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Streamlining savings calculations within Europe: lessons learnt from the Capacity Support Facility in EU Member States

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ABSTRACT

The Capacity Support Facility has been established within HORIZON2020 project streamSAVE targeting to streamline energy savings calculations according to Articles 3 and 7 of the Energy Efficiency Directive through bottom-up calculation methodologies of standardized energy efficiency actions. The Capacity Support Facility provides one-to-one technical support to Member States facilitating the energy savings calculations for different Priority Actions. The technical assistance is provided through the real-case application and validation of the streamlined bottom-up calculation methodologies and the related indicative values so as to further intensify their efforts to deliver energy efficiency improvements by 2030. The Priority Actions are technical solutions with high energy savings potential being selected based on stakeholder needs, through a literature survey and consultations carried out in 2019 and 2020. In the first half of the streamSAVE project five Priority Actions were selected (namely building automation & control systems, refrigeration systems, lighting systems, electric vehicles and heat recovery). In a nutshell, the Capacity Support Facility aims at going beyond the theoretical Bottom-Up (hereafter BU) calculation methodologies to facilitate their application during and after the time horizon of the streamSAVE project taking into account the national characteristics.

The main lessons learnt from the conducted activities within the Capacity Support Facility in the ten partner countries are described providing valuable insights for the type and focus of technical support for the most important technical issues being addressed. Finally, the expected changes of the targeted policies and measures are presented along with the key outputs and the main impacts, which are anticipated by the Capacity Support Facility.

Introduction

The delivery of a sustainable and long-lasting Energy Union requires robust grounds and engagement of a great variety of actors. In order to achieve the 2030 targets of 32.5% reduction of final and primary energy compared to 2007 reference scenario projections for 2030, the implementation of the energy efficiency pillar according to Directive 2018/2002/EU (European Commission 2018a) amending Directive 2012/27/EU (Energy Efficiency Directive, hereafter EED) (European Commission 2012) especially calls for the full engagement of the public sector at all governance levels, who often act within limited time and resources.

The current implementation of the EED has led to meaningful conclusions. More specifically, the EED has triggered numerous positive developments at the national level within Member States (hereafter MS) by setting targets and requirements to incentivise and enable investments in energy efficiency programmes across all sectors. With regard to the implementation of Article 7, half of the MS overachieved their cumulative savings target over the period 2014-2016 and half of the MS have set an energy efficiency obligation scheme (hereafter EEOs).

The achievement of the energy efficiency targets according to the provisions of the EED is rather challenging. According to the conducted assessment (European Commission 2020), 12 MS managed to reduce or keep the final energy consumption level below their hypothetical linear trajectory for reaching their indicative energy efficiency targets by 2020. Moreover, the analysis revealed that several MS risk not meeting their national energy savings obligation by the end of 2020 within the framework of Article 7. Therefore, it is broadly recognised that additional efforts to reverse this trend to reach the aforementioned targets have to be mobilized, while emphasis must be put on tapping under-used energy savings opportunities. Obviously, it is urgent to tackle this challenge immediately taking into account that the proposal for a new EED as part of the package "Delivering on the European Green Deal" foresees an additional reduction of energy consumption of 9% by 2030 compared to the 2020 reference scenario projections, while an additional increase from 9% to 13% is expected by REPowerEU Plan in order to reduce dependence on Russian fossil fuels and fast forward the green transition.

The streamSAVE "Streamlining Energy Savings Calculations" project has the objective to address this gap by assisting public authorities in the streamlining of energy savings calculations under Article 3 as well as under Article 7 of the EED. More specifically, streamSAVE builds capacity through the creation of an open dialogue focusing on streamlining calculation methodologies to estimate bottom-up (hereafter BU) savings and to assess cost effectiveness of technical energy savings actions. It should be highlighted that the streamSAVE project targets actions with high energy saving potential and considered as a priority issue by national public authorities, the so-called Priority Actions.

To fulfil this objective, it is crucial to engage public authorities, energy agencies and their representatives from the beginning so that a strong dialogue can immediately be built. Consequently, the co-creation of knowledge among knowledge partners and energy agencies, tailored to their real-life needs, can effectively be embedded into practice. In that sense, streamSAVE supports public authorities and key stakeholders in ten MS represented in its consortium (Austria, Belgium, Czech Republic, France, Greece, Lithuania, the Netherlands, Portugal, Slovenia, Spain), and shows the replication potential in at least 3 non-consortium countries.

Building upon the lessons learned from policy developments and from previous European projects (such as MultEE, Odyssee-Mure, EPATEE, ENSPOL, DEEP), a step has already been taken in achieving its objective. A preliminary survey was conducted in May 2019 by the streamSAVE consortium to precisely map the needs of public authorities and energy agencies of the MS. The survey targeted the main issues at stake with the calculation of energy saving measures implemented under Article 3 and Article 7 of the EED, especially on the issues related to calculations and monitoring and verification that (may) act as a barrier to the uptake of potentially more advanced technical energy saving actions that offer significant savings and that have been under-used so far. The streamSAVE project, based on those results, identified a set of five Priority Actions (hereafter PA), which will be subject to an in-depth analysis and capacity building in the framework of this project. Moreover, at a later stage of the project, based on a further assessment of MS needs, a second set of (maximum) five PAs will be subjected to close attention, while additional technical assistance will be provided to the involved policy officers for the newly selected PAs.

Methodological approach: Capacity Support Facility

The technical assistance is provided through the Capacity Support Facility (hereafter CSF), which has been established within streamSAVE project in order to test both the actual application of the streamlined calculation methods and the developed Training Module of the streamSAVE platform. Therefore, technical support is provided to the countries involved through the CSF facilitating the conduction of energy savings calculations. As a result, the achievement of the untapped energy savings potentials is facilitated, while it improved the implementation and reporting on specific energy efficiency policies and measures which either have been implemented or are planned in the involved partner countries in a meaningful way. The main objective of the CSF is to improve the obligations of the MS under Article 3 and Article 7 of the Energy Efficiency Directive, namely an improved implementation and reporting on EED policies and measures.

Since the CSF is demand-driven and tailored-made to the actual needs of the public authorities, the streamSAVE partners are capable of applying the appropriate conditions in accordance with the needs and expectations of the involved policy officers.

Before starting the CSF, a set of BU calculation methodologies was developed within the streamSAVE project for the following five energy efficient technologies (Figure 1), entitled as Priority Actions:

- Heat Recovery: heat recovery from industrial processes for on-site use in industry, either fed back into a process or used for on-site applications, and heat recovery for feed-in to a district heating grid;
- Building Automation and Control Systems or BACS: all products, software and engineering services for automatic controls, including interlock control function avoiding heating and cooling simultaneously, monitoring, optimization for operation, human intervention and management to achieve energy-efficient, economical and safe operation of building services;
- Commercial and Industrial Refrigeration Systems: new installations of air- or water cooled compression refrigeration units with compressors powered by electrical energy;
- Electric Vehicles: fuel switching from conventional to electrical vehicles in private or public transportation;
- Road Lighting Systems: replacement of existing road lighting systems by more energy efficient technologies, such as more efficient LED light sources and lighting control technologies.

Figure 1. Selected PAs within streamSAVE project.

The BU calculation methodologies were developed including information about various aspects, such as indicative calculation values per parameter based on EU-wide data, reference consumption or baseline, correction factors for behavioural or regional effects, costs and benefits and other related indicative values for estimating the delivered CO_2 savings (streamSAVE, 2021a). It should be noted that the standardized calculation methodologies were developed taking the existing practices in all MS into consideration (streamSAVE, 2021b).

Furthermore, a user-friendly calculation tool (on the streamSAVE platform) also provides robust indicative values for each PA separately, while a Training Module has been integrated facilitating the provision of a broad technical assistance for the selected PAs.

Each partner country applied the streamSAVE BU calculation methodologies to concrete country cases (ten in total) during the operational phase of the CSF. The concrete cases were selected in a demand-driven way, and therefore in close contact with the public authorities in the ten countries involved.

The application was facilitated by an operational framework enabling the evaluation of the triggered impacts of the CSF within the countries, and provided useful lessons and feedback to the consortium to further improve the developed calculation methods. A specialised guidance was prepared for ensuring the smooth and effective application of the operational framework.

The CSF ran from September 2021 until January 2022 by the PA Working Groups (hereafter WGs) for the selected PAs, which were established and led by the PA leader (i.e., technical experts on the savings action, supported by PA co-leaders). During the CSF the use and contents of the streamSAVE platform were tested and validated resulting in an improved and more user-friendly platform.

The WG gathered technical and country experts from streamSAVE project, as well as the implementing authorities (and/or technical experts) from the involved countries. The involvement of the policy officers with the WG were essential to facilitate the actual implementation of the various activities in the specific national context.

Five different WGs were established based on the selected PAs, aiming at supporting the policy officers in each country on the identified cases. Where needed, the PA leader and the country leader identified relevant technical experts at the EU and the national level.

At the national level, the streamSAVE country leader coordinated the national activities and streamlined the communication of the PA WG with the policy officers. The technical PA leader - with the support of the PA co-leader - was responsible for the coordination and operation of each WG. More specifically, the country leader arranged and undertook the support, next to the testing and validation activities with the actual participation of policy officers for each selected case. The PA leader was responsible for solving technical issues related to the streamlined calculation methodologies and the indicative values of the PA. The PA co-leader was responsible for supporting the testing and validation of the streamSAVE platform, particularly regarding its use and contents (i.e., user friendliness and testing of the Training Module).

The following type of activities were organized in the CSF, to actively engage and involve the policy officers and other country experts within the ten involved counties:

- Identification and documentation of a selected case for each round of the CSF, supported by the PA leaders and the country leaders.
- Participation in the planned in-country ad-hoc meetings (with a maximum of three meetings per round).
- Application of the BU calculation methodologies for the selected cases supported by the PA leader and the country leader. The implementation of the streamSAVE calculation methodologies and related indicative values started through the application of the proposed BU calculation methodology to an existing or a planned policy measure in the involved country.
- Testing and validation of the streamSAVE platform, supported by the PA co-leader and the country leader.
- Participation of policy officers in the planned workshops on a voluntary basis.

Generally, an introductory meeting was organised with the targeted policy officers at the beginning of the CSF to clarify the objectives of the CSF and present the developed calculation methodologies and the defined indicative values. The initial meeting enhanced their understanding of the role of the CSF and increased their engagement. Subsequently, the country leaders interacted directly with the public authorities via different means, such as email/online support, phone support, in-country meetings or workshops, as well as via peer-to-peer dialogue groups that are organized within the streamSAVE project.

The technical support covered a wide range of methodological support related to the PAs. Indicatively, the following topics were studied:

- Improving countries’ existing savings methodologies and defining a monitoring program for a new PA covered by policies or measures under Article 7.
- Streamlining savings estimations of a PA between Article 3 and Article 7 of the EED ensuring that the combined bottom-up savings do not exceed top-down savings, identifying the impact of the autonomous actions and quantifying the impacts triggered by the application of the additionallity criterion.
- Identifying and assessing monitored data within a country to improve savings calculation methodology.
- Determining the baseline consumption for a PA in relation to Article 7 and/or Article 3.
- Correcting estimated energy savings by including behavioural aspects, such as rebound effects.

Finally, the technical support during the period of the project is expected to lead to meaningful impacts, such as the:

- Improved capacities and skills of the policy officers on BU calculation methodologies within the framework of Article 3 and Article 7 of the EED.
- Enhanced national policies and measures related to the examined PAs.
- Effective implementation of Article 3 and Article 7 of the EED, including improved Monitoring, Evaluation, Reporting and Verification systems through the harmonized bottom-up calculations.

All streamSAVE documentation was prepared in English and includes both the meeting minutes and the supporting material. Nevertheless, the in-country meetings or workshops were organized in the national language, to facilitate the participation and to improve the engagement of the national experts and policy officers.

Implemented activities

The selected PAs for each involved country within the framework of the CSF are presented in Table 1.

Table 1. Selected PA for each country separately.

Country	Selected PA for the first cycle
Austria (AT)	BACS
Belgium (BE)	Electric Vehicles
Czechia (CZ)	Heat recovery
Croatia (HR)	Heat Recovery
Greece (GR)	Heat recovery
Netherlands (NL)	Electric Vehicles
Lithuania (LT)	BACS
Portugal (PT)	Electric Vehicles
Slovenia (SI)	BACS
Spain (ES)	Electric Vehicles

The technical aspects, which were examined within the CSF, are presented in Table 2 for each country, confirming the diversity of technical needs and requirements stemming from the EED.

Table 2. Examined technical aspects within the CSF.

Technical aspect	BACS			Electric vehicles				Heat recovery		
	AT	LT	SI	BE	NL	PT	ES	CZ	HR	GR
Baseline				X	X	X	X	X	X	X
Data collection or assessment of monitored data	X		X	X		X	X	X	X	X
Energy savings based on deemed streamSAVE methods	X	X	X		X	X	X		X	X
Cost effectiveness							X		X	X
CO_2 savings		X			X		X		X	
Behavioural aspects			X						X	
Calculation of rebound, spill-over and free-rider effects									X	
Article 3					X			X	X	
Article 7	X	X	X	X		X	X	X	X	X
Streamlining between Article 3 and Article 7										

Screening and initial assessment of promising technical savings actions			X	X					X	X
Changing or improving existing practices from the other MSs on calculation methodologies or indicative values		X	X		X	X	X		X	X
Reviewing existing calculation methodologies					X			X		
Other issues and targets	X		X	X		X	X			

The different types of the conducted activities within the framework of the CSF are presented in Table 3 for the involved countries demonstrating the demand-driven and tailored-made orientation of the CSF.

Generally, the technical support comprised a telephone/online workshop in combination with online/email support for all involved countries. The desk research conducted by the consortium was considered as an effective approach for the vast majority of the involved countries, while the organization of in-country workshop and peer-to-peer exchange of experiences between countries were less applied within the CSF.

Table 3. Type of conducted activities within the CSF.

Conducted activities	**BACS**			**Electric vehicles**				**Heat recovery**		
	AT	**LT**	**SI**	**BE**	**NL**	**PT**	**ES**	**CZ**	**HR**	**GR**
In-country workshop			X							X
Telephone support/Online workshop	X	X	X	X	X	X	X	X	X	X
Online/email support	X	X	X	X	X	X	X	X	X	
Desk research consortium	X		X	X	X	X	X	X	X	X
Peer-peer exchange of experience between countries		X				X			X	
Other activities						X		X		

Looking closer at the PAs, the technical support for BACS was provided in three different countries (Austria, Lithuania and Slovenia) with the participation of seven policy officers representing five different organizations. The compliance with Article 7 of the EED constituted a priority by all involved countries (and not Article 3 of the EED), for which the data collection procedures and the estimation of the delivered energy savings through deemed savings methods were recognised as the most crucial technical aspects. Furthermore, two countries (Lithuania and Slovenia) aimed at adjusting or improving existing practices from the other MSs on calculation methodologies or indicative values.

Additional technical issues were also discussed during the support period, such as the lifetime and the calculation of the cumulative energy savings (Austria), the required documentation for verifying the achieved energy savings (Austria), the avoidance of double counting of energy savings (Slovenia) and the establishment of data collection procedures in a manner consistent with the guidelines for monitoring and reporting to implement the National Energy Climate Plans (Slovenia).

The technical support for electric vehicles was provided in four different countries (Belgium, Netherlands, Portugal and Spain) with the participation of twelve policy officers representing five different organizations. The compliance with Article 7 constituted a priority for the majority of the involved countries (Belgium, Portugal and Spain). Other crucial technical aspects included the determination of the baseline, the establishment of data collection procedures and the estimation of the energy savings by means of deemed savings methods for the calculation of the delivered energy savings by the promotion of electric vehicles. Three countries (Netherlands, Portugal and Spain) aimed at adjusting or improving existing practices from other MS on the calculation methodologies or the determination of indicative values. Additional technical issues were covered by the CSF, such as the compliance with the additionality criterion to the Clean Vehicle Directive (EU) 2019/1161 (Belgium), the potential decrease of the energy savings over the years and the specification of the lifetime of savings and the documentation requirements for verification (Spain). Furthermore, a methodology for evaluating the savings from soft modes in transport based on desk research and sharing of experiences from other countries was also requested (Portugal).

Finally, specialised technical support was requested for assessing policies and measures in order to promote soft modes, e.g., bicycles and scooters in the replacement of conventional vehicles, as well as greater use of public transport. The best available information was collected from other countries, while the Greek approach was analysed within the framework of the EEO for quantifying the energy savings triggered by the promotion of e-bikes in Greece, also including the respective calculation sheet.

The technical support for heat recovery was provided in three different countries (Czech, Croatia and Greece) with the participation of seven policy officers representing five different organizations. The compliance with Article 7 constituted a priority by all involved countries, while the constitution of the baseline and the data collection or assessment of the monitored data were identified as crucial technical aspects for the PA of heat recovery. The estimation of energy savings and the cost-effectiveness were also considered important. Two countries (Croatia and Greece) aimed at both adjusting or improving existing practices from the other MS on calculation methodologies or indicative values and screening and initial assessment of promising technical savings actions, highlighting the fact that insufficient knowledge was available for estimating the achieved energy savings by the promoted heat recovery systems. Additional technical issues were discussed in the CSF, such as the procedure for controlling and verifying the achieved energy savings and specification of the lifetime of savings (Greece).

It should be noted that a technical memo entitled ”Analysis of heat recovery technologies in the industrial sector“ was prepared in Greece exploring the possibility to develop a deemed savings method (with reference to the results of previous independently monitored energy improvements in similar installations). Totally 39 energy efficiency proposals for the installation of heat recovery systems in industrial sector were analysed leading to the various statistics (Table 4) for being utilised for the determination of indicative values.

Table 4. Statistics of energy efficiency proposals for the installation of heat recovery systems in industry.

Statistics	**Final energy savings (toe)**	**Primary energy savings (toe)**	**Investments (euros)**	**CO_2 reduction (tn CO_2)**
Average	41	51	68,608	145
Median	19	21	30,000	58
Minimum	2	3	2,000	6
Maximum	238	362	560,000	1,434
Standard deviation	56	76	121,979	254

Table 5 summarises the examined policy measures for each involved country and the expected type of change and improvement of the EED at MS level as a result of the provided technical support by the CSF.

Table 5. Expected impacts triggered by the performed streamSAVE activities within the CSF.

MS (PA)	**Article**	**Examined case - Adapted policy measure**	**Type of change**	**Improvement of national EED implementation**
AT (BACS)	Article 7	I. Integration into the national catalogue	Preparation and adaption of the BACS methodology and indicative calculation values for the Austrian catalogue of BU saving methodologies	Increase reporting, improve quality in the calculation of energy savings delivered and enhance awareness of obligated parties on BACS
BE (Electric vehicles)	Article 7	I. Promotion of fuel switch in the federal fleet though the developed BU methodology and II. Promotion of fuel switch of company cars though the developed BU methodology	Introduction of the energy savings from EVs in the Alternative Measures Scheme	Estimated final energy savings

MS (PA)	Article	Examined case - Adapted policy measure	Type of change	Improvement of national EED implementation
CZ (Heat recovery)	Articles 3 & 7	I. Application of the developed BU methodology into the OP TAC (Operational Programme Technologies and Applications for Competitiveness)	Verification of the Ministry's approach, adoption of streamSAVE methodologies, increase quality of the OP TAC funded projects and efficiency of ESIF funds spending and increase successfulness in achieving National EE Action Plan objectives	Improve the quality of the targeted scheme, extend the project portfolio supported by OP TAC and increase the quality and comprehensiveness requirements on energy savings measures in the projects supported by OP TAC
ES (Electric vehicles)	Article 7	I. Application of the developed BU methodology into the Next MOVE (sustainable mobility) aid programme	Application of the developed concept to the next mobility support programmes, mainly based on the non-adoption of the scrapping hypothesis	Estimate primary and final energy savings, improve reporting on the implemented actions due to a less complicated reporting process, increase accuracy of the calculations for the delivered energy savings, improve awareness of the involved parties of actions for the promotion of electromobility and expand savings to those vehicles that are scrapped
HR (Heat Recovery)	Articles 3 & 7	I. Integration into the national catalogue	Add new calculation methodologies to relevant regulation	Quantify the delivered energy savings, improve awareness of the involved parties and ensure compliance with the technical requirements of Annex V of the EED
GR (Heat Recovery)	Article 7	I. Integration into the national catalogue of the EEOs II. Application of the developed BU methodology into the Recovery and Resilience Fund programme for improving the energy efficiency in industrial sector	Addition of a specialized equation into the Greek catalogue of the EEO scheme. Potential application of the developed equation within the planned RRF programme for improving the energy efficiency in industrial sector.	Quantify the delivered energy savings, increase the accuracy of the calculations for the delivered energy savings, calculate the cost-effectiveness ratio for facilitating the evaluation of the implemented policies and measures, improve awareness of the involved parties and compliance with the technical requirements of EED Annex V
LT (BACS)	Article 7	I. Installation of BACS systems in buildings though the developed BU methodology	Development of a deemed savings method and specification of the required input data, determination of the required data collection procedures and recommendations for complying with the requirements of the additionality criterion	Estimate energy savings from the policy measures, which will be applied for the installation of BEMS and BACS measures in buildings

MS (PA)	Article	Examined case - Adapted policy measure	Type of change	Improvement of national EED implementation
NL (Electric vehicles)	Article 3	I. Application of the developed BU methodology in the SEPP subsidy scheme electric passenger cars II. Application of the developed BU methodology in the SEBA Subsidy Scheme Zero Emission Company Cars III. Application of the developed BU methodology in the National Agenda on charging infrastructure IV. Application of the developed BU methodology in the SEB subsidy scheme for electric non-mobile machinery V. Application of the developed BU methodology in the Fiscal benefits for zero emission vehicles (both for consumers and business)	Changes in policy measures in the long-term, providing calculation methods for the replacement of soft modes of transport, as well as methods dealing with imports	Achieve more accurate estimations of energy savings and CO2-emission reductions in the EV sector
PT (Electric vehicles)	Article 7	I. Application of the developed BU methodology in the upcoming programs: I. "Maintain and promote incentives for the purchase of 100% electric light vehicles, as well as the existing framework of tax incentives" II. "Promote electric vehicles for urban micro-logistics" III. "Promote the introduction and use of low emission vehicles and sustainable mobility in the state"	Alignment of the existing methodology with the methodology developed in streamSAVE, in particular regarding the baseline and adoption of streamSAVE methodology and indicative values for the new measures which are advocated in the NECP	Estimate energy savings for the new energy efficiency measures, improve reporting quality, raise awareness of the involved parties, assess the already implemented measures and adoption of streamSAVE methodologies for the measures which are advocated in the NECP
SI (BACS)	Article 7	I. Integration into the national catalogue	Preparation and adaption of the BACS methodology and indicative calculation values for the Slovenian catalogue of BU saving methodologies	Adjust and modify the new methodology to be used in the national catalogue, streamline the reporting process considering the guidelines for monitoring and reporting on the implementation of the NECP, improve awareness of obligated parties on BACS and support the national Statistical Office with the development of the monitoring methodology

It should be noted that all the developed streamSAVE BU calculation methodologies within the framework of examined PAs (streamSAVE 2021a) were tested for the majority of the before-mentioned policy measures using actual input data.

For example, in Greece the following BU equation was tested for estimating the final energy savings from the potential installation of heat recovery systems in order to exploit the excess heat for on-site applications in industrial units:

$$TFES = Q_{rec} \cdot \frac{1}{eff_{mhs}} \cdot f_{BEH}$$

where:

Q_{rec}	Recovered heat consumption of the application [kWh/a]
eff_{mhs}	Conversion efficiency of the main heating system of the relevant application [%]
f_{BEH}	Factor for correction of behavioural effects [%]

More specifically, the total final energy savings amounted to 559 MWh annually assuming that the recovered heat consumption of the application can be considered equal to 475 MWh on annual basis based on the performed analysis in Table 4 and the conversion efficiency of the main heating system of the relevant application equal to 85% for a typical industrial unit in Greece. Moreover, the analysis of the expected cost was occurred using the specified fluctuation of the total investment costs (0.10-0.56 €/kWh recovered heat) leading to estimates ranging from 47.5 to 266 thousand euros validating the presented results in Table 4. Obviously, the attained outcomes from the performed analysis provided valuable insights to the policy officers for designing the upcoming Recovery and Resilience Fund programme for improving the energy efficiency in industrial sector in regards the targeted energy savings and the required public funds.

Main lessons learnt

The conduction of the performed activities within the CSF for providing technical assistance led to the conclusion that all BU calculation methodologies developed by streamSAVE are useful for the involved policy officers facilitating the effective measurement, monitoring, control and verification of the delivered energy savings by the examined technical efficiency actions.

For BACS, the streamSAVE BU calculation methodology was developed ensuring the integration of the energy efficiency factors before and after implementation of an action according to EN15232 (2018), both for new installations and upgrades of BACS, and the provisions of Articles 14 and 15 of the Energy Performance of Buildings Directive (European Commission 2018b).

Nevertheless, difficulties were recognised in applying the developed BACS methodology to the national circumstances for the case of non-residential buildings due to the lack of standardized calculation values at national level on the total floor area and final energy demand of the different types of the buildings in the tertiary sector. Therefore, more emphasis should be put on the development of specialized data collection procedures to collect national reference values for the implementation of a BU calculation methodology for the different end-use and sub-sectors of the tertiary sector. Next to that, the access to existing data sources, which are not easily accessible, should be facilitated in order to address the limited availability of required data.

Despite the fact that various approaches are implemented to estimate the achieved energy savings by the promotion of electric vehicles, a standardized and robust data interchange procedure is missing in all almost examined countries, while the existing data sources are not easily accessible. Therefore, a standardised data collection mechanism should be encouraged based on a robust and independent monitoring and verification structure capable of triggering the effective design and implementation of the required energy efficiency policies and measures for the further penetration of electric vehicles.

Moreover, it is essential to compare the resulting savings based on the streamSAVE BU calculation methodology with the nationally determined values to infer the validity of the results and to improve the reliability and accuracy of both methodologies. In the case that the differences are considerable, it is important to identify the parameters which contribute to these deviations so as to select the most accurate approach.

More emphasis should be put on compliance with the additionality criterion and on the promotion of soft modes of transport. Finally, it is crucial to examine potential discrepancies of the actual lifetime of vehicles with the theoretical ones as specified in the respective legislative documents. Last but not least, the potential expansion of the measurement methodology so as to include the CO_2 emission reduction can provide a different perspective to select the most effective policies to facilitate the energy transition of the transport sector towards carbon neutrality.

The proposed implementation of the metered method within the streamSAVE BU calculation methodology for energy efficiency interventions in the industrial sector, including heat recovery technologies, is considered an applicable approach by the involved policy officers. Nevertheless, their higher preference for deemed methods in order to minimize the administrative burden and facilitate the calculation of the energy savings was stated. Furthermore, the potential application of a scaled method (e.g., by utilizing engineering estimates for the calculation of the energy savings) should be examined as an alternative method. Furthermore, more focus should be put on the required control and verification procedures and on the specifications of the metering systems. Last but not least, the analysis of all available data should be ensured facilitating the acquisition of valuable statistics, which can be utilised both the determination of indicative values and the development of a new deemed or scaled method.

The provided technical assistance also led to meaningful general lessons. Firstly, the BU calculation methodologies can improve the consistency of the required monitoring, reporting and verification procedures and streamline the cooperation and communication of the different bodies that are responsible for monitoring the implemented energy efficiency measures. Obviously, the official definition and appointment of the foreseen duties and responsibilities for all the involved bodies, including the specification of the required time plan and activities, will improve the effectiveness of the monitoring, reporting and verification procedures.

Special attention should be given to the data collection procedure, which can facilitate both the monitoring and reporting on the implementation of the energy efficiency policies and measures to reach the national targets within the framework of Article 3 and Article 7 of the EED. Indisputably, the developed streamSAVE BU calculation methodologies can improve the understanding of policy officers of the technical requirements for measuring the delivered energy savings along with the facilitation of the data collection.

Summarizing, the development of common BU calculation methodologies and indicative values at the European level for all MS will considerably improve:

- The determination of the national calculation values, by showcasing which types of data and possible data sources could be used.
- The collection of the required data.
- The effective application of the monitoring and verification procedures and compliance with quality requirements.
- The fulfilment of the EED reporting obligations.

Finally, the provided support by standardized BU calculation methodologies motivates the responsible authorities and other involved (obligated) parties in designing and implementing policy energy efficiency measures targeting technical actions, which still have a considerable savings potential. Furthermore, a comparative analysis of the planned and implemented policies and measures - based on the assessment of cost effectiveness of the policy instruments - will ensure that most efficient and beneficial ones will be promoted facilitating the fulfilment of the ambitious energy efficiency targets at national and European level.

Conclusions

The establishment of the CSF within the streamSAVE project seems to be effective for all the involved countries as it addresses significant barriers which hinder the effective implementation of the required monitoring, reporting and verification procedures. Indicative examples of these barriers are the scarcity of human resources in the public bodies, the continuous changes in the personnel of the public bodies and the need to improve the skills and knowledge of the involved public officers to comply with the technical requirements of the EED.

Obviously, the actual application of streamlined BU calculation methodologies and the streamSAVE platform facilitate more realistic and accurate calculations of the achieved energy savings and increase the effective exploitation of the untapped energy savings potentials in the various end-use sectors.

The delivered impacts by the CSF in the involved countries can be assessed as meaningful, taking into account that:

- 26 policy officers representing 15 public bodies or organizations across 10 countries have participated in the activities
- 14 workshops and 11 meetings have been organized
- 16 energy efficiency policies covering the selected PA will be potentially affected.

The involved policy officers tend to integrate the developed BU calculation methodologies into the national catalogues to quantify energy savings from new policies and measures, which illustrates the high level of support provided during the work on the selected PAs.

Experience shows that the cross-country exchanges on calculation methodologies can further contribute to streamlining existing practices and increasing the number of the utilized calculation methods among MS.

Finally, the establishment and operation of the CSF can be assessed as rather effective despite the difficulties that emerged because of the restrictions due to COVID-19. Nevertheless, conducting in-person meetings is imperative for providing technical assistance to the public bodies, accompanied by the activities organized during CSF, in order to maximize the expected impacts.

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