ to the calculations of the annual new savings rate and the cumulative end-use savings pursuant to point (b) in the first subparagraph of Article 7(1) EED.

The second subparagraph in Article 7(5) EED provides that, whether or not Member States exclude, in whole or in part, energy used in transport from their calculation baseline or make use of any of the options in Article 7(4) EED, they must ensure that the calculated net amount of new savings to be achieved in final energy consumption over the 2021-2030 obligation period is not less than the amount resulting from applying the annual savings rate referred to in point (b) in the first subparagraph of Article 7(1), i.e. 0,8 % (0,24 % for Cyprus and Malta).

3.4. Options under Article 7(4) EED

For the 2021-2030 obligation period, Member States may make use of one or more of the following options (Article 7(4) EED):

- (b) full or partial EU Emissions Trading Scheme (ETS) industry exclusion;
- (c) counting certain energy savings from energy transformation and transmission sectors;

⁽¹⁵⁾ 0,24 % for Cyprus and Malta.

⁽¹⁶⁾ See Appendix I and sections 3.2, 3.3 and 3.4.

⁽¹⁷⁾ See Appendix I.

⁽¹⁸⁾ See Annex III(2) to the Governance Regulation.

- (d) early actions after the end of 2008 that still deliver savings beyond 2020;
- (e) individual actions carried out from the beginning of 2018 to the end of 2020 that still deliver savings beyond 2020;
- (f) exclusion of 30 % of energy generated on or in buildings for own use as a result of policy measures promoting new installation of renewable energy technologies; and
- (g) counting certain energy savings that exceed those required for the 2014-2020 obligation period.

Under point (b) in Article 7(5) EED, these options can be used only towards the 'amount of energy savings calculated in accordance with Article 7(2) and (3)' and taken together 'shall not lead to a reduction of more than 35 %' of that amount.

Crucially, the options cannot be used to reduce the total amount of cumulative end-use energy savings required under point (b) in the first subparagraph of Article 7(1) EED. In other words, whether or not Member States exclude, in whole or in part, energy used in transport from their calculation baseline or make use of any of the options, they must ensure that the calculated net amount of new savings to be achieved in final energy consumption in the 2021-2030 obligation period is not less than the amount resulting from applying the annual savings rate referred to in point (b) in the first subparagraph of Article 7(1) EED ⁽¹⁹⁾. To ensure this, Article 7(5) EED requires them to calculate the effect in the obligation period of the decision to make use of one or more of the options ⁽²⁰⁾.

The options in points (b) and (f) in Article 7(4) EED may be used only for the calculation of the own baseline pursuant to Article 7(2) and (3) EED. The amounts can be deducted from that calculation (subject to the restrictions provided for).

The options provided in points (c), (d), (e) and (g) relate to energy savings and can be counted only towards the calculated amount of savings required under Article 7(2) and (3) EED. Thus, they cannot be used to lower the level of the energy savings obligation under point (b) in the first subparagraph of Article 7(1) EED, but they can be used to help fulfil it.

3.4.1. Options in detail

3.4.1.1. Full or partial ETS industry exclusion (Article 7(4)(b))

If a Member State uses only the option of fully or partially excluding sales of energy used in ETS industry (Article 7(4)(b) EED), it must establish what volumes of delivered or retailed energy are used for those industrial activities. The calculation is based on the energy used for the activities listed under Annex I to the ETS Directive ⁽²¹⁾.

The energy used for the 'energy activities' listed in that Annex (combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations), mineral oil refineries and coke ovens) and the energy used in aviation are then deducted from that amount ⁽²²⁾.

⁽¹⁹⁾ Within the limits set in the second subparagraph of Article 7(5).

⁽²⁰⁾ See section 9.

⁽²¹⁾ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community as amended by Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, p. 32).

⁽²²⁾ Alternatively, to establish the quantities of energy use in the non-ETS industries, the reported final energy use figure for the corresponding industrial sector could be multiplied by the ETS/non-ETS ratio of greenhouse gas emissions, as reported in the greenhouse gas inventories.

3.4.1.2. Energy savings from energy transformation and transmission sectors (Article 7(4)(c))

Article 7(4)(c) EED allows Member States to count energy savings achieved in the energy transformation, distribution and transmission sectors, including efficient district heating and cooling infrastructure, as a result of implementing the requirements in Articles 14(4) and (5)(b) and 15(1)-(6) and (9) EED, towards the amount of energy savings calculated in accordance with Article 7(2) and (3) EED ⁽²³⁾.

3.4.1.3. Energy savings from individual actions newly implemented since 31 December 2008 (Article 7(4)(d))

If a Member State counts energy savings resulting from individual actions newly implemented since 31 December 2008 towards the amount of required energy savings calculated in accordance with Article 7(2) and (3) EED, those actions must continue to have an impact beyond 2020 with respect to the 2021-2030 obligation period, i.e. result in new energy savings after 31 December 2020. Article 2(19) EED defines '*individual action*' as an action that leads to verifiable, and measurable or estimable, energy efficiency improvements and is undertaken as a result of a policy measure. Furthermore, energy savings must be measured and verified.

3.4.1.4. Individual actions carried out between the beginning of 2018 and the end of 2020 (Article 7(4)(e))

Under Article 7(4)(e) EED, a Member State may count energy savings that stem from policy measures towards the amount of savings calculated in accordance with Article 7(2) and (3) EED, provided that it demonstrates that those measures result in individual actions that are carried out between 1 January 2018 and 31 December 2020 and still deliver energy savings thereafter.

Whereas Article 7(4)(d) EED refers to the implementation of the individual actions between 31 December 2008 and 31 December 2013, Article 7(4)(e) EED is only applicable for individual actions implemented between 1 January 2018 and 31 December 2020. This difference is relevant where Member States consider a lifetime of an action of up to 21 years implemented in 2008, respectively a lifetime of an action of up to 12 years implemented in 2018. In practice this means that the first case is relevant, e.g. for actions with a long lifetime such as insulation of a building envelope.

3.4.1.5. Energy generated on or in buildings for own use from new installation of renewable energy technologies (Article 7(4)(f))

This option allows Member States to exclude a verifiable amount of energy generated for own use by new renewable energy installations on or in buildings from the calculation of energy savings required under Article 7(2) and (3) EED.

Its use is restricted in three respects:

- no more than 30 % of energy generated for own use by new renewable energy installations on or in buildings can be excluded from the baseline calculation;
- this must not lead to a reduction of more than 35 % of the amount calculated pursuant to Article 7(2) and (3) EED; and
- the amount of such energy must not be excluded from the calculation of the savings obligation under point (b) in the first subparagraph of Article 7(1) EED.

Annex V(2)(e) EED sets out how energy savings resulting from measures promoting the installation of small-scale renewable energy technologies on or in buildings can be counted towards the savings required under Article 7(1) EED ⁽²⁴⁾. This is not subject to volume restrictions.

⁽²³⁾ See section 9.

⁽²⁴⁾ See section 7.5 and Appendix X.

Since Article 7(4)(f) EED refers to the 'verifiable amount of energy generated on or in buildings for own use' ⁽²⁵⁾ (not the amount actually used), Member States have to determine and verify the volumes of renewable energy (in ktoe, MW or equivalent) that will be generated on buildings for own use as a result of policies that promote new installations in the 2021-2030 obligation period. Since the provision refers to a 'verifiable amount', this calculation can take into account the estimated average renewable energy volume to be produced for own use in 2021-2030 only from units installed on or in buildings after 31 December 2020.

Article 21(b)(3) of the Governance Regulation requires Member States to include information on the implementation of national EEOSs and alternative policy measures in their integrated national energy and climate progress reports. Therefore, as of 15 March 2021 (and every two years thereafter), they should provide information on the actual amount of energy generated on or in buildings for own use from newly installed renewable energy technologies.

Indicative and non-exhaustive example

The table below shows, for a non-exhaustive list of technologies, how much energy can be excluded from the calculation of the energy savings requirement. For example, the installation of a solar-thermal/gas boiler package could lead to the generation of 1 000 kWh of renewable energy, of which 30 % (300 kWh) could be excluded from the calculation (provided this does not exceed 35 % of the required savings):

Technology type	Final energy demand (kWh)	Share of renewables generated on buildings (%)	Generation accountable for savings target reduction (kWh)	30 % that can be excluded from savings requirement (kWh)
(1) Gas-fired condensing boiler	10 526	0	0	
(2) Wood-fired condensing boiler	10 870	100	10 870	3 261
(3) Heat pump (with grid electricity)	2 857	0	0	
(4) Solar-thermal with gas boiler package	10 474	~ 10	1 000	300
solar-thermal installation	1 000	100	1 000	300
gas-fired condensing boiler	9 474	0	0	
(5) PV installation	3 500	100	3 500	1 050

3.4.1.6. Energy savings exceeding those required for the first obligation period (Article 7(4)(g))

Member States may count energy savings that exceed those required for the first obligation period (2014-2020) towards the calculation under Article 7(2) and (3) EED, provided that:

— they resulted from individual actions under an EEOS or alternative policy measures; and

⁽²⁵⁾ The EED does not provide a definition on 'energy generated on or in buildings for own use'. This concept should however be understood as a final customer operating on or within its building as defined in Article 2(1) of the Directive 2010/31/EU on the energy performance of buildings, who generates renewable energy for its own consumption, and who may store the self-generated renewable energy within its premises located within confined boundaries. The concept of 'energy generated on or in buildings for own use' excludes self-generated energy sold or fed back to the grid. For a non-household self-consumer, the concept excludes, in addition, energy generation constituting a primary commercial or professional activity.

- the Member State notified the relevant policy measures in its NEEAP and reported them in its progress report under Article 24(2) ⁽²⁶⁾.

4. CHOICE OF POLICY MEASURES TO ACHIEVE THE REQUIRED AMOUNT OF CUMULATIVE END-USE ENERGY SAVINGS

Under Article 7(10) EED, Member States must achieve the required cumulative end-use energy savings by:

- establishing an EEOS;
- adopting alternative policy measures; or
- a combination of the above.

Article 7 EED clarifies that EEOSs and alternative policy measures are an equally valid in this respect. Member States have significant flexibility and broad discretion to choose, from various types of scheme, the system best suited to their particular situation and circumstances ⁽²⁷⁾.

Articles 7a(1) and 7b(1) EED require that all policy measures be designed for the purpose of fulfilling the energy savings obligation under Article 7(1) EED and be eligible to contribute to 'end-use energy savings' that are 'among final consumers'. However, it does no harm if a policy measure also addresses other objectives and targets (e.g. under policies on energy, to address the need to preserve, protect and improve the quality of the environment or to promote the prudent and rational utilisation of natural resources).

Article 2(18) EED defines a 'policy measure' as a regulatory, financial, fiscal, voluntary or information provision instrument formally established and implemented in a Member State to create a supportive framework, requirement or incentive for market actors to provide and purchase energy services and to undertake other energy efficiency improvement measures. Policy measures that are intended to support only policy objectives other than energy efficiency, that are designed to provide or purchase energy services only or that trigger end-use savings that are not achieved among final consumers, might not be considered eligible under Article 7 EED. In any case, Member States will need to assess measures carefully and demonstrate that energy savings can be directly attributed to them.

Whether a Member State decides to use an EEOS or adopt alternative policy measures, it must ensure that the policy measures are eligible to achieve the required cumulative end-use energy savings by 31 December 2030 (or in a subsequent saving period, depending on when the measures are formulated).

The following non-exhaustive list of definitions is relevant when setting up policy measures (they are unchanged in the amended EED).

Article 2 EED

'(4) "energy efficiency" means the ratio of output of performance, service, goods or energy to input of energy;

(5) "energy savings" means an amount of saved energy determined by measuring and/or estimating consumption before and after implementation of an energy efficiency improvement measure, whilst ensuring normalisation for external conditions that affect energy consumption;

(6) "energy efficiency improvement" means an increase in energy efficiency as a result of technological, behavioural and/or economic changes;

⁽²⁶⁾ The measures must therefore have been notified by 30 April 2017, as Article 24(2) was deleted on 24 December 2018 in accordance with Articles 59 and 54(3)(b) of the Governance Regulation.

⁽²⁷⁾ Judgment of the Court of 7 August 2018 in Case C-561/16 *Saras Energía* (ECLI:EU:C:2018:633, paragraph 35) with reference, by analogy, to the judgment of 26 September 2013 in Case C-195/12 — *IBV & Cie* (ECLI:EU:C:2013:598, paragraphs 62 and 70).

- (14) “obligated party” means an energy distributor or retail energy sales company that is bound by the national energy efficiency obligation schemes referred to in Article 7.
- (15) “entrusted party” means a legal entity with delegated power from a government or other public body to develop, manage or operate a financing scheme on behalf of the government or other public body;
- (16) “participating party” means an enterprise or public body that has committed itself to reaching certain objectives under a voluntary agreement, or is covered by a national regulatory policy instrument;
- (17) “implementing public authority” means a body governed by public law which is responsible for the carrying out or monitoring of energy or carbon taxation, financial schemes and instruments, fiscal incentives, standards and norms, energy labelling schemes, training or education;
- (18) “policy measure” means a regulatory, financial, fiscal, voluntary or information provision instrument formally established and implemented in a Member State to create a supportive framework, requirement or incentive for market actors to provide and purchase energy services and to undertake other energy efficiency improvement measures;
- (19) “individual action” means an action that leads to verifiable, and measurable or estimable, energy efficiency improvements and is undertaken as a result of a policy measure;
- (20) “energy distributor” means a natural or legal person, including a distribution system operator, responsible for transporting energy with a view to its delivery to final customers or to distribution stations that sell energy to final customers;
- (21) “distribution system operator” means “distribution system operator” as defined in Directive 2009/72/EC and Directive 2009/73/EC respectively;
- (22) “retail energy sales company” means a natural or legal person who sells energy to final customers;
- (23) “final customer” means a natural or legal person who purchases energy for own end use;
- (24) “energy service provider” means a natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer’s facility or premises;

For the purpose of Article 7(10) EED, Member States can count energy savings from policy measures newly adopted in the 2021-2030 obligation period. They can also count energy savings from policy measures adopted in the 2014-2020 obligation period (or before), provided that these comply with the requirements in Articles 7, 7a or 7b EED.

Member States may count savings from measures adopted by 31 December 2020 or later only if those measures result in new individual actions that are carried out after 31 December 2020 and before 31 December 2030.

Examples of measures, actions and savings

A financial support programme for the energy renovation of buildings was put in place in 2010. As long as it remains in place and delivers new renovations in the relevant period, the energy savings resulting from those new renovations can be counted towards the savings required in the second obligation period.

A fuel tax was established prior to 2021 to trigger behavioural savings and improve transport efficiency. As long as it remains in place and effects on behaviour are measurable and verifiable considering latest price elasticities, energy savings resulting from the measure may be counted towards the savings required in the second obligation period.

4.1. Energy efficiency obligation schemes

The key rationale of choosing to implement an EEOs to achieve the cumulative end-use energy savings required under point (b) in the first subparagraph of Article 7(1) EED might be that energy suppliers, retailers and distributors are best placed to identify energy savings with their customers and will be able to achieve energy savings in business models for energy services. In this case, Member States must designate one or more obligated parties at national level ⁽²⁸⁾ that are required to achieve energy savings among final customers ⁽²⁹⁾. The designation of an obligated party must be based on objective and non-discriminatory criteria as provided in Article 7a(2) EED.

When designating obligated parties under an EEOs, Member States should consider the judgment of the European Court of Justice in Case C-561/16. The Court ruled that Member States can 'impose energy efficiency obligations on only certain specific undertakings in the energy sector, provided that the designation of those companies as obligated parties is based on explicitly stated, objective and non-discriminatory criteria, which it is for the referring court to ascertain' ⁽³⁰⁾.

In addition, Member States must establish the amount of energy savings to be achieved by each (sub-category of) obligated party. Those amounts must then be assigned to each obligated party, to check that it has fulfilled its obligations.

Article 7a(4) allows Member States to express the amount of energy savings required of each obligated party in terms of either final or primary energy consumption ⁽³¹⁾, using the conversion factors set out in Annex IV.

Member States can also decide to permit or require obligated parties to fulfil all or part of their obligation under national law as a contribution to the EENF ⁽³²⁾. They may allow obligated parties to count savings achieved by energy service providers ⁽³³⁾ or other third parties towards their obligation. Article 7a(6)(a) EED requires them to ensure that the certification of energy savings follows an approval process that is clear, transparent and open to all market participants, and that aims to minimise the costs of certification ⁽³⁴⁾.

Article 7a(3) EED clarifies that Member States are to ensure that energy sales companies do not create any barriers that discourage consumers from switching from one supplier to another.

Article 7a(5) EED requires Member States to put in place measurement, control and verification systems under which documented verification is carried out on at least a statistically significant proportion and representative sample of the energy efficiency improvement measures put in place by the obligated parties ⁽³⁵⁾.

Under Article 7a(6)(b) EED, Member States may provide for the possibility of 'banking and borrowing', i.e. allowing obligated parties to count savings obtained in a given year as if they had been obtained in any of the 4 previous or 3 following years. It should be noted that this flexibility:

- applies only for energy savings stemming from EEOs implemented since 1 January 2014 and not for alternative policy measures; and
- is restricted in time — Member States may allow obligated parties to 'bank or borrow' only within an obligation period.

⁽²⁸⁾ Article 2(14) defines 'obligated party' as an energy distributor or retail energy sales company that is bound by the national EEOs. Member States could also consider the role of local energy communities or renewable energy communities when designing EEOs.

⁽²⁹⁾ See Annex I, part 3.2, point v to the Governance Regulation.

⁽³⁰⁾ Judgment in Case C-561/16 *Saras Energía* (ECLI:EU:C:2018:633, paragraph 56).

⁽³¹⁾ Under Article 7a(4), the method chosen to express the amount of required energy savings should also be used to calculate the savings claimed by obligated parties.

⁽³²⁾ See recital 17 EED and section 4.2.2.

⁽³³⁾ Article 2(24) defines 'energy service provider' as a natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer's facility or premises.

⁽³⁴⁾ See section 8 and examples in Appendix XII.

⁽³⁵⁾ See Appendix XII.

In other words, savings obtained between 2014 and 2020 must not be 'banked or borrowed' after 31 December 2020. Those obtained between 2021 and 2030 must not be 'banked or borrowed' before 31 December 2020 or after 31 December 2030. Savings obtained after 2010 and before 1 January 2014 cannot be 'banked or borrowed' for the purposes of point (b) in the first subparagraph of Article 7(1) EED.

Since Article 7(8) EED provides explicitly a derogation, its application is restrictive and limited to the purposes of point (a) in the first subparagraph of Article 7(1) EED.

Examples

Energy savings obtained in 2014 (as a result of an EEOS) can be counted as if they had been obtained in 2017.

Energy savings obtained in 2014 (as a result of an EEOS) cannot be counted for 2021.

Energy savings obtained in 2018 (as a result of an EEOS) can be counted for 2014.

The second subparagraph in Article 7a(6) EED provides that Member States 'shall assess and, if appropriate, take measures to minimise the impact of the direct and indirect costs of energy efficiency obligation schemes on the competitiveness of energy-intensive industries exposed to international competition'.

In general, there are two types of cost involved:

- investment costs; and
- administrative costs (including monitoring and reporting).

In its impact assessment ⁽³⁶⁾, the Commission showed, on the basis of the available evidence, that EEOSs are highly cost-effective. When implementing such schemes, obligated parties are obliged to ensure that they realise end-use savings at lowest (investment and administrative) cost, in particular if the costs are passed on to the end-users. This requirement also holds if obligated parties choose to count certified energy savings achieved by energy providers and other third parties.

Article 7a(7) EED requires Member States to 'publish the energy savings achieved by each obligated party, or each sub-category of obligated party, and in total under the scheme on an annual basis'. They may publish this information in combination with other data they have to make publicly available. The publication of such data by other parties, e.g. the Commission, does not relieve them of this obligation.

4.2. Alternative policy measures

The EED clarifies that Member States should have a high degree of flexibility in the design and implementation of alternative policy measures. While the EED no longer lists types of measure, Article 2(18) EED provides in its definition of 'policy measure' a non-exhaustive list of possible types, i.e. 'regulatory, financial, fiscal, voluntary or information provision instruments which have to be formally established and implemented in a Member State to create a supportive framework, requirement or incentive for market actors to provide and purchase energy services and to undertake other energy efficiency improvement measures'.

Member States may consider promoting the role of local renewable energy communities in contributing to the implementation of alternative policy measures ⁽³⁷⁾.

Annex V(3) EED lays down requirements for the design and administration of alternative policy measures:

- '(a) policy measures and individual actions produce verifiable end-use energy savings;
- (b) the responsibility of each participating party, entrusted party or implementing public authority, as relevant, is clearly defined;

⁽³⁶⁾ SWD(2016) 402 final, pp. 46 and 47.

⁽³⁷⁾ See Annex I, part 3.2, point v to the Governance Regulation.

- (c) the energy savings that are achieved or are to be achieved are determined in a transparent manner;
- (d) the amount of energy savings required or to be achieved by the policy measure is expressed in either final or primary energy consumption, using the conversion factors set out in Annex IV;
- (e) an annual report on the energy savings achieved by entrusted parties, participating parties and implementing public authorities be provided and made publicly available as well as data on the annual trend of energy savings;
- (f) monitoring of the results and taking appropriate measures if progress is not satisfactory;
- (g) the energy savings from an individual action are not claimed by more than one party;
- (h) the activities of the participating party, entrusted party or implementing public authority are shown to be material to the achievement of the energy savings claimed.'

Article 7b(2) EED requires Member States to put in place measurement, control and verification systems under which documented verification is carried out on at least a statistically significant proportion and representative sample of the alternative energy efficiency improvement measures (except taxation) put in place by the participating or entrusted parties.

It should be noted that:

- the measurement, control and verification is to be carried out independently of those parties ⁽³⁸⁾; and
- a 'statistically significant proportion and representative sample' should be understood as a subset that accurately reflects the statistical population of the energy-saving measures and thus allows for reasonably reliable conclusions as regards confidence in the totality of the measures.

4.2.1. *Financing schemes and instruments, and fiscal incentives*

These are policy measures established by a Member State under which a monetary and fiscal incentive leads to the application of energy-efficient technology or techniques and which have the effect of reducing end-use energy consumption ⁽³⁹⁾.

It should be noted that:

- the effects are to be measured, controlled and verified independently of the participating or entrusted parties ⁽⁴⁰⁾; and
- in the case of financing schemes or instruments, the funding should come from:
 - public (European or national) sources; or
 - a combination of public (European or national) sources and private sources (e.g. banks, investment funds, pension funds) explicitly targeting the realisation of individual actions that lead to end-use energy savings.

4.2.2. *Energy efficiency national fund*

Member States can set up an EENF in accordance with Article 20(6) EED either as an alternative policy measure or as part an EEOS, so that obligated parties can fulfil all or part of their savings as a contribution to the fund.

⁽³⁸⁾ See Appendix XII.

⁽³⁹⁾ See Appendix III.

⁽⁴⁰⁾ An 'entrusted party' is a legal entity with delegated power from a government or other public body to develop, manage or operate a financing scheme on its behalf.

If a Member State establishes a mechanism of annual contributions to an EENF as the principal method of fulfilling energy efficiency obligations, its national legislation must ensure that:

- the energy savings achieved are equivalent to those under EEOs; and
- the measures funded satisfy the requirements of Articles 7b and 20(6) and Annex V(3) EED ⁽⁴¹⁾.

The EENF can be any fund established by a Member State with the purpose of supporting national energy efficiency initiatives. It can be created to finance economic and financial support schemes, technical assistance, training and information, or other measures to increase energy efficiency, so as to contribute to the achievement of the objectives of EU law ⁽⁴²⁾. In general, a combination of public funds (e.g. for addressing market failures — cost categories or measures not usually addressed under market-based mechanisms) and private capital could also be established to provide more effective solutions.

To count for the purposes of Article 7 EED, the funding must come from:

- public (European or national) sources; or
- a combination of public (European or national) sources and private sources (e.g. banks, investment funds, pension funds, obligated parties) explicitly targeting the achievement of individual actions that lead to end-use energy savings.

4.2.3. *Regulations and voluntary agreements*

These are policy measures established by a Member State that lead to the application of energy-efficient technologies or techniques and have the effect of reducing end-use energy consumption. They can be:

- legally binding measures that impose specific technologies or techniques; or
- voluntary agreements under which firms or local authorities commit themselves to certain action ⁽⁴³⁾.

The 'participating parties' include 'enterprises or public bodies that have committed themselves to reaching certain objectives under a voluntary agreement, or are covered by a national regulatory policy instrument'.

4.2.4. *Standards and norms*

These are policy measures established by a Member State that are aimed at improving the energy efficiency of (for example) products, services, buildings and vehicles ⁽⁴⁴⁾. The parties under these schemes are 'implementing public authorities'.

4.2.5. *Energy labelling schemes*

These are labelling schemes established by a Member State, with the exception of those that are mandatory under EU law (e.g. savings from the application of energy labelling regulations or the Energy Labelling Regulation ⁽⁴⁵⁾ cannot be counted) ⁽⁴⁶⁾.

Other policy measures being implemented at the same time may also have an impact on energy savings, so not all changes observed since the introduction of the measure being evaluated can be attributed to that measure alone. Careful consideration of the impact of a labelling scheme is required to establish a link with individual action leading to savings that can be attributed to it.

⁽⁴¹⁾ Judgment in Case C-561/16 *Saras Energía* (ECLI:EU:C:2018:633, paragraph 37 on Articles 7 and 20 EED).

⁽⁴²⁾ See also judgment of the Court in Case C-561/16 *Saras Energía* (ECLI:EU:C:2018:633, paragraphs 30-33).

⁽⁴³⁾ Appendix III.

⁽⁴⁴⁾ Appendix III.

⁽⁴⁵⁾ Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU (OJ L 198, 28.7.2017, p. 1).

⁽⁴⁶⁾ Appendix III.

4.2.6. *Training and education, including energy advisory programmes*

These are policy measures established by a Member State that lead to the application of energy-efficient technology or techniques and have the effect of reducing end-use energy consumption through (for example) training programmes for energy auditors, education programmes for energy managers or energy advisory programmes for households.

It should be noted that:

- such measures must be monitored by an ‘implementing public authority’; and
- careful consideration of their impact is required to establish:
 - a link between the training or education activity and the individual action attributable to it; and
 - the period for which programmes may continue to have an effect ⁽⁴⁷⁾.

4.2.7. *Other alternative measures*

The list of alternative policy measures is not exhaustive and other policy measures may be applied. However, Member States must explain in their notification to the Commission how an equivalent level of savings, monitoring and verification is achieved ⁽⁴⁸⁾.

The reduction of energy consumption and the use of energy from renewable sources in buildings are important measures of reduced energy dependence and greenhouse gas emissions, especially in view of the EU’s ambitious climate and energy objectives for 2030 and its global commitment in the context of the Paris Agreement. Hence, policy measures promoting the installation of small-scale renewable technologies on or in buildings can also be considered to fulfil the energy savings obligation ⁽⁴⁹⁾.

Measures must be designed to generate end-use energy savings relative to the technology they replace. For example, such savings can be claimed from switching to more efficient heating or cooling systems or hot-water technologies in buildings, whether or not this involves renewable energy. Those savings are eligible even if the alternative policy measure is not primarily designed to improve energy efficiency, provided that the Member State can show that they are additional, measurable and verifiable according to the methods and principles in Annex V EED.

4.2.8. *Energy or CO₂ taxes*

Member States’ tax measures to reduce end-use energy consumption may be eligible. Member States may also combine tax measures with other measures such as subsidies ⁽⁵⁰⁾.

Taxation for the purpose of energy efficiency mainly aims to address market failures caused by energy consumption by charging a tax or levy on certain types of energy source or energy usage. CO₂ or carbon taxes can also be a driver for individual actions designed to switch to energy sources with lower CO₂ emissions. However, it should be noted that such a source control does not necessarily lead to energy efficiency improvements.

The objective of tax measures is to make consumers and producers pay the social cost of the good (including in the form of carbon emissions and greenhouse effects).

In practice, measures ⁽⁵¹⁾ typically consist of:

- direct measures — these include charges related directly to the ‘externality’, i.e. the activity that imposes an effect on an unrelated third party. This type of measure implicitly assumes that the market failure is observable and quantifiable. An example is taxes on carbon emissions; and

⁽⁴⁷⁾ Appendix III.

⁽⁴⁸⁾ Appendix XII.

⁽⁴⁹⁾ Appendix X.

⁽⁵⁰⁾ See Appendix IV.

⁽⁵¹⁾ See Appendix IV.

- indirect measures — these are taxes related to the consumable generating the externality (e.g. the fuels generating carbon emissions) or consumables related to it (e.g. the cars that use such fuels).

Member States may establish new tax measures for the purpose of the energy savings obligation for the new period (2021-2030) and/or continue to apply existing measures from the first period (2014-2020).

In determining the energy savings that can be claimed as additional ⁽⁵²⁾, Annex V(2)(a) provides that 'Member States shall have regard to how energy use and demand would evolve in the absence of the policy measure in question by taking into account at least the following factors: energy consumption trends, changes in consumer behaviour, technological progress and changes caused by other measures implemented at Union and national level'.

In addition, Member States should take into account the requirements of Annex V(4) when calculating the effect of tax measures:

- '(a) credit shall be given only for energy savings from taxation measures exceeding the minimum levels of taxation applicable to fuels as required in Council Directive 2003/96/EC or 2006/112/EC;
- (b) price elasticities for the calculation of the impact of the (energy) taxation measures shall represent the responsiveness of energy demand to price changes, and shall be estimated on the basis of recent and representative official data sources;
- (c) the energy savings from accompanying taxation policy instruments, including fiscal incentives or payment to a fund, shall be accounted separately.'

Member States should implement measures that aim to exceed minimum levels under EU law, including:

- minimum levels for the taxation of energy products and electricity ⁽⁵³⁾; and
- provisions on the common system of VAT ⁽⁵⁴⁾ in relation to energy-consuming products and goods.

When calculating the impact of their (energy) taxation measures, Member States should take account of price elasticities (which represent the responsiveness of energy demand to price changes), estimating these on the basis of recent and representative official data sources ⁽⁵⁵⁾. Under part 3.3(f) of Annex III to the Governance Regulation, Member States must provide information on their calculation methodology, including the price elasticities they have used and how they have been established, in accordance with Annex V(4) EED.

For the purposes of Annex V(4)(c) EED, it is important to assess how tax measures interact with other policy measures. When calculating the impacts of tax measures used in combination with other measures, Member States are recommended to use:

- short-term elasticities only; or
- short- and long-term elasticities, but not claim energy savings for the other measures (i.e. treat the tax measure as the main policy measure in a package).

⁽⁵²⁾ See Appendix IV.

⁽⁵³⁾ Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity (OJ L 283, 31.10.2003, p. 51).

⁽⁵⁴⁾ Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax (OJ L 347, 11.12.2006, p. 1).

⁽⁵⁵⁾ See Appendix IV.

For tax measures implemented prior to the 2021-2030 obligation period, Member States should pay particular attention to the second subparagraph of Article 7(1) EED: 'Member States may count energy savings that stem from policy measures, whether introduced by 31 December 2020 or after that date, provided that those measures result in new individual actions that are carried out after 31 December 2020'.

If a Member State establishes a combination of tax and subsidy measures, it must keep separate accounts of energy savings from tax measures and from accompanying policy measures (including fiscal incentives).

Using short-term elasticity estimates throughout the target period will make it less likely that savings are double-counted.

4.3. Policy measures to alleviate energy poverty

Under Article 7(11) EED, when designing policy measures to meet their energy savings obligations, Member States are to take account of the need to alleviate energy poverty by requiring, as far as appropriate, that a proportion of energy efficiency measures under their national EEOS, alternative policy measures or programmes/measures financed under an EENF be implemented as a priority among vulnerable households, including those affected by energy poverty and, where appropriate, in social housing ⁽⁵⁶⁾.

For the purpose of the NECPs, Member States must assess the number of households in energy poverty in accordance with Article 3(3)(d) of the Governance Regulation ⁽⁵⁷⁾.

Taking into account their existing practices, Member States should set criteria for how they will address energy poverty in their policy measures. Long-term measures to renovate and improve the energy performance of the building stock, as required under the Energy Performance of Buildings Directive ('EPBD') ⁽⁵⁸⁾, will also benefit those affected by energy poverty. Under Article 2a EPBD, Member States have to produce long-term strategies to support the renovation of the national stock of public and private residential and non-residential buildings into a highly energy-efficient and decarbonised building stock by 2050.

These are to:

- facilitate the cost-effective transformation of existing buildings into nearly zero-energy buildings; and
- encompass an outline of relevant national action to help alleviate energy poverty ⁽⁵⁹⁾.

As of its entry into force and transposition/implementation in national law, this requirement to take account of the need to alleviate energy poverty applies to measures taken under EEOSs and alternative policy measures. Member States are free to decide which kind of policy measures they use, since both are on an equal footing. However, the measures chosen have to be aimed at alleviating energy poverty.

⁽⁵⁶⁾ Appendix V.

⁽⁵⁷⁾ Member States should assess in their NECPs the number of households in energy poverty, taking into account the necessary domestic energy services needed to guarantee basic standards of living in the relevant national context, existing social policy and other relevant policies, and Commission indicative guidance on relevant indicators, including geographical dispersion, that are based on a common approach for energy poverty. If a Member State finds that it has a significant number of households in energy poverty, it should include in its plan a national indicative objective to reduce energy poverty.

⁽⁵⁸⁾ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13).

⁽⁵⁹⁾ Recital 11 of Directive (EU) 2018/844 of the European Parliament and of the Council (OJ L 156, 19.6.2018, p. 75), which amends the EPBD and the EED, provides that '[t]he need to alleviate energy poverty should be taken into account, in accordance with criteria defined by the Member States. While outlining national actions that contribute to the alleviation of energy poverty in their renovation strategies, the Member States have the right to establish what they consider to be relevant actions'.

The EU Energy Poverty Observatory is a Commission initiative to help Member States improve the measuring, monitoring and sharing of knowledge and best practice on energy poverty. It is aimed at helping Member States in designing policy measures. The 'Policies & Measures' section of the Observatory's website ⁽⁶⁰⁾ contains examples of specific types of policies and measures.

4.4. Choice of sectors

Member States have the flexibility to target one or more specific sector(s) in order to meet the energy savings obligation, by introducing policy measures in line with Article 7a or 7b EED ⁽⁶¹⁾. Under sections 3.1, 3.2 and 3.3 of Annex III to the Governance Regulation, they have to provide information on the sector(s) (and, in the case of taxation, the taxpayer segment) targeted by each measure. Annex V(2)(d) EED permits measures to improve the energy efficiency of products, equipment, transport systems, vehicles and fuels, buildings and building elements ⁽⁶²⁾, processes or markets.

Where appropriate, such measures should be consistent with the national policy frameworks established pursuant to Directive 2014/94/EU of the European Parliament and of the Council ⁽⁶³⁾. Member States might target, for example, the buildings or the industry sector.

According to the assessments of achieved and expected energy savings notified by Member States in their annual reports and national energy efficiency and action plans ('NEEAPs') under Article 24 EED, it is expected that:

- the biggest proportion of savings will be in general generated by measures targeting buildings (supported, for example, by renovation financing schemes);
- the second and third biggest proportions will come from industry and transport; and
- the EEOS (a cross-sector policy) will generate the highest share of savings per policy measure; it also targets buildings, through measures promoting the replacement of heating systems, etc ⁽⁶⁴⁾. Other sectors with untapped energy saving potential (e.g. transport and water) could contribute to achieving the energy saving obligation in/2021-2030

4.4.1. Transport sector

Based on reports from Member States, the Commission concluded in its 2016 impact assessment that 6 % of the energy savings under Article 7 could be associated with measures targeting the transport sector ⁽⁶⁵⁾.

Since the first NEEAPs in 2014 and most recently in their 2017 NEEAPs, Member States have updated their lists of EEOSs and alternative policy measures, and have notified more transport measures. These developments indicate that the (potential) proportion of energy savings achieved in the transport sector in 2014-2020 may be even higher than assessed in the impact assessment.

Given that final energy consumption in transport is included in the calculation baseline, this may be an obvious sector to target to achieve the 2021-2030 savings obligation.

⁽⁶⁰⁾ <https://www.energypoverty.eu/policies-measures>

⁽⁶¹⁾ See Appendices II and III.

⁽⁶²⁾ Article 2(9) EPBD defines 'building element' as a technical buildings system or an element of the building envelope.

⁽⁶³⁾ Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (OJ L 307, 28.10.2014, p. 1).

⁽⁶⁴⁾ See Economidou et al., 2018. Assessment of the Second National Energy Efficiency Action Plans under the Energy Efficiency Directive. EUR 29272 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-87946-3, doi:10.2760/780472, JRC110304 (report available at <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/assessment-second-national-energy-efficiency-action-plans-under-energy-efficiency-directive>) and Tsemekidi-Tzeiranaki et al., 2019. Analysis of the Annual Reports 2019 under the Energy Efficiency Directive. EUR 29667 EN, Publications.

⁽⁶⁵⁾ Appendix VII.

Examples

Policy measures could promote more efficient vehicles (exceeding the minimum levels laid down in Regulations (EC) No 443/2009⁽⁶⁶⁾, (EU) No 510/2011⁽⁶⁷⁾ or (EU) 2019/631 of the European Parliament and of the Council⁽⁶⁸⁾ or the revised Clean Vehicles Directive⁽⁶⁹⁾), a modal shift to cycling, walking and collective transport, or mobility and urban planning that reduces demand for transport.

Measures that accelerate the uptake of new, more efficient vehicles or policies fostering a shift to better-performing fuels that reduce energy use per kilometre may also be eligible, subject to materiality and additionality (see Annex V(2)).

4.4.2. Water sector

Energy and water correlate closely in economic life and at many levels ('water-energy nexus'). Water is needed for energy purposes, e.g. for cooling, storage, biofuels or hydropower. Energy is needed for water purposes, e.g. to pump, treat and desalinate⁽⁷⁰⁾.

The energy generation sector is the largest consumer of water, accounting for 44 % of consumption⁽⁷¹⁾. The water and wastewater sectors account for 3,5 % of electricity use in the EU and that share is expected to rise⁽⁷²⁾. At the same time, leaks account for 24 % of total water consumed in the EU, representing significant wastage and a loss in terms of wasted water resources and in terms of the energy used to treat those resources.

With the entry into force of the Governance Regulation and the amended EED, the 'energy efficiency first' principle applies. The water sector can be amongst the beneficiaries of this principle'.

The effective and energy efficient management of water can contribute significant energy savings. According to the International Energy Agency (IEA), 10 % of global water withdrawals relate to energy production and this figure is expected to increase significantly with the promotion of several low-carbon but water-intensive processes, including electricity generation, biofuel production and carbon-capture-and-storage⁽⁷³⁾. Member States could therefore explore the potential for energy savings through the use of smart technologies and processes.

By fully exploring the potential for energy savings by using smart technologies and processes — which Member States are encouraged to use by the EED⁽⁷⁴⁾ — Member States could find solutions to break the link between energy consumption and consumption of water.

Member States could, for example, assess the potential of the construction of two-tier system necessary for separate treatment of storm water and sanitary wastewater. This could avoid the need for additional water treatment capacities which might result in increased energy consumption.

Member States have notified a limited number of water-related measures to meet the energy savings obligation in Article 7. The most common is the production of hot water by solar collectors (replacement of non-renewable-based hot-water production) or more efficient gas water-heaters, but such measures relate to heat generation rather than water production.

⁽⁶⁶⁾ Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO₂ emissions from light-duty vehicles (OJ L 140, 5.6.2009, p. 1).

⁽⁶⁷⁾ Regulation (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO₂ emissions from light-duty vehicles (OJ L 145, 31.5.2011, p. 1).

⁽⁶⁸⁾ Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO₂ emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 (OJ L 111, 25.4.2019, p. 13).

⁽⁶⁹⁾ 'Directive of the European Parliament and of the Council amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles'. Not yet published in the Official Journal.

⁽⁷⁰⁾ For further information, see JRC's Water — Energy Nexus in Europe, 2019, <http://publications.jrc.ec.europa.eu/repository/handle/JRC115853>

⁽⁷¹⁾ See recital 22.

⁽⁷²⁾ See recital 22.

⁽⁷³⁾ For further information, see the IEA's World Energy Outlook 2018; <https://www.iea.org/weo/water/>

⁽⁷⁴⁾ See recital 22.

Policy measures relating to the energy-efficient production of drinking water could be considered along the whole supply chain (distribution, use and wastewater treatment). To date, the main national objectives have been to ease water scarcity and improve water quality. Apart from installing more efficient pumps, the notified action results in energy savings indirectly via reduced water demand or the reuse of water.

The potential for saving energy in the water sector lies in:

- reducing the amount of energy used to produce and treat different types of water; and
- reducing water demand and network losses, which translates into lower energy requirements for pumping and treatment.

Energy savings in the water sector can relieve municipalities' budgets. Especially when municipalities own the water utility, the electricity consumption of (waste) water plants might represent a significant share of its electricity bill. As, for example, the awareness, experience, capacities can vary largely from one municipality to the other, regional or national programmes can be useful to facilitate experience sharing, technological support and financial aids could thus increase the energy savings potential.

Indicative non-exhaustive examples

Member States could take measures to save energy in the production, use and disposal of water in all its forms along the whole supply chain:

- the production of drinking water (pumping, cleaning of groundwater or surface water, desalination of sea water);
- reducing water losses along the distribution network;
- reducing the use of water by end-users (including use for industrial processes, irrigation, households);
- reducing water use through the recirculation of domestic water;
- cleaning wastewater for reuse or discharge (pumping, wastewater treatment processes, heat recovery); and
- reducing energy use for storm water treatment (reducing the burden of treatment on storm water systems).

5. IMPACT OF THE REVISION ON THE FIRST OBLIGATION PERIOD

Member States must bring into force the laws, regulations and administrative provisions necessary to comply with the amended energy savings obligation at the latest 18 months after the entry into force of the EED, i.e. by 25 June 2020.

Member States must comply with:

- the common methods and principles of calculating the impact of EEOSs or other policy measures (Annex V EED);
- the requirement to take account of the need to alleviate energy poverty when designing policy measures (EEOS and alternative policy measures), although different measures may be taken to target households affected by energy poverty (Article 7(11) EED);
- the provision that savings resulting from the implementation of EU law cannot be claimed, except renovation measures and the early replacement of more efficient appliances and vehicles (Annex V(2)(b) EED);
- the requirement that the calculation of energy savings is to take account of the lifetime of measures and the rate at which savings decline over time (Annex V(2)(g) EED — from entry into force); and

- the requirement that, in fulfilling their savings obligation, retail energy sales companies (under the EEOS) do not impede consumers from switching from one supplier to another (Article 7a(3) EED).

Member States may transpose and implement the amended EED before the deadline. In such cases, they may for the remaining time before the end of the first obligation period:

- make use of the derogation under Article 7(8) EED;
- make use of the derogation under Annex V(2)(b) EED; and
- decide that obligated parties fulfil the savings obligation, in whole or in part, as a contribution to the EENF (Article 20(6) EED).

Member States that make use of Article 7(4)(a)-(d) EED for the calculation of the amount of energy savings required for the first obligation period must apply and calculate the effect of the options chosen for the first period separately according to Article 7(5)(a) EED.

6. COUNTING TOWARDS THE ENERGY SAVINGS OBLIGATION

Article 7(1) EED provides that the two obligation periods (2014-2020, as referred to in point (a) in the first subparagraph of Article 7(1) EED, and 2021-2030, as referred to in point (b)) are two separate periods.

In principle, as already provided for in respect of the first period, only energy savings obtained within a period count towards the achievement of the obligation for that period, unless provided otherwise in the EED.

Member States may not count energy savings retrospectively, i.e. under Article 7(7) EED, savings achieved after 31 December 2020 cannot count towards the amount required for 2014-2020.

Under the second subparagraph of Article 7(1) EED, Member States may count savings that stem from policy measures introduced before or after 31 December 2020 towards the amount required for 2021-2030, provided that the measures result in new individual actions after 31 December 2020 ⁽⁷⁵⁾.

In principle, Member States may count energy savings obtained in a given year only for that year. However, Article 7a(6)(b) EED allows those with an EEOS to allow obligated parties to count savings obtained in a given year for any of the 4 previous or 3 following years as long as this falls within the relevant obligation period, as set out in Article 7(1) EED.

Indicative example

Savings achieved in 2014 may be counted for 2017 (three years later), but savings achieved in 2024 cannot be counted for 2020, although this is one of the 4 previous years, as it is in a separate obligation period.

Article 7(8) EED is a specific derogation from the principle. If an EEOS in force at any point between 31 December 2009 and 31 December 2014 allowed an obligated party to make use of 'banking and borrowing' (Article 7a(6)(b) EED), the Member State in question may count energy savings obtained in any given year after 2010 and before 1 January 2014 as if they had been obtained after 31 December 2013 and before 1 January 2021, provided that all of the requirements in Article 7(8) EED are fulfilled:

'(a) the energy efficiency obligation scheme was in force at any point between 31 December 2009 and 31 December 2014 and was included in the Member State's first NEEAP submitted under Article 24(2);

(b) the savings were generated under the EEOS;

⁽⁷⁵⁾ See definitions provided in section 4.

- (c) the savings are calculated in accordance with Annex V; and
- (d) the years for which the savings are counted as having been obtained have been reported in the NEEAP.’

7. COMMON METHODS AND PRINCIPLES FOR CALCULATING THE IMPACT OF ENERGY EFFICIENCY OBLIGATION SCHEMES OR OTHER POLICY MEASURES UNDER ARTICLES 7, 7A, 7B AND 20(6)

Article 7(9) EED requires Member States to ensure that energy savings resulting from policy measures referred to in Articles 7a, 7b and 20(6) EED are calculated in accordance with Annex V EED.

7.1. **Measurement methods**

7.1.1. *Measurement methods for policy measures other than taxation measures*

Annex V, part 1 EED sets out methods for calculating energy savings other than those arising from taxation measures for the purposes of Articles 7, 7a, 7b and 20(6) EED.

Obligated, participating or entrusted parties, and implementing public authorities may use the following methods for calculating energy savings:

- ‘(a) deemed savings, by reference to the results of previous independently monitored energy improvements in similar installations. The generic approach is termed “ex ante”;
- (b) metered savings, whereby the savings from the installation of a measure, or package of measures, are determined by recording the actual reduction in energy use, taking due account of factors such as additionality, occupancy, production levels and the weather which may affect consumption. The generic approach is termed “ex post”;
- (c) scaled savings, whereby engineering estimates of savings are used. This approach may be used only where establishing robust measured data for a specific installation is difficult or disproportionately expensive, e.g. replacing a compressor or electric motor with a different kWh rating than that for which independent information about savings has been measured, or where those estimates are carried out on the basis of nationally established methodologies and benchmarks by qualified or accredited experts that are independent of the obligated, participating or entrusted parties involved;
- (d) surveyed savings, where consumers’ response to advice, information campaigns, labelling or certification schemes or smart metering is determined. This approach may be used only for savings resulting from changes in consumer behaviour. It shall not be used for savings resulting from the installation of physical measures.’

7.1.2. *Measurement methods for taxation measures*

For determining the energy savings from tax-related policy measures introduced under Article 7b EED ⁽⁷⁶⁾, the principles in Annex V(4) EED apply:

- ‘(a) credit shall be given only for energy savings from taxation measures exceeding the minimum levels of taxation applicable to fuels as required in Council Directive 2003/96/EC or 2006/112/EC,
- (b) price elasticities for the calculation of the impact of the (energy) taxation measures shall represent the responsiveness of energy demand to price changes, and shall be estimated on the basis of recent and representative official data sources;
- (c) the energy savings from accompanying taxation policy instruments, including fiscal incentives or payment to a fund, shall be accounted separately.’

⁽⁷⁶⁾ See Appendix IV.

7.2. Lifetime of measures and rate of decline over the lifetime

Annex V(2), point (i) EED provides that ‘the calculation of energy savings shall take into account the lifetime of the measures and the rate at which the savings decline over time. That calculation shall count the savings each individual action will achieve during the period from its date of implementation to 31 December 2020 or 31 December 2030 as appropriate. Alternatively, Member States may adopt another method that is estimated to achieve at least the same total quantity of savings. If they use another method, Member States shall ensure that the total amount of energy savings calculated using that method does not exceed the amount of energy savings that would have been the result of their calculation when counting the savings each individual action will achieve during the period from its date of implementation to 31 December 2020 or 31 December 2030 as appropriate’.

The concept of the ‘lifetime’ of an individual energy-saving action refers to the fact that savings may be obtained not only in the year of implementation, but also in future years. The ‘lifetime’ is therefore the period for which the action will continue to deliver measureable savings.

In calculating energy savings over the lifetime of an action, Member States may:

- attribute to each action the ‘real’ savings that it will achieve between the year of its implementation and the end of the second obligation period (i.e. 31 December 2030) — this is referred to as the ‘straightforward’ method ⁽⁷⁷⁾.

The attribution of savings beyond 2030 is not permitted. Member States may count savings from policy measures introduced before 2030 for the energy savings obligation post-2030 only if those measures result in a new individual action in the subsequent obligation period;

- apply an ‘index value’ that reflects the expected lifetime ⁽⁷⁸⁾;
- ‘cap’ the lifetimes attributed to individual actions ⁽⁷⁹⁾ — for example, the Member State could ‘cap’ the lifetime at 5 years. Member States using this method must ensure that the result is not higher than that given by the ‘straightforward’ approach; or
- use full lifetimes, but ‘discount’ future-year savings ⁽⁸⁰⁾ — under this method, the Member State could discount the savings in the subsequent years at a rate of 10 % per year, if reasonable. Again, it must ensure that the result is not higher than that given by the ‘straightforward’ approach.

In counting savings towards the required amount of cumulative end-use energy savings from any policy measure, Member States must take into account:

- (i) when the measure is implemented;
- (ii) the amount of annual energy savings; and
- (iii) whether the measure will still result in energy savings in 2030 ⁽⁸¹⁾.

Regarding policy measures targeting buildings, the EU standard EN 15459-1:2017 ⁽⁸²⁾ already provides guidelines for the assessment of lifetimes.

⁽⁷⁷⁾ SWD(2013) 451 final, recitals 47 and 49-52.

⁽⁷⁸⁾ SWD(2013) 451 final, recital 53.

⁽⁷⁹⁾ SWD(2013) 451 final, recital 54.

⁽⁸⁰⁾ SWD(2013) 451 final, recital 55.

⁽⁸¹⁾ Lees, E., and Bayer, E. (February 2016), *Toolkit for energy efficiency obligations* (Regulatory Assistance Project); <http://www.raponline.org/document/download/id/8029>

⁽⁸²⁾ Energy performance of buildings — Economic evaluation procedure for energy systems in buildings — Part 1: Calculation procedures; <https://www.en-standard.eu/din-en-15459-1-energy-performance-of-buildings-economic-evaluation-procedure-for-energy-systems-in-buildings-part-1-calculation-procedures-module-m1-14/>

Particular care should be taken when claiming lifetimes for behavioural measures that are not associated with the installation of physical measures⁽⁸³⁾. Behavioural measures are highly reversible, since the duration over which an efficient behaviour will be sustained can depend on a variety of factors. If, for example, the efficient behaviour promoted is eco-driving, depending on the drivers and the type of eco-driving training, the effects of an eco-driving training can last only a few days, but also up to several years.

Examples on how lifetimes of measures could be accounted for

1. 'Straightforward' method

An individual action (e.g. window replacement) saves 1 toe of energy consumption per year and goes on delivering this saving year after year. If the action is carried out in 2021, it will save 1 toe in 2021 and 1 toe in each subsequent year up to 2030, i.e. a total of 10 toe to 2030. If the action is carried out in 2022, it will save 1 toe each year from 2022 to 2030, i.e. a total of 9 toe. If it is carried out in 2030, it will contribute to the requirement only that year, i.e. a total of 1 toe.

A Member State has to save 65 Mtoe over the period and expects to achieve this by means of one information campaign per year delivering, for example, a million actions (a survey has demonstrated that the effectiveness of each action is 1 toe), and a million window replacements per year (the deemed value of each is estimated to be 1 toe). Each of the information campaigns would deliver 1 Mtoe in the year in which it is conducted and the 10 campaigns **10 Mtoe** in total over the 10 years by 31 December 2030. There will be savings equal to 10 Mtoe for the million windows replaced the first year, 9 Mtoe for the million replaced the second year, 8 Mtoe for the third, 7 Mtoe for the fourth, 6 Mtoe for the fifth, 5 Mtoe for the sixth, 4 Mtoe for the seventh, 3 Mtoe for the eighth, 2 Mtoe for the ninth and 1 Mtoe for the 10th, i.e. **55 Mtoe** in total by 31 December 2030. The savings from information campaigns and window replacements are thus 10 Mtoe + 55 Mtoe = **65 Mtoe**.

By contrast, a shorter-lived action (e.g. an information campaign) may save 1 toe in the year of implementation and nothing thereafter. Whatever the year of implementation between 2021 and 2030, its contribution will be 1 toe.

If a Member State introduces predominantly individual actions with short lifetimes at the beginning of the 10-year obligation period, it will need to take additional measures to reach the savings required under point (b) in the first subparagraph of Article 7(1).

The 'straightforward' method clearly fulfils the condition that the calculation method must lead to the required quantity of savings actually being achieved. However, Member States may consider alternative methods more appropriate.

2. 'Index value' method

One alternative is to give each action an 'index value' that reflects its expected lifetime. An information campaign could be given an index value of 0,25, while a window replacement could be given an index value of 6. If each of these actions saves 1 toe per year, the saving attributed to an information campaign would be $(1 \times 0,25 \text{ toe}) = 0,25 \text{ toe}$. The saving attributed to a window replacement, whatever the year of implementation, would be $(1 \times 6 \text{ toe}) = 6 \text{ toe}$.

The information campaigns would then count as delivering 0,25 Mtoe in the year in which they are conducted or **2,5 Mtoe** in total for 10 campaigns over the 10 years to the end of 2030. If 7 million window replacements are carried out over the period, this will deliver savings of 7 Mtoe multiplied by the factor of 6, giving **42 Mtoe**. The savings from information campaigns and window replacements would then be counted as 2,5 Mtoe + 42 Mtoe = **44,5 Mtoe**.

A Member State using this method must ensure that the result is not higher than that given by the 'straightforward' approach.

3. 'Cap' method

Another alternative is to 'cap' the lifetimes attributed to individual actions. For example, a 'cap' of 5 years could be chosen. The saving attributed to an information campaign would be **1,25 Mtoe**, e.g. 0,25 Mtoe in 2022, 0,25 Mtoe in 2023, 0,25 Mtoe in 2024, 0,25 Mtoe in 2025 and 0,25 Mtoe in 2026. The saving attributed to a window replacement, whatever the year of implementation, would be $(1 \times 5) = \mathbf{5 \text{ Mtoe}}$, e.g. 1 Mtoe in 2022, 1 Mtoe in 2023, 1 Mtoe in 2024, 1 Mtoe in 2025 and 1 Mtoe in 2026.

⁽⁸³⁾ See also Appendix VI and Appendix VIII.

Again, a Member State using this method must ensure that the result is not higher than that given by the 'straightforward' approach.

To reflect the full value of a policy measure for energy efficiency, Annex V(2)(i) EED requires Member States to take account of the decline of energy savings over the lifetime of each measure⁽⁸⁴⁾. The intention is to ensure that the savings are accounted realistically, given that, for example, a new energy-efficient product may not generate the same energy savings after some years of use⁽⁸⁵⁾. Therefore, Member States must take this into account in their methodologies. The declining rate may vary by type of policy measure and must be notified and explained by each Member State in line with Annex V(2)(i) EED⁽⁸⁶⁾.

7.3. **Additionality**

The additionality requirement needs to be taken into account when determining energy savings for all kinds of policy measure. The basic principles are set out in Annex V(2)(a) and (b) EED:

- '(a) The savings shall be shown to be additional to those that would have occurred in any event without the activity of the obligated, participating or entrusted parties, or implementing public authorities. To determine the savings that can be claimed as additional, Member States shall have regard to how energy use and demand would evolve in the absence of the policy measure in question by taking into account at least the following factors: energy consumption trends, changes in consumer behaviour, technological progress and changes caused by other measures implemented at Union and national level.
- (b) Savings resulting from the implementation of mandatory Union law shall be considered to be savings that would have occurred in any event and thus cannot be claimed as energy savings for the purpose of Article 7(1) ...'

This means that, if EU law requires Member States to achieve a certain amount or degree of savings, they can claim only savings above this level — provided that other requirements are fulfilled, e.g. it can be shown and verified that the savings are due to the action/measure in question.

Annex V(2)(a) EED also requires Member States to look at current market developments and establish a baseline scenario. This is particularly important to avoid counting 'free riders' which are common in the context of supplier obligations and financial support schemes. For example, if a national support scheme for building renovation supports 100 individual actions in a given year, some of those actions would have happened anyway (without the scheme) and must be deducted.

Likewise, when a policy is in place for many years, it is very likely that it has market transformation effects. For example, private stakeholders will take it into account in their own strategies to develop products, services, etc. This means, for example, that the current trends in the market average can be partly due to the effects of policy from previous years. Therefore, if a survey is conducted to assess 'free-rider' effects, it is likely that some of these effects today are also spill-over effects from previous years. Annex V(2)(b) and (c) EED provide derogations from these basic principles:

'... By way of derogation from that requirement, savings related to the renovation of existing buildings may be claimed as energy savings for the purpose of Article 7(1) provided that the materiality criterion referred to in point 3(h) of Annex V is ensured. Savings resulting from the implementation of national minimum requirements established for new buildings prior to the transposition of Directive 2010/31/EU can be claimed as energy savings for the purpose of point (a) of Article 7(1), provided that the materiality criterion is ensured and those savings have been notified by Member States in their National Energy Efficiency Action Plans in accordance with Article 24(2).

(c) Credit may be given only for savings exceeding the following levels:

- (i) Union emission performance standards for new passenger cars and new light commercial vehicles following the implementation of Regulations (EC) No 443/2009 and (EU) No 510/2011 of the European Parliament and of the Council;
- (ii) Union requirements relating to the removal from the market of certain energy related products following the implementation of implementing measures under Directive 2009/125/EC.'

⁽⁸⁴⁾ For further explanations and examples, see Appendix VIII.

⁽⁸⁵⁾ For further explanations and examples, see Appendix VIII.

⁽⁸⁶⁾ See also Appendix VIII.

Furthermore, Member States need to consider and exceed with their national laws levels set by the Regulation (EU) 2019/631, and minimum targets for the public procurement of clean and zero-emission vehicles for certain road transport vehicles following the implementation of the revised Clean Vehicles Directive.

7.3.1. *Additionality in relation to measures targeting the renovation of buildings* ⁽⁸⁷⁾

As a general principle, Annex V(2)(b) EED provides that energy savings resulting from the implementation of mandatory EU law are to be considered as savings that would have occurred in any event and should thus not be claimed.

In general, building codes associated with the energy performance of buildings lay down mandatory requirements under EU law (the EPBD) and are part of the 'business as usual' scenario.

By way of derogation, Member States may count in full savings from the renovation of buildings, provided that the materiality criterion referred to in Annex V(3)(h) EED is satisfied and all energy savings stem from policy measures promoting the renovation. They must also show that the savings claimed from the measures exceed savings that would have occurred in the absence of the measures. They should demonstrate that the obligated, participating or entrusted party has contributed to the achievement of the savings claimed ⁽⁸⁸⁾.

The starting point for calculating the savings is to measure the consumption of the building before and after the renovation. Member States may use this derogation for both obligation periods, from the entry into force of the amending Directive (EU) 2018/2002, i.e. since 24 December 2018.

Example

A national building code requires that buildings undergoing major renovation be upgraded to at least energy performance class B. The Member State concerned cannot claim the resultant savings for the purposes of Article 7.

However, it can claim savings if it has taken a measure promoting the renovation (e.g. it provides households with a subsidy for a renovation that they would otherwise not undertake). In that case, all the savings resulting from that measure can be claimed irrespective of the energy class upgrade (i.e. all savings can be claimed for energy upgrades from class D to C or from D to B, or from D to A, etc.).

Renovation projects have to comply with national minimum energy performance requirements established under the EPBD. Measures that can support a higher degree of ambition, i.e. energy performance that goes beyond what is required, may be encouraged.

7.3.2. *Additionality in relation to measures targeting the construction of new buildings*

From the entry into force of the amended EED and, if necessary, from national transposition or implementation, Member States may count energy savings resulting from the implementation of national minimum requirements established for new buildings only towards the savings required for the first obligation period (2014-2020), provided that:

- (i) they meet national minimum requirements established prior to the transposition of the EPBD, i.e. by 9 July 2012 (see Article 28(1) EPBD);

⁽⁸⁷⁾ Article 7(1) EPBD provides that 'Member States shall take the necessary measures to ensure that when buildings undergo major renovation, the energy performance of the building or the renovated part thereof is upgraded in order to meet minimum energy performance requirements set in accordance with Article 4 in so far as this is technically, functionally and economically feasible'.

Article 2(10) EPBD defines 'major renovation' as the renovation of a building where:

- (a) the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated; or
- (b) more than 25 % of the surface of the building envelope undergoes renovation.

Member States may choose to apply option (a) or option (b).

⁽⁸⁸⁾ See recital 41 EED.

(ii) they are 'material'; and

(iii) they have been notified in the NEEAP by 30 April 2017 (see Article 24(2) EED).

Energy savings can only be claimed from the date of entry into force of the amended EED and only towards the cumulative end-use savings required by 31 December 2020. Member States must show that the application of the national minimum requirements led to measurable savings that would not otherwise have been achieved. If any national transposition or implementation measures are necessary to allow those savings to be claimed, these must be adopted and in place before any savings are claimed.

If a Member State makes use of the derogation, it should carefully assess possible interaction with the exemption provided for in Article 7(4)(d) EED ('early action') and ensure that double-counting is avoided.

Building's construction projects must comply with national minimum energy performance requirements. Measures that can support a higher degree of ambition, i.e. energy performance that goes beyond what is required, may be encouraged.

7.3.3. *Additionality in relation to public bodies' buildings*

In principle, the derogation from the principle of additionality in Annex V(2)(b) EED also applies to energy savings related to the renovation of public bodies' buildings, since such savings are 'related to renovation of existing buildings' (see second sentence in Annex V(2)(b) EED).

The aim of the derogation is to allow Member States, from the entry into force of the amending Directive, to claim all energy savings for the purpose of Article 7(1) EED stemming, for example, from measures taken to achieve the renovation rate of 3 % floor area of heated and/or cooled buildings owned and occupied by central government (see Article 5).

However, Member States have to show that all savings claimed stem from policy measures implemented for the renovation of public bodies' buildings⁽⁸⁹⁾. They cannot count energy savings that would have occurred in the absence of the policy measure. Hence, Member States need to demonstrate materiality. If any national transposition or implementation measures are necessary to allow those savings to be claimed, these must be put in place before any savings are claimed.

Member States have to calculate energy savings claimed from policy measures implemented for the renovation of public bodies' buildings in accordance with Annex V. The amount of energy savings which is counted towards the required end-use energy savings under Article 7(1) EED shall be expressed in final energy consumption. If the amount of energy savings is expressed in primary energy, Member States have to use the conversion factors set out in Annex IV EED.

7.3.4. *Additionality in relation to implementing measures under the Ecodesign Directive⁽⁹⁰⁾*

The replacement of boilers only is not considered as a renovation measure, because of the specific provision in Annex V(2)(c) EED. Thus, the starting point will always be the minimum requirements under the specific ecodesign provisions⁽⁹¹⁾. Energy savings resulting from the replacement of appliances regulated by ecodesign legislation, e.g. space heaters, may be counted only if they exceed the minimum ecodesign requirements, except in the case of early replacement (see Annex V(2)(e) EED).

If Member States provide incentives or subsidies for products covered by EU energy labelling regulations, it is recommended that they target the higher classes of energy efficiency. For example, an incentive or subsidy to encourage the installation of new, more energy-efficient boilers would only cover boilers in the two highest significantly populated classes of the energy label for boilers, based on market data relevant to the period in question.

⁽⁸⁹⁾ See recital 41 EED.

⁽⁹⁰⁾ Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285, 31.10.2009, p. 10).

⁽⁹¹⁾ For regulations listed by category of product, see:

https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products_en

7.3.5. *Additionality in relation to energy audits under Article 8*

Article 8(4) requires Member States to ensure that large enterprises (i.e. firms that are not SMEs) conduct an energy audit every 4 years; this does not in itself lead to energy savings.

Measures to encourage or support the implementation of the recommendations of an audit go beyond the minimum required under Article 8 — the second subparagraph of Article 8(7) provides that Member States ‘*may* implement an incentive or support scheme’. Therefore, energy savings resulting from such measures can be counted, as they would not have happened anyway, provided the materiality criterion is fulfilled. The same applies for savings that result from measures targeting SMEs.

7.4. **Materiality and eligibility**

In addition to the additionality principle, Member States need to satisfy the ‘materiality’ criterion. The automatic roll-out of EU legislation or autonomous improvements because of market forces or technological developments (for example) cannot be taken into account, as Member States may not count actions that would have happened anyway.

The activities of national public authorities in implementing the policy measure must be ‘material’ to the achievement of the energy savings claimed; in other words:

- they must have contributed to the individual action in question; and
- the subsidy or involvement of the obligated, participating or entrusted party must clearly have had more than a minimal effect on the end-user’s decision to undertake the energy-efficiency investment.

Therefore, Member States need to show that the savings are caused by a policy measure designed to trigger end-use energy savings⁽⁹²⁾. Measures taken pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council⁽⁹³⁾ can be considered material, but Member States have to show that they result in verifiable and measurable or estimable energy-efficiency improvements.

For financing schemes, for example, an indication of the amount of subsidy is not enough to demonstrate materiality, since this alone does not prove that subsidies have influenced end-users’ investment decisions. The role played by actors involved in the actions may in principle be proved without a subsidy as a benchmark; standardised actions (e.g. creation of installation standards for products, energy advice and energy audits followed by the actual implementation of actions) could be an important materiality indicator.

To ensure compliance, Member States could set general materiality requirements under an EEOS or alternative measures and verify these on a project-by-project basis⁽⁹⁴⁾. These could establish that parties (e.g. when applying for a ‘white certificate’⁽⁹⁵⁾) must document and prove a direct contribution to the implementation of the action.

Obligated parties could be required to prove:

- whether the contribution has been delivered directly or indirectly (i.e. by intermediaries); and
- whether it has been decided prior to the installation of the action.

Member States could also require, for example, that:

- a contract be concluded between distribution system operators (i.e. the obligated parties) and third parties;

⁽⁹²⁾ For criteria to show materiality in NEEAPs and Article 7 notifications, see Appendix IX.

⁽⁹³⁾ Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (OJ L 156, 19.6.2018, p. 26).

⁽⁹⁴⁾ See Appendix XII.

⁽⁹⁵⁾ A legal instrument issued by an authorising body guaranteeing that a specified amount of energy savings has been achieved. Each certificate is a unique and traceable commodity carrying a property right over a certain amount of additional energy savings and guaranteeing that the benefit of those savings has not been accounted for elsewhere.

- energy savings not be generated before the contract is issued;
- parties can count savings only where they have been directly involved in the implementation of the measure (e.g. by providing energy audits, subsidies, etc.); and
- agreements be drawn up covering the whole chain from obligated actors to energy end-users.

7.5. **Measures promoting the installation of small-scale renewable energy technologies on or in buildings for own use**

It is important to distinguish between:

- the possibility provided for in Article 7(4)(f) EED, which refers to an amount of energy generated on or in buildings for own use that can be excluded from the amount of energy savings calculated in accordance with Article 7(2) and (3) EED; and
- the clarification in Annex V(2)(e) EED, whereby savings stemming from measures promoting the installation of small-scale renewable energy technologies on or in buildings can in principle be counted towards the savings required under Article 7(1).

This is also explained in recital 43 EED.

Under Annex V(2)(e) EED, Member States may count energy savings stemming from measures promoting the installation of small-scale renewable energy technologies on or in buildings for own use towards the required amount of energy savings under Article 7(1) EED, provided that those measures result in verifiable, and measurable or estimable end-use energy savings and are calculated in accordance with Annex V EED ⁽⁹⁶⁾.

Thus, the requirements of additionality and materiality, and the Member State's established monitoring and verification rules also apply.

Member States must show that such measures result in end-use energy savings because of the technological switch. For example, savings from switching to more efficient heating and hot-water technologies in buildings, including renewable energy technologies, remain fully eligible as long as Member States can ensure that they are additional, measurable and verifiable according to the methods and principles in Annex V ⁽⁹⁷⁾.

This is clarified in Annex V(2)(e) EED and is geared to the overall objective of Article 7(1) EED, i.e. to save energy in end-use, regardless of the technology (be it a measure promoting renewable or fossil energy fuelled technology, which results in reduced actual energy use in buildings, transport or industry).

Annex V(2)(e) EED refers explicitly to the energy savings obligation under Article 7(1), which requires Member States to achieve cumulative end-use energy savings and aims at actual reduction in energy use by a natural or legal person (in line with Annex V(1)(b)). Article 2(5) defines 'energy savings' as an amount of saved energy determined by measuring and/or estimating consumption before and after implementation of an energy efficiency improvement measure, while ensuring normalisation for external conditions that affect energy consumption. Since Article 7 EED aims at an actual reduction of energy end-use, it can be concluded that Annex V(2)(e) requires that measures promoting the installation of small-scale renewable energy technologies on or in buildings be shown to result in energy savings, i.e. an actual reduction in end-use energy.

⁽⁹⁶⁾ For measures promoting the installation of small-scale renewable energy technologies on or in buildings, see Appendix X.

⁽⁹⁷⁾ See Appendix X.

Member States have the flexibility to express the energy savings in terms of either final or primary energy consumption, as provided for in Annex V(3)(d) (alternative policy measures) and Article 7a(4) (EEOs). This flexibility does not alter the obligation for cumulative energy savings in terms of energy sales (in the period to 2020) and final energy consumption (2021-2030).

7.6. Measures promoting the uptake of more efficient products and vehicles

Member States' energy efficiency improvement measures in transport are eligible to be taken into account for achieving their end-use energy savings obligation ⁽⁹⁸⁾. Such measures include:

- policies to promote more efficient vehicles or a modal shift to cycling, walking and collective transport; and
- mobility and urban planning that reduces demand for transport.

The public procurement of clean and zero-emission vehicles are eligible, subject to their additionality to the minimum requirements of the revised Clean Vehicle Directive.

Schemes that accelerate the uptake of new, more efficient vehicles or policies fostering a shift to better-performing fuels that reduce energy use per kilometre are also eligible, subject to compliance with the rules on materiality and additionality ⁽⁹⁹⁾.

Annex V(2)(f) clarifies that full credit may be claimed for policies that accelerate the uptake of more efficient products and vehicles, provided that it is shown that:

- such uptake takes place before expiry of the average expected lifetime of the product or vehicle, or before the product or vehicle would usually be replaced; and
- the full amount of savings is claimed only for the period until the end of the average expected lifetime of the product or vehicle to be replaced ⁽¹⁰⁰⁾.

Where appropriate, such measures should be consistent with Member States' national policy frameworks established pursuant to Directive 2014/94/EU on the deployment of alternative fuels infrastructure.

7.7. Ensuring that quality standards are maintained

Annex V(2)(g) EED clarifies that the promotion of energy-efficiency measures must not lower quality standards for products, services and the installation of measures. Member States must ensure that quality standards are maintained, or introduced where they do not yet exist.

7.8. Addressing climatic variations

Annex V(2)(h) EED allows Member States to adjust energy savings to address climatic variations between regions. The provision lists two options:

- (i) adjust to a standard value; or
- (ii) attribute different energy savings in accordance with temperature variations.

7.9. Avoiding double-counting

Article 7(12) EED requires Member States to demonstrate that energy savings are not double-counted where the impacts of policy measures or individual actions overlap. Given the wide variety of instruments notified by Member States and the high likelihood of policy overlaps from the use of EEOs and alternative measures in tandem (e.g. interaction between energy taxation and subsidies to households to replace windows or space heaters), it is crucial to address the risks of double-counting.

⁽⁹⁸⁾ See Appendix VII.

⁽⁹⁹⁾ Recital 15 EED.

⁽¹⁰⁰⁾ See Appendix VII.

A national database could be an effective tool in this respect. For example, the database would register that a subsidy to encourage the replacement of old boilers had been paid to a certain household and alert the user if the same household applied again.

Using multiple policy measures in combination results in greater complexity for the Member States, in terms of:

- greater effort associated with implementation, e.g. calculating the energy savings; and (more importantly)
- ensuring:
 - enforcement, especially where the different instruments are extensive in scope; and
 - verification of the impact without double-counting.

Article 7(12) EED also forbids double-counting where policies overlap, i.e. Member States must take account of the fact that other policy measures carried out in the same timeframe may have an impact on the amount of energy savings, so not all changes observed since the introduction of a particular policy measure can be attributed to that measure alone.

8. MEASUREMENT, MONITORING, CONTROL, QUALITY AND VERIFICATION

The EED emphasises the importance of monitoring and verification rules for the implementation of EEOSs and alternative policy measures, including the requirement to check a statistically representative sample of measures.

Selecting a statistically significant proportion and representative sample of the energy efficiency improvement measures involves establishing a subset of a statistical population of energy-saving actions within each measure that accurately reflects the entire population of all energy-saving actions and thus allows for reasonably reliable conclusions to be drawn regarding confidence in the totality of the measures ⁽¹⁰¹⁾.

Article 7a(5) EED (for EEOSs)

'Member States shall put in place measurement, control and verification systems under which documented verification is carried out on at least a statistically significant proportion and representative sample of the energy efficiency improvement measures put in place by the obligated parties. The measurement, control and verification shall be carried out independently of the obligated parties.'

Article 7b(2) EED (for alternative policy measures)

'For all measures other than those relating to taxation, Member States shall put in place measurement, control and verification systems under which documented verification is carried out on at least a statistically significant proportion and representative sample of the energy efficiency improvement measures put in place by the participating or entrusted parties. The measurement, control and verification shall be carried out independently of the participating or entrusted parties.'

The measurement, control and verification systems should ensure that the energy savings calculations are verified in respect of a statistically significant proportion and representative sample of the energy-efficiency improvement measures.

These requirements can be met, inter alia, by means of

- automatised computer checks or desktop review of the data and calculations reported by the obligated, participating or entrusted parties, or by the beneficiaries (where the beneficiaries report the data directly to the public authority);
- evaluating metered energy savings on a statistically significant proportion and representative sample of measures or beneficiaries;
- using verifications carried out under a regulation, qualification, accreditation or certification scheme, e.g. where the reported energy savings are based on energy audits or energy performance certificates (scaled savings).

⁽¹⁰¹⁾ See Appendix XII.

The documentation for the policy measure should explain how the requirements of this other scheme ensure that controls or verifications are carried out on a statistically significant proportion and representative sample of the energy audits or other savings assessments.

The monitoring and verification system can be organised in different steps or levels. On-site inspections can be part of the approach, as a second stage of verification on sub-samples of individual actions identified as being at risk of non-compliance with the requirements of the measures. Where these are not technically or economically feasible, this can be explained in the documentation for the measure.

Member States must explain how they use benchmarks to check deemed or scaled savings (Annex V(5)(g) EED).

The independence of the measurement, control and systems (see Annex V(5)(j) EED) can be documented on the basis that the verification body (non-exhaustive list of criteria):

- is a public body with statutory independence; or
- has no financial link with (i.e. is not partly or fully owned nor paid by) the obligated, participating or entrusted parties; or
- may be contracted by obligated, participating or entrusted parties, but in this case is subject to controls by the public authority or a qualification, accreditation or certification body.

The verification body can be:

- directly in charge of the verification of energy-efficiency improvement measures or energy-savings calculations; or
- in charge of controlling the verification processes and sampling verifications done by other organisations, including the obligated, participating or entrusted parties.

9. PLANNING AND REPORTING OBLIGATIONS

9.1. First obligation period

For the 2014-2020 obligation period, Member States must submit annual reports by 30 April 2019 and 2020 (Article 24(1) and Annex XIV, part 2) ⁽¹⁰²⁾. In doing so, they report, inter alia, on progress towards the energy savings target and on policy measures adopted or planned pursuant to Annex XIV, part 2. This will be assessed by the Commission.

Article 27 of the Governance Regulation requires each Member State to report to the Commission by 30 April 2022 on the achievement of its national 2020 energy-efficiency target (as established pursuant to Article 3(1) EED) by providing the information set out in part 2 of Annex IX to the Governance Regulation.

9.2. Second obligation period and beyond

For the 2021-2030 obligation period and beyond, the following major planning and reporting obligations apply (Articles 7, 7a and 7b and Annex V EED):

- in their (draft and final) integrated NECP (Annex III to the Governance Regulation), Member States must show their calculation of the amount of energy savings to be achieved over the 2021-2030 period, as referred to in point (b) in the first subparagraph of Article 7(1) (see Article 7(6) EED);
- since some data (e.g. annual final energy consumption, averaged over 2016-2018 (in ktoe)) might not have been available for notification in the first draft NECP ⁽¹⁰³⁾, it might not have been possible to show the above calculation. However, Member States must show in their first final and subsequent draft and final NECPs how they have taken account of the elements listed in Annex III to the Governance Regulation;

⁽¹⁰²⁾ Under the second subparagraph of Article 59 of the Governance Regulation, Article 24(1) is deleted as from 1 January 2021.

⁽¹⁰³⁾ This was due by 31 December 2018 (Article 9(1) of the Governance Regulation).

- in addition to the above and where relevant, Member States must explain in their (draft and final) NECP how they established the annual savings rate and the calculation baseline under Article 7(2) and (3) EED, and how and to what extent they applied the options referred to in Article 7(4) (see Article 7(6) EED);
- if a Member State decides to apply one or more of the options in Article 7(4) EED, it must apply and calculate the effect for the obligation period (see Article 7(5) EED); and
- if a Member State makes use of the option in Article 7(4)(c) EED for 2021-2030, it must inform the Commission of the intended policy measures in its (draft and final) NECP. It must calculate the impact of the measures in accordance with Annex V EED and include it in the NECP (see Article 7(4)(c)). It must submit this information for the first time in the first final NECP (by 31 December 2019).

In addition, Member States must:

- include information on the outcome of measures to alleviate energy poverty in the context of the EED in their national energy and climate progress reports under Article 17 of the Governance Regulation (see Article 7(11) EED);
- publish, on an annual basis, the energy savings achieved by each (sub-category of) obligated party and in total under the scheme (see Article 7a(7) EED); and
- describe in detail in their NECPs the alternative method and provisions to ensure that they meet the requirement in Annex V(2)(i) EED, i.e. that the calculation of energy savings takes into account the lifetime of the measures and the rate at which savings decline over time.

Alternatively, Member States may adopt another method that is considered to achieve at least the same total amount of savings. In this case, they must ensure that the amount calculated using that method does not exceed the amount from a calculation counting the savings each individual action will achieve during the period, from its date of implementation to 31 December 2020 or 2030 as appropriate.

In conclusion, the following planning and reporting obligations under the Governance Regulation also apply to the implementation and progress of the energy savings obligation under Articles 7, 7a and 7b and Annex V EED:

Timeline	
31 December 2018 (subsequently 1 January 2028 and every 10 years thereafter)	Submission of draft NECP (Articles 9(1), 4 and 6, Annexes I and III Governance Regulation)
6 months before final NECP	Commission may issue recommendations to Member States whose contributions (including the contribution of the energy savings obligation towards Article 3(5) EED) it deems insufficient (Article 31(1) Governance Regulation)
31 December 2019 (subsequently 1 January 2029 and every 10 years thereafter)	Submission of final NECP (Articles 3(1), 4 and 6, Annexes I and III Governance Regulation)
10 March 2020	Submission of first long-term renovation strategy (Article 2a(8) EPBD)

By 31 October 2021 (and every 2 years thereafter)	Commission assessment of progress towards EU targets, in particular on the basis of the integrated national energy and climate progress reports (Article 29 Governance Regulation). As regards the energy savings obligation, Articles 29, 21 (integrated reporting on energy efficiency) and 24 (integrated reporting on energy poverty) of the Governance Regulation are relevant. In the event of insufficient progress by a Member State, the Commission will issue recommendations (Article 32(1) Governance Regulation).
By 30 April 2022	Report on the achievement of the 2020 energy efficiency targets by each Member State (Article 27 and Annex IX, part 2 Governance Regulation)
By 15 March 2023 (and every 2 years thereafter)	Report on implementation of the NECP ('integrated national energy and climate progress report') (Article 17 Governance Regulation)
30 June 2023 (subsequently 1 January 2033 and every 10 years thereafter)	Submission of draft update of NECP (Article 14(1) Governance Regulation)
30 June 2024 (subsequently 1 January 2034 and every 10 years thereafter)	Submission of final update of NECPs (Article 14(2) Governance Regulation)

9.3. Notification of EEOSs and alternative measures (except taxation)

Under Annex V(5) EED and Annex III of the Governance Regulation, Member States must notify the Commission of their proposed detailed methodology for the operation of their policy measures, as referred to in Articles 7a, 7b and 20(6) EED. Except in the case of taxation (see section 9.4), the notification must include details of:

- (a) the level of energy savings required under point (b) in the first subparagraph of Article 7(1) or expected to be achieved over the whole 2021-2030 period;
- (b) obligated, participating or entrusted parties, or implementing public authorities;
- (c) target sectors;
- (d) policy measures and individual actions, including the expected total amount of cumulative energy savings for each measure;
- (e) the duration of the obligation period for the EEOS;
- (f) the actions provided for under the policy measures;
- (g) the calculation methodology, including how additionality and materiality have been determined and the methodologies and benchmarks used for deemed and scaled savings;
- (h) the lifetimes of measures, and how they are calculated or what they are based on;

- (i) the approach taken to address climatic variations within the Member State; and
- (j) the monitoring and verification systems for measures under Articles 7a and 7b and how their independence from the obligated, participating or entrusted parties is ensured.

In addition, part 3.1 and 3.2 of Annex III to the Governance Regulation requires Member States to notify the following information:

‘3.1. Energy efficiency obligation schemes referred to in Article 7a of Directive 2012/27/EU:

- (a) description of the energy efficiency obligation scheme;
- (b) expected cumulative and annual amounts of savings and duration of the obligation period(s);
- (c) obligated parties and their responsibilities;
- (d) target sectors;
- (e) eligible actions provided for under the measures;
- (f) information on the application of the following provisions of Directive 2012/27/EU:
 - (i) where applicable, specific actions and proportion of savings to be achieved in households affected by energy poverty in accordance with Article 7(11);
 - (ii) savings achieved by energy service providers or other third parties (point (a) in Article 7a(6)); and
 - (iii) “banking and borrowing” (point (b) in Article 7a(6)); and
- (g) where relevant, information on trading of energy savings.

3.2. Alternative measures, as referred to in Articles 7b and 20(6) of Directive 2012/27/EU (except taxation):

- (a) types of policy measure;
- (b) brief description, including design features, for each measure notified;
- (c) expected total cumulative and annual amounts of savings for each measure and/or amount of energy savings in relation to any intermediate periods;
- (d) implementing public authorities, participating or entrusted parties and their responsibilities for implementing the policy measure(s);
- (e) target sectors;
- (f) eligible actions provided for under the measures; and
- (g) where applicable, specific policy measures or individual actions targeting energy poverty.’

9.4. Taxation measures

Annex V(5)(k) EED requires Member States (in accordance with the Governance Regulation) to notify the Commission of their methodology for the operation of taxation measures. In particular, they must notify the following details:

- ‘(i) the target sectors and segment of taxpayers;
- (ii) the implementing public authority;
- (iii) the expected savings to be achieved;

- (iv) the duration of the taxation measure; and
- (v) the calculation methodology, including the price elasticities used and how they have been established.’

In addition, part 3.3 of Annex III to the Governance Regulation requires Member States to notify the following information on tax measures:

- ‘(a) brief description of measures;
- (b) duration of measures;
- (c) implementing public authority;
- (d) expected cumulative and annual amount of savings per measure;
- (e) target sectors and segment of taxpayers;
- (f) calculation methodology, including which price elasticities are used and how they have been established, in accordance with point (4) of Annex V to Directive 2012/27/EU.’

Member States should show how they have calculated the elasticities and which recent and representative official data sources they have used ⁽¹⁰⁴⁾.

10. POST-2030 ENERGY SAVINGS OBLIGATION PERIOD

The second subparagraph of Article 7(1) EED requires Member States to continue to achieve new annual savings in accordance with point (b) in the first subparagraph for 10-year periods after 2030, unless reviews by the Commission by 2027 and every 10 years thereafter conclude that this is not necessary to achieve the EU's long-term energy and climate targets for 2050.

⁽¹⁰⁴⁾ For further proposals on elasticities to be used to capture the responsiveness of demand, see Appendix IV.

Illustrative examples for annual savings rate if applying options under Article 7(2)-(4) ⁽¹⁾

	Mtoe	Annual savings rate (%)	Explanation
Baseline (average final energy consumption)	100		Average final energy consumption
Self-generation for own use	5		
Final energy consumption in transport	33		
Adjusted baseline	62		
Minimum savings rate (Article 7(1)(b))		0,8 %	The average final energy consumption (100) is multiplied by 0,8 % and cumulated over 10 years (resulting in 44 Mtoe as the total savings to be achieved over the obligation period)
Option 1: full use of exemptions (35 %)			
Required own savings rate required before exemptions applied		1,2 %	Own savings rate a Member State would need to apply if it decides to use the options in paragraph 4 to the maximum (35 %); this means that the exemption would have to be applied to cumulative savings of 68 Mtoe.
Option 2: exclude transport and self-consumption			
Savings after baseline exclusions	27,3		These are the cumulative savings left when applying the 0,8 % savings rate to consumption after all exclusions.
Additional savings needed	16,7		These are the savings needed to reach the minimum required (44 Mtoe).

	Mtoe	Annual savings rate (%)	Explanation
Required own savings rate used before baseline exclusions		1,3 %	Own savings rate a Member State would need to apply if it decides to exclude energy consumption in transport and self-generation from the calculation baseline.
Option 3: full use of exemptions and baseline exclusions			
Savings after baseline exclusions	27,3		These are the savings left when applying all exclusions to baseline.
Savings after applying maximum exemptions	17,7		These are the savings left when applying all exclusions and options under Article 7(2)-(4).
Additional savings needed	26,3		These are the savings needed to reach the minimum required (44 Mtoe)
Required own savings rate used before baseline exclusions and exemptions		2 %	Own savings rate a Member State would need to apply if it decides to exclude transport and self-generation from the calculation baseline and use the options in paragraph 4 to the maximum (35 %).

(¹) The figures in the table do not relate to any particular Member State. The aim of this example is to show possible consequences when using different options under Article 7(2)-(4) and their effect on the energy savings to be achieved. The calculated amount of savings will differ for each Member State in question.

APPENDIX II

ENERGY EFFICIENCY OBLIGATION SCHEMES

Member States should consider at least the following aspects when designing and implementing an EEOS ⁽¹⁾:

1. Policy objectives

Member States should keep the policy objectives of the EEOS simple, clear and focused on achieving energy savings by taking into account which end-use sector has the most energy savings potential and where the scheme could best help overcome the barriers to energy-efficiency investment.

If the scheme has multiple objectives, ensure that the achievement of any non-energy-related objectives does not hinder pursuit of the energy-savings objective.

When designing the scheme, Member States are required (Article 7(11) EED) to take account of the need to alleviate energy poverty (unless it is decided that it will be addressed under the alternative policy measures). For example, the EEOS may include a specific target relating to energy poverty (e.g. minimum share or amount of energy savings to be achieved from actions for low-income households) or a bonus factor for actions implemented for low-income households. An alternative could be for obligated parties to contribute to a fund that will finance energy efficiency programmes for low-income households ⁽²⁾.

2. Legal authority

Use a carefully selected combination of legislation, regulation, and ministerial and administrative processes to establish and operate the EEOS. Setting up the broad design of an EEOS under enabling legislation provides stakeholders with certainty as to the legal status of the scheme. Developing detailed implementation procedures under regulation allows the details of the scheme to be amended in the light of experience.

Before an EEOS becomes fully operational, it could take some years (3 to 4, depending on the design of the scheme and the legal context in the Member State) to estimate potential, plan and design the policy, and test it in the market.

3. Fuel coverage

Decide the fuel coverage of the EEOS according to the overall policy objectives and estimates of energy-efficiency potential for the various fuels. An EEOS set up to meet the energy savings obligation under Article 7 can cover a wide range of fuels. However, a number of successful programmes have started by covering one or two fuels and then expanded to other fuels in the light of experience.

Fuel coverage should also take into account the risks of market distortion where different energy types can compete to provide the same energy service (e.g. for space heating).

4. Sector and facility coverage

Decide the end-use sector and facility coverage of the EEOS according to the overall policy objectives and estimates of energy-efficiency potential for the various sectors and facilities. If the intention is to restrict sector and facility coverage tightly, consider whether assessing compliance will become too onerous.

In jurisdictions where there are energy-intensive, trade-exposed industries (e.g. aluminium smelting), governments may decide to exclude (or 'carve out') such industries from an EEOS on the grounds that their competitiveness in international markets may be adversely affected.

⁽¹⁾ Adapted from RAP (2014), *Best practices in designing and implementing energy efficiency obligation schemes* (<https://www.raponline.org/knowledge-center/best-practices-in-designing-and-implementing-energy-efficiency-obligation-schemes/>) with the inclusion of lessons learned from the ENSPOL project (<http://enspol.eu/>); RAP (Lees, E., Bayer, E.), *Toolkit for energy efficiency obligations* (2016) (<https://www.raponline.org/wp-content/uploads/2016/05/rap-leesbayer-ecotoolkit-2016-feb.pdf>)

⁽²⁾ See Appendix V for further proposals on measures alleviating energy poverty.

5. **Energy savings target**

Set the level of the energy savings target for the EEOS according to the overall policy objectives and aim to strike a balance between making progress, the cost to consumers of meeting the target and what is practically possible based on an assessment of energy-efficiency potential.

Set the target in terms of final energy (i.e. the quantities of energy delivered to, and used by, consumers), unless the scheme covers several different fuels, in which case primary energy may be more appropriate.

Denominate the target in energy units, unless the scheme has a policy objective that relates to some other objective (e.g. reducing greenhouse gas emissions), in which case consider using CO₂-equivalent units.

Set a relatively long timeframe for the target, preferably between 10 and 20 years. With a clear signal of the increasing (or same level of) target over time, obligated parties can adapt their business models, e.g. starting with behavioural measures in the first period and moving to more complex energy-saving technologies in later periods.

Calculate eligible energy savings over the estimated lifetime for each energy-efficiency measure.

Consider setting sub-targets where the scheme has policy objectives that are not solely related to achieving energy savings.

6. **Obligated parties**

Determine the obligated parties in the EEOS according to the fuel coverage of the scheme and the type of energy provider that has the infrastructure and capability to manage the delivery and/or procurement of eligible energy savings, bearing in mind the requirement (Article 7a(2) EED) that designation of the obligated parties must be based on objective, non-discriminatory criteria.

Consider restricting the obligation to larger energy providers, which are usually able to implement energy-efficiency projects in customers' facilities themselves or to contract third parties to do so. In unbundled energy and gas markets, obligations can be placed on energy retailers and/or transmission and distribution system operators. It will be necessary to decide which type of energy provider will be obligated. Energy retailers' existing relationships with end-use customers may make it easier to initiate the scheme. Transmission and distribution system operators are further from the end-user, but (as regulated monopolies) their incentives can be more easily aligned with the objectives of the EEOS.

Allocate individual energy-saving targets to each obligated party on the basis of its market share of energy sales. If there are carve-outs for energy-intensive, trade-exposed industries and/or other specified groups of end-users, sales to these end-users can be excluded from the calculation of market shares.

7. **Compliance regime**

As an integral component of the EEOS, establish a procedure for obligated parties to report claimed eligible energy savings to an appropriate authority and a process for checking and verifying these savings.

Establish a penalty to be imposed on obligated parties that fail to meet their individual energy saving targets. Set the level of the penalty high enough to give energy providers an incentive to meet their targets.

Consider whether energy providers should be required to make up any shortfall in energy savings in addition to paying a penalty ⁽³⁾.

8. **Performance incentives**

Consider whether to include in the EEOS performance incentives to be awarded to obligated parties that exceed their energy saving targets. Where out-performing energy providers stand to gain significant revenue from performance incentive payments, it is important to have in place robust measurement, verification and reporting procedures to ensure that incentive payments are justified.

⁽³⁾ See also Appendix IX on materiality and Appendix XII on monitoring and verification.

9. Eligible energy savings

Enable service providers to implement energy-efficiency projects to produce eligible energy savings. Obligated parties may then be able to:

- engage specialist firms, such as energy service companies, to implement projects on their behalf;
- contribute to an EENF that supports the implementation of energy-efficiency projects; or
- in the case of 'white certificates' (see section on trading below), purchase verified eligible energy savings achieved by accredited non-obligated parties.

10. Removing barriers to energy savings

Do not create or uphold regulatory or non-regulatory barriers to the achievement of energy-efficiency improvements.

Provide incentives for energy-efficiency projects or policy measures that can be implemented to produce eligible energy savings, while ensuring that the savings can be verified.

Remove barriers, e.g. by:

- providing incentives;
- repealing or amending legal or regulatory provisions;
- adopting guidelines and interpretative communications; and/or
- simplifying administrative procedures.

This may be combined with the provision of education, training and specific information, and technical assistance on energy efficiency.

Evaluate barriers and action taken to remove barriers, share the findings with the Commission and share national best practices in this regard.

11. Eligible energy-efficiency measures

Consider establishing in the EEOS an extended, non-exclusive list of approved energy-efficiency measures with deemed energy-saving values (to as many sectors as possible, depending on the target of the scheme, so that the energy service market can be triggered).

Allow qualifying non-listed measures, so as to encourage innovation among obligated parties and energy service companies in the achievement of policy objectives.

12. Interaction with other policy measures

Consider ways in which the EEOS can interact positively with other policy measures such as information and financing measures, both of which can help enable consumers to participate in the take-up of energy-efficiency measures. This can reduce the costs to obligated parties of meeting their obligations and enable the setting of more ambitious targets.

Ensure that the double-counting of energy savings is avoided when reporting impacts.

Avoid targeting the take-up of the same energy-efficiency measures with other similar policy measures, such as energy-efficiency auctions. This leads to competition between measures for available energy-efficiency opportunities, driving up the costs borne by either the obligated parties or auction participants.

13. Evaluation, measurement, verification and reporting

As an integral component of the EEOS, establish a robust system for measuring, verifying and reporting energy savings and other activities that contribute to scheme targets.

Establish procedures to evaluate whether savings are additional to what would have happened in the absence of the EEOS.

Ensure that monitoring and verification processes that are independent of the involved parties are put in place and that on-site inspections are used as a means of verification alongside desk-based checks ⁽⁴⁾.

14. **Trading of energy savings**

Consider enabling the trading of energy savings among obligated parties and third parties. The purpose of trading is to broaden the pool of opportunities to produce eligible energy savings and to enable market forces to identify the most cost-effective opportunities.

Energy savings can be traded bilaterally or through a market established by a market maker (who may be, but usually is not, the scheme administrator) or more typically a third party.

Some EEOSs require disclosure of prices, whereas in others this is voluntary.

Energy savings are often traded through the creation and sale of 'white certificates', but they can be traded bilaterally without the need for certificates.

15. **Funding**

Establish an appropriate mechanism in the EEOS to enable recovery of the costs incurred by obligated parties in meeting their individual energy-savings targets.

16. **Scheme administration**

The administration of an EEOS should include at least:

- allocating the energy-savings target between obligated parties;
- approving eligible energy-efficiency measures and (where required) assigning them deemed energy-saving values;
- monitoring, measuring and verifying actual energy savings, including auditing the results of energy-efficiency projects;
- enforcing compliance with the obligation, inter alia, by reviewing the performance of obligated parties against their targets and administering any penalties;
- if applicable, requiring obligated parties to report:
 - aggregated statistical information on their final customers (identifying significant changes to previously submitted information); and
 - current information on final customers' consumption, including, where applicable (while preserving the integrity and confidentiality of private and commercially sensitive information in compliance with EU law):
 - load profiles;
 - segmentation; and
 - geographical location;
- registering the creation and ownership of 'white certificates' (if required); and
- creating and operating a trading market for energy savings (if required).

17. **Scheme results**

A key issue in establishing an EEOS is how the results of the scheme will be reported. This could be done by publishing annual reports on the operation of the scheme that include at least details of:

- developments in the scheme over the year;
- compliance by the obligated parties;
- results against the scheme's overall energy-savings target, including a breakdown of savings by types of energy-efficiency measure;
- results against any scheme sub-targets and portfolio requirements;

⁽⁴⁾ See also Appendix IX on materiality and Appendix XII on monitoring and verification.

- results relating to any trading of energy savings;
- estimated costs of compliance by obligated parties; and
- costs of scheme administration.

18. **Areas for improvement**

Effective EEOSs establish processes for continuous improvement in operation and administration. As part of a continuous cycle of evaluation and policy development, this includes consideration as to how areas for improvement will be identified and how specific improvement action will be taken.

19. **'Banking and borrowing'**

Under Article 7a(6)(b), the EEOS may allow obligated parties to count savings from a given year as if they had been obtained in any of the 4 previous or 3 following years. Depending on the timeframe of the targets or periods of the EEOS, this flexibility can be used to allow obligated parties to overachieve their future target to compensate underachievement of the current target (borrowing), or *vice versa*.

For example, it can be useful to tackle uncertainties in the success rate of the strategies deployed by the obligated parties, which is relevant, *inter alia*, for avoiding penalties imposed by the Member State under Article 13.

Care should be taken to avoid creating 'stop "n" go' cycles (in the event of excessive banking) or to jeopardise the achievement of future targets (in the event of excessive borrowing). This can be avoided by setting maximum proportions of targets or savings that can be borrowed or banked, and maximum durations over which this can be done.

APPENDIX III

ALTERNATIVE POLICY MEASURES

Article 7b EED allows Member States to achieve their energy savings targets by implementing alternative policy measures. Where Member States decide to do so, they should ensure, without prejudice to Article 7(4) and (5) EED, that the savings required under Article 7(1) EED are achieved among final customers and the requirements in Annex V EED (in particular, section 3) are met.

Without prejudice to the legal requirements and the Commission's assessment of planned and existing alternative policy measures notified by Member States, the following indicative and non-exhaustive list of key characteristics might help Member States to formulate alternative measures (except in the transport sector ⁽¹⁾):

1. Financing schemes and instruments, and fiscal incentives**1.1. Building renovation subsidies**

Member States could offer building renovation subsidies, e.g. for the energy-efficiency improvement of existing residential buildings and upgrading of their heating and cooling systems.

The level of subsidy can depend on:

- the energy performance to be achieved (e.g. a specific energy-performance class);
- the energy savings achieved; or
- the efficiency of the heating/cooling system ⁽²⁾.

The subsidy could take the form of a grant or a subsidised loan.

SMEs may be a suitable target for such subsidies. In any case, subsidies must be in line with state aid rules.

1.2. Contracting

Member States may promote energy-performance contracting — a form of market-based energy service aimed at implementing energy-efficiency measures.

Companies provide energy-efficiency services, such as:

- building energy-performance improvement;
- renewal of heating systems or replacement of potentially inefficient appliances; or
- cross-cutting technologies in industry (electric motors, etc.).

The companies guarantee the energy and/or monetary savings of the measures and the contractor's compensation is linked to the performance of the measures implemented.

1.3. VAT reduction for energy efficiency measures

Member States may introduce a reduced VAT rate for certain products, materials or services to encourage the implementation of energy-efficiency measures.

In the implementation of such measures, particular attention should be paid, inter alia, to the requirements of Directive 2006/112/EC on reduced VAT for certain products and services.

⁽¹⁾ See Appendix VII for further proposals on the transport sector.

⁽²⁾ Article 10(6) EPBD requires Member States to link their financial measures for energy-efficiency improvements in the renovation of buildings to the targeted or achieved energy savings, by one or more methods such as:

- the energy performance of the equipment or material used for the renovation,
- standard values for calculation of energy savings in buildings,
- EPCs issued before and after renovation,
- the results of an energy audit, and
- any another relevant, transparent and proportionate method.

1.4. *Accelerated depreciation of efficiency measures*

Member States may promote tax relief that grants tax-paying companies accelerated depreciation for their investments in energy-efficient products. This type of measure may be suitable for increasing the use of energy-efficiency equipment, e.g. in the industrial sector.

A list of eligible products based on specific technology criteria could be developed, so as to capture only the most energy-efficient products available on the market. This should be continually updated to reflect technological and market developments and include the latest technologies.

2. **Energy-efficiency national fund**

Member States could set up EENFs to bundle several types of policy measure. The EENF arrangements might involve grants and subsidies for energy-efficiency measures in several sectors (e.g. businesses, households and municipalities) and information campaigns as accompanying measures.

To ensure high leverage effects, the overall granting process must be designed to be as efficient as possible. Cooperation between the government and banks might be an effective way of doing this. To be eligible under Article 7, the funding of such EENFs must come either from public sources or a combination of public sources and private sources (e.g. banks).

In the implementation of an EENF, particular attention must be paid to avoiding possible overlaps and double-counting of savings with other financial schemes.

Obligated parties under an EEOS may contribute to the EENF to meet all or part of their savings obligation.

3. **Regulations and voluntary agreements**

Member States could promote voluntary or regulated agreements between government and actors in various sectors. The aim could be to enhance the voluntary or binding implementation of certain technological or organisational measures, such as the replacement of inefficient technologies.

4. **Minimum performance standards for industrial processes**

Minimum efficiency standards might be a suitable means of reducing industrial energy demand, as they address the main obstacles to the take-up of cost-effective energy-efficiency measures in industry: risk aversion and uncertainty.

However, as industrial processes can be very (sub)sector-specific, standard-setting might be challenging. In addition, to ensure the effectiveness of policy instruments addressing energy-intensive industries, they should be designed with an awareness of possible interactions or overlaps with the EU emissions trading scheme.

5. **Energy labelling schemes**

Energy labelling must be additional to that required under EU law enabling customers to make informed choices based on the energy consumption of energy-related products. This is why there is limited scope for anything in addition to the labels required for appliances under the Energy Labelling Regulation or for buildings via energy performance certificates (EPCs).

The focus is therefore on end-uses not covered by the Energy Labelling Regulation or for old energy-related products (e.g. see next section), as the Regulation covers energy labelling for energy-related products on the market.

6. **Labelling of old heating systems**

This measure introduces an efficiency label for old heating systems equipped with a heating boiler above a certain age. Consumers are informed about the efficiency status of their heating appliance and may seek energy advice, offers and subsidies. The labelling is intended to increase the replacement rate for old heaters and give consumers an incentive to save energy.

In addition to the labelling of new heating appliances, this measure should accelerate the replacement of inefficient old heating systems.

7. **Training and education, including energy advisory programmes**

These programmes are usually accompanying measures, providing favourable conditions for the success of other alternative measures (e.g. financing schemes). To avoid double-counting, it is common practice to report energy savings only for the alternative measure for which the direct monitoring of participants is possible (e.g. through the approval process for financial aids). Where energy savings are reported directly for training and education programmes, particular care should be taken to justify materiality ⁽³⁾.

8. **Energy-auditing programme for SMEs**

Energy audits are an important tool for identifying measures to increase energy efficiency and reduce energy costs. By determining how much energy is consumed in which areas of a company, such audits identify where potential savings can be made and can therefore be of significant economic benefit.

Although energy audits can offer large potential savings, they are not typically carried out in SMEs. Various measures (e.g. information campaigns, subsidies or tax relief for these services) could be taken to make them more attractive for SMEs.

9. **Energy-efficiency learning networks**

This type of measure establishes branch-specific networks to support the implementation of energy-efficiency measures in businesses and produce lasting cooperation and exchange of information between participants. In many cases, cooperation continues after funding has ended and this has an impact on overall energy-efficiency developments in businesses.

10. **Other alternative measures**

10.1. *Energy-efficiency auctions*

This measure determines the allocation of grants for energy-efficiency projects on the basis of technical and economic criteria (e.g. project size, energy saved or wattage reduced) in a reverse auction mechanism.

Auctions may be open (specifying only amounts to be saved) or closed (specifying certain type of technology). It might be necessary to require participants to undergo an energy audit and/or to monitor savings after implementation. Special requirements for providers might help to address low-income households.

10.2. *National ETS for non-ETS sectors*

This measure establishes a separate upstream emissions trading system (ETS) for parts (e.g. transport and heat in buildings) or all of the sectors not already covered by the EU ETS.

In contrast to a downstream ETS such as the EU ETS, an upstream ETS covers emissions in the upper part of the value chain, i.e. primary energy sources such as natural gas, oil or its derivatives such as petrol or diesel.

The effect is achieved by the same mechanisms as in a downstream system: the fixing of a maximum emission quantity and annual reductions of this cap create a politically set scarcity from which CO₂ prices are formed. This results in incentives for reduction measures.

10.3. *Energy and CO₂ taxes ⁽⁴⁾*

Information on further types of alternative measure can be found in the 'successful measures facility' of the ODYSSEE-MURE project ⁽⁵⁾. Support for the implementation and revision of robust alternative policy measures can be found in the ENSPOL project ⁽⁶⁾. The IEA database ⁽⁷⁾ and the EEA database ⁽⁸⁾ provide more general collections of information on energy efficiency measures.

⁽³⁾ See also Appendix IX.

⁽⁴⁾ See also Appendix III for further details on this type of alternative measure.

⁽⁵⁾ MURE database of successful measures;

<http://www.measures-odyssee-mure.eu/successful-measures-energy-efficiency-policy.asp>

⁽⁶⁾ <http://enspol.eu/>

⁽⁷⁾ <https://www.iea.org/policiesandmeasures/energyefficiency/>

⁽⁸⁾ <https://www.eea.europa.eu/themes/climate/national-policies-and-measures/policies-and-measures>

Given the additionality requirement, it is essential to consider the interaction between measures of certain types so as to avoid double-counting. The ODYSSEE-MURE 'policy interaction facility' ⁽¹⁾ provides an overview of such interaction and its reducing or increasing effect. This can help in assessing impacts if alternative policy measures are combined.

The IEA study ⁽²⁾ provides helpful information on possible ways to finance the implementation of alternative policy measures, including public-private approaches.

⁽¹⁾ <http://www.odyssee-mure.eu/>

⁽²⁾ <https://www.iea.org/publications/freepublications/publication/finance.pdf>

APPENDIX IV

TAXATION MEASURES

ENERGY OR CO₂ TAXES, INCLUDING ELASTICITIES TO CAPTURE THE RESPONSIVENESS OF DEMAND

Whether applying existing tax measures (implemented prior to either obligation period) or new tax measures (introduced in the course of a period), Member States must comply with all the requirements of Annex V(2)(a) and (4) EED.

They should consider the following when calculating energy savings from tax measures implemented as alternative policy measures under Article 7b EED:

1. Basic calculation for each year for which the tax measure is in place

To calculate the impact on energy consumption of individual actions taken during the obligation period, Member States must analyse consumption without the energy or CO₂ tax (counterfactual energy consumption).

As set out in Annex V(4)(b) EED, Member States should apply price elasticities representing the responsiveness of energy demand to price changes (see section 3 below). It is recommended that price elasticities be applied annually on the basis of observed energy consumption, in order to estimate counterfactual energy consumption, taking into account the actual percentage changes in end-user prices elicited by the taxation measure (see section 2).

The counterfactual energy consumption must then be compared with the resulting observed energy consumption to provide an estimate of the reduction in energy consumption as a result of the tax measure each year (see figure below):

$$\begin{array}{lcl}
 \left(\begin{array}{c} \text{Energy /} \\ \text{Electricity Tax} \end{array} - \begin{array}{c} \text{Min. threshold} \\ \text{under EED} \end{array} \right) \times \frac{1}{\text{Energy price}} = \begin{array}{c} \Delta p \\ [\%] \end{array} \\
 \begin{array}{c} \text{Energy cons.} \\ \text{observed} \end{array} \times \frac{1}{1 + \Delta p \frac{\partial e}{\partial p}} = \begin{array}{c} \text{Energy cons.} \\ \text{w/o Energy and} \\ \text{Electricity Tax [PJ]} \end{array} \\
 \begin{array}{c} \text{Energy cons.} \\ \text{w/o Energy and} \\ \text{Electricity Tax} \end{array} - \begin{array}{c} \text{Energy cons.} \\ \text{observed} \end{array} = \begin{array}{c} \text{Saving from the} \\ \text{measure} \\ \text{[PJ / a]} \end{array}
 \end{array}$$

Note: Δp = change in price; $\partial e / \partial p$ = price elasticity of demand

Source: Europe Economics, 2016

If different tax rates or exemptions apply to different end-consumer groups or fuel types, the counterfactual energy consumption should be calculated separately for each group or type.

2. Calculating percentage changes in end-user prices

The difference (or delta) between a Member State's taxation level and minimum levels under EU law determines the eligible level of tax per unit of energy for counting the energy savings. An effort must be made to understand and justify the extent to which the tax is passed on to end-consumers and any exemptions or variations in tax rates for particular groups of end-consumers or energy type, also taking account of any parallel subsidies.

Where rates vary, separate analyses should be carried out for each group and energy type. The impact on end-consumer prices should be expressed as the percentage change relative to the energy price including the tax.

If there is an allowance for low-income households (to alleviate the impact of a tax increase), the weighted increase of the tax that is passed on to end-consumers should be estimated. For instance, if the increase of energy prices due to the imposition of a tax is equal to EUR 1/kWh and 30 % of the affected consumers receive an allowance equal to EUR 0,2/kWh, the weighted increase will amount to:

$$\text{EUR } 1/\text{kWh} \times 70 \% + ((\text{EUR } 1/\text{kWh} - \text{EUR } 0,2/\text{kWh}) \times 30 \%) = \text{EUR } 0,94/\text{kWh}$$

These estimates can be made through national studies on energy price changes due to taxes, subsidies, tax exemptions or primary-energy (fuel) costs over the whole of the year in question.

3. Calculating price elasticities

The relevant price elasticities are estimated by applying econometric modelling to the variables affecting energy demand, in order to isolate the impact of changes in energy prices. A long-enough time series (at least 15 to 20 years, used for calculating long-term elasticities) or a large cross-section of Member States is needed to ensure that estimates have good statistical properties and that all the relevant explanatory variables are included in the modelling framework. For short-term elasticities that depict short-term behavioural change, an observation period of 2-3 years is adequate.

The relevant explanatory variables depend on the sector subject to the tax measure. In the residential sector, for example, the model would need to take account of:

- income (where appropriate, broken down into regional or income groups);
- population;
- floor area;
- technological developments;
- the autonomous rate of energy-efficiency improvement; and
- the need for heating and cooling (through a temperature variable).

Including other policy measures in the analysis will make it possible to assess potential overlap and to distinguish their separate contribution to the energy savings achieved (see section 4).

The estimated price elasticities will vary over time. In the short term, at the beginning of the 2021-2030 obligation period or at the point at which a new policy measure is introduced, they will be smaller. This reflects the limited options (e.g. indicative behavioural measures or fuel substitution decisions) that consumers face as they adapt to the change in prices. Over time, elasticities become larger, as more and more consumers make investment decisions based on the higher prices, which offer better returns on investments in more efficient goods and services.

For existing tax measures, the impacts of energy-efficiency actions in the obligation period should be isolated from the impacts of actions taken in earlier periods. In particular, investment decisions in 2014-2020 that were based on energy prices raised by the imposition of a tax should be deducted from claims of energy savings in 2021-2030.

Where tax rates differ between fuel types, cross-price elasticities (measuring the effects of a price on demand for another fuel) should be estimated to account for the substitution of fuel types that have been made relatively more expensive (thanks to taxation) with those that have not. An example of a cross-price elasticity would measure the responsiveness of diesel fuel to changes in the price of petrol.

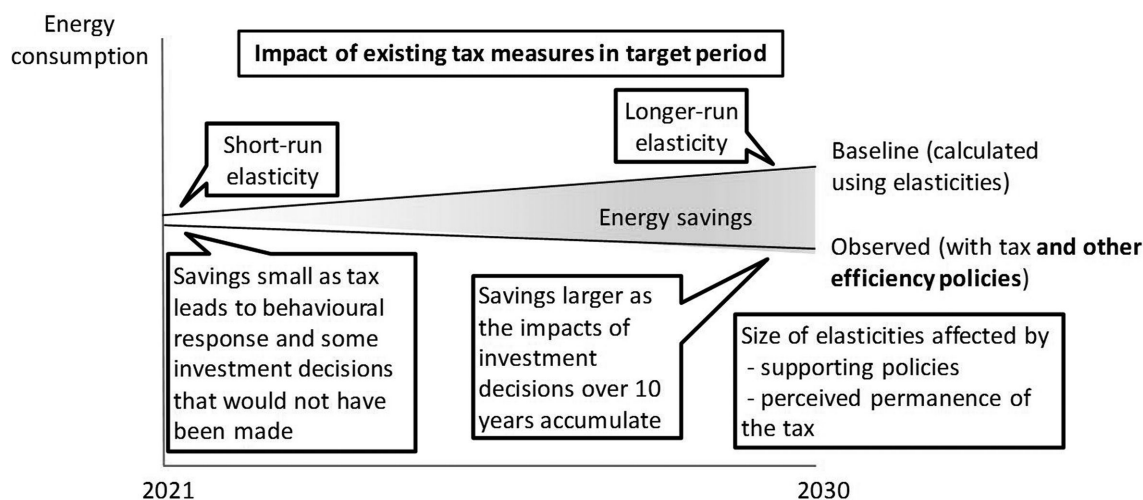
4. Overlaps with other policy measures

Elasticities are estimated over long periods to integrate the effects of the tax measure and those of other historic policy measures. In addition, tax and other measures often complement each other; for example, subsidy programmes make it easier for end-consumers to adapt to higher prices and tax measures make subsidy programmes more attractive to end-consumers.

This means that longer-run elasticities will integrate the outcomes of the supporting policy measures implemented over the estimation period, i.e. the more ambitious and effective the other measures, the greater will be the elasticities.

Given the high degree of overlap between tax and other policy measures, the use of one of the following approaches is recommended:

- estimate the impact of the energy or CO₂ tax measure using only short-term elasticities across the entire obligation period (e.g. 2021-2030) and estimate the impacts of other policy measures separately with bottom-up approaches; or
- estimate the impact of the energy or CO₂ tax measure using short-term elasticities in 2021 (or if the measure is introduced after 2021, from the point at which it was introduced) and graduating to long-run elasticities until 2030. In this case, energy savings from other policy measures affecting the final energy use that is taxed should be subtracted, as they resulted from bottom-up approaches in line with the technical requirements of the EED, including autonomous individual actions (see figure below):



The same approaches can be used for the 2014-2020 obligation period.

5. Overlaps with EU law

5.1. Overlaps with emission performance standards for new passenger cars and new light commercial vehicles (Regulations (EC) No 443/2009 and (EU) No 510/2011)

The impacts of energy or CO₂ tax measures on the energy consumption of passenger cars and light commercial vehicles can be calculated using a regression analysis correlating energy prices (including the effect of the tax increase) with sales of new passenger cars and new light commercial vehicles exceeding the EU minimum emission performance standards. National values must be used in the regression analysis. The national study can estimate what percentage of the sales corresponds to the taxation effect and the energy savings can be estimated bottom-up taking account of the additionality criterion.

5.2. Overlaps with requirements for the removal from the market of certain energy-related products (implementing measures under the Ecodesign Directive)

The impacts of measures under the Ecodesign Directive can be calculated with a regression analysis correlating energy prices (including the effect of the tax increase) with sales of products exceeding the minimum standards under the Directive. With this time-series approach, dummy variables can be also introduced to pick up the impacts of product standards on energy consumption. In any case, bottom-up estimation of the energy savings should ensure that additionality is taken into account.

6. Resource requirements

Estimating elasticities requires modelling expertise. In the absence of in-house modelling teams with the necessary capability, Member States should ensure that methodologically rigorous and transparent studies are carried out to produce estimates on the basis of recent and representative official data sources. They should also ensure that they have access to all the necessary data, assumptions and methodologies used in order to comply with the reporting requirements in Annex V(5)(k).

Where insufficient data are available to produce robust estimates of elasticities, the results of similar modelling exercises with the targeted end consumer groups or fuel types could be used to produce proxies. The choice of comparable estimates should be well justified and could be derived from inter alia:

- results from academic literature, published in a well-recognised and peer-reviewed journal that makes use of recent data and models that reflect the current policy landscape; and
- regression results for a particular sector in a similar Member State (clear justification should be provided for the choice of Member State).

As a final option and only where it can be documented that the above options are impossible, results from one sector could be applied to other sectors, where appropriate. Again, clear justification should be provided.

APPENDIX V

ALLEVIATING ENERGY POVERTY

INDICATIVE, NON-EXCLUSIVE EXAMPLES OF POLICY MEASURES ALLEVIATING ENERGY POVERTY

Most Member States have implemented policies to alleviate energy poverty. These can be characterised as policy measures addressing the energy consumption of a specific target group, i.e. vulnerable households, households affected by energy poverty or those in social housing. They fall into two groups as regards their relevance for Articles 7(1) and (11)2 EED:

- social policies addressing energy consumption — these are aimed at the rapid alleviation of the effects of energy poverty, but do not address energy efficiency. Examples are exemptions from paying energy bills, direct payments, reduced tariffs and social security payments. Such policies are not relevant in the context of Article 7(11) EED, under which only policy measures implemented to fulfil the energy savings obligation (e.g. by reducing energy use) are eligible; and
- energy-efficiency policies specifically targeting low-income households, either through a specific component or by only focusing on this group — these are relevant in the context of Article 7(11) EED, since they are aimed at removing barriers and incentivising investments for energy efficiency, and at alleviating energy poverty.

The table below gives an overview of certain types of energy-efficiency policy addressing low-income households that are already implemented in several Member States; the examples are indicative and non-exhaustive:

Indicative examples of policies to alleviate energy poverty ⁽¹⁾

Policy type	Energy-efficiency policy addressing low-income households	Member States concerned ⁽²⁾
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Measures taken under EEOs (Article 7a EED)

Market-based instrument	Specific target relating to energy poverty (or low-income households) or bonus factor for actions implemented for low-income households	AT, FR, IE, UK
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Measures taken under alternative policy measures (Article 7b EED)

Financing schemes and instruments	Incentives for energy-efficient building renovations, e.g. focused on low-income households or dwellings with worst energy classes (e.g. G and F) or offering higher incentive rates subject to income or social criteria	BE, BG, CY, DE, DK, EL, ES, FR, IE, LT, LV, MT, NL, RO, SI, UK
Financing schemes and instruments	Incentives for appliance replacements, e.g. focused on low-income households or offering higher incentive rates subject to income or social criteria	AT, BE, DE, HU
Fiscal incentives	Income tax credit/reduction, e.g. offering higher incentive rates subject to income or social criteria	EL, FR, IT

Policy type	Energy-efficiency policy addressing low-income households	Member States concerned ⁽²⁾
Training and education	Information campaigns and information centres	AT, DE, FR, IE, HU, MT, SI, UK
Training and education	Energy audits ⁽³⁾	BE, DE, FR, IE, LV, SI

⁽¹⁾ Ugarte, S. et al., *Energy efficiency for low-income households* (study for the ITRE Committee, 2016); [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/595339/IPOL_STU\(2016\)595339_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/595339/IPOL_STU(2016)595339_EN.pdf)

⁽²⁾ Status as of mid-2016.

⁽³⁾ The policy type 'Training and education' is the general type of policy intervention. The energy efficiency policy type 'energy audits' is one possible sub-type for this category. The energy audits for low income households, for example, indeed aim at informing them about the sources of energy consumption and training them about how they can optimize or reduce them in an efficient manner. Moreover, some of these programmes include also the training of unemployed persons to become energy advisors (case of the Caritas programme in Germany for example).

These policies are implemented as a specific component within an EEOS and as selected types of alternative policy measure ⁽³⁾. Financial instruments consisting of loans and grants for building renovations are the most widely established measures to promote energy efficiency in low-income households. Appliance replacement policies and informational measures are also in place, but only in a few Member States. In addition, some Member States have introduced specific energy audit programmes targeting low-income households.

The following sources can be consulted for more detailed examples of energy-efficiency policies addressing low-income households:

— EU Energy Poverty Observatory:

<https://www.energypoverty.eu/policies-measures>

— MURE database under the H2020 ODYSSEE-MURE project:

<http://www.measures-odyssee-mure.eu/>

— *Energy efficiency for low-income households* (study for the European Parliament's Committee on Industry, Research and Energy):

[http://www.europarl.europa.eu/RegData/etudes/STUD/2016/595339/IPOL_STU\(2016\)595339_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/595339/IPOL_STU(2016)595339_EN.pdf)

⁽³⁾ Therefore, the general explanations in Appendices II (EEOSs) and III (alternative policy measures) are also relevant here.

APPENDIX VI

CALCULATION OF ENERGY SAVINGS FROM BEHAVIOURAL MEASURES

'Behavioural measures' cover any type of policy measure or intervention aimed at saving energy by changing end-users' behaviour, i.e. the way they use energy, energy-using products (e.g. appliances, technical devices, vehicles) or systems (e.g. residential and non-residential buildings). Such measures may involve energy advice, targeted information campaigns, real-time energy-consumption display or feedback, training for eco-driving, energy-saving campaigns at work, etc.

Behavioural measures require specific evaluation, since the materiality of a change in behaviour is more difficult to prove than, for example, the installation of a technical solution. Also, changes in behaviour can be highly reversible, so it is more difficult to determine the lifetime of the measures and the amount of savings over time.

1. Evaluation approaches

1.1. Randomised controlled trials

To overcome the above difficulties, Member States are recommended to use, where appropriate, the randomised controlled trials (RCT) approach⁽¹⁾, which involves collecting data on metered or monitored energy consumption before and after the intervention(s). By comparing the (before/after) changes in energy consumption between the treatment and the control groups, it is possible to verify whether the real energy savings are close to what was expected.

It is recommended that experiments be carried out with this approach before it is deployed at full scale, thus allowing for:

- comparison between variants;
- improvements in design and effectiveness; and
- rigorous evaluation of the effects.

1.2. Quasi-experimental approach

Where it is not possible to use the RCT approach, an alternative is a quasi-experimental approach⁽²⁾, whereby a treatment group is compared with a comparison group. The main difference from RCT is that individuals are not randomly assigned to the groups. It is therefore necessary to control or minimise possible sampling or selection biases, e.g. by means of matching methods. It is also important to document the statistical tests used to verify the validity and significance of the results.

⁽¹⁾ The RCT approach, commonly used in health sciences, is to randomly assign individuals (from the whole target population) into treatment groups or a control group. The treatment groups will be subject to the intervention (treatment) under evaluation, while the control group will not. The random assignment of individuals is assumed to provide rigorous conditions for a comparison where the only statistically significant difference between the groups is whether or not they receive the treatment. Different treatment groups can be used when the objective is to compare different types of intervention.

For detailed guidance on the RCT approach, see for example:

- Vine, E., Sullivan, M., Lutzenhiser, L., Blumstein, C., & Miller, B. (2014), 'Experimentation and the evaluation of energy efficiency programs', *Energy Efficiency*, 7(4), 627-640,
- Frederiks, E. R., Stenner, K., Hobman, E. V., & Fischle, M. (2016), 'Evaluating energy behavior change programs using randomised controlled trials: Best practice guidelines for policymakers', *Energy research & social science*, 22, 147-164.

⁽²⁾ For more information on the quasi-experimental approach, see for example:

- Hannigan, E., & Cook, J. (2015), 'Matching and VIA: quasi-experimental methods in a world of imperfect data', *Proceedings of IEPEC 2015* (https://www.iepec.org/wp-content/uploads/2018/02/2015paper_hannigan_cook-1.pdf),
- Voswinkel, F., Broc, J.S., Breitschopf, B., & Schlomann, B. (2018), *Evaluating net energy savings — a topical case study of the EPATEE project*, funded by the Horizon 2020 programme (https://epatee.eu/sites/default/files/files/epatee_topical_case_study_evaluating_net_energy_savings.pdf).

1.3. Metering or monitoring energy consumption

Where it is not possible to use either of the above approaches, energy savings can be evaluated by metering or monitoring the participants' energy consumption before and after the intervention. This approach is easier to implement, but is subject to much greater uncertainty, due to the difficulty of isolating changes due to the intervention from changes due to other factors. It is therefore necessary to explain how other factors have been taken into account (e.g. by normalising energy consumption for weather conditions) and how uncertainties are handled (e.g. by using conservative assumptions).

2. 'Deemed energy savings' method for calculating impact

Evaluations using one of the above approaches provide results that can then be used as a benchmark for 'deemed savings' (see Annex V(1)(a)), provided these savings are used for the same type of intervention (same implementation conditions) and similar target groups. The results of behavioural measures can vary strongly depending on the type of intervention (and implementation conditions) and type of target group, so results obtained for a given type of intervention for a given target group cannot be extrapolated to another type of intervention or another group.

An example of a general calculation formula using deemed savings for the case of behavioural measures is given below:

$$\text{Total final energy savings} = \sum_{\text{number of participants}} (\text{unitary final energy consumption} \times \text{deemed savings ratio} \times \text{double-counting factor})$$

The number of participants can be obtained:

- directly through a monitoring system (e.g. where participants register for the programme or report their actions); or
- through surveys of the whole targeted population, in which case the sampling method must explain how it is ensured that the sample is representative, to enable extrapolation to the whole population.

'Unitary final energy consumption' (i.e. per participant) can be obtained:

- directly from data reported by the participants (e.g. energy bills, self-metering); or
- by estimating the average energy consumption per participant for the target group (e.g. on the basis of national statistics or previous studies), in which case it is necessary to explain how it is ensured that the average energy consumption is representative of energy consumption in the target group.

The 'deemed savings ratio' is a percentage of energy saved based on previous evaluations (see above approaches). It is necessary to explain how it is ensured that the conditions of the intervention for which the ratio is used are similar to those for which the benchmark has been obtained.

The 'double-counting factor' (in %) applies when the policy measure is implemented repeatedly, targeting the same group without direct monitoring of the participants. It takes account of the fact that a proportion of those affected by the policy measure will have already been affected the previous time(s) (overlap in the effects).

In the case of a policy measure with a targeted approach and direct monitoring of participants (e.g. a training scheme), the double-counting of participants can be detected directly, so there might be no need to apply a double-counting factor.

Likewise, if the lifetime of the energy savings is taken as the duration between two implementations of the policy measure (e.g. two communication campaigns), there is no risk of double-counting ⁽³⁾.

⁽³⁾ See Appendix VIII for further details on the issue of lifetime.

APPENDIX VII

TRANSPORT SECTOR POLICIES THAT GO BEYOND EU LAW

In the transport sector, national, regional and local policies (in addition to energy/CO₂ tax measures) could generate energy savings by:

- reducing the need to travel;
- shifting travel to more energy-efficient modes; and/or
- improving the efficiency of transport modes.

1. Measures to promote more energy-efficient road vehicles

1.1. Increasing the average efficiency of new vehicle fleets

Policy measures that promote the purchase of more efficient new vehicles include:

- financial incentives or regulations for the purchase of electric or other energy-efficient vehicles;
- other incentives such as preferential treatment on roads or for parking; and
- vehicle taxation based on CO₂ emissions or energy-efficiency criteria.

However, the energy savings are likely to be limited to vehicles not covered by EU emission performance standards and energy savings from public procurement must be additional to those required by the revised Clean Vehicles Directive.

The revised Clean Vehicles Directive requires Member States to ensure that the public procurement of certain road transport vehicles complies with minimum procurement targets for clean and zero-emission vehicles, over two reference periods (from entry into force until 31 December 2025, and from 1 January 2026 to 31 December 2030). When considering energy savings from policy measures aimed at promoting the public procurement of more efficient vehicles, Member States would need to demonstrate the additionality of these savings in relation to those deriving from the Clean Vehicles Directive requirements; this could be the case, e.g. if the policy measures lead to a higher percentage of clean vehicles in public procurement than mandated by the Directive. Since the minimum procurement targets of the Clean Vehicles Directive are not defined for individual years, but over a multiannual period, savings from this kind of measure should be accounted for in the last year of each period, in order to allow for a meaningful assessment of their additionality and to respect the flexibility provided to individual public authorities under the Clean Vehicles Directive ⁽¹⁾.

Since Annex V(2)(b) EED requires that energy savings be additional to those stemming from the implementation of mandatory EU law, and regarding existing emission performance standards, Member States must carefully assess existing EU law, including Regulations (EC) No 443/2009 and (EU) No 510/2011 and Regulation (EU) 2019/631 (emission performance standards for new passenger cars and light commercial vehicles).

Regulations (EC) No 443/2009 and (EU) No 510/2011 require manufacturers of passenger cars and light commercial vehicles, respectively, to ensure that their vehicles' average specific CO₂ emissions do not exceed their specific emissions target, as determined in accordance with Annex I to the Regulations or with any derogation they have been granted. Regulation (EU) 2019/631 requires each manufacturer of passenger cars and/or light commercial vehicles to ensure that its average specific emissions of CO₂ do not exceed its specific emissions targets from 2025 and from 2030, determined in accordance with Annex I of that Regulation or, where a manufacturer is granted a derogation in accordance with that derogation.

All three Regulations allow manufacturers to decide how to meet their targets and to average emissions over their new vehicle fleet rather than respecting CO₂ targets for each vehicle. Also, manufacturers can form a pool on an open, transparent and non-discriminatory basis. Individual manufacturers' targets are replaced by a joint target to be attained collectively by the members.

⁽¹⁾ See [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI\(2018\)614690](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2018)614690); and https://ec.europa.eu/transport/themes/sustainable/consultations/2016-clean-vehicles_en.

If a Member State introduces national policy measures, manufacturers would be expected to adapt their pricing strategies across all EU markets to meet their targets at EU level. Member States would need to show that energy savings attributed to such measures had not merely substituted for efforts required by manufacturers and had led to overachievement in target years or beyond a reasonable trajectory for emissions between target years (2021, 2025 and 2030). Energy savings associated with new vehicles covered by EU emission performance standards could be generated by measures that incentivise early replacement (see sections 1.2 and 1.3).

Future EU law covering trucks is expected to have a similar effect on the ability to generate eligible energy savings through the replacement of vehicles ⁽²⁾. Proposed legislation would require each manufacturer of large lorries to ensure that its average specific emissions of CO₂ do not exceed its specific emissions target from 2025. A proposed review of future Union law covering heavy-duty vehicles is likely to consider the setting of targets in 2030 for larger lorries, smaller lorries, buses and coaches.

For vehicles not covered by EU emission performance standards (e.g. motorcycles, smaller lorries, buses, coaches (and until 2025, larger lorries)), annual savings can be calculated by comparing the annual energy consumption of vehicles purchased as a result of a measure with the average annual energy consumption of the market-average vehicle in the same class of vehicle (denominated by size and power).

Indicative example (vehicle class not covered by Union emission performance standards)

$$TFES = \sum n_{\text{affected}} \times (FEC_{\text{average}} - FEC_{\text{affected}})$$

where:

TFES = final annual energy savings (gross);

n_{affected} = number of vehicles purchased as a result of the programme;

FEC_{average} = market average annual final energy consumption (FEC); and

FEC_{affected} = average annual FEC of vehicles purchased as a result of the programme.

1.2. Increasing the rate at which more efficient vehicles replace less efficient vehicles in fleets

Policy measures that increase the rate of take-up of more efficient vehicles include vehicle scrappage programmes and fleet-replacement policy measures. Other measures that incentivise the take-up of more efficient vehicles (see section 1.1) may bring purchases forward in time, e.g. where financial incentives are time-limited.

Annex V(2)(f) EED clarifies that, for policy measures that accelerate the uptake of more efficient vehicles, full credit may be claimed 'provided that it is shown that such uptake takes place before expiry of the average expected lifetime of the (...) vehicle, or before the (...) vehicle would usually be replaced'.

Therefore, the calculation of the energy savings should be divided into two parts:

- (i) calculating savings in full (for the number of years until the normal expiry of the old vehicle's lifetime or when the vehicle would normally have been replaced); and
- (ii) for the remaining lifetime of the new vehicle after the assumed expiry or usual replacement of the old vehicle, calculating savings taking account of additionality.

⁽²⁾ See http://europa.eu/rapid/press-release_IP-19-1071_en.htm

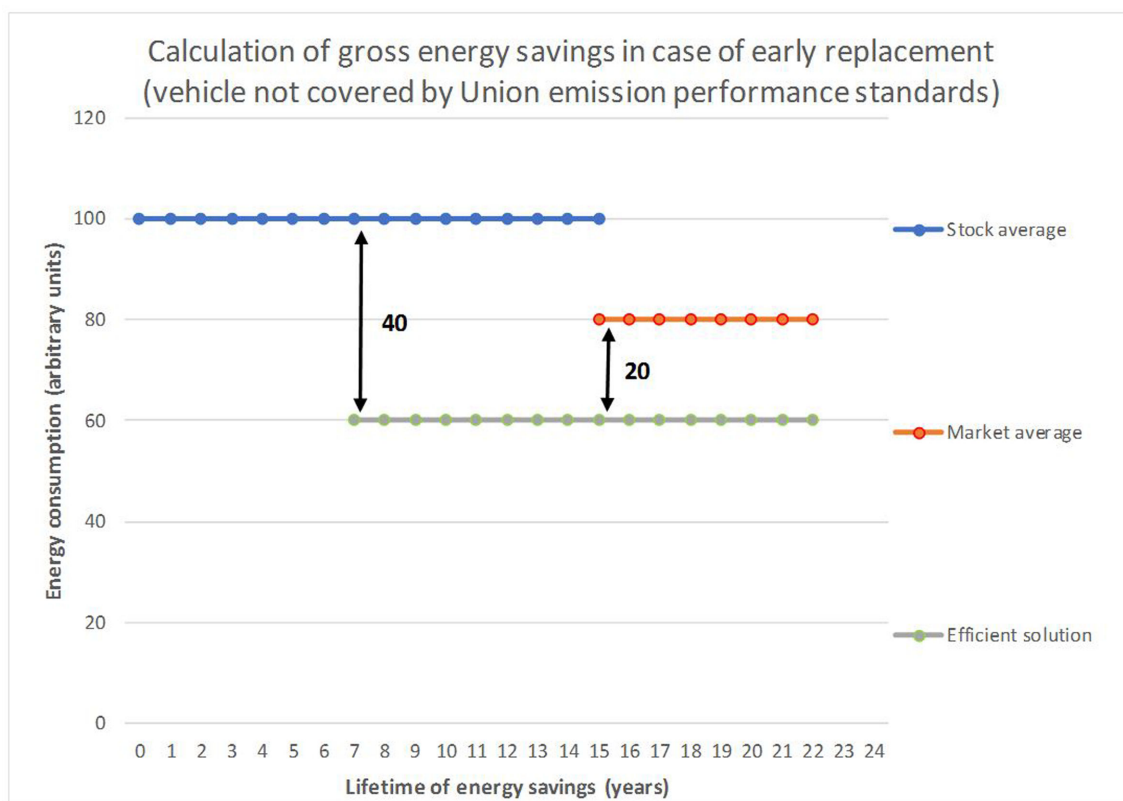
The replacement of the most inefficient vehicles with the longest average expected lifetimes would be expected to generate greater energy savings. Member States should describe in their NECPs the method used to estimate the average lifetimes and what the method was based on, including surveys to ensure the robustness of the methodology. In this regard, they could provide evidence on the average expected lifetimes of the vehicles targeted by accelerated take-up policies, e.g. vehicle scrappage statistics. If vehicles older than the average expected lifetime are targeted, surveys may be needed to identify their average expected lifetimes.

Indicative calculation example for the calculation of energy savings from early replacement (vehicle not covered by Union EU emission performance standards)

The figure below shows a sample calculation of energy savings (arbitrary units) in the case of early replacement of a vehicle not covered by Union EU emission performance standards (e.g. a motorcycle) in a mass market class with an assumed lifetime of 15 years.

The average vehicle of this class in the stock is assumed to consume 100 units and to be substituted at the end of year 7 (i.e. vehicle replacement is brought forward by 8 years). The market-average reference consumption of the market average is assumed to be 80 units and the consumption of the efficient solution is assumed to be 60 units. Additional energy savings amount therefore amount to $(100-60) \times 8 + (80-60) \times 7 = 460$ units.

In this example, in the absence of data on the actual consumption of the replaced vehicles, the stock- average consumption is used as the reference against which savings are calculated for the first 8 years; the market-average reference consumption of the market average when the replacement purchase is made is considered as the baseline for the calculation of energy savings for the remainder of the replacement vehicle's assumed lifetime.



For new passenger cars and light commercial vehicles, as covered by EU emission performance standards following the implementation of Regulations (EC) No 443/2009, (EU) No 510/2011 and (EU) 2019/631, the energy consumption associated with average CO₂ emissions in the year of purchase should be used as the reference value for the replacement vehicles. This accounts for the offsetting effects on the efforts that manufacturers would need to make to meet their binding targets, as required under Annex V(2)(b), which states that energy savings must be additional to those occurring from the implementation of mandatory EU law.

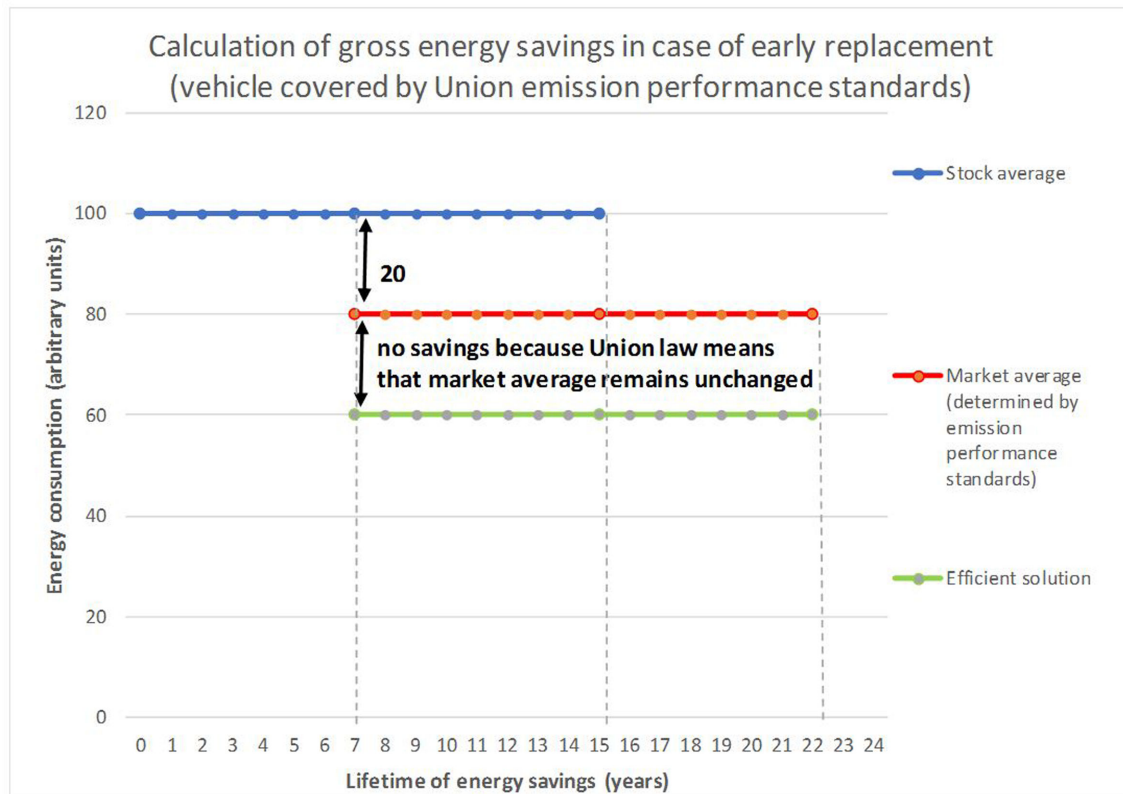
Future EU law covering trucks might have a similar effect on the ability to generate eligible energy savings through the replacement of vehicles ⁽³⁾.

⁽³⁾ See http://europa.eu/rapid/press-release_IP-19-1071_en.htm

Calculation example for energy savings from early replacement (vehicles covered by EU emission performance standards)

The figure below shows a calculation of energy savings (arbitrary units) in the case of the early replacement of a vehicle covered by EU emission performance standards (e.g. a passenger car) in a mass market class with an assumed lifetime of 15 years. The stock-average vehicle of this class is assumed to consume 100 units and to be substituted at the end of year 7 (i.e. vehicle replacement is brought forward by 8 years).

The market-average reference consumption is assumed to be 80 units and the consumption of the efficient solution 60 units. However, because of the offsetting effect of EU law, only the energy savings in the early replacement period are eligible and these should be calculated with reference to the market average, not the replacement vehicle. Additional savings therefore amount to $(100 - 80) \times 8 = 160$ units.



For all accelerated take-up policy measures, evidence should be provided to show that the replaced vehicles do not re-enter the second-hand market, to ensure that energy savings are not displaced by additional consumption from inefficient vehicles.

1.3. Increasing the energy-efficiency of existing vehicles

Policy measures that achieve the following can lead to energy savings by reducing energy consumption per passenger/tonne-kilometre:

- improve the efficiency of existing vehicles (e.g. by incentivising the take-up of more energy-efficient tyres or energy-saving lubricants);
- improve transport infrastructure and the functioning of the transport system (e.g. by reducing congestion);
- increase average loads (e.g. by incentivising car-sharing or freight logistics); and
- affect the behaviour of drivers (e.g. by lowering speed limits or through eco-driving campaigns).

To calculate the energy savings from these measures, estimates must be made of the number of affected participants (e.g. vehicles, drivers, passengers or freight-tonnes), along with expected savings per participant and the persistence of the effects of the measures over time.

Indicative example for eco-driving campaign

$$TFES = \sum n_{\text{affected}} \times FEC_{\text{average}} \times Sawar \times (1 - Et) \times (1 - Pt)$$

Where:

TFES = final annual energy savings (gross);

n_{affected} = number of participants trained as a result of the programme;

FEC_{average} = average annual final energy consumption;

Sawar = % savings per participant in the programme;

Et = % improvement in new vehicle technologies which make energy consumption less sensitive to driving habits (e.g. regenerative braking on electric vehicles) and increases over time; and

Pt = % reduction in impact of training per participant after the training has ended (depreciation factor that increases over time).

2. Reducing the need to travel or shifting travel to more energy-efficient modes

Policy measures designed to reduce the need to travel or to shift travel to more efficient modes could include:

- investments in transport infrastructure (e.g. railways, buses, ferries, bus lanes, cycle lanes, pedestrianisation) to provide more options, including:
 - integrated cross-mode mass transit systems;
 - shared bicycles and scooters that provide door-to-door options for travellers;
 - passenger and freight transportation;
 - incentivise teleworking; and
 - high-speed railways that provide alternatives to short-haul aviation;
- fiscal instruments such as subsidies for mass transit;
- road charging based on the level of congestion and/or CO₂ emissions;
- reforming existing regulations or taxation measures, e.g. through integrated land-use planning to favour development close to public transport infrastructure; and
- amending company car regulations or taxation to offer mass transit or cycling expense alternatives to employees.

Indicative example for the calculation of energy savings through congestion charging

If a city introduces a congestion charge, energy savings could be calculated by comparing the expected energy consumption by the volume of traffic in the absence of the charge with the energy consumption by the volume of traffic with the measure in place. The data on traffic volumes could be collected using toll infrastructure.

Member States would need to take account of offsetting impacts, e.g. from increases in the use of public transport, changes in transport activity outside the congestion zone and changes in energy consumption resulting from changes in traffic flow.

APPENDIX VIII

LIFETIME OF MEASURES AND RATE AT WHICH SAVINGS DECLINE OVER TIME

Member States should first distinguish between the requirements to take into account:

- the lifetime of a measure; and
- the rate at which energy savings decline over the relevant obligation period.

1. Lifetimes of measures

For the purposes of Annex V(2)(i), Member States may use indicative lifetime values per type of policy measure, as provided in the non-exhaustive list in the table below ⁽¹⁾. They may also use other values, but in any case must describe in their integrated NECP the lifetimes applied per type of measure and how they are calculated or what they are based on ⁽²⁾.

Indicative energy savings lifetimes per measure type

Action type (by target sector)	Indicative lifetime (years)
BUILDINGS	
Energy-efficient construction	> 25
Insulation of building envelope (cavity wall, solid wall, loft, roof, floor)	> 25
Windows/glazing	> 25
Insulation of hot-water pipes	20
New/upgraded district heating	20
Heat-reflecting radiator panels (insulation material installed between radiators and the wall to reflect heat back into the room)	18
High-efficiency boilers (< 30 kW)	20
Heat-recovery systems	17
Heat pump	10 (air-to-air); 15 (air-to-water); 25 (geothermal)
Circulating pump (heat distribution)	10
Efficient lightbulb (LED)	15

⁽¹⁾ Sources used to establish these indicative values:

- CWA 15693:2007, *Saving lifetimes of energy efficiency improvement measures in bottom-up calculations*, CEN Workshop Agreement, April 2007,
- European Commission, 2010, *Preliminary draft excerpt — Recommendations on measurement and verification methods in the framework of Directive 2006/32/EC on energy end-use efficiency and energy services* (unpublished).

⁽²⁾ See Annex V(5)(h) EED.

Action type (by target sector)	Indicative lifetime (years)
Luminaire with ballast systems (lighting units with dedicated efficient lamp fittings)	15
Efficient cold appliances	15
Efficient wet appliances	12
Hot-water-saving taps with flow restrictors	15
Hot-water tank with insulation	15
Efficient chiller or room air-conditioner	10
Hydraulic balancing of heating distribution (for central heating systems)	10
Heating control	5
Draughtproofing (material to fill gaps around doors, windows, etc. to increase the airtightness of buildings)	5
Consumer electronic goods	3
SERVICES	
Energy-efficient construction	> 25
Insulation of building envelope (cavity wall, solid wall, loft, roof, floor)	> 25
Windows/glazing	> 25
Boilers (> 30 kW)	25
Heat pumps	10 (air-to-air); 15 (air-to-water); 25 (geothermal)
Heat-recovery systems	17
Efficient central air-conditioning and chillers	17
Efficient ventilation systems	15
Public/street lighting systems	13
New/renovated office lighting	12
Commercial refrigeration	8
Motion-detection light controls	10
Energy-efficient office appliances	3
Energy management systems (cf. ISO 50001)	2
TRANSPORT	
Efficient vehicles	(100 000 km) (*)

Action type (by target sector)	Indicative lifetime (years)
Low-resistance tyres for cars	(50 000 km) (*)
Low-resistance tyres for trucks	(100 000 km) (*)
Side-boards on trucks (aerodynamic additions for heavy goods vehicles)	(50 000 km) (*)
Tyre-pressure control on trucks (automatic tyre-pressure monitoring devices)	(50 000 km) (*)
Fuel additives	2
Modal shift	2

(*) data on average distances travelled are needed.

Action type	Indicative energy savings lifetime (years)
INDUSTRY	
Combined heat and power (CHP)	10
Waste-heat recovery	10
Efficient compressed-air systems	10
Efficient electric motors/variable-speed drives	8
Efficient pumping systems	10
Efficient ventilation system	10
Energy management systems (cf. ISO 50001)	2

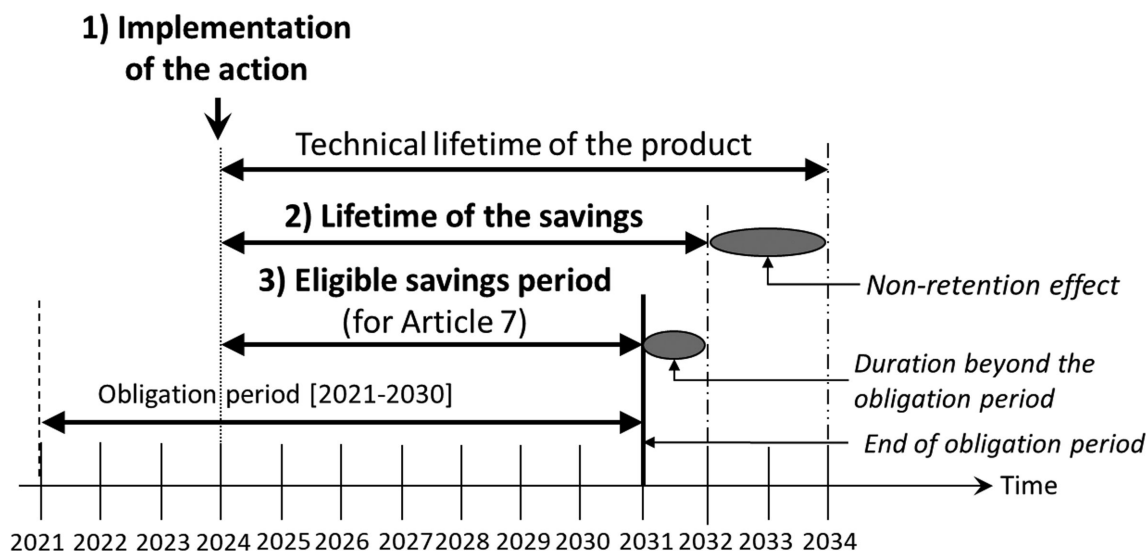
If applicable, the energy performance of the individual action types listed above should exceed the minimum required under mandatory EU law, e.g. Annex V(2)(c) EED.

'Indicative energy-savings lifetime' is the period for which the action is in place and operable. This may be shorter than the technical lifetime (as claimed by the manufacturer) due to non-retention effects (e.g. removal or obsolescence of the product), which can apply particularly:

- for individual behavioural actions;
- where there are issues relating to the quality or maintenance of the installed product or individual action; and
- in activity sectors with uncertain business cycles (e.g. stores that close a few years after opening).

The calculation of cumulated energy savings for Article 7 EED also needs to take into account the eligible energy savings period. This means that only those savings achieved during the relevant obligation period (from the start of implementation of the individual action until the end of the obligation period) can be counted.

As regards behavioural measures, Member States may assume by default that the lifetime applied equals the duration of the intervention promoting the energy-efficient behaviours. They may claim another value, but in any case must describe in their integrated NECP the applied lifetimes and how they are calculated or what they are based on ⁽³⁾.



2. Rate at which energy savings decline over the relevant obligation period

2.1. General considerations

In addition to the lifetime of each measure, Annex V(2)(i) EED requires Member States to take into account the rate at which energy savings decline over time. In doing so, they should consider:

- the number of years for which the individual actions have an impact (i.e. taking into account the lifetime);
- the point in time when the individual action was/will be newly implemented;
- the duration of the obligation period; and
- if applicable, their intention to use the options in Article 7(4) and/or (8) EED.

In general, the assessment of a rate at which savings decline over time needs to respect the duration of the obligation periods. If there is no intention to use the options in Article 7(4)(d), (e) or (g) and/or (8) EED, the maximum duration is:

- 7 years for the first obligation period (2014-2020); and
- 10 years for the second (2021-2030) and subsequent obligation periods.

If Member States do envisage using those options, the maximum duration could be up to 22 years (see table below):

Example	Period in which actions newly implemented	Savings achieved in:	Obligation period for which savings apply	Conditions
1	1.1.2014 to 31.12.2020	2014-2020	2014-2020	No particular condition

⁽³⁾ See Annex V(5)(h).

Example	Period in which actions newly implemented	Savings achieved in:	Obligation period for which savings apply	Conditions
2	1.1.2021 to 31.12.2030	2021-2030	2021-2030	No particular condition
3	after 31.12.2008 to 31.12.2013	2011-2013	2014-2020	See Article 7(8)
4	after 31.12.2008 to 31.12.2013	2014-2020	2014-2020	See Article 7(4)(d) + limits in Article 7(5)
5	after 31.12.2008 to 31.12.2013	2021-2030	2021-2030	See Article 7(4)(d) + limits in Article 7(5)
6	1.1.2014 to 31.12.2020	2014-2020	2021-2030	See Article 7(4)(g) + limits in Article 7(5)
7	1.1.2018 to 31.12.2020	2021-2030	2021-2030	See Article 7(4)(e) + limits in Article 7(5)

Only examples 4, 5 and 7 above could involve lifetimes of more than 10 years. It should also be noted that Article 7(5) limits the use of these options to a maximum of:

- 25 % of the savings counted for the 2014-2020 obligation period (example 4); or
- 30 % of the savings calculated in accordance with Article 7(2) and (3) EED for the 2021-2030 obligation period (examples 5 and 7).

In any case, Member States must describe in their integrated NECP the applied lifetimes of measures and how they are calculated or what they are based on ⁽⁴⁾.

2.2. Energy savings persistence

In addition, energy savings change over time — mainly due to two types of factor:

- performance degradation of the individual action (to be compared with the possible degradation that would have occurred in the baseline scenario); and
- changes in the condition of use (e.g. volume of production).

The evidence base for the rate at which the savings decline over time is limited. However, performance degradation can be exacerbated by bad or poor quality and maintenance, or inefficient behaviours. It may therefore be relevant if provisions on quality and maintenance, e.g. Annex V(2)(g) EED or Articles 14 and 15 EPBD (inspections of heating and air-conditioning systems), are enforced. Similarly, energy-management systems enable the detection and rapid correction of unexpected excess energy consumption or other faults, thereby mitigating the risk of decline in energy savings over time.

A simplified approach could be to establish a default rate of decline (equivalent to a technical discount factor). Where the enforcement of quality and maintenance provisions can be justified, the rate could be set as low, or even at zero if it can be justified, and no relevant decline in energy savings over the relevant obligation period can be shown.

Particular attention should be paid to individual action types with a lifetime of less than 10 years — especially low-cost actions, which are more likely to be subject to a decline in energy savings over the obligation period.

⁽⁴⁾ See Annex V(5)(h).

As in the context of a measure's lifetime, behavioural measures represent a specific case, because the extent to which the energy-efficient behaviours are applied can easily vary over time. It is therefore recommended that Member States investigate the actual effects of behavioural measures ⁽³⁾.

3. Methods to investigate lifetime and savings persistence

In the light of the notification obligation under Annex V(5)(h) EED, Member States are encouraged, where possible, to put in place measuring arrangements to increase knowledge about how energy savings evolve over time.

Examples of methods to investigate lifetime, retention and performance degradation are briefly presented in the table below:

Type of method	Issues covered	Remarks
On-site installation verification	Lifetime/retention	Sampling issues (size + sample losses or consistency over time): achieving statistically significant results (unless monitoring done for multiple purposes) can be expensive Legal issues (accessing sites several years later)
On-site measurement and testing	Performance degradation	Sampling issues (but can be used for targeted verifications); costly (unless already done for other purposes, e.g. quality management or market surveillance) Not always technically possible
Laboratory testing	Performance degradation	Costly (but there could be synergies, e.g. between countries, with market surveillance, etc.) Difficult to reflect actual conditions of use (or simulate ageing)
Surveys/interviews	Lifetime/retention Performance degradation	Less costly Suitable depending on the action type Issue of reliability for declarative data (need to design questionnaire carefully)
Billing analysis	Retention Performance degradation	Difficult to find a relevant control group (if needed) Difficult to get long-enough time series Need to collect complementary data to analyse changes in energy consumption Costly (unless participants report data as part of the measure)
Benchmarking and secondary literature review	Lifetime/retention Performance degradation	Rely on available data Can help build a consensus Can help identify where more investigation is needed

⁽³⁾ See also Appendix VI for further proposals on behavioural measures.

Type of method	Issues covered	Remarks
Stock modelling	Lifetime/retention	Sales data (needed to estimate renewal rate) often costly Alternative data sources could be waste collection/recycling bodies (not applicable to all action types)

APPENDIX IX

CRITERIA TO SHOW MATERIALITY

Under Annex V(5)(g) EED and Annex III(4)(d) to the Governance Regulation, Member States are required to notify their calculation methodology, including:

- how they have determined additionality and materiality; and
- what methodologies and benchmarks they have used for deemed and scaled savings.

Without prejudice to the Commission's assessment of planned or existing policy measures, the following non-exclusive list of criteria could help Member States establish a methodology to document materiality. They should assess for each measure whether one or a combination of the criteria is eligible.

1. Examples of criteria to document materiality (EEOS)

- Criteria used to approve or reject the eligibility of the contributions reported by obligated parties (or other parties allowed to claim savings) and how this is verified

Indicative example

Pre-defined types of eligible contribution (e.g. financial aid, targeted energy advice, technical support for the design or implementation of the action) and corresponding requirements (e.g. minimum incentive rate, threshold for pay-back time, minimum contents of energy advice); signed contract with the customer for project implementation, paid invoices and project documentation.

- Criteria used to approve or reject the validity of contributions for reported actions, based on the conditions in which these were given, and how this is verified

Indicative example

Requirement that the contribution was decided with the beneficiary prior to action installation (and corresponding types of proof, e.g. standardised statement form filled in and signed by the beneficiary).

Where intermediaries make the contact with the final beneficiaries, requirement that the contracts or agreements covering the whole chain from obligated parties (or other parties allowed to claim savings) to final beneficiaries were in force before action installation (and corresponding types of proof).

- Criteria used to avoid double-counting of the reported actions and related energy savings, and how this is verified

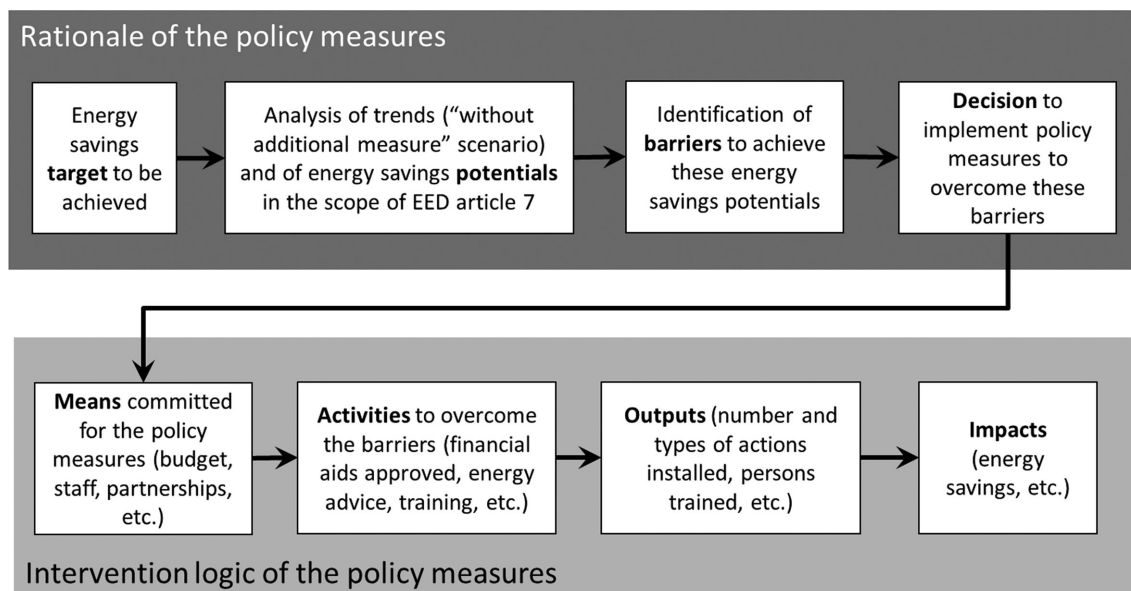
Indicative example

Requirement that the final beneficiaries gave agreement for energy savings to be claimed on their behalf only once for a given action (and corresponding type of proof).

Requirement that the details of each action be entered in an online database that enables automatised duplication checks, e.g. standard statement form filled in and signed by the beneficiary.

2. Examples of criteria to document materiality (alternative policy measures)

The materiality of an alternative measure should at least be documented by explaining the expected causal chain from the launch of the measure to the installation or implementation of actions by the target group(s). A basic, general description of the rationale and intervention logic of energy-efficiency policies in the context of Article 7 EED is presented in the figure below:



The causal chain is not necessarily linear and can include several causal pathways or cause-impact relationships.

The *Better Regulation Toolbox* ⁽¹⁾ provides a description of the intervention logic. Where a Member State identifies barriers, it should explain how the policy measure is designed to overcome these in practice ⁽²⁾. Further guidelines on designing measures and analysing barriers can be found in the final report of the Intelligent Energy Europe project AID-EE ⁽³⁾.

For the purposes of Article 7(1) EED, Member States could consider the following non-exhaustive list of questions to show materiality. For example, if financial incentives are used, the explanation of the intervention logic could cover what preliminary analysis has been done to design the financial incentives, to explain the choice of type (grants, soft loans, financial guarantees, etc.) and level of incentive (grant rate, interest rate for loans, etc.).

Indicative and non-exhaustive list:

- what is the rationale for the policy measure? In particular, what barriers (to the achievement of energy savings) is it expected to overcome?
- what are the possible interactions with other policy measures?
- what are the operational objectives of the measure?
- what (qualitative or quantitative) changes are expected from implementing the measure?

⁽¹⁾ *Better Regulation Toolbox*, European Commission;
https://ec.europa.eu/info/files/better-regulation-toolbox-46_en

⁽²⁾ For more details on the intervention logic and how to design and analyse it, see tool #46, section 3.3 in the *Better Regulation Toolbox*.

⁽³⁾ 'Active implementation of the European Directive on Energy Efficiency';
https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/aid-ee_guidelines_en.pdf

- how will the measure achieve these changes (qualitatively, how is the measure expected to lead to changes as regards the targeted barriers)?
- what means has the implementing public authority (and its entrusted party, where relevant) committed to the measure (budget, staff, equipment, etc.)?
- who is expected to be involved in policy implementation and how (e.g. partnerships, intermediaries/middle actors, target groups)?
- what activities is the measure expected to produce/deliver (e.g. financial aids, energy advice, training)? what outputs are expected (e.g. installations of actions, persons trained)?

In addition, Member States could consider evaluating the policy measure *ex post* and collecting data to assess the assumptions made in the intervention logic as to its effects.

On the particular issue of separating the effects of a measure from those of other policy measures targeting the same groups or types of action, there are two general cases:

- the Member State decides to report only one policy measure per (sub-)sector — in this case, the documentation of the intervention logic for this measure and the analysis of its effects might be sufficient; or
- the Member State decides to report several policy measures that may overlap — in this case, it must explain how double-counting is avoided.

3. **Examples of criteria to document the materiality of activities of the participating party, entrusted party or implementing public authorities**

Voluntary agreements

Although the implementation of voluntary agreements might in principle be considered sufficient to prove materiality, specific criteria can be established to ensure that the agreements actually entail material involvement by participating parties.

These criteria may relate, for example, to:

- a list of eligible actions, or eligibility criteria for the actions to be reported by the participating parties;
- a requirement for participating parties to have a certified energy-management system in place;
- implementation of suitable monitoring and verification procedures; and
- sanctions or exclusions in the event of infringement, etc ⁽⁴⁾.

Information and energy advice

The large-scale provision of advice by an energy service provider to energy end-users cannot generally be considered sufficient to prove material involvement. Such measures often consist merely of some type of feedback (e.g. through websites) as to how end-users might reduce their energy consumption.

Given the wide variety of individual actions that can generally be targeted through single measures, the high degree of uncertainty affecting estimates of associated energy savings and the limited scale of the savings ⁽⁵⁾, on-site activities or some type of economic incentive are generally necessary to ensure the actual implementation of a significant number of actions and actual material involvement by participating parties, entrusted parties or implementing public authorities. Similar considerations apply in the context of information campaigns.

⁽⁴⁾ In the context of voluntary agreements among industrial manufacturers (e.g. of refrigerators), suitable protocols should be established, for example, on the periodic verification of products' energy performances by third parties and provision could be made for penalties where verified performances are below declared performances, etc.

⁽⁵⁾ For households, the literature indicates that the energy savings that can be expected from this type of measure can reach 2-3 % of total consumption as estimated *ex ante* (Gaffney, K., 2015, *Calculating energy savings from measures related to information and advice on energy efficiency*, presentation to workshop on common methods and principles for calculating the impact of EEOs or other policy measures under Article 7; <http://iet.jrc.ec.europa.eu/energyefficiency/node/9080>).

The following non-exhaustive list of criteria could be considered when establishing a method for showing the materiality for these types of measure:

- replies/feedback to a thematic survey (number of actual respondents);
- participation of targeted audience in thematic workshops/seminars, users/followers of web platform/application; or
- consumers receiving advice at a dedicated one-stop shop (on renovations, etc.), as registered in a database (indicating the question addressed, e.g. where to obtain a loan, how to prepare the grant application, information on certified construction companies, etc.) ⁽⁶⁾.

⁽⁶⁾ See also Appendix VI.

APPENDIX X

Calculation of savings from measures promoting the installation of small-scale renewable energy technologies and other heating technologies on or in buildings

1. Savings from measures promoting the installation of small-scale renewable energy technologies

As explained in section 7.5, measures promoting the installation of small-scale renewable energy technologies on or in buildings may be eligible for fulfilling the energy-savings requirement under Article 7(1) EED, provided that they result in verifiable, and measurable or estimable, energy savings.

The examples below illustrate how savings could be calculated in line with Annex V(2)(e) EED. The figures are indicative and do not represent real-life values. They are chosen to illustrate the calculation logic.

1.1. Replacement of an old oil boiler with a new oil boiler

	Heat demand	Conversion efficiency	Final energy demand ⁽¹⁾	Final energy savings relative to old boiler ⁽²⁾	Final energy savings relative to minimum efficiency ⁽³⁾
Status quo ante					
Oil fired boiler	10 000 kWh	0,77	12 987 kWh		
Fossil-fuel fired boiler with minimum efficiency ⁽⁴⁾	10 000 kWh	0,86	11 628 kWh		
Energy efficiency options					
(1) Gas-fired condensing boiler	10 000 kWh	0,975	10 526 kWh	2 731 kWh	1 371 kWh
(2) Solar-thermal/gas boiler package	10 000 kWh		10 474 kWh	2 731 kWh	1 371 kWh
Solar-thermal Installation	1 000 kWh	1	1 000 kWh		
Gas-fired condensing boiler	9 000 kWh	0,95	9 474 kWh		

⁽¹⁾ Heat demand divided by the assumed conversion efficiency.

⁽²⁾ Difference between final energy demand of the *status quo ante* and the final energy demand of the savings option. For the calculation of final energy savings, see also explanations on the principle of additionality.

⁽³⁾ Difference between final energy demand of the minimum efficiency boiler and the final energy demand of the savings option. For the calculation of final energy savings, see also explanations on the principle of additionality.

⁽⁴⁾ Under Commission Regulation (EU) No 813/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters (OJ L 239, 6.9.2013, p. 136).

1.2. Replacement of an old oil boiler with a new biomass boiler

	Heat demand	Conversion efficiency	Final energy demand ⁽¹⁾	Final energy savings relative to old boiler ⁽²⁾	Final energy savings relative to minimum efficiency ⁽³⁾
Status quo ante					
Oil-fired boiler	10 000 kWh	0,77	12 987 kWh		
Minimum standard					
Biomass-fired boiler with minimum efficiency ⁽⁴⁾	10 000 kWh	0,75	13 333 kWh		
Energy efficiency options					
(1) Biomass boiler (best technology available on the market, estimated from product catalogues/certification schemes)	10 000 kWh	0,92	10 870 kWh	2 117 kWh	2 464 kWh

⁽¹⁾ Heat demand divided by the assumed conversion efficiency.

⁽²⁾ Difference between final energy demand of the *status quo ante* and the final energy demand of the savings option.

⁽³⁾ Difference between final energy demand of the minimum efficiency boiler and the final energy demand of the savings option.

⁽⁴⁾ Under Commission Regulation (EU) 2015/1189 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers (OJ L 193, 21.7.2015, p. 100).

1.3. Replacement of an electric heater with a heat pump

	Heat demand	Conversion efficiency	Final energy demand ⁽¹⁾	Final energy savings relative to old boiler ⁽²⁾	Final energy savings relative to minimum efficiency ⁽³⁾
Status quo ante					
Oil-fired boiler	10 000 kWh	0,77	12 987 kWh		
Minimum standard					
Minimum standard heat pump ⁽⁴⁾	10 000 kWh	3,1	3 225 kWh	9 762 kWh	0
Energy efficiency options					
(1) Heat pump	10 000 kWh	3,5	2 857 kWh	10 130 kWh	368 kWh

⁽¹⁾ Heat demand divided by the assumed conversion efficiency.

⁽²⁾ Difference between final energy demand of the *status quo ante* and the final energy demand of the savings option.

⁽³⁾ Difference between final energy demand of the minimum efficiency boiler and the final energy demand of the savings option.

⁽⁴⁾ Under Regulation (EU) 2015/1189.

1.4. Photovoltaic installation

			Final energy demand ⁽¹⁾	Final energy savings ⁽²⁾
Status quo ante				
Grid electricity	3 500 kWh		3 500 kWh	
Energy efficiency option				
PV installation	3 500 kWh		3 500 kWh	0 kWh

⁽¹⁾ Electricity demand divided by the assumed conversion efficiency.

⁽²⁾ Difference between final energy demand of the *status quo ante* and the final energy demand of the savings option.

The example shows that electricity from a photovoltaic installation is accounted as final energy delivered to the building to satisfy the final energy demand of the building.

2. Savings from measures promoting the installation of micro-CHP

On-site installed combined heat and power (CHP) units may be relevant for the required amount of energy savings under Article 7(1) EED if they use less energy than the installation they replace. The total system efficiency of the combined CHP outputs (i.e. electricity and useful thermal output) based on the fuel consumed would need to be greater than that of the heating installation that is replaced.

While CHP may generate substantial primary energy savings (depending on the electricity mix), its potential to reduce final energy consumption is lower. In terms of final energy, electricity has the same value as fossil fuels or renewables.

Only final savings stemming from the efficiency gain of the on-site system can be counted under Article 7(1) EED, as illustrated below:

Example

Assume that:

- the reference case is an oil boiler with a thermal efficiency (η_{thermal}) of 0,77 (efficiency relative to net calorific value);
- as the CHP also generates electricity, in the base case an equal amount of electricity will have to be delivered to the building;
- the CHP case is a CHP gas plant with an efficiency of $\eta_{\text{thermal}} = 0,70$ and $\eta_{\text{electricity}} = 0,30$;
- the delivered heat is 10 000 kWh, thermal

To calculate the total savings, we first have to calculate the amount of electricity generated by the CHP plant. In a first step, we calculate the amount of fossil fuel used by the plant by dividing the delivered heat by the thermal efficiency of the plant. From this, we can derive how much electricity is produced.

CHP case:

10 000 kWh, thermal/ η_{thermal} = 14 285 kWh, gas

14 285 kWh, gas $\times \eta_{\text{electricity}}$ = 4 285 kWh, electricity

A total of 14 285 kWh final energy (all natural gas) is delivered to the building.

For the base case, the calculation is different. We derive the amount of gas from the thermal efficiency and delivered heat of the boiler:

Base case:

10 000 kWh, thermal/eta, thermal = 12 987 kWh, gas

In addition, 4 285 kWh of electricity has to be delivered from the grid to the building.

A total of 17 273 kWh final energy (natural gas and electricity) is delivered to the building.

In this example, installing CHP would save 2 988 kWh of final energy.

APPENDIX XI

ADDITIONALITY

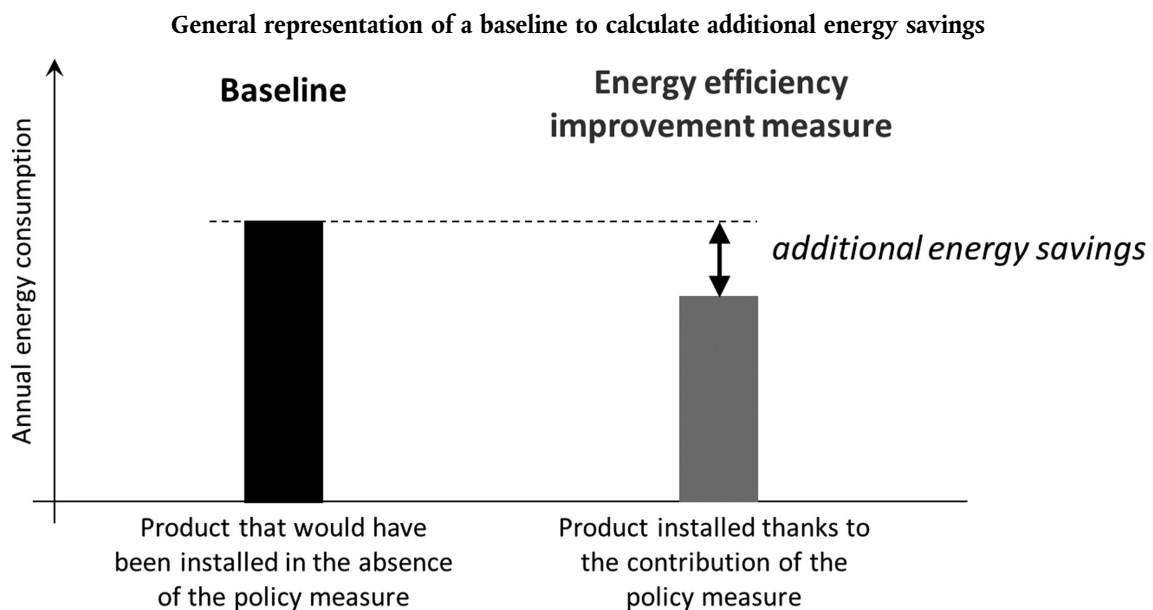
Annex V(2)(a) EED:

'The savings shall be shown to be additional to those that would have occurred in any event without the activity of the obligated, participating or entrusted parties, or implementing public authorities. To determine the savings that can be claimed as additional, Member States shall have regard to how energy use and demand would evolve in the absence of the policy measure in question by taking into account at least the following factors: energy consumption trends, changes in consumer behaviour, technological progress and changes caused by other measures implemented at Union and national level.'

To determine how energy use and demand would evolve in the absence of a policy measure, it is important to assess the product that would have been installed, for example by:

- taking the market-average energy consumption of products as the baseline;
- analysing energy consumption trends; and
- carrying out surveys by comparing answers of participants and control groups).

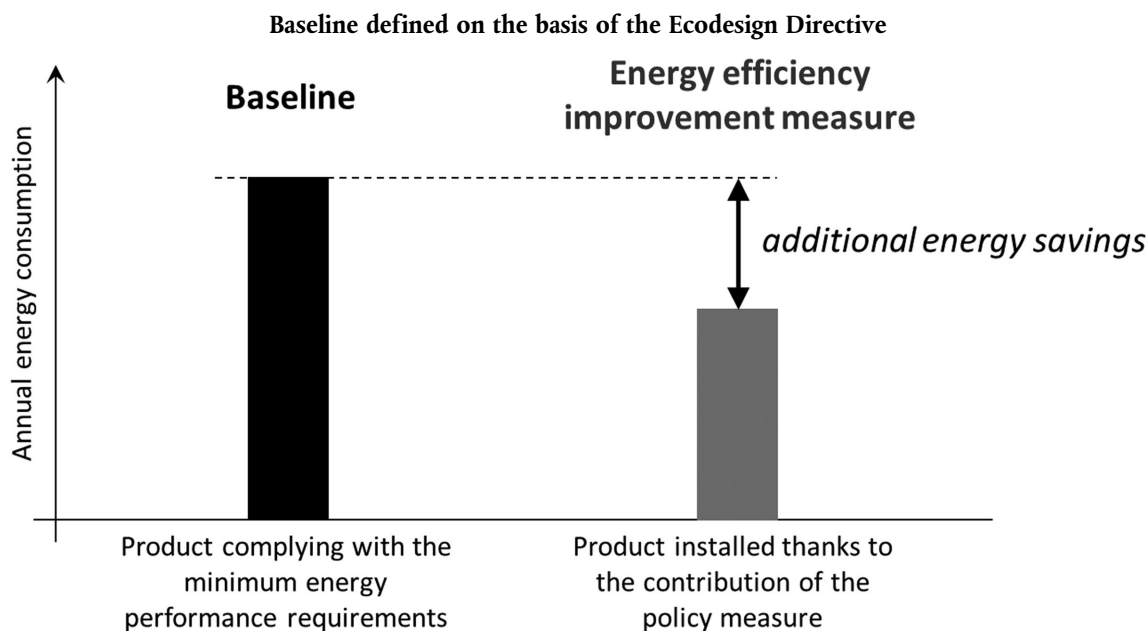
This produces a baseline as shown below:



Annex V(2)(b) clarifies that 'savings resulting from the implementation of mandatory Union law shall be considered to be savings that would have occurred in any event'. Annex V(2)(c) specifies, inter alia, that the minimum requirements in Regulations (EC) No 443/2009 and (EU) No 510/2011 (for new passenger cars and new light commercial vehicles) and implementing measures under the Ecodesign Directive for energy-related products should be considered in the baseline for calculating energy savings.

For example, the baseline for energy savings from the installation of energy-related products covered by the Ecodesign Directive (e.g. heating systems) should be at least equivalent to the minimum energy performance requirements set out in the relevant Directive in force at the time the individual action is installed. If the relevant minimum requirements under EU law are amended, revised or updated, this must be taken into account when revising the baseline.

The figure below shows such a baseline, defined as the energy consumption of a product with an energy performance equivalent to the minimum requirements of the Ecodesign Directive:



In practice, the requirements could apply to the annual energy consumption of the product or to other energy-performance indicators (e.g. boiler efficiency). The baseline can be established accordingly, e.g. by taking account of the requirements on boiler efficiency, combined with other data to calculate the heating demand that the boiler will need to meet.

These data could be:

- specific to the building where the new boiler is installed (e.g. using data from EPCs or energy audits); or
- average values representative of the stock of buildings targeted by the policy measure (e.g. when using deemed savings).

Member States should also take into account the information on each category of products, as provided on the Commission's website ⁽¹⁾.

Annex V(2)(a) refers to additional factors that should be included in the baseline, such as:

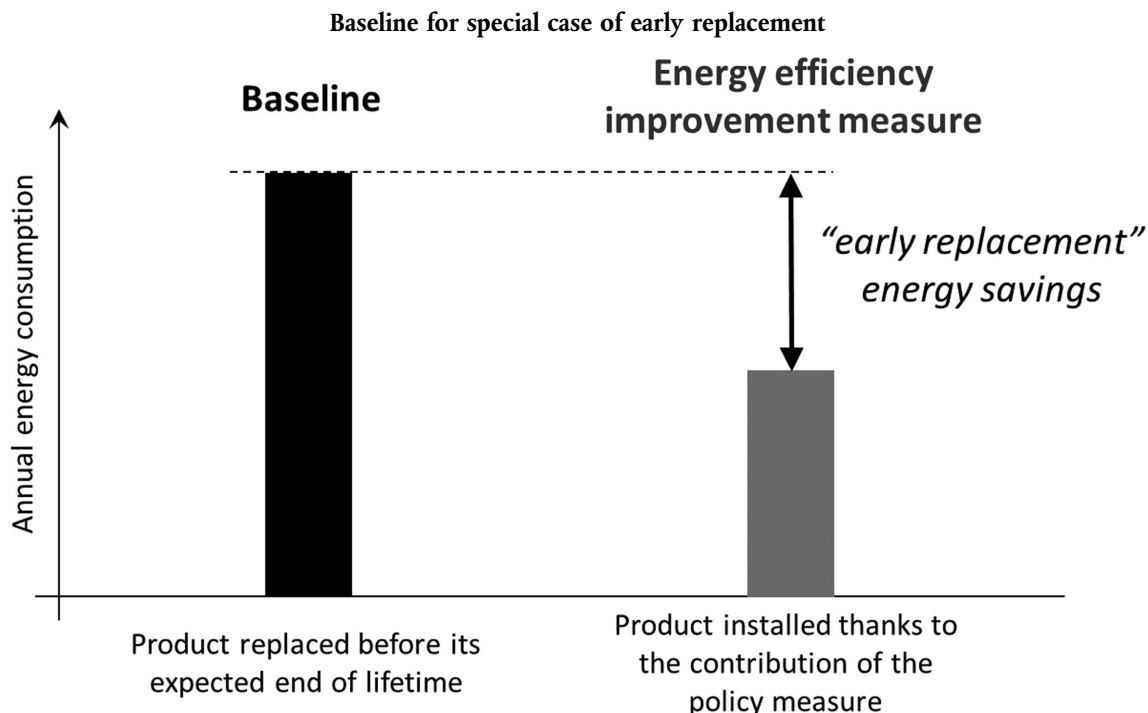
- changes in consumer behaviour over time;
- technological progress; and
- effects of other national policy measures that have already been implemented and continue to have an effect on energy use, including possible overlaps from other policies notified under Article 7 EED.

To avoid double-counting, Article 7(12) EED stipulates that 'Member States shall demonstrate that where there is an overlap in the impact of policy measures or individual actions, there is no double-counting of energy savings'.

More generally, the baseline should take account, where possible, of assumptions (renovation rate without a policy measure, change in the average age of the car fleet, lifetime of existing boilers, etc.) consistent with the national energy efficiency strategy or similar policy framework. Likewise, when reporting several policy measures, Member States should ensure the consistency of the assumptions used to define baselines.

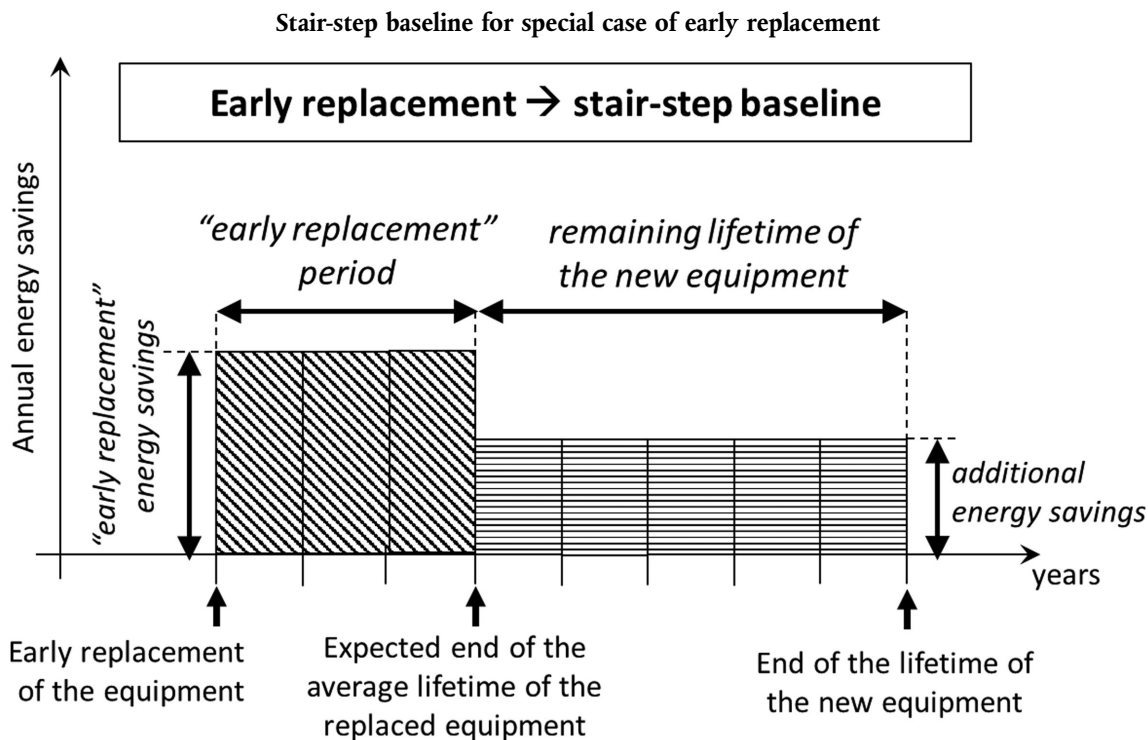
⁽¹⁾ https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products_en

Annex V(2)(f) EED clarifies the specific case of policy measures that ‘accelerate the uptake of more efficient products and vehicles’. In that context, where the early replacement of a product or vehicle can be shown, the baseline can be the energy consumption of the replaced product or vehicle (see figure below):



This specific case applies only for the ‘early replacement period’, i.e. between the installation of the new equipment and the end of the average expected lifetime of the replaced equipment.

A baseline to calculate additional energy savings must be used for the remaining lifetime of the new equipment. This leads to a stair-step baseline, as shown below:



In this example, the existing equipment was replaced 3 years before the end of its expected lifetime. These 3 years correspond to the early replacement period. The new equipment has an expected lifetime of 8 years. Therefore, for the 5 remaining years, the baseline for calculating additional energy savings is established as explained above.

An alternative to the stair-step baseline could be to calculate weighted energy savings applied to the whole lifetime of the action. This must not lead to the reporting of energy savings exceeding the stair-step baseline. Also, the calculation of the weighted energy savings should be explained.

In cases of derogation from the additionality requirement for existing buildings (Annex V(2)(b) EED), the baseline could be taken as the situation before the renovation of the building. Member States may use:

- building-specific data (e.g. from energy bills, an EPC or energy audit); or
- average values representative of the building stock targeted by the policy measure (when using deemed savings).

Additionality can then be evaluated, taking account of renovation works that would have happened anyway. For example, depending on the national context, financial incentives to replace windows can have significant free-rider effects, e.g. participants who benefit from the financial incentives when they had planned to replace their windows anyway (for reasons other than energy efficiency, e.g. noise protection, aesthetic reasons).

In some situations, the process of establishing a baseline is more complex. These are listed in the table below, with proposals as to how to address them:

Situation	Issues	Guidance
Policies already implemented for many years	Difficult to determine the situation in the absence of the policy. Current trends (e.g. in market average) can be partly due to market transformation effects of the policy in previous years.	Define the baseline on the basis of minimum levels in EU legislation. Otherwise, use the same assumptions as in the official national 'business as usual' scenario used as a basis for the national energy efficiency strategy or similar policy framework.
Local transport policies promoting modal shifts, mobility management, etc. (this may also apply to other policies that may reduce energy consumption in one area but increase it in another)	Difficult to monitor individual changes. Difficult to take account of side-effects (e.g. new public transport on one route can create congestion on another).	Use local transport modelling to compare scenarios without/with the policies (with models calibrated on the basis of transport surveys).

Situation	Issues	Guidance
Complex industrial processes without a clearly defined market	Market averages are difficult to establish for complex systemic processes individually designed for a certain industrial plant (no real market).	A reference investment can be constructed as the baseline. The approach should be based on the technological system with the lowest investment cost and an output that is comparable with that of the efficient option.

More generally, the following methods ⁽¹⁾ could be considered when assessing net or additional savings:

- randomised controlled trials (RCTs) and options for randomised approaches ⁽²⁾;
- quasi-experimental designs, including matching ⁽³⁾;
- survey-based approaches;
- market sales data analyses;
- structured expert judgement approaches;
- deemed or stipulated ‘net to gross’ ratios;
- historical tracing (or case study) method;
- common practice baseline approaches;
- top-down evaluations (or macroeconomic models).

⁽¹⁾ For more details, see for example: Voswinkel, F., Broc, J.S., Breitschopf, B., & Schlomann, B. (2018), *Evaluating net energy savings — topical case study of the EPATEE project*, funded by the Horizon 2020 programme;
https://epatee.eu/sites/default/files/files/epatee_topical_case_study_evaluating_net_energy_savings.pdf

⁽²⁾ See also Appendix VI.

⁽³⁾ See also Appendix VI.

APPENDIX XII

MONITORING AND VERIFICATION

1. Verification of actions and energy savings

When putting in place a monitoring and verification system, it can be useful to distinguish between verification of actions on the one hand and energy savings on the other. This does not mean that the two have to be verified by different entities. The distinction is to ensure that the issues specific to each type of verification are tackled.

Actions are verified to ensure that they were installed or implemented in compliance with quality, performance or other requirements under the policy measure.

Reported energy savings are verified to ensure that they comply with the calculation rules or methodology of the policy measure.

Depending on the national context and the type of policy measure, monitoring and verification processes may involve different parties, with different points of view. The table below sets out the roles of each type of party, taking into account the peculiarity of each measure:

	Implementing public authorities	Participating or entrusted parties/contractors/ obligated parties
Actions or projects to be approved/rejected	Aim: ensuring quality of actions and projects (compliance with predefined requirements) + providing key data for policy management and evaluation	Aim: ensuring that actions/projects will qualify for the scheme (e.g. to secure a financial incentive or energy savings credits) + ensuring customer satisfaction (for contractors or obligated parties) or energy savings (for end-users)
	Roles: (1) establishing requirements and reporting/documentation rules; (2) approving/rejecting submitted actions or projects; (3) carrying out or commissioning <i>ex post</i> verifications (documentation and/or on-site) and imposing penalties/sanctions	Roles: (1) submitting information required by the public authorities; (2) storing documentation needed for <i>ex post</i> verification; (3) implementing quality processes
Energy savings to be accounted for (or credited)/cancelled	Aim: ensuring quality of energy savings evaluation and reporting (compliance with predefined calculation rules and/or evaluation requirements), so that the monitored energy savings reflect policy impacts in line with the policy objectives and EED requirements + providing key data for policy management and evaluation	Aim: ensuring that energy savings will qualify for the scheme (e.g. to secure energy savings credits) + ensuring customer satisfaction (for contractors or obligated parties) or energy savings (for end-users)

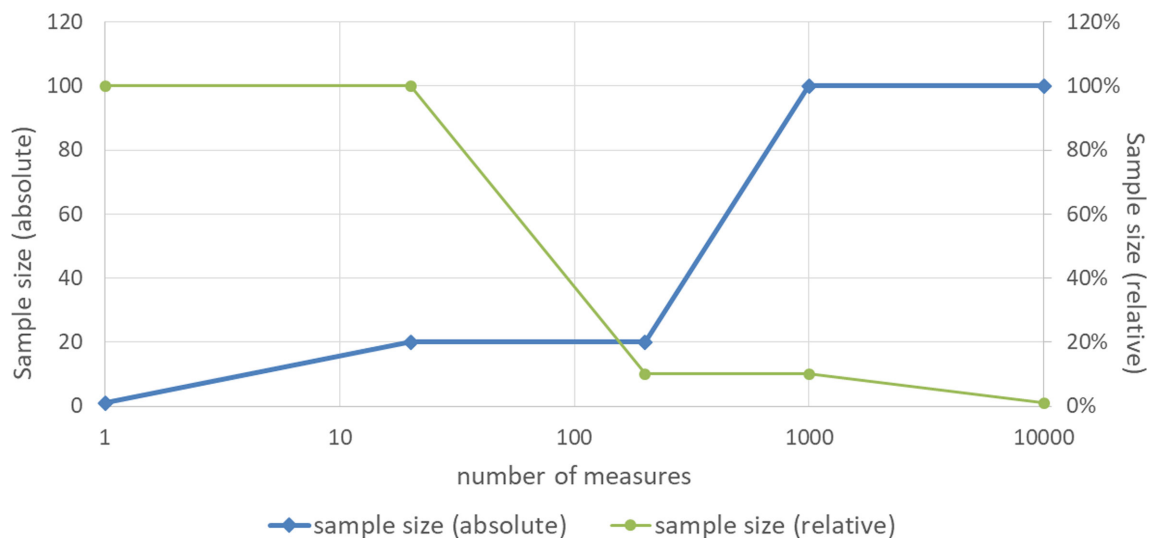
	Implementing public authorities	Participating or entrusted parties/contractors/ obligated parties
	Roles: (1) establishing calculation rules and/or evaluation requirements; (2) approving/rejecting reported energy savings (or calculating energy savings, depending on the type of policy measures and its rules); (3) carrying out <i>ex post</i> verifications (documentation and/or on-site) and imposing penalties/sanctions	Roles: (1) submitting information required by the public authorities; (2) storing documentation needed for <i>ex post</i> verification; (3) calculating energy savings; (4) implementing quality processes

2. Statistically significant proportion and representative sample

Articles 7a(5) EED (for EEOSSs) and 7b(2) EED (for alternative measures) require that 'Member States shall put in place measurement, control and verification systems under which documented verification is carried out on at least a statistically significant proportion and representative sample of the energy efficiency improvement measures'.

The aim of this requirement is to check that the energy savings are actually achieved as reported. It is therefore crucial to select a statistically representative sample that represents the characteristics of the entire population (i.e. energy-efficiency measures) with sufficient accuracy.

What is 'statistically representative' depends to a large extent on the number of measures considered and other framework conditions of the individual measures that are implemented. Therefore, it is not possible to provide a generally valid definition, e.g. percentages or numbers of cases. The following assumptions are indicative only and cannot replace case-specific analysis of the statistical properties of the measure:



Member States might find the following non-exhaustive, indicative list helpful when considering what could constitute a significant statistical proportion and a representative sample:

- full survey for a small number of cases ($n < 20$);
- with an average number of cases, a sample of 10 % of the population, but at least $n = 20$ might be appropriate;

- for large samples, a sample of ~ 100 may be considered sufficient for a 1 % probability of error for a proportion of 5 % of false reports (i.e. 5 % of the action reports are presumably false). For samples with a higher proportion of false reports, a smaller sample is sufficient (see table):

Proportion of false reports	Probability of error		
	10 %	5 %	1 %
5 %	31	51	103
10 %	15	24	49
20 %	7	11	22
50 %	2	3	5

Note: The 1-10 % range of probability of error is illustrative. The probability of error may be higher, depending on the type of policy measure, individual actions and whether quality processes and penalties or sanctions are enforced.

Other aspects should be considered when determining the representative sample. For example, it may be necessary to take a stratified sample if the same type of individual action (as defined in Article 2(19)) can be implemented across a range of building types. This approach would ensure that the number of buildings sampled in each category is proportional to the number in that category (in the population of actions reported for the measure under evaluation). If there is a reason to assume that an action could result in a wide range of energy savings in different types of building, it may be appropriate to sample each category separately.

The sample size refers to the verification, not the measurement. Diverse individual actions (as defined in Article 2(19)) may be implemented under the same policy measure, but meaningful measurement requires homogeneity. The first step in the sampling process should therefore be to establish what factors or criteria should be taken into account to identify homogeneous groups (of actions or participants) for which it is possible to extrapolate results from measurements on a representative sample (per group).

Depending on the type of policy measure, other criteria may be needed at this stage. For example, for EEOs, the obligated parties or third parties that can promote individual actions to end-users can use very different strategies and collect data and calculate savings in different ways. Therefore, samples should be taken for each party.

3. Illustrations of how to set up a monitoring and verification system

The indicative examples below include basic information on how to ensure that:

- control and verification are carried out independently of the obligated, participating or entrusted parties; and
- verification is carried out on at least a statistically significant proportion and representative sample of the energy efficiency improvement measures.

3.1. EEOs (deemed savings)

Aspects of verifying actions under EEOs include the following:

- obligated parties could be required to commission independent third parties to verify samples of actions. Such verification could take place in the course of on-site visits to check that actions comply with the requirements of the EEOs and that actions and their conditions of installation/implementation (including comparison of the situation before and after installation/implementation, if needed) are consistent with the data reported by the obligated parties for the energy savings calculations;

- the independent third parties could be required to be registered with the public authority and pay registration fees. They could be asked to report the results of their verification to both the public authority and the obligated party;
- the public authority could establish verification protocols (e.g. checklist for each action type) to harmonise verification practices among the third parties;
- the public authority, together with accreditation bodies, could establish criteria that third parties have to meet to be registered by the public authority; and
- accreditation bodies could carry out regular controls of the third parties (to ensure that they act independently and in accordance with the verification protocols). These could be funded by the third parties' registration fees. The accreditation bodies would then report their results to the public authority.

To ensure that verifications are carried out independently, the third parties should be organisations that are not partly or fully owned by an obligated party or its holding. This should be checked by an accreditation body.

These arrangements are designed to minimise costs and administrative burden for the public authority; in particular:

- verifications could be organised and paid for by the obligated parties; and
- controls could be organised by the accreditation bodies and paid for by the third parties.

The role of the public authority should thus focus on:

- establishing rules on sampling, criteria for the third parties, verification protocols, etc.;
- reviewing the findings of the reports from the accreditation bodies; and
- on the basis of its review:
 - requiring the obligated parties to take action to remedy any non-compliance;
 - cancelling, in part or in full, the energy savings reported for the cases investigated; and
 - enforcing sanctions or penalties.

Sampling of the verifications of the actions could be based on statistical criteria (for representativeness) or on a risk-based approach, as the verifications are also used to ensure consumer protection and fight fraud.

The public authority should verify the energy savings under EEOs independently of the obligated parties. In this context, the public authority:

- should establish:
 - rules for energy savings calculation;
 - data requirements; and
 - (possibly) an online data platform to facilitate data collection.

Obligated parties could be required to use the platform to report a minimum set of information relating to the calculations and to store proofs (including for complementary information). The platform would enable systematic and automatised plausibility checks of the values reported. When outliers are detected, the public authority would verify the corresponding data and calculations;

- could verify the data and calculations on a statistically significant proportion and representative sample ⁽⁴⁾ of reported actions via desktop verifications, for which it requires the obligated parties to provide the relevant evidence;
- on the basis of the results of the above steps, could then carry out on-site controls for further verification.

The online data platform represents an upfront cost for the EEOS, but it then facilitates data collection and processing, and is likely to minimise administrative burden for both the obligated parties and the public authority.

On the basis of the results from the various verification steps, the public authority could:

- require the obligated parties to provide further explanations or justifications;
- cancel, in part or in full, the energy savings reported for the cases investigated; and
- enforce sanctions or penalties.

3.2. Voluntary agreement (scaled savings)

When entering into a voluntary agreement, participating parties should commit themselves to establishing an action plan and an energy savings target based on sound methodology, e.g. an energy audit. The action plan should set out the actions to be implemented in a reasonable period (depending on the specificities of each agreement) and be revised regularly within a reasonable time.

Since the participating parties benefit directly from the actions they undertake to implement (as they are also end-users), they could verify the quality of the actions themselves. However, the public authority should provide clear guidance for checking the quality of the most common action types. In this case, the focus is on checking the actions that have been implemented. However, to ensure full compliance, a monitoring body should verify the actions and the energy savings, independently from the co-signatories of the agreement (public authority and participating parties).

Sampling of the verifications of savings should be based on a sound statistical approach to ensure representativeness, so that results can be extrapolated to the whole scheme.

The following are indicative aspects of verifying actions and energy savings under voluntary agreements:

- the public authority (ministry co-signing the agreement) could appoint an independent monitoring body (e.g. the national energy agency) with which it could establish:
 - the data requirements (i.e. minimum data to be reported and minimum documentation to be stored by the participating parties); and
 - guidelines for energy savings calculations;
- the monitoring body could set up an online data platform enabling systematic and automatised plausibility checks of the reported data. Where outliers are detected, the monitoring body should verify the corresponding data and calculations;
- the participating parties should be obliged regularly to report data on the actions they implement via the online platform and to store suitable evidence (e.g. invoices);
- the monitoring body should verify a statistically significant proportion and representative sample of the actions reported, e.g. via desktop verifications of the reported data and calculations. It should require the participating parties to provide the corresponding evidence;
- on the basis of the results of the above steps, the monitoring body could then carry out on-site controls for further verification;

⁽⁴⁾ Sampling of the verifications of the energy savings should be based on a statistical approach to ensure representativeness, so that results can be extrapolated to the whole scheme.

- on the basis of the results of its verifications, the monitoring body should require the participating parties to take action to remedy any problems identified or cancel reported energy savings. If appropriate, the public authority could impose sanctions (e.g. exclusion from the agreement) or fines; and
- the monitoring body should prepare annual reports on the results of the agreement and the verification and controls carried out. These reports should be published.

3.3. Subsidy scheme (metered savings)

A subsidy scheme could relate to the renovation of houses up to a certain performance level. The actions and energy savings should be verified independently of the entrusted party, i.e. by another contractor.

Sampling for the verifications of the quality of the actions should be based on:

- a risk-based approach, in order to detect possible fraud; and
- a statistical approach to ensure representativeness, so that results can be extrapolated to the whole scheme.

The following are indicative aspects of verifying energy savings and actions in subsidy schemes:

- building professionals performing the works should have a specified qualification and be registered by the public authority;
- when applying for the subsidy, households should be required (subject to relevant consumer and data protection provisions) to grant access to their energy bills and answer a survey on request (if they are included in the verification sample); and
- the level of performance achieved after a renovation should be confirmed by an EPC issued by a certified assessor.

The scheme could be administered by an entrusted party.

Verification of the implementation of renovation projects and the performance level or energy savings achieved could be managed as follows:

- the entrusted body could maintain a database with details of the renovation projects approved, which would make it possible to create a statistically significant proportion and representative sample of renovation projects;
- the public authority could commission a monitoring contractor which would have access to that database or any other necessary data or database (e.g. the EPC database). On the basis of a first step of verification, the contractor should select a sub-sample for on-site inspection; and
- the verification of energy savings or the level of performance achieved should be transparently confirmed by an EPC issued by a certified assessor or any other transparent and relevant method (see Appendix III, section 1.1).

The monitoring contractor should collect all necessary data, depending on the methodology applied for a statistically reliable sample (EPCs, energy bills, etc.), and carry out further analysis to determine:

- estimated or metered savings; or
- the improvement in energy performance.

4. **Guidance and examples of monitoring and verification systems**

Member States are encouraged to take into consideration further sources, for example:

- the multEE project (Horizon 2020) ⁽⁵⁾;
- presentations of EEOS monitoring systems ⁽⁶⁾; and
- the EPATEE case study, which includes examples of monitoring systems used to evaluate energy savings ⁽⁷⁾.

⁽⁵⁾ <https://multee.eu/>

⁽⁶⁾ http://atee.fr/sites/default/files/part_3-monitoring_verification_and_evaluation.zip

⁽⁷⁾ https://epatee.eu/sites/default/files/files/epatee_topical_case_study_linkage_between_monitoring_and_evaluation.pdf

COMMISSION RECOMMENDATION (EU) 2019/1659**of 25 September 2019****on the content of the comprehensive assessment of the potential for efficient heating and cooling
under Article 14 of Directive 2012/27/EU**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 194 thereof,

Whereas:

- (1) The Union is committed to developing a sustainable, competitive, secure and decarbonised energy system. The Energy Union Strategy establishes ambitious Union objectives. It notably aims to reduce greenhouse gas emissions by at least 40 % by 2030 compared with 1990, to increase the proportion of consumption of renewable energy to at least 32 %, and to make ambitious energy savings, improving the Union's energy security, competitiveness and sustainability. Directive 2012/27/EU of the European Parliament and of the Council ⁽¹⁾ (Energy Efficiency Directive — EED), as amended by Directive (EU) 2018/2002 of the European Parliament and of the Council ⁽²⁾, establishes an energy efficiency target of at least 32,5 % savings at Union level by 2030.
- (2) Heating and cooling is the most significant energy end-use sector, accounting for about 50 % of total energy demand in the EU. Buildings represent 80 % of this consumption. To ensure an 'energy transition' at every administrative level in the EU, it is essential to identify energy efficiency potential to achieve savings across all Member States, and to align policy.
- (3) Article 14 of Directive 2012/27/EU (Energy Efficiency Directive) requires each Member State to carry out and notify to the Commission a comprehensive assessment of the potential for efficient heating and cooling with a view of promoting it. The comprehensive assessment must include all the elements mentioned in Annex VIII to the EED.
- (4) The Member States had to carry out a first comprehensive assessment by 31 December 2015, and notify it to the Commission. That assessment must be updated and notified to the Commission every five years following a request by the Commission.
- (5) The Commission's Joint Research Centre (JRC) analysed the first set of comprehensive assessments and found that they could benefit from the gathering of new data, descriptions of new potential for heating and cooling, and better interaction between national and local administrations.
- (6) By letter of 8 April 2019, the Commission asked the Member States to submit updated comprehensive assessments under Article 14(1) of the Energy Efficiency Directive by 31 December 2020.
- (7) The Commission has identified the need to set clearer requirements for the gathering and processing of data, and to allow Member States to focus their analysis on locally relevant ways of heating and cooling in a technologically neutral way.

⁽¹⁾ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

⁽²⁾ Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (OJ L 328, 21.12.2018, p. 210).

- (8) Commission Delegated Regulation (EU) 2019/826 ⁽³⁾ simplifies the requirements for the assessments and aligns them with the updated energy union legislation, in particular the Energy Performance of Buildings Directive ⁽⁴⁾, the Energy Efficiency Directive ⁽⁵⁾, Directive (EU) 2018/2001 of the European Parliament and of the Council ⁽⁶⁾ (the Renewable Energy Directive) and Regulation (EU) 2018/1999 of the European Parliament and of the Council ⁽⁷⁾ (Governance Regulation).
- (9) In particular, the preparation of the analysis should be closely linked to the planning and reporting laid down in Regulation (EU) 2018/1999 and builds on previous assessments wherever possible. A reporting template provided by the European Commission may be used when submitting the results of the comprehensive assessments.
- (10) This document will supersede Commission guidance on promotion of efficiency in heating and cooling ⁽⁸⁾.
- (11) This Recommendation does not alter the legal effects of the EED and is without prejudice to the binding interpretation of the EED as provided by the Court of Justice. It focuses on the provisions relating to comprehensive assessment of the potential for efficient heating and cooling and concerns Article 14 of and Annex VIII to the EED,

HAS ADOPTED THIS RECOMMENDATION:

Member States should follow the guidelines in the annexes to this Recommendation in carrying out the comprehensive assessments pursuant to Article 14 of and Annex VIII to Directive 2012/27/EU.

Done at Brussels, 25 September 2019.

For the Commission

Miguel ARIAS CAÑETE

Member of the Commission

⁽³⁾ Commission Delegated Regulation (EU) 2019/826 of 4 March 2019 amending Annexes VIII and IX to Directive 2012/27/EU of the European Parliament and of the Council on the contents of comprehensive assessments of the potential for efficient heating and cooling (OJ L 137, 23.5.2019, p. 3).

⁽⁴⁾ As amended by Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency (OJ L 156, 19.6.2018, p. 75).

⁽⁵⁾ As amended by Directive (EU) 2018/2002.

⁽⁶⁾ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (OJ L 328, 21.12.2018, p. 82).

⁽⁷⁾ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1).

⁽⁸⁾ Guidance note on Directive 2012/27/EU;

<https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52013SC0449>

ANNEX I

CONTENTS OF COMPREHENSIVE ASSESSMENTS OF THE POTENTIAL FOR EFFICIENT HEATING AND COOLING**1. GENERAL RECOMMENDATIONS TO ANNEX VIII EED**

Article 14(1) and (3) of Directive 2012/27/EU (Energy Efficiency Directive — EED) requires each Member State to carry out and submit to the Commission a comprehensive assessment of the potential for energy efficiency in heating and cooling. The assessment must include all the elements referred to in Annex VIII EED.

The Member States had to submit a first assessment by 31 December 2015. That assessment is to be updated every five years following a request from the Commission. The preparation of the analysis must be closely linked to the planning and reporting arrangements in Regulation (EU) 2018/1999 (Governance Regulation) and build on previous assessments where possible. Member States may use a reporting template provided by the Commission.

In order to simplify the assessments, the Commission used the possibilities in Articles 22 and 23 EED to propose a Delegated Regulation (EU) 2019/826 amending Annex VIII and Part 1 of Annex IX EED.

The aim of this document is to explain the new requirements and to facilitate the effective and coherent application of the provisions of Annex VIII EED on the information to be notified to the Commission in the comprehensive assessments. This document replaces the existing guidance on promotion of efficiency in heating and cooling published by the Commission ⁽¹⁾.

To generate a national overview of heating and cooling, the steps leading to a complete comprehensive assessment must include:

- an assessment of the amount of useful energy (UE) ⁽²⁾ and quantification of final energy consumption (FEC) ⁽³⁾ by sector (GWh per year);
- the estimated and identified current heating and cooling supplied to sectors of final consumption (GWh per year), with breakdowns by technologies and as to whether the energy was derived from fossil and renewable sources;
- the identification of potential supply from installations that generate waste heat or cold (GWh per year);
- reported shares of energy from renewable sources and from waste heat or cold in district heating and cooling FEC over the past 5 years;
- forecast trends in demand for heating and cooling for the next 30 years (GWh); and
- a map of the national territory showing energy-dense areas, heat and cold supply points identified under point 2(b) and district heating transmission installations, both existing and planned.

To give a general overview of policy on heating and cooling, the assessment must include:

- a description of the role of efficient heating and cooling in long-term greenhouse gas (GHG) emission reductions; and
- a general overview of existing policies and measures on heating and cooling, as reported in accordance with the Governance Regulation.

⁽¹⁾ Guidance note on Directive 2012/27/EU;
<https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52013SC0449>

⁽²⁾ 'Useful energy' means all the energy required by the end-users in the form of heat and cold after all the steps of energy transformation have taken place in the heating and cooling equipment.

⁽³⁾ All energy supplied to industry, transport, households, services and agriculture. FEC excludes deliveries to the energy transformation sector and the energy industries themselves. Any differences from statistics and balances available through Eurostat must be explained.

In order to analyse the economic potential for efficiency in heating and cooling, the steps leading to a complete assessment must include:

- the identification of suitable technologies for supplying low-carbon and energy-efficient heat and cold on the national territory using a cost-benefit analysis (CBA);
- a baseline and alternative scenarios for a well-defined geographical area;
- financial and economic analyses (the latter taking into account external costs);
- a sensitivity analysis; and
- a presentation of the method used and assumptions made.

Finally, proposals for additional and future policy measures in heating and cooling must be presented to complete the comprehensive assessment.

2. SPECIFIC RECOMMENDATIONS

2.1. OVERVIEW OF HEATING AND COOLING

2.1.1. *Assessing annual heating and cooling demand in terms of useful energy and quantified final energy consumption by sector*

Under point 1 in Annex VIII EED, Member States must report the most recent quantified FEC data for heating and cooling in residential, service and industry sectors, and any other sector that individually accounts for more than 5 % of total national useful heating and cooling demand. In parallel, Member States must also assess and report UE required for heating and cooling in these sectors. The FEC and UE for each sector must be expressed in GWh.

Final heating and cooling energy consumption should be based on real, measured and verified information, and sectoral breakdowns as provided as default in European energy statistics and national energy balances ⁽⁴⁾.

To comply with point 3 in Annex VIII EED, it is useful to present a geographical breakdown of supply and consumption data, in order to relate future energy demand to sources of supply. This requires knowledge of the location of the main heating and cooling users. Together with the information on potential suppliers for point 2 of Annex VIII to the EED, this allows creating a map of locations for point 3 thereof and improve understanding of the varying conditions within a country. One approach for the geographical breakdown could be to use a well-established system of territorial division, such as postcode areas, local administrative units (LAUs), municipalities, industrial parks and their surroundings, etc.

A sectoral breakdown of heating and cooling demand into relevant sub-elements may be produced where possible and useful, e.g. to determine the amount or temperature grade of energy that would typically be needed ⁽⁵⁾ (e.g. into high grade heat, medium grade heat, medium/low grade heat, low grade heat, cooling and refrigeration). This would make the analysis more accurate and useful, e.g. in establishing technical and economic viability as part of the CBA of specific heating & cooling supply solutions to meet the specific needs in different sub-sectors.

A proper breakdown of demand requires a robust data gathering and processing. It will often involve combining different data sets, processing data top-down and bottom-up, and using hypotheses and assumptions. If no direct data on energy consumption is available, indirectly derived data should be used. Possible elements could include the population in a territorial unit, energy consumption *per capita* and heated area of buildings *per capita*. Different sub-sectors will probably require different approaches.

⁽⁴⁾ Guidance note on Directive 2012/27/EU;

<https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52013SC0449>

⁽⁵⁾ For more information on a typical heat and cold breakdown based on their application, see Annex IV.

The residential sector and most of the service sector consist of a large number of small and medium-sized consumers, dispersed over the territory of a municipality or other territorial unit. Their energy demand is primarily for space heating/cooling and thus determined by the building area that requires heating and/or cooling. It might be useful to apply criteria that explain demand in geographical terms ⁽⁶⁾, e.g. to group such consumers into high and low heat demand density groups. Where building segments are differentiated, e.g. to meet 'nearly zero-energy building' standards, the same segmentation may also be used.

The industrial sector usually consists of a small number of large heat consumers, whose demand is governed by industrial processes. In this case, the consumers could be grouped using energy demand (MWh/a) and temperature thresholds.

2.1.2. **Identifying/estimating current heating and cooling supply by technology**

The purpose of this step is to identify the technological solutions used to supply heating and cooling (point 1 in Annex VIII EED). The analysis and reported values should follow the same structure as the description of heating and cooling demand. Under point 2(a) in Annex VIII EED, the most recent data available must be reported, in GWh per year. Distinctions should be made between on-site and off-site sources and between renewable and fossil energy sources.

Point 2(a) lists the technologies for which supply data must be provided:

— in the case of supply provided on-site:

- heat-only boilers;
- high-efficiency heat and power generation;
- heat pumps;
- other on-site technologies and sources; and

— in the case of off-site supply:

- high-efficiency heat and power generation;
- waste heat;
- other off-site technologies and sources;

For each technology, a distinction must be made between renewable and fossil energy sources. Data that cannot be gathered directly should be derived indirectly. The above list is not exhaustive and represents the minimum to be included. Additional energy sources should be added if necessary to ensure completeness and accuracy.

The level of detail of data on heating and cooling supply sources should reflect the requirements of the method chosen for the comprehensive assessment. This could include location data, technology, fuel used, the quantity and quality ⁽⁷⁾ of energy supplied (MWh/a), the availability of heat (daily or yearly), the age and expected lifetime of the installation, etc.

⁽⁶⁾ Examples of such criteria are:

- heat demand density (MWh/km²) — the annual consumption of heating and cooling by buildings located in a given territorial unit, e.g. according to the STRATEGO project report (<https://heatroadmap.eu/wp-content/uploads/2018/09/STRATEGO-WP2-Background-Report-6-Mapping-Potenital-for-DHC.pdf>), high-demand areas are those consuming over 85 GWh/km² of heating per year; and
- plot ratio (m²/m²) — the heated or cooled floor area of buildings in a given territorial unit divided by the area of that unit. For more details, see *Background report providing guidance on tools and methods for the preparation of public heat maps*, point 2.1.1; <http://publications.jrc.ec.europa.eu/repository/handle/JRC98823>

⁽⁷⁾ For more information on a typical heat and cold breakdown based on their application, see Annex IV.

2.2. IDENTIFYING INSTALLATIONS THAT GENERATE WASTE HEAT OR COLD AND THEIR POTENTIAL HEATING OR COOLING SUPPLY

The purpose of this step is to identify, describe and quantify sources of waste heat or cold that are not yet used to their full technical potential. This could serve as an indicator to cover existing or future heating and cooling demand. Point 2(b) in Annex VIII EED lists the heat generation installations to be analysed:

- ‘— thermal power generation installations that can supply or can be retrofitted to supply waste heat with a total thermal input exceeding 50 MW;
- heat and power cogeneration installations using technologies referred to in Part II of Annex I with a total thermal input exceeding 20 MW;
- waste incineration plants;
- renewable energy installations with a total thermal input exceeding 20 MW other than the installations specified under point 2(b)(i) and (ii) generating heating or cooling using the energy from renewable sources;
- industrial installations with a total thermal input exceeding 20 MW which can provide waste heat.’

Member States may go beyond the listed waste heat and cold sources, in particular from the tertiary sector and report them separately. For the purposes of authorisation and permitting records of Article 14(7) EED, Member States can assess the waste heat generation potential of thermal power generation installations with a total thermal input between 20 and 50 MW.

It might also be useful to describe the quality of energy produced, e.g. temperature (steam or hot water) available per application for which it could typically be used⁽⁸⁾. If the quantity or quality of the waste heat or cold are not known, they can be estimated using proper methodology based on well-documented assumptions. For example, waste heat from electricity generation installations can be recovered using various methods and technologies⁽⁹⁾.

Member States must show on a map the location of the potential sources of waste heat and cold that could satisfy demand in the future.

2.3. MAPS ON THE SUPPLY AND DEMAND OF HEAT AND COLD

Annex VIII EED requires that the comprehensive assessment of national potential for efficient heating and cooling include a map of the entire national territory that shows the sources and infrastructure of heating and cooling demand, including (point 3 in Annex VIII):

- ‘— heating and cooling demand areas following from the analysis of point 1, while using consistent criteria for focusing on energy dense areas in municipalities and conurbations;
- existing heating and cooling supply points identified under point 2(b) and district heating transmission installations;
- planned heating and cooling supply points of the type described under point 2(b) and district heating transmission installations’

This list contains only the items that must be included on the map. Other items may be included, e.g. distribution of renewable energy resources.

Producing the heat and cold map should not be seen as a separate task, but rather as an integral part of the process of assessing potential heating and cooling efficiency improvements and synergies between consumers and their potential suppliers. In the light of the requirement to produce the map, all data collected on heating and cooling supply and demand should have a spatial dimension, so that opportunities for synergies can be identified.

⁽⁸⁾ For more information on a typical heat and cold breakdown based on their application, see Annex V.

⁽⁹⁾ *Guidelines on best practices and informal guidance on how to implement the comprehensive assessment at Member State level*; <http://publications.jrc.ec.europa.eu/repository/handle/JRC98819>

The resolution of the map elements required under point 3(a) in Annex VIII EED must be sufficient to identify particular heating and cooling demand areas. For the elements under point 3(b) and (c), the virtual representation may be more general (subject to the chosen method of analysis and information available), but it must make it possible to determine the location of a particular element with sufficient accuracy for the purpose of the CBA.

Where plans for future supply points and installations have been notified to the national administration or referred to in national policy documents, that may mean that they are sufficiently mature to be included in this category. This will not prejudice future planning or investment decisions and will not be binding on any party.

Various methods can be used to compose map layers⁽¹⁰⁾. Some provide more detail and may require larger sets of detailed information (e.g. isopleth-based maps). Others may require less effort, but are less useful for identifying synergies between consumers and suppliers of heat and cold (e.g. choropleth maps). Member States are encouraged to construct maps using the most detailed information available, while protecting commercially sensitive information.

It is advisable to make the heat map publicly available on the internet. This is already the practice in some Member States and the map can be a useful tool for potential investors and the public.

2.4. FORECAST OF HEATING AND COOLING DEMAND

Point 4 in Annex VIII EED requires a forecast of demand for heating and cooling for the next 30 years, with more precise information for the next 10 years. The forecast must take into account the impact of policies and strategies relating to energy efficiency and heating and cooling demand (e.g. long-term building renovation strategies under the Energy Performance of Buildings Directive⁽¹¹⁾, integrated energy and climate plans under the Governance Regulation) and should reflect the needs of the various sectors of industry.

When preparing forecasts, Member States should use the segmentation established pursuant to points 1 and 2 in Annex VIII EED to determine current supply and demand (i.e. residential, service, industrial and other, and their possible sub-segments).

Relevant international, national and scientific reports can be used, as long as they are based on a well-documented methodology and provide sufficiently detailed information. Alternatively, forecasting can be based on energy-demand modelling. The methods and assumptions must be described and explained.

2.5. SHARE OF ENERGY FROM RENEWABLE SOURCES AND FROM WASTE HEAT OR COLD IN THE FINAL ENERGY CONSUMPTION OF THE DISTRICT HEATING AND COOLING SECTOR

Member States must report the share of energy from renewable sources and from waste heat and cold in accordance with Article 15(7) of the Renewable Energy Directive (RED)⁽¹²⁾. The data may be reported for every type of renewable non-fossil source referred to in Article 2(1) RED, and also for waste heat.

Until the methodology for accounting renewable cooling is established in accordance with Article 35 RED, Member States must use an appropriate national methodology.

⁽¹⁰⁾ For more details on methods for estimating waste heat, see *Background report providing guidance on tools and methods for the preparation of public heat maps*, points 3 and 4; <http://publications.jrc.ec.europa.eu/repository/handle/JRC98823>

⁽¹¹⁾ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13).

⁽¹²⁾ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (OJ L 328, 21.12.2018, p. 82).

3. OBJECTIVES, STRATEGIES AND POLICY MEASURES

3.1. ROLE OF EFFICIENT HEATING AND COOLING IN LONG-TERM GHG EMISSION REDUCTION AND OVERVIEW OF EXISTING POLICIES

An overview of existing policies relevant for efficient heating and cooling should be presented briefly, focussing on any changes compared to those reported under the Governance Regulation and avoiding any duplication.

Specific policies for heating and cooling must be consistent with policies contributing to the five energy union dimensions, in particular energy efficiency (Article 4, point b(1) to (4) and Article 15(4)(b) of the Governance Regulation); these dimensions are:

- decarbonisation, including the reduction and removal of GHG emissions and contributing to the trajectories of the sectoral share of renewable energy in FEC;
- energy efficiency, including the contribution to achieving the EU's 2030 energy efficiency target and indicative milestones for 2030, 2040 and 2050;
- energy security, including diversification of supply, increasing the resilience and flexibility of the energy system and reducing import dependency;
- internal energy markets, including improving interconnectivity, transmission infrastructure, competitively priced and involvement-oriented consumer policy and alleviating energy poverty; and
- research, innovation and competitiveness, including the contribution to private research and innovation, and the deployment of clean technologies.

Member States must describe how energy efficiency and the reduction of GHG emissions in heating and cooling relate to these five dimensions and quantify this where justified and possible.

3.1.1. *Example: Decarbonisation dimension*

For example, for the decarbonisation dimension, the impact of policies for energy efficiency in heating and cooling on the amount of GHG emitted and on land use must be quantified. The use of technologies in the future should be stated, indicating the uptake of renewable non-fossil sources, including renewable electricity applications for heat or cold (wind, solar PV) and the direct generation of heat from renewable energy carriers (solar thermal heating and cooling, biomass, biogas, hydrogen, synthetic gases), or other. The subsequent CBA (see section 4) would make it possible to identify new policies and measures (section 5) in order to achieve national energy efficiency and decarbonisation targets related to heating and cooling.

3.1.2. *Example: Energy Efficiency dimension*

As regards general energy efficiency, Member States must express the amount that policy on energy efficiency in heating and cooling is expected to contribute to the 2030, 2040 and 2050 milestones. This must be quantified in terms of primary or final energy consumption, primary or final energy savings, or energy intensity, in line with the approach chosen in the context of the Governance Regulation.

Member States should also describe the relevant impact of their policies on energy security, research, innovation and competitiveness.

4. ANALYSING ECONOMIC POTENTIAL FOR EFFICIENCY IN HEATING AND COOLING

4.1. ANALYSIS OF ECONOMIC POTENTIAL

4.1.1. *Outline*

Member States have a range of options when it comes to analysing the economic potential of heating and cooling technologies, but the method must (points 7 and 8 in Annex VIII EED):

- cover the entire national territory – this does not exclude possible sub-analyses, e.g. using regional disaggregation;

- be based on a CBA (Article 14(3) EED) and use net present value (NPV) as the assessment criterion;
- identify alternative scenarios for more efficient and renewable heating and cooling technologies – this involves constructing baseline and alternative scenarios for national heating and cooling systems ⁽¹³⁾;
- consider a number of technologies — industrial waste heat and cold, waste incineration, high-efficiency cogeneration, other renewable energy sources, heat pumps and reducing heat losses in existing district networks; and
- take account of socioeconomic and environmental factors ⁽¹⁴⁾.

The part of the CBA dedicated to the Article 15(7) RED assessment must include a spatial analysis of areas suitable for the 'low ecological risk' deployment of energy from renewable sources and of the use of waste heat and cold in the heating and cooling sector, and an assessment of the potential for small-scale household projects.

Depending on their availability and that of the requisite information, other advanced energy system modelling tools could be used to evaluate more complex relationships between heat demand and supply components of the national energy system, in particular the more dynamic aspects.

The assessment report must set out what assumptions have been made, in particular as regards the prices of major input and output factors and the discount rate.

4.1.2. **Geographical and system boundaries**

Establishing geographical and system boundaries for the comprehensive assessment is a critical step in the analysis. These determine the group of entities and the aspects of their interaction that the analysis will cover.

Point 8(d) in Annex VIII EED lays down two general requirements in this context:

- the geographical boundary must cover a suitable well-defined geographical area; and
- the CBA must take account of all relevant centralised or decentralised supply resources available within the system and geographical boundaries.

The area enclosed by the overall geographical boundary must be identical to the territory covered by the assessment, i.e. the administrative territory of the Member State in question. However, large Member States in particular are recommended to divide their territory further into regions (e.g. NUTS-1), in order to make energy mapping and planning exercise more manageable, and allowing to take account of different climatic zones. Member States should identify opportunities for synergies between heating and cooling demand and sources of waste and renewable heat and cold within the geographical boundary.

System boundaries, on the other hand, are a much more local concept. They must enclose a unit or a group of heating and cooling consumers and suppliers between which the exchange of energy is or might be significant. The resulting systems will be analysed within their boundaries (applying the CBA) in order to determine whether it is economically worthwhile to implement a particular heating and cooling supply option.

Examples of such systems could be ⁽¹⁵⁾:

- a group of apartment buildings (heat consumers) and a planned district heating system (potential supplier of heating);
- a district of a city located near a suitable heat source;

⁽¹³⁾ Including assessment of the potential of energy from renewable sources and of the use of waste heat and cold in the heating and cooling sector, as referred to in Article 15(7) RED.

⁽¹⁴⁾ For more explanations, see Annex V.

⁽¹⁵⁾ This non-exhaustive list is presented here for illustration purposes only.

- smaller heating and cooling installations such as shopping areas (heat and cold consumer) and heat pumps (possible technology to cover heat and cold demand); and
- an industrial plant that consumes heat and another plant that could supply waste heat.

4.1.3. *Identifying suitable technical solutions*

A wide range of high-efficiency heating and cooling solutions could satisfy the demand identified in the previous steps. The most cost-effective and beneficial heating or cooling solution can be defined as one or more of the following elements:

- a resource used as a source of energy, e.g. waste heat, biomass or electricity;
- a technology used to convert the energy carrier into a useful form of energy for consumers, e.g. heat recovery or heat pumps; and
- a distribution system that allows the provision of useful energy to consumers (centralised or decentralised).

Possible technical solutions should also be assessed on the basis of their applicability in:

- decentralised (or individual) systems, where several producers (or each consumer) produce their own heat or cold on-site; and
- centralised systems, which use district heating and cooling systems to distribute thermal energy to consumers from off-site heat sources – these can be used to supply heating and cooling to system boundaries that have been characterised as high demand density and to large-scale consumers, e.g. an industrial plant.

The choice of suitable solutions within the boundaries of a particular energy supply and demand system ⁽¹⁶⁾ will depend on many factors, including:

- the availability of the resource (e.g. the availability of biomass might determine the practicality of biomass boilers);
- properties of heat demand (e.g. district heating is particularly suitable for high heat demand density urban areas); and
- properties of possible heat supply (low-temperature waste heat might not be suitable for use in industrial processes, but it might be suitable as an input to a district heating system).

4.1.4. *Baseline scenario*

As outlined in point 8(a)(ii) in Annex VIII EED, the baseline scenario will serve as a reference point, by taking account of policies at the time of compiling the comprehensive assessment. The characteristics of the following national heating and cooling system elements should provide the point of departure:

- overview of heat consumers and their current energy consumption;
- current heat and cold supply sources; and
- potential heat and cold supply sources (if such developments can be reasonably expected given current policies and measures under Part I of Annex VIII EED).

The baseline scenario shows the most likely development of energy demand, supply and transformation based on current knowledge, technological development and policy measures. It is therefore the 'business as usual' (BAU) or reference scenario. It must reflect existing policy measures under national and EU legislation and can be based on the energy efficiency and renewable energy 'with existing measures' (WEM) scenarios developed for the Governance Regulation.

⁽¹⁶⁾ This means an area within which supply and demand systems are interconnected and similar system characteristics apply.

It should include information on how demand is met at present and assumptions as to how it will be met in the future. The future technologies do not have to be confined to options used currently. They might include, for instance, high-efficiency cogeneration or efficient district heating and cooling (DHC), if such developments can reasonably be expected.

4.1.4.1. **Current mix of heating and cooling supply technologies**

The baseline scenario must include a description of the current mix of heating and cooling supply technologies for each segment of heat demand and within each energy system boundary. Priority should be given to a bottom-up approach based on detailed information (e.g. data gathered close to source, results of inquiries, etc.).

In the absence of detailed information, this input could be derived by means of a top-down approach based on:

- information on the current mix of fuel consumption; and
- assumptions about the main technological solutions applied in the national context.

Since the heat supply technology mix is related to the heat demand source, information on the latter can be used to calibrate estimates for the former. For example, data on the number of houses or flats within an energy system boundary could be used to estimate the total number and size of individual heating units installed (assuming one installation per house). Likewise, data on the number and size of industrial installations could be used to approximate the number of heat generation units (and their sizes) in the industrial sector.

4.1.4.2. **Future mix of heating and cooling supply technologies and their replacement rate**

The future mix of heating and cooling supply technologies could be estimated by taking the fuel mix in the final year and then determining the technology mix for that year and all years in between, assuming different evolution trajectories depending on how the technologies involved. By combining this information with the heating and cooling demand forecasts, it is possible to produce technology mix forecasts for the whole period.

Assumptions as to the future mix of heating and cooling supply technologies can also be formulated on the basis of the technology replacement rate. Assuming that current heat generation equipment will have to be replaced at the end of its economical lifetime, assumptions may be made as to:

- the use of some technologies throughout the timeframe of the analysis; and
- the replacement of others.

In these cases, the replacement rate would represent the limit for the penetration of new technologies for existing demand. The replacement rates for specific sectors could be:

- determined by market studies or other relevant sources, also taking into account the potential influence of policy measures; or
- estimated on the basis of the average lifetime of the technology – assuming a lifetime of 20 years and market saturation, 1/20 of the stock of this technology is replaced each year.

4.1.5. **Construction of alternative scenarios**

Under point 8(c) in Annex VIII EED, all scenarios that may affect the baseline must be considered, including the role of efficient individual heating and cooling. Consequently, within each analysed energy system, the number of alternative scenarios should correspond to the number of technically viable solutions, presented in accordance with point 7.

Scenarios that are not feasible (for technical or financial reasons or due to national regulation) may be excluded at an early stage of the CBA, but well-documented justifications must be given for such exclusion.

The procedures for producing alternative scenarios mostly resemble those used for the baseline scenario. The shares of different technologies can be determined for each year and the size and number of installations has to be calculated. Alternative scenarios must take into account of the energy efficiency and renewable energy objectives for the European Union in the Governance Regulation and should explore ways to deliver a more ambitious national contribution, assuming that the evolution of energy demand is the same as in the baseline.

The level of detail in the alternative scenarios will differ, as follows:

- for on-site solutions, the share of technology within a ‘segment’ of demand ⁽¹⁷⁾ should be determined; while
- for off-site solutions, the decision to implement the solution will affect all segments as a block; therefore, the required capacity should be assessed on the basis of total demand and seasonal load patterns, without distinguishing between demand segments (e.g. if a DHC network supplies heating to households and the service sector, it is necessary to estimate only the combined capacity of both segments).

Each alternative scenario must quantify the following (as compared with the baseline scenario):

- the economic potential of technologies examined, using NPV as the criterion;
- GHG emission reductions;
- primary energy savings (GWh per year); and
- impact on the share of renewables in the national energy mix.

4.2. COST-BENEFIT ANALYSIS

A CBA must be carried out to assess the welfare change attributable to an investment decision relating to efficient heating and cooling technology. Under point 8(a)(i) in Annex VIII EED, NPV must be used as the evaluation criterion.

The social discount rate (SDR) needs to be determined. This is a parameter that reflects society's view as to how future benefits and costs should be valued against present ones ⁽¹⁸⁾. By giving future costs and benefits a present value, it is possible to compare them over time.

The CBA must include an economic analysis and a financial analysis from an investor's perspective, including applying a financial discount rate. This makes it possible to identify potential areas for policy influence based on the difference between the financial and the economic costs of a technical solution.

In order to assess the impact and possible benefits of heating and cooling to the energy system, Member States should assess what types of technical solutions could be best suited to meeting the needs. The benefits could include:

- a flattening of the energy demand curve;
- offsetting demand in cases of grid congestion or peak energy price periods;
- improving system resilience and security of supply; and

⁽¹⁷⁾ i.e. a specific end-use (space heating, cooling, hot water or steam) or (sub-)sector (e.g. residential sector or one of its sub-sectors).

⁽¹⁸⁾ The SDR recommended by the Commission (*Guide to cost-benefit analysis of investment projects*) is 5 % in cohesion countries and 3 % for other Member States. Member States may establish a different benchmark, provided that:

- they justify it on the basis of an economic growth forecast and other parameters; and
- they apply it consistently across similar projects in the same country, region or sector.

- offering load at times of high supply or offering inertia in the energy system — the CBA should take account of the value of this flexibility.

4.3. SENSITIVITY ANALYSIS

The CBA must include a sensitivity analysis to assess the impact of changes in key factors. This involves assessing the effect of changes and uncertainties on the NPV (in absolute terms) and makes it possible to identify parameters with a higher associated risk. Typical parameters to explore would be:

- changes in investment and operating costs;
- fuel and electricity prices;
- CO₂ quotas; and
- effects on the environment.

5. POTENTIAL NEW STRATEGIES AND POLICY MEASURES

5.1. PRESENTING FUTURE LEGISLATIVE AND NON-LEGISLATIVE POLICY MEASURES

Member States should provide an overview of policy measures that are additional to the existing ones described under point 6 in Annex VIII EED. There should be a logical link between:

- the data on heating and cooling gathered for points 1 and 2;
- the future policy measures; and
- their assessed impact.

Under point 9, the following elements must be quantified for each policy measure:

- ‘— greenhouse gas emission reductions;
- primary energy savings in GWh per year;
- impact on the share of high-efficiency cogeneration;
- impact on the share of renewables in the national energy mix and in the heating and cooling sector;
- links to national financial programming and cost savings for the public budget and market participants;
- estimated public support measures, if any, with their annual budget and identification of the potential aid element.’

Planned policy measures to realise energy efficiency potential in heating and cooling should be included in the integrated national energy and climate plan pursuant to Article 21 of the Governance Regulation. Member States can include new elements and establish a link to the comprehensive assessment when updating the plans by 30 June 2024.

ANNEX II

ADDITIONAL SOURCES OF LITERATURE

1. General literature

- Best practices and informal guidance on how to implement the Comprehensive Assessment at Member State level. Joint Research Centre, European Commission, 2016. ISBN 979-92-79-54016-5.

<http://publications.jrc.ec.europa.eu/repository/handle/JRC98819>

2. Literature on the estimation of waste heat and cold

- Waste heat from industry for district heating. Commission of European Communities, Directorate-General Energy, 1982.

<https://publications.europa.eu/en/publication-detail/-/publication/2fcd5481-ac79-4e8f-9aaa-ed88a38444db>

3. Literature on the preparation of maps on the supply and demand of heat and cold

- Background report providing guidance on tools and methods for the preparation of public heat maps. Joint Research Centre, European Commission, 2016. ISBN 978-92-79-54014-1.

<http://publications.jrc.ec.europa.eu/repository/handle/JRC98823>

4. Literature on the execution of cost-benefit analysis incl. external costs

- Handbook on the external costs of transport. A report by CE Delft for European Commission, Directorate-General for Mobility and Transport, 2019.

<https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf>

- Methodologies for the Assessment of Project GHG Emissions and Emission Variations. European Investment Bank, 2018.

https://www.eib.org/attachments/strategies/eib_project_carbon_footprint_methodologies_en.pdf

- The Economic Appraisal of Investment Projects at the EIB. European Investment Bank, 2013.

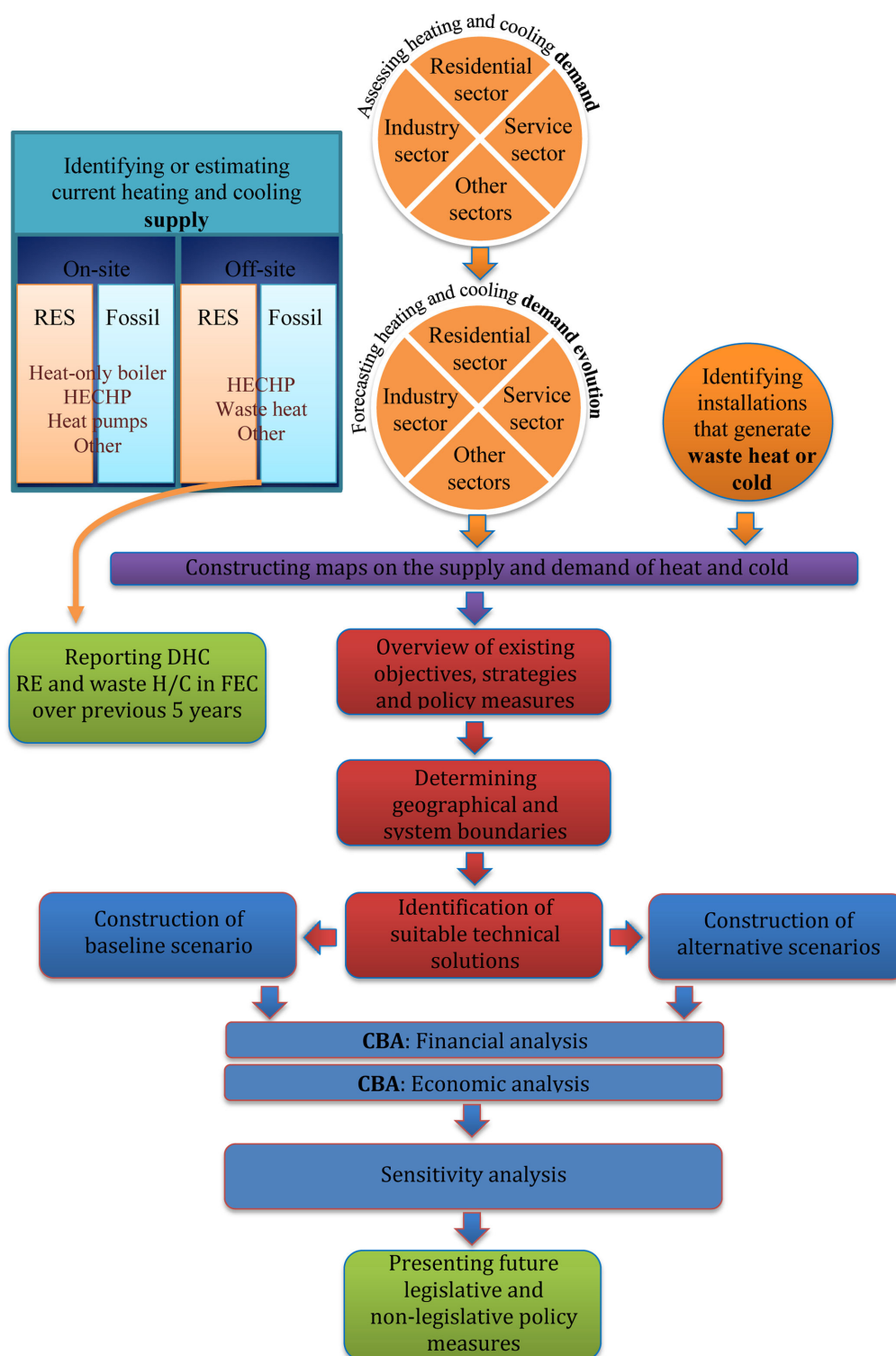
https://www.eib.org/attachments/thematic/economic_appraisal_of_investment_projects_en.pdf

- Guide to Cost-Benefit Analysis of Investment Projects. Economic appraisal tool for Cohesion Policy 2014-2020. European Commission, Directorate-General for Regional and Urban policy, 2014. ISBN 978-92-79-34796-2.

https://ec.europa.eu/inea/sites/inea/files/cba_guide_cohesion_policy.pdf

ANNEX III

PROCESS FOR COMPREHENSIVE ASSESSMENTS (ANNEX VIII EED)



ANNEX IV

WASTE HEAT ACCOUNTING

1. Outline

Waste heat is the excess thermal energy left after an industrial process and the extraction of heat. The scope for reporting waste heat for points 2(b) differs from that of point (c) in Annex VIII EED. Point 2(b) is concerned with potential waste heat supply in GWh (the technical potential) per year that can be supplied outside the listed installations. Point 2(c) on the other hand requires the reporting of the 'share of energy from renewable sources and from waste heat or cold in the final energy consumption of the district heating and cooling ⁽¹⁾ sector over the past 5 years'.

2. Accounting of waste heat and cold projects

Waste heat and cold from processes are difficult to account for, because from the moment the excess is used on-site, it is no longer 'waste' and feeds into the increased efficiency or reduced operational cost for the installation.

In principle, heat is considered as waste heat only when it is a by-product of another process that would be emitted into the environment, until supplied for off-site use. In other words, industrial waste heat is equivalent to the energy load that is not extracted otherwise and requires external cooling.

The following categories should not be considered as waste heat:

- heat that was generated with the main purpose of being directly used on- or off-site and is not a by-product of another process, irrespective of the energy input;
- cogenerated heat from combined heat and power (CHP) plants, because CHP is an energy-efficiency measure by design. It reduces waste heat, as it uses the energy of the input fuel in a more efficient way; and
- heat that is or could be recovered internally on the same site.

The following should be considered as examples of waste heat:

- data centres or shopping areas that need to be cooled down, where the heat resulting from the operations can be delivered off-site instead of being dissipated into the environment; and
- the direct use of condenser cooling stream from power plants (e.g. the heat can be supplied for warming greenhouses).

If heat generated from renewable fuels is a by-product of a main process, it can be considered waste heat (e.g. biodegradable waste incineration and biomass) for the purposes of reporting under point 2(b) and (c).

In order to show waste heat and cold projects on maps (point (3), Member States are recommended to collect the following information:

- name and location of plant;
- quantity (GWh/a) and quality (usual temperature and medium) of current and potential waste heat and cold available; and
- availability of waste heat and cold (hours per year).

3. Accounting waste heat for cogeneration

The heat accounted for cogeneration must be deducted and cannot be counted towards waste heat for the purposes of presenting the results for analysis of potential heating and cooling supply (point 2(b) and (c)) and three kinds of energy need to be accounted separately:

- electrical energy;

⁽¹⁾ 'Renewable cooling' should be identified according to the common methodology for calculating the quantity of renewable energy used for cooling and district cooling (Article 35 RED), once it has been established. Until then, an appropriate national methodology should be used.

- thermal energy from cogenerated heat; and
- waste heat that is not used and could be recovered from the condenser of a power plant or exhaust gases. Point 2(b) requires that all such heat be reported. For point 2(c), only the portion of such heat present in the final energy consumption of the district heating system can be reported.

4. Accounting waste heat and cold for point 2(b) Annex VIII EED

There is no limitation on waste heat and cold reporting related to a district system for point 2(b). Therefore, total current and potential waste heat and cold that can be used directly for another process (if the supplied temperature level allows) or be upgraded to a suitable level using heat pumps to be provided off-site must be reported.

Reporting of waste heat potential for the purposes of point 2(b) can also be based on a survey of industrial sites. The survey could ask respondents to quantify:

- total energy input;
- heat capacity;
- how much of the generated heat is already used; and
- how much of the heat is cooled down (or how much of the cold is warmed up) or emitted into the environment.

Another possibility of assessing potential waste heat and cold supply is to use indirect estimates based on an assumption of similar heat-temperature profiles among plants that:

- are in the same sector;
- are of a similar age;
- have the same degree of energy integration ^(?); and
- are subject to similar measures to reduce energy losses.

Consequently, a similar amount of waste heat or cold could be estimated to be available per tonne of product produced or treated (e.g. all plants of a given age and technology could have similar waste heat profiles).

The estimated potential can be weighted by an availability factor that takes into account:

- the technology used in recovery equipment;
- the age of the plant;
- the degree of energy integration; and
- recent levels of investment in recovery equipment.

It is strongly recommended that Member States report the temperature grade and the medium (liquid water, steam, molten salt or other) of waste heat and cold; these factors determine possible applications and transmission distances, thus influencing the analysis of the scenarios. The most common media used to recover waste heat include:

- combustion exhausts from glass-melting furnaces, cement kilns, fume incinerators, aluminium reverberatory furnaces and boilers;
- process off-gases from steel electric arc furnaces, aluminium reverberatory furnaces, and drying and baking ovens; and
- cooling water from furnaces, air compressors and internal combustion engines.

Steam rarely appears as waste heat, because it is usually generated on demand and exhausted or condensed during the process.

^(?) *Waste heat from industry for district heating* (Commission guidance)
<https://publications.europa.eu/en/publication-detail/-/publication/2fcd5481-ac79-4e8f-9aaa-ed88a38444db>

The table below gives an indicative categorisation of heat and cold based on temperature level and lists common applications of heat. This applies for both waste and useful heat, regardless of the fuel used to produce it.

Category	Medium	Temperature interval (°C)	Common applications
high-grade heat	direct heating via convection (flame-based), electric arc, oil-based, etc.	> 500	steel, cement, glass
medium-grade heat	high-pressure steam	150-500	steam processes in chemical industry
medium/low-grade heat	medium-pressure steam	100-149	steam processes in paper, food, chemical industry, etc.
low-grade heat	hot water	40-99	space heating, processes in food industry, etc.
cooling	water	0-ambient	space cooling, processes in food industry, etc.
refrigeration	refrigerant	< 0	refrigeration in food, chemical industry

5. Reporting waste heat for point 2(c) Annex VIII EED

The RED ⁽³⁾ makes a close link between efficiency and renewable energy, and considers that both can be counted towards the indicative target of annual increased share of renewable energy in the heating and cooling sector.

The RED ⁽⁴⁾ defines waste heat as ‘unavoidable heat or cold generated as by-product in industrial or power generation installations, or in the tertiary sector, which would be dissipated unused in air or water without access to a district heating or cooling system, where a cogeneration process has been used or will be used or where cogeneration is not feasible’.

For the purposes of reporting the historical share of energy from waste heat or cold ⁽⁵⁾ over the past 5 years (point 2(c)), only the waste heat or cold in the final energy consumption of district heating and cooling can be accounted for.

⁽³⁾ Article 23 RED (mainstreaming renewable energy in heating and cooling) sets indicative targets and governs the accounting of renewable energy and waste heat or cold.

⁽⁴⁾ Article 2(9) RED.

⁽⁵⁾ In this Annex, ‘waste heat and cold’ and ‘excess heat and cold’ are treated as synonyms. Waste heat is mostly the remaining heat from a thermodynamic cycle that would be emitted into the environment unless it is captured and supplied for off-site use. Part of it can be used off-site if an appropriate heat sink is found. It can be supplied to a heat network or another industrial site. The part of waste heat or cold that is distributed through a district system can be reported for the purposes point 2(c) in Annex VIII EED.

ANNEX V

FINANCIAL AND ECONOMIC COST-BENEFIT ANALYSIS**1. Outline**

A CBA is an essential analytical approach to assess the welfare change attributable to an investment decision. It involves assessing changes in cost and benefits between baseline and alternative scenarios. The results must then be integrated into a common framework to compare them over time and come to conclusions about their profitability.

Under Annex VIII EED, the CBA must include:

- an economic analysis — this takes account of socioeconomic and environmental factors and covers changes in the welfare of society as a whole (i.e. level of prosperity and standard of living), which can be linked to well-being. Economic analysis has generally been used to support policymaking; and
- a financial analysis — this takes a private investor's perspective, using the conventional discounted cash flow approach to assess net returns.

Conducting analysis from both perspectives makes it possible to identify areas in which policy can fill the gaps between society's need and the financial viability/suitability of an initiative. Policy-makers can then adopt measures to support or promote (e.g. by means of obligations, economic incentives, etc.) an initiative and abolish support mechanisms when evaluation shows that they are not justified in social terms.

The CBA is based on a discounted cash flow analysis, whereby the analyst:

- determines the baseline and alternative scenarios for each energy system boundary;
- quantifies and monetises their respective costs and benefits (considering also the distribution of costs and benefits along the timeframe of the analysis); and
- assesses the changes between the baseline and each alternative scenario.

Once information has been collected on total cost and total benefit, evaluation criteria (in this case, NPV) are used to assess the return on the various alternative scenarios.

2. Financial analysis

The financial analysis should take account of:

- inward and outward cash flows only; accounting items that do not correspond to actual flows (i.e. depreciation, reserves, etc.) are disregarded;
- constant (real) prices fixed at base-year or current (nominal) prices, in order to reduce uncertainty and complexity;
- a forecast consumer price index (CPI);
- VAT on costs and revenues (unless this is recoverable by the project promoter); and
- direct taxes on the prices of inputs (i.e. electricity, labour, etc.).

The benefits to be included are:

- revenues from selling energy;
- subsidies; and
- residual values.

The costs should include:

- the capital costs of the heating and cooling technology;
- its operation and maintenance costs; and
- CO₂ costs.

A financial discount rate (FDR) is used to reflect the opportunity cost of capital, i.e. the potential return from investing the same capital in an alternative project. As an indicator of risk perception, this can vary depending on the decision-maker's perspective and between technologies (see section 4).

3. Economic analysis

The economic analysis must include at least the costs and benefits of point 8(b) of Annex VIII EED, including

- the value of output to the consumer;
- capital costs of plants;
- equipment and the associated energy networks;
- variable and fixed operating costs; and
- energy costs.

Economic potential is a subset of technical potential that is economically cost-effective compared with conventional supply-side energy resources. The alternative scenarios are built to test the effects of realising the potential of various technical solutions to cover heat demand. Those parts of the potential that provide positive NPV compared with the baseline scenario indicate cost-effectiveness and therefore constitute the economic potential of that technology.

For alternative scenarios with similar results, the reduction of CO₂ emissions, primary energy savings or other key indicators could be used as additional criteria to support decision-making. Once the most cost-efficient solutions have been identified at system boundary level, they could be aggregated to determine the most cost-efficient potential at national level.

The social discount rate (SDR) used for the economic analysis reflects society's view as to how future benefits and costs should be valued against present ones (see section 4).

Although economic analysis follows the same route as financial analysis, there are a number of very important differences; in particular, in economic analysis:

- fiscal corrections have to be applied, as we are dealing mainly with transfers between agents within the economy that do not reflect real impacts on economic welfare;
- the prices of inputs (including labour) do not include direct taxes;
- subsidies are not included, because they are transfers between agents and do not affect the economic welfare of society as a whole;
- transfers of wealth from taxpayers to companies and the related societal and welfare impacts are a cost for society and should be accounted for; and
- externalities and impacts on society welfare should be estimated ⁽¹⁾; the main externalities to consider are:
 - the environmental and health impact of the combustion of fuels; and
 - the macroeconomic impact of investment in the energy system.

4. Financial and social discount rates

Estimating NPV requires the use of a 'discount rate', a parameter that reflects the value for society of future cost and benefits, as compared with present ones. Discount rates are used to convert future costs and benefits into their present value, allowing comparison across time.

Two discount rates are used:

- a financial discount rate (FDR) – this is used in financial analysis to reflect the opportunity cost of capital, i.e. the potential return that could have been obtained by investing the same capital in an alternative project. It can vary depending on:
 - the perspective of the decision-maker – different stakeholders (e.g. industries, service enterprises and household owners) may have different expectations and opportunity costs on their available capital; and

⁽¹⁾ Financial analysis does not take these into account, as they do not generate a real cash flow for investors.

- the technology, because it is an indicator of risk perception; and
- a social discount rate (SDR) – this is used in economic analysis to reflect society's view as to how future benefits and costs should be valued against present ones.

For the 2014-2020 programming period, the Commission ⁽²⁾ suggests using two benchmark SDRs: 5 % for the cohesion countries and 3 % for the others. It also encourages Member States to provide their own benchmarks for the SDR. Those Member States that have their own values can use them for the CBA; those that do not can use the reference values. Since these are provided for 2014-2020, the impact of a potential change in the SDR post-2020 could be analysed in the sensitivity analysis.

⁽²⁾ *Guide to cost-benefit analysis of investment projects*;
https://ec.europa.eu/inea/sites/inea/files/cba_guide_cohesion_policy.pdf

ANNEX VI

EXTERNAL COSTS OF THE COST-BENEFIT ANALYSIS

1. Outline

Energy production has a range of environmental impacts relating to pollution, land use and the consumption of resources (e.g. fuel, water); these affect the welfare of society. There are various methods for estimating the monetary value of environmental impacts in order to account for them in the decision-making process ⁽¹⁾ ⁽²⁾.

2. Assessing environmental value

Assessing environmental value is data- and resource-intensive. It can be facilitated by the use of databases providing 'environmental damage factors' that contain information on the environmental damage generated, for example, by each additional unit of energy produced using a certain technology.

These factors can be used to assess environmental and health impact in each scenario. Where they are expressed per additional unit of energy produced, the environmental damage of the scenario would be the result of multiplying the energy production from a given technology by the damage factor per unit of energy produced by that technology, as follows:

$$[ENV_{y,t}]_{Scen.} = [E_{y,t}]_{Scen.} \cdot DF_y$$

where:

$[ENV_{y,t}]_{Scen.}$ is the environmental damage associated with energy produced by technology y , in year t , in a specific scenario [EUR];

$[E_{y,t}]_{Scen.}$ is the energy produced by technology y , in the year t , in one scenario [MWh]; and

DF_y is the environmental damage per unit of energy produced by technology y [EUR/MWh].

The environmental damage under a scenario in any given year will be the sum of that generated by production from all the technologies used in that scenario that year:

$$[ENV_{Total,t}]_{Scen.} = \left[\sum_{y=1}^n ENV_{y,t} \right]_{Scen.}$$

Further information can be found in reports that provide environmental damage factors for the following environmental impact categories: climate change, ozone depletion, terrestrial acidification, freshwater eutrophication, human toxicity, particulate matter formation, agricultural land occupation, urban land occupation, depletion of energy resources, etc.

These values can vary over time due to changes in different parameters (e.g. population density, overall pollution load of the atmosphere). The impact of such changes could therefore be assessed as part of the sensitivity analysis.

Modifications in technology design and country-specific factors such as the energy mix will also have an impact on the external environmental costs ⁽³⁾ ⁽⁴⁾.

The financial analysis takes account of the costs of CO₂ emissions from installations covered by the EU emissions trading system (ETS), as they have been internalised in the market prices for CO₂. The valuation of climate change impact can be based on a damage-cost approach that provides higher values per tonne of emissions.

Regardless of the approach used, when going from the financial to the economic analysis, the costs of CO₂ emissions have to be removed to avoid double counting.

⁽¹⁾ *Guide to cost-benefit analysis of investment projects*;
https://ec.europa.eu/inea/sites/inea/files/cba_guide_cohesion_policy.pdf

⁽²⁾ Zvingilaite, E., *Health externalities and heat savings in energy system modelling* (Kgs. Lyngby, DTU, 2013).

⁽³⁾ European Commission ExternE-Pol project.

⁽⁴⁾ *Subsidies and costs of EU energy — final report* (Ecofys, 2014).

2.1. Examples

When the environmental impact of additional CHP capacity in the alternative scenario is assessed, account should be taken of the environmental effect of changes in electricity production:

- construction of new CHP plants — the impact of both energy products obtained as an output (heat and electricity) has to be accounted for (using the damage factors). In addition, the avoided environmental damage costs of producing the same amount of electricity and heat using another technology should be taken into account;
- conversion of existing power plants into CHP — it can be assumed that the fuel consumption of the plants and their environmental impact with respect to the baseline scenario will remain constant, so it is not necessary to account for it. Only the environmental impact of the additional electricity to be supplied using other technology has to be assessed.

3. Externalities on society welfare

It is required to estimate the positive and negative externalities and impacts on society welfare. These are not taken into account in the financial analysis as they do not generate a real cash flow for investors. The main externalities in terms of both costs and benefits, include:

- air quality and health impacts;
 - security of energy supply to consumers, if not internalised via market mechanisms (e.g. value of flexibility, grid tariffs);
 - investments and/or savings in energy infrastructure;
 - circular economy and resource efficiency;
 - broader environmental impacts;
 - industrial competitiveness through increased energy efficiency in heating and cooling; and
 - growth and jobs.
-

ANNEX VII

VOLUNTARY REPORTING TEMPLATE FOR COMPREHENSIVE ASSESSMENTS OF EFFICIENCY POTENTIAL FOR HEATING AND COOLING

The following forms are available on DG ENER's Europa website (<https://ec.europa.eu/energy/en/topics/energy-efficiency/heating-and-cooling>) and on request to ENER-EED-REPORTING@ec.europa.eu.

Voluntary reporting template for reporting of inputs and outputs of Comprehensive Assessment under Article 14 and Annex VIII of the Directive 2018/2002/EU
The following forms are available on DG ENER's Europa website (https://ec.europa.eu/energy/en/topics/energy-efficiency/heating-and-cooling) and on request to ENER EED REPORTING@ec.europa.eu.
The aim of this template is to facilitate reporting of the quantitative parameters and variables used in and resulting from the comprehensive assessment of the potential for efficient heating and cooling.
This template is based on Article 14 of and Annex VIII to Directive 2012/27/EU, as amended by Delegated Regulation (EU) 2019/826, and the Commission Recommendation C(2019) 6625 on the contents of comprehensive assessments of the potential for efficient heating and cooling.
The use of this reporting template is highly recommended, but voluntary. If the template is used, it must be annexed to the main report on the comprehensive assessment. It is not intended as a substitute for that report.
Member States are free to include additional information on this template.
Year X is the first year of the period covered by the comprehensive assessment.
This document states the views of the Commission services, does not alter the legal effects of the Directive and is without prejudice to the binding interpretation of the revised EED, as provided by the Court of Justice.

Part I: Overview of heating and cooling

1. Reporting current heating and cooling demand; 4. Reporting forecasted heating and cooling demand

		Year							
		Unit	X	X+5	X+10	X+15	X+20	X+25	X+30
Heating demand, final energy	Residential sector	GWh/a							
	Service sector	GWh/a							
	Industrial sector	GWh/a							
	Other sectors	GWh/a							
Cooling demand, final energy	Residential sector	GWh/a							
	Service sector	GWh/a							
	Industrial sector	GWh/a							
	Other sectors	GWh/a							
Heating demand, useful energy	Residential sector	GWh/a							
	Service sector	GWh/a							
	Industrial sector	GWh/a							
	Other sectors	GWh/a							
Cooling demand, useful energy	Residential sector	GWh/a							
	Service sector	GWh/a							
	Industrial sector	GWh/a							
	Other sectors	GWh/a							
Notes: X represents the starting year of the analysis;									
The column for year X should contain actual numbers of current heating and cooling demand;									

Part I: Overview of heating and cooling**2.(a) Reporting current heating and cooling supply****YEAR X****Energy provided on-site**

			Unit	Value
Residential sector	Fossil fuel sources	Heat only boilers	GWh/a	
		Other technologies	GWh/a	
		HECHP	GWh/a	
	Renewable energy sources	Heat only boilers	GWh/a	
		HECHP	GWh/a	
		Heat pumps	GWh/a	
		Other technologies	GWh/a	
Service sector	Fossil fuel sources	Heat only boilers	GWh/a	
		Other technologies	GWh/a	
		HECHP	GWh/a	
	Renewable energy sources	Heat only boilers	GWh/a	
		HECHP	GWh/a	
		Heat pumps	GWh/a	
		Other technologies	GWh/a	
Industrial sector	Fossil fuel sources	Heat only boilers	GWh/a	
		Other technologies	GWh/a	
		HECHP	GWh/a	
	Renewable energy sources	Heat only boilers	GWh/a	
		HECHP	GWh/a	
		Heat pumps	GWh/a	
		Other technologies	GWh/a	
Other sectors	Fossil fuel sources	Heat only boilers	GWh/a	
		Other technologies	GWh/a	
		HECHP	GWh/a	
	Renewable energy sources	Heat only boilers	GWh/a	
		HECHP	GWh/a	
		Heat pumps	GWh/a	
		Other technologies	GWh/a	

Energy provided off-site

Residential sector	Fossil fuel sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
	Renewable energy sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
Service sector	Fossil fuel sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
	Renewable energy sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
Industrial sector	Fossil fuel sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
	Renewable energy sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
Other sectors	Fossil fuel sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	
	Renewable energy sources	Waste heat	GWh/a	
		HECHP	GWh/a	
		Other technologies	GWh/a	

COMMISSION RECOMMENDATION (EU) 2019/1660**of 25 September 2019****on the implementation of the new metering and billing provisions of the Energy Efficiency Directive 2012/27/EU**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 292 thereof,

Whereas:

- (1) The Union is committed to developing a sustainable, competitive, secure and decarbonised energy system. The energy union sets ambitious Union objectives. It notably aims to: (i) reduce greenhouse gas emissions by at least 40 % by 2030 compared with 1990; (ii) to increase the proportion of renewable energy consumption to at least 32 %; and (iii) to make energy savings, improving the Union's energy security, competitiveness and sustainability. Directive 2012/27/EU of the European Parliament and of the Council ⁽¹⁾ ('EED'), as amended by Directive (EU) 2018/2002 of the European Parliament and of the Council ⁽²⁾, sets an energy efficiency target of at least 32,5 % savings at Union level by 2030.
- (2) Heating and cooling is the most significant source of end-use energy consumption, representing about 50 % of the total energy demand in the European Union. 80 % of this is used in buildings. Therefore, the Union's achievement of its energy and climate goals is greatly influenced by its efforts to renovate building stocks and to promote a more optimal building operation and use.
- (3) Clear and timely information and energy bills based on actual consumption empower consumers to play an active part in reducing energy needs for heating and cooling. More than 40 % of dwellings in the Union are located in multi-family buildings or semi-detached houses, many of which have collective systems for the provision of space heating or for domestic hot water preparation. Accurate, reliable, clear and timely information about energy consumption is therefore important for occupants of such dwellings, regardless of whether or not they have a direct, individual contractual relationship with an energy supplier.
- (4) The EED is the Union level piece of legislation that addresses the metering and billing of thermal energy supplies. In 2018, the EED was amended. One of the aims of the amendment was to clarify and strengthen the applicable rules concerning metering and billing.
- (5) The clarifications include the introduction of the notion of 'final users' alongside the notion of 'final customer' already used in the EED to clarify that the rights to billing and consumption information also apply to consumers without individual or direct contracts with the supplier of energy used for collective heating, cooling or domestic hot water production systems in multi-occupant buildings.
- (6) The changes also make explicit the requirement for Member States to publish criteria, methodologies and procedures used to grant exemptions from the general requirement for sub-metering in multi-occupant buildings, and to clarify the unconditional requirement to meter domestic hot water individually in residential parts of new multi-occupant buildings.
- (7) Given their importance for facilitating fair outcomes and establishing adequate incentives among occupants of multi-apartment and multi-purpose buildings, Directive (EU) 2018/2002 also requires Member States to have in place transparent and publicly available cost allocation rules for such buildings.
- (8) To strengthen the impact of metering and billing in terms of the behavioural change they might induce, and the consequent energy savings, the revised EED also contains clearer requirements for more useful and complete billing information based on climate corrected consumption data. This includes relevant comparisons and new elements such as information on related energy mix and greenhouse gas emissions, and on available complaints procedures or dispute resolution mechanisms.

⁽¹⁾ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

⁽²⁾ Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (OJ L 328, 21.12.2018, p. 210).

- (9) At the same time, stricter requirements for frequent billing or consumption information wherever remotely readable devices are combined with rules ensuring the gradual transition to remote readable meters and heat cost allocators aim to ensure that more timely and frequent information will eventually be available for all final users.
- (10) Member States are to bring into force the laws, regulations and administrative provisions transposing the metering and billing related provisions of Directive (EU) 2018/2002 by 25 October 2020 at the latest.
- (11) The EED gives Member States a margin of discretion in transposing and implementing the revised set of requirements regarding metering and billing, allowing them to do so in a way that best fits their national circumstances, including climatic conditions, tenancy and property ownership models and building stocks. This Recommendation explains the amended requirements and illustrates how the objectives of the Directive can be achieved. The aim in particular is to ensure a uniform understanding of the EED across Member States as they prepare their transposition measures.
- (12) The guidance provided with this Recommendation complements and partially supersedes the guidance previously issued by the Commission in relation to Articles 9 to 11 of the EED ⁽³⁾.
- (13) This Recommendation does not alter the legal effects of the EED and is without prejudice to the binding interpretation of the EED as provided by the Court of Justice. It focuses on the provisions relating to metering and billings and concerns Articles 9a, 9b, 9c, 10a, 11a of and Annex VIIa to the EED,

HAS ADOPTED THIS RECOMMENDATION:

Member States should follow the guidelines provided in the Annex to this Recommendation when transposing the requirements introduced by Directive (EU) 2018/2002 and set out in Articles 9a, 9b, 9c, 10a, 11a of, and Annex VIIa to the EED.

Done at Brussels, 25 September 2019.

For the Commission

Miguel ARIAS CAÑETE

Member of the Commission

⁽³⁾ COM(2013) 762 final and SWD(2013) 448 final, Brussels, 6 November 2013.

ANNEX

1. INTRODUCTION

1.1. Legal and policy context

Articles 9, 10 and 11 and Annex VII of Directive 2012/27/EU on energy efficiency ('the EED') cover the metering and billing of individual energy consumption. The changes related to metering and billing introduced by the revision of the EED through an amending Directive ⁽¹⁾ essentially comprise:

- the addition of new legal provisions specifically applicable to thermal energy, namely Articles 9a, 9b, 9c, 10a, 11a and Annex VIIa, and
- the removal of thermal energy from the scope of the original EED provisions (Articles 9, 10, 11 and Annex VII).

As regards the metering and billing of electricity, the existing body of EU law has been consolidated within a recast of the Electricity Market Directive which was also adopted as part of the Clean Energy for All Europeans Package.

For gas, the legislator (the European Parliament and the Council) included as part of the EED revision a review clause in Article 24(14) to ensure that the case for similar changes is considered based on an assessment or a proposal from the Commission no later than 31 December 2021.

In summary, the revised EED substantially modifies the provisions on metering and billing as regards the requirements applicable to thermal energy. For electricity, these provisions remain unchanged until the new provisions in the Recast Electricity Market Directive apply as of 1 January 2021 ⁽²⁾; for gas they remain unchanged until and unless the legislator adopts further changes.

1.2. Scope and purpose of this document

The aim of this Recommendation is to facilitate the effective and coherent application of the EED provisions on the metering and billing of thermal energy. It partly supplements and partly supersedes guidance already published by the Commission.

The Commission's 2013 guidance note on Articles 9-11 ⁽³⁾ remains relevant for electricity and gas, since the original EED provisions on electricity and gas remain in force for the time being. For thermal energy, however, much has been changed or clarified, and the 2013 note will therefore be only partially relevant once the deadline for transposing the revised provisions (25 October 2020) has passed ⁽⁴⁾.

The Commission has also published specific guidance for the sub-metering of thermal energy in multi-unit buildings ⁽⁵⁾. The general approach of this guidance remains valid, as do many of its recommendations.

⁽¹⁾ Directive (EU) 2018/2002.

⁽²⁾ Cf. Articles 70 and 73 of Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (OJ L 158, 14.6.2019, p. 125).

⁽³⁾ SWD(2013) 448 final, Brussels, 6 November 2013, <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1416394987283&uri=SWD:2013:448:FIN>

⁽⁴⁾ In particular, the principles set out in paragraphs 19-26, 50-54, and 56 of the 2013 note are also relevant for the new provisions covering thermal energy.

⁽⁵⁾ 'Guidelines on good practice in cost-effective cost allocation and billing of individual consumption of heating, cooling and domestic hot water in multi-apartment and multi-purpose buildings', empirica GmbH — Communication and Technology Research, Simon Robinson, Georg Vogt, December 2016 <https://ec.europa.eu/energy/en/studies/specific-guidance-sub-metering-thermal-energy-multi-unit-buildings-implementation-articles-9>

1.3. Overview of changes relating to the metering and billing of thermal energy

The main differences introduced under the revised EED for metering and billing requirements for thermal energy supplies are as follows:

- Introduction of the notion of ‘final users’ alongside the existing ‘final customer’ notion. This is in particular to clarify that the rights to billing and consumption information (Article 10a) also apply to consumers without individual or direct contracts with the supplier of energy used in collective heating, cooling or hot water production systems in multi-apartment and multi-purpose buildings.
- A clearer distinction between metering and sub-metering (Articles 9a and 9b respectively).
- Explicit requirement for Member States to publish criteria, methodologies and procedures used to grant exemptions from the general requirement for sub-metering in multi-apartment and multi-purpose buildings (Article 9b(1)).
- Clarified unconditional requirement to sub-meter domestic hot water in residential parts of new multi-apartment and multi-purpose buildings (Article 9b(2)).
- New mandatory requirement for Member States to have in place transparent and publicly available cost allocation rules (Article 9b(3)).
- Introduction of remote reading requirements for meters and heat cost allocators (Article 9c).
- Strengthened requirements for frequent billing and consumption information wherever remotely readable devices are available (two or four times per year as of 25 October 2020 and monthly as of 1 January 2022) (Article 10a and Annex VIIa).
- Introduction of more useful and complete billing information based on climate corrected consumption data and including relevant comparisons and new elements such as information on related energy mix and GHG emissions, and on available complaints procedures or dispute resolution mechanisms (Annex VIIa).

2. OBLIGATION FOR METERING (ARTICLE 9a)

The new Article 9a is made up of two paragraphs, each of which develops a similar requirement in the original EED, namely the first sub-paragraphs of Article 9(1) and 9(3). Together they constitute the general obligation to meter the supply of thermal energy.

Article 9a(1) contains the general requirement to ensure that final customers ⁽⁶⁾ are provided with meters ⁽⁷⁾ that accurately reflect their actual energy consumption. In contrast to the original EED Article 9(1), this requirement is not subject to any conditions. The provision does not include a requirement for the meter to provide information on actual time of use.

Article 9a(2) contains a more specific requirement for a meter to be installed at the heat exchanger or point of delivery where thermal energy is supplied to a building from a central source that services multiple buildings or from a district heating or district cooling system.

This provision was already included in the original EED Article 9(3).

⁽⁶⁾ A final customer is defined in EED Article 2(23) as ‘a natural or legal person who purchases energy for own end use’.

⁽⁷⁾ Compared to Article 9, Article 9a does not refer to ‘individual’ meters. This difference does not change the scope of the requirement and is simply intended to reinforce the clearer distinction between metering and sub-metering and between final customers and final users. In the revised EED, the term ‘individual’ is mainly used in the context of sub-metering.

In many situations, the requirements of the two provisions referred to above overlap and lead to the same outcome: this is the case where a final customer is supplied with thermal energy exclusively for purposes relating to a single building (typically for space heating and domestic hot water production). This is also the case where a building is divided into multiple units that each have their own heat exchanger/substation and where each unit's occupant is a final customer with his/her own, direct contract with the district heating/cooling network ⁽⁸⁾. In both of these cases, the Article 9a provisions imply a need to install a meter at the point of delivery/heat exchanger for each individual final customer's premises.

However, the requirements are also complementary. Consumption can in principle occur outside a building, for example for process heat purposes at an industrial site. Under Article 9a(1), supply like this must also be metered. Similarly, some final customers may receive supplies for several buildings. By way of example, a final customer may receive supplies to several buildings from the same district heating network. If all these are connected to the network via a single point, Article 9a(1) by itself would require only one meter. In such cases, however, Article 9a(2) is intended to ensure that each building's individual consumption is also determined ⁽⁹⁾. Another example could be a large site, for example a military base, with its own plant supplying heating, cooling or domestic hot water to multiple buildings on the site. In this case Article 9a(2) (but not Article 9a(1)) would be relevant.

Situations involving thermal storage systems may raise particular questions on the application of Article 9a. A situation where more than one final customer, final user or building connected to an aquifer thermal energy storage system (ATES) is supplied with heat from a collective shallow geothermal ground source can serve as an example. In such a case, the system does not necessarily need to be considered as district heating under Article 9a(1) ⁽¹⁰⁾ nor as a central source of heating or domestic hot water under in Article 9a(2) provided that:

- the heat is supplied at a temperature which needs to be upgraded by individual heat pumps to be useful for space heating or domestic hot water production, and
- the energy required to run the heat pumps is not part of the service but is individually paid for by each final customer or final user ⁽¹¹⁾.

In this case, metering of the low-temperature heat is not required under Article 9a.

Likewise, where such a system is reversible and also provides cooling, metering of the cold retrieved from the ground storage is not required under Article 9a, if such an operation is required for seasonal regeneration of the heat source and if the cold source is regenerated exclusively through (seasonally) alternating heating/cooling operations ⁽¹²⁾.

Finally, special considerations may be necessary in situations where thermal energy in the form of already prepared domestic hot water is delivered from a district heating system or a similar external source to a multi-apartment or multi-purpose building where the occupants are individually final customers of the supplier. In this case, and given that the EED does not specify whether a heat or a water meter is required for domestic hot water, water meters at the individual flats may in principle be sufficient if the delivery points are considered to be the taps or inlets in each apartment/unit. However, this presupposes that the energy supplier has sole responsibility for any thermal losses occurring up to those delivery points within the building. If the latter is not the case, and given that thermal energy losses in district heating networks can be considerable, it would be necessary to also place a heat meter at the point where the supplier's responsibility ends. Otherwise it will be impossible for the final customers to ascertain whether billing corresponds to actual consumption in energy terms: the supplier may argue that the losses occurred within the building, beyond their responsibility, and without a heat meter there will be no means of verifying to what extent this is the case.

⁽⁸⁾ This situation is not so common but does occur. The more common situation is that there are several final users but only one final customer — c.f. also Section 7.1.

⁽⁹⁾ It should be noted that the responsibility for installing such building-level meters should not be placed on the district heating company but rather on the buildings' owner or manager.

⁽¹⁰⁾ District heating is not defined in the EED, but according to the Renewable Energy Directive it means the '... distribution of thermal energy in the form of steam [or] hot water ... from central or decentralised sources of production through a network to multiple buildings or sites, for the use of space or process heating ...'.

⁽¹¹⁾ Since thermal energy sourced from a shallow geothermal ground source tends to come at low temperatures at which it is not directly useful (unless combined with a heat pump) for typical energy uses (space heating, domestic hot water preparation, process heating), it is arguable that it should not necessarily be considered district heating or a 'source' of 'heating ... or domestic hot water'. In relation to Article 9a(2), such an interpretation is further strengthened if any heat pumps used (to make the thermal energy from the ground source useful) are individually paid for because, if this is the case, a critical component of the heating service does not come from a central source.

⁽¹²⁾ Under these conditions, it is arguable that there is no net supply of cold sold by the system operator but a temporary use of a storage facility used to provide heat in colder periods.

3. OBLIGATION FOR SUB-METERING (Article 9b(1))

As explained in recital 31 to the amending Directive, rights relating to billing and information about billing or consumption should apply to consumers of heating, cooling or domestic hot water supplied from a central source even where they have no direct, individual contractual relationship with an energy supplier. To clarify this aspect of the legislation, the term 'sub-metering' was introduced and refers to measuring consumption in individual units of multi-apartment or multi-purpose buildings where such units are supplied from a central source and where the occupants⁽¹³⁾ have no direct or individual contract with the energy supplier⁽¹⁴⁾.

Sub-metering is required as a general rule, subject to certain conditions, under Article 9b. It was already included under Article 9(3), second sub-paragraph, of the original EED, according to which the deadline for introducing sub-metering was 31 December 2016. The deadline is not found in the revised text simply because it has already passed.

The requirement set out in the new Article 9b is in substance identical to the requirement contained in the original EED. However, a few clarifications have been made; these are explained below.

Firstly, the wording of the first sub-paragraph now more clearly indicates the nature of the conditions under which sub-metering is mandatory, namely '... where [it is] technically feasible and cost-effective in terms of being proportionate to the potential energy savings.' This is also reflected in recital 30 which states that '... whether sub-metering is cost-efficient or not depends on whether the related costs are proportionate in relation to the potential energy savings', and that the '... assessment of whether sub-metering is cost-efficient may take into account the effect of other concrete, planned measures in a given building, such as any forthcoming renovation'. This clarification confirms the approach taken in the specific guidance published by the Commission to help Member States apply the relevant conditions⁽¹⁵⁾ when implementing the original EED.

Secondly, the provision now spells out the obligation for Member States to clearly set out and publish the 'general criteria, methodologies and/or procedures' used to determine a lack of technical feasibility or cost-effectiveness. Again, this is consistent with the approach taken in the specific guidance referred to above. The Commission has consistently considered it necessary for Member States to be explicit about how the conditions are made operational and how they are applied in practice⁽¹⁶⁾.

4. SPECIFIC OBLIGATION FOR SUB-METERING DOMESTIC HOT WATER IN RESIDENTIAL PARTS OF NEW BUILDINGS (ARTICLE 9b(2))

As a general rule, the sub-metering of domestic hot water consumption is required, subject to conditions of technical feasibility and cost-effectiveness under Article 9b(1). However, under Article 9b(2), a stricter, unconditional requirement applies in the special case of new multi-apartment buildings and the residential parts of new multi-purpose buildings that are equipped with a central heating source for domestic hot water or are supplied with domestic hot water from district heating systems.

The reasoning behind this stricter requirement is that, in such situations, the sub-metering of domestic hot water can generally be assumed to be both technically feasible and cost-effective. In new multi-apartment buildings and in the residential parts of new multi-purpose buildings, the additional costs of metering the domestic hot water consumption of individual dwellings can be assumed to be limited, as appropriate provisions can be made already at the construction phase. At the same time, there are no particular reasons to expect that demand for domestic hot water will decrease systematically or significantly over time so the benefits of encouraging efficient behaviours through consumption-based billing and feedback (in terms of the potential savings triggered) can be expected to remain significant.

⁽¹³⁾ Occupants can be households, companies or any other entities entitled to occupy the premises concerned.

⁽¹⁴⁾ Occupants that do have individual, direct contracts with the energy supplier have such rights by virtue of being final customers (i.e. natural or legal persons purchasing the energy concerned for their own end use) under Article 9a, 10a and 11a.

⁽¹⁵⁾ See footnote 4.

⁽¹⁶⁾ Cf. para. 25 in SWD(2013) 448 final.

The revised EED does not specify what constitutes a ‘new’ building for the purposes of Article 9b(2). On the one hand, occupants of newly constructed buildings made available for occupation for the first time after the transposition deadline (i.e. 25 October 2020) might expect the building to be equipped with metering devices. On the other hand, metering may not have been planned for if the applications for construction permits were submitted before national transposition took place. In transposing this provision, Member States may therefore wish to assess the extent to which it is possible or reasonable to meet expectations. In any event, new buildings for which applications for construction permits were submitted after the transposition deadline fall within the scope of the requirement in Article 9b(2) and must be equipped with meters.

The requirement is for a meter, but does not specify whether this should be a water meter or a heat meter. Where individual units have their own substation supplying both space heating and energy for domestic hot water preparation taking place in the unit, and where the total energy consumption of each substation is metered, the requirement in Article 9b(2) has been met. In other words, where domestic hot water preparation occurs in each unit by means of thermal energy supplied from a central source or a district heating substation, the related energy consumption may be metered together with consumption related to space heating.

5. HEAT COST ALLOCATION RULES (ARTICLE 9b(3))

Where a sub-metering system is implemented, the measurement values or indices obtained by reading the individual devices (be they meters or heat cost allocators) are used to allocate the total cost to the individual premises covered by the system. This can be done in many ways and there is arguably no single, best way⁽¹⁷⁾, at least not for space heating or cooling in the typical case of multi-apartment or multi-purpose buildings where individual units are not thermally independent of each other, i.e. where heat flows across internal walls are not negligible compared to the flows across the building’s envelope (external walls, roof, etc.).

However, the use of cost allocation methods that are perceived as fair and based on sound principles greatly facilitate acceptance among users. Therefore, and as acknowledged in recital 32 of the amending Directive, transparency of accounting for individual consumption of thermal energy can facilitate the implementation of sub-metering. In the original EED, having such national rules in place was optional, and only around two thirds of Member States have put such rules in place. The revised EED now requires Member States to have in place transparent, publicly available cost allocation rules⁽¹⁸⁾.

More precisely, Article 9b(3) states that ‘[w]here multi-apartment or multi-purpose buildings are supplied from district heating or district cooling, or where own common heating or cooling systems for such buildings are prevalent, Member States shall ensure they have in place transparent, publicly available national rules on the allocation of the cost of heating, cooling and domestic hot water consumption in such buildings to ensure transparency and accuracy of accounting for individual consumption’. Since buildings in which at least one of the conditions are fulfilled can be found in most, if not all, Member States, by 25 October 2020 most if not all Member States will have to have put such rules in place, or make existing rules publicly available.

It is worth highlighting that national cost allocation rules do not necessarily need to define every detail of how costs are allocated. Member States may choose to only lay down a framework that sets out key principles or parameters, and to leave regional or local authorities, or even stakeholders of individual buildings, some flexibility to specify or agree on further details.

⁽¹⁷⁾ For a discussion and analysis of heat cost allocation principles, see for example Castellazzi, L., *Analysis of Member States’ rules for allocating heating, cooling and hot water costs in multi-apartment/purpose buildings supplied from collective systems — Implementation of EED Article 9(3)*, EUR 28630 EN, Luxembourg: Publications Office of the European Union, 2017, ISBN 978-92-7969286-4, doi:10.2760/40665, JRC106729 <https://ec.europa.eu/jrc/en/publication/analysis-member-states-rules-allocating-heating-cooling-and-hot-water-costs-multi-apartmentpurpose>

⁽¹⁸⁾ It should be noted that the requirement applies without distinction to the prevalence of sub-metering, and that the rules should also cover situations where individual data for actual consumption or heat cost allocator readings are not available because sub-metering has been found not to be technically feasible or cost-effective.

Regardless of the level of detail, however, the rules should be designed in a way that ensures that the achievement of certain EED-related objectives is not undermined. In particular, cost allocation rules must ensure that the principle of billing based on actual consumption is not in practice undermined by too weak a link between the device readings of a given final user and his/her final bill. If too little weight is given to individual readings in the calculation of individual occupants' share of total costs, the intended incentive to use energy efficiently will be undermined. On the other hand, it is equally important that this link is not too strong in situations where the consumption of each user is not entirely independent of the consumption of others, and where the outcome could be that the distribution of costs across individual building units could be very varied. A varied distribution of costs can create or exacerbate split incentives among occupants with respect to energy efficiency investments at the level of the whole building (such as improvements to the building envelope). Where Member States' national cost allocation rules are designed in such a way that they do not mitigate this risk, the Commission takes the view that this could potentially be contrary to Article 19 of the EED which obliges Member States to evaluate and take appropriate measures to address split incentives among building owners and/or tenants. As already stated, there is no single correct way of allocating costs, but well-designed rules guarantee a balance between the resulting incentives for occupants as individuals and as a community. Allocation rules that fail to strike such a balance and allow extreme outcomes risk jeopardising the achievement of the aims pursued by Articles 9b and 19, respectively. Possible tools used by some Member States to achieve such outcomes include permissible ranges for the fraction of costs allocated according to individual readings, maximum limits for individual bills' deviations from the building's average or systems of correction factors reflecting unfavourable positions of naturally colder/more exposed apartments within a building.

In this context, the Commission stresses that the obligation under Article 10a for billing to be based on actual consumption or heat cost allocator readings should not be understood to imply that billing must be *exclusively* based on readings from such devices. In multi-apartment and multi-purpose buildings there are indeed good, objective reasons for not allocating costs exclusively based on or in proportion to such readings, at least in so far as space heating and cooling is concerned (cf. footnote 16). Two requests for preliminary rulings on questions of potential relevance to this issue were lodged before the Court of Justice in late 2017 ⁽¹⁹⁾. The Advocate-General's conclusions in these joint cases, presented on 30 April 2019, reflect similar arguments on this matter ⁽²⁰⁾.

6. REMOTE READING (ARTICLE 9c)

6.1. The transition to remotely readable devices

As proposed by the Commission, a specific objective of the EED revision was to '[e]mpower consumers of thermal energy through better and sufficiently frequent feedback on their consumption including by taking advantage of progress in technology' ⁽²¹⁾.

To this end, the revised EED contains new requirements to promote the use of remotely readable devices as critical enablers of frequent feedback to final users on their consumption.

The amending Directive does not define in technical terms what constitutes a remotely readable device. In recital 33 of Directive (EU) 2018/2002, it states that '[r]emotely readable devices do not require access to individual apartments or units to be read'. This, however, should be understood as a common minimum feature of remotely readable devices, but not necessarily as the *only* feature. Recital 33 also states that 'Member States are free to decide whether walk-by or drive-by technologies are to be considered remotely readable or not'. This is an important decision for Member States to take, because their choice has direct implications for how they should transpose and enforce the requirements set out in Article 9c and in Annex VIIa. Where, for example, a Member State decides to consider so-called walk-by or drive-by technologies as remotely readable, it might consider such technologies to be sufficient to comply with the obligations to introduce remote reading contained in Article 9c. Doing so, however, would also mean that the condition which triggers the obligation to provide frequent information as provided for in point 2 of Annex VIIa would be fulfilled in buildings equipped with such systems. In other words if a device is considered remotely readable for the purpose of Article 9c, it must also be considered as such for the purpose of point 2 of Annex VIIa.

⁽¹⁹⁾ See Cases C-708/17 and C-725/17: <http://curia.europa.eu/juris/document/document.jsf?text=&docid=200142&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=1928887> and <http://curia.europa.eu/juris/document/document.jsf?text=&docid=200154&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=1928887>

⁽²⁰⁾ <http://curia.europa.eu/juris/document/document.jsf?text=&docid=213510>

⁽²¹⁾ Cf. Commission Impact Assessment, Section 3, p. 26 (SWD(2016) 405 final).

Conversely, if a Member State decides not to consider walk-by/drive-by technologies as remotely readable, it would have to provide for a requirement to install other, more advanced or additional devices or systems to comply with Article 9c⁽²²⁾. In this situation, the condition triggering the obligations to provide frequent information under point 2 of Annex VIIa would only be met when and where systems of the latter kind had been introduced.

When deciding whether to consider walk-by/drive-by technologies as remotely readable or not, Member States may differentiate this decision according to objective parameters such as the types of energy service or devices concerned, the type or location of the buildings concerned, and whether the devices are used for metering or sub-metering. For example, drive-by/walk-by devices might be considered remotely readable for the purpose of metering supplies from a district cooling network but not for the purpose of metering supplies from a district heating network. Where Member States do decide to differentiate based on such parameters, they should ensure that the applicable rules are clear and easy to communicate and understand.

It is important for market players that Member States take and communicate their national decisions on whether walk-by/drive-by technologies are considered remote reading as soon as possible during the transposition process and in any event before 25 October 2020. Otherwise, building owners and service providers preparing for new installations after that date will not have clarity on precisely which functional requirements will apply. In the absence of such decisions, they can of course choose to go for remotely readable solutions that do not rely on walk-by/drive-by technology to be on the safe side.

Neither the legal provisions nor the above considerations intend to introduce a hierarchical relation between walk-by/drive-by based technologies and technologies based on other communication infrastructures. Whereas a decision to consider the former as remotely readable would enlarge the range of devices that can be used for compliance with Article 9c in the Member State concerned, and could in that sense be seen as the least demanding option, it would also have implications for compliance with Annex VIIa(2) which would most likely be more demanding. Member States may wish to take into consideration, however, that walk-by/drive-by technologies will typically restrict the frequency at which data can realistically and cost-effectively be collected, which in turns limits the potential additional services and co-benefits that might be derived from the devices. By way of example, in a district heating network where metering data are transmitted/collected automatically on an hourly or daily basis, such data will represent a significantly higher value in terms of their potential use for optimising system operation, fault detection, alert services, etc., than metering data collected on a monthly basis with walk-by/drive-by technologies.

6.2. Devices installed after 25 October 2020

Under the revised EED, Article 9c requires the gradual introduction of remotely readable meters and heat cost allocators 'for the purposes of Articles 9a and 9b', i.e. irrespective of whether the devices are used for metering or sub-metering.

The transition to remotely readable devices is promoted in two different ways. The first is set out in Article 9c(1), which states that meters and heat cost allocators installed after 25 October 2020 must be remotely readable. This requirement means, for example, that meters installed after this date at any new or existing connection points in a district heating network will have to be remotely readable. It also means that heat meters, domestic hot water meters or heat cost allocators installed after this date as part of a sub-metering system will have to be remotely readable (see, however, remarks in Section 6.3 below).

Article 9c(1) states that '[t]he conditions of technical feasibility and cost-effectiveness set out in Article 9b(1) shall continue to apply'. This should not be understood to imply that the remote reading obligation itself, as provided for in Article 9c(1), is conditional or subject to such criteria. The statement rather clarifies that in the context of installing a system for sub-metering in a building (which is the subject of Article 9b(1), to which Article 9c(1) refers) after 25 October 2020, technical feasibility and cost-effectiveness would continue to be valid reasons for making exemptions from the general sub-metering requirement, especially because the remote reading requirement applicable after that date in some cases might affect the extent to which one or other criterion is met. A situation where this could be relevant would be a situation where the existing sub-metering system in a given building has reached its technical life-time and

⁽²²⁾ In many cases a walk-by/drive-by installation can be made 'truly' remotely readable by installing one or more 'gateways' in the building. Such gateways collect signals from the devices and transmit them via the internet or telecommunication systems to the service providers' data systems.

needs to be replaced, or where a system is to be installed for the first time. In situations like these, it would be justified to make an assessment of the criteria provided for in Article 9b(1) to determine whether sub-metering as a whole would be technically feasible and cost-effective, taking into account the remote-reading requirement. In other words, the reference in Article 9c(1) to the 'conditions ... set out in Article 9b(1)' should be understood not as a separate conditionality relating to a device's features, but as part of the general assessment under Article 9b(1).

6.3. Replacements or additions of individual sub-metering devices in existing installations

A specific question may arise as regards situations where an existing, already installed device needs to be replaced prematurely because it has broken, disappeared or no longer works correctly. In principle, Article 9c(1) also applies in such cases. However, if a device to be added or replaced is one of many devices that together constitute a sub-metering system for a building, it may in certain, specific circumstances not be possible or meaningful to replace the malfunctioning or missing devices with remotely readable ones:

- For heat cost allocator installations, all devices in a given sub-metering installation must be of the same manufacture and type to be compliant with European standards⁽²³⁾. In the case of evaporation heat cost allocators, remote readable alternatives are simply not available as a technical option.
- In the case of electronic heat cost allocators, a remotely readable version of the model used elsewhere in the building may not always be available, but even if it were, the capability would be of limited or no use since the data from the remaining sub-metering devices necessary to draw up the cost allocation accounts are anyhow only available at less frequent intervals after manual readings.
- The same situation arises if radiators are added to an apartment in a building equipped with non-remotely readable heat cost allocators.
- A similar issue can also arise in the case of an individual heat or hot water meter being replaced or added in a sub-metered building where the other meters are not remotely readable.

The Commission is therefore of the view that, in the above specific circumstances, Article 9c(1) should not be interpreted as preventing the replacement of individual devices with non-remotely readable devices when they form part of a sub-metering system based on non-remotely readable devices, even after the deadline referred to in Article 9c(1) has passed.

On the other hand, the requirement to render all devices and installations remotely readable by 1 January 2027, set out in Article 9c(2) (cf. the section below), also needs to be considered where the need for isolated replacements in a building equipped with non-remotely readable devices arises; if replacements are not remotely readable, the risk of them representing sunk costs will increase as the 2027 deadline approaches.

6.4. Existing installations

Article 9c(2) states that '[m]eters and heat cost allocators which are not remotely readable but which have already been installed shall be rendered remotely readable or replaced with remotely readable devices by 1 January 2027, save where the Member State in question shows that this is not cost-efficient'.

This requirement aims to ensure that all final users of metered or sub-metered premises will eventually obtain the benefits derived from remotely readable devices, in particular the provision of monthly information (cf. Section 9), the absence of a recurring need to be home to give meter readers access and, where applicable, any additional services enabled by such devices (e.g. leak alerts for hot water).

In the light of this, the possibility to deviate from the requirement must be interpreted in a very restrictive manner and any deviations should be specific and duly justified and documented.

⁽²³⁾ Cf. EN834 Section 6.5 and EN835 Section 6.4.

The deadline of 2027 — more than 10 years into the future from the time the Commission's proposal was published — was intended to minimise the risk of sunk costs arising due to devices having to be replaced significantly before they have been depreciated. Many devices are in any event replaced within such a time-span for technical reasons. The vast majority of new heat cost allocators installed nowadays are electronic and typically need to be replaced within 10 years due to battery constraints. As regards meters, most Member States have in place calibration requirements that in practice typically lead to meters being replaced at intervals of 10 years or less. Where devices are older than 10 years they have typically in any case reached their economic life-time/been depreciated already.

For these reasons, sunk costs related to existing devices cannot be considered an adequate justification for deviating from the remote reading requirement. More specific circumstances would need to be present. One example where compliance could conceivably be proven not to be cost-effective would be where a building is constructed with materials that prevent the wireless technologies available in 2026 from functioning properly and where wired alternatives would be disproportionately costly to put in place (for example if there are large amounts of iron in walls and floor separations).

6.5. Considerations on verification and enforcement

Under Article 13 of the EED, Member States are obliged to ‘... lay down the rules on penalties applicable in case of non-compliance with the national provisions adopted pursuant to Articles 7 to 11 ...’ and ‘... to take the necessary measures to ensure that they are implemented’. The penalties provided for must be effective, proportionate and dissuasive.

As a result of the amendment of the EED, the scope of this obligation now covers both some existing and some new provisions, including the new remote reading requirements in Article 9c ⁽²⁴⁾.

As part of their wider responsibility and efforts to ensure effective implementation and enforcement of the Directive, Member States will therefore also have to consider how to verify compliance with the new requirements for remote reading. In doing so, they may wish to consider whether any existing EPBD ⁽²⁵⁾-related or national processes could be adapted to also serve this purpose. However, the remote reading requirements apply not only to new buildings (for which construction permits are normally needed) or to existing buildings being sold or rented out to a new tenant (for which Energy Performance Certificates are required under the EPBD), and they apply without regard to the size of a building and no matter what the capacity of the heating installation. This means that existing processes related to building permits, HVAC inspections or energy labels/EPCs may not necessarily be sufficient to verify compliance with the new requirements.

As regards the transition to remote reading for meters used for the purposes of Article 9a(1), one possibility could be that Member States oblige operators of district heating and cooling systems and operators of any other installations supplying multiple buildings with thermal energy to document compliance and/or regularly report on the share of connection points in their network that is metered with remotely readable meters. Since this share should in principle ⁽²⁶⁾ reach 100 % no later than 1 January 2027, Member States could monitor the figures to verify that sufficient progress towards compliance is made before the deadline is reached.

For sub-metering, similar obligations could be envisaged for the parties responsible, but as who they are varies between Member States and may depend on the type of tenancy or ownership, a mix of approaches may be relevant. Where Member States have a system for identifying or registering providers of sub-metering services, such systems might help identify operators from which information on the type of equipment present in each building under their management could be collected in a cost-effective way.

⁽²⁴⁾ Articles 9a, 9b, 9c and 10a added by Directive (EU) 2018/2002 fall within the range ‘Articles 7 to 11’. The recast of the Electricity Market Directive further amends Article 13 of the EED to ensure that Article 11a also falls within the range referred to in that paragraph.

⁽²⁵⁾ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13), as amended.

⁽²⁶⁾ I.e. save where specific exceptions are duly justified and documented, cf. Section 6.4.

7. BILLING AND CONSUMPTION INFORMATION (ARTICLE 10a)

7.1. The terms ‘final users’ and ‘final customers’

One of the key clarifications in the revised EED comes from the introduction of the term ‘final users’ in Article 10a, complementing the existing term ‘final customers’.

The original EED defines a ‘final customer’ as ‘a natural or legal person who purchases energy for own end use’⁽²⁷⁾. The scope of this definition has however been the subject of different interpretations. In its 2013 Guidance Note, the Commission argued that individual end-users/households in multi-apartment buildings with collective systems and contracts for the supply of energy should be considered as final customers too⁽²⁸⁾. However, as was noted in recital 31 to the revision of the EED, ‘the definition of the term “final customer” is capable of being understood as referring only to natural or legal persons purchasing energy based on a direct, individual contract with an energy supplier. For the purposes of the relevant provisions, the term “final user” should therefore be introduced to refer to a broader group of consumers and should, in addition to final customers purchasing heating, cooling or domestic hot water for their own end use, also cover occupants of individual buildings or of individual units of multi-apartment or multi-purpose buildings where such units are supplied from a central source and where the occupants have no direct or individual contract with the energy supplier’.

To this end, the operative requirement in Article 10a(1) refers to ‘final users’ and clarifies that these are:

- (a) natural or legal persons purchasing heating, cooling or domestic hot water for their own end use (such final users are also final customers as defined under Article 2(23)); or
- (b) natural or legal persons occupying an individual building or a unit in a multi-apartment or multi-purpose building supplied with heating, cooling or domestic hot water from a central source who have no direct or individual contract with the energy supplier.

It is worth emphasising that the notion of final users includes final customers. Where provisions refer to final users, these should therefore not be understood to exclude final customers.

This clarification means that, from now on, under the revised EED, it is beyond any doubt that sub-metered consumers are also entitled to consumption-based billing⁽²⁹⁾ and consumption information.

For the purposes of Article 9a, 9c, 10a and 11a, in the context of a multi-apartment or multi-purpose building, supplied from a district heating or cooling system or from a similar central source, based on a single contract with an energy supplier, who the ‘final customer’ actually is may vary from situation to situation. Where the building has a single owner, the owner will typically, but not necessarily, be the contractual party to the supply contract with the energy supplier. Similarly, where there are multiple owners, an association or a community of co-owners will often but not always be the contractual party vis-à-vis the energy supplier. In some situations, owners delegate certain tasks to third parties or a representative, such as a management company (in some countries known as a ‘syndic’), and these parties may also be the contractual party vis-à-vis the energy supplier. Where owners have rented out units, the tenants may or may not have contractual relationships with the energy supplier.

In transposing the revised Directive, Member States will have to take account of the diversity of situations that are relevant in their jurisdiction. However, regardless of which entity or body purchases the energy collectively on behalf of the occupants of the building, it is important that implementation is organised in such a way that the information required under Annex VIIa is effectively provided and can also be used as the basis for informing the occupants of each apartment/unit. The fact that the definition of ‘final customer’ refers to a person who purchases energy ‘for own end use’ should for example not be understood as implying that there is no final customer in situations where a delegated management company or ‘syndic’ is the actual contractual party for the building’s energy supplier.

⁽²⁷⁾ EED Article 2, point 23.

⁽²⁸⁾ See para. 9 of SWD(2013) 448 final.

⁽²⁹⁾ In a sub-metering context sometimes also referred to as ‘heat cost allocation’.

7.2. Who is responsible for the billing and consumption information?

The EED does not specify who is responsible for providing final users with the billing and consumption information referred to in Article 10a. For final users who are also final customers (and purchase energy from the concerned energy supplier), it would appear most logical that the energy supplier is made responsible for providing information. In contrast, the energy supplier may not be the best placed to have the responsibility for informing final users with whom they have no direct or individual contractual relationship. Therefore, Article 10a(3) of the revised EED explicitly states that 'Member States shall decide who is to be responsible for providing the information referred to in paragraphs 1 and 2 to final users without a direct or individual contract with an energy supplier'. Which entities are best placed to inform final users will depend on national circumstances and specific tenancy situations. Potential candidates could be building owners, building managers, delegated management companies or service providers, owners' associations, etc. In transposing the revised Directive, Member States need to ensure that the responsibility for informing final users is clearly defined for all relevant situations.

7.3. Billing based on actual consumption

Article 10a requires Member States to ensure 'that billing and consumption information is reliable, accurate and based on actual consumption or heat cost allocator readings ...'.

This wording is similar but not identical to the original EED's requirement to ensure 'that billing information is accurate and based on actual consumption'.

The inclusion of 'consumption information' is significant and reflects the EED's flexibility, as now meeting the requirement specified in Annex VIIa point 2 is possible by providing frequent billing or consumption information. Consumption information is simpler to provide because it relates only to the quantities consumed, not to the costs involved or to any other element of billing information.

The legislator considered it appropriate to add the words 'or heat cost allocator readings' to eliminate any doubt that such readings can be used as a basis for billing. Such doubts had been expressed because heat cost allocators are devices that allow the measurement of heat supplied to an individual apartment in a less direct way, and which in certain specific circumstances may be considered as a poorer indication of the amount of energy actually released by the heating installation in the individual apartment concerned.

However, above and beyond the differences between heat meters and heat cost allocators, it is worth stressing that the requirement for billing and consumption information to be based on actual consumption or heat cost allocator readings should not be interpreted as requiring that costs for space heating or cooling are allocated exclusively based on readings from individual meters or heat cost allocators. In a sub-metering context, doing so risks creating adverse outcomes in terms of fairness and split incentives (see also Section 5 above). From a technical point of view, individual apartments in multi-apartment buildings cannot usually be considered thermally independent from the rest of the building. Whenever temperature differences occur across internal walls or horizontal separations, heat will naturally flow across such separations since these are rarely thermally insulated to a very high degree compared to the buildings' external walls. Individual units are therefore typically heated not only by heat emitted from radiators within the unit itself but also, at least in part, by heat emitted in other parts of the building. As already discussed in Section 5, well-designed cost allocation rules should take account of this fact.

Whether the actual heat emission within each unit is measured or estimated by means of individual meters or heat cost allocators, the fact that heat can flow across internal separations constitutes a good reason not to allocate a building's total heating costs exclusively based on readings obtained from such devices. It is common (and good) practice that only a certain proportion of costs is based on individual measurements and that the remaining costs are allocated to occupants based on other factors (such as the apartments' share of total floor area or heated volume of the building). This is the case even where the individual units are equipped with heat meters and not heat cost allocators. It is also normal practice that the cost of heating a building's common areas (staircases, corridors, etc.) be shared between the occupants of the individual units. Costs due to losses from building level installations and for heating common areas are usually not directly controlled by individual user behaviour, and Member States typically include them among fixed costs in their respective allocation rules. The fixed cost part of total heating costs can usually be recovered by charging occupants in proportion to the respective size of the property they occupy (e.g. floor area or volume).

Where the information provided is based on heat cost allocator readings, this must be done in a way that is clear and useful for the final user. Heat cost allocation may for example involve applying technical coefficients related to radiator types and/or correction factors for an apartment's location within a building. Such parameters should be taken into account in the information provided to final users.

7.4. Self-reading

The original EED obliges Member States to ensure that billing information is accurate and based on actual consumption, 'in accordance with point 1.1 of Annex VII', which in turn specifies certain minimum frequencies with which billing and billing information need to be provided. Article 10 provides that '[t]his obligation may be fulfilled by a system of regular self-reading by the final customers whereby they communicate readings from their meter to the energy supplier'. For example, this makes it possible for an annual settlement bill to be based on readings communicated by the customer to the energy supplier without the latter needing to visit the premises to read the meter.

In the context of the transition to remotely readable devices, self-reading will lose relevance over time. The revised EED nevertheless allows self-reading for thermal energy, but only under certain circumstances⁽³⁰⁾. In particular, self-reading is not allowed in the case of sub-metering of space heating on the basis of heat cost allocators. This would require each user to communicate readings for each radiator, and the legislator did not consider this to be either realistic or desirable.

For metering or other sub-metering situations, for example the space heating or cooling of premises equipped with heat meters, or of domestic hot water consumption, self-reading can in principle be allowed if the Member State in question 'so provides'. In other words district heating companies, building managers and other entities made responsible for providing the information required under Article 10a to final users may not rely on self-reading to meet these obligations unless the Member State in question has expressly provided for that possibility in the national transposition measures.

7.5. Data availability and privacy

Article 10a(2) point (a) states that '... if information on the energy billing and historical consumption or heat cost allocator readings of final users is available, it be made available upon request by the final user, to an energy service provider designated by the final user'. A similar provision is found in the original EED, but the new one removes any doubts about the right to access data on energy billing and historical consumption or heat cost allocator readings applying to situations where sub-metering is used. The entity responsible for sub-metering — be it a building manager, a sub-metering service provider or anybody else — will thus upon request have to provide any single final user with access to such data in an appropriate and useful format. In the context of sub-metering, this in particular must be understood to include both the device readings of the user's own device(s) and the sum of readings of the entire installation as the former is only useful together with the latter. Upon request, such information should also include key technical parameters such as rating factors applied for radiators in order to allow for independent verification or plausibility checks of the heat cost allocation calculations.

At the same time, Article 10a(2) point (a) guarantees that billing information related to a main meter measuring supplies from a district heating or cooling network to a sub-metered multi-apartment or multi-purpose building can be made available directly to energy service providers⁽³¹⁾ responsible for the sub-metering and cost allocation within the building. This is important since accurate cost-allocation requires timely access to the aggregate consumption values. Direct and timely access to billing information, including metering values, is particularly important where buildings are sub-metered with remotely readable devices and where there is therefore a need to provide sub-annual information. In such cases, the customer of the district heating/cooling network can request that the information relating to the main meter be made available to an energy service provider of their choice, which could be the company providing sub-metering services.

⁽³⁰⁾ Article 10a(1) second subparagraph states that '[t]his obligation may, where a Member State so provides, save in the case of sub-metered consumption based on heat cost allocators under Article 9b, be fulfilled by a system of regular self-reading by the final customer or final user whereby they communicate readings from their meter. Only where the final customer or final user has not provided a meter reading for a given billing interval shall billing be based on estimated consumption or a flat rate'.

⁽³¹⁾ Article 2(24) of EED defines 'energy service provider' as a natural or legal person who delivers energy services or other energy efficiency improvement measures to a final customer's facility or premises.

Article 10a(2) point (c) states that Member States must ensure that 'clear and comprehensible information is provided with the bill to all final users in accordance with point 3 of Annex VIIa'. The implications of this are discussed in further detail in Section 9.3 below. For final users without a direct/individual contract with the energy supplier, 'the bill' should also be understood to refer to heat cost allocation accounts or any other recurring request for payment for heating/cooling/domestic hot water services on behalf of the natural or legal person responsible for providing such services ⁽³²⁾.

Finally, a new provision (Article 10a(2) point (d)) emphasises that Member States must 'promote cybersecurity and ensure the privacy and data protection of final users in accordance with applicable Union law'. While this provision adds no specific obligations over and above those already applicable under EU law (such as the General Data Protection Regulation ⁽³³⁾), it highlights that cybersecurity, privacy and data protection are also relevant in the context of metering, sub-metering, remote reading and billing of thermal energy.

7.6. Access to electronic billing information and bills

As is the case in the original EED, the revised EED obliges Member States to ensure that final customers are offered the option of electronic billing information and bills (Article 10a(2) point (b)). It should be noted here that the reference is only to final customers, and not final users, which means that the revised EED does not confer a right to opt for electronic delivery to individual sub-metered consumers. The EU legislator deliberately made this choice to avoid restricting the freedom of the stakeholders involved in a given building or for national authorities to decide on how to organise the delivery of billing information and bills to sub-metered consumers.

8. COSTS OF ACCESS TO METERING AND BILLING AND CONSUMPTION INFORMATION (ARTICLE 11a)

The revised EED's new Article 11a is almost identical to Article 11 in the original EED. A few differences should be noted, however.

Firstly, the new provision reflects the clarified position of sub-metered consumers and therefore makes reference to final users rather than just final customers (recalling that the latter is a sub-set of the former, broader group).

Secondly, the new article clarifies that paragraph 2 applies to both multi-apartment and multi-purpose buildings.

Thirdly, a new paragraph 3 is added to clarify that '[i]n order to ensure reasonable costs for sub-metering services as referred to in paragraph 2, Member States may stimulate competition in that service sector by taking appropriate measures, such as recommending or otherwise promoting the use of tendering and/or the use of interoperable devices and systems facilitating switching between service providers'. Whilst the actions referred to in this provision are clearly optional and not mandatory for a Member State to undertake, the legislator considered the provision helpful as it spells out examples of specific measures that Member States may take to stimulate competition in the provision of sub-metering services with a view to minimising the costs of the transition to remotely readable devices and systems.

Finally, paragraph 2 of the original Article 11 is deleted because the revised EED reduces its scope to electricity and gas, and since the original Article 11(2) concerned only sub-metering of thermal energy and is now replaced by the new Article 11a(2).

⁽³²⁾ This includes requests for payments of recurring charges that include specified energy costs in buildings of the kind referred to in Article 9b(1) where sub-metering has been shown not to be cost-effective or technically feasible.

⁽³³⁾ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1). <http://data.europa.eu/eli/reg/2016/679/2016-05-04>

In addition to the drafting differences discussed above, another development relating to this topic is worth noting. In April 2018, a preliminary ruling request was lodged with the Court of Justice ⁽³⁴⁾ by a Finnish Court. In summary, the question asked was whether the obligation to provide billing free of charge should be understood as preventing rebates being given to customers that receive bills electronically. The Commission in the 2013 Guidance Note ⁽³⁵⁾ had argued that the requirement to provide billing free of charge does not prevent discounts being offered to customers who chose a particular billing delivery method. In its judgement of 2 May 2019 the Court of Justice took a similar view. It concluded that Article 11(1) must be interpreted as not precluding, in circumstances such as those at issue in the main proceedings, a discount on electricity network charges granted by an electricity retail sales company exclusively to final customers who have chosen electronic billing.

9. REQUIREMENTS FOR BILLING AND CONSUMPTION INFORMATION

9.1. Annual billing based on actual consumption

The new Annex VIIa requires that '[i]n order to enable final users to regulate their own energy consumption, billing shall take place on the basis of actual consumption or heat cost allocator readings at least once per year'. A very similar requirement exists under Annex VII to the original EED, but the phrasing in Annex VIIa makes reference to final users (and thus applies to sub-metered consumers). Moreover, the word 'should' found in Annex VII has been replaced with 'shall' in Annex VIIa to reflect the binding nature of the requirement. As mentioned in Section 7.2, it is worth stressing that, in sub-metering contexts, the requirement for billing and consumption information to be based on actual consumption or heat cost allocator readings should *not* be interpreted as requiring that costs for space heating or cooling are allocated *exclusively* based on readings from individual meters or heat cost allocators.

In essence, the requirement makes sure that final users of thermal energy are informed about their actual consumption at least once a year and that their payment for their consumption is calculated or adjusted accordingly, for instance by the settlement of any differences between the actual amount due and the sums paid on the basis of regular flat rate payments not based on actual consumption or heat cost allocator readings.

9.2. Frequent billing or consumption information

9.2.1. Situations where provision of sub-annual information is required

The frequency with which final users are informed about their actual consumption of thermal energy was a key objective of the proposal to revise the EED and is reflected in point 2 of the new Annex VIIa.

Under the original EED, the provision of sub-annual information is obligatory where 'technically possible and economically justified'. In the revised EED, this conditionality has been simplified so that the requirements apply 'where remotely readable meters or heat cost allocators have been installed'.

Whether this condition is met or not must be assessed in the light of each Member State's decision as regards what types of devices are considered remotely readable (cf. Section 6.1).

It is possible that a building contains both remotely readable and non-remotely-readable devices. Such situations need to be considered on a case-by-case basis.

⁽³⁴⁾ See C-294/18 <http://curia.europa.eu/juris/document/document.jsf?text=&docid=203750&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=1938672>

⁽³⁵⁾ Commission Staff Working Document — Guidance note on Articles 9-11 metering, billing information, cost of access to metering and billing information, para. 50-52 (SWD(2013) 448 final).

For example: in a multi-apartment building supplied from district heating, where the devices installed in each building unit are remotely readable heat cost allocators or meters, the building's main meter measuring the total heat supplied or consumed is perhaps not remotely readable. In this case a fully-fledged heat cost allocation calculation can in principle only be made whenever readings are also available from the main meter. A similar situation could arise for a building with a common boiler operating, say, on gas or oil: also in this case an exact value for the aggregate consumption for each sub-annual period might not be available if the main gas meter is not remotely readable, or if the oil tank or burner is not equipped with a gauge allowing the remote reading of consumption. In such cases it is nevertheless still possible to make an approximate heat allocation calculation by using the readings from individual devices and extrapolating an estimated value for total consumption. A question could then arise on how to reconcile the requirement in Article 10a(1) that '... billing and consumption information is reliable, accurate and based on actual consumption or heat cost allocator readings, in accordance with points 1 and 2 of Annex VIIa for all final users' with the fact that in the absence of sub-annual values for aggregate consumption (by installing a remotely readable gas meter, by manually reading the main gas meter more frequently, by installing a connected oil gauge, etc.), any heat cost allocation calculation made can only be approximate. The Commission takes the view that the absence of sub-annual readings of the main meter is not a justification for not providing sub-annual consumption information to sub-metered users as long as circumstances make it possible to make a reasonably fair estimate/approximation of the cost allocation calculation. In such cases it should simply be made clear that the sub-annual values are partly estimated/extrapolated. The value of the sub-annual information for the consumer will very likely outweigh the slightly reduced accuracy arising from the lack of an aggregate consumption value.

On the other hand, if a sub-metered building is equipped with a remotely readable main meter towards a district heating/cooling network, but the devices used for sub-metering within the building are not remotely readable, the condition in Annex VIIa(2) is not met in so far as the sub-metered final users are concerned. In contrast, it *would* be met for the district heating/cooling network and its customer/the building as a whole. In this case, building level information would have to be provided to the final customer, in accordance with Annex VIIa(2).

Another example could be a sub-metered building where heat cost allocators are remotely readable but where domestic hot water meters are not. In this case, each service can be treated separately, and sub-annual information can be provided for space heating but not for domestic hot water.

9.2.2. *Minimum frequency required*

The implication of the simplified conditionality explained above is that, wherever remotely readable devices are in place, final users must be provided with frequent information, which can be either billing information or simply consumption information. As of 22 months after the date on which the amending Directive enters into force, i.e. as of 25 October 2020, the minimum frequency required will be similar to the one provided for in the original EED, namely 'at least quarterly, on request or where the final customers ⁽³⁶⁾ have opted to receive electronic billing or else twice yearly'. As of 1 January 2022, the minimum frequency will be monthly.

9.2.3. *Exemptions outside heating/cooling seasons*

Heating and cooling may be exempted from the requirement to provide monthly information outside the heating/cooling seasons. What constitutes the heating or cooling seasons may vary depending on location and jurisdiction, or from building to building. The possibility to make exceptions to the monthly requirement can be understood as a possibility to suspend the provision of information during the period in which space heating or cooling is not provided by a building's collective installation.

⁽³⁶⁾ The use of 'final customers' here rather than 'final users' reflects the fact that the EED does not require that sub-metered consumers have the right to opt to receive electronic billing, cf. Section 7.6. In a sub-metered building, the final customer for the building might opt for electronic billing and thus be entitled to sub-annual information quarterly, but this does not automatically imply that the buildings' individual occupants (who are final users but not final customers) are entitled to such information more than twice a year before 1 January 2022.

9.2.4. *Distinguishing between the provision and making available of information*

The requirement that, where remotely readable meters or heat cost allocators have been installed, billing or consumption information based on actual consumption or heat cost allocator readings must be provided to final users at sub-annual intervals may trigger questions about what constitutes compliance. The Commission notes that the legislator deliberately left the means of providing the information open, while also clearly making a distinction between providing information and making it available.

The core requirement is to provide information to the user. This can be done on paper or by electronic means such as email. Information can also be made available via the internet (and interfaces such as a web portal or a smartphone app), but in such cases the final user must be notified in some way at the regular intervals indicated, otherwise the information cannot be considered as having been provided to the final user with that frequency, but merely made available. Merely making information available but leaving it to the final user to find it would not be aligned with the overall objective of this part of the revised EED, namely to raise final users' awareness of their consumption.

This subtle but important distinction is important to highlight also because the legislator included the optional, additional making available of information via the internet after the core requirement to provide information at regular intervals: 'It may also be made available via the internet and be updated as frequently as allowed by the measurement devices and systems used. The term 'also' was not used in the sense of 'instead' but to flag an additional possibility. Any other interpretation would leave too much scope for designing and using systems that do not make frequent feedback possible, thereby circumventing the core requirement and undermining the achievement of a key aim of the revised EED. This interpretation is confirmed by the use of the wording 'may instead' in point 3 of Annex VIIa, where the legislator clearly intended that the provisions constitute alternatives. In short, the continuous 'making available' of information via the internet is not an alternative or sufficient means of complying with the requirements under Annex VIIa point 2 to provide sub-annual information unless it is combined with some kind of active notification of the final user at the intervals required.

9.2.5. *The content of sub-annual billing or consumption information*

As mentioned in Section 7.3, the revised EED provides flexibility as to the nature of the information that has to be provided at sub-annual intervals under Annex VIIa point 2.

As a minimum, basic information on how actual consumption (or heat cost allocator readings) has developed must be included. This may for example be combined with estimates of how the observed trend might affect the final user's future consumption and what their bill level would be if consumption continues in the same way.

If billing takes place at the same time as the provision of information under point 2 of Annex VIIa, the provisions in point 3 of this annex will determine the minimum requirements for the content of the billing information.

9.3. **Minimum information contained in the bill**

Point 3 of Annex VIIa specifies certain minimum elements of information that must be available to final users in or with bills, with differing requirements depending on whether or not the bill is based on actual consumption or heat cost allocator readings. It is worth noting that final users who occupy parts of a building not equipped with individual meters or heat cost allocators, or those who rent their premises on a 'warm rent' basis, may never receive bills based on actual consumption or heat cost allocator readings. Indeed, in the case of 'warm rent' they may not even receive any energy bills at all, and none of the requirements in Article 10a or Annex VIIa would therefore apply.

Compared to Annex VII of the original EED, the new Annex VIIa is worded in a way that more clearly reflects the binding nature of the requirements it contains, for instance by leaving out qualifications like 'where appropriate' or 'preferably' ⁽³⁷⁾.

Annex VIIa also contains some entirely new elements, including an obligation for bills to contain 'information about related complaints procedures, ombudsman services or alternative dispute resolution mechanisms, as applicable in the Member States'. In transposing this requirement, Member States should publicly identify which, if any, ombudsman services or alternative dispute resolution mechanisms ⁽³⁸⁾ are legally competent to deal with complaints and disputes relating to metering, sub-metering, billing and cost-allocation, so that energy suppliers and other parties issuing bills can include this information on their bills.

9.3.1. Bills based on actual consumption/heat cost allocator readings

The individual information elements to be made available in or with a bill based on actual consumption or device readings are in part based on the existing Annex VII and in part new.

While not all need an explanation, a few aspects are worth highlighting.

As in the original EED, Annex VIIa point 3(a) refers to 'actual prices'. For final customers of district heating and cooling, this will typically imply specification of the total price to pay as well as its various components, such as consumption-related, capacity-related and fixed tariffs/prices. For sub-metering, this should include at least the individual's share of the heat cost to pay, together with the device readings and the totals for the building from which it is derived.

As regards comparison with consumption in the same period in previous years (point 3(c)), the obligation to make this available in graphic and climate-corrected form should be noted. In the light of data protection and privacy requirements (cf. also Section 7.5) this requirement should be understood to only apply to information about energy consumed by the current occupant, i.e. the same final user that the information must be made available to.

For the purpose of the climate correction, it may be necessary to make assumptions about the share of energy used for domestic hot water production where that energy is not measured separately from space heating needs. Moreover, location-specific or representative outdoor temperature data are necessary for calculating the heating degree days (HDDs) or cooling degree days (CDDs) that are used to perform the climate-correction. In order to be used for billing information purposes, such data need to be available without significant delays. Member States and parties responsible for providing billing information need to identify available sources of such data, which could conceivably be either national, regional, local or building-specific (if for example a building is equipped with an outdoor sensor from which measurements can be retrieved). They should also be transparent about the methodology used to perform the climate correction ⁽³⁹⁾.

As regards information about the fuel mix used, this will be relatively straightforward in most multi-apartment/multi-purpose buildings equipped with their own collective boiler, in particular where these are always operated using the same kind of fuel. Where boilers can be operated using multiple fuels or, for example, where they use pilot fuels when starting up, annual average values would be sufficient for compliance purposes. Where buildings are supplied from district heating or district cooling networks, the legal or physical person who is the final customer will by virtue of the same provision be entitled to receive information on the fuel mix used to provide the district heating/cooling service. In multi-apartment/multi-purpose buildings that information can in turn can be used ⁽⁴⁰⁾ to provide fuel mix information to the final users occupying each unit.

⁽³⁷⁾ In at least two cases, this has not been done consistently in all language versions. The Commission considers that a formal corrigendum should be issued to address these inconsistencies. The intention in the Commission's proposal was clear in this respect, cf. bullet 1.3.3 in Section 4.3.2 of the impact assessment (Commission Staff Working Document, SWD(2016) 405 final).

⁽³⁸⁾ Such as those listed here: <https://ec.europa.eu/consumers/odr/main/?event=main.adr.show2>

⁽³⁹⁾ There is no universal standard for how to calculate degree days, and in the absence of better alternatives Member States may wish to encourage or require the use of the methodology used by Eurostat: Cf. https://ec.europa.eu/eurostat/cache/metadata/en/nrg_chdd_esms.htm (Section 3.4).

⁽⁴⁰⁾ By whoever is responsible for informing the sub-metered consumers/final users, in accordance with the decisions taken by the Member States under Article 10a(3).

The means used to provide information on fuel mix can also be used to provide information on the share of renewable energy used in district heating and cooling, thus fulfilling in part the obligation of Member States under Article 24(1) of the revised Renewable Energy Directive (RED II) ⁽⁴¹⁾, which states that 'Member States shall ensure that information on the energy performance and the share of renewable energy in their district heating and cooling systems is provided to final consumers in an easily accessible manner, such as on the suppliers' websites, on annual bills or upon request'. The RED II does not define the term 'final consumers' but, in the Commission's understanding, the term 'final user', as it is used in the revised EED, fully covers the term 'final consumers' as used in Article 24(1) of RED II. In particular, both terms include occupants of individual units within multi-apartment/multi-purpose buildings supplied with district heating/cooling even if they have no individual or direct contract with the supplier ⁽⁴²⁾. Therefore, the billing and consumption information provision implemented under the EED can be used to provide information on the share of renewable energy used in district heating and cooling under RED II. This can be a cost-effective way of complying with the relevant provisions of both the EED and RED II, as fuel mix information must include the share of renewable energy where such energy is part of the fuel mix.

This way of meeting the requirements of the information provision on the share of renewable energy in district heating and cooling systems would be unequivocal and would thus avoid possible legal challenge, if the information on fuel mix would include the category of renewable energy (with possible specification of its type/s) in the fuel mix information, specifying a value of zero (0) in cases where there is no renewable component.

The fuel mix disclosure specifying the renewable component of the supply of heat or cold would not fully satisfy the requirements under Article 24(1) of RED II unless information about the energy performance of the district heating and/or cooling systems is also included.

As regards the way in which the information is provided, the requirements under EED Annex VIIa point 3(b) and RED II Article 24(1) are slightly different. The former is slightly stricter in the sense that fuel mix information must be provided 'in or with [final users'] bills' whereas the RED II allows the renewables share and energy performance information to be provided 'in an easily accessible manner' via the supplier's website or upon request. Conversely, the RED II requirement is slightly stricter in the sense that it applies to all final consumers whereas the EED requirement only applies in the context of billing based on actual consumption or heat cost allocator readings.

As regards information on the related annual greenhouse gas emissions, a number of issues arise depending on whether supplies come from a single fuel source, for example a collective gas or oil boiler in a building, or from a district heating or district cooling system. In both cases, attention must be paid to how and to what extent the impact of efficiency losses in the building or the network is reflected, and which indicators are used (i.e. absolute or relative/specific (kgCO₂e/kJ), aggregate or per apartment, etc.).

As a minimum, district heating and cooling operators must provide the network's annual average emissions per energy unit billed/supplied (i.e. including the impact of network losses), so that the corresponding absolute emissions for any given final customer can be calculated.

On this basis, or based on the building's own fuel consumption, sub-metered consumers can have information on their share of absolute emissions (kg) AND their relative/specific average emissions, e.g. reflecting district heating composition or fuel used, and where relevant, local renewable energy sources.

⁽⁴¹⁾ Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (OJ L 328, 21.12.2018, p. 82).

⁽⁴²⁾ This is explicit in the revised EED (cf. also Section 7.1). In the RED II, it can be inferred from the use of the narrower term 'customer' in Article 24(2), indicating the legislators' desire to differentiate the scope of the obligations contained in Article 24(1) and Article 24(2).

In any case, Member States may limit the scope of the requirement to provide information about greenhouse gas emissions to include only supplies from district heating systems with a total rated thermal input exceeding 20 MW. Where a Member State chooses to do so, this allows in particular small-to-medium sized district heating networks and sub-metered buildings with their own boilers to be exempt from the need to provide such information. It must be emphasised that this possibility to limit the scope of the information requirement does not apply for fuel mix information, it only concerns the related annual greenhouse gas emissions information.

In district heating or cooling systems where customers have the option to choose particular 'green' products sold as derived from a particular fuel mix (e.g. 100 % renewables) or with a particular greenhouse gas emission footprint differing from the system's average, this should be accounted for in order to avoid double-counting and misleading consumer information. Any such sales should be excluded when calculating the average fuel mix or GHG footprint for final customers. Not doing so would potentially constitute a breach of EU consumer legislation ⁽⁴³⁾.

Annex VIIa point 3(f) requires comparisons of the user's consumption with the consumption of an average normalised or benchmarked final user in the same user category, so Member States will have to develop or delegate the responsibility for developing adequate benchmarks and user categories. For sub-metering, sub-metering service providers could make relevant and accurate benchmarks available based on data from the buildings in their portfolios. For electronic bills, such comparisons may be made available online and should then be signposted within the bills themselves. For bills provided in paper copy, the comparisons must of course be included with the actual bill, as is the case for other elements that must be included.

9.3.2. *Bills not based on actual consumption/heat cost allocator readings*

It is currently common practice (at least in situations where remotely readable devices are not available) to base any regular/sub-annual bills on flat rate estimates of yearly consumption. Such bills do not need to include all the elements listed above, but must 'contain a clear and comprehensible explanation of how the amount set out in the bill was calculated, and at least the information referred to in points (d) and (e)' of Annex VIIa point 3. These requirements also apply in situations where bills are never based on actual consumption/heat cost allocator readings. This will be the case for individual final users in multi-apartment and multi-purpose buildings that are not-sub-metered, and where energy costs are passed on to the final users through recurring charges or heat cost accounting based exclusively on other parameters such as floor area, volume, etc.

⁽⁴³⁾ Cf. Also SWD(2016) 163 final, 25 May 2016: Commission Staff Working Document: Guidance on the Implementation/Application of Directive 2005/29/EC on Unfair Commercial Practices.
<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016SC0163>

