Study evaluating progress in the implementation of Article 7 of the Energy Efficiency Directive

Appendix 4: Policy Case Studies

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Table of contents

1 Introduction

Article 7 of EED allows Member States to establish either energy efficiency obligation schemes (EEOS) or alternative policy measures, to achieve their energy savings targets. Therefore Article 7 and Annex V requirements need to be sufficiently broad to address the characteristics of different types of the policy measures and sufficiently flexible to not disadvantage Member States that choose a certain policy mix.

This appendix provides an in-depth analysis of how Member States have implemented the requirements of Article 7 and Annex V at the policy level, for different types of policy instruments. The majority of the analysis presented in this appendix is based on the Article 7 notifications submitted by Member States **up to the 1 May 2015**. More recent changes to national policies will therefore not be captured in the analysis.

To ensure a balanced and representative assessment, the analysis has been carried out for four types of policy measures, focussing on the most successful policy measure types in terms of their expected contribution to the overall savings of Article 7. Together, they account for 79% of the total cumulative savings in the EU in 2020, as expected in the Member States' notifications.

The policy measure types were identified as follows:

1. Energy Efficiency Obligation Schemes (EEOS)
2. Energy or CO_2-taxes
3. Financing schemes or fiscal incentives
4. Regulations or voluntary agreements.

In the following sections, a case study is provided for each policy type. The case studies begins by describing how the policy instruments work, including the factors which influence their cost-effectiveness. Cost-effectiveness of the measures has been explored through a review of published literature on the measures types in general and is not specific to the instruments notified in accordance with Article 7. The case studies then provide a review of how Member States have implemented the requirements of Article 7 and Annex V, in relation to the specific policy measure. As part of this review, best-practice examples of how the requirements have been met are identified.

2 Energy Efficiency Obligation Schemes (EEOS)

2.1 Introduction

This section provides more detailed analysis of Energy Efficiency Obligation Schemes (EEOS) given the subject matter of Article 7. It provides a case study analysis of the EEOS that have been notified by Member States under Article 7, supplemented by a broader review of the literature.

2.1.1 Overview of policy instrument

Energy efficiency obligation schemes (EEOS) are mandatory schemes, established by a Member State, that place an obligation on energy providers to achieve savings amongst final consumers (Commission guidance). EEOS have first been implemented in the EU in the UK in 1994.

2.1.2 How the policy instrument works

The basic architecture of the policy instrument is as following: The government (usually a ministry) sets an energy savings target which has to be achieved by a number of obligated parties (usually energy producers, suppliers or distribution companies).

The obligated parties use a variety of means to deliver the target including direct provisions of energy efficiency improvements to end-users, working with contractors to deliver energy savings on their behalf, and collaborating with third-party actors such as municipalities.

The government (usually through the regulator) administers and monitors the EEOS. Some EEOS allow trading between the obligated parties and/or between the obligated parties and third parties, sometimes using white certificates which represent units of energy savings.

The cost of the EEOS are borne by the obligated parties which pass those on to end-users i.e. the general public.

2.1.3 Cost effectiveness of the policy instrument

A recent review of EEOS in France, Italy and the UK systematically analysed the cost-effectiveness of the schemes and showed that all three systems are highly cost-effective with the benefits in the form of energy cost savings by far outweighing the surcharge on energy bills.[1]

There is an emerging body of evidence on the cost of EEOS. For four countries the cost (including capital cost and administrative cost) have been as following:

- France: 0.4 Eurocent / kWh[2]
- Denmark: 0.45 Eurocent / kWh [3]
- Italy: 1.7 Eurocent / kWh [4]
- UK: 0.7 Eurocent / kWh [5]

The cost of EEOS are significantly below the price of energy which makes them highly cost-effective.

The cost of the scheme depends on the type of energy efficiency measures supported by the EEOS – a scheme promoting expensive measures incurs higher cost per unit of energy savings compared to a scheme that support low-cost measures. Furthermore, the administration of the scheme adds to the cost and the more complex an EEOS (e.g. more complex calculation methods, more sophisticated measures supported such as deep renovations and industrial energy efficiency projects) the higher its administrative cost are likely to be. However, the evidence on administrative cost suggests that those are very small compared to the overall cost of the scheme.

[1] Giraudet, L.-G., Finon, D. (forthcoming) European experiences with white certificate obligations: A critical review of existing evaluations. Economics of Energy & Environmental Policy
[2] Lees, E. (2012): Energy efficiency obligations – the EU experience. European Council for an Energy Efficient Economy
[3] ibid
[4] ibid
[5] Rosenow, J., Galvin, R. (2013): Evaluating the Evaluations: evidence from energy efficiency programmes in Germany and the UK. Energy & Buildings 62, pp. 450–458

For example, in the UK the administrative costs for the Carbon Emissions Reduction Target (CERT), an EEOS that ran from 2008 to 2012, were estimate to be around £1.4 million per year which is equivalent to about 0.1% of the costs to the energy suppliers to implement the obligation.[6] The succeeding scheme, the Energy Company Obligation (ECO) was estimated to lead to administrative costs of around £2.5 million per year plus £1.3 million for setting up the administrative systems as a one-off cost. Together, this is equivalent to about 0.2% of the cost to the energy companies.[7] Administrative costs elsewhere are of a similar range: Reviewing existing EEOS in Europe the European Commission estimates that overall administrative costs are around 0.002 Eurocent per kWh of energy saved.[8] Assuming a cost to the energy companies of 0.4-1.7 Eurocent per kWh of energy saved[9] this is equivalent to about 1-5% of the total cost of EEOS.

The effectiveness of EEOS depends on the level of the energy savings target (i.e. how ambitious the target is in terms of required energy savings) and whether or not compliance is ensured. Generally, EEOS can be highly effective as they set a mandatory target that has to be delivered in contrary to incentives where the outcome is uncertain.[10] However, this is only the case if compliance is ensured (through a robust monitoring and verification system and penalties).

2.2 Compliance with the Article 7 requirements

Article 7 and Annex V include certain requirements that need be taken into account by Member States when calculating the impacts of EEOS. Drawing upon real examples from the schemes that have set up in the different Member States, in the following sections we described “best practice” examples of how these requirements have been met.

2.2.1 Level of energy savings target

Annex V (4) (c) requires Member States to notify the level of the energy savings target for EEOS. When deciding on the size of the target Member States consider a range of factors that are taken into account.

In particular, the following factors are important:[11]

- Supply chain constraints
- Cost of EEOS

2.2.1.1 Supply chain constraints

The initial size of the target and the speed at which the target of EEOS can be increased is limited by the capacity of the supply chain to deliver the energy savings. In Member States with little experience it is likely that a staged approach of implementing EEOS will be more successful as it allows the supply chain to develop and grow with increasing targets. Experience from existing EEOS suggests that the target can be increased relatively quickly:

- In the UK it was doubled in 2005 and in 2008 followed by another increase of 20% (of the 2008 target) in 2009.
- In France, the target was increased by 640% from the period 2006-2009 to 2011-2014. The target form 2015-2017 is almost 100% larger than the 2011-2014 target, in France[12]
- In Italy the yearly targets increased by 100% every year from 2005 to 2007, almost by 300% from 2007 to 2008 and then increased by on average 20% until 2016.
- In Denmark the target increased by 100% from 2006-2009 to 2010-2012 and increased by 75% in 2013.

[6] DEFRA (2008): Explanatory Memorandum to the Electricty and Gas (Carbon Emissions Reduction) Order 2008. London
[7] DECC (2012): Final Stage Impact Assessment for the Green Deal and Energy Company Obligation. London
[8] European Commission (2011): Commission Staff Working Paper Impact Assessment accompanying the document Directive of the European Parliament and of the Council on energy efficiency and amending and subsequently repealing Directives 2004/8/EC and 2006/32/EC {COM(2011) 370 final} {SEC(2011) 780 final}
[9] Lees, E. (2012): Energy efficiency obligations – the EU experience. European Council for an Energy Efficient Economy
[10] Experience shows that the obligated targets meet their targets.
[11] Note that the list if not exhaustive but covers key issues that in our view deserve consideration. Which factors Member States consider is in the end a political choice.
[12] Trauchessec, E. (2014) The French Energy Saving Certificate scheme in the Transport sector. Presentation at Third Project Workshop “Monitoring of energy efficiency in the EU” ODYSSEE-MURE 25/26 September 2014 Zagreb, Croatia

Energy suppliers consistently had met their targets even though the targets were increased substantially from one period to another. In the UK some energy suppliers missed their targets in 2012 but this was mainly related to the difficulties around finding low-income households that were willing to receive insulation measures (due to the requirement to do EE measures with the low income households). The target size was not the main reason for missing the targets – overall the energy companies achieved 101.3% of the overall EEOS target.[13]

2.2.1.2 Cost effectiveness

The costs of the EEOS are ultimately born by the final customers as energy companies pass on the costs of delivering the obligations to their customers via a surcharge on bills as they do with any other cost. This suggests that there is a limit to the amount of cost that can be raised via energy bills (assuming customers are only able and willing to pay for a certain level of cost) which determines the maximum size of the target. In addition, raising revenues for energy efficiency programmes via the energy bill, which is the case with EEOS, is by default regressive if cost pass through is unregulated.[14]

Regressive impacts (i.e. where low-income consumers pay a proportionally larger share of their disposable income to the cost of the EEOS) can be counterbalanced and reduced by progressive delivery of measures by allocating a large proportion to low income customers. A comprehensive analysis of the extent to which this has been achieved is missing, but given that most households received energy efficiency measures in the past and that these were generally highly cost effective, all income groups benefitted.[15]

In the UK, the impact of EEOS on consumers' energy bills has been systematically assessed since their inception in 1994 in the various impact assessments carried out by government. Evaluations[16] have shown that over time the cost of the Obligations are not only recouped but consumers are better off as they benefit from reduced energy bills. Recent analysis conducted by the UK Government assessing the impact of energy and climate policies on energy bills (2013, p. 11) concludes that 'in 2020 households are estimated on average to save around 11 % […] on their energy bills compared to what they would have paid in that year in the absence of policies'[17].The effect of EEOS over the period 2002-2012 led to a reduction of about 7% of the average household energy bill.[18]

To conclude, if the benefits of the EEOS in the form of energy efficiency measures are shared widely across customers, over time most customers will benefit from lower energy bills as the savings more than compensate the cost.

2.2.2 Eligible measure categories

Annex V (4)(e) requires Member States to notify as part of their detailed methodology the eligible measures categories. Eligibility can apply to be individual actions and policies measures. For an action or measure to be eligible it needs to satisfy the necessary conditions set out in the Directive. In particular, it needs to deliver energy savings to final consumers i.e. end use energy savings (Article 7(1)).

Therefore a good practice in meeting this requirement would be that a Member State's notification of the methodology contains a list of the actions that are targeted by the EEOS, identifies those measures and individual actions that are eligible in relation to the achievement of the required savings amount under Article 7. Where the action is not a typical energy efficiency measure (for example in the case of renewable energy technologies) the Member State should provide a description of how the action delivers end-use energy savings. The list of eligible measures under the EEOS should be published – good examples can be found within the Irish[19], French[20] and British EEOS[21].

Typical measures that have been promoted by the EEOS in the past include:

[13] Ofgem (2013): The final report of the Carbon Emissions Reduction Target (CERT) 2008-2012. Ofgem: London
[14] For a comprehensive discussion of this issue see Rosenow, J., Platt, R., Flanagan, B. (2013): Fuel poverty and energy efficiency obligations. The case of the Supplier Obligation in the UK. Energy Policy 62, pp. 1194–1203
[15] Rosenow, J, Croft, D., Eyre, N. (2013): Energy policy in transition: evidence from energy supply and demand in the UK. Proceedings of ECEEE Summer Study 2013, pp. 439-447
[16] e.g. Lees, E. (2006). Evaluation of the Energy Efficiency Commitment 2002–05. Wantage, Eoin Lees Energy and Lees, E. (2008). Evaluation of the Energy Efficiency Commitment 2005–08. Wantage, Eoin Lees Energy.
[17] DECC, (2013a). Estimated impacts of energy and climate change policies on energy prices and bills. London, DECC.
[18] ibid.
[19] http://www.seai.ie/EEOS/Energy-Saving-Credits-Table.pdf
[20] www.developpement-durable.gouv.fr/1-le-secteur-du-batiment.html
[21] https://www.ofgem.gov.uk/publications-and-updates/eco1-measures-tables

- energy efficient appliances;
- energy saving lightbulbs;
- building insulation;
- heating and cooling system upgrades; and
- cross-cutting industrial measures (e.g. energy efficient motors).

In practice, most EEOS usually target low-cost energy savings measure for the following reasons:

- low-cost measures (for example, appliances, lighting, loft insulation) usually can be standardised more easily (opposed to high-cost / more complex measures) in terms of the technical specifications;
- standardised measures enable a streamlined monitoring and verification regime – deemed savings (benchmarks) are used based on representative samples[22];
- usually the cost of delivering energy efficiency obligations are passed on to customers and delivering high-cost measures to a relatively small number of households paid for by all customers has social equity implications in that the costs and benefits are shared very unequally;
- targeting low-cost measures allows policy makers to argue that the benefits in terms of cost savings the benefits of low-cost measures in terms of energy cost savings outweigh the costs in form of increased energy bills so overall customers benefit.

However, the UK modified their energy efficiency obligations scheme in 2013 as part of the Energy Company Obligation (ECO). Despite the success of the previous obligations in place (CERT and CESP), the UK government decided to radically overhaul the existing system at an unprecedented pace. Energy savings obligations were supposed to be directed primarily towards high-cost measures such as solid wall insulation and hard-to-treat cavity wall insulation. This was reversed in the second year of ECO following a public debate around the negative impact on energy prices of so-called 'green levies' paid for environmental policies such as ECO. In October 2014 it was confirmed that low-cost measures such as loft and cavity wall insulation would become eligible for a much larger share of ECO to reduce the cost of the EEOS. In addition, the overall target was reduced by about 25%.

In summary, energy efficiency obligations have largely targeted low-cost measures in the past and recent attempts to include high-cost measures were reversed in the UK.

Table 1 provides an overview of the measures implemented or expected to be implemented in Member States using EEOSs.

Table 1: Measures implemented as part of EEOSs (as of October 2015, based on Member States' notifications, NEEAPs and their replies to EU Pilots)

Country	Measures
Austria	scheme is operational but no data available yet on the types and share of measures • 40 % of the measures must be implemented in households
Bulgaria	no data on share of measures available. The following measures have been installed by obligated parties:[23] • building renovation measures • transition to natural gas • smart grids (remotely managed distribution systems, automatic stop switches, etc.) • replacing electricity distribution grid elements with components with better technical characteristics

[22] Ideally randomised control trials of energy efficiency measures should be carried out to derive the typical energy savings of specific measures.
[23] Ministry of Energy (2015): Annual Report on the Implementation of the National Energy Efficiency Action Plan 2014–2020

Croatia	• scheme is planned to be operational in 2016 and no indication of types of measures so far
Denmark	data for 2013:[24] • 30% heating system measures • 20% process equipment measures • 19% insulation measures • 8% ventilation measures • 2.5% lighting measures • 2% appliances measures • 1.5% cooling measures • 17% other measures
Estonia	• scheme is expected to be operational in 2018 and there is no indication of the types of measures so far
France	data for 2014:[25] • 42% insulation measures • 40% heating system measures • 18% other measures (mainly building services)

Ireland	no data available yet on share of measures
	• 25% of measures need to be delivered in residential sector of which 5% have to be delivered in fuel poor households):
	  ○ Insulation measures (no data on share of measures available yet)
	  ○ Heating system measures (no data on share of measures available yet)
	• 75% of measures in non-residential sector
	  ○ no restrictions on type of measures (no data on share of different measures available yet)

Italy	data on period 2005-2012:[26] • 37% insulation measures • 33% Solar thermal for DHW • 18% heating system measures • 11% lighting measures
Latvia	no data available yet as scheme not operational yet; majority of measures expected from household sector; list of expected measures includes: • Heat insulation of buildings • Installation of heat controllers and meters in apartments • Informing of consumers about heat adjustment options • Installation of solar collectors for heating of premises and water heating (NB: this specific measure cannot be counted towards art.7 (renewable energy, not energy saving)) • Installation of heat pumps • Installation of heating boilers with better energy efficiency parameters (to be counted when above minimum efficiency requirements)

[24] http://enspol.eu/sites/default/files/results/D2.1.1%20Report%20on%20existing%20and%20planned%20EEOs%20in%20the%20EU%20-%20Part%20I%20Evaluation%20of%20existing%20schemes.pdf
[25] https://ec.europa.eu/energy/sites/ener/files/documents/FR_Annual%20Report%202015_en.pdf
[26] http://enspol.eu/sites/default/files/results/D2.1.1%20Report%20on%20existing%20and%20planned%20EEOs%20in%20the%20EU%20-%20Part%20I%20Evaluation%20of%20existing%20schemes.pdf

	• Installation of heat recuperation systems • Replacing of electrical devices (refrigerators, electric stoves etc.) • Replacement of lighting fixtures • Introduction of automatic lighting control and management systems • Replacement of electric motors, pumps and other devices • Introduction of energy management system (ISO 5000.1) • Services provided by energy service companies (ESCO)
Lithuania	no data available yet on share of measures key categories of EE measures will be identified after approving the Catalogue of energy efficiency improvement measures and resulting savings has been developed[27]
Luxembourg	no data available yet on share of measures; the following measure types are expected:[28] • 9 building-related measures • 4 measures on appliances • 1 measure relating to the installation of a block-Strip "cut-sleep" • 4 measures in lighting • 1 measure relating to the installation of high efficiency motors • 2 measures for circulation pumps • 2 ventilation related measures • 4 measures on compressed air • 2 measures for industrial boilers • 2 measures for refrigeration systems • 1 measure relating to the implementation of an energy management system ISO 50001 • 2 measures in the transport sector
Malta	no data available yet on share of measures; the following measure types are expected:[29] • smart meters • adjusted tariffs
Poland	no data available yet on share of measures; the following measure types are expected:[30] • insulation of industrial installations • refurbishment of buildings • modernization of: a) appliances intended for household use, b) lighting, c) appliances serving individual needs, d) appliances and installations used in industrial processes, e) local heating grids and heat sources • waste heat recovery in industrial processes • curb of: a) reactive power flows, b) grid losses, e.g. in electrical networks, oil- and gas pipe systems, c) losses in transformers • heating or cooling facilities with energy produced in own RES or those connected to the grid (within the meaning of the Energy Law Act of 10

[27] State Enterprise Agency (2015): 2013 Progress Report on the Implementation of the National Energy Efficiency Targets
[28] Response of Luxembourg to the EU Pilot
[29] Notification from Malta on Article 7
[30] http://enspol.eu/sites/default/files/results/D2.1.1%20Report%20on%20existing%20and%20planned%20EEOs%20in%20the%20EU%20-%20Part%20I%20Evaluation%20of%20existing%20schemes.pdf

	April 1997), useful heat in cogeneration (as above), or waste heat from industrial installations
Slovenia	no data available yet on share of measures; the following measure types are expected:[31] • insulation measures • solar panels • heat pumps • heating system measures • CHP • upgrades of heating plants for district heating • electric vehicles • energy efficient tyres • lighting • optimisation of industrial processes • energy efficient motors • frequency changers • energy management schemes and energy audits • smart meters
Spain	no data available yet on share of measures; the following measure types are expected:[32] • energy management schemes and energy audits • optimisation of industrial processes • improvement of urban mobility and transport for businesses • management of road transport fleets • efficient driving for driving school instructors • efficient driving for drivers of industrial and private vehicles • electric, natural gas and hydrogen vehicles • infrastructures for recharging electric vehicles • promote rail transport for passengers and goods • promote maritime transport of goods • management of transport infrastructures • insulation measures • heating system measures • lighting • improvement of the energy efficiency in the existing lift installations in buildings • improvement of the energy efficiency of existing data centres • energy efficient appliances • smart meters • improvement of the energy efficiency of district heating and cooling • improvement of the energy efficiency of current residual water treatment, storage and processing and desalination
UK	data on period April-August 2015:[33] • 72% insulation measures • 28% heating system measures

[31] Response from Slovenia to EU Pilot
[32] Notification from Spain on Article 7
[33] https://www.ofgem.gov.uk/environmental-programmes/energy-company-obligation-eco/energy-company-obligation-eco-public-reports?utm_source=OFGEM&utm_medium=email&utm_campaign=102182_ECO%20Newsletter%20issue%203&utm_content=ECO_Compliance_update_title_link&dm_t=0%2C0%2C0%2C0%2C0

2.2.3 Banking and borrowing

Art. 7(7)(c) provides Member States with the opportunity to allow obligated parties to count savings obtained in a given year as if they had instead been obtained in any of the four previous or three following years. This is a mechanism also known as banking and borrowing.

Banking can help to avoid 'stop-go' cycles with negative impacts on the energy efficiency industry as it provides an incentive for obligated parties to over-deliver their target knowing that they can use the surplus savings in the next obligation period. A number of Member States have implemented banking as part of their EEOSs.

Examples for banking and borrowing include Italy and Denmark. Borrowing for one year is implicitly allowed in Italy, where a one-year grace period exists if at least 60% of the annual target is met. In Denmark annual savings targets for sectors represent an average over the three year obligation period and over- and under-coverage can be transferred between individual years. The deficit at the end of a calendar year may not exceed 35% of the year's average annual target.

2.2.4 Social aims

Article 7(7)(a) provides Member States with the option to include requirements with a social aim in the saving obligations they impose through including a requirement that a share of energy efficiency measures has to be implemented in households affected by fuel poverty or in social housing.

There are various options of integrating social aims in EEOSs including a) defining a share of energy savings to be delivered in specified geographical areas that are characterised by a high degree of deprivation and fuel poverty and b) defining a share of energy savings to be delivered to households on low-incomes. The measurement of fuel poverty is very complex which is why so far it has proven difficult to establish whether or not individual households receiving support from EEOSs are in fuel poverty.[34]

- Historically only the UK has used EEOS widely for this purpose (although France introduced the option to support fuel poverty programmes as part of their EEOS as well). Since the beginning of EEOSs in 1994 there have been provisions with social aims, although initially on a voluntary basis.[35] The current EEOS requires that: about 1/3 of the total energy savings is delivered in the poorest areas (25% lowest areas on the Index of Multiple Deprivation); and
- £3.7bn of lifetime savings need to delivered within a group of households who receive certain state benefits.

2.2.5 Calculation of energy savings

Article 7(6) requires that Member State ensure that the savings stemming from the notified policy measures are calculated in accordance with parts (1) and (2) of Annex V.

2.2.5.1 Measurement methods

Annex V (1) sets out four common methods which should be used (by selecting the appropriate method) for calculating the impact of the measures implemented under the EEOS or alternative policy measures. Each method includes a number if provisions that should be taken into account depending on the type of method:

- For **deemed savings** – that the values are based on the results of previous independently monitored energy improvements in similar installations.
- For **metered savings** – that savings *take due account* of certain factors which can lead to differences in the level of savings from one application to the next (e.g. occupancy levels).
- For **scaled savings** – the savings are estimated on the basis of nationally established methodologies and benchmarks by qualified or accredited experts.
- For **surveyed savings** - only be used for savings resulting from changes in consumer behaviour.

Therefore, good practice in the notification of the measurement methods would involve demonstrating how these conditions have been met.

[34] Rosenow, J., Platt, R., Flanagan, B. (2013): Fuel poverty and energy efficiency obligations. The case of the Supplier Obligation in the UK. Energy Policy
[35] For a detailed analysis of the history see Rosenow et al. (2013).

Generally, different methods are appropriate for different types of projects. For large projects (e.g. in industry) direct monitoring of the savings may be a sensible approach as the cost savings can justify a more sophisticated measurement approach (for example metered savings). However, many EEOSs focus on smaller projects and often are very similar (e.g. insulation measures in domestic buildings).

If such standardised measures are the main focus, the use of deemed savings is often the preferred option because it allows benchmarks to be set by the regulator / the government based on statistical evidence on energy savings for specific measures.

Table 2 shows which measurement methods were notified by MS for the EEOS. It is clear from the table that most MS (13) chose to use deemed savings, 6 use scaled savings and 5 metered savings. Only one MS (Latvia) uses surveyed savings (in this case for measuring the effects of information campaigns).

Table 2: Measurement methods adopted by MS for the EEOS

	Deemed savings	Scaled savings	Metered savings	Surveyed savings	Not clear
Austria	✓				
Bulgaria					✓
Croatia		✓			
Denmark	✓	✓			
Estonia	✓				
France	✓				
Ireland	✓	✓	✓		
Italy	✓	✓	✓		
Latvia	✓	✓	✓	✓	
Lithuania	✓				
Luxembourg	✓				
Malta	✓				
Poland		✓	✓		
Slovenia					✓
Spain	✓				
UK	✓				

An example of best-practice is Ireland. The deemed savings are clearly listed on the website of the administrator of the EEOS[36] stating a) the type of measures in detail and b) the savings that can be assumed for each measure (separate for houses and apartments). However, the lifetimes of the measures are missing making it difficult to calculate the lifetime savings without further sources on lifetimes.

[36] http://www.seai.ie/EEOS/Energy-Saving-Credits-Table.pdf

2.2.5.2 Additionality

Annex V point (2)(a) requires that when calculating energy savings, only the savings that go beyond the minimum requirements originating from specific EU legislation can be counted as contributing towards the energy savings target.

Particularly important are the provisions of the Eco-design Directive which cover the energy performance of energy-using products. EEOS often promote energy efficient appliances which fall under the scope of the Eco-design Directive. For the purpose of the EED, only those savings that are additional to the minimum energy performance requirements laid down by the Eco-design Directive can be counted towards the target under Article 7. This means that Member States should establish higher standards for energy performance of appliances supported by EEOSs than the minimum level set by the Eco-design Directive. Another important EU Directive with relevance for additionality is the Energy Performance of Buildings Directive (EPBD). to The Commission provided further explanation to the Members of the EED Committee (on 16 September 2015) as regards the additionality to national building codes, the Commission confirmed that cost-optimal levels for energy efficiency in new buildings should be considered as mandatory and applicable under EU law. Member States can count energy savings, which result from the application of national building codes which are more stringent than the national cost optimal level established/calculated under Article 5(2) of the EPBD.

Furthermore, EEOS need to support energy efficiency improvements which are additional to those improvements that would happen in the absence of EEOS. A good example is the acceleration of renovation rates. At the same EED Committee of 16 September 2015, the Commission also explained that Member States need to establish as baseline (i.e. how many renovations care carried out without the policy instrument). Any increase in the renovation rate achieved by the policy instrument can be counted as energy savings. It follows that additionality of EEOS can be partly addressed by setting a target of the right size. For example, in the UK it is estimated that about 50,000 cavity walls would be insulated every year without any policy support.[37] Hence setting a target to insulate 50,000 cavity walls per year would simply require energy companies to support those 50,000 households who would have done it even in absence of the EEOS. In other words, free-rider effects would be 100% of the total savings with no additional savings generated compared to having no EEOs in place.

It is impossible to support no free-riders as it is not practicable to determine whether or not someone is a free-rider or not. This suggests that the target needs to be set at a level sufficiently high so that measures that are additional to the uptake rate before the implementation of EEOSs are incentivised. The higher the target the less likely it is that a large proportion of free-riders are benefitting from EEOSs or in other words the higher the target the smaller the share of the savings taken up by free-riders. This is because the number of free-riders is likely to be constant and if the target requires support of a much larger number of beneficiaries than the number of free-riders the share of savings from free-riders is lower compared to a situation where the target is so low that just the free-riders are supported.

In France the EEOS has recently been reviewed to adapt it to requirements of with EED.[38] This includes an adjustment of the deemed savings used for the catalogue of standard measures eligible under the French White Certificate scheme. For instance, savings that would happen anyway (for example due to the Eco-Design Directive) are no longer eligible as part of the EEOS. The deemed savings for a range of measures falling under EU minimum requirements have been reduced accordingly in order to reflect the need for any savings to be additional to EU minimum requirements (in this case the baseline is the market average in France). Savings from products covered by the Eco-Design Directive are now separated into one part of savings required under the Eco-Design Directive and one part of savings eligible under the EED (any savings additional to the Eco-Design Directive requirements). For the purpose of counting savings towards the Article 7 target only the portion of savings eligible under the EED additionality provisions is used. The Eco-Design Directive-related savings are not counted.

2.2.5.3 Materiality

Annex V, point (2c) requires that the energy efficiency measures must be demonstrably material to the achievement of the claimed savings. According to the Commission Guidance note (paragraph 33), the term “material” means that the party in question (i.e. obligated party or a third party participating in the EEOS on behalf of the obligated party) has contributed to the realisation of the specific individual action

[37] Rosenow, J. (2012): Energy Savings Obligations in the UK – A History of Change. Energy Policy 49, pp. 373–382
[38] Osso, D. (2015): Policy interactions between European directives and the French white certificate scheme or how to give the right signal to the residential refurbishment market. Proceedings of the eceee Summer Study 2015

(in excess of the automatic rolling out of EU legislation, or autonomous improvements because of, for example, market forces or technological developments).

The requirement was introduced to ensure that the activities of the party in question have contributed to the realisation of the specific individual action, and that the subsidy or involvement of the obligated, participating or entrusted party had a significant effect on the end user's decision to undertake the energy efficiency investment (i.e. without the involvement of the obligated party the energy efficiency measure would not have been carried out). For example, a contribution by the obligated party of only 1% of the total cost of the measure is unlikely to be significant enough whereas a contribution of 50% clearly is significant. There are no definitive guidelines for what can be deemed significant.

Issues related to materiality mainly arise because most Member States do not provide any information on the matter and how it is ensured that the EEOS make a material difference to end-use savings. In particular, the share of the contributions to the investment cost of energy efficiency measures is in most cases not clear, although this relates to existing schemes where this data exists.

An example of best practice is Ireland which has addressed the requirements that the energy efficiency measures must be demonstrably material to the achievement of the claimed savings by demanding a joint declaration of obligated parties and their service partners when carrying out residential projects. This declaration has to be provided before the energy efficiency improvements are carried out. For non-residential projects the regulator has developed an online platform that needs to be used by obligated parties and includes the need for the beneficiary to sign a declaration confirming that the obligated party has been involved in the execution of the project and has been material to the achievement of the claimed savings.[39]

2.2.5.4 Policy overlaps

Article 7(12) and Annex V (2)(d) require Member States to ensure that when the impact of policy measures or individual actions overlaps, no double counting of energy savings is made. However, there is no specific requirement to notify how overlaps/double counting is addressed.

EEOS often do not operate in isolation and there are other policy instruments in place that support the same energy efficiency improvements. Where this is the case there is the risk of policy overlaps i.e. two or three policy instruments support the same energy efficiency measures. Overlaps are not necessarily problematic and there can be good reasons for why a range of policy instruments is chosen to support energy savings in the same sector. An example is the French EEOS which is closely linked to tax rebates. Households typically receive a contribution from the tax rebates and the EEOS. If the savings were counted twice (for EEOS and for tax rebates) this would qualify as double counting which is not permitted under Article 7.[40]

There are different options to address such policy overlaps:

- The savings can be apportioned among the overlapping policy instruments. For example, 70% of the savings are allocated to policy instrument 1 and 30% of the savings are allocated to policy instrument 2. A simple basis for the apportioning is the relative financial contribution to the investment cost of the supported energy efficiency measures. However, this information may not always be available and splitting the energy savings is not straightforward in all cases particularly when different entities are responsible for administering and monitoring the policy instruments.
- The savings can be attributed only to one of the policy instruments whereas the other policy instrument(s) are assumed to deliver no savings at all. A good example is Denmark which only counts savings from the EEOS but not from other policies that also deliver energy savings.
- The beneficiaries of the policy measures are only allowed to use one type of incentive provided from one policy instrument.

Two last methods are compliant with the Directive as they avoid double counting of savings.

A good example of best-practice is Italy which has introduced provisions that avoid double counting using approach No 3 outlined above. With effect from 1 January 2013 it is forbidden to use more than one national incentive scheme for the same project (including EEOS, the tax deductions and the Thermal Account). The implementing public authorities of the three policy measures – namely the

[39] SEAI (2014): Energy Efficiency Obligation Scheme Ireland - Guidance Document - Version 2 final - 22nd May 2014. Dublin: SEAI
[40] Note that France addresses this problem by not using tax rebates for the purpose of Article 7 so all savings are allocated to the EEOS.

Manager of Electricity Services (GSE) for both EEOS and Thermal Account and Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) for tax reductions – perform the necessary checks on the obligated parties holding white certificates to ensure that they do not get other national incentives. GSE, responsible for EEOS and Thermal account, carries out these checks by its own means and the possibility of building a database is currently weighed up. For what concerns tax reductions, ENEA manages a database and checks for congruity the savings claimed to access the fiscal incentive, while the Revenue Agency (Agenzia delle Entrate) performs tax spots-checks. Beneficiaries of the Thermal account incentive scheme must declare in the application form that they have not claimed any other national incentives. In case of non-compliance, they are prosecutable. The prohibition of combining different national incentives, entered into force on 1 January 2013, has resulted in a severe decrease in the overall number of projects submitted.[41]

2.2.5.5 Lifetime of measures

Annex V point (2)(e) requires Member States, in their calculation of energy savings, to take into account the lifetime of savings. This may be done by counting the savings each individual action will achieve between its implementation date and 31 December 2020 (i.e., straightforward approach). Alternatively, Member States may adopt another method that is estimated to achieve at least the same total quantity of savings.

Most Member States have adopted the straightforward approach (Austria, Bulgaria, Estonia, France, Italy, Latvia, Luxembourg, Malta, Poland, Spain and UK), two Member States use first year savings only (Denmark, Ireland) and for three Member States it is not clear yet (Croatia, Lithuania, and Slovenia).

Common issues identified from the notifications are a) the lack of any information on lifetimes, b) only reference that lifetimes have been taken into account but no indication of actual lifetimes used, c) vague definitions of lifetimes (e.g. wide range), and d) unjustifiable lifetimes.

Good practice can be found in the French notification. France has established a detailed and comprehensive list of eligible actions (grouped according to target sectors). Each action has an assigned lifetime, even though it is only referred to in the notification. The list of standard energy saving actions is made public at the website[42] of the responsible ministry.

2.2.6 Quality standards

According to Annex V point (2)(g) Member States are required to maintain quality standards for products, services and installation of the energy efficiency improvement measures. This includes introducing relevant quality standards, where they are absent, and monitoring compliance with the standards. In all cases, monitoring should be conducted independently.

Quality standards can be achieved in a variety of ways, for example through:

- technically monitoring a statistically significant sample of recipients of energy efficiency measures (common for insulation installations);
- customer satisfaction monitoring of a statistically significant sample of recipients of energy efficiency measures, often required of energy providers for heating and insulation installations in properties;
- customer utilisation monitoring of a statistically significant sample of recipients of energy efficiency measures, which ensures that the measures are being used and that energy savings are actually being realised;
- using an approved list for specific energy efficiency measures;
- appliances and products carrying an energy label; products with specifications for performance such as specific U-values compliant with the national or European standards; and
- ensuring that installers use national best practice guides regarding the installation of energy efficiency measures like insulation and heating.

[41] Based on the country report for Italy.
[42] visit http://www.developpement-durable.gouv.fr/- Operations-standardisees-.html

In submissions from MS there is often no information provided on quality standards or it lacks sufficient detail. Also, even if there are quality standards there enforcement needs to be ensured through quality checks and inspections of energy efficiency improvements carried out.

An example of good practice regarding quality standards is the UK. A specification, known technically as PAS 2030, sets out requirements that installers will follow to ensure that the installation of new energy efficiency measures are completed properly. PAS 2030 is a mandatory document to be used in the installation of energy efficiency measures under the EEOS. PAS 2030 addresses topics such as installation methods and quality control, installer operative competence, equipment, inspections, handover and corrective action procedures. It has been developed by an expert working group bringing together the views of government, trade associations relating to the construction, building, energy and manufacturing sectors, businesses and consumers.

2.2.7 Monitoring, reporting and verification

Article 7(6) sets requirements with regards to the monitoring and verification of savings delivered by EEOSs. In particular, the provision requires the Member States to put in place measurement, control and verification systems that ensure verification at least a statistically significant proportion and representative sample of the energy efficiency improvement measures. The independence of the monitoring and verification systems from the obligated parties must be ensured.

Monitoring and verification encompasses a range of elements:

- reporting;
- audits;
- validation; and
- penalties.

2.2.7.1 Reporting

Article 7(8) requires that the obligated parties provide an annual report of the achieved energy savings which needs to be made publically available. Reporting is also necessary so that Member States can monitor and verify the savings as required by Article 7(6).

Obligated parties typically report to the entity responsible for monitoring that EEOS are delivered. This can be the regulator, a government department or agency.

Without robust reporting it is impossible for the administrator of the EEOS to monitor progress and ensure that the obligated parties deliver their obligations in line with expectations. The reports can also be used for the purpose of desk-based compliance checks and cross-checks that the same beneficiary does not claim for the same energy efficiency improvement twice.

Best-practice includes a specification by the Member State what information and data are expected from the obligated parties to be provided (at least once a year) in the reports, when reports are due, and putting in place sanctions in case of not respecting the reporting requirements. Member States shall make these reports public on an annual basis.

An example of a well-designed reporting regime (of the EEOS in the UK) is provided below.

Box 1: Reporting in the UK

Energy suppliers have to report on a monthly basis to Ofgem and notify them of the installed measures. When they report to Ofgem they need to supply information on:[43]

- the name or ECO reference of the obligated supplier (i.e. licence-holder) that promoted the installation of the completed measure;
- the address at which the measure was installed;
- the type of measure installed;
- the date on which the installation of the measure was completed;

[43] http://www.ofgem.gov.uk/Sustainability/Environment/ECO/guidance/Documents1/Energy%20Companies%20Obligation%20%28ECO%29%20Guidance%20for%20Suppliers%20-%2015%20March.pdf

- the obligation element (CSO, CSCO, AF) the measure is intended to be credited towards; and
- the carbon or cost saving as appropriate.

In addition to the monthly reports energy suppliers need to hold detailed paperwork as proof of the installed measures. This paperwork includes but is not limited to:

- specification of the measure;
- evidence of the supplier's payment;
- if recommended measure Green Deal Advice Report produced following a qualifying assessment or report by a chartered surveyor;
- contractual agreement with installer;
- declaration of completed installation, completed and signed by the installer and customer;
- details on savings calculation method; and
- evidence of households receiving benefits (if in AW group).

The paperwork does not need to be submitted to Ofgem but can be audited.

Ofgem publishes monthly updates on progress on its website.[44]

2.2.7.2 Auditing

Article 7(6) requires Member States to verify at least a representative sample of the energy efficiency improvement measures put in place by the obligated parties.

In order to do this, the organisation responsible for checking that the EEOS are delivered in line with the requirements needs to carry out audits of the reports submitted by the obligated parties (otherwise those could claim savings that cannot be substantiated). Credible audits need to be conducted by independent bodies and not by the obliged parties.

Issues identified with regard to audits and EEOS include a) no information in MS submissions on audits, b) only sparse information on auditing provided (e.g. it is mentioned that audits will be carried out but not how), and c) the audits are not carried out independently from the obligated parties.

An audit may be purely desk-based checking the paperwork has been provided. Alternatively, visits of individual projects may be undertaken. One way of doing this is to require the obligated parties to carry out technical monitoring of the promoted measures. This should be done by an independent third party with no vested interest in the outcome of the monitoring.

MS often do not specify whether or not technical monitoring is carried out or do not provide detailed information on what it entails. Ideally, MS would specify:

- the proportion of measures that are technically monitored;
- who carries out the technical monitoring;
- what happens as part of technical monitoring; and
- how independence of the technical monitoring is ensured.

A good practice example is provided below.

Box 2: Audits in the UK

Suppliers have to monitor 5% of all installed measures making sure they meet the technical standards. Technical monitoring must be undertaken by a suitably qualified third party, who is independent from the supplier, installer, or any other party involved in the installation of the measure. Technical monitoring involves site-based visits, commissioned by the supplier.

Technical monitoring must be undertaken by a suitably qualified third party, who is independent from the supplier, installer, or any other party involved in the installation of the measures.

During the technical monitoring the surveyor checks:

- whether the property, measure and materials used are as notified by the supplier;

[44] https://www.ofgem.gov.uk/environmental-programmes/energy-company-obligation-eco/energy-company-obligation-eco-public-reports

- whether the measure has been installed in accordance with the relevant standards of installation; and
- whether the measure is eligible to be claimed as a qualifying action (i.e. meets the requirements of the law).

Note that the monitoring does not include monitoring of energy consumption and is purely about the relevant quality standards. Depending whether the monitoring results of the first 9 months show a high failure rate (above 5%) suppliers have to continue with monitoring 5% of all installed measures or can reduce this to just 1%.

2.2.7.3 Validation of achieved (real) savings

Most evaluations of EEOSs rely on estimated energy savings rather than metered savings due to the high cost of metering of individual buildings and facilities. There is a risk that if the assumed energy savings from specific technologies are too optimistic the real impact of EEOSs is significantly less than calculated and claimed.

A source of discrepancy between estimated and actual energy savings is related to the technical quality of energy efficiency measures. This is also known as the 'performance gap'. In addition, engineering models often assume a specific energy consumption prior to the energy efficiency intervention which is often based on an assumed indoor temperature and building physics. In reality the actual energy consumption can be much lower as studies have shown. If the energy savings resulting from an energy efficiency improvement are calculated based on an inflated energy consumption this leads to an overestimation of the actual savings generated. This is known as the 'pre-bound effect'.[45]

A good example for validating the deemed savings estimates (i.e. to ensure the assumed savings are realistic) is the UK's National Energy Efficiency Database (NEED) framework. NEED contains a large data sample of domestic buildings, their energy consumption and energy efficiency measures installed. It also includes data about property attributes and household characteristics, obtained from a range of sources. NEED allows for comparisons between a control group of buildings with no energy efficiency measures installed and a treatment group with certain energy efficiency measures installed. Using statistical methods NEED provides estimates for typical savings from individual energy efficiency measures for different types of properties.

NEED is used to refine the deemed savings used by the regulator and the obligated parties. Over time and with increasing evidence the deemed savings estimates are modified to reflect the best available evidence. For a review of the practices in the UK to review and validate deemed savings scores see Rosenow and Galvin (2013).[46]

A good example of the validation of energy savings is the French EEOS. 95% of all energy savings delivered by the French EEOS are the result of so-called about 300 Standardised Actions.[47] The savings are determined using standardised operation sheets developed by the Technical Energy-Environment Association (ATEE), which brings together the schemes stakeholders. Each sheet contains information:

- eligible end-use application;
- brief description of the measure, its applicability, and any relevant technical standards;
- requirements concerning installation of measure;
- measure lifetime; and
- deemed energy saving (e.g., per unit, per square meter), including any variations between the three French climatic zones.

The schemes are examined by experts from the French Agency for Environment and Energy Management (ADEME) and arbitrated by the French General Directorate for Energy and Climate (DGEC). ATEE regularly reviews and updates that savings values in the operation sheets with the aim to use the most realistic values.

[45] Sunikka-Blank M., Galvin R. (2012). Introducing the Prebound Effect: the Gap Between Performance and Actual Energy Consumption, Building Research & Information, 40(3): 1–14
[46] Rosenow, J., Galvin, R. (2013): Evaluating the Evaluations: evidence from energy efficiency programmes in Germany and the UK. Energy & Buildings 62, pp. 450–458
[47] MEDDE (2014) Arrêté du 22 décembre 2014 définissant les opérations standardisées d'économies d'énergie [Decree of 22 December 2014 defining the standard for energy saving operations], NOR: DEVR1428341A, Journal Officiel de la République Française, 24 décembre 2014, 297 p.

2.2.7.4 Penalties

If obligated parties are not subject to a penalty in case of non-delivery of their obligations there is a risk that the targets may not be achieved.

Whilst there is some reputational risk in case obligated parties do not deliver their obligations, this in itself is not a sufficient deterrent, particularly if the obligated party does not have any customer-facing position (e.g. a distribution company).

Therefore, having penalties in place is important and this should be clearly communicated to the obligated parties. Furthermore, the penalties need to be sufficiently large to act as a deterrent. If it is cheaper to pay the penalty than delivering the obligations the obligated parties are likely to simply pay the penalty. Finally, the penalties need to be enforced in case of non-delivery. Even if penalties are in place, sufficiently high and clearly communicated, a lack of enforcement could potentially lead to obligated parties being complacent about delivering their obligations.

An example of good practice can be found in Ireland. The document 'Energy Efficiency Obligation Scheme Ireland - Guidance Document - Version 2 final - 22nd May 2014' provides detailed information on penalties. The penalties are above the cost of generating the savings (we use the average cost of the UK scheme as a benchmark). We therefore conclude that the penalty levels are sufficient and should be a deterrent to non-compliance.

2.2.7.5 Summary of monitoring and verification regimes

Table 3 presents an overview of the main elements of monitoring and verification regimes in the Member States using EEOSs.

Table 3: Overview of main elements of monitoring and verification regimes

Member State	M&V system in place	Indepen-dence of verifica-tion	Represen-tative sample	Audit protocols	Penalties
Austria	yes	yes	yes	yes	option to pay 20 Eurocent per kWh not delivered if target not delivered and buy-out mechanism not used penalty of up to €100,000 per obligated party
Bulgaria	in preparation	N/A	N/A	N/A	not proposed at this stage
Croatia	yes	yes	yes	lack of detail	contribution that has to be paid to the EE Fund equivalent to the cost of delivering the missing savings (cannot not recovered by network charge)
Denmark	yes	yes	not stated	yes	yes, but not clear how high
Estonia	yes	yes	yes	yes	not proposed at this stage
France	yes	yes	yes	yes	yes, buy-out of 0.02 €/kWh
Ireland	yes	yes	yes	yes	yes, penalty set at multiple of 1.25 of the buyout price across all sub-sectors
Italy	yes	yes	yes	yes	penalty is due if compliance is less than 60% of obligation; set depending on the market price of certificates which is multiplied by a number greater than 1 (penalties in 2014: €2,500 and €65,000)
Latvia	yes	yes	yes	lack of detail	not specified yet (expected by 31/12/2015)

Lithuania	in preparation	N/A	N/A	N/A	not proposed at this stage
Luxembourg	yes	no	yes	lack of detail	2€/MWh
Malta	yes	yes	not stated	lack of detail	up to €100,000 or €600 for each day of non-compliance
Poland	yes	no	not stated	lack of detail	financial penalties of up to €2 million but not more than 10% of turnover of obligated parties
Slovenia	yes	yes	yes	not stated	€15,000-€250,000
Spain	yes	yes	not stated	not stated	yes, level to be specified in future
UK	yes	yes	yes	yes	penalties can be as high as 10% of global turnover

2.2.8 Discussion and conclusions

EEOS are a relatively new policy instrument with long-term experience in only few EU MS such as the UK and Denmark. Most of the EEOS notified for the purpose of Article 7 have only recently started or are about to start. These new schemes should draw on the existing evidence and best practice examples. This analysis shows that for each design element that needs to be considered there is at least one example of good practice. Not surprisingly, most of the examples have been drawn from EEOS that have existed for some time and where policy learning lead to the establishment of sound procedures.

Whilst each EEOS is different the key principles apply to all schemes. MS where EEOS are about to be implemented are advised to build on the practices established over many years in MS with long-running EEOS. This report offers some of those examples of good practice.

2.3 Detailed overview of EEOS (September 2015)

Table 4: Overview of key features of EEOS in Member States (information refers to EEOS as notified)

Member State	Date started	Contribution to overall Article 7 target	Target (as set by Member States)	Timeframe of obligation period	Obligated parties	Sectoral coverage	Trading provisions	Banking and borrowing	Penalty regime	Provisions for vulnerable customers
Austria*	2009 (voluntary) 2014 (mandatory)	42%	159 PJ	2015-2020	all retailers of energy - including motor fuels and biomass - excluding small retailers	all sectors but mandatory minimum share for residential sector (40%)	bilateral trading between obligated parties	implicit borrowing of up to 3 months	up to option to pay 20 Eurocent per kWh not delivered if target not delivered and buy-out mechanism not used penalty of up to €100,000 per obligated party	uplift by factor of 1.5 for savings achieved in fuel poor households
Bulgaria	2008	100%	not specified yet	2014-2016	electricity, heat, natural gas, liquid and solid fuel traders selling an amount greater than the equivalent of 75 GWh annually, or employing more than 10 people, or having a turnover or end-of-year balance for the previous year of more than BGN 3.9 million;	all sectors incl. energy transformation, distribution and transmission sectors	no trading proposed at this stage	not proposed at this stage	not proposed at this stage	not proposed at this stage

					transport fuel retailers are not obliged to participate in the scheme					
Croatia	expected to start in 2016	41%	22,156 PJ	2014-2020	distributors of electricity, natural gas and thermal energy (gradual inclusion of obligated parties, first distributors of electricity from 2016, other parties from 2017) minimum size for obligated party: from 2016 >10,000 GWh average annual distributed energy between 2009-2013, from 2017 >200 GWh average annual distributed energy between 2009-2013, from 2019 >30 GWh average annual distributed energy between 2009-2013	all sectors	no trading proposed at this stage	only banking with no limitations	contribution that has to be paid to the EE Fund equivalent to the cost of delivering the missing savings (cannot not recovered by network charge)	not proposed at this stage
Denmark	1995	100%	2013-2014: 10.7 PJ (final energy) / year	Jan 2013 to 31 Dec 2015	all companies in sectors covered by Electricity Supply, Natural Gas Supply and Heating Supply Acts	all sectors except transport	none	only Banking and with limitations	yes, but not clear how high	none

			after 2015: 12.2 PJ (final energy) / year							
Estonia	expected to start in 2018	5%	no targets set yet 345 GWh of savings expected (over the period 2018-2020)	2018-2020	energy network operators and retail energy sales companies whose annual amount of energy supplied or sold exceeds 100 GWh/yr	all sectors	no trading proposed at this stage	not proposed at this stage	not proposed at this stage	not proposed at this stage
France	2006	87%	700 TWh cumac	01 Jan 2015 - 31 Dec 2017	all LPG suppliers with a turnover >100 GWh, suppliers of electricity, gas and district heating with a turnover >400 GWh	all sectors except for actions in facilities subject to the ETS	vertical trading via trading platform and bilateral trading	yes, savings can be banked for up to 9 years	yes, buy-out of 0.02 €/kWh	option for obligated parties to contribute to 4 programs on fuel poverty (no mandatory requirement)
Ireland	2012	48%	550 GWh per annum	01 Jan 2014 - 31 Dec 2016	energy suppliers that sell more than 600 GWh per year; importers of road transport fuel	mandatory split: non-residential (75%), residential (20%) and energy poverty (5%)	bilateral trading between obligated parties and vertical trading via trading platform put in place in Nov 2014	unrestricted banking of savings possible no borrowing	yes, penalty set at multiple of 1.25 of the buyout price across all sub-sectors	5% of savings need to be achieved in energy poor households defined as receiving certain welfare transfers or located in RAPID (Revitalising Areas by Planning,

										Investment and Development) or Clár area (rural location) and designated areas specified by regulator
Italy	2005	62%	2013: 4.60 Mtoe 2014: 6.20 Mtoe 2015: 6.60 Mtoe 2016: 7.60 Mtoe	01 Jan 2013 - 31 Dec 2016	electricity and gas distributors having more than 50,000 end users	all sectors	vertical trading via spot market and bilateral trading; initial generation of WCs is 2/3rd by bilateral contracts with EE providers of all WCs	banking and borrowing up to 40% allowed	penalty is due if compliance is less than 60% of obligation; set depending on the market price of certificates which is multiplied by a number greater than 1 (penalties in 2014: €2,500 and €65,000)	none
Latvia	unclear	65%[48]	not specified yet (expected by	not specified yet (expected by 31/12/2015)	electricity supplier AS "Sadales tikls", the operator of the national gas system, and heating supply	all sectors	no trading proposed at this stage	not proposed at this stage	not specified yet (expected by 31/12/2015)	not proposed at this stage

[48] Though target for the EEOS not yet formally notified by Latvia

			31/12/2015)		companies or operators of district heating system (with threshold of heat sold, e.g. 40 GWh/year)					
Lithuania	2015(expected)	77%	not specified yet	1 Jan 2014 - 31 Dec 2016	electricity distribution network operator AB Lesto, the natural gas distribution network operators AB Lietuvos dujos and heating companies whose heat sales exceed 90 GWh	all sectors	not proposed at this stage	not proposed at this stage	not proposed at this stage	not proposed at this stage
Luxembourg	January 2015	100%	285 GWh/a	1 January 2015 to 31 December 2020	all suppliers of electricity and natural gas serving residential, service sector and industrial customers	all sectors	not proposed at this stage	not proposed at this stage	2€/MWh	not proposed at this stage
Malta	2009 smart meter roll out + behavioural change from 2016; 2014 for progressive tariffs	17%	not clear	2014-2020 (end not clear)	Enemalta Corporation (monopoly distributor)	residential	not relevant as only one obligated party	not proposed at this stage	up to €100,000 or €600 for each day of non-compliance	not proposed at this stage
Poland	2012	100%	1.36 Mtoe by the end of 2016 3.68 Mtoe by the end of 2020	Jan 2013–Dec 2016 Jan 2017 – Dec 2020	electricity, natural gas and district heating companies selling to final consumers members of a commodities exchange	all sectors including transport distribution, and own energy use	tender procedure certificates can be traded via Polish Power Exchange	not proposed at this stage	financial penalties of up to €2 million but not more than 10% of turnover of	not proposed at this stage; being discussed as part of the reforms of the WC system

					commodity brokerage houses				obligated parties	
Slovenia	2014	33%	4,260 GWh	2014-2020	suppliers of electricity, heat, gas and liquid and solid fuels to final customers	all sectors	not proposed at this stage	not proposed at this stage	€15,000-€250,000	not proposed at this stage
Spain	July 2014	44%	6,356 ktoe	annual obligation periods until 2020	suppliers of electricity and natural gas, and wholesale retailers of oil products and LPG obligation will not be imposed on small energy distributors, small retail energy sales companies and small energy sectors	all sectors	certificates will be tradable but unclear whether only bilaterally or also vertically	not proposed at this stage	yes, level to be specified in future	not proposed at this stage
UK	1994	21%	Three subtargets: (a) CERO carbon emissions reduction target is 12.4 MtCO2; (b) CSCO carbon saving communit	April 2015 to March 2017	energy suppliers that have more than 250,000 domestic customer accounts and supply more than 400 GWh of electricity or 2,000 GWh of gas to domestic customers a year	residential	bilateral trading between obligated parties trading between energy efficiency providers and obligated parties via online auctioning platform (brokerage)	unrestricted banking of savings possible no borrowing	penalties can be as high as 10% of global turnover	part of the target (CSCO) needs to be achieved in 25% lowest areas on the Index of Multiple Deprivation part of the target (HHCRO) needs to be achieved in households receiving certain

			y target is 6 MtCO2; (c) HHCRO home heating cost reduction target is £3.7bn cost savings							welfare transfers

* information based on personal communication with Dr Simon Moser, Energieinstitut an der Johannes Kepler Universität Linz Department of Energy Economics

3 Energy and CO_2 taxes

3.1 Introduction

This case study provides an analysis of the energy and CO_2 taxes that have been notified by Member States as contributing towards their energy savings targets under Article 7. The case study begins by describing how energy and CO_2 taxes work, including the factors which influence their cost-effectiveness. This is followed by a review of how Member States have implemented the requirements of Article 7 and Annex V, in relation to energy and CO_2 taxes. As part of this review, best-practice examples of how the requirements have been met are identified.

3.1.1 Overview of policy instrument

Energy and CO_2 (carbon) taxes refer to policy instruments which apply a tax on the energy and/or carbon content of fuels. This tax increases the price of the fuels at the point of purchase, and thereby increases the cost of consumption – thereby incentivising fuel saving.

The tax rate may be applied equally to all fuels, for example on the basis of a fixed rate per unit of energy or carbon. However, tax rates may also vary from one fuel to the next. Indeed the Commission's proposal for an amendment to Directive 2003/96/EC on the taxation of energy products and electricity[49] stated that, taking into account the energy content of the various products, minimum levels of taxation vary substantially according to the product concerned. In the context of energy efficiency, this means that energy taxes may provide an unequal stimulus for energy savings, across the different fuel types. Similar complexities may also arise with carbon taxes. For example, carbon taxes do not apply to biofuels, biogas and bioliquids as they are considered as having zero CO_2 emissions.

This definition of energy and CO_2 taxes does not include other types of financial instrument which can also provide a financial stimulus to energy efficiency investments through the taxation system, such as tax rebates for building renovation. These broader financial instruments are introduced briefly below, but are covered in more detail by a separate case study.

3.1.2 How the policy instrument works

Taxation on the energy and/or CO_2 content of fuels affects the market price of these fuels. Since the demand (and associated consumption) for energy will bear a direct relationship with the price of energy, the change in the price of energy resulting from the tax will lead to a change in demand. The responsiveness of energy demand to a change in price is known as the price elasticity. The price elasticity for a good is expressed as the percentage change in quantity demanded in response to a one percent change in price. Therefore, if price elasticity of demand is -0.35, it means that 10% increase in energy price will result in a 3.5% drop in energy demand.

Elasticities can capture both short-run and long-run effects. Short-run elasticities describe the behavioural effect that occurs immediately or practically immediately after a price rises or falls. This would include, for example, turning down the thermostat to reduce heating costs when prices rise. In contrast, the effects described by long-run elasticities only reach their full impact several years after the rise or fall in price. This is because these long-term effects arise from changes in investment behaviour, such as the purchase of a more energy efficient heating system, and the effect is therefore related to natural replacement cycles. It takes at least the life cycle of the measure in question before the maximum effect is achieved.

3.1.3 Cost effectiveness of the policy instrument

The aim of this section is to provide a brief review of the literature on the overall cost-effectiveness of energy and CO_2 taxes, and the main influencing factors.

[49] Proposal for a COUNCIL DIRECTIVE amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. COM(2011) 169 final.

3.1.3.1 Costs

Taxes are one of several market-based policy instruments. Market-based instruments have been found to achieve policy outcomes at lower costs than traditional command and control policy approaches such as regulatory standards (Harrington and Morgenstern, 2004[50]; OECD, 2011[51]). This is because regulators know less about a business' (or a household's) operations than the business itself, a circumstance known as asymmetric information. With command and control approaches regulators have to make a best guess about the cheapest way for businesses to reduce energy use. With market-based instruments, businesses usually have greater flexibility as to the actions they wish to take, so can deliver reductions in energy use in the most cost-efficient way.

The cost of energy and CO_2 taxes are typically borne directly by the end user. If the tax is applied equally to all forms of consumption then all end-users will be affected directly. This may have important distributional impacts where energy consumption represents a large proportion of expenditure in poorer households, and these households may have less opportunity to reduce consumption. As a result poorer households may be disproportionately affected by the policy i.e. the tax is regressive. It may be possible to design energy and CO_2 taxes in such a way to reduce these distributional impacts. However, the way that energy taxes work generally makes it more difficult to control the target sectors than for other instrument types. An alternative approach would be to complement the taxation with social aid for poorer households, which would address the distributional impacts, without complicating the tax measure. This latter approach recognises the need for taxation measures to be seen as part of the wider policy framework. It also recognises that taxes (including on energy) can provide the funding for other fiscal measures (social aid, non-refundable grants or preferential loans).

The transaction costs for a tax are made up of administrative costs and compliance costs. The Handbook of Research on Environmental Taxation (Milne and Andersen, 2012[52]) presents some evidence for the administrative costs associated with environmental taxes[53]. This suggests that administrative costs are typically a small proportion of the overall revenues generated. The table below provides four examples of tax measures and the associated administrative cost for each.

In the case of energy and CO_2 taxes specifically, it could be argued that the administrative costs will be at the lower end of the range as the energy taxes are subject to harmonisation, and these taxes are often collected from a small number of economic operators (typically large traders in energy products and electricity) which keeps transaction costs low.

Table 5: Administrative Costs of Environmental Taxes

Country	Tax	Administrative Cost
Poland	Environmental taxes	0.8-4.5% of revenues
Germany	Environmental taxes	0.1% of revenues
Czech Republic	Energy taxes	0.7-2.7% of revenues
UK	Environmental taxes	0.2-0.3% of revenues

Source: Milne and Andersen 2012.

While taxes present a direct cost to end-users, the tax revenues can be used to fund government spending. The revenues can therefore be used to support other investments in energy efficiency measures. However, as finance ministries frequently do not endorse ring-fencing/ hypothecation of revenues for specific purposes, the revenues could equally be directed to other policy areas. It is also relevant to consider the role of energy and CO_2 taxes alongside other tax instruments. In order to minimise the net costs of a tax to society it is possible that governments could offset any tax increases in relation to energy by lowering taxes elsewhere, known as a 'tax swap' (Centre for Policy and Energy Solutions, 2013).

[50] Harrington, W., Morgenstern, R.D., 2004, Economic Incentives versus Command and Control: What's the best approach for solving environmental problems?
[51] OECD, 2011, Environmental Taxation A Guide for Policy Makers
[52] Milne J.E, Andersen (eds), M.S, 2012, Handbook of Research on Environmental Taxation
[53] The analysis by Milne and Andersen was broader that energy and CO_2 taxes and also included other environmental taxes including aviation fuel taxes and plastic bag levies. Nevertheless, the results from the analysis are still considered applicable to the costs of energy and CO_2 taxes.

3.1.3.2 Effectiveness

The Green Fiscal Commission (2009)[54] synthesised a number of evaluations of environmental taxes and concluded that environmental taxes were an effective instrument i.e. they contribute to the achievement of the environmental objectives for which they have been designed. It was though emphasised that the design of the instrument is crucial. The tax must be set at the right level to achieve the objectives, and must be directed at the source of the environmental burden which it is sought to reduce.

In the context of Article 7, the objective of energy and CO_2 taxes is clear – to reduce end-use energy consumption. However, energy and CO_2 taxes alongside the achievement of the energy savings may also be implemented to deliver other climate policy objectives, such as reduction of greenhouse gases emissions or improvements in air quality. Depending upon how the different policy objectives are prioritised, this may lead to differences in the design of individual instruments, for example in the levels of taxation being applied to different fuels. The OECD (2015)[55] highlights the case of transport fuel taxes, where the energy content correlates strongly with carbon emissions, but not with local air pollutants. Thus setting taxes on the basis of energy content is effective at targeting energy savings and CO_2 reductions, but less effective in targeting local air pollution. Likewise, as biofuels, biogas and bioliquids can be considered by Member States as having zero CO_2 emissions for tax purposes, setting taxes based on CO_2 content would not provide any incentive to reduce energy consumption for these fuels.

The report by Green Fiscal Commission (2009) compiled evidence on the effectiveness of a range of tax measures. The information that was compiled on energy and CO_2 taxes is repeated in the table below. The Danish energy/carbon taxes, the German energy and transport taxes, and the UK industrial energy tax were cited as particularly effective examples. However, it is also clear that it is difficult to compare the effectiveness of different instruments on a like for like basis, given the different performance metrics that are used, and the different national circumstances. This means it is difficult to conclude that a taxation policy has been more effective in one Member State than other.

Table 6: Impact of national energy and carbon tax measures

Country and tax	Period evaluated	Impact
Finland – carbon/ energy tax	1990-2005	CO_2 emissions 7 per cent lower than would have otherwise been A shift from carbon tax to output tax on electricity in 1997 may have lessened impact
Norway – carbon dioxide tax	1991-2007	21 per cent reduction in CO_2 from power plants by 1995 14 per cent national reduction in CO_2 in 1990s, 2 per cent attributed to carbon tax 12 per cent reduction in CO_2 emissions per unit of GDP
Denmark – carbon and energy taxes	1992- 1997	CO_2 emissions in affected sectors down by 6 per cent and economic growth up by 20 per cent between 1988 and 1997 and a 5 per cent reduction in emissions in one year in response to tax increase In 1990s a 23 per cent reduction in CO2 from business as usual trend and energy efficiency increased by 26 per cent Subsidy to renewables may have accounted for greater proportion of emissions reductions than tax
Sweden – energy and carbon taxes	1990-2007	Emissions reductions of 0.5 million tonnes per annum Emissions would have been 20 per cent higher than 1990 levels without tax
The Netherlands – energy tax	1999-2007	Emissions 3.5 per cent lower than would have otherwise been Low tax rates may have limited impact

[54] The Green Fiscal Commission (2009),The Case for Green Fiscal Reform, Final Report of the UK Green Fiscal Commission
[55] OECD (2015), Taxing Energy Use 2015

Germany – green fiscal reform, taxes on transport, other fuels and electricity	1990-2005	CO_2 reduced by 15 per cent between 1990 and 1999 and 1 per cent between 1999 and 2005 CO_2 emissions 2-3 per cent lower by 2005 than they would have been without tax German re-unification an important factor in reductions
UK – industrial energy tax	2001-2010	UK CO_2 emissions reduced by 2 per cent in 2002 and 2.25 per cent in 2003 and cumulative savings of 16.5 million tonnes of carbon up to 2005 Reduction in UK energy demand of 2.9 per cent estimated by 2010

Source: Green Fiscal Commission (2009)

It is also important to recognise that the overall effectiveness of taxes in terms of future energy savings may be more uncertain in comparison with other policy mechanisms. An economic agent will reduce energy demand until the cost of doing so is less than the value of the tax payment. However, due to asymmetric information it is not possible to predict the outcome of a tax with certainty (Centre for Climate and Energy Solutions, 2013[56]). This may result in some aspect of trial and error on the part of the taxation body to find the right rate which can deliver the required level of energy savings.

3.1.3.3 Overall cost-effectiveness of taxes

Cost-effective is concerned with the level of resources that need to be invested in order to deliver a certain outcome. It is difficult to draw firm conclusions on the cost-effectiveness of energy and CO_2 taxes in general terms. As described above, while the administrative costs of taxes are generally modest in relation to the revenues generated, there are a range of factors which need to be considered when assessing their effectiveness. This means that any results are context specific. For example, the Green Fiscal Commission (2009) concluded that green taxes can be very cost-effective by shifting taxes from areas that society values (profits, jobs, incomes) to areas that society does not like (pollution). Conversely, the IPCC (2007[57]) concluded that the cost-effectiveness of energy taxes for GHG mitigation in the buildings sector was low, and taxes were most effective when combined with other policy instruments. This highlights the importance of considering the role of taxes as part of the whole policy package. Finally, the OECD (2015) concluded that energy taxes were cost-effective since they provide polluters/consumers with the freedom to find their own most efficient way of reducing pollution/energy consumption.

3.2 Use of the policy instrument by Member States

A number of Member States notified taxation measures, with some Member States e.g. Austria, notifying more than one type of taxation measure. Energy and CO_2 taxes were notified by 8 Member States. In addition, tax rebates for energy savings technologies or measures were notified by 7 Member States. In four cases, other tax measures were included in notifications, on the basis that they increase the cost of energy consumption, but are not specifically labelled as energy taxes[58]. 15 Member States did not notify any type of taxation measures.

The taxation measures that were notified by Member States in relation to Article 7 are summarised in the table below. It is important to note that some Member States may have in place energy and CO_2 taxes, but may have chosen not to notify these policies under Article 7. In some instances, as was the case in Finland with their non-transport taxes, this decision was taken to eliminate the risk of double counting.

[56] Centre for Climate and Energy Solutions, 2013, Options and Considerations for a Federal Carbon Tax
[57] IPCC, 2007, IPCC Fourth Assessment Report: Climate Change 2007, Effectiveness of and experience with policies for reducing CO2 emissions from energy use in buildings
[58] These are: Austria (tolls for trucks, green electricity), Finland (strategic stockpile fee), Germany (tolls for trucks and air passenger duty) Spain (spent nuclear fuel production, storing spent nuclear fuel and radioactive waste in centralised facilities)

Table 7: Use of taxation measure by Member States

Energy and CO_2 taxes	Tax rebates for energy saving technologies or measures	Other tax measures	No taxation measures
Austria (electricity, natural gas and mineral oil/ petrol)	Croatia (vehicle environmental fee)	Austria (tolls for trucks, green electricity)	Belgium
Estonia (electricity, natural gas, transport fuels and district heating)	Finland (tax breaks for households with heat pumps)	Finland (strategic stockpile fee)	Bulgaria
Finland (transport fuels)	Ireland (vehicle tax)	Germany (tolls for trucks and air passenger duty)	Cyprus
Germany (electricity, fuel oil, petrol, diesel and natural gas)	Italy (tax deductions for building renovations)	Spain (spent nuclear fuel production, storing spent nuclear fuel and radioactive waste in centralised facilities)	Czech Republic
Netherlands (electricity, natural gas and transport fuels)	Malta (tax incentive for air-conditioning improvements in industry and tax credit scheme for more energy efficient lighting)		Denmark*
Spain (electricity, natural gas and coal)	Netherlands (tax incentives for fuel efficient cars)		France*
Sweden (electricity, fossil fuels in industry and transport fuels)	Portugal (vehicle tax)		Greece
United Kingdom (coal, gas and non-renewable electricity)			Hungary
			Latvia
			Lithuania
			Luxembourg
			Poland
			Romania
			Slovakia
			Slovenia*

* Some Member States may have CO_2 taxes in place even though they did not notify these measures under Article 7.

As described above, the focus of this case study is on those taxes which apply to fuels based on their energy or CO_2 content. We briefly mention the other types of taxation measures that were notified by Member States below.

3.2.1.1 Tax rebates for energy saving technologies or measures

Several Member States notified tax rebates which stimulate the uptake of energy saving measures. Croatia, Ireland, Portugal, and the Netherlands all notified tax rebates for more efficient road transport vehicles. Italy notified a policy that offers tax reduction for building renovations. Malta notified a tax incentive for air-conditioning improvements in industry and tax credit scheme for more energy efficient

lighting. Finland notified a scheme to offer tax breaks for households that have heat pumps installed. These measures are discussed more fully in a separate case study on financial incentives.

3.2.1.2 Other tax measures

Some Member States notified other fees and levies which increase the cost of energy consumption, and therefore influence demand in a similar way to taxes, but are not considered an energy or CO_2 taxes in accordance with the definition used here. Both Austria and Germany include a toll for trucks which increased the price of road transportation, and therefore reduces consumption. Finland imposes a strategic stockpile fee which is applied to the price of transport fuels. Spain imposes a fee relating to spent nuclear fuel production and storage to electricity prices. Likewise, Austria imposes a green electricity tax with a flat rate and an additional levy based on the impacts on the electricity grid.

3.3 Compliance with the Article 7 requirements

Article 7 and Annex V include certain requirements that need to be taken into account by Member States when calculating the impacts of energy and CO_2 taxes. Some of these requirements apply to all policy measure types, and some are specific to energy and CO_2 taxes.

Drawing upon real examples from the policies that have been notified by Member States, in the following sections we described how the requirements of Article 7/Annex V have been met, and describe "best practice" examples which illustrate cases where the requirements have been met and clearly demonstrated in the notifications.

3.3.1 Calculation of energy savings

As regards taxation measures, Article 7(10)(f) requires that energy savings are calculated using the methods and principles provided in point 3 of Annex V.

3.3.1.1 Additionality

According to Annex V(3)(a), credit shall only be given for energy savings from taxation measures exceeding the minimum levels of taxation applicable to fuels as required in Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity or in Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax.

The following approaches were taken by Member States in their notifications, in response to this requirement.

Table 8: Implementation of Annex V(3)(a) by Member States

Member State	Approach
Austria	• The notification states that the electricity, natural gas and mineral oil taxes lay down higher tax rates than the EU Energy Taxation Directive (Directive 2003/96/EC). • However, no description is provided of the calculation.
Estonia	• The formula for calculating the energy savings is set out in a supporting study submitted alongside Estonia's notification. • The supporting study provides details of the formula that has been used to calculate the energy savings, and therefore clearly describes how the requirement of Annex V(3)(a) have been met (see Box below).
Finland	• The notification demonstrates how the requirements of Annex V(3)(a) have been met by describing the calculation approach. • Values are stated for the minimum tax rate and the expected tax rate from 2014-2020, and also the EU minimum level of VAT and the expected tax level of VAT. • The calculation of the savings is made by comparing the energy consumption with tax rates set at EU minimum levels with the energy consumption associated with the expected tax levels.

Germany	• The notification states that minimum taxation levels as stipulated by the EU Energy Taxation Directive (Directive 2003/96/EC) have been taken into account in the calculations. • To demonstrate this, a study is attached to the notification which outlines the approach taken. • The study describes the formula that has been applied when calculating the energy savings, which clearly shows that the calculation is based on the proportion of taxation that is above the EU minimum levels.
Netherlands	• The notification states that all taxes rates have been set well above EU minimum values for some time. • The calculation of the energy savings from taxes has been based on the year-on-year price increase of the energy tax. The energy savings are therefore based on the change in the total tax rate. • Since this rate is well above the EU minimum levels, and savings are based on the incremental increase in this rate, the requirements of Annex V(3)(a) are satisfied.
Spain	• The notification states that the relevant national law that put the taxation measure in place was not passed to comply with any EU Directive or to ensure compliance with Directives 2003/96/EC and 2006/112/EC, and as such should be considered above the applicable minimum levels of taxation. • However, the calculation approach is not described.
Sweden	• The notification described how the energy savings are based on the price differentials between the Swedish tax levels and the EU minimum levels. • A clear description is provided as to how the calculations are made in accordance with Annex V(3)(a) (see Box below).
United Kingdom	• The notification states clearly that the savings have been calculated for the difference between the projected retail price with the tax and the retail price excluding the tax rate charged above the EU minimum. • However, the calculation approach is not described.

As described in the table above, the notifications from Member States all respond to the requirements of Annex V(3)(a). Most notifications recognise that Annex V(3)(a) only allows credit to be given for energy savings from taxation measures exceeding the minimum EU levels of taxation. However, the level of information provided on how Member States are complying with the requirements of Annex V differs, with some notifications being more explicit on how the requirements have been met, for example by including a description of the calculation approach.

In the box below two examples are provided of what might be considered good practice in demonstrating that the requirements of Annex V(3)(a) have been met.

Box 3: Demonstrating that energy saving are additional to EU Minimum Levels

In the notification provided by Estonia a supporting study is attached which describes the formula that is applied to calculate the energy savings from the energy and CO_2 taxes. This clearly illustrates how the calculation of the energy savings taxes into account EU minimum requirements.

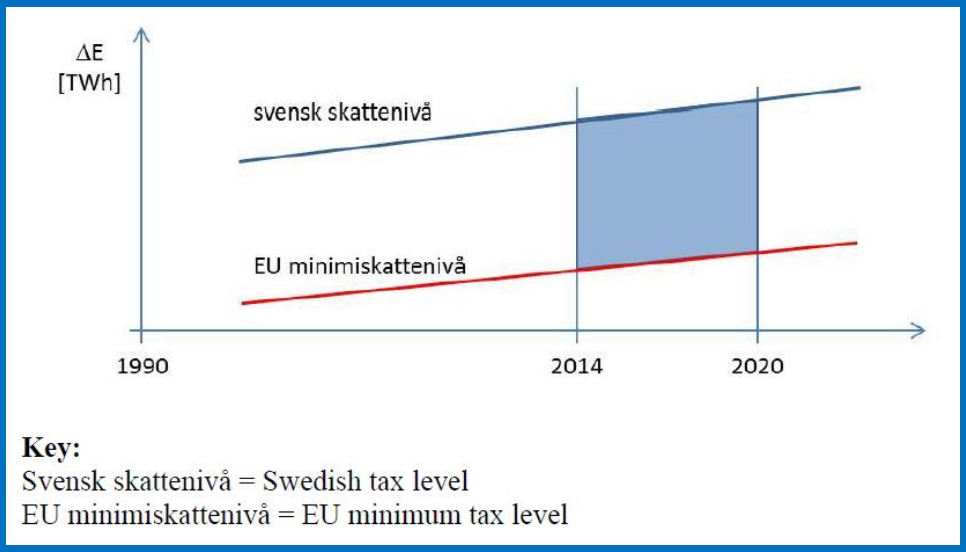
The formula is repeated below.

dD(%) * Eanv = dEanv

where dD(%) = dPSM * EPE,
where dPSM = (P + SEE + MEE) – (P + SM + MM) / (P + SM + MM), where

P – price of final consumption of the form of energy,
SEE – current rate of excise duty in Estonia,
SM – minimum rate of excise duty under EU Directive 2003/96/EC,
MEE – current rate of value added tax in Estonia, i.e. 20%,
MM – minimum rate of value added tax under EU Directive 2006/112/EC,
EPE – price elasticity coefficient,
Eanv – final energy consumption,
dEanv – calculated energy savings.

In the notification provided by Sweden, a diagram (see below) is used to help explain how the savings have been calculated based on the difference between the Swedish tax level and the EU minimum tax level. The calculation of the energy savings is described in terms of the difference between the actual tax level and a counterfactual case, which would be the energy savings if the tax level were lowered to be equivalent to the EU's minimum tax levels. The cumulative energy saving then becomes the difference between the scenarios, which consists of the increased use of energy that results from the lowered taxes.



3.3.1.2 Price elasticities

According to Annex V(3)(b), in determining the energy savings from energy and CO_2 taxes, recent and representative official data on price elasticities shall be used for calculation of the impact.

The price elasticities that were notified by Member States are summarised in the table below. Details of the values for the elasticities that were used in the calculation were notified by all Member States, with the exception of Austria. Austria notified the tax rate, but not the elasticities that were applied.

There are no default values for price elasticities to determine if the values that have been applied can be considered representative. However, the published literature can provide benchmark values to

indicate if the elasticities applied are in the expected range. However, any such benchmarking should be treated with caution and the specific context needs to be understood.

Table 9: Values for price elasticities used in the energy savings calculation

Sector	Fuel	Benchmark	Austria	Estonia	Finland	Germany	Netherlands	Spain	Sweden	UK
Households	Oil					-0.05 to -0.2			Not reported (small consumption)	
	Gas	-0.10 SR[59]		-0.26 SR		-0.05 to -0.2	-0.10 SR -0.20 LR	-0.18 SR -0.32 LR		
	Electricity	-0.20 to -0.40 SR[60]		-0.18 SR		-0.05 to -0.2	-0.15 SR -0.25 LR	-0.14 SR, -0.40 LR	-0.07 SR, -0.50 LR	
	District Heating			-0.20 SR						
	All fuels	-0.1 to -0.35 SR								
Services	Oil					-0.025 to -0.2			Not reported (small consumption)	
	Gas			-0.26 SR		-0.025 to -0.2	-0.10 SR -0.23 LR	-0.18 SR, -0.32 LR		
	Electricity			-0.18 SR		-0.025 to -0.2	-0.10 SR -0.22 LR	-0.03 SR, -0.2 LR	-0.07 SR, -0.50 LR	
	District Heating			-0.20 SR						
	All fuels									
Road transport	Petrol	-0.10 to 0.40 SR[61]		-0.26 SR	-0.49 SR	-0.25	-0.05 SR -0.40 LR		-0.40 SR, -0.60 LR	
	Diesel	-0.10 to 0.40 SR		-0.26 SR	-0.17 SR	-0.05	-0.05 SR -0.40 LR		-0.50 SR, -0.00 LR	
	All fuels	-0.10 to 0.40 SR							-0.19 SR, -0.26 LR	
Industrial	Electricity					-0.025	-0.03 SR -0.10 LR	-0.05 SR, -0.2 LR	-0.00 to -1.24	
	Gas					-0.1	-0.03 SR -0.15 LR	-0.18 SR, -0.32 LR	-0.21 to -1.43	
	Coal									
	All fuels									-0.47 LR
Agriculture and horticulture	Electricity						-0.05 SR -0.10 LR		-0.39	
	Natural gas						-0.05 SR			

[59] Lavin, Dale at al., 2011. The Impact of price on residential demand for electricity and natural gas,
[60] Fan and Hyndman, 2011. The price elasticity if electricity demand in South Australia,
[61] Goodwin, Dargay et al., 2004. Elasticities of road traffic and fuel consumption with respect to price and income: a review

							-0.23 LR			
	Fossil fuels								-0.21	

Notes: SR = Short-run, LR= Long-run. No data was provided on the specific elasticities applied in Austria

In accordance with Annex V(3)(b), the elasticities applied should be representative of the sectors concerned, since the elasticities that might be relevant in the context of transport demand may be different to those relating to the heating/cooling of buildings. They should also be representative of the national circumstances (for example, relevant sectoral characteristics, economic context). Annex V(3)(b) also requires the elasticities to be based on national statistics, to ensure the credibility of the estimates, and based on recent data.

The notifications prepared by Member States responded to these requirements in the following ways.

Table 10: Implementation of Annex V(3)(b) by Member States

Member States	Approach
Austria	• The notification includes limited information on the elasticities that have been applied. • It was though indicated that the calculation is 'only a first rough estimation which will be refined after implementation of the monitoring body'. It was also clarified that a new study will be commissioned to review the elasticities used.
Estonia	• The notification states that the elasticities that were used in the calculation are from a range of sources, including previous studies from other regions[62] and national statistics. • The argument is made that due to the small relative size of Estonia's economy energy consumption statistics can be heavily distorted by the behaviour of a single large energy user. Therefore, Estonia has chosen to use data on the price elasticities calculated from larger countries or economic areas
Finland	• The elasticities that are used in the calculation are based on research carried out on elasticities for Sweden. • Whilst this should be considered second-best to national data, a clear explanation is provided as to why these elasticities can be considered representative of the situation in Finland, as described in Box below.
Germany	• The elasticities that are used in the calculation are based on a research by an economics consultancy. • Values for a range of elasticities are provided, which reflect different sectors, and the different fuels used in these sectors. This implies the estimates are sector specific.
Netherlands[63]	• The elasticities that are applied in the calculation are derived from two separate sources from the literature. • These are described in the notification as the most recent available estimates of the price elasticity of energy consumption.
Spain	• The elasticities that are used in the calculation are based on academic research. Specifically, the elasticities are based on a review of existing academic literature for Spain. • A copy of the academic paper is attached to the notification, which includes a justification, based on the research performed, of the elasticities that are recommended. • The review itself is focussed on studies that are specific to Spain, explores separately elasticities for different energy-end use sectors, and takes into consideration the age of the data.
Sweden	• The elasticities that are used in the calculation are based on academic research. Specifically, new econometric estimates of price elasticity have been made for

[62] The notification provides some explanation why national data may not be appropriate for the calculation of the elasticities

[63] The calculation approach that is presented only serves to demonstrate – without adjustment for overlap with a different policy – what would have been attributable to the price incentives offered by taxes, excise duties and surcharges. The actual approach taken is different, and assess taxes as part of a packages to avoid double counting energy savings.

	electricity consumption in housing and services and for the use of petrol and diesel in the transport sector. • For industry a more simple approach was used based on linear relationships. • The notification provides a detailed description of the analysis that was performed, and attaches a copy of the supporting research in the Annex to the notification.
United Kingdom	• A range of elasticities are presented based on an academic review. This showed that there is a high range of possible elasticities within the Industrial sector. • The chosen long-run elasticity is based on a single study which uses UK industrial data for the period 1973-2005. The values from the study provide a median estimate from the range identified in the literature. • The reference is therefore representative of the sector concerned, and national circumstances. The notification also states that the estimate includes recent years in the analysis.

The responses provided by Member States vary greatly in the detail as regards the application of the requirement of Annex V(3)(b). In some cases Member States have provided a detailed explanation for their choice of elasticities including attaching supporting research. In other cases the Member State simply state the basic characteristics of the data source which relate to the requirements, without any further elaboration of how it is used to calculate the impact. None of Member States have explicitly stated that the elasticities meet the requirements for "recent", "representative" and "official data", although it could be inferred in some cases. In general greater attention was given to demonstrating the representativeness of the elasticities.

In the box below some examples are provided of what might be considered good practice in demonstrating that the requirements of Annex V(3)(b) have been met, with respect to requirement to be "representative".

Box 4: Demonstrating that elasticities are representative

Approach taken in Sweden

Sweden notified that it would only use a single type of policy measure – energy and CO_2 taxes - to deliver its target under Article 7. Therefore it is particularly important that Sweden has applied a robust methodology when calculating the energy savings from its tax measures.

To ensure that the elasticities that were used were recent, and representative of the situation in Sweden, new econometric estimates of price elasticity were made for the use of electricity in housing and services, and for petrol and diesel in transport. For the industry sector, a more simplified approach was applied based on a linear model.

The notification clearly explain how the elasticities have been calculated, including:

- Time period: the long-run elasticities have been calculated by exploring how energy consumption changes in response to prices over the period 1970 – 2010 (for housing and services) and 1976 to 2012 (for transport) and 1990 – 2004 (for industry).
- Variables: The calculation takes into account a number of variables including for the housing and commercial sector (electricity consumption, electricity prices, income and temperature) and for the transport sector (fuel consumption, fuel prices, income, consumer price index and population).
- Modelling approach: The modelling of the elasticities in the building and commercial, and transport sectors, are dynamic in nature which allows both short-run and long-run effects to be assessed. The modelling provides a calculation of when the long term equilibrium is reached, which has been used for the basis of assessing when savings described by long term elasticities can be realised. For the industry sector, a more simplified approach was applied based on a linear model.
- Uncertainties: Uncertainties in the analysis are stated, and the results of the analysis and the associated parameters are well explained in most cases.

Approach taken in Finland

While the use of elasticities from another country would typically be considered second best to analysis for the country itself, in the absence of such data this may provide a valid source. However, where this would be the cases, it would be necessary to demonstrate clearly *why* these values can be considered representative in the notification. This was the approach taken by Finland.

To calculate the savings from its policy taxing road transport fuels Finland calculated the energy savings based on price elasticities that were derived for Sweden. In order to demonstrate that the results from this study could be considered representative of the context in Finland a number of indicators were cited to demonstrate that economic context is similar in the two countries. This was especially the case with households, which is relevant as most of the savings arose in the area of private car transport. The following indicators were used to make the case:

- Household income (final consumption expenditure) in Finland was EUR 29 300 per person and in Sweden EUR 33 000 per person (Source: Eurostat)
- Prices in general in both counties are well above the EU average. The price level index in Finland was 123.4 in 2013, while in Sweden it was 134.8 (Source: Eurostat).
- Consumer price of petrol (95 E10) was 145 cents per litre in Finland and 134 cents per litre in Sweden in 2014, with corresponding consumer prices of diesel at 137 and 134 cents per litre (Source: Statistics Finland)
- Both countries have vast sparsely populated areas, where public transport services are unsatisfactory and where the only transport option is the private car. On the other hand, both countries have good networks of well patronised public transport in the largest cities. The potential, therefore, for modal shift, as well as the constraints connected with it, are very similar. In 2013, private cars accounted for 84.9 % of passenger transport (person-kilometres) in Finland and 84.0 % in Sweden (Source: Eurostat).

A further consideration with respect to elasticities is whether they reflect short-term or long-term effects.

The following requirements of Article 7 are relevant in the context of long-term elasticities:

- Savings can only be counted for the energy savings delivered in the savings period 2014-2020 (Article 7(1)).
- Savings from taxes introduced before 2014 can only be considered as part of early actions (Article 7(2)(d)). Therefore the first year from which measures can be counted as contributing towards the energy savings target is 2014.
- Since it takes the full life cycle of the measure in question before the maximum impact that is reflected in long-run elasticities is achieved, the full value of long-run elasticities cannot be counted completely in the earlier part of the energy saving period[64].
- The elasticities that are applied may therefore be dynamic, with savings in the first year (2014) being based on short-run effect[65], and then savings in later years (2015-2020) reflecting the transition to long-run effects. This rate of transition may vary by sector.

It is therefore important to understand what elasticities have been applied by Member States, and if long-run elasticities have been applied, how the above factors have been taken into account.

The approach taken by Member States is described below.

Table 11: Use of short-run and long-run elasticities by Member States

Member State	Approach
Austria	• It is stated in the notification that both short-term and long-term elasticities have been applied • A range is provided in the notification, reflecting the difference between the savings using long-run elasticities and the savings using short-run elasticities.
Estonia	• Only short-run elasticities are applied.

[64] Since Article 7 only allows actions taken during the period 2014 - 2020 to be counted against the energy savings target (action taken prior to 2014 may contribute towards the "early action" exemption when setting the target but not the delivery of the target itself) this means that the effects of taxes can only be counted from 2014 at the earliest. Since it takes time for the long-run effects to be realised, the full impact of long-run effects will not be realised until later in the savings period. Therefore, in 2014 the short-run effects of taxes can be realised, and from 2014 there will likely be a gradual transition towards the long-run effects, with the full long-run effects only realised towards the end of the savings period.

[65] In their notification Member States have generally assumed that the short-run effects of taxes are instantaneous, so will begin as soon as the tax is in place, and will finish as soon as the tax measure is removed. The implicit lifetime is therefore zero years – although since Member States have to report savings on an annual basis the reported savings are typically per 1-year of operation.

Finland	• Only short-run elasticities are applied.
Germany	• Only short-run elasticities are applied.
Netherlands[66]	• The elasticities presented in the notification include both short-term and long-term effects. • The calculated savings are based on the transition between short-run and long-run elasticities. • The notification describes how different transitional periods are used for different sectors: ranging from 10 years for electricity for households, the service sector and for fuels in the transport sector to 20 years for natural gas in households, services and industry. • The calculation of the savings takes into account the average impact period (i.e. the time required in order to achieve the maximum impact) associated with the long-run elasticity in each sector. The average impact period was estimated on the basis of the average lead time of (capital) goods per sector/application.
Spain	• The elasticities presented include both short terms and long term effects. • An academic paper attached to the notification provides a review of previous estimates of elasticities for Spain, before recommending the values to be used in the calculation of the Article 7 savings. • This recognises the difference between long-run and short-run elasticities, as well as the fact that short-run elasticities apply to the full population, whereas long-run elasticities only concern operators who chose to make replacements. • The paper calculates a value of transition, which describes how the elasticity values should change over time to reflect the transition from short-run effects to long-run effects. This takes into account the fact that long-run elasticities do not affect the full population. • For the domestic sector the transition is based on annual increase in number of operators, plus an allowance for increased awareness of consumers on energy efficiency. For industry the transition is based on long-run elasticities calculated for other European countries. For transport the transition is based on a linear interpolation due to a lack of data on the penetration of different vehicle power trains.
Sweden	• The elasticities include both long-run and short-run effects. • The challenges associated with the correct use of long-run elasticities in the context of Article 7 are well understood and described, including the need for assumptions to be made regarding how long it will take before the full effect is achieved and how the effect will develop over time. • The savings have been quantified on the basis that the measure is “new” i.e. has a short term behavioural impact (e.g. reduced vehicle use) in the first few years from implementation, but then longer term structural effects (e.g. by purchasing more energy-efficient vehicles) towards the end of the savings period.
United Kingdom	• The elasticities presented in the analysis are based on long-run effects. • The values appear to have been applied in a uniform manner for all years, so implicitly assume that long-run effects arise from 2014. This will overestimate the energy savings that can be counted under Article 7.

Some Member States have only applied short-run elasticities, so the issues described above are not relevant. For those Member States that have implemented long-run elasticities, one group of Member States recognises that the full long-run impact cannot be counted across the full savings period, and therefore the calculation of savings considers the transition between short-run and long-run effects. Another group of Member States do not calculate the savings in this way, and potentially overestimate the savings from long-run elasticities that can be counted under Article 7.

[66] The calculation approach that is presented only serves to demonstrate – without adjustment for overlap with a different policy – what would have been attributable to the price incentives offered by taxes, excise duties and surcharges. The actual approach taken is different, and assess taxes as part of a packages to avoid double counting of energy savings.

In the box below two examples are provided of what might be considered as good practice. At the same time, even in these examples, the approach could be have explained more clearly.

Box 5: Demonstrating that savings from long-run elasticities have been applied correctly

Sweden

The notification from Sweden describes how the long-term elasticities have been applied in the calculation of the energy savings. A summary of the approach used for energy savings from housing and services is summarised below.

The estimates of price elasticity show that a higher electricity price reduces electricity consumption in the housing and services sector. A price increase of 10 % indicates a reduction in electricity consumption of around 5 % in the long term. However, electricity consumption is only reduced by 0.7 % in the short term following a price increase of 10 %.

The descriptive analysis shows that it takes a long time for the household and services sector to adapt fully to changes in prices and incomes. People keep the same buildings, heating systems and other installations from one year to the next, which means that they can only make minor changes in electricity consumption from one year to the next as a result of electricity price changes, for example. However, this does not mean that this consideration cannot be included in long-term changes in connection with the calculation of the cumulative energy saving. Some households and companies will adapt quicker than others.

After applying the dynamic modelling it was calculated that around two thirds of the long-term energy saving effect in the household and services sector is achieved during the period up until 2020. However, the remaining on third of the long-term energy saving effect will not be achieved within this period, so was not counted.

The Netherlands

The notification from the Netherlands provides a clear description of short term and long term elasticities, as we well as how to apply them in the context of Article 7

The calculation of the savings as an impact of taxes and levies is carried out using the following steps.

- Determination of average impact period (i.e. the time required in order to achieve the maximum impact) associated with the long-run elasticity in each sector.
    - The average impact period was estimated on the basis of the average lead time of (capital) goods per sector/application.
    - The average impact per year was then estimated (the overall impact once the full impact period has elapsed)/(impact period)
- Determination of values of energy taxes/excise duties per sector per energy source for the period
- Calculation of the cumulative savings impact within the EED period by
    - determining for each change to the rates in the period 1995–2020 what the overall impact is over the long term – whether positive or negative
    - Which part of this impact falls in which year of the EED period on the basis of the impact period and
    - Calculation of the cumulative impact per year by multiplying it by the applicable factor in each year in which a rate rise takes place (2014: 7, 2015:6, 2016:5, 2017:4, 2018:3, 2019:2, 2020:1).

3.3.1.3 Accounting for savings from other fiscal instruments

By determining the energy savings from energy or CO_2 taxes that have the effect of reducing end-use energy consumption, Annex V(3)(c) requires that the energy savings from accompanying taxation policy instruments, including fiscal incentives or payment to a fund, shall be accounted separately. This is relevant where the revenues from the energy or CO_2 taxes may be reinvested in other energy saving actions via other policy instruments.

No examples were identified in Member State notifications where energy savings from accompanying policy instruments, including fiscal incentives or payment to a fund, were not accounted separately. At the same time it was not stated explicitly in any cases what actions were taken to address this requirement.

3.3.1.4 Double counting

With the exception of Sweden, energy and CO_2 taxes are just one of several instruments that are notified by Member States i.e. other policy measures in addition to tax measures have been proposed to meet the target. This requires, as specified in Article 7(12), for Member States to ensure that when the impact of policy measures or individual actions overlaps, no double counting of energy savings is made.

Savings from energy and CO_2 taxes are calculated top-down, based on elasticities which are derived from aggregated statistics. This means that the energy savings are calculated by looking at the trends in overall energy consumption at a sectoral level, and then isolating the drivers of those trends using econometric analysis. This will include factors such as, in the case of road transport, fuel consumption, fuel prices, income, consumer price index and population.

In contrast, calculation methodologies for most of the other policy types are based on bottom up approaches, which are based, for example, upon the number of different energy saving technologies that are implemented and the individual savings per measure. In the case of road transport this might be based on the number of more efficient vehicles entering the stock.

Since the savings from these other policies, calculated bottom up, will be reflected in the aggregated statistics that are used to calculate energy and CO_2 taxes, there is a risk of overlap and double counting of the savings. For example, energy taxes might be expected to stimulate consumers to purchase more energy efficient vehicles, which would result in a reduction in the energy intensity of the vehicle stock. However, at the same time the Member State may have in place a fiscal incentive to stimulate the uptake of more efficient vehicles, which is seeking to achieve the same objective. It is necessary that the assumed energy savings from more efficient vehicles are not double counted.

The approach taken by Member States to address double counting is described below.

Table 12: Implementation of Article 7(12) by Member States

Member State	Approach
Austria	• The notification specifies that for strategic measures, where there is a danger of double counting with other measures, the savings are not taken into account.
Estonia	• The notification states that taxes on energy consumption do not have a sufficient impact to be able to independently induce investments with a similar impact in the areas to be supported through the alternative policy measures. • This is demonstrated by providing an example of the payback for a building refurbishment with the inclusion of the energy tax, by arguing that the energy tax is not sufficient to stimulate the investment[67].
Finland	• Only savings from energy and CO_2 taxes associated with road transport are included in the notification. • However, Finland also has energy and CO2 taxes in other sectors. The savings from these measures are not notified since the savings impact would significantly coincide with the other measures that are notified. • In other words Finland avoids the risk of double counting by not including those energy and CO_2 taxes that strongly overlap with the other measures.
Netherlands	• The savings from energy taxes are assumed to be part of a cluster of policy measures. The calculation approach that is presented therefore only serves to demonstrate – without adjustment for overlap with a different policy – what would have been attributable to the price incentives offered by taxes, excise duties and surcharges. • The risk of double counting has therefore been mitigated by attributing the savings at the level of the policy package.
Germany	• The notification states that since only short-term behavioural effects are taken into account, then overlaps with other instruments are not considered significant.

[67] As described above, Estonia has calculated the energy savings based on short-run elasticities, which do not include long-run capital investments so the risk of overlaps with measures such as building refurbishments is limited.

	• However, Germany's notification also includes certain other measures targeting changes in energy behaviour such as energy advice programmes which may potentially overlap with the effect of energy taxes.
Spain	• The notification recognises that taxation measures have an effect on energy prices, which then affects the cost-effectiveness of energy saving and efficiency projects. Thus savings from replacing equipment and/or processes are allocated to taxation measures where the price effect makes the investments cost-effective. • Energy savings from subsidy programmes have been allocated to these programmes, since it is argued that without the subsidy the measures would not be cost-effective (even allowing for the effect of the taxation measure).
Sweden	• No risk of double counting as the taxation measure is the sole instrument for delivering the energy savings target.
United Kingdom	• Allowance has been made for overlap of the tax instrument (the Climate Change Levy, CCL) with the linked policy on Climate Change Agreements (CCAs). • Organisations within a range of sectors can claim partial exemption from the CCL if they have a Climate Change Agreement. Since this reduction reduces the rate to approximately the EU minimum levels, no energy savings have been assumed from energy used by organisations covered by CCAs which have been reported separately.

Member States have adopted different approaches to address double counting and also provided varying levels of details on how they have addressed the requirement. Sweden, has only notified a single policy under Article 7 to avoid any risk of double counting, even though Sweden implements other energy efficiency measures. A different approach is used by Finland, where only energy and taxation measures where the risk of double counting is expected to be small (see table above) have been notified. Likewise, in the UK the calculation approaches addresses the specific overlap with a linked policy. An alternative approach to dealing with double counting is used by the Netherlands, which involves only estimating energy savings for a package of policies which includes energy and CO_2 taxes. In the case of Spain and Estonia the argument is made that double counting is not an issue because the tax levels are insufficient to stimulate the large scale investments.

In the box below an examples are provided of what might be considered as best practice.

Box 6: Demonstrating how policy overlap have been addressed

Netherlands

The notification from the Netherlands describes in detail the approach that has been followed for situations in which energy savings are achieved as a result of different policy measures when taxation measures are used. This also includes examples to illustrate the approach. This notified information is stated below.

In observing and/or estimating the savings, the monitoring activity uses the information relating to the projects carried out as much as possible, whereby the savings are generally known at measure and/or company level. The monitoring activity also analyses whether different policy instruments implement the same measure (e.g. long-term agreement and EIA). The savings are only counted once as a result of the method of reporting at cluster level. This prevents a situation in which parts of the achieved savings have to be arbitrarily attributed to individual policy instruments, in which case they must be re-counted at national level. This method prevents double counting easily and in a way that ensures efficiency in terms of costs and implementation.

Allocating impact is often rather difficult

Double counting is prevented by clustering overlapping measures into cohesive policy packages. If different measures are geared towards the same energy saving actions, it is in fact often the case that the impact of the individual policy measure can no longer be distinguished; in that case, it is an artificial splitting of the impact.

Clustering in order to prevent double counting

This is the reason why the notification is based on clusters of policy measures as much as possible, whereby each cluster focuses on a specific type of sub-consumption, to prevent overlap between the clusters. It is therefore usually not necessary to make adjustments for overlap afterwards.

Division into established and proposed policy

The notification also makes a distinction between the impact of existing and proposed policy, but this is not only done by means of clustering. The overall impact of existing policy, and existing policy combined with proposed

policy, were calculated using model simulations, after which the additional impact of proposed policy was calculated by subtracting both values from one another. Thus the scenario with existing policies was compared with the scenario with new policies, to identify the net impact of the new policies.

Example 1: existing dwellings

A good example is the policy in the built environment. The proposed policy regarding existing dwellings has been divided into three separate sub-sectors (owner-occupied sector dwellings, rented sector dwellings and social housing and other property). A cohesive package of policy measures is in place for each of these three sub-sectors. We have worked out the overall impact of these packages as a whole, and they have not been divided up further into effects of the underlying individual measures. That would not make sense either, as in many cases, these are integrated policy packages. For example, a funding scheme to assist housing associations with the costs of reducing energy consumption in their rented properties forms an integrated part of the package that was agreed on within the scope of the voluntary agreement, which makes it possible to achieve the objectives of the voluntary agreement.

Example 2: enforcement of the Dutch Environmental Management Act within the service sector

Another example is the tightened enforcement of the Dutch Environmental Management Act (WMB) in relation to energy-saving measures. The WMB makes it mandatory to apply energy-saving measures if they have a return-on-investment time of less than 5 years. The return-on-investment time of measures depends, of course, on the costs involved, but also on the energy prices, which are far higher than would otherwise be the case, due to energy tax and the sustainable energy surcharge (ODE). The energy tax and ODE, combined with the WMB, have an overall impact, and it therefore does not make sense to split up the impact according to the WMB on the one hand, and energy tax/ODE on the other hand.

3.3.2 Monitoring of the results

Article 7(10)(h) requires Member States to ensure monitoring of the results and envisage appropriate measures if the progress is not satisfactory. In the case of taxation measures monitoring and verification cannot be carried out in the same way as for the other policy measures - this is reflected in Annex V(4) which exempts taxation measures from the need to provide details on the monitoring and verification regime amongst other elements that have to be addressed for other policy measures.

This is because taxation measures cannot easily be linked with specific (bottom-up) energy efficiency measures, which can then subsequently be monitored. Instead, taxation measures incentivise behaviour change and make investment in energy efficiency measures more economically viable from the perspective of the investor. Therefore, monitoring of taxation measures is limited to ensuring that the taxes are paid and collected but there are no specific requirements in the Directive.

3.3.2.1 Monitoring

Most Member States do not address monitoring of taxation measures explicitly in their notifications, which is most likely because of Annex V(4) not requiring the Member States to notify the monitoring and verification system. The following Member States did provide some information on monitoring and verification related to taxation measures.

Table 13: Monitoring and verification systems for energy and CO_2 taxes

Member State	Approach
Finland	• The notification states that the development of transport energy efficiency (including the effects of taxes) is being monitored as part of the national energy and climate change strategy implementation.
Netherlands	• The notification states that monitoring of compliance with and enforcement of laws and regulations in the Netherlands is in general well secured. Tasks and responsibilities are laid down in legislation.
Sweden	• The notification states that as part of the enactment of Directive 2012/27/EU, Ordinance (2014:520) laying down the terms of reference for the Swedish Energy Agency has been amended; this was duly notified to the Commission (MNE [2014] 53811). Section 3(10) of the Ordinance provides that the Swedish Energy Agency is responsible for the yearly review of cumulative energy savings required

	by Article 7 of Directive 2012/27/EU, and that the review must be carried out in line with Sweden's implementation plan.
United Kingdom	• Monitoring of the Climate Change Levy, an energy tax, is referred to in the notification. The UK states that the Climate Change Levy has a small tax base and because the tax is collected through fuel bills there is little opportunity for evasion; the Climate Change Levy is therefore considered to be a low risk tax, and receipts are in line with forecasts.

3.3.2.2 Penalties

As most taxes are automatically paid at the point of purchase, or collected before the retail sale, there is little scope for energy end-users to evade paying taxes. This means that there is no need for specific penalties as energy and CO_2 taxes are dealt with as any other form of taxation. How penalties are applied to individual operators, in this case as tax contributors, is therefore not entirely relevant. As a result, most Member States did not provide information on penalties related to taxes specifically.

Table 14: Penalties associated with energy and CO_2 taxes

Member State	Approach
Finland	• The notification stated there are no sanctions in connection with taxation on transport fuel.
Netherlands	• It is stated that the Dutch Tax and Customs Administration acts as the independent enforcement body.
Sweden	• If energy tax is not correctly declared, earlier tax decisions may be reviewed by the Swedish Tax Agency to ensure that the right level of tax is charged. The level of taxation may be reviewed on the taxpayer's own initiative or on the Agency's initiative. Such decisions are subject to judicial review. Moreover, additional tax may be imposed as an administrative penalty in the event of irregularities, and criminal penalties may be imposed for tax offences. If a tax is not paid on time, interest can be charged. These penalties are dissuasive and effective. Where both administrative and criminal penalties are imposed, the principle of proportionality must be considered. The taxable person may apply for a judicial review of the imposed penalty.
United Kingdom	• Suppliers of taxable commodities must register with the Treasury (HMRC) to pay CCL on supplies to end customers. Where suppliers fail to register with HMRC a geared penalty applies based on a percentage of the CCL due. Where a non-resident taxpayer fails to appoint a representative a penalty of £10,000 applies. HMRC has the power to require taxpayers and relief recipients to provide business information and produce documents reasonably required to check their CCL tax position or that of anyone else. A penalty of £250 per offence applies for failure to maintain and preserve records: For failure to produce information and documents an initial penalty of £300 applies and an additional £60 for each day thereafter. If the information provided proves inaccurate or contains an inaccuracy, HMRC may charge a penalty of up to £3,000 for each inaccuracy. There is a range of penalties for failure to declare or pay the correct amount of CCL due. A penalty of £250 penalty plus interest on the amount due applies for failure to make returns and payments: In the case of under declaration of tax due a geared penalty applies based on a percentage of the amount under declared plus interest. In the event of an incorrect claim to the end-use exemption or the reduced rate a penalty of 105% of the additional amount is chargeable.

3.3.3 Discussion and conclusions

Energy or CO_2 tax measures (Article 7(9)(a)) require special attention because the approach taken to quantify the savings from these measures is different to almost all other types of energy efficiency measures under Article 7. Specifically, the price signal that is provided by taxes is, in most cases, technology/measure neutral, so a range of energy saving behaviours and/or technologies can be encouraged. Therefore, energy taxation measures cannot easily be assessed bottom-up. Instead, they

are quantified on the basis of price elasticities, which represent the responsiveness of energy demand to price changes.

These complexities are recognised in Article 7 and Annex V, which require some specific requirements to be met in relation to energy and CO_2 taxes. Member States have however adopted different approaches to implement these requirements, particularly when it comes to *demonstrating* that the requirements have been met. In some cases Member States have simply recognised the requirements and stated that the requirements have been met, in other cases Member States have clearly demonstrated how the requirements have been met, for example, by describing the calculations that were applied. The latter approach represents best practice, as it provides evidence that the requirements have indeed been met.

In some cases the requirements, or their specifics, do not appear to have been fully understood – or not implemented fully for other reasons. This was the case with the application of long-run elasticities, where the other requirement of Article 7 requires savings to be based on the transition from short-run to long-run elasticities, within the savings period. Some challenges also related to double counting, where it was clear in all cases that the potential for overlaps was adequately addressed.

As part of the regular monitoring of the savings achieved under Article 7 it is important to check that the estimated savings notified for the taxation measures are realised in practice i.e. that the elasticities that were used in the calculations reflect the actual outcome.

3.4 Characteristics of the notified measures

Table 15: Overview of the characteristics of the taxation measures as notified by the Member States.

Member State	Duration of the measure	Share (%) of target	Savings projected to be achieved in 2014 (ktoe)	Savings achieved in 2014 (ktoe)	Target sectors/ segments of taxpayers	Implementing public authority
Austria	2014- 2020 Lifetime of a tax effect is one year.	Not notified	251 (cumulative to 2020 1789 ktoe)	-	All sectors (Households, transport, industry, services, agriculture)	Federal Government, Federal Ministry of Finance
Estonia	2014- 2020 Lifetime of a tax effect is one year.	71%[68]	Not notified	48*	All end-use sectors, and energy transformation, distribution and transmission sectors.	Tax and Customs Board
Finland	2014- 2020 Lifetime of tax effect is one year.	Not notified	Not notified	-	Road transport	Ministry of Finance and customs
Germany	Past 2020 Lifetime of tax effect is one year.	Not notified	24	-	All sectors	Federal ministry of Finance
The Netherlands	2014-2020 Lifetime of tax effect is one year.	Not notified	Not notified	-	Households, services, industry	Not notified
Spain	Planned to be in place over the full savings period and beyond 2020 Lifetime of tax effect is one year.	Not notified	316	276*		Not notified

[68] This assumes that the savings gap incurred due to late implementation of the EEOS will be met by energy and CO2 taxes.

Sweden	2014-2020 Lifetime of tax effect is one year.	Not notified	411	-	Those who generate taxable electric power commercially and those who supply electrical power commercially	Swedish Tax Agency
UK	Planned to be in place over the full savings period and beyond 2020 Lifetime of tax effect is one year.	Not notified	610	610*	Energy products used by business consumers including consumers in industry, commerce, agriculture, public administration, and other services. The main rates of CCL do not apply to taxable commodities supplied for use by domestic consumers or to charities for non-business use.	HM Revenue & Customs

* notified in Member States' 2015 Annual Reports

4 Financial schemes and fiscal incentives

4.1 Introduction

This case study provides an analysis of financial schemes and fiscal incentives (FSFIs) that have been notified by Member States as contributing towards their energy savings target under Article 7. The case study begins by describing how FSFIs work, and then, based on a broader review of the literature[69], identifies the main factors which influence their cost-effectiveness. This is followed by a review of how Member States have implemented the requirements of Article 7 and Annex V, in relation to FSFIs. As part of this review, best-practice examples of how the requirements have been met are identified.

It is important to note that more than 130 individual FSFIs have been notified by Member States in relation to Article 7. It has not been possible to review the characteristics of each of these different policies at a detailed level. Instead the case study explores the characteristics of a smaller number of policies, focussing on examples which demonstrate best practice in relation to Article 7 implementation.

4.1.1 Overview of policy instrument

Financing schemes and fiscal incentives include a broad range of different instruments that share the common characteristic of providing monetary and/or fiscal support for energy efficiency actions. The support can take various forms such as a non-refundable grant, preferential loan, bank guarantee, tax concession and it can target different sectors.

4.1.2 How the policy instrument works

FSFIs work by addressing the financial barriers to energy efficiency investments. They can provide the needed upfront capital to overcome the cash-flow problem that constitute a barrier to many – otherwise economically viable – energy savings investment and/or can reduce the payback period of such investments. In addition, they can make energy efficient products more cost competitive. The monetary support provided from public sources can be allocated either on the basis of application (e.g. applying for a grant under a renovation support scheme) or automatically by purchasing energy efficient products (e.g. automatic eligibility to tax concession when purchasing an EV). Apart from inducing action, the additional financial resources channelled into energy saving investments allow the beneficiaries to achieve higher savings by more advanced solutions (deeper renovation level, high-end equipment).

4.1.3 Cost effectiveness of the policy instrument

There is no standard way of assessing the cost-effectiveness of FSFIs. Most evaluations of energy efficiency FSFIs assess effectiveness in terms of the energy savings that have been delivered, although some consider other performance metrics such as CO_2 savings. In relation to the policy costs, some evaluations consider the total investment cost, whereas others only consider the financial contribution provided by the instrument e.g. value of the grant. Likewise, some evaluations only assess the financial savings from the reduced energy consumption, whereas others also include wider economic impacts such as the employment stemming from the leveraged investments. As a result of these inconsistencies, it is difficult to determine the cost-effectiveness of FSFIs in general terms, and where estimates do exist they vary widely from case to case. Some further discussion on the cost-effectiveness of FSFIs, including specific examples from the literature, is provided in the Annex of this case study.

Despite these challenges in comparing the cost effectiveness of different schemes, the literature provides some evidence on the factors that may play a role in the successful implementation of FSFIs for targeting energy efficiency. A summary of the success factors that were identified in relation to financial schemes for building renovation are summarised in the table below.

[69] Even though FSFIs have been notified extensively by Member States as contributing towards their energy savings targets, insufficient information is available on the effectiveness of these policies to date in delivering energy savings under Article 7. It was therefore necessary to assess the cost-effectiveness of these instruments based on a wider review of literature on FSFIs in general.

Table 16: Factors of success and risks/barriers of the take-up of building renovation support

	Factors of success	Risks/barriers
Coverage of the scheme	compatible with the policy goal	target group defined too broadly (problem of free-riding) or inefficiently (i.e. not based on savings potential)
Administrative conditions	simplified and standardised applications	many documents to prepare before grant/loan application
	lists of eligible materials and equipment	changing support conditions and administering entities
	marketing of schemes by the involved financial institutions (branding)	burdensome reporting
	Setting ex-ante goals and establishing a monitoring process	long lead time
Availability of matching funds	availability of local and regional public funds	
	long maturity loans with modest monthly debt service	
	loans to provide the self-financing part of grants	
	collaboration between public and private sector to provide bundled financial packages	
Quality of EE investments	support level dependent on the deepness of retrofit	EE equipment price increase due to anticipated extra revenue of purchasers
		diffusion of not up-to-date technologies

Source: Ricardo AEA/CE Delft/REKK

4.2 Use of the policy instrument by Member States

Policy measures belonging to the FSFI category have been notified by the majority of Member States (21). Altogether more than 130 FSFI policy measures have been notified, which in total represent 20% of the total cumulative energy savings from Article 7 at the EU28 level.

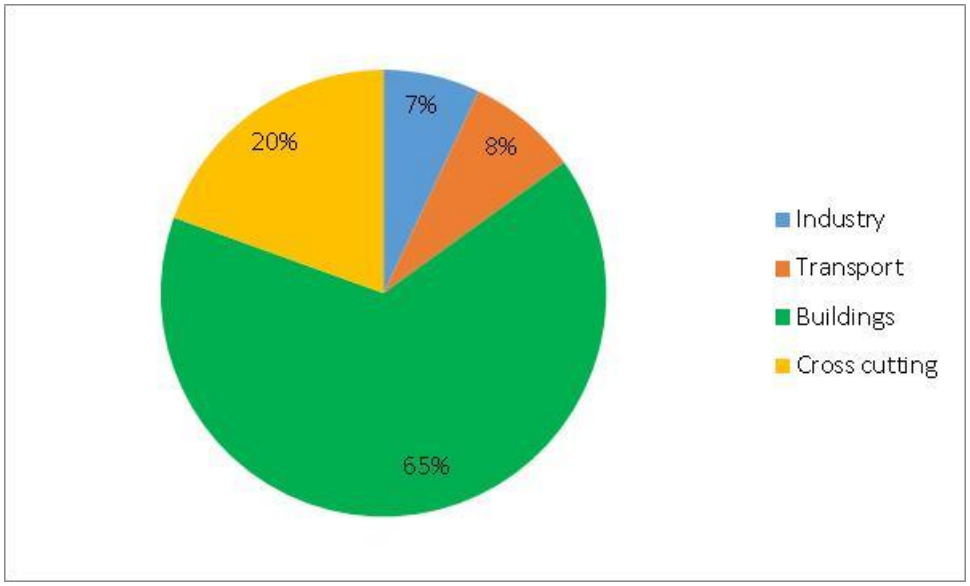
The notified FSFIs target a wide range of sectors and energy savings actions. Typical actions include building renovations, modernisation of vehicle fleets (passenger and freight) and support for energy saving products. This latter type would include products used in buildings and also public lighting. The following list provides some selected examples of FSFIs and the associated actions stimulated. The coverage is not complete, but does illustrate the breadth of instruments that have been applied, and the associated energy saving actions:

- building renovation:
  - grants for building renovation (Croatia, Romania, Italy)
  - tax incentives for building renovation (Italy: up to 65% tax reduction on energy efficient investments in buildings, residential and other)
  - guarantee fund for building renovation (France)
  - mixed soft loan and grant for buildings (Germany)
  - grants for the construction of exemplary buildings with outstanding energy efficiency features (Belgium – Brussels region)
- vehicles: vehicle fleet (passenger and freight) modernisation (differentiated tax rates based on CO_2 emissions in Croatia, grants for low emission cars and vans in Ireland: grant provided for low CO_2 emissions vehicles in the UK)

- products**:**
  - equipment replacement (tax incentive in Malta, grants in Romania, accelerated capital allowance in Ireland)
  - modernisation of public lighting (tax credit in Malta and grants in Romania).

The majority of savings attributable to FSFIs is expected to be achieved in the building sector (65%) and from measures that are cross cutting across more than one sector (such as taxes and financial incentives applying to multiple sectors) (20%).

Figure 1: The sectoral split of savings from financial schemes and fiscal instruments notified under Article 7 (cumulative savings in 2020, EU28)

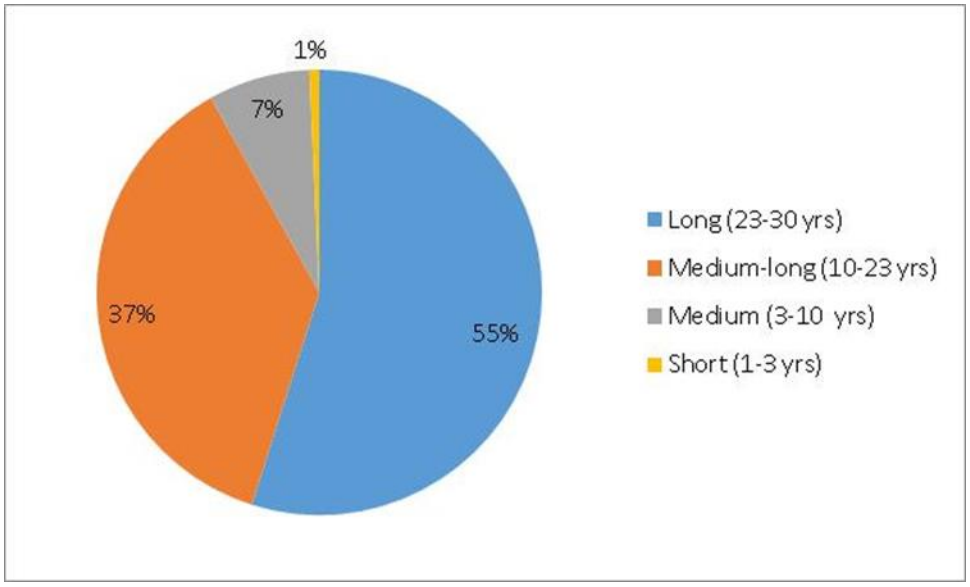


Notes: based on data notified by Member States up to 1 May 2015

The split according to the longevity of FSFI policy measures shows that they almost exclusively have medium-long and long lifetimes i.e. of 10-30 years, the majority (55%) having long lifetimes (23-30 years). It should be noted that Member States notified information on the projected cumulative energy savings of their policy measures, together with information on the individual actions that are stimulated by the policy measures. However, for the majority of the policy measures a range of different energy saving actions are stimulated, so it was necessary to approximate the relative contribution of the different actions to the total savings, and then from this point attribute the lifetime of the energy savings in accordance to CEN values[70]. These estimates are based on the expert judgement of the project team taking into account any information that was available on sectors that were targeted by the measure (e.g. buildings, industry) and the types of actions that would be triggered (e.g. technical measures, behavioural actions).

[70] CEN, 2007: Saving lifetimes of energy efficiency improvement measures in bottom-up calculations, CWA 15693.

Figure 2: The lifetime of savings of financial schemes and fiscal instruments notified under Article 7



Notes: based on data notified by Member States up to 1 May 2015

4.2.1 Use of EU funds

Altogether 6 Member States indicated in their notifications that they intend to finance their FSFIs partly from EU funds. For example, under the Fund for Environmental Protection and Energy Efficiency, Croatia has established a co-financing scheme which includes withdrawal from the EU Structural Funds. The Czech Republic plans to use EU funds for some of its alternative policies, and Estonia also makes reference to the use of EU money. Latvia and Lithuania plan to support the policy measures with the assistance to be received from EU Funds programmes. Romania stated that their alternative policy measures will be financed from own financial sources, bank loans and European funds. This – however – is not necessarily a definite list as Member States were not required to report on the sources used to finance their FSFIs.

4.3 Compliance with the Article 7 requirements

Article 7 and Annex V include certain requirements that need be taken into account by Member States when calculating the savings impacts of FSFIs. Drawing upon examples from the schemes that have been notified by the different Member States, in the following sections we describe “best practice” examples of how these requirements have been met.

Based on our assessment of the information notified by the Member States in relation to Article 7, not a single FSFI was found to satisfy fully all aspect required by Article 7 and Annex V (eligibility, calculation of energy saving and monitoring, reporting and verification) properly. In the forthcoming section we have analysed each of the different requirement and provided examples of best practices for each of them.

4.3.1 Eligible measure categories

Annex V(4)(e) requires Member States to notify as part of their detailed methodology the eligible measures categories. The eligibility criterion can apply to both the policy measure and the individual actions targeted by the policy measure. The eligibility of a policy measure is based on the eligibility of the individual actions it stimulates and as such it often cannot be assessed fully as it may contain individual actions that are eligible but also some that are not. For an action or measure to be eligible it needs to deliver energy savings to final consumers i.e. end use energy savings (Article 7(1)).

Good practice in demonstrating that this requirement has been met may include the notification of a comprehensive list of actions that are all eligible, or the clear differentiation between savings from eligible and non-eligible. The identification of these individual actions is also a prerequisite for the

adequate notification of other Article 7 requirements that are action specific, such as assignment of adequate lifetimes, measurement/calculation methodology.

A good practice example of where eligibility has been demonstrated for a FSFI that targets several different types of eligible actions is the two grant schemes of Wallonia ("Energy grants for citizens and industry"). These schemes target both building renovations and the replacement of the major energy consuming equipment in the buildings and industry sectors. The notification lists the eligible actions at a detailed level (including possible exemptions).

Box 7: List of actions under the "Energy grants for citizens and industry" policy measures - Belgium, Wallonia region

Grants for citizens:

- thermal insulation of the roof or attic, walls and floors,
- except for single-family houses, installation of a condensing natural gas boiler labelled and complying with AR 18/03/1997,
- heaters, air condensing furnaces and radiating devices,
- except for single-family homes and apartment subsequent to April 30, 2010:
  - Grant for installing an instant natural gas bath heater without burner, flame modulating and turbofan,
  - Grant for the installation of a condensing hot water generator on natural gas,
  - Installation of a heat pump for the exclusive production of domestic hot water,
- ventilation system with heat recovery in housing that meets certain conditions,
- management system of electric lighting installations and equipment less than 20 kW equipment to extinguish or control automatically the electrical equipment of a building,
- replacement of lights fitted in an interior lighting system,
- analysis of power consumption and under certain conditions the replacement of exterior joinery

Grants for industry:

- any system recovering heat from flue gases in industrial and artisanal ovens, dryers or natural gas boilers and steam generators.
- a system wide modulation of natural gas burners for more effective regulation.
- direct -fired natural gas for product heating.
- a management system of electric lighting installations and equipment.
- variable speed drive or a compressor, pump and ventilation system achieving 10% energy savings.
- control device or the optimization of defrost cycles achieving energy savings of 20%.
- complete replacement of fixtures
- analysis of the power consumption for the operation of a technical unit.

As described above, some policy measures may stimulate both eligible and non-eligible actions. For example, some FSFIs will stimulate the uptake of renewable energy generation alongside energy efficiency measures. Since only energy efficiency measures can be counted towards the energy savings target, Member States need to demonstrate how this has been addressed when calculating the energy savings from the relevant policy measures.

The notification from Italy provides a good example of how to deal with the problem of financial programmes with a mix of energy savings and renewable actions: the savings due to renewable actions are not counted towards the Article 7 target (under "Tax deductions" and "Thermal Accounts" policy measures). Another good example is the "Energy grants" policy measure of Belgium, Brussels region. Even though solar panels are eligible for granting, they have a special code in the programme and hence are excluded from the savings aggregation in a relatively straightforward manner.

4.3.2 Calculation of energy savings

Article 7(6) requires that Member State ensures that the savings stemming from the notified policy measures are calculated in accordance with the points (1) and (2) of Annex V. In the following sections these requirements are analysed and examples of best practices provided from the FSFIs measures notified by Member States.

4.3.2.1 Measurement methods

Annex V(1) sets out a number of methods which may be used for calculating the impact of EEOS or alternative policy measures. Therefore, good practice in the notification of the measurement methods would involve demonstrating how these conditions have been met.

The different measurement methods are appropriate for different types of projects. For large individual projects that are not replicated (e.g. large industrial projects) metering of the savings may be a sensible approach as – on the one hand - the cost/energy savings can justify a more sophisticated measurement approach and – on the other - the individual features of the these projects might not be represented adequately by existing benchmark values. However, if the policy measures includes action that are replicable and hence can be standardised then the use of deemed savings is often the preferred option because it allows benchmarks to be set by the implementing public authority based on statistical evidence and past experience on energy savings for these individual measures. These standardised measures can be monitored more efficiently on the basis of predefined benchmarks.

As described in the previous sections FSFIs may target a range of different sectors and energy saving actions e.g. buildings refurbishment, vehicle and equipment modernisation. The most appropriate measurement method will vary between actions. Examples of the best practice in relation to the use of the deemed, scaled and metered savings for FSFIs are provided below.

The appropriate application of *deemed savings* methods requires that the Member States define benchmarks based on savings achieved with similar actions executed in the framework of previous policy measures.

Box 8: Examples of good practice for the use of deemed savings

Energy grants – Belgium, Brussels region

Brussels applied the deemed savings approach to its programme providing grants for energy renovations and renewable energy generation to building owners (Individuals; public sector; non-commercial organizations; legal persons; trustees of buildings, regardless of their legal form; EU institutions) in the region Brussels-Capital based on energy savings results obtained between 2009 and 2013.

Programmes PANEL and NEW PANEL and State programmes to promote energy savings – Czech Republic

The Czech Republic will apply a deemed savings approach and the savings will be assigned on the basis of model calculations (comparing the energy performance of new technologies and technologies commonly used today) and the experience gained form previous programs, such as the Green Savings Programme. In case of the State programmes to promote energy savings, the estimated savings are calculated on the basis of experience gained form the program EFFECT in 2008.

Scaled savings are based on engineering estimates including the main conditions (year of construction, heating degree day, insulation values etc.) affecting the savings that can be achieved.

Box 9: Examples of good practice for the use of scaled savings

Home Energy Efficiency Programmes - UK

The UK calculates savings by using the Domestic Energy Model for Scotland (DEMScot) which is based on data from the Scottish House Condition Survey, building physics parameters and Scottish weather variables, and assumes a rebound effect of 15%.

Building renovation programmes (residential, public and commercial) - Croatia
Croatia calculates the savings of its various building renovation schemes based on the combination of the parameter describing the insulation characteristics of the building element (U-value), the construction year of the buildings and its elements and HDDs.

A good practice example for the use of *metered savings* method is Croatian policy measure to subsidise the installation of individual heat meters in flats within block/multi-apartment buildings. The following example can serve as good practice for many Central and Eastern European Member States where

these buildings are traditionally served by a single heat meter per building so flat owners cannot control their own consumption. Measurements done before and after the installation of meters allow a more robust estimate of the effect of the policy measure, so long as it is implemented in isolation (not as an element of a complex renovation package).

Box 10: Example of good practice for the use of metered savings

The introduction of a system of individual measurements of heat – Croatia

Croatia plans to use metered savings approach: energy consumption data shall be provided before and after the installation of individual heat meters in multi-apartment buildings. Suppliers are responsible for metering energy consumption before and after the installation of meters.

4.3.2.2 Additionality

Article 7(6) and Annex V point (2)(a) requires that when calculating energy savings pertaining to FSFIs, only the savings that go beyond the minimum requirements originating from specific EU legislation can be counted as contributing towards the energy savings target.[71]

The issue of additionality arises in relation to energy efficiency actions where minimum standards are defined by EU legislation:

- in case of building refurbishment programmes the cost optimal level defined by the Energy Performance of Buildings Directive (EPBD),
- in case of vehicle modernisation schemes (i.e. promotion of replacement of inefficient passenger cars and light commercial vehicles with more efficient ones) the emission performance standards defined by Regulation 443/2009 and 510/2011,
- in case of products and equipment the requirements included in the Ecodesign Directive.

In the Commission's clarification of specific aspects of Article 7 EED provided to the Members of the EED Committee, 16/09/2015' the Commission clarified that cost-optimal levels for energy efficiency in new buildings should be considered as mandatory and applicable under EU law. Member States can count energy savings, which result from the application of national building codes which are more stringent than the national cost optimal level established/calculated under Article 5(2) of the EPBD.

FSFIs – just like any other type of policy measure targeting building modernisation renovation under Article 7- need to support energy efficiency improvements which are additional to those improvements that would happen in the absence of the policy intervention. A good example for such policy effect is the higher renovation rates. Any increase in the renovation rate achieved by the policy instrument can be counted as energy savings.

For products covered by the Ecodesign Directive and new passenger cars and commercial light vehicles only savings that are additional to the minimum performance requirements laid down in the relevant EU legislation can be counted towards the Article 7 savings target.

Box 11: Example of good practice for the additionality to EPBD and Ecodesign Directive

Call for exemplary building practices (BATEX) – Belgium, Brussels region

Only savings that go beyond the savings obtained by the cost optimal solution are counted in the support scheme for exemplary building projects. In addition, the application period of the policy measure reflects the planned upgrade of minimum performance levels. Even though from 2015 very strict energy standards will be introduced, calls for exemplary building practices is expected to continue to 2017 because a two-year delay is assumed due to the time required to obtain permits and the required time to realise the work.

Energy grants – Belgium, Brussels region

In the energy grant scheme the savings are calculated as the additional savings that the project has to realise to qualify for this policy compared to the cost optimal methodology as laid down in the EPBD and the minimum requirements set by the Ecodesign Directive. In addition, the MS states that e.g. grants for energy efficient

[71] Annex V point 3(a) deals with additionality in the context of taxation measures that is discussed in the other case study.

cooling fridges and/or wash dryers is only provided for the additional costs compared to the European obligations.

The Czech Republic applies a less strict interpretation of additionality regarding EPBD requirement. Only those projects are granted that lead to a lower energy use than required by the EPBD. However, the Member States considers the total savings to be eligible since the owner's decision to carry out this building renovation work is due to a public incentive (policy measure) that will speed up the rate of renovation work. Similarly, Finland claims that its "Start-up assistance for building renovation" policy measure delivers additional savings by bringing forward renovation activities that would not have happened otherwise (or would have happened later).

The consideration of additionality only appears at the level of general statements in the notifications and only in case of a minority of Member States hence this issue calls for further attention in the assessment of the effectiveness of Article 7.

There is no standardised way to demonstrate that energy savings actions/investments would not have happened without the introduction of the policy measure. The elimination of free riders in case of grants and subsidies (FSFIs) requires the identification of those target groups that would abstain from action without the public support. The focus of low income groups would be a good example of such targeted aid dispersion. We could not locate such example among the FSFIs notified by the Member States. Another method of demonstration would be to justify the public support by means of economic analysis showing that previously non-viable projects become economically rational with some public support. Aid programmes of Spain require the assessment of its incentive effect, i.e. if the project would have implemented anyway (without the subsidy) the project does not get financed.

4.3.2.3 Materiality

Annex V, point 2(c) requires that the energy efficiency measures must be demonstrably material to the achievement of the claimed savings. According to the Commission Guidance note (paragraph 33), the term "material" means that the party in question – in case of FSFIs the implementing public authority or the entrusted party - has contributed to the realisation of the specific individual action (in excess of the automatic rolling out of EU legislation, or autonomous improvements because of, for example, market forces or technological developments).

The requirement was introduced to ensure that the activities of the party in question has contributed to the realisation of the specific individual action, and that the subsidy or involvement of the implementing public authority or entrusted party had a significant effect on the end user's decision to undertake the energy efficiency investment.

Materiality can be demonstrated by stating the contribution level of the policy measure to the overall cost of the measure either as a relative or absolute contribution level or the impact on the pay-back time of the investment. Even though here are no standard benchmarks, all of these methods are suitable for justifying the material impacts of the policy intervention resulting in the achieved energy savings.

Table 17: Examples of good practice for demonstrating materiality

Member State	Policy measure	Target of policy measure	Level of public contribution
Belgium/ Flanders region	RUE scheme	replacing glazing or improving insulation	reduction in the pay-back period of approximately one year compared with the same investment without a grant
Belgium/ Wallonia region	UREBA ordinaire and exceptionnel	Ordinary and exceptional grants to public law and non-commercial organizations to carry out work to improve the energy efficiency and the rational use of energy in buildings	30% and 60% of investment costs, respectively

Belgium/Brussels region	Call for exemplary building practices (BATEX)	exemplary building projects	100 EUR/m2 refurbished/newly built building area
Croatia	Building renovation programs (residential, public and commercial)	complex renovations	40-80% of investment cost
Cyprus	Energy efficiency investments and use of RES in public buildings[72]	complex building renovation	100% of investment cost in relation to government buildings and 40% in relation to wider public sector buildings
Cyprus	Energy efficiency investments and use of RES by businesses	complex building renovation	up to 40% of investment cost
Cyprus	Energy efficiency investment and use of RES in homes	complex building renovation	45% of investment cost in case of energy upgrade of houses, 30% in case of thermal insulation and 30% in case of solar hot water systems
Czech Republic	Programs PANEL and NEW PANEL	renovation of block buildings	very low interest loan of 0.75% per year that can be set up for 30 years
Czech Republic	Operational Programme Enterprise and Innovation		40% of investment cost
Estonia	Financing schemes and instruments or fiscal incentives	KredEx Credit and Export Guarantee Fund	15-35% of investment costs
France	Guarantee fund for energy renovation (Fonds de garantie)	loans for home energy renovation in order to reduce the cost of borrowing for households	average loan will be 13.500 EUR
Italy	Tax deduction	upgrading of the building's energy performance and heating/cooling generation	65% of the investment costs
Spain	PIVE	promotion of scrapping old vehicles for more fuel efficient ones	Final discount of at least 2,000 EUR in purchase price of a new vehicles will be provided (consisting of 1,000 EUR as minimum from the car dealer), for large families 3,000 EUR

4.3.2.4 Policy overlaps

Annex V(2)(d) requires Member States to ensure that when the impact of policy measures or individual actions overlaps, no double counting of energy savings is made. However, there is no specific requirement to notify how overlaps/double counting is addressed.

FSFIs are often applied together with other policy instruments in supporting the same energy efficiency improvements. Where this is the case there is the risk of policy overlaps i.e. two or three policy instruments support the same energy efficiency measures. Overlaps are not necessarily problematic and there can be good reasons for why a range of policy instruments is chosen to support energy savings in the same sector. An example is the French EEOS which is closely linked to tax rebates

[72] Note, that only the savings due to energy efficiency actions are counted against the Art. 7 target, even though the programme involves renewable utilization elements.

(being an FSFI policy measure). Households typically receive a contribution from the tax rebates and the EEOS. France addresses this problem by not using tax rebates for the purpose of Article 7 so all savings are allocated to the EEOS.

There are different options to address such policy overlaps:

- The savings can be apportioned among the overlapping policy instruments. For example, 70% of the savings are allocated to policy instrument 1 and 30% of the savings are allocated to policy instrument 2. A simple basis for the apportioning is the relative financial contribution to the investment cost of the supported energy efficiency measures. However, this information may not always be available and splitting the energy savings is not straightforward in all cases particularly when different entities are responsible for administering and monitoring the policy instruments.
- The savings can be attributed only to one of the policy instruments whereas the other policy instrument(s) are assumed to deliver no savings at all.
- The beneficiaries of the policy measures are only allowed to use one type of incentive provided from one policy instrument.

The two last methods are compliant with the EED as they avoid double counting of savings.

A good example of best-practice is Italy which has introduced provisions that avoid double counting using approach No 3 outlined above. With effect from 1 January 2013 it is forbidden to use more than one national incentive scheme for the same project (including EEOS, the tax deductions and the Thermal Account). The implementing public authorities of the three policy measures – namely the Manager of Electricity Services (GSE) for both EEOS and Thermal Account and Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) for tax reductions – perform the necessary checks on the obligated parties holding white certificates to ensure that they do not get other national incentives. GSE, responsible for EEOS and Thermal account, carries out these checks by its own means and the possibility of building a database is currently weighed up. For what concerns tax reductions, ENEA manages a database and checks for congruity the savings claimed to access the fiscal incentive, while the Revenue Agency (Agenzia delle Entrate) performs tax spot-checks. Beneficiaries of the Thermal account incentive scheme must declare in the application form that they have not claimed any other national incentives. Non-compliance is subject to penalty. The prohibition of combining different national incentives, entered into force on 1 January 2013, has resulted in a severe decrease in the overall number of projects submitted.

4.3.2.5 Lifetime of measures

Annex V point (2)(e) requires Member States, in their calculation of energy savings, to take into account the lifetime of savings. This may be done by counting the savings each individual action will achieve between its implementation date and 31 December 2020. Alternatively, Member States may adopt another method that is estimated to achieve at least the same total quantity of savings.

It should be noted that lifetime needs to be defined for all individual measures regardless the type of policy measure it supports (EEOS, FSFIs, voluntary agreements etc.). The lifetime of an individual eligible measure i.e. the period during which it generates savings is indifferent whether it is a part of an EEOS or a grant scheme. The precondition for compliance with lifetime information is the definition of individual actions. As far as FSFIs concerned, this is especially relevant in case of complex building renovation policy measures. Individual actions can be clustered according to their lifetime. The “Program for energy renovation of commercial non-residential buildings” in Croatia uses the following lifetimes:

- 25 years for building envelope and cooling systems
- 20 years for solar collectors
- 12 years for lighting
- 10 years for boiler replacement

The use of cutting edge technologies allows for the definition of a single long lifetime. Projects within the BATEX (Belgium/Brussels region) are extensive renovations and very high efficiency construction works of which the energy savings last at least 20 years that is a valid assumption given the specified levels of energy saving the projects have to achieve to qualify for this scheme.

Another good practice that can be followed by Member States that implement FSFIs in parallel to EEOS is to use the technical lifetimes defined in the EEOS. This is the path chosen by Italy and Latvia.

Box 12: Examples for using the lifetimes of EEOS

Tax deductions and Thermal Account – Italy

Lifetimes are defined in the EEOS as used for these FSFI policy measures that are used concurrently with EEOS in Italy. The lifetimes correspond overall to the lifetimes recommended by the Commission (http://www.energy-community.org/pls/portal/docs/906182.PDF). The Member State uses the straightforward approach to account for lifetimes of measures. Where the lifetime extends beyond 2020, the savings delivered after 2020 will not be taken into account.

FSFIs – Latvia

Latvia has prepared and published a deemed energy savings catalogue, based on the template of Denmark (https://www.em.gov.lv/lv/nozares_politika/energoefektivitate_un_siltumapgade/energoefektivitate/energijas_ietaupijumu_katalogs/). The lifetimes of savings are provided in the published catalogue with energy saving measures and these lifetimes are used for all policy measures (EEOS and FSFIs).

4.3.3 Quality standards

According to Annex V point (2)(g), Member States are required to maintain quality standards for products, services and installation of the energy efficiency improvement measures. This includes introducing relevant quality standards, where they are absent, and monitoring compliance with the standards.

Good practice would entail the reference to the quality requirements to the materials and products involved in the energy saving investments. Reference to quality requirements are notified in case of a few FSFI policy measures only. Independent monitoring was quoted only in case of exemplary buildings in Belgium/Brussels region (exemplary building practices - BATEX) where during the realisation of the project a technical expert is hired by the Brussels region to oversee the realisation and guarantee that the agreed quality is realised. This personal oversight is only feasible in those schemes that contain only a limited number of investments. The conditionality of payment can be a forceful motivation for compliance with quality standards. In the “Tax reductions” policy measure in Italy all projects targeting buildings and associated heating technology must meet minimum access requirements, compliance with which is verified before payment of the incentive and therefore before the reporting of savings by ENEA and GSE. Therefore all projects are subject to quality control and scrutinised against the rules set by the national legislation.

Box 13: Example of good practice for monitoring quality standards

New grants supporting exiting EEO scheme called RUE – Belgium/Flanders region

To be eligible for a RUE grant a number of quality requirements must be met (e.g. minimum thermal resistance). The quality requirements are laid down in the ministerial Decree of 29 November 2011 establishing further rules, technical requirements and levels of the grants referred to in Article 6(4)(1/1), Article 6(4)(1/3), Article 6(4)(1/4) and Article 6(4)(1/5) of the Energy Decree of 19 November 2010. In addition, the customer must provide a number of supporting documents to obtain a grant. For the grants for existing buildings, the usual evidence required consists of invoices giving specific details about the materials installed. Additional documents may be requested depending on the measure concerned. An independent quality system (STS 71-1) has been developed for cavity wall insulation which must be complied with.

4.3.4 Monitoring, reporting and verification

Article 7(10) require the Member States to put in place appropriate measurement, control and verification systems for the energy efficiency improvement measures and set specific requirements for these systems, such as reporting, monitoring and penalties in case of non-compliance.

4.3.4.1 Reporting

Article7(10)(g) requires that the participating parties provide an annual report of the achieved energy savings which is published. Reporting is also necessary so that Member States can monitor and verify the savings as required by Article 7(10(h) and (j). The various FSFI policy measures are often administered by different organisations and these parties typically report to the entity responsible for

the overall monitoring of savings delivered. This can be the regulator, a government department or agency.[73] In Hungary, for example, the different public bodies that will be responsible for the implementation of the proposed policy measures are obliged to provide information on achieved savings to the main administrator, the Hungarian Energy and Public Utility Regulatory Authority. Without robust reporting it is impossible for the administrator of the national energy savings to monitor progress and ensure that the planned savings are delivered.

Best-practice includes a specification by the Member State what information and data are expected from the participating parties that would provide a solid basis for the annual report to be made public each year. The aggregation of savings data is essential not only at policy measure level but also at the level of individual actions of each policy measure. Several good practices for well governed information collection can be found in the practice of Member States.

Box 14: Example of good practice for reporting

Thermal Account – Italy

As far as reporting concerned, each year GSE (the Energy Services Operator), with ENEA's (the Italian National Agency for new technologies, energy and sustainable economic development) technical assistance, prepares a report on:

- the number of the applications received;
- the number of actions installed;
- the value of the investments made;
- the value of incentives granted;
- an estimate of the costs of the scheme in the coming years;
- the primary energy savings achieved;
- the thermal energy generated via the actions as well as GHG emissions avoided;
- the number and outcomes of checks carried out, broken down by type of action and Region.

PAREER - Spain

In this grant scheme supporting comprehensive action in existing buildings IDEA, the managing organisation of grant programmes, requires that the following documentation is provided by the applicants for a grant:

- A final certificate of works signed by the project supervisor and works supervisor.
- Certificate for the heating installation signed by the installation director or authorised installer belonging to the competent Autonomous Community body.
- An energy performance certificate obtained after completing the action, signed by a competent technician, confirming the improvement of at least one point on the scale of carbon dioxide emissions.
- A report attesting proper completion of the activities in accordance with technical requirements, issued by control body or control authority.
- The invoices and bank documents relating to the payments made.
- Documentations showing that the applicant holds the account or accounts indicated in the application.

An annual monitoring report is published on the basis of data from individual energy savings projects.

Call for exemplary building practices (BATEX) – Belgium/Brussels region

A web based application is under development to allow for the gathering of the administrative and technical details of all the projects with details on realised savings in energy and water consumption in the buildings that were realised during the foregoing 5 years. The goal is to gather information on 500 individual measures. A detailed monitoring of the real consumptions, the experienced comfort level in relation to the energy efficiency target of the building is put in place. Annual energy consumption trends are published annually in the "Energy Balance of the Region of Brussels-Capital."

4.3.4.2 Auditing

Article7(10)(i) requires that Member States put in place a control system that includes the independent verification of at least a statistically significant proportion and representative sample of the energy

[73] For an overview of M&V systems in Member States for alternative measures see Table 6 in the Final Report titled "Study evaluating progress in the implementation of Article 7 of the Energy Efficiency Directive".

efficiency improvement measures. A good practice hence includes the independence of the verifying body. Three examples are provided below.

Box 15: Examples of good practice for auditing

PAREER – Spain

IDEA - as a manager of large part of support programmes in Spain - has put in place relevant control systems that include independent verification. IDEA may carry out the appropriate inspections of actions before the aid is paid, and it may use the services of independent specialist undertakings to follow up, monitor and verify the approved actions, not only in the final checking phase but also at times in between when checks may be made to verify the purposes for which the aid is being granted. Additionally, public support programmes are audited by Intervención General de la Administración del Estado (IGAE) that reports to the Secretariat of State for Finance and Budgets. Also the National Audit Office carries out financial control of domestic subsidies and monitors proper compliance with regulatory bases applicable to each scheme. In this context, sampling and technical visits are carried out by the audit departments, these are additional to these arranged by IDEA.

Operational Programme Enterprise and Innovation – The Czech Republic

In this programme, after the completion of the investment the realized savings are monitored by the obligation of the applicant to report it for 12 consecutive months after the date the project was completed in order to check whether the expected savings as documented in the project dossier are realised in practice. The observation period in which this goal may be reached is 2 years.

Thermal Account – Italy

The energy performance contracts with the participants of the scheme include specific guidance on quantification and verification of savings achieved, guarantees and penalties in the case of failure to reach the targets of savings (legislative decree 102/2014). GSE carries out both desk based checks including document verification and on-site checks (inspections) on a basis of an annual programme, to verify the proper installation and operation of the actions. The checks, which can be implemented with the assistance of ENEA or public service concessionaires and other specialised bodies, cover at least 1% of approved applications which is deemed statistically significant.

It is important to note that some Member States that are beneficiaries of EU Structural Funds plan to use the monitoring regulations and institution laid down in the Structural Funds regulations (e.g. Latvia). Bearing in mind, however, that the operational programmes usually cover wider policy fields compared to end-use energy savings and hence their regulation is likely to be more general than required by Article 7, the applicability of these systems for monitoring and verifying energy savings needs further justification from the Member States.

4.3.4.3 Penalties

FSFI do not place compulsory energy savings requirements on the participating actor but offer public support in various forms (grants, loans, tax reduction etc.) for the target groups. As such the involvement of FSFIs is not compulsory, penalty can only apply in case of failing to execute the savings investment in the manner agreed at the support contract. Several Member States apply such penalty regime to safeguards the credibility of the support scheme (only eligible actions and target groups participates in the scheme) and the realisation of expected energy savings.

In the Czech Republic the effective and dissuasive “penalty” means the threat of non-payment or the duty to return the subsidy (Energy Management Act No 406/2000). In its Operational Programme Enterprise and Innovation, for example, subsidy can only be paid after the verification that the investment had resulted in the planned energy savings. Belgium/Wallonia region defined a three year period to verify compliance of applications with the conditions for granting and to claim a refund of the grant if applicable in its “Energy grants for citizens” policy measure.

Penalties can be applied not only to non-compliance with grant conditions but also to reporting obligations. A special penalty regime is applied in Flanders in reference to the reporting obligation of the grant providers (network companies) (“New grants supporting exiting EEO scheme called RUE”). The Energy Decree provides for sanctions for failure to fulfil reporting obligations. The minimum fine is EUR 1,000 and the maximum is 1% of the turnover that the infringer realised on the Flemish energy market during the most recently ended financial year. It can be considered high enough to be dissuasive.

4.3.5 Discussion and conclusions

FSFI policy measures cover a wide range of public interventions to support energy savings at the end users. The main aim of these measures – both in terms of the number of policy measures and the expected savings – is the modernisation of buildings and secondly to provide stimulus for a quicker replacement of energy consuming products (including vehicles). Support schemes have been employed in the majority of Member States, especially in relation to buildings. Most Member States already used some of the Cohesion Policy allocations to support energy efficiency investments in the previous period, 2007-2013 and some reported its plan to do so in the current financing period (2013-2020) as well. The alleviation of the market distorting effect of grants is an issue that requires careful consideration. It is important to note, however, that the requirements of Article 7 are more detailed and demanding from the Member States than those included in the general guidelines of EU Funds. The literature on previously operating support schemes show the difficulty to assess to cost-effectiveness of energy efficiency programmes because while costs are relatively easy to estimate – either if limited to the public funds involved or total investments considered – there are wide variations in calculating potential and/or actual benefits.

Based on our assessment of information submitted by the Member States on the implementation of Article 7, no single FSFI notified fulfilled all aspects required by Article 7 and Annex V (eligibility, calculation of energy saving and monitoring, reporting and verification) properly. Analysis shows that there are good practices in the Member States relating to the various requirements that can be shared and applied in other Member States.

A.1 Appendix: The cost-effectiveness of FSFIs and the factors of successful implementation

The aim of this annex is to provide an overview on the cost-effectiveness of fiscal programmes implemented in the past by various EU countries and the success factors in implementing these measures based on literature research. This section – hence – is not based on policy measures notified under Article 7 but provides an assessment of fiscal/financial energy efficiency measures implemented in various countries in the past. We noted on the basis of our review that the relevant literature almost exclusively focuses on the building sector and comparisons are often made across policy measure types targeting the building renovation.

A.1.1.1 Cost effectiveness of the policy instrument

There is no standard way of assessing the cost-effectiveness of FSFIs. Most evaluations of energy efficiency FSFIs assess effectiveness in terms of the energy savings that have been delivered, although some consider other performance metrics such as CO_2 savings. In relation to the policy costs, some evaluations consider the total investment cost, whereas others only consider the financial contribution provided by the instrument e.g. value of the grant. Likewise, some evaluations only assess the financial savings from the reduced energy consumption, whereas others also include wider economic impacts such as the employment stemming from the leveraged investments. As a result of these inconsistencies, it is difficult to determine the cost-effectiveness of FSFIs in general terms, and where estimates do exist they vary widely from case to case.[74]

Even for the same programme, assessments may vary widely. Two different evaluations of the German KfW's CO_2 Reduction Programme and the CO_2 Building Rehabilitation Programme that combined long-term fixed rate low interest loans with subsidies linked to the achievement of higher energy efficiency levels concludes at different level of achieved annual carbon savings: KfW's own figures suggest carbon savings in 2006-2009 in the region of 3 million tonnes per year.[75] According to the European Commission's Joint Research Centre (JRC), KfW's CO_2-efficient Buildings Programme resulted in a total investment of EUR 135 billion between 2006 and 2012, with CO_2 savings of 6.5 Mt/year during the same period.[76] This translates to an average of almost 3,000 EUR/tCO_2. Accepting an estimate for 2011 according to which 1 EUR of public money spent on KfW's energy efficiency programmes over 15 EUR were invested in construction and retrofit, and more than 4 EUR went back to the public finances in taxes and savings[77], the cost-effectiveness of public funds can be put at less than 200 EUR/tCO_2. If the savings is compared to the public contribution (and not the total investment cost) then the unit cost of savings is lower. Rosenow et al. (2013) put the costs of KfW's CO_2-Building Rehabilitation Programme at 48 EUR/tCO_2, and even this number is significantly higher than their estimate of 21 EUR/tCO_2 for the UK's Supplier Obligation[78]. Although the latter one is not a financial support scheme, its cost-effectiveness can be measured along the same lines: it is partly supplied by the public in the form of higher energy bills, and the calculated cost only accounts for the amount covered by the suppliers (excluding the contribution of households).

According to Rosenow at al. (2013), one reason for higher costs of the KfW programme could be that German dwellings are more energy efficient than the UK's, the latter of which can therefore benefit proportionately more from cheaper upgrade measures at lower levels. Further, subsidies in Germany are only given for top-end retrofits, where the marginal return per euro invested is low. In fact, savings from the German programme might even be overestimated as its evaluations do not account for any of the rebound, pre-bound and free-rider effects. According to Rosenow at al. (2013), when rebound and pre-bound effects are taken into account, actual savings may be only half as great as the evaluation estimates, quite apart from any possible free-rider effects. In contrast, the UK evaluations account for all three of the savings reduction effects.

Based on the main parameters of the Estonian KredEx scheme, Pikas et al. (2015) concluded that annual government subsidies of 3.5, 20.5 and 47.9 million EUR can produce annual energy savings of

[74] BPIE (2013): Boosting building renovation. An overview of good practices
[75] Association for the Conversation of Energy (2013): Financing energy efficiency in buildings: an international review of best practice and innovation
[76] JRC (2014): Financing building energy renovations. Current experiences & ways forward
[77] Association for the Conversation of Energy (2013): Financing energy efficiency in buildings: an international review of best practice and innovation
[78] J. Rosenow, R. Galvin (2013): Evaluating the evaluations: Evidence from energy efficiency programmes in Germany and the UK. Energy and Buildings (62 (2013) 450–458)

0.88, 3.76 and 6.27 million EUR in different scenarios, respectively.[79] They argue that non-energy efficiency repairs at 31 EUR/m^2 would lead to the same cost as an integrated renovation at 160 EUR/m^2 over 20 years if investments by the government and the private sector, tax revenue and energy savings are all included.

JRC has published results on the leverage factors of some tax schemes aimed at energy efficiency investments in buildings. In Italy, a fiscal support of about 8.5 billion EUR in the period of 2007-2011 for the tax incentive programme has yielded investments equivalent to 15.5 billion EUR in the same period. This compares moderately to the Dutch scheme, which reported 1.3 billion EUR of investments and total tax benefit for its recipients of 94 million EUR in 2012. The total costs (public and private) of the Italian tax scheme were estimated to be 13 EUR cents/kWh of saved energy, in comparison to 4 EUR cents/kWh associated with the Italian White Certificate scheme. This is due to the fact that the former is designed to support high cost measures with sufficient savings while the latter is optimised to deliver the most energy savings with the least amount of investment. The Dutch scheme is estimated to cost 4-7 EUR per tonne of CO_2 avoided. A general drawback of tax incentive schemes, however, is the difficulty to prevent free-riders (i.e. those who would have executed the energy efficiency investment anyway, without the incentive) from benefiting from the scheme. In an ex-post evaluation of the Dutch scheme for the period 2000-2005, a range of free ridership rates was estimated to be 26-68% depending on technology, with the average rate being 47%.[80]

It should be noted that fiscal measures on income tax or company tax usually have a poor performance in an economy in recession or in transition; they are more adapted to well-developed countries where the tax collection rate is sufficiently high.[81] Also, unlike subsidies, tax credits do not lower the barrier of the initial upfront payment.

A.1.1.2 Success factors of take up

As far as take-up is concerned, the German KfW programme can be considered the most effective: with 3 million enrolled dwellings in the period 2006-2012, about 1% of the German residential stock was involved. Other schemes have been found to have a much smaller effect.[82] *Active marketing of the financial institutions* that take part in the distribution of support funds is an important factor in helping take-up; the "KfW-Effizienzhaus" brand has been successful in creating visibility and transparency. The Estonian KredEx scheme has also won credibility with the commercial banking sector, whose market experience has been a key to success. Information campaigns targeting small and medium companies and low-income households that are generally harder to reach might be especially useful. The marketing of subsidies can be more effective if standardized products are offered to a clear target group, with centralized information on the schemes made available.

For the success of such programmes, it is important that building owners have *available matching capital* to invest. This can be made easier if the size of the grant and the interest rate is dependent on the household's income. Loans should be of long maturity with affordable monthly reimbursements; in case of grants, loans can be offered to support those who cannot provide upfront self-financing to supplement them. A legal framework that establishes *state guarantees for energy efficiency loans* can also help their take-up.

The relatively wide reach of KfW is partially due to the *comprehensive nature* of its programmes: almost all buildings are eligible for support. On the other hand, a more careful design of grant schemes can reduce the effects of free ridership. For example, the eligible interventions can be restricted to renovations leading to state-of-art energy performance requirements or the scheme could be open only for a specific target group, e.g. low income households and small and medium enterprises. *Additional local and regional subsidies* have also contributed to the take-up of KfW support, while in the case of the Hungarian Green Investment Scheme (GIS), the help from local authorities and companies specialized in the *preparations of application* has been identified as an important factor.

A streamlined project organization with *simplified and standardised applications* procedures can be helpful in reducing costs and processing times, thus contributing to overall effectiveness. Drawing up *lists of eligible materials and equipment* can also simplify the process, and by allowing for frequent

[79] E. Pikas, J. Kurnitski, R. Liias, M. Thalfeldt (2015): Quantification of economic benefits of renovation of apartment buildings as a basis for cost optimal 2030 energy efficiency strategies. Energy and Buildings (86 (2015) 151–160)
[80] JRC (2014), pp. 42-43
[81] World Energy Council (2013): World Energy Perspective. Energy efficiency policies: what works and what does not
[82] JRC (2014), p. 29

updates of the eligible measure list, the schemes can facilitate the market introduction phase of new technologies as well. This is all the more important as effective programmes tend to facilitate a gradual shift to market based activities, for example by risk sharing in the form of state guarantees and subordinated loans[83] instead of grants. As energy efficiency markets mature, greater numbers of financial institutions and amounts of finance can be involved, and "bundled" financial instruments can be employed; dedicated credit lines led by public financial institutions tend to provide good leverage and mixing for public with private finance.[84] By establishing a concurrent *collaboration between public and private sector*, joined resources can be raised which enables a market transformation while public aid is still on-going.

Loan programmes are usually easier to administer, with potentially lower administrative costs than grants. To reduce the cost for the public budget, economic incentives are increasingly linked to energy or environment funds with diverse finance sources rather than coming from the public budget alone: funding from dedicated taxes, from international financing institutions, or from the banking system. A comprehensive *network of energy auditors and independent experts* can also contribute to effective programme implementation.

Another aspect of effectiveness is the depth of retrofit that the various programmes encourage. As shown by Pikas et al. (2015), if a wide range of costs and benefits are included in calculations, integrated renovations are not more expensive than non-energy repairs, i.e. repairs that are necessary to merely maintain the building (e.g. roof and facade renovation without the inclusion of additional insulation.[85] To encourage an integrated approach, the size of the grant and the interest rate can be made dependent on the depth of retrofit, or support can only be given to packages instead of individual measures. A key strength of the KfW programme is that it adds energy efficiency into normal refurbishment activity: the higher the targeted energy performance of the building, the higher the rate of support.[86] A similar improvement took place in Hungary when GIS introduced a "climate bonus" (i.e. higher support level) to encourage multiple measures.[87]

Setting ex-ante goals and establishing a monitoring process along implementation can also help improve effectiveness. Having substantial information on existing building stock has proved to be a valuable help in designing effective policies in Denmark, while in Ireland, a pilot scheme was first introduced to inform the final design and evaluation system of the full grant scheme.[88] Recycling loans, where the energy savings are reused to provide more finance, such as those offered by Salix Finance to the public sector in the UK, are amongst the most cost-effective energy efficiency delivery programmes.[89] In KredEx, funds also stay in constant use due to the revolving model.

A.1.1.3 Barriers of uptake

The cost of preparing the application for the support should be kept at a minimum; it can hinder uptake if there are *many documents to prepare before grant/loan application*, or if *lead time is long* (from application until the end of refurbishment). *Reporting requirements* can also be burdensome. As in the case of KfW, *conditions can change over time* when the programme is linked to the budget, or financial pressures can lead to delays in announcement and uncertainty regarding continuation (as it happened with GIS). *Changing of entities* announcing the calls also adds uncertainty. The *target groups* should be identified with great care to ensure effectiveness: GIS has been criticized, for example, for focusing too much on multi-flat buildings built with industrial technology and neglecting conventional buildings even if family house owners are the best clients in terms of repayment and this sector has a much higher saving potential.[90]

[83] Subordinated loans, i.e. junior rank loans in case of bankruptcy, provided from public sources leverage private (senior) bank funds by reducing their default risk.
[84] Energy Efficiency Financial Institutions Group ("EEFIG" 2015): Final Report covering Buildings, Industries and SMEs.
[85] Costs are that of the renovation carried out. Benefits beyond energy savings assessed in this study are direct and indirect tax revenues, and direct and indirect employment generation. Other (non-monetized) benefits may include an increase in property values and health benefits.
[86] Association for the Conversation of Energy (2013): Financing energy efficiency in buildings: an international review of best practice and innovation
[87] V. Czakó (2012): Evolution of Hungarian residential energy efficiency support programmes: road to and operation under the Green Investment Scheme. Energy Efficiency (5 (2012) 163–178) and REKK (2013): A lakóépületek és középületek primerenergia-felhasználásának modellezése
[88] Concerted Action EPBD (2013): Implementing the Energy Performance of Buildings Directive - Featuring Country Reports 2012
[89] P. S. Mallaburn, N. Eyre (2014): Lessons from energy efficiency policy and programmes in the UK from 1973 to 2013. Energy Efficiency (7 (2014) 23–41)
[90] V. Czakó (2012): Evolution of Hungarian residential energy efficiency support programmes: road to and operation under the Green Investment Scheme. Energy Efficiency (5 (2012) 163–178)

Another kind of danger is that subsidy schemes may have a negative impact on the market by leading to an *increase in the cost of equipment*, as a result of manufacturers or contractors raising their prices in anticipation of the rebates that purchasers will be granted.[91] Also, economic incentives may result in the *diffusion of poor-quality equipment* (e.g. CFLs) or partial/shallow renovation activities focusing on single elements of the building envelope and hence not resulting in suboptimal solution. As IEA (2011) notes, insufficient or costly information on the energy performance, cost and benefits of different technologies leads to sub-optimal investment decisions.[92] When designing support schemes, special emphasis should be given to bridging this information-gap. Eligible lists of materials and equipment, and carefully designed packages of supported measures can be of help in this regard as well.

Channelling large amounts of public grants to the building sector crowds out private investment and high support intensity can results in investments that are not economically optimal. However, in the EU12 countries, the reduction of "grant dependency" is difficult due to the past high amounts of funding but also due to the fact that households tend to be risk-averse regarding debt as they remember the bank crashes of the past.[93]

To conclude, it is quite difficult to assess to cost-effectiveness of energy efficiency programmes, because while costs are relatively easy to estimate – either if limited to the public funds involved or total investments considered – there are wide variations in calculating potential and/or actual benefits. In terms of avoided CO_2 emissions, even the most effective programmes can be considered expensive compared to currently low CO_2 quota prices. From the point of view of national budgets, however, benefits tend to exceed costs if additional tax revenues and positive employment effects are also taken into account (see Pikas et al. 2015). Such programmes can support non climate-related policies, too. When the German CO_2 Reduction Programme was first introduced in 1996, for example, it also aimed at supporting a weakening construction industry and channelling investment into infrastructure. But even the balance of national budgets is limited in scope to give a whole picture of cost-effectiveness, as energy efficiency programmes contribute to an increase in asset values and to a healthier environment as well.

Because of the wide-reaching benefits that can be potentially reaped from such programmes, it can be argued that effective policies encourage renovations close to the cost-optimum level. This can be achieved by schemes that make the size of the grant and the interest rate dependent on the depth of retrofit and adding energy efficiency into normal refurbishment activity. The higher costs of such investments can be covered by a combination of loans and subsidies. Involvement of the commercial banking sector is essential in both the promotion and the cost-effective administration of such programmes, while it can also provide for the necessary transition to market based activities as energy efficiency markets evolve.

Table 18: Factors of success and risks/barriers of the take-up of building renovation support

	Factors of success	Risks/barriers
Coverage of the scheme	compatible with the policy goal	target group defined too broadly (problem of free-riding) or inefficiently (i.e. not based on savings potential)
Administrative conditions	simplified and standardised applications	many documents to prepare before grant/loan application
	lists of eligible materials and equipment	changing support conditions and administering entities
	marketing of schemes by the involved financial institutions (branding)	burdensome reporting
	Setting ex-ante goals and establishing a monitoring process	long lead time

[91] World Energy Council (2013): World Energy Perspective. Energy efficiency policies: what works and what does not
[92] IEA (2011): Energy Efficiency Policy and Carbon Pricing
[93] Ramboll Management Consulting and Institute for European Environment Policy (2015): Energy efficiency in public and residential buildings, Final Report (Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF))

Availability of matching funds	availability of local and regional public funds	
	long maturity loans with modest monthly debt service	
	loans to provide the self-financing part of grants	
	collaboration between public and private sector to provide bundled financial packages	
Quality of EE investments	support level dependent on the deepness of retrofit	EE equipment price increase due to anticipated extra revenue of purchasers
		diffusion of not up-to-date technologies

5 Regulations and voluntary agreements

5.1 Introduction

This section provides an analysis of regulations and voluntary agreements as a means to meet the aims and requirements of Article 7. It first provides a general overview of these types of policy measures, based on a literature review, and an overview of the measures of this type that were notified by the Member States under Article 7. This is followed by an analysis of the best practices in relation to the Member State implementation and notification of these types of measures. The aims of this case study are the following:

- To identify the typical use of regulations and voluntary agreements for the implementation of Article 7.
- To assess the cost effectiveness from a social point of view and the success factors of these types of policy measures based on literature review.
- To identify best practices – based on Article 7 notifications of the Member States – of meeting the various requirements of Article 7.

5.1.1 Overview of policy instrument

Article 7(9)(c) defines this type of policy measure as 'regulations or voluntary agreements that lead to the application of energy-efficient technology or techniques and have the effect of reducing end-use energy consumption'. Member States have included a range of policy measures that meet this definition, ranging from voluntary energy efficiency agreements with industrial companies or municipalities to regulations that oblige energy suppliers to install smart meters in non-domestic premises.

5.1.2 How the policy instrument works

Voluntary agreements (VA) in the context of Article 7 of the EED are typically agreements by a sector -or group of similar actors- with public authorities, in which they commit to:

- reduce end-use energy consumption over time,
- design and implement an energy efficiency plan or
- apply specific energy efficient technologies in specific applications.

See the overview of notified policy measures in section 5.2.

The agreements are voluntary, but once a party enters into the agreement, they typically enter into a legally binding contract. Governments may choose to provide specific incentives to encourage participation, such as some form of financial support or fiscal incentives that are only available to participants of the agreement (for example, energy or carbon tax exemptions or reductions, subsidies for energy audits), by enabling easier access to environmental licenses or by providing information or training programmes for participants (JRC, 2010[94]). Participation may also be encouraged by governments stating the intention to impose taxes or other regulations if the voluntary agreement is not implemented or adhered to (MPRA, 2014)[95]. Many voluntary agreements have some sort of penalty or sanction specified In case of non-compliance, for example repayment of rebates, subsidies or tax credits, or a tightening of the environmental license (JRC, 2010[96]).

Agreements typically aim to include a large part (in terms of energy use) of a well-specified group of companies, institutions or authorities, to gain maximum impact and cost efficiency, and reduce potential

[94] JRC, 2010. Voluntary agreements in the field of energy efficiency and emission reduction: review and analysis of the experience in member states of the European Union; Paolo Bertoldi and Silvia Rezessy, May 2010, Ispra.
[95] MPRA, 2014
Voluntary Agreements and CO2 Reduction - An empirical Assessment of German Industries; Anton Parlow and Dennis Hövelmann, University of Kaiserslautern, Munich Personal RePEc Archive, MPRA Paper No. 59972, December 2014. See, for example, the voluntary agreements of the EU with passenger car manufacturers, between 1998 and 2008, and overview can be found at
http://www.transportpolicy.net/index.php?title=EU:_Light-duty:_GHG
[96] ebid

competitive impacts[97]. The agreements may relate to quantitative targets such as to achieve a specific amount of energy savings in a given year, or include commitments to implement certain actions over a specified time period. In addition, the agreements typically include monitoring and reporting requirements.

Regulations also have concrete targets or obligations, similar to the voluntary agreements, and progress is typically monitored and verified[98]. Regulations will be implemented in legal provisions, and participation is mandatory. Regulations can also be combined with support measures such as financial or fiscal incentives, communication or training campaigns, to support obliged parties to meet the requirements.

Voluntary agreements may be used as alternative to regulations, standards or norms (see the next section on a comparison of voluntary agreements versus regulations).

To address potential conflicts between voluntary agreements and the EU internal market regulations, the European Commission has issued a Communication with 'Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements', (2011/C 11/01). This guideline explains the boundary conditions for voluntary agreements to be compliant with the internal market regulations. For example, agreements with industry must result in efficiency gains that outweigh the restrictive effects on competition, and they should allow for different options to comply with the agreement, allowing competition to still take place for other characteristics (see the Guidelines for a more detailed elaboration and the examples provided).

5.1.3 Cost effectiveness of the policy instrument

Clearly, the overall cost and effectiveness of voluntary agreements and regulations depends on the level of the energy savings targets or specific actions agreed on or regulated - compared to business as usual - and whether or not compliance is ensured. The *cost effectiveness* of these measures (the ratio between cost and effectiveness) then depends on further factors, including the design and details of the agreements and regulations.

The notifications (or other literature sources) do not include the data needed to assess cost effectiveness for the policy measures that are notified for Article 7, and the diversity of the notified policy measures that fall into the category voluntary agreement and regulations (see the overview in Section5.2) does not allow for quantification of cost-effectiveness on a general level. In addition, these agreements and regulations are often implemented in combination with other policy measures such as financial support, the EU ETS, etc. For example, in the past, the voluntary agreement scheme of Denmark was closely integrated with the Green Tax Package, and companies who enter an agreement receive a rebate on the green taxes (see DEA, 2015[99]). It is then not possible to distinguish between effects of the various measures, and an assessment of cost-effectiveness should rather be carried out for the whole integrated policy package.

A literature review on the topic, mainly based on ex-post evaluations of effectiveness of voluntary agreements, was therefore used as an alternative approach to provide insight in effectiveness and cost-effectiveness of these measures. These evaluations may also provide valuable learning points on how to increase the effectiveness of voluntary agreements. A broad overview of the key findings is given in the following[100].

5.1.3.1 Cost and effectiveness of voluntary agreements

Some voluntary agreements target the implementation of specific technical measures, such as the procurement of energy efficient street lighting or vehicles, or the installation of smart meters in a specific part of the built environment. Others involve agreement on a higher level energy efficiency target, and leave the choice of technology to the stakeholders involved. This is likely to result in a diverse range of

[97] If the voluntary agreement leads to increased cost of the parties involved, they will experience negative competitive impacts, compared to the competitors that do not participate. However, likewise if the energy efficiency measures lead to economic benefits, their competitiveness may improve.
[98] Note that there are many different types of regulations, in fact some of the other types of policy measures mentioned in Article 7(9), notably EEOS and standards and norms, are implemented as a regulation. In context of this report and case study, regulations that do not belong in any of the other categories mentioned in Article 7(9) are considered to be obligatory and legally binding measures.
[99] DEA, 2015. http://www.ens.dk/en/consumption-savings/energy-consumption-production-industries/voluntary-agreements-industry-energy. Voluntary agreements industry on energy efficiency, website by the Danish Energy Agency. Accessed on 4 December 2015.
[100] Note that the literature in this review includes energy-related voluntary measures and regulations in general, there is no specific assessment yet on the effectiveness and cost-effectiveness of policy measures notified in the context of Article 7 of the EED,

measures to be promoted by the policy measure, leaving room for the parties involved to choose the most cost effective or otherwise most attractive technical measures from their own perspective[101].

This latter issue was recently assessed in a study on the experiences in the Netherlands with voluntary agreements in industry (Abeelen, 2015[102]), where it is concluded that cost effectiveness of technical measures is often not the main criterion for companies when they decide on how to implement the voluntary agreement. This paper assesses the planning and implementation of energy efficiency investments by companies, to provide insight in the differences between planning and actual implementation and understand the reasoning by which companies select the technical measures to implement to meet the targets and conditions of the agreements. In the Netherlands, long-term agreements (LTAs) have been implemented for more than 20 years, as an important part of the Dutch policy on energy efficiency for industrial companies, together with other measures such as fiscal incentives and regulation. According to Abeelen (2015[103]) almost 1100 companies currently participate in these agreements, covering almost 80% of the industrial energy use in the Netherlands. These companies are mostly industrial, but some non-industrial sectors like academic hospitals, universities and financial institutions are also included. Cost-effectiveness of the implemented measures was expressed in terms of the payback period (PBP) that was reported by the companies in their Energy Efficiency Plans. This indicator is linked to the Dutch Environmental Act, which obliges companies to implement all projects with a PBP of up to 5 years. The period of 5 years is the legal implementation of the ALARA-principle (As Low As Reasonably Achievable) for companies. The study finds that the PBP of planned projects (technical measures) varied widely, as well as the PBP of the projects that were actually implemented by the companies. Many companies had planned projects with a PBP over 5 years, and many of these were indeed implemented, whilst at the same time, many planned projects with a low PBP were not implemented. The study concludes therefore that the PBP may not have been assessed properly in the Energy Efficiency Plans, or other, non-energy and non-financial criteria may be more important than PBP, such as productivity gains that can be achieved with the investments or increased employee satisfaction. It is also concluded that it is difficult to develop a more sophisticated criterion than the PBP, as this would increase administrative cost and complicate the assessments.

An assessment of long-term voluntary agreements in Denmark (Person, 2005) also found that cost effectiveness of a technical measure is not always the most relevant indicator for the implementation of energy efficiency measures in industry. This study found that participating industries would report additional benefits such as better product quality and increased employee engagement, once the agreement was in operation. In some cases, these additional benefits were even more significant than the tax rebate.

JRC (2010)[104] reviews the experience and plans of EU Member States with voluntary agreements on energy efficiency in various end-use sectors, and draws conclusions on their effectiveness and flexibility. The study also gathered success factors, barriers and best practices, resulting in an overview of the guiding principles of an optimal operational framework of these agreements.

The report includes an overview of the annual administrative costs of the voluntary agreements in place in the years before the study (i.e. prior to 2010). Some estimates were found to include only the public authorities' manpower costs (Denmark and Sweden), which were reported to be in the range of 150,000-270,000 Euro/year. Other cost items such as public authorities' subcontracting costs (Finland) and financial support to the development of roadmaps for relevant sectors (the Netherlands) were found to be much more substantial, up to 25.5 million Euro in the Netherlands in 2010. Additional costs are also incurred if governments grant tax exemptions or subsidize energy audits, which was the case for Sweden, Finland and the Netherlands. Administrative costs for the participants of the agreements were found to be in the range of 10,000 – 20,000 Euro/year.

Based on their assessment of the measures in place, JRC (2010) also identifies a number of risks related to voluntary agreements:

[101] Note that this may not be the most cost-effective measures from societal or government point of view, since the companies and municipalities involved will take into account energy taxes, internal procedures on discount rates and return on investment, etc.
[102] Abeelen, 2015. Planning versus implementation of energy-saving projects by industrial companies. Insights from the Dutch Long-Term Agreements; Christiaan Abeelen & Robert Harmsen & Ernst Worrell; Energy Efficiency May 2015.
[103] ebid
[104] JRC. (2010) Voluntary agreements in the field of energy efficiency and emission reduction: review and analysis of the experience in member states of the European Union; Paolo Bertoldi and Silvia Rezessy, May 2010, Ispra.

- Obligations and targets may reflect little more than business as usual (resulting in a large portion of free riders),
- Sanctions for not meeting targets may be too lenient.
- Reporting and monitoring that rely on self-reporting from industry are considered to be the weakest points of voluntary agreements. This can be addressed by engaging independent third parties to verify the data and reports.

The authors therefore recommend to include the following core elements in the institutional framework of a voluntary agreement (from JRC, 2010):

- Ambitious but realistic targets (quantified commitments) that go beyond business-as-usual and are set by legislation or national policy, transparent preparation and negotiation of rules and targets,
- A transparent process of negotiating and setting the targets;
- Having a public authority with appropriate statutory powers and expertise in charge of the agreements;
- Coverage of a major part of an industrial branch (number of players) for significant actions, most importantly effective implementing provisions relying on energy management and/or energy audits, over a reasonable timescale,
- Effective and independent monitoring and evaluation mechanism, based on robust indicators and followed by third party verification with reporting made public,
- Credible and enforceable mechanisms to discourage non-compliance, including sanctions or the introduction of other policy instruments such as taxation or regulation if no results are delivered or no satisfactory targets are agreed.
- Accompanying measures, such as free or subsidised energy audits, technical assistance, information, financing for implementation, etc., are in most cases needed to facilitate the implementation and success of agreements.
- Importance of pre-agreement data for the evaluation of the VA (as opposed to ongoing compliance monitoring) to point whether the VA is effective,
- Importance of capacity building within public authorities related to VA design, implementation and evaluation.

A recent study by MRPA (2014) specifically aimed at assessing the effectiveness of voluntary agreements. This study included an empirical assessment of the effect of voluntary agreements of the German regulatory agency with German industry, using data on a voluntary agreement that started in 1995, where 14 of Germany's most energy-intense industries entered into the agreement and 43 industries did not. The aim was to reduce CO_2-emissions up to 30% until 2005, compared to the base year 1990.

Based on these data, MRPA (2014) finds that industries that participated in the voluntary agreements reduced their CO_2-emissions up to 30% or more during the period 1995 to 2010, compared to industries that did not participate. It was furthermore concluded that the success of these agreements could be explained by a credible threat of the regulatory agency to impose taxes. The same finding was reported in (Persson, 2005), based on the experiences with long-term voluntary agreements in Denmark.

5.1.3.2 Comparative aspects of voluntary agreements and regulations

The cost and effectiveness of regulations has received less attention in literature, which may be due to their diverse nature (as will be illustrated in the overview of measures in the next paragraph).

JRC (2010) discusses the comparative aspects of voluntary agreements and legislation – where legislation includes the type of regulations that fall into this policy measure category but also includes, for example, efficiency targets, standards and taxation. They consider a quantitative comparison, for example in terms of emission reductions or cost savings, unfeasible, mainly because the results are considered incomparable, and no other literature sources could be found that include a quantitative comparison between these two types of policy measures. Rosenow (2015) furthermore explains that voluntary agreements typically target more costly measures than regulations which is expected as regulation defines the floor whereas voluntary agreements go beyond compliance.

Nevertheless, a number of advantages of voluntary agreements for public authorities are identified in JRC (2010), in comparison to legislation, such as

- They can be introduced quicker and offer more flexibility to introduce and update targets and obligations over time.
- In general they are more acceptable by industry as a policy instrument.
- They allow tailor-made solutions both the specific industrial sectors and for individual companies within the sector.
- They lead to lower administrative cost during the preparation phase.

Legislation, on the other hand, may result in overall lower cost to governments (over the lifetime of the measure), since legislation does not require the accompanying support measures that are often used to encourage participation in voluntary agreements.

It is furthermore to be expected that the main risks and recommendations listed above for voluntary agreements also hold for regulations, as these reflect general best practices for cost-efficient and effective policy making.

5.1.3.3 Combining voluntary agreements and regulations with other energy efficiency policies

As is shown in the main report, most Member States have notified a diverse policy package to meet the Article 7 requirements, combining different types of policy measures. As was recently analysed by Rosenow (2015)[105], voluntary agreements are currently not combined with EEOS or regulations for the same target group, they are usually understood as alternative means of reaching the same goal. Combining voluntary agreements and regulations with energy or CO_2 taxes, however, were found to be complementary, and lead to savings that are larger than the sum of the savings of the individual policy measures.

Rosenow (2015)[106] furthermore looked at the combination of policy instruments notified for Article 7, and many combinations were found: regulations are combined with EEOS (in one Member State), grants, loans, tax rebates, voluntary agreements and information type measures; voluntary agreements were combined with energy or CO_2 taxes, grants, loans, tax rebates and regulations. These do not always target the same end-use sector, though.

5.1.3.4 Summary of the main findings

To summarize the above, we can conclude the following regarding cost-effectiveness of voluntary agreements and regulations.

- Voluntary agreements and regulations are two different types of policy measures, with different characteristics and different applications. Due to the nature and process of voluntary agreements, they can be introduced quicker than regulations, and they may offer more flexibility to introduce and update targets and obligations over time.
- The measures of this type that have been implemented throughout the EU are very diverse, and cost-effectiveness is likely to vary significantly, depending on the level of the targets or actions agreed, on potential supporting measures, etc. It is therefore not possible to draw any solid quantitative conclusions on a general level. A number of qualitative conclusions can be drawn, thought, mainly from ex-post assessments of voluntary agreements in various Member States:
    - Parties involved in the voluntary agreements do not always implement the most cost-effective technical measures, but also take into account more strategic, technical or other non-financial considerations such as productivity gains or increased employee satisfaction.
    - The administrative cost of voluntary agreements or regulations is typically limited. These cost are incurred when setting up the agreement or drafting the regulation, and, after implementation, cost will be involved with monitoring and verification.
    - When these policy measures are combined with supporting measures, for example to incentivise parties to join the agreement or to provide investment support, cost to governments may be significant, in terms of financial support or reduced tax income, depending on the support provided.
    - Achieving the targets or complying with the regulations is likely to result in cost to the parties involved, but they will also benefit from reduced energy cost and possibly other benefits

[105] Rosenow, 2015. Efficiency Obligation Schemes, D5.1 Combining of Energy Efficiency Obligations and alternative policies, J. Rosenow, T. Fawcett, N. Eyre, V. Oikonomou; ENSPOL Energy Saving Policies, 2015
[106] ebid

(such as productivity increase, reduced maintenance cost, etc.) during the lifetime of the technical measure. Depending on the technical measures implemented, the benefits may outweigh the cost over time.

- The effectiveness of a voluntary agreement depends strongly on the design and implementation details. Ex-post evaluations have resulted in a number of recommendations and best practices that can help to design an effective framework for voluntary energy efficiency agreements (listed above). This is relevant for Member States who aim to use this type of policy measure.
- Regulation typically has higher administrative cost in the preparation phase than voluntary agreements, but once in operation, cost are limited, mainly because they are not combined with the support measures that are often used to encourage participation in voluntary agreements.

5.2 Use of the policy instrument by Member States

Based on the Member States notifications and submissions so far, a total of 11 Member States have notified eligible policy measures of the type 'regulations and voluntary agreements' in the context of Article 7: Belgium, Finland, Germany, Greece, Latvia, Malta, the Netherlands, Portugal, Romania, Slovakia and the United Kingdom[107]. The United Kingdom notified both regulations and voluntary agreements. Belgium, Finland, Latvia, Malta, the Netherlands and Slovakia notified voluntary agreements but no regulations, and Germany, Greece, Portugal and Romania notified regulations but no voluntary agreements.

The overall notified cumulative savings (2020) delivered by these policy measures amounts to about 7% of the total Article 7 notified cumulative savings in 2020. As will be shown below, Germany relies on **regulations** for about 22% of the total Article 7 savings in 2020, to a large part expected from the 'Energy Savings Ordinance (existing buildings)'. Regarding **voluntary agreements,** Finland expects 78% of its Article 7 savings in 2020 from two voluntary agreements, most of which will be contributed by a wide-reaching agreement with parties including industrial companies, private service sector companies and municipalities. Belgium also relies heavily on voluntary agreements, for 57% of their total savings – four in total, with the agreement with 'companies operating under VER' having the largest (expected) effect.

Belgium, Finland and Malta use this type of policy measure to achieve more than 30% of their notified cumulative savings, in the other 8 Member States listed above, this type of policy measure is expected to contribute less than 30% to the total cumulative savings.

An overview of the notified eligible **regulations** is provided in Table 19 with an indication of the expected contribution of these measures to the total Article 7 target of the Member State[108]. A similar overview of policy measures is also provided for voluntary agreements, see Table 20.

Table 19: Overview of 'regulation' type policy measures, sorted by the expected contribution of the measure towards the Member State's total Article 7 cumulative savings, in 2020.

Member State	Name policy measure	Brief description	Contribution of this measure to total expected cumulative savings in 2020
Germany	Energy Savings Ordinance (existing buildings)	The Energy Savings Ordinance sets minimum energy performance standards for existing buildings in case major alterations are made.	16%

[107] NB: categorisation of the notified policy measures is done by the project team, since this categorisation is not required from the Member States in their notifications and submissions. Furthermore, Austria also notified a voluntary agreement, but that was not considered eligible as it targeted supply side measures, and was therefore not considered in this case study.
[108] One notified measure that falls in this category was considered non-eligible, and is therefore not include in this table: Regulations for district heating, as notified by Austria – this is a supply side measure.

Member State	Name policy measure	Brief description	Contribution of this measure to total expected cumulative savings in 2020
Germany	Energy Savings Ordinance (new built)	The Energy Savings Ordinance sets minimum energy performance standards for new buildings which are tightened over time.	5%
Germany	Renewable Energies Heat Act	The Renewable Energies Heat Act obliges building owners and developers to use renewable energy sources in new buildings. Alternatively, surpassing the minimum requirements set out in the building codes by a specified amount can be chosen instead.	1%
Greece	Energy Managers in the state and general public buildings	Energy managers will be appointed with their responsibilities described that include keeping records of energy consumption of the buildings, preparing annual summary report on energy recording and control etc.	6%
Portugal	RGCE TRP	Regulatory measure require transport fleet operators to prepare rationalisation plans, by means of specific audits, with a view to improving energy intensity or reducing specific consumption. However, it is not stated the nature of the actions taken. The regulation may require a plan, but it does not require action to be taken in response to the plan.	3%
Portugal	Efficient Public Lighting	The measure is concerned with the installation more efficient public lighting.	1%
Portugal	More efficient State sector transport	The measure is concerned with procurement of low emission vehicles.	0.3%
Romania	Development of energy services/the ESCO market	Legislative development for stimulating the ESCO market	11%
United Kingdom	CRC Energy Efficiency Scheme	The CRC Energy Efficiency Scheme (CRC) is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large public and private sector organisations. The scheme features a range of drivers which aim to encourage organisations to develop energy management strategies that promote a better understanding of energy usage. It is designed to target energy supplies not already covered by Climate Change Agreements (CCAs) and the EU Emissions Trading System.	10%
United Kingdom	Energy Savings Opportunity Scheme	wide range of measures	5%
United Kingdom	Smart metering (Non-domestic)	Energy suppliers will be responsible for the provision and installation of smart meters in non-domestic premises and are required under conditions in their licences to take all reasonable steps to complete the roll-out by the end of 2020.	4%

Table 20: Overview of 'voluntary agreement' type policy measures, sorted by the expected contribution of the measure towards the Member State's total Article 7 cumulative savings, in 2020

Member State	Name policy measure	Brief description	Contribution of this measure to total expected cumulative savings in 2020
Belgium	Companies operating under VER (verifiable emission reduction) (Flanders)	Voluntary agreement that leads to the application of energy-efficient technology or techniques in industry which have the effect of reducing end-use energy consumption.	33%
Belgium	New voluntary agreements (Wallonia)	Voluntary agreement that leads to the application of energy-efficient technology or techniques in industry which have the effect of reducing end-use energy consumption.	12%
Belgium	Companies not operating under VER (Flanders)	Voluntary agreement that leads to the application of energy-efficient technology or techniques in industry which have the effect of reducing end-use energy consumption.	8%
Belgium	Branche agreements 2 (Wallonia)	Voluntary agreement that leads to the application of energy-efficient technology or techniques in industry which have the effect of reducing end-use energy consumption.	4%
Finland	Energy efficiency agreement activities	Industrial companies, private service sector companies, municipalities and joint municipal authorities, industrial facility owners and rental housing associations that have joined in the agreement. The agreements commit the organisations to implement their own agreement/action plan, set an energy savings target for themselves and report annually on implemented measures and their savings impact, and on other measures taken under the agreement.	61%
Finland	Energy efficiency agreements/Action plan for energy services and Hoyla-III customers	Measures relating to information and awareness raising in relation to energy use and energy savings including: o Guidance e.g. by email and on-line o Communication e.g. energy saving material for schools o Consumption feedback e.g. energy consumption monitoring reports	17%
Latvia	Agreements on energy efficiency	These are voluntary agreements between the Latvian governments and companies or municipalities to achieve energy savings of at least 10% in that specific industry, company or municipality	2%

Member State	Name policy measure	Brief description	Contribution of this measure to total expected cumulative savings in 2020
Malta	Initiatives in Government-Owned Industries	The notification (Table A) states that these are measures of own initiative and dialogue with Regulator. The measure includes Reduction of Power Requirements in the Transfer and Distribution of Water through Various Pipelines, the Use of Variable Speed Drives for Groundwater Abstraction Pumps and Replacement of RO Auxiliary Pumps, Upgrading of RO High Pressure Pumps and Energy Recovery Systems, Replacing Desalinated RO Water by Groundwater, Reducing Electricity Consumption through the Elimination of Seawater Infiltration in the Sewage Collection Network, Upgrading the Quality of Treated Sewage Effluent to Replace Desalinated RO Water for Non-potable Uses and Rendering Plant (Autoclave) for Animal Waste in the Civil Abattoir.	28%
Malta	Street Lighting Retrofitting	It is a measure of control through national budget and Public Sector leading by example. The measure concerns Street Lighting Retrofitting (in Gozo and all Malta), including replacement of road and street lighting from present luminaries to LEDs and introduction of smart lighting, including dimming capability.	9%
Malta	Retrofitting of Energy Efficiency Measures in Public Buildings	These are measure of control through national budget and Public Sector leading by example. The measures include: Retrofitting of Energy Efficient Measures in Public Schools, at St. Vincent De Paul – Rehabilitation Centre & Old Peoples' Home, Armed Forces of Malta Barracks, Civil Abattoir, Auberge D'Aragon, Malta Police Force Buildings and Project House, Blocks A and B.	6%
Netherlands	Buildings (households): Voluntary agreements, existing buildings	Policy adopted households: voluntary agreements existing construction	5%
Netherlands	Industry: Enforcement, other industry	Industry: Enforcement other manufacturing	1%
Netherlands	Industry: Long-term voluntary agreement on energy efficiency, ETS companies (MEE)	Industry: ETS companies - Multi-annual Agreement energy efficiency (ce-)	0.4%
Netherlands	Industry: Enforcement, MJA3	Industry: LTA3 - Enforcement	0.2%
Slovakia	voluntary agreements	voluntary agreements to increase energy efficiency	19%

Member State	Name policy measure	Brief description	Contribution of this measure to total expected cumulative savings in 2020
United Kingdom	Climate Change Agreements	Wide range of measures being implemented across 51 broad industrial activities	8%
United Kingdom	Greening Government Commitment	The measures promoted under the GGC include: o behaviour change o facilities management o estate management & rationalisation o greening ICT o energy efficient refurbishment o on-site renewables o travel, data and performance management o improved video / tele-conferencing o low emission vehicles o better procurement o other measures	1%
United Kingdom	Re:Fit	Energy efficiency building improvement measures. Procurement framework for ESCOs.	0.2%

Whilst it is aimed in this project to categorise the notified policy measures into one of the categories listed in Article 7 (EEOS and the categories mentioned in Art. 7(9)(a) through (f)), some of the policy measures listed here are in fact combinations of different types, as allowed by Art. 7(9). For example, a voluntary agreement can be combined with financial instruments or fiscal incentive, or an information campaign. This will be addressed further in the assessment below.

As can be seen from the brief description of the policy measures in the table above, these policy measures are used for different sectors (end-user categories). Especially voluntary agreements can target a very diverse and, in many cases, large group of end users. For example, VAs have been arranged with industry, both ETS or non-ETS companies, and various agreements have been concluded with government-owned industries and municipalities.

Regulations are found to be quite diverse but only applied in five Member States:

- In Germany, were a number ordinances are notified that target energy savings and renewable heat in buildings;
- In Greece, where Energy Managers in the state and general public buildings will set out measures to improve energy efficiency and energy savings ;
- in Portugal, where three regulations are notified, aimed at the transport sector (fleet operators and public procurement of vehicles) and efficiency improvement in public lighting;
- in Romania, where legislation is developed for the ESCO market,
- in the United Kingdom, where regulations are aimed at energy suppliers (to implement smart metering), large public and private sector organisations and non-domestic large energy users.

Both the regulations and the voluntary agreements can be aimed at implementation of specific technical measures such as street lighting retrofitting (in Malta) or smart meters (in the UK). Alternatively, they can set a more general goal, for example, by agreeing on a target for the reduction of end-use energy consumption by the participants without specifying the technical measures to be implemented (applied in voluntary agreements in Belgium, Finland, Latvia, the Netherlands and the United Kingdom). Both the voluntary agreements and regulations are typically aimed at a well-defined group of stakeholders or parties, such as large industrial companies or large domestic energy users, ESCOs or municipalities.

5.3 Compliance with the Article 7 requirements

Article 7 and Annex V include certain requirements that need be taken into account by Member States when calculating the impacts of regulations and voluntary agreements. Drawing upon the measures notified by the different Member States, we describe “best practice” examples of how these requirements have been met in the following sections.

5.3.1 Level of energy savings target

Member States had to notify in line with Annex V(4)(c) the expected savings to be achieved over the whole and intermediate periods of the various alternative measures, under Article 7(9). Expected savings were reported for all policy measures of this category and in line with Annex V(4)(c), where some Member States reported annual cumulative savings and others new annual savings, and some countries reported savings in ktoe and others in TWh.

5.3.2 Eligible measure categories

Annex V (4)(e) requires Member States to notify as part of their detailed methodology the eligible measures categories. Eligibility can apply to be individual actions and policies measures. For an action or measure to be eligible it needs to satisfy the necessary conditions set out in the Directive. In particular, it needs to deliver energy savings to final consumers i.e. end use energy savings (Article 7(4)).

Therefore good practice in meeting this requirement would include a list of the actions that are targeted by the instrument, identification of those instruments that are eligible in relation to the Article 7 target.

Based on the notifications and submissions of the Member States, a number of good practices can be identified. In some cases, for example, the policy measure is explicitly targeted at technical measures that deliver energy savings to end users: For example, in **Malta**, the voluntary agreement on ‘Street Lighting Retrofitting’ is specifically aimed at replacing road and street lighting from present luminaries to LEDs; **Portugal** has included a regulation on more efficiency transport in the public sector, focussing on the procurement of low emission vehicles – all technical measures that are eligible under Article 7. Eligibility can then be easily demonstrated.

In other cases, the eligible measures included in these policies are very diverse, for example when the VA or regulation involves agreement on a higher level energy efficiency target, and leaves the choice of technology to the stakeholders involved. Demonstrating eligibility may then require more comprehensive and in-depth information of the technical measures that are included in the agreement or regulation, through the list of eligible measures that is required to comply with Annex V(4)(e). If the policy measure also includes non-eligible technical measures, Member States are then required to ensure that savings from these non-eligible measures are excluded from the Article 7 calculated and actual savings, and address this issue explicitly in their notification.

For example, for the voluntary agreements in **Belgium** (Flanders) with companies that are under the EU-ETS, the notification specifies the eligible measures categories, and confirms that all measures that could reduce the specific energy consumption of the establishment and its processing plant are eligible. An example of a regulation which targets a wide range of measures is the CRC Energy Efficiency Scheme in the **United Kingdom.** For this measure, the notification provides details on the technical measures (incl. equipment efficiency improvements, automatic control of lights and stairwells, energy management systems and was insulation), thus demonstrating eligibility.

5.3.3 Calculation of energy savings

Article 7(6) requires that Member State ensure that the savings stemming from the notified policy measures are calculated in accordance with the points (1) and (2) of Annex V.

5.3.3.1 Measurement methods

Annex V(1) set out a number of methods which may be used for calculating the impact of regulations and voluntary measures. The Annex also defined certain conditions associated with the methodologies, see the main report. Generally, different methods are appropriate for different types of projects. For large projects (e.g. in industry) metered savings may be a sensible and best practice approach as the relatively large savings can justify a more sophisticated measurement approach and the other methodologies may not provide an accurate estimate due to the complex nature of the action taken.

However, if more standardised measures are the main focus (e.g. of the regulations regarding installation of energy efficient street lighting and smart meters, as notified by Portugal and the United Kingdom respectively), the use of deemed savings can be the preferred option because it allows benchmarks to be set by the regulator/the government based on statistical evidence on energy savings for these specific measures.

When looking at the policy measures in detail, it can be concluded that different methodologies are used, although the deemed savings methodology seems to be the preferred option. Of the 11 notified regulations, the savings methodology used was only specified for three, and all three used deemed savings (these were the regulation for Energy Managers in Greece, and the smart metering regulation and CRC energy efficiency scheme in the UK).

Of the 18 notified voluntary agreements, 11 report that they used the deemed savings methodology. In some cases where the agreement would cover a range of technical measures, other methods were used as well, for specific measures. For example, Belgium (Flanders) states that for the voluntary agreements with companies operating under VER, the measurement method is preferably deemed but also partly metered. The notification of the voluntary agreements on energy efficiency in Latvia, for example, suggest that deemed savings is the standard methodology, but scaled savings is used for complex production processes. Other measurement methods are also used, but much less frequently. Malta, for example, uses metered savings, supported by scaled savings, for the voluntary agreement with government-owned industries.

A good example of the application of the deemed savings method is the smart metering regulation in the **UK**. The notification also includes an elaboration of the calculation methodology: the UK assumes that smart/advanced meters, together with provision of data, reduce energy consumption by 2.8% (electricity) and 4.5% (gas) per meter in central scenarios. The primary source of evidence for this is a trial of advanced metering in 538 SME sites carried out by the Carbon Trust in 2007.

Similarly, the **Malta** 'Street Lighting Retrofitting' voluntary agreement is based on actual data for street lighting load as in June 2013, technical specifications of typical LEDs and lighting practices by Transport Malta. Furthermore, the metered savings measurement method that is applied is explained: the real savings are determined by subtracting the (metered) consumption of the new system from the (metered) consumption of the previous system; a one year period will be considered to cater for seasonal variations (daylight hours, traffic levels) in use.

It was not possible to identify a best practice for the more complex voluntary agreements that cover a wider range of technical measures. Meeting the requirements of Article 7/Annex V regarding the measurement methods for savings would include an explicit notification of the methodology used, and details on the methodology – with a clear description of the different methodologies used for the various energy efficiency measures included in the agreement.

5.3.3.2 Additionality

Article 7(6) and Annex V point (2)(a) (3)(a) require that when calculating energy savings, only the savings that go beyond the minimum requirements originating from specific EU legislation can be counted as contributing towards the energy savings target – see the main report, section 5.2.4.2 for more in-depth information on this requirement.

As can be derived from the policy measure overviews in the tables above, the notified regulations and voluntary agreements often include technical measures that are also regulated by the Ecodesign Directive, the emission performance standards of new cars and light duty vehicles and the EPBD. The notification then needs to address potential additionality issues, and demonstrate how it is ensured that only energy savings that are additional to these Directives are counted towards Article 7 savings (Annex V(4(f)).

For example, voluntary agreements on energy efficiency targets have been agreed with industry and other non-domestic large energy users in a number of countries (Belgium, Finland, Latvia, the Netherlands and the United Kingdom). These agreements can be met by a range of actions that improve energy efficiency, including a number of (technical) energy efficiency measures that are also regulated by the Eco-design Directive: electrical motors, industrial fans or water pumps, etc. To meet the additionality requirement of Article 7 and Annex V, Member States therefore need to ensure that only those energy efficiency measures that are additional to this regulation (in this case, the part of the savings that go beyond the eco-design requirements) are counted towards the EED Article 7 target, and confirm in their notification that they have done this. Likewise, when determining the savings of

voluntary agreements or regulations that include procurement of vehicles, it should be ensured that only savings additional to the emission performance standards for passenger cars and light duty vehicles are counted.

The **Finnish** energy efficiency voluntary agreements can serve as an example of best practices in this respect. Their notification describes how the calculation of the savings takes into account eco-design requirements, explaining how the calculation of the savings takes into account eco-design requirements where reported savings associated with electricity savings. Specific adjustments are made for lighting measures, for engines, as well as general reduction for electricity savings in the industrial sector and service sector.

The **Netherlands** has met the additionality requirement of their voluntary agreements with industry by specifying that all measures that are undertaken under the voluntary agreements are registered. Of those measures, only the savings that are within the scope of the agreement count towards the EED; knock-on effects, purchase of sustainable energy or cogeneration do not count. Furthermore, it is made explicit that only savings additional to the minimum requirements of the Ecodesign Directive are considered.

5.3.3.3 Materiality

Annex V, point (2c) requires that the energy efficiency measures must be demonstrably material to the achievement of the claimed savings. According to the Commission guidance note, the term “material” means that the obliged, participating or entrusted party has contributed to the realisation of the specific individual action (in excess of the automatic rolling out of EU legislation, or autonomous improvements because of, for example, market forces or technological developments).

In the context of voluntary agreements and regulations, Member States are required to demonstrate that the policy measure is indeed material to the technical measures that are counted towards the target – i.e. it must be demonstrated that without the policy intervention the energy efficiency measure would not have been carried out. For example, a regulation should go beyond business-as-usual in order to count its savings, the same holds for a voluntary agreement that includes an energy efficiency target. This requirement clearly relates to the conclusion described above, that the effectiveness of both these policy measures depends on the level of the energy savings targets or specific actions agreed. Article 7 or Annex V do not specify the methodology that Member States should use for demonstrating materiality.

Some examples of how Member States have met this requirement are the following.

In **Belgium**, materiality of a voluntary agreement with industry is ensured by counting only measures that have a longer payback period than is normally acceptable for companies (this payback period is, however, not specified in the notification).

Materiality can also be confirmed with empirical (historical) data. For example, the smart meter regulation in the **UK** can be considered material since the uptake of smart meters so far is minimal, making it very unlikely that the market would develop without government intervention.

5.3.3.4 Policy overlaps

Annex V (2)(d) requires Member States to ensure that when the impact of policy measures or individual actions overlaps, no double counting of energy savings is made. However, there is no specific requirement to notify how overlaps/double counting is addressed.

There is a risk on policy overlaps as many Member States have more than one policy measure aimed at energy efficiency improvements in the various sectors - as illustrated by the large number of policy measures notified for Article 7.

As was discussed above, governments often decide to combine voluntary agreements directly with other policy measures, for example by providing fiscal benefits only to participants of a voluntary agreement, or by offering financial support for energy audits or specific technologies. This may increase the number of participants and may enable governments to increase the agreed targets and actions to a more ambitious level, which will both enhance the effectiveness of the measure. There may be less need for supporting policies when implementing regulations, but these may also be combined with supporting policies if desired. Furthermore, apart from any intentional policy overlaps, end-users that participate in a voluntary agreement or that are affected by a regulation, may also be affected by a range of other energy efficiency policies, such as EEOS, taxation measures, etc.

If these other policy measures are also notified for Article 7, there is a risk of double counting as both measures may invoke exactly the same individual action, for example the implementation of an energy efficient technology in a specific company or government building, and this needs to be addressed in the notification. There are different options to address such policy overlaps:

- The savings can be apportioned among the overlapping policy instruments. For example, 70% of the savings are allocated to policy instrument 1 and 30% of the savings are allocated to policy instrument 2. However, splitting the energy savings is not straightforward in all cases particularly when different entities are responsible for administering and monitoring the policy instruments;
- The savings can be attributed to only to one of the policy instruments whereas the other policy instrument(s) are assumed to deliver no savings at all – if applicable this could be limited to a specific group of end-users that is affected by both instruments;
- The beneficiaries of the policy measures are only allowed to use one type of incentive provided from one policy instrument.

The two last methods are compliant with the Directive as they avoid double counting of savings.

In case of supporting policy for **regulations**, it can be argued that the regulation is the main driver for the energy savings – the supporting policies (e.g. financial support or communications) are not essential to achieving the actions or targets. It can then be considered best practice to allocate the savings to the regulation only, and not include any effects of the supporting measures.

The **Greek** notification regarding their regulation on 'Energy Managers in state and general public buildings' may illustrate this issue. In the Greek NEEAP, policy overlap of this measure with two notified policy measures, namely with "Energy upgrade in public buildings" and with "Implementing energy management system ISO 50001" is identified. The NEEAP then explains that double counting is avoided by calculating the energy savings on the basis of the new energy situation of buildings, i.e. aiming to identify additional savings due to a specific policy measure.

Romania notified the policy measure 'development of energy services/the ESCO market', and states that there is a risk of double counting of savings achieved with this measure and other policy measures. Double counting will be avoided by using annual reports of ESCOs on projects carried out by energy service contracts as a basis to separate the energy savings of these measures from those due to national energy efficiency programs.

In case of **voluntary agreements** combined with support measures such as financial support for energy efficiency investments or energy audits, it is often less clear what the main driver for the resulting actions is. As explained above, it may even be the combination of the various policies that is key to achieving the savings, for example if the support measure is key to convincing the various parties to enter the agreement, or if it enables the negotiation of a higher savings target in the agreement. The EED does not explicitly specify the methodology Member States should use in these cases to avoid double counting, but Annex V does specify that they then need to ensure that the saving achieved by specific actions that are included in the agreements or regulations, are not also included in the supporting measure as well, by correcting for double counting in one of these measures.

An example of a best practice using the second option listed above can be found in the **Finnish** notification for the voluntary agreements, where it is explained how the overlap between energy audit activities and energy efficiency agreement activities is dealt with. These overlaps have been taken into account by excluding all expected savings from measures proposed in the energy audits from the savings counted towards the voluntary agreement[109]. In addition the two Finnish voluntary agreements overlap – the "Energy efficiency agreement activities" and the "Energy efficiency agreements/Action plan for energy services and Hoyla-III customers". These overlaps have been addressed by excluding savings from mid-sized industry and energy-intensive industry, or service sectors energy consumption from the savings of the "Energy efficiency agreements/Action plan for energy services and Hoyla-III customers".

[109] Savings from process industry are excepted from this approach, however, and it is not clear what proportion of the savings is affected by this exclusion.

5.3.3.5 Lifetime of measures

Annex V point (2)(e) requires Member States, in their calculation of energy savings, to take into account the lifetime of savings of individual actions. This may be done by counting the savings each individual action will achieve between its implementation date and 31 December 2020. Alternatively, Member States may adopt another method that is estimated to achieve at least the same total quantity of savings.

Best practice to meet this requirement for regulations and voluntary agreements would thus involve detailing the lifetime of measures used for the eligible measures that are supported by these policies, and an elaboration of the calculations performed to reach the total savings. This may be quite straightforward with policy measures that include a very specific technical measure. Notifications for these specific regulations and voluntary agreements should provide the lifetime of these measures, which may then apply to the whole savings of that measure.

The notification of the voluntary agreement on street lighting retrofitting in **Malta**, for example, states that the lifetime of this measures is taken to be 15 years. This is in in accordance with general practice. Furthermore, the straightforward approach has been used to account for lifetime of savings i.e. the savings are credited to the year in which they occur.

Meeting this requirement for more cross-cutting policy measures and measure that include a whole range of technical measures would then take the form of a more comprehensive overview of eligible technical measures, and associated lifetimes. In addition, the Member State should then provide details of the contribution of these technical measures towards the expected savings of the measure over the lifetime categories, to ensure transparency of the calculations.

A good practice of a transparent approach amongst others can be found in **Latvia**, for example. Latvia has prepared and published a deemed energy savings catalogue, based on the template of Denmark (https://www.em.gov.lv/lv/nozares_politika/energoefektivitate_un_siltumapgade/energoefektivitate/energijas_ietaupijumu_katalogs/). The lifetimes of savings are provided in the published catalogue with energy saving measures and these lifetimes are used for all Article 7 policy measures.

Finland also notifies savings for different types of energy saving measures, differentiating between actions with a short or long lifetime, and between sector. The lifetime of operation measures is taken to be two years for measures taken in the service sector, and five years for industrial operation measures. For technical measures, a lifetime of more than 12 years is indicated, which is considered conservative compared to the industry estimates for most technical measures of around 15 years. It is assumed that one-half of the savings impact of each technical measure is achieved in the first year, taking into account that the measures will be implemented in the course of that year.

NB: note that the requirement to notify the lifetimes that are used is about the lifetimes of the individual actions, i.e. not about the lifetimes of the savings that result from a particular policy measure.

5.3.4 Quality standards

According to Annex V point (2)(g), Member States are required to maintain quality standards for products, services and installation of the energy efficiency improvement measures. This includes introducing relevant quality standards, where they are absent, and monitoring compliance with the standards. In all cases, monitoring should be conducted independently.

Quality standards can be achieved in a variety of ways, for example through:

- technically monitoring a statistically significant sample of recipients of energy efficiency measures (common for insulation installations);
- customer satisfaction monitoring of a statistically significant sample of recipients of energy efficiency measures, often required of energy providers for heating and insulation installations in properties;
- customer utilisation monitoring of a statistically significant sample of recipients of energy efficiency measures, which ensures that the measures are being used and that energy savings are actually being realised;
- using an approved list for specific energy efficiency measures;

- appliances and products carrying an energy label; products with specifications for performance such as specific U-values compliant with the national or European standards; and
- ensuring that installers use national best practice guides regarding the installation of energy efficiency measures like insulation and heating.

The notification of **Malta** for the voluntary agreement on street lighting retrofitting specifically addressed quality standards, stating that the street lighting system is designed according to the following standards:

- EN 13201-2: 2003 Road Lighting - Part 2: Performance requirements;
- EN 13201-3: 2003 Road Lighting - Part 3: Calculation of Performance;
- EN 13201-4: 2003 Road Lighting - Part 4: Methods of measuring lighting performance

Regarding the voluntary agreement on retrofitting of energy efficient measures in public buildings, Malta also states quality standards for roof insulation and double glazing, and for energy efficient lighting

5.3.5 Monitoring, reporting and verification

Given that regulations and voluntary agreements are alternative measures, the requirements of Article 7(10) and Annex V(4)(f) should be taken into account: these set out, inter alia, requirements regarding appropriate measurement, control and verification systems for the energy efficiency improvement measures and set specific requirements for these systems. In particular, the provision requires the Member States to put in place measurement, control and verification systems that ensure verification at least a statistically significant proportion and representative sample of the energy efficiency improvement measures. The independence of the systems must be ensured.

In voluntary agreements, it is therefore best practice to include comprehensive requirements on monitoring, reporting and verification in the agreements, which are legally binding contracts for the participants. The monitoring and reporting requirements could either be specifically aimed at monitoring and reporting the relevant data such as the energy savings that count towards Article 7, or include all data that government authorities need to calculate the actual savings for Article 7. The latter approach may be the best approach in case the voluntary agreement or regulation is not directly in line with the Article 7 requirements such as eligibility and additionality – for example, if the voluntary agreement includes an energy savings target which also allows participants to include measures specified in the Ecodesign Directive. The government then needs to take the additionality requirement into account when determining the savings of that measure for Article 7.

The following table provides an overview of the approach taken by the Member States that have addressed the monitoring, reporting and verification requirements in their notifications on voluntary agreements and regulations. Especially the Member States with voluntary agreements that are expected to contribute significantly to the total Article 7 savings (Belgium and Finland, see the overview table above) have elaborated on the M&V processes put in place.

Table 21: Monitoring, reporting and verification systems for regulations an voluntary agreements

Member State	Approach
Belgium	• For the Flemish voluntary agreements, there is a system for monitoring, verification, control and compliance in place. The Flemish energy agency monitors compliance and reports to the government and the general public, and can intervene if progress is insufficient. The Verification Office has responsibilities regarding, for example, accepting energy experts and energy plans, on-site inspections, etc. • The notification of the voluntary agreements in Wallonia also outlines a specific plan for monitoring, verification control and compliance. This includes that technical experts validate sector plans, annual reports by the parties that signed the agreements, auditing and independent verification.
Finland	• A specific section is included on the monitoring of results and corrective measures. The results of the agreements are monitored through annual reporting by participating companies, and checks (audits) on the order of magnitude of data and its general accuracy are made by Motiva, the entrusted party for the scheme. A survey using random sampling was also used to explore calculation

	methodologies. With respective to corrective actions, each agreement has its own steering group to assess the efficiency of the agreement activities. • 100% of the implemented measures reported annually are examined independently, and the savings impact checked. This may involve clarifying the savings claimed. In addition, 5% of the measure are audited.
Malta	• In Malta, the Sustainable Energy and Water Conservation Unit (SEWCU), a government agency, is entrusted with the monitoring, reporting and setting up the verification protocols specific to each scheme. The Managing Authority shall impose an obligation upon beneficiaries to carry out audits including independent verification on established energy savings and submit the results to SEWCU. SEWCU may include extra inspections for independent verification.
Netherlands	• Only the parties that will be involved in monitoring verification control and compliance are listed.
Romania	• The Department for Energy Efficiency monitors energy savings and draws up an annual report based on the reports it receives from the institutions involved in the implementation of the various policy measures. The verification will also be implemented by these institutions.
Slovakia	• The notification only reports which organisation is responsible for the monitoring, control and verification.
United Kingdom	• M&V is addressed for each of the different VAs and regulations notified, which mainly describe who is responsible for the administration, assessment and monitoring of the measure, and what their responsibilities are. The CCR energy efficiency scheme, for example, is administered by the Environment Agency who carries out audits, assesses the savings and ensures compliance amongst participants with a programme of audits based on risk assessment with additional financial penalties levied on those found not to have complied. The Environmental Agency also has a similar role in the Climate Change Agreements. The smart metering regulation is administered by Ofgem, the UK's energy regulator.

5.3.5.1 Auditing

The organisation responsible for checking that the actions and saving agreed on in the voluntary agreements needs to carry out audits of the reports submitted by the participating parties, in line with the requirements (to ensure the claims can be substantiated). Credible audits need to be conducted by independent bodies and not by the participants themselves. The same principles apply to regulations.

The Member States notification should specify who is responsible for the administration of the agreement or regulation, and outline its responsibilities. These should include independent audits of the reports submitted as well as audits of the actions taken.

Not many Member States have detailed the auditing procedures in their notification, but some examples of how this has been approached are given in the following.

In **Belgium** (Wallonia), for example, it is ensured that an auditor certifies the information provided and data used in the annual reports of companies related to the voluntary agreements for industry.

The **UK**'s Climate Change Agreements include a process of audits by the Environmental Agency on selected facilities and sector associations to verify eligibility and performance. These facilities are selected either by using a risk-based approach (looking, for example, for facilities that are new entrants, or where the eligible process is considered to be more complex) or by random selection. These audits can be either desktop audits, based on data provided by the operator, or full site audits.

5.3.5.2 Technical monitoring

The quality of the measures delivered by a policy measure needs to be ensured, otherwise the savings may not be realised. One way of doing this is to require the parties involved in the voluntary agreement or subjected to the regulation to carry out technical monitoring of the promoted measures. This should be done by an independent third party with no vested interest in the outcome of the monitoring.

In **Belgium**, for example, verification of the voluntary agreement is carried out by an independent research institute and consists of checking the presence of data and compliance with the methodology. A technical expert, appointed by open market, is the methodological reference for each actor.

Verification of the implementation of energy management measures is also part of the monitoring and verification procedures.

5.3.5.3 Validation of achieved (real) savings

Most evaluations of voluntary agreements and regulations rely on the monitoring and validation process described above. These do not always relate to real savings, though, as the voluntary agreements and regulations are not always directly aimed at achieving specific energy savings – in some cases they rather monitor and validate specific actions such as the roll-out of smart meters or of efficient street lighting, the implementation of energy audits, etc. These monitoring data then need to be converted to actual savings achieved. Monitoring and validation of real energy savings is therefore preferable to monitoring of other indicators such as number of smart meters installed, but this will not always be feasible.

Validation of real savings will become more important in the coming years, as actual savings must be reported from 2016 onwards. The measurement methodology and processes should be in place well before this time, though, since validation of real savings requires data on the reference energy use or energy efficiency, and validation of the actual implementation of the energy efficiency measures. The process set up in **Finland** can be used to illustrate what kind of process could be implemented: each voluntary agreement has its own steering group to assess the efficiency of the agreement activities. The quality of this assessment could not be confirmed, however. In addition, Finland reports that 100% of the implemented measures reported annually are examined independently, and the savings impact checked. This may involve clarifying the savings claimed.

5.3.5.4 Reporting

Reporting is an essential element of a well-designed policy measure. Article 7(10) (g) requires participating parties to submit an annual report of the energy savings, unless this is not feasible, and make it publically available. Best-practice reporting includes a specification what the reports need to contain exactly (so that it can be checked and compared), when reports are due, and what happens in case of not providing the information required.

A number of issues related to the implementation of reporting requirements included in the voluntary agreements or regulations were that the participating parties are not always required to report energy savings, but other indicators and data. This may occur, for example, when the voluntary agreements and regulations are not directly aimed at achieving specific energy savings, but rather define targets or require specific actions related to, for example, the roll-out of smart meters or of efficient street lighting, the implementation of energy audits, etc. As mentioned above, the annual reports should contain data on energy savings, unless this is not justified - which should then be stated.

A number of examples of reporting best practices could be identified, although details on the reporting requirements were very scarce in the notifications.

Annual reporting of energy savings has been established, for example, in **Finland**, where the results of voluntary agreements are monitored through annual reporting by participating companies. Motiva, one of the entrusted parties of the agreement, furthermore issues regular publications for the general public, on the status, progress and achievements of the agreement[110].

In **Belgium** (Wallonia), reporting requirements are also included in the voluntary agreements. Industrial federations (the parties that signed the voluntary agreements) report annually on results such as changes in consumption and energy efficiency and the environmental efficiency index. The annual monitoring reports on the alternative measures of Article 7, made for the Walloon Government, will be published on the website of the Department of Energy and Sustainable Building of Wallonia.

Regarding the regulation targeting the development of energy services/ESCOs in **Romania**, the Department for Energy Efficiency monitors energy savings and draws up an annual report covering the preceding year. The Department's report is based on the reports it receives from the institutions involved in the implementation of the various policy measures.

Reporting requirements of the **UK**'s Climate Change Agreements are also well specified, and laid out in a 'Climate Change Agreements Operations Manual', published by the Environmental Agency (latest version: February 2015). Every participant must regularly report energy consumption and other relevant

[110] See the most recent reports on http://www.motiva.fi/en/publications/energy_efficiency_agreements_2008-2016

data via the register. A set of workbooks is available to assist with the calculations needed for reporting and to present performance data in a standardised format.

5.3.5.5 Penalties

As mentioned above, even though participation in a voluntary agreement is not obligatory, once a company or municipality joins the agreement, it is binding. Regulations are binding by nature. However, in both cases, if participating parties are not subject to a penalty in case of non-delivery of their obligations there is a risk that the targets may not be achieved. Whilst there is some reputational risk in case parties do not deliver their obligations, this in itself is not a guarantee that all requirements are adhered to, particularly if the party does not have a customer-facing position (e.g. a distribution company).

As was discussed above, participants that do not comply with voluntary agreements are often not entitled to the financial benefits and other support that is provided to participants. They may also have to repay rebates, subsidies or tax credits received, as penalty for non-compliance. These penalties and sanctions should be clearly defined in the agreement, as well as the party that has the authority to impose these. Not meeting regulations may have juridical consequences, which may be defined specifically in the law itself.

Most notifications do not address the penalties and sanctions for not complying with the various voluntary agreements and regulations analysed here, but some examples of how Member States address this issue are given in the following.

The **UK** smart meter regulation includes that energy suppliers are required by licence conditions to submit plans and report the progress of their non-domestic smart meter roll out to Ofgem, the UK's energy regulator. Ofgem has statutory powers to enforce compliance against supplier plans for roll out of smart meters in non-domestic premises.

The notification of the voluntary agreements in **Belgium** (both in Flanders and Wallonia) states that any business that does not meet its commitments will have the benefits included in the agreement withdrawn. In **Finland**, the state subsidy may be re-claimed if the company or municipality neglected its contractual obligations. Furthermore, the penalties are described that are associated with the provision of false information.

The **UK**'s Climate Change Agreements have a system of financial penalties set out, which addresses a range of potential issues, including inadequate reporting of intermediate progress, and inaccurate baseline or target period data. The penalties are expressed in terms of reduced discount of the Climate Change Levy (CCL) – a discount which is available only to participants of the Agreements. If a target is not met, the participant will need to pay a buy-out fee to be recertified.

5.3.6 Discussion and conclusions

Voluntary agreements (VA) and regulations (Article 7(9) (c)) is a very diverse policy measure category, which can be applied for different sectors (industry, distribution companies, municipalities, etc.). They can have very different objectives, such as

- a general reduction of energy consumption, for example in wide-ranging voluntary agreements on energy efficiency targets in industry as notified by Belgium, Finland and the Netherlands);
- energy performance improvements in existing buildings, (for example in the German Energy Savings Ordinance)
- implementation of specific technologies by a specific group of actors, such as with the smart meter regulation of the UK, or a voluntary agreement on street lighting retrofitting in Malta.

Member States notified 11 regulations, and 18 voluntary agreements; regulations were notified by Germany, Greece, Portugal, Romania and the United Kingdom, voluntary agreements by Belgium, Finland, Latvia, Malta, the Netherlands, Slovakia and the United Kingdom.

The cost effectiveness of these measures cannot be quantified due to lack of data and large variations between specific measures, but a literature analysis does lead to the following general conclusions on cost and effectiveness of these types of measures:

- The administrative cost of both voluntary agreements and regulations is relatively limited, and generally lower for VAs than for regulations

- Cost of voluntary agreements may increase significantly when these policy measures are combined with other policies, such as tax reductions or other types of financial support. These financial support policies are often used to encourage participation in voluntary agreements, and to incentivise participants to comply with the requirements of the agreements – when they do not comply, they may lose these benefits.
- The effectiveness of both voluntary agreements and regulations depends on the level of the targets that are set, and the actions that are agreed to (in a VA) or made obligatory by law (in a regulation).
- Effectiveness furthermore depends on whether an adequate monitoring and verification scheme is put in place, and compliance is ensured. This is true for both types of policy measures assessed here.

Looking at the notifications and submissions by the Member States, there are still significant gaps in the information on how the various requirements of Article 7 and Annex V are met, and only a relatively limited number of best practices could be identified.

VAs can achieve relatively large savings when they are applied to a large target group and cover a significant share of energy consumption in a Member State. As the actual effectiveness of the VA furthermore depends on the level of the target or the actions agreed on - compared to business as usual and taking into account requirements such as additionality and materiality – some VAs lead to very significant savings (e.g. in Finland, one VA is expected to account for 61% of the total savings of Article 7) whereas others are expected to contribute less than 1% (e.g. various VAs in the Netherlands). Additionality and materiality require specific attention in the calculation of savings and in the notifications. Eligibility issues also need to be addressed, especially when including a VA or regulation that also includes combined heat and power (CHP) or renewable energy actions.

Meeting the double counting requirements of Article 7 and Annex V may also require special attention and a sound methodological approach, especially when the voluntary agreement or regulation is wide-ranging, in terms of target sectors or eligible measures. As mentioned above, voluntary agreements are often combined with other policies, such as tax reductions or other types of support for participating companies. The notifications do not address this type of incentives for VA participants explicitly, but Member States should treat this as any other policy overlap.

Including adequate monitoring, reporting, verification and compliance requirements in the VAs and regulations are paramount to ensure that the expected savings are achieved in reality. Belgium, Finland, Malta and the United Kingdom have provided the most detailed elaboration of their monitoring, verification, control and compliance systems for the voluntary agreements and regulations they have notified. Other notifications typically provide limited information about the details of the processes put in place, although most indicate which government authority is responsible for the monitoring and verification processes, and some have clear reporting procedures in place.

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