Standardized savings calculations within Europe: exchanging practices to streamline theory and practice

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Abstract
According to the European Commission's 2020 progress report, 12 Member States will (very) unlikely achieve their target for Article 7 of the Energy Efficiency Directive EED during the obligation period 2014–2020. Moreover, the national contributions to the 2030 EU target, as reported in the final NECPs, stand short of the existing 32.5 % ambition. The EU Green Deal will promote even more efforts on energy efficiency by 2030. Therefore, most Member States need to tackle untapped energy savings potentials. One of the reasons why some savings remain untapped is the difficulty to calculate, and thereby report, the energy savings, as it is challenging to estimate savings aligned with actual savings achieved, including behavioural impacts. To assist Member States to further intensify efforts in delivering energy efficiency improvements by 2030, the new H2020 project streamSAVE supports Member States in estimating energy savings for a set of priority action types. Given the importance of deemed savings approaches in Member States' EED reporting, streamSAVE focuses on streamlining bottom-up calculations methodologies of standardized technical actions.

This paper presents the status of standardized calculations in Europe, starting from an overview of catalogues and an assessment of differences observed among Member States. These catalogues are mainly designed to monitor the implementation of energy efficiency obligation schemes. Next to that, the status is explained in more detail by a range of sectors and end-uses having limited coverage of standardized savings estimations in the EU. To get a clear view on stakeholder's needs and priorities, the assessment was complemented by an EU-wide online survey and interviews among public authorities & technical experts (October–November 2020). The paper concludes by describing how the exchange of calculation experiences can further improve the implementation of Article 3 (target setting) and Article 7 (obligation schemes or alternative measures) of the EED.

Introduction
In December 2018, the European Parliament and the Council of the European Union adopted the revised Energy Efficiency Directive 2018/2002/EU which set the 2030 energy efficiency target to be at least 32.5 %. According to the European Commission's 2020 progress report, 12 Member States MS will (very) unlikely achieve their target for Article 7 of the EED during the obligation period 2014–2020. Moreover, the national contributions to the 2030 EU target, as reported in the final NECPs, stand short of the existing 32.5 % ambition. The EU Green Deal will incentivise even more efforts on energy efficiency by 2030, so the updated 2030 emissions reduction target of net 55 % compared to 1990 levels can be reached. Therefore, most Member States need to tackle untapped energy savings potentials. Within the frame of the Task Force on mobilising efforts to achieve the 2020 targets for energy efficiency, Member States pointed out possible reasons to the European Commission, depending on their national context, that explain the difficulty to increase energy savings:

- Good economic performance and low-oil prices

- delayed implementation of energy efficiency policies;
- difference in the estimated energy savings and the actual energy savings achieved;
- insufficient consideration of the impact of behavioural aspects such as the rebound effect;
- lack of funding for energy efficiency policies and restrictions by EU state aid rules.

The Member States clearly raised the difficulty to calculate, and thereby report, the energy savings from measures taken or planned, as it is challenging to estimate savings aligned with actual savings achieved, including behavioural impacts.

Although Annex V of the energy Efficiency Directive identifies four main methodologies to calculate energy efficiency savings (deemed savings; metered savings; scaled savings or surveyed savings), most of the savings under Article 7 come from deemed savings approaches or from energy savings calculated using standardized methodologies. Deemed savings can be considered as a good practice to minimize administrative burden, provide quick feedback and give visibility to stakeholders, especially when it comes to efficiency measures with a straightforward impact. Although Member States all use deemed scores, the JRC analysis of the energy savings calculation methods (Economidou et al., 2018) shows that deemed savings estimates for a same individual action may vary greatly among countries. This difference between methodologies indicates a lack of communication among countries concerning methodologies adopted in the same sectors and the need for an in-depth cross-country comparison of methodologies to allow for streamlining of savings calculations as applied by Member States.

Concerning Article 3, the EED does not prescribe a specific methodology to be used in defining the national indicative energy efficiency targets. Member States are free to determine their own national contributions towards the 2020, as well as 2030 EU target. Given the variation of assumptions and input parameters used by Member States, direct comparability of the energy savings by 2020 and 2030 across Member States can therefore not be made (Economidou et al., 2018; Economidou et al., 2020). A more streamlined approach which covers how Article 3 targets as well as Article 7 savings of energy efficiency measures are to be estimated is very relevant, especially in the context of the 2030 Integrated Energy and Climate Plans (NECPs) under the Governance Regulation 2018/1999 (Economidou et al., 2018).

To assist Member States to further intensify efforts to deliver energy efficiency improvements by 2030, the Horizon2020 project *streamSAVE streamlining energy savings calculations* assists public authorities – being closely involved in the Article 3 and Article 7 of the EED implementation – in estimating energy savings aligned more with the actual energy savings achieved. Given the importance of deemed savings approaches in Member States' EED reporting, streamSAVE focuses on streamlining bottom-up calculations methodologies of standardized technical actions. Knowing the above-mentioned differences, streamSAVE will suggest these savings methodologies in a transparent and streamlined way, not only to improve the comparability of savings and related costs between Member States, but also between both EED articles (i.e. efficiency gains for MS in implementation costs). The savings actions are targeted to those measures with high energy saving potential and considered as priority issues by Member States, the so-called *priority actions*.

In order to streamline the energy savings calculation methodologies, streamSAVE started by understanding the stakeholders' needs and comparing existing practices on savings estimation methodologies within Member States, next to facilitating in-depth, peer-to-peer knowledge exchange between public authorities as well as technology group experts and market actors. Such an approach takes the advantage of pooling of expertise, knowledge and practical experience with the energy efficiency actions or selected *priority actions*. More information on the project can be found on streamsave.eu.

Status of standardized calculations in European Union

OVERVIEW OF CATALOGUES

To get an overview on standardized calculations across the European Union, streamSAVE started by identifying documents containing standardized methodologies within Member States. These documents range from guidelines defined by Member States on how savings can be calculated, including how to determine the values used in these calculations, to catalogues containing methodologies on deemed savings completed with standardized calculation values. In total, these documents have been identified in 14 Member States, containing 531 methodologies as shown in Table 1. Another Member State for which a document on savings calculation was identified is Latvia. However, this document is currently under revision and was not available at the time of the analysis (January 2021).

As shown in the table, publicly available guidelines or catalogues on savings calculations are mainly available for Member States which have implemented an Energy Efficiency Obligation scheme for their Article 7 target fulfilment. The structure of those documents is closely related to the design of the Obligation Scheme. While schemes that focus on single measures providing high savings prepare technically detailed guidelines on the savings calculation and definition of calculation values (e.g. Italy's White Certificate scheme), other schemes prepare a wide range of deemed savings methodologies (including calculation values for standardized use cases) for measures with lower savings potential per savings action but a high number of actual actions to be implemented (e.g. France, Austria, Denmark). The French catalogue explains a very high number of methodologies as similar deemed savings methods are often included separately for each sector and/or region.

In the case of catalogues of standardized actions, the following methodological aspects are often included by Member States:

- Description of the action;
- Application area or scope of the standardized calculation methodology (e.g. subsector; limits of methodology);
- Calculation formula to estimate the savings; parameter definition and indicative values (e.g. lifetime), including description of sources for these standardized values;
- How the baseline consumption has been determined for each action; how frequently and according to which criteria and data these baselines should be updated; and

Table 1. Number of standardized calculation methodologies identified per Member State.

Member State	Article 7 Implementation	Number of methodologies
Austria	EEO & Alternative Measures	50
Bulgaria	EEO & Alternative Measures	36
Croatia	EEO & Alternative Measures	34
Cyprus	Alternative Measures	22
Denmark	EEO	34
France	EEO	214
Greece	EEO & Alternative Measures	25
Ireland	EEO & Alternative Measures	16
Italy	EEO & Alternative Measures	7
Luxembourg	EEO	34
Portugal	Alternative Measures	17
Slovenia	EEO & Alternative Measures	33
Spain	EEO & Alternative Measures	6
United Kingdom	EEO	3
Total		**531**

- Correction factors for behavioural effects (e.g. rebound effects) and/or geographical factors.

Additionally, the results from other initiatives focussing on bottom-up calculation methodologies like multEE (2016) or EMEEES (2009) were examined. Both projects offer guidance on how bottom-up methodologies for savings calculations can be prepared and provide a variety of methodologies and calculation formulas as well as guidance on the identification of calculation values in Member States for deemed savings actions to be implemented in different sectors.

The collected methodologies were classified not only per Member State, but also per type of end-use and sector they cover. The result of this classification is presented in Figure 1, showing that the methodologies to estimate savings for the sector of buildings and related end-uses on space heating and cooling are well covered by the catalogues. This is in line with the policy efforts taken by Member States to improve energy efficiency in these demand sectors. In contrast, the sectors of Agriculture & Forestry, Fishing, next to Transport are less represented in the catalogues' methodologies. Same holds true for the end-use categories ICT and office equipment, process heat (furnaces, steam & hot water), process cooling and water heating which are not well covered by the catalogues.

Stakeholder consultation performed during the proposal (June 2019) and initial phase of streamSAVE (October 2020) showed that there are indeed savings potentials that are not yet covered by existing bottom-up methodologies and that for other methodologies already available, Member States find it difficult to identify the baseline or calculation values for the savings estimation in accordance with the EED framework. streamSAVE, therefore, identified so far five priority actions or technical solutions with a high energy savings potential. For these priority actions standardized calculation methodologies, indicative calculation values including guidelines on Member States' customization, cost parameters and related CO_2 savings potential will be developed. Those priority actions are:

- Heat recovery from industry and district heating
- Building energy management systems (BEMS) and Building automation and control systems (BACS)
- Commercial and industrial refrigeration systems
- Private and public electric vehicles
- Lighting systems including public lighting

A second round of priority actions will be identified halfway through the project based on expertise as well as identified needs of the stakeholders involved in streamSAVE.

METHODOLOGICAL INSIGHTS ON STANDARDIZED CALCULATIONS

Based on the 14 identified documents containing standardized calculation methodologies within the Member States, the main methodologies aligned with the priority actions were characterized.

Various methodologies exist on how to *calculate savings for heat recovery from different parts of industrial processes,* namely from compressed air systems (i.e. Bulgaria, Luxembourg), furnaces and (condensing) economizers (i.e. Bulgaria, Luxembourg, France) and cooling towers (i.e. Bulgaria and France). Other methodologies available offer calculation options for the installation of heat recovery systems in general (i.e. Cyprus, Slovenia). The calculation formulas either compare the final energy consumption before the installation of a heat recovery system to the final energy consumption afterwards, or multiply the installed power and operating time or final energy consumption with a savings factor or percentage of heat recovered. Therefore, all methodologies prepared in the Member States require additional information like energy consumption me-

Sector \ End-use	Appliances	ICT/Office eq.	Lighting	Steam&Hot water	Furnaces	RES electricity generation	RES heat generation	Process cooling	Water heating	Space heating&cooling	Electric motors	Transport	User behaviour	Ventilation	Other	**Grand Total**
Industry	4	2	16	9	9	4	7	3	0	32	46	0	6	5	13	**156**
Transport	0	0	0	0	0	0	0	0	0	1	0	72	2	0	2	**77**
Commercial	7	3	33	3	3	7	9	8	4	117	6	1	10	9	21	**241**
Residential	19	0	12	0	1	8	14	0	6	171	2	0	12	7	11	**263**
Agriculture & Forestry	0	0	3	0	0	1	2	2	0	22	3	2	1	1	3	**40**
Fishing	0	0	1	0	0	1	2	0	0	5	0	1	1	1	2	**14**
Grand Total	**30**	**5**	**65**	**12**	**13**	**21**	**34**	**13**	**10**	**348**	**57**	**76**	**32**	**23**	**52**	

Figure 1. Number of standardized calculation methodologies per type of end use and sector.

tering data or installed power to be prepared by the implementing parties in order to calculate savings. Given the large variety of areas where heat recovery systems can be implemented in industry and the various technological solutions, more savings methodologies are needed so technical solutions are not excluded.

Only a limited number of Member States have implemented *standardized methodologies for BEMS/BACS,* namely six in total in Bulgaria (BG), Croatia (HR) and France (FR): automation and heating control systems in residential buildings (BG); energy efficient management systems at a distribution station (BG); heating system regulation equipment (HR); automatic regulation of lighting systems (HR); automatic regulation of electricity consumption (HR); and the installation of automation and heating control systems & hot sanitary water in residential buildings (FR). The identified savings methodologies differ in multiple ways for buildings using various automation functions. On the one hand, the so-called BACS factor method[1] can be used to estimate savings per type of end-use according to the 15232 standard. On the other hand, more detailed, installation- or technology-specific approaches exist, such as energy savings at a distribution station based on power and average seasonal conversion factor of the installation. The advantage of the BACS factor method is that no information is needed about any specific control and automation function from the building, as the energy savings per type of end-use are calculated with a reference BACS efficiency class. Another difference is that some methodologies rely on deemed savings estimates or on scaled savings. Important to note is that none of these methodologies considers behavioural effects like rebound effects.

Several *methodologies related to industrial or commercial refrigeration* exist, but are not focused solely on centralised compression refrigeration systems. Some methodologies relate to the replacement of cooling equipment as well, for instance in Italy and Croatia. The methodologies for the replacement or new installation of efficient cooling equipment uses the annual cooling requirements, based on the European seasonal energy efficiency ratio ESEER, to determine the energy savings. From Italy, three measures have been collected in relation to the replacement or new installation of cooling equipment, requiring detailed technology-specific and monitoring data, which makes standardised data collection difficult. The methodologies from Luxembourg, tackling increasing evaporator temperature and lowering condenser temperature, might be implemented with almost no additional costs. However, there is a constraint on the number of operational hours of the system (permanent 8,760 h/y) to apply the methodology. The calculation methodology for central compression refrigeration systems as used in Austria and in the multEE project is based on the difference of ESEER between a reference and the more efficient system, installed cooling power and full-load hours.

Several countries have developed methodologies for the evaluation of savings associated with the *purchasing of alternative vehicle technologies.* This is the case of Austria, Croatia, Cyprus, Greece, Luxembourg and Slovenia, as well as the multEE project. The standardized calculation is usually based on the number of purchased vehicles, the difference of energy consumption between a reference and the efficient vehicle, and the yearly mileage. In some cases, the methodology also includes the conversion factors between different units of energy consumption (as in Croatia), or the fuel density and the heating value of the fuel (as in Cyprus), or the division of the consumption of electricity and other fuels with the respective calorific values (as in Luxembourg). In the case of Slovenia, the reference energy consumption is calculated based on the average projected specific emissions of CO_2. The consumption can also be adjusted by factors to calculate effects, such as rebound, spill-over, and free-ridership, as well as the lifetime of savings. This is the case for Austria, as well as the methodology devel-

1. The BAC factor method gives a rough estimation of the impact of BACS and TBM functions on thermal and electric energy demand of the building according to the efficiency classes A, B, C and D. The impact of BACS functions on the building's energy demand is established with the aid of BACS efficiency factors.

oped by the multEE project, but without presenting indicative values to correct for behavioural effects.

There are *standardized methodologies for lighting systems* in almost all sectors, such as street lighting, traffic lighting, industrial lighting, building lighting and residential lighting. Most of the measures are dedicated to the installation of more energy efficient technologies, including the use of lighting control systems. The calculation formulas are based on the number of lighting points/lamps, the difference between the power of both technologies (inefficient and efficient) and the total annual burning hours. In some cases, where lighting controls are applied, their contribution is accounted using a different number of annual burning hours (with and without sensors), reference indicative values (e.g. light control sensors in Bulgaria), or different reduction factors according to the type of control used (e.g. Croatia). In almost all methodologies, the baseline consumption is calculated using the power of the installed lighting points/lamps and annual burning hours, requiring access to the existing characteristics of installed technologies. In just two methodologies (i.e. Austria, multEE), the consumption can also be adjusted using factors, such as rebound, spillover, and free-ridership, as well as the lifetime of savings, but without presenting indicative values to correct for behavioural effects. Two of the most simplified approaches analysed is used by Slovenia and France, which use annual standardized energy savings when replacing or improving outdoor lighting systems, combined with indicative values according to the power of the old mercury lamps and new equivalent more efficient technologies (Slovenia), or to two different efficiency levels for the new lamps (e.g. France).

Stakeholder needs and priorities

Next to the status of standardized calculations in the EU, a rapid needs assessment was conducted by the streamSAVE consortium to understand Member States' needs (Altschuld and White 2009) on standardized methodologies for the five priority actions (Rabinowitz, 2017) regarding energy policy implementation, particularly Article 3 and Article 7 of the EED. The needs assessment was based on an online survey to the most relevant stakeholders concerning EED implementation, complemented by an interview with the public authorities involved. The survey – which was open for 40 days, between 19 October and the end of November 2020 – explored the overall needs and priorities in the EED field from EU27 countries and UK. The personal interviews aimed to understand better and in-depth Member States' interests as well as current practices of energy savings estimations from public authorities in the streamSAVE partner´s countries (i.e. AT, BE, CZ, ES, FR, GR, HR, LT, NL, PT, SI).

A total of 112 online surveys were fully completed, representing a success rate of 45 %. Besides, 22 stakeholders from 12 different countries were interviewed, after having filled in the online survey. In total, it was possible to collect replies from 38 implementing public authorities from 19 different countries. 33 entities out of 38 have the responsibility in the design, implementation, monitoring & verification and/or evaluation of policy measures under Article 7 of the EED; 23 entities are responsible for the identification and monitoring of the progress of 2020/2030 energy efficiency targets under Article 3 of the EED; 53 respondents provide technical support to public authorities and others, particularly research/technology experts provide technical support to industrial sectors in terms of energy efficiency and EEOs. As the sample includes implementing authorities from 19 countries (representing 73 % of the European Member States and the UK), the results of this consultation give a reliable picture of the situation and supporting needs in Member States in relation to the policymaking process.

Without a uniform and transparent savings calculation system, Member States raise concerns about regulating their relationship with obligated parties in a fair manner and putting them at a financial disadvantage in comparison with competitors from the other Member States. To some extent, standardized calculation methodologies need to be complex enough to characterize the situation with accuracy. However, those responsible for monitoring the implementation of Article 3 and 7 of the EED and also in charge of the evaluation of energy-saving actions reported by obligated parties, often lack the expertise and technical background to apply these correctly. In some countries, the preparation of new calculation methodologies involves – apart from technical experts – the interest of advocacy groups on the relevant topic as well as stakeholders from the obligated parties, leading to higher acceptance. It is however hard to find the balance between technical accuracy and an easy-to-use approach. It was generally recognized, even by countries having more experience in preparing standardized calculation methodologies, that the definition of baselines and additionality of savings are still challenging issues in the implementation of the EED. Member States also indicate that the revision of the scheme for the period 2030 brings an excellent opportunity to revise and update calculation methodologies.

The survey results on the importance of the priority actions highlight a preference for electric vehicles and BACS systems, as presented in Figure 2. In the online survey, the stakeholders indicated their concerns for each priority action, when they were asked if there are specific needs related to the calculation of energy savings for which they would be interested in getting more guidance or in discussing with other technical experts. For heat recovery, several respondents indicated the need for clear rules and definitions on how to calculate the net heat being transferred, as well as how to valorize these measures. Concerning BEMS and BACS, stakeholders are generally interested in representative studies to gather default savings values, as well as in sharing best practices and best available techniques. Moreover, the availability of streamlined or standardised methodologies to calculate energy savings would be here of added value. The need for a baseline definition to ensure additionality, next to the need for simplified methods to avoid collecting large amounts of data and calculations were mentioned specifically for refrigeration systems. Regarding electric vehicles, the main concern is the simultaneous evaluation of electric vehicles and infrastructure, to avoid double counting and ensure additionality. Lastly, respondents indicated a gap in the methodologies for lighting systems, as rather than the efficiency of lamps and systems, other criteria such as lighting levels and quality of service should be considered as well.

Methodological challenges arise given the technical background of involved staff, and the complexity of the calculations themselves. More specifically, streamlining calculation methodologies requires accuracy to characterize the complexity of

	Lighting systems and public lighting	Electric vehicles and related infrastructure	Commercial and industrial refrigeration	BEMS and BACS	Heat recovery: district heating and excess heat from ndustry
Implementing public authority	3,8	4,7	3,4	4,3	4,2
Managing authority	4,3	5,0	4,3	4,8	4,3
Obligated party	4,0	4,9	4,8	5,1	4,9
Other	4,0	4,5	4,5	4,4	4,2
Research / Technology expertise	4,4	4,8	4,1	4,4	4,1
Technology provider	4,4	4,0	4,2	4,8	4,6
Third party (participating or entrusted parties)	4,3	4,7	3,8	4,5	4,3
Grand Total	**4,1**	**4,7**	**4,0**	**4,5**	**4,2**

Figure 2. Average importance of priority action per stakeholder type (survey scores from 1, not at all important to 6, extremely important).

the situation, and at the same time simplicity to lighten the monitoring and evaluation procedures. Concerning the additionality criteria, the definition of the baselines still raises concerns, as they are considered as a necessary condition to accurately assess the reported energy savings. Regarding data collection, there is a lack of data in some sectors which is hindering the development of bottom-up methodologies to estimate energy savings. Respondents also struggle with the collection of appropriate data to fulfil the requirements of Article 7. Recognizing the challenge to reach a balance between the amounts of data to collect and the appropriateness of the data, respondents are therefore interested in guidance on data collection and technical support on the baseline definition and calculation methodologies to estimate energy savings.

Stakeholders are concerned about meeting the energy efficiency targets in line with Article 3 and Article 7 of the EED. The assessments carried out recently show that Member States are not coming close to meeting the current obligations (Economidou et al., 2020; EC, 2020). The NECPs (National Energy & Climate Plans) submitted to the European Commission by Member States for the period 2021–2030, reflect Member States have made additional efforts to increase their ambition to achieve 2030 contributions in comparison to the draft versions. According to (Economidou et al., 2020), less than half of the Member States have notified sufficient cumulative energy savings of measures, in line with EED Article 7 requirements. Member States, therefore, need to increase their efforts and align their national ambitions with EU goals. The streamSAVE consultation shows Member States are well aware of their main needs to comply with EED targets and are committed to improve their performance. Concerning Articles 3 and 7 of the EED, in particular, the main methodological challenges identified during the consultation were additionality, baseline definition, prevention of double counting of savings and assessment of behavioural aspects (spill-over & rebound effects, free riders). Streamlining calculation methodologies while taking into account country-specific realities and characteristics, as well as sharing of experiences & knowledge on priority actions is therefore much welcomed by stakeholders involved in the EED implementation.

Cross-country knowledge and experience sharing to improve coverage and reliability of savings estimations

Reviews of current practices in the monitoring and evaluation of energy savings have shown that even if general methodologies have similarities, the details of their implementation might vary significantly from one country to the other, and sometimes from one scheme to the other in the same country (Labanca and Bertoldi, 2016; Broc et al., 2018). These differences might be due to national specificities in terms of policy objectives, metrics used to assess energy savings, data availability, etc. As discussed above, the differences can also be in the coverage of calculation methods in terms of end-use sectors and action types. Sharing knowledge and experience between countries can therefore help the dissemination of existing practices and improve the overall coverage of the calculation methods.

Attempts to harmonize calculation methods over European countries included the European project EMEEES (2009) and the calculation methods prepared by the JRC and recommended by the European Commission for the reporting to the Energy Services Directive ESD (2006/32/EC). These attempts showed that most of the Member States were opposed to a full harmonization that would require the calculation methods to use, especially when they have had their own calculation methods and monitoring systems in place for many years. However, some Member States did make use of the recommended methods, either to ensure compliance with the ESD requirements or because they did not have previous official calculation methods for energy savings for some or all the action types covered by the recommended methods. Similarly, European projects such as multEE (2016) and ENSPOL (2016) have supported the transfer of experiences between countries. For example, they contributed to the development of an Energy Efficiency Obligation Scheme (EEOS) in Greece and its M&V system. Other exchanges of knowledge and experience also occurred bilaterally about catalogues of calculation methods for EEOS, for example between Denmark and Luxembourg.

These previous experiences show that cross-country exchanges can be more effective than top-down approaches that would aim at imposing calculation methods from the EU level. We therefore follow a horizontal approach for sharing knowledge and experiences as part of the streamSAVE project. The exchanges are structured along the priority actions presented above. A dialogue group is formed for each priority action, gathering experts from various countries and types of organisations (ministries, energy agencies, technical institutes, trade organisations, standardization bodies, etc.). The focus on a given priority action allows to discuss the details of the calculation methods and the main issues that are specific to the action. These topics are related to the identified needs during the stakeholder consultation, such as setting the baseline, identifying and sharing key data sources and assessment of behavioural aspects.

The dialogue groups of the first five priority actions started early March 2021 with a joint kick-off meeting attended by more than 100 participants, confirming the interest of stakeholders in the topic of energy savings calculations and in having detailed discussions. The sharing of experiences and knowledge across countries will improve the development and streamlining of the standardized calculation methods in the streamSAVE project, and will address specific questions raised by stakeholders to help them overcome difficulties they might face.

Conclusions

The streamSAVE consultation shows Member States are well aware of their main needs to comply with energy efficiency targets in line with Article 3 and Article 7 of the EED. It was generally recognized, even by countries having more experience in preparing standardized calculation methodologies, that the definition of baselines, additionality of savings and assessment of behavioural effects are still challenging issues in the implementation of the EED. Member States also indicated that the revision of the savings schemes for the period 2030 brings an excellent opportunity to revise and update calculation methodologies. Streamlining calculation methodologies, while considering country-specific realities and characteristics, is therefore much welcomed by stakeholders involved in the EED implementation. The standardized methodologies require, on the one hand, accuracy to characterize the complexity of the savings action, and on the other hand, simplicity of the methodology and data collection to lighten the monitoring and calculation process.

Publicly available guidelines or catalogues on savings calculations (14 Member States, containing 531 methodologies in total) are mainly available for Member States which have implemented an Energy Efficiency Obligation scheme for their Article 7 target fulfilment. The overview of methodologies across all sectors and end-uses indicates that space heating in buildings are well covered by the catalogues. However, the sectors of Agriculture & Forestry, Fishing and Transport are less represented in catalogues. Moreover, methodological gaps could be identified for the end-use categories of industrial process heat & cooling, ICT in offices and data centers, space cooling and water heating, as these are not yet well covered by existing calculation guidelines. These identified gaps are sectoral areas where support towards Member States in developing energy efficiency actions can improve the achievement of their reduction targets.

For the selected priority actions, streamSAVE will develop calculation templates and guidelines on Member States' customization, next to guidelines on cost estimations and related CO_2 savings potential. In relation to the five priority actions (i.e. technical solutions with a high energy savings potential) identified so far, the following challenges on standardized methodologies could be characterized based on existing Member States catalogues or guidelines:

- All calculation methodologies on heat recovery from industry and district heating require additional information, like energy consumption metering data or installed power to be prepared by the implementing parties. Given the large variety of areas in industry where heat recovery systems can be implemented and the various technological solutions, more savings methodologies are needed.
- Only a limited number of Member States (3) have implemented standardized methodologies for Building energy management systems and Building automation and control systems. Moreover, none of these methodologies takes into account behavioural effects.
- The savings methodologies for the replacement or new installation of efficient cooling and refrigeration equipment (industry and commercial sector) uses the annual cooling requirements, based on the European seasonal energy efficiency ratio ESEER. These methodologies often require detailed technology-specific and monitoring data, hampering standardised data collection.
- The standardized savings calculation for private and public electric vehicles is usually based on the number of purchased vehicles, the difference of energy consumption between a reference and an efficient vehicle, and the yearly mileage. The impact of behavioural effects is in none of the collected methodologies quantified.
- Lighting systems including public lighting: In nearly all methodologies, the baseline consumption is calculated using the power of the installed lighting points/lamps and annual burning hours, requiring access to the characteristics of installed technologies. The impact of behavioural effects is in none of the collected methodologies quantified.

A second round of priority actions will be identified halfway through the project based on expertise as well as identified needs of the stakeholders involved in streamSAVE.

Previous experiences show that cross-country exchanges on calculation methodologies can contribute more to streamline existing practices or to improve the overall coverage of calculation methods among Member States in comparison to top-down approaches that would aim at imposing calculation methods from EU level. streamSAVE therefore follows a horizontal approach of dialogue groups structured along the selected priority actions in which stakeholders discuss methodological and techno-economical topics. These topics are related to the identified needs during the stakeholder consultation, such as setting the baseline, identifying and sharing key data sources and assessment of behavioural aspects. More information on the streamSAVE project can be found on streamsave.eu.

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