Translated Existing Bottom-up Methodologies in EU-27

Deliverable D2.1

Version N°1

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Content

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Summary

The streamSAVE+ project builds on the foundations of the H2020 streamSAVE initiative to further support EU Member States (MSs) in streamlining energy savings calculations and meeting the ambitious targets of the Energy Efficiency Directive (EED) recast EU/2023/1791. Despite past efforts, many MSs still face challenges in improving their approaches, particularly regarding simplified yet accurate methodologies for estimating energy savings and enhancing data collection procedures. A key issue identified in previous consultations is the lack of quality data for reliable savings estimations, as well as the need for knowledge exchange on calculation methodologies among MSs and energy efficiency experts. To address these challenges, streamSAVE+ facilitates benchmarking and sharing of best practices while focusing on savings estimations for key EED requirements, including Priority Actions under Article 5 (public sector), energy savings obligations under Article 8, and 2030 contributions under Article 4. By enhancing national capacities in energy savings reporting and methodology development, the project directly supports MSs in designing, adopting, and effectively implementing policies that drive higher energy efficiency across the EU.

The objective of this report is to enhance the understanding of existing energy savings calculation methodologies across EU Member States (MSs) by providing a consolidated overview of bottom-up methodologies classified by energy consumption sector and end-use. It aims to assess whether updates are required for the methodologies related to the 10 Priority Actions previously identified in the streamSAVE project, ensuring their alignment with the Energy Efficiency Directive (EED) recast. Additionally, the report characterises all available methodologies for five newly identified Priority Actions (deep renovations in buildings, IT equipment in data centres, cooling in data centres, heat recovery in ventilation, public traffic management), selected through a survey conducted within the streamSAVE+ community.

In this task, the collection of methodologies was updated through a structured process involving all project partners, who provided data using a standardized template. The process included two steps. (1) first, updating the list of methodologies to incorporate new ones related to the 10 Priority Actions (PAs) from streamSAVE and the five newly identified PAs as reported until February 2025. (2) Second, translating these methodologies into English, detailing their descriptions, equations for energy savings estimation, indicative values, and assessments of cost-effectiveness and CO_2 savings. Data collection was based on a comprehensive review of national bottom-up methodology catalogues and recent project reports. Additionally, the analysis examined correction factors for situational influences such as weather conditions and biases (e.g., double counting, free riders, rebound effects). A standardized template ensured consistency by including methodological descriptions, energy and greenhouse gas savings formulas, and cost evaluations.

A total of 24 catalogues containing 773 bottom-up (BU) energy savings calculation methodologies were identified, covering 22 countries and two research projects (EMEEES and MultEE). These methodologies span various sectors and end-uses, with the residential sector having the highest number (361 methodologies across 21 countries), primarily addressing heating systems, renewable energy transitions, and energy-efficient retrofitting. The commercial sector follows with 319 methodologies from 19 countries, while industry is represented by 179 methodologies from 17 countries, both showing cross-country adoption of well-developed approaches. The transport sector includes 118 methodologies from 17 countries, mostly focused on road transport, with limited coverage for rail and maritime transport. Agriculture, Forestry & Fishing remain underrepresented, with only 44 methodologies identified across six countries, mainly covering space heating, cooling, lighting, and renewable heat generation. While space heating and cooling in buildings, particularly in the residential sector, are well covered, areas such as building automation, domestic hot water, energy poverty, and IT systems lack sufficient methodological representation.

The streamSAVE project developed methodologies for ten priority areas (PAs), including heat recovery, building automation, refrigeration, electric vehicles, lighting, small-scale renewable heating, energy poverty, motor replacement, behavioural changes, and modal shift in freight transport. Among the 24 catalogues of bottom-up energy savings calculation methodologies, 235 new methodologies compared to the streamSAVE assessment (reflecting the status as of 2021). These include entirely new approaches or savings actions, previously unrecognised methodologies, and existing ones with significant updates. Of these, 66 methodologies relate specifically to the ten PAs established in streamSAVE, with electric vehicles, lighting, energy poverty, and behavioural changes standing out, each contributing more than ten new methodologies. These new methodologies were compared with the streamSAVE bottom-up methodologies to assess their alignment and improvements. The findings highlight that the streamSAVE methodologies still provide a structured and standardized approach to energy savings calculations, ensuring accuracy, comparability, and policy alignment across MSs. The integration of EU-wide data sources, climate correction factors, behavioural effects, and cost-effectiveness assessments enhances their reliability. Furthermore, the alignment with EU standards and directives ensures a robust and scalable framework for evaluating energy savings, assisting policymakers in meeting efficiency targets effectively.

The same approach was applied to five new Priority Actions introduced in streamSAVE+, identifying and characterizing relevant existing methodologies for the areas of deep renovations in buildings; IT equipment in data centres; cooling in data centres; heat recovery in ventilation; and public traffic management. Such methodologies will constitute the baseline for the development of the streamSAVE+ methodologies for these new PAs.

1. Introduction

1.1. About streamSAVE+

With the ambitious recast of the Energy Efficiency Directive (EED - EU/2023/1791), there is increased pressure on the Member States (MSs) to introduce new policy measures or to improve existing policies to generate significantly higher energy savings. Supporting countries has never been more relevant and important to better design, adopt and report on energy-saving measures. Although a lot has been done to streamline the energy savings calculations (cf. H2020 streamSAVE) and to improve measurement and verification procedures (cf. H2020 ENSMOV), many MSs still need to further improve their approaches to successfully meet their EED targets.

Building on previous experience, streamSAVE+ supports the selected MSs in order to improve their capacity to identify, adapt, and implement new methods to calculate energy savings resulting from existing policies like in electrification and modal change in transport, integration of RES for heating in buildings, improvements in industrial technologies such as refrigeration or electric motors, and systemic changes related to boosting deep renovations, emerging energy communities and positive energy districts.

Four key activities are envisioned:

(1) Development of a knowledge hub. Guidance and recommendations for measurement will be developed and compiled for further use based on the outcomes of country support. This will aim at improving the effectiveness of the policy measures.
(2) Facilitation of dialogue among the MSs to foster knowledge sharing and peer-to-peer cooperation. This involves nine participating countries (AT, BE, BG, CZ, EL, HR, LT, PT, SI), and a broader group of interested participants from six other countries (ES, FI, FR, IE, RO, SK).
(3) Providing capacity support. Assistance to participating countries based on their specified requirements and needs. In-depth support will be given by technology experts, policy experts and country experts.
(4) Analysing policies and future trends to establish the data framework and preparation of the set of country policy measures.

Due to the focus of streamSAVE+ at the MSs policy makers level, the project activities will positively contribute to the overall achievement of the EED objectives.

1.2. Needs for streamlining energy savings estimations

In September 2023, the European Parliament and the Council of the European Union adopted the revised Energy Efficiency Directive (EU/2023/1791), which set a binding energy efficiency target of at least 36% in final and energy consumption by 2030. Under the directive, EU Member States are required to establish indicative national contributions for 2030 (Article 4) and regularly report on their achieved energy savings (Article 8). These reporting obligations aim to ensure that the results of energy efficiency efforts across Member States are comparable and supported by robust monitoring and verification processes grounded in reliable data collection.

To fulfil their energy-saving obligations, Member States have the flexibility to establish Energy Efficiency Obligation Schemes (EEOS) or to implement alternative energy efficiency measures. These measures can be supported through mechanisms such as Energy Efficiency Funds, Eco Funds, voluntary agreements, tax exemptions, and reductions. In countries with EEOS in place, methodologies for calculating energy savings are well-established and these countries often provide publicly available catalogues and guidelines for bottom-up (BU) calculation methodologies (Rosenow & Bayer, 2017; streamSAVE D4.1, 2022).

Recognizing the challenges, the Member States face in the complex task of calculating energy savings, the Knowledge Facility of the H2020 project streamSAVE (https://streamsave.eu/) summarized and analysed existing methodologies, as well as identify gaps and opportunities for improvement, facilitating the development of streamlined methodologies for energy savings calculations. These efforts were particularly focused on a significant number of measures classified as Priority Actions (PA), which, despite their high potential for energy savings, remain underutilized in several Member States due to a lack of experience, practices, and reliable data.

streamSAVE targeted a total of 10 Priority Actions over two cycles of experience sharing and capacity building, namely:

- Heat recovery (district heating and excess heat from industry);
- Building Energy Management Systems (BEMS) and Building Automation and Control Systems (BACS);
- Commercial and Industrial Refrigeration System (C&I Refrigeration);
- Electric Vehicles (private & public) and related infrastructure (charging stations);
- Lighting Systems and public lighting;
- Small-scale RES central space heating (incl. hot water): heat pumps, biomass boiler and solar hot water generation;
- Measures alleviating (also) energy poverty;
- Anticipated motor replacement;
- Providing feedback about energy use and tailored advice towards households: behavioural changes;
- Modal shift for freight transport (from road to rail).

The 2023 State of the Energy Union Report, which is based on the assessment of the Member States' NECP progress reports, concludes that the pace of emissions reduction needs to increase to almost triple the average annual reduction over the last decade in order to achieve a 55% emissions reduction by 2030. Hereto, additional efforts should be implemented by MS, as stated in the recently adopted EED recast 2023/955, and this, amongst others, in the domains of energy efficiency savings obligations (Article 8 and related), energy efficiency contributions (Article 4) and the reduction targets for the public sector (Article 5 and related).

The streamSAVE+ builds further on the support given in the H2020 project streamSAVE aiming to streamline energy savings calculations in the frame of the Energy Efficiency Directive. The project addresses the following needs, which were identified during multiple streamSAVE's consultations (D4.1 Energy savings needs, May 2022, https://streamsave.eu/wp-content/uploads/2021/01/D4.1_Needs-Assessment.pdf):

- A clear need for simplified, yet accurate, methodologies to calculate energy savings from energy efficiency actions being implemented by the MS. Data collection procedures were stressed, as well as the lack of quality data for these savings estimations.
- Sharing experience in calculation methodologies with other countries and energy efficiency experts, and comparing the MS' methodologies with indicative benchmark methodologies. There was also a clear need to easily find these existing practices.

The streamSAVE+ focuses on savings estimations for Priority Actions as required by Article 5 of the EED recast (public sector), Article 8 and related articles (savings obligations), and Article 4 (2030 contributions).

1.3. The role of deemed savings methodologies

Annex V of the Energy Efficiency Directive (EED) outlines a standardized set of methods and principles for calculating the energy savings resulting from Energy Efficiency Obligation Schemes (EEOS) or other policy measures. Obligated, participating, or entrusted parties, as well as implementing public authorities, may utilize the deemed savings method. This method relies on referencing results from previously independently monitored energy improvements in comparable installations. This approach, commonly referred to as "ex ante," provides a generic framework for estimating energy savings in advance.

Deemed savings means a measurement of energy savings or demand savings for a single unit of an installed energy efficiency measure or adopted efficiency practice that (a) is determined ex-ante and applied to all such measures without further measurement or verification, and (b) has been developed using data sources and analytical methods that are widely considered acceptable for the measure and purpose (Tanguay, 2018). Deemed savings are therefore pre-determined, validated estimations of energy savings attributable to an Energy Efficiency action of a particular type of application as opposed to savings determined through measurement and verification activities. Deemed savings calculation values are agreed upon, in advance of the implementation of any energy saving measures or energy plans. Besides deemed savings, also individual parameters and indicative values, as well as calculation methodologies, can be deemed, meaning they are developed from commonly accepted data sources, evidence-based data and analytical methods. Deemed savings can also take the form of an algorithm, providing a formula of inputs for calculating a savings estimate.

While deemed savings estimations offer several advantages—such as being quick to calculate, straightforward, consistent, and predictable—their quality can vary significantly. A recent study highlighted that "static efficiency assumptions are inherently imprecise" (CADMUS, 2016). Furthermore, impact assessment studies have identified discrepancies in the energy savings claimed by Member States (MS) and inconsistencies across similar measures (EC TaskForce, 2019; Ricardo, 2016; Rosenow & Bayer, 2017; Tsemekidi-Tzeiranaki et al., 2018). These findings underscore the need to enhance the reliability of energy savings estimates reported by MS (Labanca & Bertoldi, 2015; Marion Santini, & Samuel Thomas, 2020). If deemed savings values are not regularly updated using recent and accurate data, their validity becomes questionable. This is because deemed savings depend on multiple assumptions that, if outdated or inaccurate, can lead to significant deviations from the actual savings achieved (Economidou et al., 2020). Regular updates and robust data integration are therefore critical to improving the precision and reliability of deemed savings estimates.

Like any other investment, energy efficiency investments—whether implemented under Energy Efficiency Obligation Schemes (EEOS) or alternative measures funded by ratepayers or taxpayers—must be evaluated for cost-effectiveness. This evaluation requires not only an understanding of the costs but also accurate information on the energy savings achieved. Poorly planned data collection can impose significant administrative burdens, complicating the evaluation process. Despite some scepticism, particularly regarding their use in larger projects, deemed savings estimations remain valuable tools in planning and evaluating energy efficiency programs. When supported by validated assumptions based on established practices, proven examples, and best-case studies, deemed savings provide a practical and efficient means of estimating energy savings, enabling effective program management and cost analysis.

Recent studies and ongoing projects suggest that countries with Energy Efficiency Obligation Schemes (EEOS) in place tend to have more robust energy savings evaluation practices. This is largely because EEOS require obligated parties to report their actions' results to National Authorities, ensuring a structured evaluation process (Bere, I., Scheuer, S., 2020; Fawcett et al., 2019; Marion Santini, & Samuel Thomas, 2020; Rosenow & Bayer, 2017; streamSAVE D4.1, 2022). According to the stakeholder consultation conducted at the outset of the streamSAVE project (streamSAVE D4.1, 2022), one of the primary challenges faced by Member States (MS) in implementing the Energy Efficiency Directive (EED) is the lack of high-quality data. Stakeholders highlighted baseline definition and data collection as critical areas where guidance and knowledge sharing from streamSAVE would be highly beneficial. Experience with EEOS indicates that defining clear data requirements at the design stage of the scheme is a key factor in ensuring efficient data collection processes. This proactive approach significantly enhances the success and acceptance of deemed savings practices, offering advantages in terms of reduced evaluation efforts while maintaining the integrity and reliability of reported savings.

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1.4. Purpose and scope of the report

This report enhances the understanding of existing energy savings calculation methodologies across various Member States (MSs) by providing a consolidated overview of current bottom-up methodologies, categorised by energy consumption sector and end-use, across the EU-27 and the UK. The methodologies related to the 10 Priority Actions identified in the streamSAVE project have been analysed to assess whether updates are required in response to the Energy Efficiency Directive (EED) recast. Additionally, five newly identified Priority Actions (deep renovations in buildings, IT equipment in data centres, cooling in data centres, heat recovery in ventilation, and public traffic management) have been determined through a survey conducted within the streamSAVE+ community. All available methodologies for these actions have been characterised. Given that many methodological catalogues exist only in national languages, relevant calculation methodologies have been translated into English. For each Priority Action, a comprehensive overview of existing practices has been compiled using a standardised template, based on the well-received approach used in Deliverable 2.1 of streamSAVE. Where multiple methodologies exist for calculating energy savings for a particular action, all approaches have been documented to ensure a thorough and comparable analysis.

2. Collection of deemed savings methodologies

To analyse the current situation in the EU, a combination of methods was employed to gather relevant data and identify the challenges faced by Member States. The streamSAVE project carried out a needs assessment (streamSAVE D4.1, 2022), reviewing existing bottom-up (BU) methodologies from Member States and other relevant projects (streamSAVE D2.1, 2022).

In streamSAVE+, the previous collection of methodologies was updated. As a result, all project partners were requested to provide specific details following a standardized template. This process was carried out in two steps, based on catalogues available in the Member States for which their respective organizations were responsible:

- The first step was to update the list of methodologies and identify the new methodologies related to the 10 PAs developed in the streamSAVE project and the methodologies related to the five newly identified PAs.
- In the second step, partners provided English translations of all new calculation methodologies related to the 10 Priority Actions (PAs) in the streamSAVE project, as well as those within the scope of the additional 5 PAs under streamSAVE+. This was done using a standardized Word template, which included a brief description of each methodology, the equations used to estimate energy savings, indicative calculation values prepared for the respective Member States, and an explanation of whether and how cost-effectiveness or CO_2 savings are assessed. These methodologies have been compiled and consolidated into documents, available as Annex III (updated and new methodologies related to the 10 PAs in streamSAVE) and Annex IV (methodologies related to the 5 new PAs in streamSAVE+) to this report.

The collected data is based on a comprehensive review conducted by all partners of the identified bottom-up methodology catalogues in the Member States, as well as information from recent project reports. Table 1 provides an overview of the countries assigned to the streamSAVE+ partners.

Table 1 – Country coverage of partners to translate and summarize BU methodologies.

Partner	Country coverage catalogues
ISR	Portugal, Spain, France
VITO	Belgium, Luxembourg, Malta
IEECP	Netherlands, Denmark, Sweden, Finland
AEA	Austria, Germany, Italy
CRES	Greece, Cyprus
SEVEn	Czech Republic, Poland, Slovakia
JSI	Slovenia, Romania
LEA	Lithuania, Latvia, Estonia
EIHP	Croatia, Hungary
EnEffect	Bulgaria, Ireland

2.1. Evaluation framework for Priority Action methodologies

The identified bottom-up (BU) methodologies have been organized by the sectors they address and classified according to the primary end-use categories. These methodologies target one or more sectors, including Industrial, Transport, Commercial or Services, Residential or Household, and Agriculture, Forestry, and Fishing[1].

[1] Agriculture, Forestry, and Fishing sectors: These sectors are defined based on Eurostat Energy Balances. In this report, Agriculture, Forestry, and Fishing are combined due to their similar relevance within the context of energy-saving methodologies.

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For the new methodologies developed under the streamSAVE Priority Areas (PAs) and those covered by streamSAVE+, the calculation methodologies were summarized. The review also examined the indicative values and correction factors applied, specifically how energy savings estimates account for situational factors such as weather and other biases (e.g., double counting, free riders, and direct rebound effects). A standardized template (presented in Annex I) was designed to ensure uniform data collection, including the following elements:

- Description of the methodology;
- Formula and standardized calculation values for the evaluation of final energy savings;
- Formula and standardized calculation values for the evaluation of primary energy savings;
- Formula and standardized calculation values for the evaluation of Greenhouse Gas savings;
- Overview of costs related to the action;
- Methodological Aspects.

The information was collected from:

- Existing catalogues within Member States, the main source of information.
- Existing methodologies for calculating energy savings and/or energy consumption reduction from other projects (e.g., multEE and EMEEES) were reviewed and incorporated into the analysis. Additionally, other initiatives, scientific literature, grey reports, and similar sources providing guidance on bottom-up methodologies for energy savings calculation were considered.

Additionally, other relevant methodological information valuable for streamSAVE+, such as measure lifetimes, benchmarks, climate correction factors, default parameters, and literature references, has also been gathered.

2.2. Collection of deemed savings methods in all sectors and end-uses

Across the EU-27 and UK, a total of 24 catalogues and guidelines containing bottom-up calculation methodologies were identified, encompassing 773 distinct methodologies applicable to various sectors and covering a broad range of technologies and end-uses. In some cases, catalogues provided only general approaches without specifying calculation parameters or assumptions. Additionally, older catalogues exist in certain countries, but these are likely outdated, having been developed during the implementation of the first National Energy Efficiency Action Plans - NEEAPs (2012–2014). Overall, it can be observed that in countries where Energy Efficiency Obligation Schemes (EEOS) are in place, catalogues or supporting documents such as guidelines and ordinances are more readily available. Table 2 presents all the end-use categories identified in relation to the collected BU methodologies.

Table 2 – List of initial end-use categories for the categorization of the BU methodologies.

Category	End-uses
Household appliances	Household appliances like white goods, consumer electronics
IT systems	ICT and office equipment
Lighting	Reduction of energy demand by lighting
Process Heat (> 200 °C),	High-temperature process heat, furnaces
Process Heat (< 200 °C), Steam&Hot Water	Low-temperature process heat, steam&hot water
RES electricity generation	Electricity generation from renewable sources
RES heat generation	Heat generation from renewable sources
Process cooling	Includes central compression refrigeration units, industrial refrigeration, compression cooling
Domestic hot water	Includes boilers, insulation pipes, etc.
Space Heating & Cooling	Includes building envelope (new construction & retrofitting), changes in heating systems)

Stationary Engines	Electric motors, pumps, fans, compressors, compressed air, etc.
Transport	Includes vehicles, changes in modal shift, changes in fuel, on-site transport like conveyor bands, etc.
User behaviour	Cross-cutting changes in behaviour (e.g. energy advice for households in general)
Ventilation	Adaption of ventilation systems
Others	

Table 3 lists the links for the catalogues with calculation methodologies for the countries where the methodologies are publicly available in their national languages.

Table 3 – List of catalogues (weblinks) per country.

Country	Weblinks to available catalogues
Austria	– https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2016_II_172/COO_2026_100_2_1241958.pdfsig – https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2024_II_28/BGBLA_2024_II_28.pdfsig
Bulgaria	– https://seea.government.bg/bg/metodiki/2-uncategorised/10209-aktualizirani-metodiki – https://seea.government.bg/bg/metodiki/2-uncategorised/10240-otzenyavane-na-stoinosti-na-spestyavaniya-na-energiya-v-saotvetstvie-s-rezultati-ot-nezavisim-monitoring-na-predhodni-merki-za-energiina-
Croatia	– https://narodne-novine.nn.hr/clanci/sluzbeni/2021_09_98_1772.html – https://narodne-novine.nn.hr/clanci/sluzbeni/2022_03_30_370.html
Cyprus	– https://circabc.europa.eu/ui/group/8f5f9424-a7ef-4dbf-b914-1af1d12ff5d2/library/fe843fca-b17b-48f1-983b-3bf7cbca5242?p=1&n=10&sort=modified_DESC – http://cylaw.org/KDP/data/2024_1_212.pdf
Czechia	– https://www.zakonyprolidi.cz/cs/2012-480
Denmark	– https://ens.dk/forsyning-og-forbrug/energiselskabernes-energispareindsats
Estonia	– https://kliimamarket.ee/ohksoojuspumbad-ja-ohk-vesi-soojuspumbad-ohksoojuspumba-hind
EU	– https://multee.eu/system/files/D2.1_Document%20with%20general%20formulae%20of%20bottom-up%20methods.pdf – http://www.emeees.eu/emeees/en/evaluation_tools/index.html
France	– https://www.ecologie.gouv.fr/operations-standardisees-deconomies-denergie#scroll-nav__7
Greece	– http://www.cres.gr/obs/yliko.html – http://www.cres.gr/obs/files/BUs-2024_v1.pdf
Hungary	– https://static1.squarespace.com/static/5d63affc1ac7d1000158fdb0/t/65d73203c87340632e06b779/1708601862971/1_2020+%C3%A9s+17_2020+MEKH+rendeletek+m%C3%B3d_mell%C3%A9klet_tartalomjegyz%C3%A9k.pdf
Ireland	– https://www.seai.ie/business-and-public-sector/business-grants-and-supports/energy-efficiency-obligation-scheme/
Italy	– https://www.mise.gov.it/images/stories/normativa/DD-2019-Allegato-1-Guida-operativa.pdf – https://www.gse.it/servizi-per-te/efficienza-energetica/certificati-bianchi/documenti
Latvia	– https://www.bvkb.gov.lv/lv/zinojumi-un-metodiskie-materiali
Lithuania	– https://www.e-tar.lt/portal/lt/legalAct/08450d50404c11efbdaea558de59136c

	– https://www.e-tar.lt/portal/lt/legalAct/c3eb4b20bbb911e688d0ed775a2e782a/asr
Luxembourg	– http://data.legilux.public.lu/eli/etat/leg/rgd/2015/08/07/n1/jo – https://legilux.public.lu/filestore/eli/etat/leg/rmin/2021/06/15/a458/jo/fr/pdfa/eli-etat-leg-rmin-2021-06-15-a458-jo-fr-pdfa.pdf
Netherlands	– https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2024Z11105&did=2024D26463
Poland	– https://commission.europa.eu/publications/poland-draft-updated-necp-2021-2030_en – https://www.bgk.pl/files/public/user_upload/Przewodnik_do_audytow_przedsiebiorstwa.pdf?__cf_chl_tk=aqCouq2fw2LM_kax2L4Ppa52iXR_UWpSD1_2Vz4AkjI-1730298316-1.0.1.1-gbdUd21X1u5XeUOGxy9hlhFXnsYs70tgsa2udbTKTIU
Portugal	– https://circabc.europa.eu/ui/group/8f5f9424-a7ef-4dbf-b914-1af1d12ff5d2/library/45bfec93-ae1a-40c6-a024-79d978d737dc?p=1&n=10&sort=modified_DESC
Slovakia	– https://www.economy.gov.sk/uploads/files/EirowzB0.pdf
Slovenia	– http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV12443
Spain	– https://www.idae.es/publicaciones/
UK	– https://www.ofgem.gov.uk/publications-and-updates/eco2t-guidance-and-associated-documents

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3. Status of deemed savings methodologies

3.1. Overview

This section presents the list of available bottom-up (BU) energy savings calculation methodologies identified by the energy consumption sector and end-use in the EU-27+UK. As explained in Chapter 2, the compilation of these methodologies was based on the translation of the catalogues. The complete list of the identified methodologies can be consulted in Annex II of this report.

In total, as shown in Table 4, 24 catalogues containing bottom-up energy savings calculation methodologies were identified, covering 22 different countries and two research projects (EMEEES, 2009; MultEE, 2016). These catalogues include a total of 773 methodologies (235 more than in streamSAVE, as collected in 2021) applied across various activity sectors, covering a wide range of technologies and end-uses.

Table 4 – Number of BU calculation methodologies identified per country.

Countries	Art. 8 implementation	N° BU methodologies
Austria	EEO & Alternative Measures	55
Bulgaria	EEO & Alternative Measures	21
Croatia	EEO & Alternative Measures	31
Cyprus	Alternative Measures	48
Czechia	Alternative Measures	1
Denmark	EEO	34
Estonia	Alternative Measures	1
EU	(Research projects)	49
France	EEO	253
Greece	EEO & Alternative Measures	30
Hungary	Alternative Measures	51
Ireland	EEO & Alternative Measures	24
Italy	EEO & Alternative Measures	11
Latvia	Alternative Measures	23
Lithuania	Alternative Measures	10
Luxembourg	EEO	40
Netherlands	Alternative Measures	2
Poland	Alternative Measures	8
Portugal	Alternative Measures	17
Slovakia	Alternative Measures	20
Slovenia	EEO & Alternative Measures	33
Spain	EEO & Alternative Measures	8
UK	EEO	3
Total		**773**

However, it is important to note that not all catalogues provide complete details for the methodologies listed. Sometimes the catalogues only describe general approaches without specifying calculation parameters or underlying assumptions. Additionally, while the EMEEES project developed highly detailed methodologies, these were designed for the requirements of the former Energy Services Directive, making them less relevant within the current framework of the Energy Efficiency Directive (EED). Nevertheless, the project's outcomes remain valuable for guiding the improvement or development of new energy savings equations.

Overall, it can be stated that in countries where Energy Efficiency Obligation (EEO) schemes are in place, catalogues or other supporting documents, such as guidelines and ordinances, are typically available to facilitate the application of these methodologies.

The methodological approaches used to quantify energy savings for individual actions are broadly consistent across countries, with similar equations applied. These equations are primarily used for energy savings calculations. Most identified methodologies provide indicative values for key parameters, such as lifetime, energy savings factors (average savings), and hours of operation. However, correction factors for behavioural effects and methodologies to assess the cost-effectiveness of Priority Actions were not found in the country catalogues.

Despite methodological similarities, the conditions influencing energy savings—such as end-uses, technical options, key actors, and organizational structures—vary significantly across sub-sectors, both in industry and in the commercial sector, as well as between countries and even within different regions of the same country. A review of methodologies from the catalogues revealed that classifying them by sub-sector was not feasible for any country, either in the industrial or commercial sectors. In contrast, the residential sector—despite variations in living standards and climate regions—presents more standardized end-uses and usage profiles. The commercial sector, however, is characterized by a high degree of heterogeneity in end-uses, with diverse energy and energy service requirements.

Given this diversity, it is unsurprising that Member States (MS) primarily report aggregated energy savings when implementing the EED, which often complicates or compromises the verification of results and the assessment of energy efficiency measures' eligibility. The diversity of end-use sectors highlights the need for streamlined methodologies that incorporate representative indicative values and appropriate correction factors. Some countries have addressed this challenge by introducing geographical factors to account for climate variations—for example, in France, air conditioning measures are adjusted based on predefined climate regions.

The collected methodologies were categorized not only by Member State but also by the type of end-use and sector they cover. Table 5 presents the results of this classification by end-uses and Table 6 by sector. Overall, the review of existing methodologies demonstrates a strong foundation for estimating various types of energy efficiency improvement measures across all end-uses and sectors. However, in terms of sectoral coverage, Agriculture, Forestry & Fishing, is underrepresented in the catalogues.

Notably, space heating and cooling in buildings—especially in the residential sector—are well-represented in the catalogues, both in terms of bottom-up methodologies and calculation values. However, Building Automation and Control Systems, Domestic Hot Water, energy poverty and IT systems are insufficiently covered by the identified methodologies.

Table 5 – Number of BU calculation methodologies identified per end-use.

End-Use	Methodologies	%
Building Automation and Control Systems	6	0.8%
Domestic Hot Water	10	1.3%
Energy Poverty	14	1.8%
Household appliances	23	3.0%
IT systems	10	1.3%
Lighting	61	7.9%
Other	26	3.4%
Process heating and cooling	34	4.4%
RES generation	41	5.3%
Space Heating & Cooling	329	42.6%
Stationary Engines	54	7.0%
Transport	121	15.7%
User behavior	29	3.8%

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Ventilation	15	1.9%
Total	**773**	

Table 6 – Number of BU calculation methodologies identified per sector.

Sector(s)	Methodologies	%
Residential	211	27.3%
Residential, Commercial	112	14.5%
Residential, Commercial, Industrial	29	3.8%
Residential, Commercial, Industrial, Agriculture	9	1.2%
Commercial	125	16.2%
Commercial, Industrial	37	4.8%
Commercial, Industrial, Agriculture	7	0.9%
Industrial	97	12.5%
Agriculture	28	3.6%
Transports	118	15.3%
Total	**773**	

It is important to highlight that each methodology may cover multiple sub-sectors and even entire sectors, end-uses, or technologies. The quantification of energy savings relies on deemed savings and enhanced engineering estimates, requiring sector-specific indicative values to be taken into account, even when the aim is to achieve streamlined calculations.

Energy audits and direct measurements are widely used in several countries, particularly in the industrial sector, where they are mandatory under Article 11 of the Energy Efficiency Directive (EED). The determination of deemed savings estimates, especially indicative calculation values, is based on measured savings from a large number of already implemented actions. This approach ensures the reliability of key indicators and enhances the accuracy of results. As these estimates are often derived from direct measurements, they offer a high level of precision while remaining simple to apply.

Measures related to renewable energy sources (RES) for electricity and heat generation have a cross-sectoral application but are particularly prevalent in the residential sector. The different methodologies associated with each RES technology, as identified in the catalogues, are summarised in the BOX.

Box: List of identified RES generation measures cross-cutting all sectors

- Measures driving the use of renewable heat across all sectors: solar thermal systems for domestic hot water in buildings; space heating and cooling systems using solar energy; centralised active solar water heating systems; solar-powered swimming pool heating systems; and heat pumps with ground heat exchangers for space heating and cooling.
- Measures promoting RES electricity generation: installation of cogeneration systems; photovoltaic (PV) modules for self-consumption and net-metering schemes, applicable to industry and buildings across all sub-sectors; installation of solar energy receivers, including both solar thermal and PV systems.

3.2. Residential Sector

The residential sector is the one with the highest number of methodologies: a total of 361 different methodologies from 21 countries (AT, BG, CY, CZ, DK, EE, ES, FR, GR, HU, HR, IR, IT, LV, LT, LU, PL, PT, SI, SK, UK) and two research projects. The measures primarily focus on technologies, including heating systems and their components, mainly for space heating but also for hot water production; the transition to more efficient or renewable energy carriers; and construction works, such as retrofitting and energy-efficient building upgrades.

The different methodologies associated with each technology area, as identified in the catalogues, are summarised in the BOX.

Box: List of BU methodologies identified for the residential sector per end-use type

Identified methodologies cover the following residential application areas:

- **Heating and district heating systems**: Implementation of central heating in non-retrofitted residential buildings; expansion of district heating in both non-retrofitted buildings and new constructions, including fuel switching; replacement of existing hot water installations with fully insulated systems for new district heating customers; and installation of ventilation systems with heat recovery and cooling systems using natural sources.
- **High-efficiency heating technologies**: Deployment of condensing boilers, high-efficiency gas boilers, and reflective radiator panels in non-retrofitted residential dwellings; installation of condensing boilers and heat pumps in newly built residential buildings; replacement of conventional boilers with electric heat pumps (air/air, water/air) in newly constructed or renovated buildings; use of ground-source heat pumps and absorption heat pumps for heating and hot water production; and improved insulation of heating pipes, hot water tanks, and spaces between radiators and walls. Additional measures include installing circulation pumps for heating, retrofitting individual building components, and thermostatic valves, and regulating solar radiation through glazed walls for summer cooling.
- **Hot water production**: Replacement of hot water boilers with higher efficiency models; installation of heat pumps for domestic hot water in non-retrofitted buildings; integration of electric heat pumps for hot water production in existing systems; deployment of solar water heaters to replace outdated systems; installation of clock-controlled circulation pumps for domestic hot water (two types of values); and implementation of water-saving fittings.
- **Lighting**: Introduction of efficient lighting solutions in residential buildings, including new lighting systems for households, non-directional and directional lamps with energy efficiency class A or better, compact fluorescent lamp campaigns, and the installation of sensors for lighting control. Additionally, technical guides on lighting energy efficiency for office environments are being developed.
- **Household appliances and white goods**: Promotion of highly efficient white goods through purchase incentives and early replacement schemes; introduction of new eco-design household appliances, including refrigerators, freezers, dishwashers, washing machines, and tumble dryers; replacement of electric water heaters for domestic hot water; and measures to reduce standby power consumption in households through the use of standby killers.

3.3. Commercial Sector

There are a total of 319 BU methodologies available for the commercial sector, originating from 19 countries (AT, BG, CY, CZ, DK, ES, FR, GR, HR, HU, IR, IT, LV, LT, LU, PL, PT, SI, SK) and two research projects. Regarding end-uses, similar technologies are used across different countries. Some Member States have indicated that they replicated methodologies from neighbouring countries when these were well developed or adopted methodologies from more experienced countries.

The various methodologies identified in the catalogues are summarized in the BOX.

Box: List of BU methodologies identified for the commercial sector per end-use type

Identified methodologies for commercial application areas include:

- **Heating and Retrofitting**: Central heating, retrofitting of non-residential buildings, upgrading existing heating systems to high-efficiency alternatives, replacing non-functioning condensing pots or installing new ones, and installing automation and control systems for heating. Additionally, methodologies cover the installation of heat recovery systems before entering cooling towers and the implementation of Minimum Energy Performance Standards (MEPS).
- **Water Heating and Conservation**: Calculation of energy savings from solar water heater replacement schemes, installation of heat pumps for domestic water heating in non-retrofitted buildings, and implementation of water-saving fittings.
- **Ventilation Systems**: Modernization of ventilation systems, ventilation of elevator shafts, installation of controlled mechanical ventilation systems with heat recovery, implementation of high-efficiency fans, and reduction of ventilation system operating times.
- **Cooling and Air Conditioning**: Installation of free cooling systems using natural sources, ventilation and energy-efficient air-conditioning systems, and energy-efficient cooling systems. Other methodologies include improving room air conditioners (<12 kW cooling capacity), district cooling, enhanced cooling solutions, and energy recovery from air conditioning systems.
- **Refrigeration**: Central compression refrigeration units, central compression cooling systems, and industrial refrigeration methodologies.
- **Lighting and Street Lighting**: Most methodologies primarily focus on replacing inefficient lamps with high-efficiency LEDs, including both non-directional and directional lamps. Additional measures include the installation of lighting control sensors, such as occupancy sensors and timers, to optimize energy use. However, comprehensive upgrades to entire lighting systems are less common. Furthermore, methodologies for energy-efficient street lighting are also covered, alongside technical guides that promote energy-efficient lighting solutions in offices, hospitals, and educational institutions.
- **Office Equipment and Appliances**: Implementation of methodologies for new office appliances and office equipment.

3.4. Industrial Sector

A total of 179 BU methodologies from 17 Member States (AT, BG, CY, CZ, ES, FR, GR, HU, HR, IR, IT, LT, LV, LU, PL, PT, SI) and two research projects are available for the industrial sector. In terms of end-uses, similar technologies are covered across different countries, as seen in the commercial sector. Some Member States have reported replicating methodologies from neighbouring countries when these are well developed or adopting methodologies from more experienced countries.

The various methodologies identified in the catalogues are summarized in the BOX.

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Box: List of BU methodologies identified for the industry per end-use type

Identified methodologies for industrial application areas include:

- **Heat Production and Waste Heat Recovery**: Methodologies include estimating energy savings from the installation of suitable burners and waste heat recovery systems in industrial furnaces, as well as implementing appliances for heat and cold production. Measures also address the installation of economizers and condensing economizers for industrial boilers, increasing evaporator temperatures, decreasing condenser temperatures, and utilizing excess heat. Optimization of steam plants, condensate collection and distribution networks, and refrigeration systems further enhance energy efficiency.
- **Electric Motors and Drives**: Methodologies focus on the renewal or replacement of motors and variable speed drives (VSDs) with higher energy efficiency models. Additional measures include the installation of VSDs in induction motors, resizing of rotational electric motors, and installing frequency converters (inverters) to regulate motor speed in ventilation systems and pump systems. Other measures involve electronic control systems for electric motors with energy recovery, motor-regulated systems, efficient transmission systems, and the adoption of permanent magnet or reluctance synchronous motor drives. Further innovations include the implementation of electric injection moulding machines.
- **Compressed Air Systems**: Energy efficiency measures for compressed air systems include reducing air leaks and pressure, achieving energy savings with compressors using external cold air supply, lowering compressed air inlet temperatures, and utilizing waste heat. Other methodologies involve heat recovery from compressed air systems, replacing circulation pump regulation with speed variators, reducing pump operating times, and implementing high-efficiency refrigeration condensing systems. Additional improvements cover the adoption of low-pressure screw or centrifugal air compressors, and adsorption compressed air dryers using heat input for regeneration.
- **Lighting Systems**: Identified methodologies focus on enhancing lighting efficiency in non-residential, industrial, and tertiary sector buildings. Measures include the installation of new lighting systems in commercial and industrial settings, the replacement of inefficient lighting with high-efficiency non-directional and directional lamps, and the integration of motion detectors and timers for optimized lighting control. Some methodologies also emphasize the use of skylights and natural lighting pipes to maximize daylight utilization. Additionally, certain approaches address behavioural aspects, promoting energy-conscious lighting practices in office environments within industrial buildings.
- **Space Heating and Cooling**: Space heating and cooling methodologies were generally presented together, with most measures targeting heating in industrial buildings and only a few addressing cooling. Identified measures include efficient decentralized heating, circulation pumps for heating, optimization of heating systems in buildings with multiple sections, and the installation and refurbishment of control switch cooling systems in the industry. Other methodologies focus on district cooling solutions, ventilation and air conditioning optimization, and free cooling by using cooling water instead of traditional cooling units. Additional measures include complete renovation of heating stations, renovation of district heating distribution networks, connection of buildings to district heating systems, and the use of efficient hot water boilers.
- **Building Insulation and Thermal Improvements**: Methodologies in this area focus on improving the thermal performance of industrial buildings to enhance energy efficiency. Identified measures include insulation of hot water tanks, thermally improved building envelopes for both newly constructed and existing non-residential buildings, and the thermal improvement of individual building elements. Other strategies involve implementing heat recovery systems in buildings and ventilation systems with heat recovery to reduce overall energy demand.

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3.5. Agriculture, Forestry and Fishing

Measures specifically applicable to the Agriculture, Forestry, and Fishing sectors are identified in only two countries (DK and FR), covering areas such as tractors, ventilation, insulation, and heating. However, several cross-cutting methodologies apply across all sectors, including Agriculture, Forestry, and Fishing. The catalogues' collection identified a total of 44 potential BU methodologies eligible for application in these sectors across six Member States (AT, CZ, DK, FR, HR, SI) and two research projects. However, when analysing the end-uses, most measures focus on space heating and cooling, lighting, behavioural changes, and renewable heat generation, which are areas that largely overlap with methodologies implemented in other sectors.

3.6. Transport

The collection of BU methodologies identified 118 BU methodologies in the transport sector across 17 Member States (AT, BG, CY, DK, ES, FR, GR, HR, HU, IR, IT, LV, LT, LU, PL, PT, SK) and two research projects. In terms of end-uses, most methodologies focus on road transport, while only nine are dedicated to rail transport and another nine to boats.

The various methodologies identified in the catalogues are summarized in the BOX.

Box: List of BU methodologies identified for the transport sector per end-use type

Identified methodologies for transport application areas include:

- **Alternative Vehicle Technologies**: Methodologies focus on incentives for electric vehicles (EVs), the replacement or acquisition of new vehicles across all categories (cars, vans, buses, and trucks), as well as the promotion of rechargeable hybrid cars and eco-fleets.
- **Behavioural Measures**: Initiatives include fuel-saving applications, fuel-saving training programs, eco-driving practices, and tyre pressure monitoring systems for both passenger cars and trucks.
- **Modal Shift**: Strategies encourage more sustainable transport options, such as the promotion of electric bikes and corporate carpooling initiatives.
- **Fuel Efficiency Improvements**: Measures focus on the use of fuel additives in internal combustion engines and the installation of high-efficiency tyres with low rolling resistance for heavy freight vehicles, light delivery vehicles, and passenger cars. In Greece, LPG is actively promoted as an alternative fuel in the transport sector.
- **Rail Transport**: Methodologies include the implementation of railway motorway wagons, intermodal transport units for combined rail-road transport, and strategies to encourage modal shifts in passenger transport.
- **River Transport**: Measures address the adoption of electric or hybrid propulsion systems for boats.

4. Overview of deemed savings methodologies for Priority Actions

4.1. Update of existing practices for Priority Actions

4.1.1 Description of the streamSAVE methodologies and Priority Actions

As mentioned, streamSAVE developed methodologies for ten PAs, which include the following:

- Heat Recovery;
- Building Automation and Energy Management Systems;
- Commercial and Industrial Refrigeration;
- Electric Vehicles;
- Lighting Systems and Public Lighting;
- Small-Scale Renewable Central Heating;
- Energy Poverty;
- Motor Replacement;
- Behavioural Changes;
- Modal Shift in Freight Transport.

Heat Recovery

Heat recovery is a crucial energy efficiency strategy in industrial processes, capturing waste heat that would otherwise be lost and repurposing it for useful applications. This recovered heat is typically used to preheat water, traditionally heated by fuel-powered boilers or furnaces, before being reintegrated into an industrial process or a district heating grid. By optimizing the use of excess heat, industries can significantly reduce their energy consumption, lower operating costs, and decrease reliance on fossil fuels. Given the variety of industrial processes that generate waste heat, heat recovery solutions must be tailored to specific applications to maximize efficiency.

The streamSAVE methodology outlines three distinct approaches for implementing heat recovery in industrial settings. The first approach focuses on on-site heat recovery within industrial processes, where excess heat is fed back into the system, reducing the overall energy input required. The second approach involves on-site heat recovery for auxiliary applications, such as heating office buildings or other industrial processes within the same facility. The third methodology targets heat recovery for district heating grids, where excess heat is redirected to supply energy-efficient heating to buildings connected to the grid. The calculation requirements for each approach vary, depending on factors such as the final energy consumption before and after implementation, the quantity of heat recovered, and the efficiency of the existing heating system. For district heating applications, additional parameter, such as grid heat losses, external incentives, and behavioural changes, must also be considered.

Due to the diversity of industrial processes with heat recovery potential, no standardized indicative calculation values are provided. Instead, streamSAVE offers guidelines for data collection, ensuring accurate and context-specific savings estimations. However, for district heating applications, indicative values are available for heating grid losses, heating system efficiencies, and behavioural effects, based on Eurostat data, the IDEES database, and other studies. The cost of implementing heat recovery measures varies significantly, but streamSAVE provides broad estimates of investment costs per kWh of recovered heat, derived from an Austrian benchmarking program for industrial sectors. For district heating, cost estimates for final consumers, including system replacement and operational expenses, are based on Austria’s annual heating system cost comparison study (“Heizkostenvergleich”). These methodologies ensure that heat recovery solutions are both technically feasible and economically viable, supporting the broader transition toward sustainable industrial energy use.

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Building Automation and Energy Management Systems

Building Automation and Control Systems (BACS) and Building Energy Management Systems (BEMS) are integral to optimizing energy efficiency within buildings. Comprising both hardware and software, these systems enable automated control, monitoring, and management of key technical equipment, including heating, cooling, ventilation, hot water, lighting, and electricity production. By automating and optimizing energy use, BACS and BEMS contribute to significant energy savings, improved building performance, and reduced operational costs. Their application is relevant for both residential and non-residential buildings, ensuring that energy-consuming processes are managed efficiently with minimal human intervention.

The streamSAVE methodology provides a structured approach to evaluating the energy savings potential of BACS installation and upgrades. Covering multiple end-uses such as heating, cooling, domestic hot water, ventilation, and lighting, the methodology ensures a standardized calculation process by utilizing BACS factors defined in EN 15232. The estimation of energy savings requires key input parameters, including the total floor area of the building, original final energy consumption of the respective end-use, and the efficiency class of the BAC system before and after implementation. To improve accuracy, a correction factor for three European climate regions (North, West, South) is incorporated. Furthermore, the methodology accounts for behavioural effects, recognizing that occupant behaviour influences energy consumption. Indicative values are provided for specific final energy consumption, BACS factors per end-use (derived from the IDEES database and Ecodesign preparatory study for BACS), climate correction factors, and behaviour-related adjustments.

The cost-effectiveness of BACS implementation is primarily assessed through hardware, software, and installation costs. streamSAVE offers cost data per square meter of total floor area, allowing for cost scalability depending on the specific action implemented. Indicative values are available for class C and class A BACS across multiple building types, based on the Ecodesign preparatory study for BACS. By integrating energy savings calculations with cost considerations, the methodology supports decision-making for building owners, policymakers, and stakeholders looking to enhance energy efficiency through smart building automation technologies.

Commercial and Industrial Refrigeration

Commercial and industrial refrigeration systems play a critical role in process cooling, where a chiller mechanically lowers and maintains the temperature of a space, product, or process. These systems use a vapour compression cycle to cool liquids, with the rejected heat dissipated into either the air (air-chiller) or ambient water (water-chiller). Efficient refrigeration is essential in industries such as food storage, pharmaceuticals, and manufacturing, where maintaining stable temperatures is crucial for product quality and safety. However, refrigeration is also highly energy-intensive, making efficiency improvements a key priority for energy savings and cost reductions.

The streamSAVE methodology focuses on estimating energy savings from newly installed and electrically operated industrial air- and water-chillers, excluding air conditioning systems. This methodology aligns with the minimum efficiency standards set by the EU's Ecodesign Directive, ensuring compliance with regulatory requirements. The energy savings calculation is based on three primary factors: installed cooling power, full-load operating hours, and the difference in the Seasonal Energy Performance Ratio (SEPR) before and after implementation. The methodology also allows for adjustments based on potential rebound effects or changes in user behaviour, although no significant behavioural changes have been observed in commercial and industrial refrigeration applications.

Indicative values for SEPR are provided based on Ecodesign Directive minimum standards (representing the baseline situation) and market averages of currently available units (post-implementation). Additionally, data on installed cooling power and full-load hours must be supplied according to the specific implementation scenario. The methodology also considers cost-effectiveness, covering investment costs, variable operating expenses, and repair and maintenance costs, with indicative cost values derived from Ecodesign Directive preparatory studies. By providing a structured approach to evaluating efficiency gains and financial feasibility, streamSAVE supports the wider adoption of high-efficiency refrigeration technologies in commercial and industrial sectors.

Electric Vehicles

Electric vehicles (EVs) encompass a wide range of transport modes, including two-wheel vehicles, cars, trucks, buses, trains, ships, and airplanes, all of which rely on electricity to power their motors. While hybrid vehicles utilize electricity alongside conventional fuels, fully electric vehicles operate exclusively on electricity. A well-developed charging infrastructure, consisting of both public and private charging stations, is essential to support the widespread adoption of EVs and ensure convenient recharging for users. The transition from conventional internal combustion engine (ICE) vehicles to electric alternatives plays a key role in reducing energy consumption and lowering greenhouse gas emissions, making it a priority for sustainable mobility policies.

The streamSAVE methodology provides a structured approach to fuel switching from conventional to electric or hybrid vehicles, covering multiple vehicle types such as cars, vans, buses, and trucks. Conventional vehicle options include diesel, petrol, and LNG-powered models, while hybrid vehicles are also considered. Energy savings are calculated by determining the difference in energy consumption between a reference vehicle and a more efficient alternative, using specific energy consumption values (kWh/100 km) multiplied by the average annual distance travelled. This approach ensures the methodology accommodates various vehicle types and hybrid configurations. Additionally, behavioural factors, including rebound effects (increased vehicle usage due to lower operating costs) and spill-over effects (influence on other transport behaviours), are taken into account.

Indicative values for specific energy consumption were derived from European CO_2 emission performance standards (2020-2030) for cars and vans. Energy consumption data for efficient vehicles was sourced from JEC Tank-To-Wheels and the EV-database (2021). Additionally, the indicative distance travelled per vehicle type was assessed using EU-27 road traffic statistics (based on Eurostat) and vehicle numbers per type (from ACEA). The cost assessment of EV adoption extends beyond the initial investment, factoring in operating costs (fuel consumption) and maintenance expenses. Indicative cost values were sourced from various online vehicle databases, enabling comparisons between conventional and electric vehicle options. By integrating these insights, the methodology ensures a comprehensive evaluation of the energy and cost implications of transitioning to electric mobility.

Lighting Systems and Public Lighting

Lighting systems encompass artificial light sources, such as lamps, luminaires, and light fixtures, and natural illumination, which is harnessed through windows, skylights, and light shelves to achieve both practical and aesthetic effects. Proper lighting plays a crucial role in enhancing task performance, improving the appearance of spaces, and increasing security. A key subset of lighting applications is public lighting, which focuses on illuminating outdoor environments such as streets, roads, and public spaces. Ensuring energy efficiency in lighting systems, particularly in large-scale applications like public infrastructure, is essential for reducing electricity consumption and operational costs.

The streamSAVE methodology aims to maximize energy savings by replacing existing road lighting systems with more energy-efficient technologies. This primarily involves the substitution of outdated light sources with modern LED technologies and the integration of lighting control systems to optimize consumption. To estimate energy savings, the methodology provides two distinct calculation approaches. The “project-based approach” offers a detailed evaluation based on specific project data, requiring extensive input parameters. Alternatively, the “simplified approach” is designed for cases with limited data availability, assuming an equivalence between the installed power of old and new light points. Both methods calculate savings based on the number of lighting points, energy consumption or installed power per unit, annual operating hours, and the impact of lighting control systems.

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To ensure accuracy and consistency, the methodology includes indicative values for different lighting technologies, as well as for pre- and post-installation power consumption. Additional factors account for lighting control effects and full-load hours, with minimum lamp efficiency standards defined under the Ecodesign Directive. Standards for lighting control systems were derived from existing bottom-up methodologies in EU Member States, incorporating guidance from EU GPP technical specification TS3 for minimum dimming performance. The methodology assumes a standardized operational duration of 11 hours per day, a globally recognized benchmark. Cost-effectiveness analysis includes investment, operational, repair, and maintenance costs, with indicative cost values based on data from the European project Streetlight-EPC. By offering a structured framework, streamSAVE facilitates the widespread adoption of efficient lighting technologies, helping cities and industries reduce energy consumption and enhance sustainability.

Small-Scale Renewable Central Heating

Small-scale renewable central heating systems enable heat generation for space heating and domestic hot water using renewable energy sources. These systems rely on small-scale energy generators, such as heat pumps, biomass boilers, and emerging technologies, to replace conventional fossil-fuel-based heating. Applicable in both residential and non-residential buildings, these systems offer a sustainable alternative that enhances energy efficiency while reducing carbon emissions. By transitioning to renewable heating technologies, households and businesses can lower their dependency on non-renewable energy sources, contributing to broader climate and energy policy goals.

The streamSAVE methodology evaluates energy savings from the replacement of existing heating systems with heat pumps or biomass boilers in residential and non-residential buildings. The calculation requires several key parameters, including the building's useful floor area (specific to the implemented action), space heating and hot water demand (derived from the IDEES database), and the conversion efficiencies of the heating system before and after replacement. Pre-installation efficiency values are calculated based on weighted averages from the IDEES database and the Ecodesign Directive, while post-installation efficiencies follow standards from Commission Decision (EU) 2013/114/EU for heat pumps and Commission Recommendation (EU) 2019/1658 for biomass boilers. To improve accuracy, the methodology also incorporates a behavioural effect factor (indicative values based on various studies) and a climate zone correction factor (accounting for regional differences in North, South, and West Europe).

The cost-effectiveness analysis includes investment costs, variable operating costs, and maintenance expenses. Indicative cost values are based on Austria's annual heating system cost comparison study ("Heizkostenvergleich"), which provides benchmarks for evaluating heating system upgrades. By offering a comprehensive framework for estimating energy savings and financial feasibility, the methodology supports policymakers, building owners, and stakeholders in transitioning towards renewable heating solutions that contribute to long-term sustainability and energy efficiency.

Energy Poverty

Energy poverty refers to the inability of households to maintain adequate indoor comfort due to financial constraints, poor housing conditions, or inefficient energy systems. Addressing energy poverty requires targeted initiatives, measures, and policies aimed at mitigating rising energy costs and improving access to energy-efficient solutions. These efforts include building renovations, installation of renewable heating systems, and behavioural interventions designed to help vulnerable households reduce energy consumption and enhance their quality of life. However, energy-poor households often reside in less efficient buildings with lower baseline energy consumption, making energy retrofits less impactful than in higher-income households. This phenomenon, known as the prebound effect, limits potential energy and cost savings, requiring adjustments in savings estimation methodologies.

The streamSAVE methodology accounts for the prebound effect by incorporating a correction factor to ensure more accurate calculations of energy savings in energy-poor households. The methodology focuses on three key interventions: thermal improvement of the building envelope, installation of renewable heating systems, and behavioural changes through feedback or tailored advice. In the case of thermal improvements, energy savings are determined by comparing final energy consumption before and after renovation. The calculation considers useful floor area, final energy demand for space heating and hot water, and the efficiency of the heating system. A prebound correction factor is applied to adjust for the typically lower energy use in energy-poor households compared to average consumers. The recently adopted EED recast (Annex V(1)(d)) allows Member States to estimate savings based on engineering models that use standardized occupancy and thermal comfort parameters to reflect realistic conditions.

To ensure reliable estimations, indicative values for space heating and hot water demand and heating system conversion efficiency are derived from the JRC IDEES database. The prebound correction factor is based on peer-reviewed studies and official reports examining the gap between theoretical and actual energy consumption in energy-poor households. Research confirms that low-income households typically use less efficient heating systems, with indicative efficiency values compiled from multiple data sources. Similar correction factors are applied for behavioural change measures and renewable heating system installations. The costs associated with energy-poverty mitigation actions, including investment, maintenance, and operational expenses, are generally comparable to those for average households. Indicative cost values are provided for each type of measure, ensuring a structured approach to assessing the financial feasibility and energy impact of interventions aimed at alleviating energy poverty.

Motor Replacement

Electric motors are among the largest consumers of electricity, as they are used to convert electrical power into mechanical power for a wide range of industrial applications, including pumps, fans, compressors, material movement, and processing. Given their extensive use, even a small improvement in efficiency can lead to substantial energy savings. However, old and inefficient motors tend to remain in operation much longer than their expected lifetime, making early replacement and renovation through policy incentives and efficiency programs highly desirable. Encouraging industries to transition to high-efficiency motors and modern control systems is a key strategy to reduce energy consumption and operational costs.

The streamSAVE methodology focuses on the replacement of existing motors classified under International Efficiency (IE2) or below with more efficient alternatives (IE3 or above) before reaching the end of their operational life. The methodology provides a standardized approach to calculating energy savings, covering not only motor replacement in fixed-speed applications but also the installation of Variable Speed Drives (VSDs), which allow motors to adjust speed and torque based on real-time demand. This approach enhances efficiency, particularly in applications where motors do not need to operate at full capacity continuously. The calculation of energy savings considers key factors such as the power of the replaced motor, annual operating hours, load factor, and efficiency differences between old and new motors. A correction factor for VSD installation is also applied, ensuring accurate savings estimations.

Indicative calculation values are available for load factor (derived from EU-15 motor stock studies and the U.S. Industrial and Commercial Motor System Market Assessment Report), motor efficiency classes (based on the IEC 60034-30-1 standard and Annex I of the Ecodesign Regulation), annual operating hours for various industry shift models, and the VSD installation factor, sourced from Ecodesign preparatory studies and reports for the European Commission. The methodology also includes a cost-effectiveness assessment, covering investment costs, variable operating costs, and fixed operating costs. Indicative cost values are based on the Ecodesign preparatory study Lot 30: Motors and Drives, ensuring a comprehensive evaluation of the financial and energy-saving potential of motor replacements. By providing a structured methodology, streamSAVE supports industries in transitioning to more efficient motor technologies, contributing to significant reductions in electricity demand and carbon emissions.

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Behavioural Changes

Research shows that human behaviour plays a crucial role in energy consumption, often equalling or surpassing the impact of a building's physical attributes. Behavioural changes—where end-users modify their energy usage habits, product choices, or system operations—can significantly contribute to energy savings. These changes can be encouraged through various interventions, such as energy advice, targeted information campaigns, real-time energy consumption displays, training, and feedback from audits or reports. By influencing decision-making and daily energy-use patterns, behavioural measures complement technical energy efficiency improvements, leading to more sustainable long-term reductions in consumption.

The streamSAVE methodology focuses on behaviour-based energy-saving measures in the residential sector. It specifically evaluates the impact of feedback-based interventions, including direct feedback (real-time energy monitoring) and indirect feedback (tailored energy-saving advice). The methodology quantifies energy savings using the Energy Saving Factor (S), which is multiplied by the unitary yearly final energy consumption per household (electricity or gas). When the same intervention is repeatedly applied to the same target group without direct monitoring, a double-counting factor can be introduced to adjust for overlapping effects. This methodology aligns with Commission Recommendation 2019/1658 for transposing energy savings obligations under the Energy Efficiency Directive (EED). To estimate energy savings evaluation methods such as randomized controlled trials (RCTs) are recommended, utilizing metered or monitored energy consumption data before and after the intervention. While indicative values provided by streamSAVE serve as EU-wide benchmarks, they should be tailored to the specific measure and target audience. Data sources include Eurostat and the JRC IDEES database for unitary final energy consumption, and median values from quality feedback studies for the Energy Savings Factor (S). However, no indicative value is provided for double-counting, as its impact varies depending on the intervention.

The cost-effectiveness of behavioural measures depends on the type of feedback mechanism and the number of participants involved. However, categorizing costs remains challenging due to limited data availability. Potential cost categories include equipment purchase and installation of monitoring systems, infrastructure and data communication, data analytics and processing, technical expertise for audits and reports, measure dissemination, and participant surveys. By integrating behavioural insights with data-driven methodologies, streamSAVE provides a comprehensive framework for assessing the energy-saving potential of behaviour-based interventions, supporting EU-wide energy efficiency goals.

Modal Shift in Freight Transport

Modal shift refers to the transition from one transportation system to another, with the objective of improving energy efficiency and environmental sustainability in freight transport. This shift plays a crucial role in achieving the EU's ambitious energy and climate targets for 2050 by reducing the reliance on road transport in favour of more efficient alternatives. The streamSAVE project specifically focuses on shifting freight transport from road to rail, as rail transport is significantly more energy-efficient and produces lower emissions. By encouraging such a transition, modal shift strategies contribute to reducing fuel consumption, mitigating traffic congestion, and lowering greenhouse gas emissions.

A stakeholder consultation conducted by streamSAVE highlighted knowledge gaps and data availability challenges regarding modal shift in freight transport. Many stakeholders lack awareness of its benefits and implementation strategies, and there are inconsistencies in statistical data across Member States. Given the high variability of modal shift actions and the numerous influencing factors depending on the initial transport conditions, providing a universal calculation formula and indicative values is not feasible. As a result, the streamSAVE methodology does not estimate energy savings for individual actions but instead assesses overall modal shift potential per Member State. This approach serves as an initial estimation tool, while actual savings calculations for specific road-to-rail modal shift actions should be based on monitored data.

The methodology evaluates road freight transport volumes per Member State, considering factors such as type of goods, transport distance class, and rail network density. A reduction factor is applied to estimate modal shift potential based on these parameters. To align with the Energy Efficiency Directive (EED), the methodology includes a territorial adjustment factor, ensuring that only savings occurring within a Member State's territory are considered. The data sources for these calculations are primarily EUROSTAT, along with modal shift studies in freight transport. Energy savings estimations incorporate the difference in energy consumption between road and rail transport, using data from JRC and IEA studies. Additionally, cost-effectiveness analysis includes fixed and variable operational costs, staff costs, mode-specific costs, and general operating expenses for both transport modes. This data was sourced from a study based on transport operator data in the Netherlands, providing valuable insights into the economic feasibility of shifting freight transport from road to rail.

4.1.2 New methodologies covering the streamSAVE Priority Actions

In the 24 catalogues containing bottom-up energy savings calculation methodologies, 235 new methodologies were identified. This includes entirely new methodologies, i.e., methodologies that had not been identified before, as well as existing methodologies that have undergone substantial changes.

Of the 235 new or updated methodologies, 66 are related to the 10 PAs developed in streamSAVE. Table 7 provides an overview of the identified methodologies. Notably, the PAs for Electric Vehicles, Lighting, Energy Poverty and Behavioural Changes stand out among the new methodologies (each with more than 15% of the newly identified methodologies).

Table 7 – Overview of new or updated methodologies related to the previous Priority Actions.

Priority Action	Nº of methods	Member State
Heat Recovery	1	FR
BEMS&BACS	3	HR, LV, SK
Refrigeration	3	HR, HU, SK
Electric Vehicles	9	AU, HR, HU, IE, IT, LT, PL, SK
Lighting	13	HU, HR, IT, LT, LV, PL, SK
Small-Scale Renewable Central heating	8	AU, HR, FR, LT, LV
Energy Poverty	13	LT, LV, PL, SK
Motor replacement	3	HR, HU, LT
Behavioural changes	11	AU. BG, FR, LT, LV, PL
Modal Shift	1	HU
Total	65	

The collected methodologies were systematically compiled using the standardized template and are presented in Annex III.

Heat Recovery

Table 8 presents the newly identified methodology related to heat recovery.

Table 8 – Identified methodologies related to heat recovery.

Country	Methodology
France	Waste heat storage system

The methodology in France involves installing a fixed thermal storage system connected to a heat distribution network to recover and utilize waste. The system consists of one or more thermal batteries, along with heat recovery and distribution components, and must undergo a preliminary sizing study to evaluate expected energy savings. The methodology quantifies the cumulative final energy savings based on key parameters, including the efficiency of the storage system, maximum heat storage capacity, and annual number of full-capacity cycles, ensuring a technical and economic justification for implementation.

The methodology developed in France focuses on waste heat storage systems, evaluating the recovery of industrial residual heat for distribution networks. The quantification of energy savings is based on system efficiency, maximum storage capacity, and the number of full-capacity cycles per year. In contrast, the streamSAVE methodology offers three distinct approaches, covering heat recovery within industrial processes, for auxiliary applications, and district heating networks. It considers heating grid losses and behavioural effects and provides indicative values from sources such as Eurostat and IDEES. The main advantage of the streamSAVE methodology is its comprehensive scope, addressing multiple heat recovery applications and integrating economic feasibility assessments.

Building Automation and Energy Management Systems

Table 9 presents the newly identified methodologies related to BEMS&BACS.

Table 9 – Identified methodologies related to BEMS&BACS.

Country	Methodology
Croatia	Automatic regulation in buildings
Latvia	Methodology for Calculating Energy Savings from an Energy Monitoring and Management System Using Specialized Computerized / Mobile Applications
Slovakia	Deployment support and technical improvement systems in buildings

The methodology in Croatia focuses on installing equipment to regulate heating systems in buildings, improving heat distribution and optimizing room temperature. The system includes thermostatic radiator sets, either classic or electronic, installed according to thermal energy market regulations. Energy savings are calculated based on project-specific or reference data, with supporting documentation such as equipment handover records, invoices, or energy audit reports. The methodology quantifies total final energy savings using parameters such as heating system efficiency before and after installation, specific annual thermal needs, and useful building surface, ensuring accurate assessment and verification of energy efficiency improvements.

The methodology in Latvia evaluates energy savings achieved through specialized computerized or mobile applications used by legal entities. These systems monitor consumption patterns and promote behavioural changes to reduce energy use. The methodology quantifies total final energy savings based on parameters such as annual final energy consumption, savings factor, measure lifetime, and adjustment factors for rebound, spill-over, and free-rider effects, ensuring an accurate estimation of the system’s impact on energy efficiency.

The methodology in Slovakia focuses on reducing energy intensity through systematic energy efficiency projects, particularly in public administration buildings and industry. It includes measures such as energy and environmental management systems, data collection and monitoring, and integration with energy consumption sources. Energy savings are calculated using ex-ante estimates based on projected improvements or ex-post measurements after implementation. The methodology quantifies final energy savings using parameters such as planned savings, energy demand before and after renovation, and standardized heat requirements, ensuring accurate monitoring and evaluation of efficiency improvements.

For building automation and energy management systems, the methodologies from Croatia, Latvia, and Slovakia focus on the installation of thermostatic controls, energy monitoring systems, and energy efficiency projects in public buildings. They quantify energy savings using project-specific data and ex-ante estimates or ex-post measurements. On the other hand, the streamSAVE methodology provides a structured and standardized calculation process based on EN 15232, covering multiple end-uses such as heating, cooling, hot water, ventilation, and lighting. It incorporates climate correction factors and behavioural effects, ensuring a more precise estimation of energy savings. Additionally, it includes cost-effectiveness analysis based on hardware, software, and installation costs, supporting decision-making for building owners and policymakers.

Commercial and Industrial Refrigeration

Table 10 presents the newly identified methodologies related to refrigeration.

Table 10 –Identified methodologies related to refrigeration

Country	Methodology
Croatia	New installation or change of cooling/refrigeration systems in commercial and industry buildings
Hungary	Replacement of central refrigeration equipment used in commercial units
Slovakia	Increased energy efficiency in industrial production

The methodology in Croatia determines energy savings from installing or replacing cooling systems in service and industrial buildings. It calculates unit annual energy savings based on cooling energy demand, building area, and the difference in seasonal energy efficiency ratios before and after implementation. Energy savings are determined for new installations, replacements at the end of system life, and early replacements of inefficient equipment. The methodology considers parameters such as cooled surface area, specific cooling needs, and seasonal cooling factors of both existing and new systems, ensuring accurate assessment and verification of efficiency gains.

The methodology in Hungary focuses on replacing inefficient central refrigeration systems with more energy-efficient alternatives in the service and industrial sectors. The measure follows EU Ecodesign regulations and applies to condensing units operating at medium or low temperatures. Energy savings are calculated based on differences in cooling capacity, coefficient of performance, and seasonal energy performance ratios between old and new systems. The methodology distinguishes between early replacements and those occurring at the end of equipment life, ensuring accurate evaluation of efficiency gains while considering factors such as system load, operating hours, and regulatory efficiency benchmarks.

The methodology in Slovakia focuses on improving energy efficiency in both production and consumption through modernization and deployment of advanced technologies. It includes measures such as upgrading equipment for cold production and distribution. Energy savings are calculated as the difference between average energy consumption before implementation and planned consumption after the project, based on energy audits or project documentation. The methodology allows for ex-ante estimates using standard savings, ex-post calculations based on measured data, or relative savings through technical assessments, ensuring a comprehensive evaluation of energy efficiency improvements.

For commercial and industrial refrigeration, the methodologies from Croatia, Hungary, and Slovakia focus on replacing inefficient refrigeration systems and modernizing cooling production and distribution. They quantify energy savings based on cooling energy demand, seasonal efficiency ratios, and equipment upgrades. The streamSAVE methodology aligns with EU Ecodesign standards and estimates energy savings for new industrial chillers based on installed cooling power, full-load operating hours, and efficiency improvements. It also considers potential rebound effects and cost-effectiveness assessments, ensuring a more structured evaluation of efficiency gains and financial feasibility.

Electric Vehicles

Table 11 presents the newly identified methodologies related to electric vehicles.

Table 11 –Identified methodologies related to electric vehicles.

Country	Methodology
Austria	Alternative vehicle technologies in passenger cars
Croatia	Replacement of existing and purchase of new, more efficient vehicles
Hungary	Energy savings by replacing a vehicle with a more energy-efficient one
Ireland	Electric Vehicles
Italy	White Certificate: Operational Guide: Transport Sector
Lithuania	Methodology for auditing energy consumption in vehicles
Lithuania	Methodology for calculating the energy saved by replacing freight transport with more efficient ones
Poland	Development of public transport in cities
Slovakia	Support of electromobility

The methodology in Austria calculates energy savings from the purchase of alternatively fuelled vehicles, specifically battery-powered electric vehicles (BEV) and fuel cell electric vehicles (FCEV). Savings are determined based on the difference in mileage-specific energy consumption between conventional and efficient vehicles, multiplied by the average annual mileage and the number of efficient vehicles purchased. The methodology applies to both new purchases and the replacement of existing vehicles. Energy savings can be calculated using standardized parameters, with required documentation including the number of vehicles purchased and their energy consumption data to ensure accurate savings assessments.

The methodology in Croatia calculates energy savings from replacing old vehicles or purchasing new, efficient ones. Savings are determined based on the difference in fuel consumption between old and new vehicles, multiplied by the average annual mileage and the number of vehicles replaced or purchased. The methodology applies to various fuel types, including petrol, diesel, LPG, electricity, and hybrids. Energy savings can be calculated using project-specific or reference data, with required documentation such as invoices, fuel consumption records, and mileage logs to verify the implementation and accuracy of the savings assessment.

The methodology in Hungary evaluates energy savings from replacing vehicles with lower fuel consumption (including EVs) and reduced greenhouse gas emissions. It considers data such as fuel type, emissions, and mileage. Savings are calculated in two steps: first, determining the eligible specific and annual emission reduction, followed by the calculation of energy savings. The methodology accounts for fuel consumption, calorific values, and regulatory emission standards, ensuring compliance with EU efficiency directives. The measure has a lifetime of 15 years, with no energy savings counted beyond the old vehicle's lifespan.

The methodology in Ireland estimates annual energy savings from switching from conventional to electric vehicles. It calculates savings based on the difference in specific final energy consumption between reference and efficient vehicles, multiplied by the average yearly distance travelled and the number of efficient vehicles purchased. The methodology also considers behavioural effects to refine the estimation.

The methodology in Italy calculates energy savings from efficiency interventions in road transport and passenger vehicle fleets (including EVs) under the White Certificates scheme. Savings are determined based on the difference in specific fuel consumption before and after the intervention, normalized for external operational variables such as route type and speed. The methodology applies to both passenger and freight transport, using different formulas based on kilometres travelled, number of passengers, or tonnes of goods transported. Energy savings must be monitored in both the pre- and post-intervention phases, ensuring accurate assessments based on real operational data.

The methodologies in Lithuania focus on improving energy efficiency in transportation by promoting electric vehicles and more efficient freight transport. The methodology for auditing energy consumption in vehicles supports the national action plan by calculating energy savings from replacing internal combustion engine cars with electric vehicles, converting fuel consumption into energy units for accurate comparison. Similarly, the methodology for calculating the energy saved by replacing freight transport with more efficient ones focuses on replacing older trucks with fuel-efficient or alternative-fuel models, calculating savings based on fuel consumption differences converted into kilowatt-hours. Both methodologies consider vehicle type, fuel efficiency, travel distance, and the lifespan of the measure to ensure precise energy savings assessments.

The methodology in Poland aims to expand and promote low-emission urban transport to serve residents in functional urban areas. It applies to the public sector, including local governments, infrastructure managers, and public transport operators. Energy savings are calculated based on the number of new electric and alternatively fuelled vehicles introduced, along with their respective final energy savings per unit. The methodology does not account for rebound, spill-over, or free-rider effects, ensuring a direct assessment of the total final energy savings achieved through the implementation of green urban transport initiatives.

The methodology in Slovakia focuses on promoting the purchase of energy-efficient vehicles and components that contribute to reducing final and primary energy consumption as well as emissions. It applies an ex-ante approach to estimate energy savings based on expected reductions in electricity consumption. Energy savings are calculated using parameters such as the electricity consumption of old and new vehicles, annual driving performance, and the number of vehicles replaced. This methodology provides a structured framework for assessing the total final energy savings achieved through the adoption of electromobility solutions.

For electric vehicles, methodologies from Austria, Croatia, Hungary, Ireland, Italy, Latvia, Lithuania, Poland, and Slovakia estimate energy savings from vehicle replacements. The streamSAVE methodology offers a more structured approach by covering multiple vehicle types, including conventional, hybrid, and electric models. It incorporates behavioural effects such as rebound and spill-over impacts and integrates cost assessments, covering investment, operating, and maintenance costs. By using EU-wide benchmarks and real-world driving data, streamSAVE provides a more accurate and scalable assessment of energy savings.

Lighting Systems and Public Lighting

Table 12 presents the newly identified methodologies related to lighting.

Table 12 –Identified methodologies related to lighting.

Country	Methodology
Croatia	New installation or change of public lighting system
Hungary	Lighting modernisation
Italy	White Certificate: Operational Guide: Public lighting
Italy	White Certificate: Operational Guide: Lighting in the private sector
Italy	White Certificate: Operational Guide: Public lighting systems with LED
Italy	White Certificate: Operational Guide: Lighting in the private sector with LED
Latvia	Methodological Guidelines for Energy Savings Reporting and Calculation
Latvia	Methodology for Calculating the Energy Saved by Using More Efficient Lighting Technologies in Non-Residential Buildings
Latvia	Methodology for Calculating the Energy Savings from Using More Efficient Street Lighting
Latvia	Methodology for Calculating Energy Savings with Efficient Lighting in Industrial Buildings

Lithuania	Methodology for calculating the energy saved by using more efficient lighting technologies
Poland	Energy efficient street lighting
Slovakia	High efficient lighting

The methodology in Croatia focuses on improving energy efficiency by replacing outdated public lighting with more efficient LED systems. It applies to two cases: replacing existing bulbs while maintaining compliance with lighting standards or reconstructing the entire public lighting system to meet technical and regulatory requirements. Energy savings are calculated based on factors such as the difference in installed power, the number of operating hours, and the applied lighting management strategy. The methodology allows for savings estimation using project-specific or reference values, ensuring an accurate assessment of the total final energy savings achieved through public lighting upgrades.

The methodology in Hungary focuses on replacing outdated lighting systems with more energy-efficient alternatives, such as LED lighting, to reduce energy consumption. It applies to indoor, outdoor, public, and emergency lighting systems, incorporating the renovation of electrical networks and installation of improved lighting fixtures. Energy savings are calculated based on factors such as the nominal power of old and new luminaires, ballast efficiency, operational correction factors, and typical annual operating hours. The methodology differentiates between early replacements and replacements after the expected lifetime of old equipment, ensuring an accurate assessment of total final energy savings while aligning with EU eco-design regulations.

The methodologies in Italy focus on improving energy efficiency through the replacement of inefficient lighting systems with more efficient alternatives in various sectors under the White Certificates scheme. The methodology for public lighting estimates energy savings from upgrading municipal lighting systems to comply with UNI 13201 and ministerial environmental criteria, considering factors such as power consumption differences, equivalent operating hours, and lighting adjustment coefficients. The methodology for lighting in the private sector evaluates savings from replacing existing lighting systems in commercial and industrial buildings, ensuring compliance with UNI EN 12464 standards and requiring a minimum energy efficiency class for new luminaires. The methodology for public lighting systems with LED focuses specifically on the transition to LED lighting in municipal infrastructure, using technological and normative additionality coefficients to account for compliance with EU efficiency standards and regulatory luminance requirements. Lastly, the methodology for lighting in the private sector with LED assesses savings from the installation of LED lighting in non-residential buildings, comparing baseline consumption with post-intervention efficiency improvements while ensuring compliance with EU energy efficiency regulations. All methodologies follow an ex-ante estimation approach and account for factors such as operating hours, power consumption differences, and regulatory compliance to ensure a standardized and accurate assessment of final energy savings.

The methodologies in Latvia focus on improving energy efficiency through the replacement of inefficient lighting systems with more efficient alternatives in various sectors. The methodological guidelines for energy savings reporting and calculation estimate energy savings from switching to LED or energy-saving lamps in residential buildings, catering establishments, and hotels, aiming to reduce electricity consumption and operational costs. The methodology for calculating the energy saved by using more efficient lighting technologies in non-residential buildings focuses on office spaces and similar facilities, incorporating additional efficiency measures like dimming and motion sensors. The methodology for calculating the energy savings from using more efficient street lighting standardizes the assessment of savings from upgrading street lighting systems with more efficient fixtures and control strategies. Lastly, the methodology for calculating energy savings with efficient lighting in industrial buildings applies to large-scale industrial facilities, considering automation and adaptive lighting technologies. All methodologies follow an ex-ante estimation approach and account for factors such as operating hours, power consumption differences, and additional energy-saving measures to ensure a standardized and accurate assessment of final energy savings.

The methodologies in Lithuania estimates energy savings achieved through the modernization of indoor and outdoor lighting systems. It relies on the replacement of inefficient luminaires with LED and smart control technologies to reduce electricity consumption and support national sustainability goals. Energy savings are calculated based on the power consumption before and after modernization, the number of luminaires replaced, and their annual operating hours. The methodology also accounts for rebound, spill-over, and free-rider effects to ensure an accurate estimation of the total final energy savings achieved through improved lighting efficiency.

The methodology in Poland estimates energy savings achieved through projects aimed at improving the efficiency of street lighting systems. It relies on co-financing initiatives that reduce electricity consumption and lower carbon dioxide emissions. Energy savings are calculated based on emission benchmarks for electricity production and the CO_2 emissions avoided under the program, as declared by beneficiaries. The methodology does not account for rebound, spill-over, or free-rider effects, ensuring a direct estimation of the total final energy savings achieved through energy-efficient street lighting projects.

The methodology in Slovakia estimates energy savings achieved through the modernization of lighting systems in the industrial sector. It relies on replacing outdated lamps with more energy-efficient alternatives, installing advanced lighting control systems, and upgrading electrical switchboards and cable distribution. Energy savings are calculated based on the reduction in electricity demand per lamp, the number of lamps replaced or installed, and their annual operating hours. The methodology ensures an accurate estimation of the total final energy savings achieved through improved lighting efficiency by utilizing data from lighting-technical studies conducted by qualified professionals.

For lighting systems and public lighting, methodologies from Croatia, Hungary, Italy, Latvia, Lithuania, Poland, and Slovakia focus on LED replacements, public lighting upgrades, and adaptive lighting technologies. The streamSAVE methodology provides two calculation approaches: a project-based method for detailed data evaluation and a simplified method for cases with limited data availability. It includes indicative values for different lighting technologies, Ecodesign Directive standards, and cost-effectiveness analysis, ensuring a more flexible and comprehensive framework for energy savings assessment.

Small-Scale Renewable Central heating

Table 13 presents the newly identified methodologies related to small-scale renewable central heating.

Table 13 –Identified methodologies related to small-scale renewable central heating

Country	Methodology
Austria	Central heating in existing non-residential buildings (heat pumps, biomass boilers, district heating)
Austria	Central heating in existing residential buildings (heat pumps, biomass boilers, district heating)
Croatia	Heat pumps
France	Solar thermal device
Latvia	Methodology for Calculating the Energy Savings from Heat Pump Installations
Latvia	Methodology for Calculating Energy Savings from the Installation of Solar Collector
Latvia	Methodology for Calculating Energy Savings from the Installation of Biomass Boilers
Lithuania	Small-scale renewable central heating

The methodologies in Austria focus on improving heating efficiency in existing residential and non-residential buildings through the replacement of central heating systems. The methodology for central heating in existing residential buildings estimates energy savings from replacing old heating systems with heat pumps, biomass boilers, or district heating, ensuring optimal operation through adjustments such as radiator calibration, hydraulic balancing, and pipe insulation. The methodology for central heating in existing non-residential buildings follows a similar approach, targeting commercial and public buildings while maintaining the existing building envelope. Both methodologies require compliance with Ecodesign regulations, excluding fossil fuel-based systems, and use effort coefficients to convert heating demand into final energy demand. All methodologies use an ex-ante approach, considering system efficiency, heating demand, and lifetime to ensure accurate energy savings assessments.

The "Heat Pumps" methodology in Croatia estimates energy savings achieved through the installation of heat pumps for space heating and domestic hot water (DHW) preparation. It relies on comparing the efficiency of heat pumps with existing heating systems or average market efficiency, considering factors such as seasonal efficiency, specific thermal energy needs, and usable building area. Energy savings are calculated for three cases: new installations, replacements at the end of a system's life, and early replacements before the end of service life. The methodology ensures an accurate estimation of the total final energy savings by incorporating data on heat pump performance, auxiliary energy sources, and documented efficiency improvements.

The "Solar Thermal Device" methodology in France estimates energy savings achieved through the installation of individual solar thermal systems for heating and domestic hot water production. It relies on the professional installation of solar collectors, a storage tank, and a temperature regulator, ensuring optimal performance without additional equipment. Energy savings are calculated based on the area of installed collectors and their efficiency, measured under standardized radiation conditions. The methodology provides a structured approach to assessing the total final energy savings achieved through solar thermal technology, supporting renewable energy integration and reducing reliance on conventional heating sources.

The methodologies in Latvia focus on improving heating efficiency by integrating renewable energy solutions. The methodology for heat pump installations estimates savings from replacing conventional heating with air-to-air, water, or ground heat pumps in residential buildings. The methodology for solar collectors evaluates savings from integrating solar energy into new and existing buildings to supplement conventional heating. The methodology for biomass boilers calculates savings from using biomass as an additional heating source in residential and public buildings. All methodologies use an ex-ante approach, considering system efficiency, heat demand, and measure lifetime to ensure accurate energy savings assessments.

The "Small-Scale Renewable Central Heating" methodology in Lithuania estimates energy savings achieved through the replacement of old boilers with more efficient, renewable energy-based heating technologies. It aligns with the National Energy and Climate Action Plan 2021-2030, aiming to reduce heating costs and promote energy security. Energy savings are calculated by comparing the energy consumption and efficiency of boilers before and after replacement, taking into account factors such as power capacity, operating hours, and lifetime. The methodology supports Lithuania's transition to renewable heating solutions, ensuring a structured approach to assessing total final energy savings while contributing to emission reduction goals.

For small-scale renewable central heating, methodologies from Austria, Croatia, France, Latvia, and Lithuania estimate energy savings from heat pumps, solar thermal systems, biomass boilers, and district heating. The streamSAVE methodology evaluates heating system replacements in residential and non-residential buildings, incorporating conversion efficiency, climate zone correction factors, and behavioural effects. It includes a structured cost analysis using heating system cost comparison studies, ensuring a standardized and policy-aligned assessment.

Energy Poverty

Table 14 presents the newly identified methodologies related to energy poverty.

Table 14 –Identified methodologies related to energy poverty

Country	Methodology
Latvia	Methodology for Calculating Energy Savings from Buildings' Thermal Properties Improvement
Latvia	Methodology for Calculating Energy Savings from Thermal Insulation of Water Heaters
Latvia	Methodology for Calculating Energy Savings from Thermal Insulation of Heating System Pipeline
Latvia	Methodology for Calculating Energy Savings from Installation of Thermostatic Valves for Radiators
Latvia	Methodology for Calculating Energy Savings from Adjustment of Hydraulic Systems
Latvia	Methodology for Calculating Energy Savings from Connection to the District Heating Network
Latvia	Methodology for Calculating Energy Savings from Installation of Thermostats
Lithuania	Methodology for calculating energy savings from renovation/modernisation of multi-apartment buildings
Lithuania	Methodology for calculating energy savings from modernisation of domestic heating and hot water systems in multi-apartment buildings (“small renovation”)
Poland	Thermomodernisation and Renovation Fund (TERMO programme)
Poland	Tax credit for expenditure on thermomodernisation of single-family dwellings, the so-called ‘thermomodernisation relief’
Poland	Improving the Energy Efficiency of Housing Buildings
Slovakia	Energy efficiency actions alleviating energy poverty

The methodologies in Latvia focus on improving energy efficiency in buildings and heating systems, particularly for reducing energy poverty. Measures include thermal property improvements such as wall and roof insulation, thermal insulation of water heaters and heating pipelines, and installation of thermostatic valves and hydraulic system adjustments to enhance heating efficiency. Additionally, connection to district heating networks and installation of thermostats help lower household energy costs while ensuring stable heating. These methodologies employ an ex-ante approach, using standardized values to calculate energy savings, ultimately supporting affordable and sustainable energy solutions for vulnerable populations.

The methodologies in Lithuania focus on improving energy efficiency in multi-apartment buildings through renovation and modernization measures for reducing energy poverty. The methodology for calculating energy savings from renovation and modernization of multi-apartment buildings aims to upgrade insulation, replace inefficient heating systems, and improve overall building energy performance, targeting at least a 40% reduction in energy consumption. The methodology for modernizing domestic heating and hot water systems in multi-apartment buildings, or "small renovation," focuses on balancing heating and hot water systems, upgrading heat points, installing thermostatic valves, and optimizing pipeline efficiency. Both methodologies contribute to lower utility costs, increased living comfort, and sustainability by reducing energy losses and improving efficiency in residential buildings.

The methodologies in Lithuania focus on improving energy efficiency in multi-apartment buildings to reduce energy poverty and lower heating costs for residents. The methodology for calculating energy savings from renovation and modernization of multi-apartment buildings focuses on upgrading insulation, replacing inefficient heating systems, and improving overall energy performance, targeting at least a 40% reduction in energy consumption. The methodology for modernizing domestic heating and hot water systems in multi-apartment buildings, or "small renovation," includes balancing heating and hot water systems, upgrading heat points, installing thermostatic valves, and optimizing pipeline efficiency. Both methodologies use an ex-ante evaluation approach, comparing energy consumption before and after modernization through standardized calculations, ensuring an assessment of energy savings and their impact on reducing household energy burdens.

The methodologies in Poland focus on improving energy efficiency in residential and public buildings to address energy poverty. The thermos-modernisation and renovation fund (TERMO programme) supports projects that reduce energy consumption for heating, lower costs for vulnerable customers, and promote renewable energy in residential buildings, public utilities, and district heating networks. The thermos-modernisation relief provides a tax incentive for energy efficiency improvements in single-family homes, covering measures such as insulation, heating system upgrades, and renewable energy installations. Both methodologies use an ex-ante evaluation approach, estimating energy savings based on energy audits and standardized efficiency ratios, ensuring accurate assessments of energy reductions and financial benefits for households in need.

The methodology in Slovakia focuses on energy efficiency actions aimed at alleviating energy poverty through significant building renovations. These renovations, which homeowners would not undertake without state intervention, prioritize insulation of the building envelope to achieve the highest energy savings. The methodology calculates savings as the difference between the energy demand before and after renovation, based on energy performance certificates. It ensures that minimum energy efficiency requirements are met where feasible and excludes savings from light source replacements. Using an ex-ante evaluation approach, it provides a standardized assessment of energy reductions, supporting vulnerable households in reducing heating costs and improving living conditions.

For energy poverty, methodologies from Latvia, Lithuania, Poland, and Slovakia focus on renovation projects, insulation improvements, and heating system upgrades to reduce household energy costs. They estimate savings using energy audits, efficiency ratios, and standardized calculations. The streamSAVE methodology accounts for the prebound effect, ensuring a more accurate estimation of savings in energy-poor households. It focuses on thermal building improvements, renewable heating installations, and behavioural interventions, integrating standardized occupancy and thermal comfort parameters for realistic energy assessments. By providing EU-wide indicative values and cost estimations, streamSAVE offers a more structured approach to assess measures to tackling energy poverty.

Motor Replacement

Table 15 presents the newly identified methodologies related to motor replacement.

Table 15 –Identified methodologies related to motor replacement

Country	Methodology
Croatia	Electromotors in industry
Hungary	Replacement of electric motors
Latvia	Calculating Energy Savings from Replacing Industrial Motors

The " methodology in Croatia estimates energy savings achieved through the replacement of existing electric motors with more efficient models using an ex-ante approach. It relies on project-specific or reference values to determine energy reductions based on motor efficiency, mechanical power, load factors, and operating hours. Energy savings are calculated by comparing the efficiency of the old and new motors, with additional factors applied when energy converters are installed. The methodology also accounts for rebound, spill-over, and free-rider effects to ensure an accurate estimation of the total final energy savings achieved through motor efficiency improvements in the industrial sector.

The methodology in Hungary estimates energy savings achieved through the replacement of existing motors with more efficient models using an ex-ante approach. It relies on project-specific data, including nominal power, efficiency, and average load before and after replacement. Energy savings are calculated by comparing the energy demand of the old and new motors, considering factors such as early replacement or end-of-life replacement. The methodology also accounts for rebound, spill-over, and free-rider effects to ensure an accurate estimation of the total final energy savings achieved through motor efficiency improvements in the industrial sector.

The methodology in Latvia estimates energy savings achieved through motor replacement in industrial enterprises using an ex-ante approach. It relies on standardized formulas to assess savings in different scenarios, including replacing motors with more efficient models, lower-power alternatives, or variable frequency drives. Energy savings are calculated based on parameters such as motor power, efficiency, load factor, and operating hours. The methodology also accounts for rebound, spill-over, and free-rider effects to ensure an accurate estimation of the total final energy savings achieved through improved motor efficiency in industrial applications.

For motor replacement, methodologies from Croatia, Hungary, and Latvia focus on replacing industrial electric motors with more efficient models, estimating savings based on motor efficiency, power ratings, and load factors. The streamSAVE methodology standardizes the calculation of energy savings by considering key parameters such as motor power, annual operating hours, load factor, and efficiency differences between old and new motors. It incorporates standardized efficiency classes, industry shift models, and cost-effectiveness assessments, providing a more robust framework for evaluating motor replacements. By using EU-wide indicative values and best practices, streamSAVE ensures a more accurate and scalable assessment of energy savings in industrial motor replacement projects.

Behavioural Changes

Table 16 presents the newly identified methodologies related to behaviour changes.

Table 16 –Identified methodologies related to behaviour changes

Country	Methodology
Austria	Energy consulting for households
Austria	Energy consulting for SMEs
Bulgaria	Energy savings resulting from household energy consultations
Bulgaria	Methodology for estimating energy savings as a result of installing smart metering and control systems for households
France	Device for displaying and interpreting consumption for a home heated by electricity
France	Device for displaying and interpreting energy consumption for a fuel-heated dwelling
Latvia	Methodological Guidelines for Assessing Energy Savings from Information and Education Measures
Latvia	Methodology for Calculating Energy Savings from the Installation of Smart Meters
Lithuania	Methodology for calculating energy savings through education and consulting measures for energy end-users
Lithuania	Methodology for calculating overall energy savings through energy saving agreements
Poland	Nationwide information and educational campaigns

The methodologies in Austria focus on achieving energy savings through energy consulting for households and small and medium-sized enterprises (SMEs). The methodology for energy consulting for households estimates savings by providing individualized advice on energy consumption patterns, helping residents adopt more efficient behaviours such as reducing room temperature. Consulting sessions must be conducted in person, either at the household or in an advice centre, lasting at least 60 minutes, and must include a written energy concept. The methodology for energy consulting for SMEs follows a similar approach, providing companies with detailed insights into their energy consumption, identifying high-energy processes, and proposing both organizational and investment measures to improve efficiency. Additionally, it allows for the evaluation of energy management and consumption monitoring systems. Both methodologies use an ex-ante approach, considering behavioural impacts and energy consumption data to ensure accurate energy savings assessments.

The methodologies in Bulgaria focus on behavioural changes to achieve energy savings in households. The methodology for energy savings resulting from household energy consultations evaluates the impact of individualized consultations on household energy consumption, considering the number of consultations, their quality level, and statistical energy use data. The methodology for estimating energy savings from installing smart metering and control systems assesses how real-time energy monitoring influences consumption behaviour by comparing usage reductions in households with and without smart meters. Both methodologies use an ex-ante evaluation approach, estimating energy savings based on standardized parameters and statistical references, ensuring a structured assessment of behavioural-driven efficiency improvements.

The methodologies in France focus on energy savings through behavioural changes by providing real-time consumption feedback to users. The methodology for displaying and interpreting consumption for a home heated by electricity estimates savings from the acquisition or rental of a device that tracks electricity use, provides consumption statistics, and alerts users when thresholds are exceeded. Similarly, the methodology for displaying and interpreting energy consumption for a fuel-heated dwelling applies the same principles to homes using combustible energy, offering insights into both fuel and electricity consumption. Both methodologies use an ex-ante evaluation approach, estimating savings based on historical consumption data, climate zone adjustments, and household characteristics, ensuring a structured assessment of behavioural-driven energy efficiency improvements.

The methodologies in Latvia focus on behavioural-driven energy savings through education, awareness, and real-time consumption feedback. The methodology for assessing energy savings from information and education measures evaluates the impact of campaigns on consumer behaviour, using standardized values and surveys to estimate energy reductions. It differentiates between broad awareness campaigns and more targeted, actionable initiatives. The methodology for calculating energy savings from the installation of smart meters assesses how real-time feedback influences household energy consumption, considering different types of meters and their effectiveness over a two-year lifetime. Both methodologies use an ex-ante evaluation approach, estimating savings based on statistical data, engagement rates, and consumer behaviour shifts to ensure a structured assessment of awareness-driven efficiency improvements.

The methodologies in Lithuania focus on achieving energy savings through education, consulting, and structured agreements. The methodology for calculating energy savings through education and consulting measures evaluates how consumer awareness campaigns and advisory services influence behaviour, requiring energy suppliers to achieve at least 1% savings from the total energy supplied. The methodology for calculating overall energy savings through energy-saving agreements assesses reductions achieved through agreements between the Ministry of Energy and network operators, comparing consumption before and after implementation. Both methodologies use an ex-ante evaluation approach, estimating energy savings based on behavioural shifts and policy-driven commitments to ensure measurable improvements in efficiency.

The methodology in Poland focuses on energy savings through nationwide information and educational campaigns that influence consumer behaviour. It estimates the impact of awareness initiatives by assessing audience reach, willingness to save energy, and the proportion of people who take concrete actions to reduce consumption. The calculation considers final energy consumption per dwelling and potential reductions through behavioural changes. Using an ex-ante evaluation approach, this methodology quantifies energy savings by linking campaign engagement with measurable shifts in household energy efficiency.

For behavioural changes, methodologies from Austria, Bulgaria, France, Latvia, Lithuania, and Poland estimate energy savings from smart metering, energy consultations, and awareness campaigns. The streamSAVE methodology focuses on feedback-based interventions, including real-time monitoring and tailored advice, using the Energy Saving Factor to quantify savings. It aligns with Commission Recommendation 2019/1658, integrating randomized controlled trials and monitored consumption data, ensuring a more evidence-based and precise evaluation of behavioural energy savings.

Modal Shift in Freight Transport

Table 17 presents the newly identified methodology related to modal shift.

Table 17 –Identified methodologies related to modal shift

Country	Methodology
Hungary	Use of intermodal transport

The methodology in Hungary estimates energy savings achieved by shifting freight transport from road to rail using an ex-ante approach. It applies to companies operating vehicle fleets that integrate rail transport into their logistics, reducing fuel consumption and improving transport efficiency. Energy savings are calculated based on the difference in specific fuel consumption between road and rail transport, considering factors such as payload, transport distance, and trailer weight. The methodology also accounts for rebound, spill-over, and free-rider effects to ensure an accurate estimation of the total final energy savings achieved through intermodal transport solutions.

For modal shift in freight transport, the Hungarian methodology estimates energy savings from switching freight transport from road to rail, considering fuel consumption differences, transport distances, and payload factors. The streamSAVE methodology, based on stakeholder consultations, highlights data inconsistencies and knowledge gaps in modal shift assessments. Instead of estimating individual actions, it evaluates modal shift potential at the national level, incorporating territorial adjustment factors and transport mode energy consumption data from Eurostat and IEA. This approach provides a broader estimation of energy savings potential across different member states, ensuring alignment with Energy Efficiency Directive targets.

4.2. Existing practices for the five new Priority Actions

streamSAVE+ will develop methodologies for five new PAs, which include the following:

- Deep renovations in buildings;
- IT equipment in data centres;
- Cooling in data centres;
- Heat recovery in ventilation;
- Public traffic management.

4.2.1 Methodologies covering the streamSAVE+ Priority Actions

In the 24 catalogues containing 773 bottom-up energy savings calculation methodologies, 37 are related to the 5 PAs to be developed in streamSAVE+. Table 18 provides an overview of the identified methodologies. Notably, the PAs for deep renovation stand out among the new methodologies, counting for 59% of the identified methodologies.

Table 18 – Overview of the identified methodologies related to the previous Priority Actions

Priority Action	Nº of methods	Member State
Deep renovations in buildings	22	AU, CY, CZ, FR, HR, EL, HU, LV, LT, PL, SI, SK
IT equipment in data centres	1	CZ
Cooling in data centres	4	CZ, FR, LU
Heat recovery in ventilation	8	AU, FR, HU, LV, LT, LU, SI
Public traffic management	2	CY, SK
Total	37	

The collected methodologies were systematically compiled using the standardized template and are presented in Annex IV.

Deep Renovations in Buildings

Table 19 presents the newly identified methodology related to deep renovations in buildings.

Table 19 –Identified methodologies related to deep renovations in residential buildings

Country	Methodology
Austria	Major renovations of constructed residential buildings
Austria	Retrofitting of single building components in residential buildings
Austria	Major renovations of non-residential buildings
Austria	Retrofitting of single building components in non-residential buildings
Croatia	Integrated energy refurbishment of residential and commercial buildings
Cyprus	Energy upgrade of the building envelope in buildings of the residential and tertiary sectors
Cyprus	Insulation measures applied to structural elements (roofs) of existing residential & tertiary sector buildings
Cyprus	Methodology used to calculate savings from deep renovation measures & implementation of specific energy efficiency measures in public sector buildings
Czechia	Deep renovations in residential and non-residential buildings
France	Global renovation of a detached house
France	Global renovation of a detached house
France	Insulation of attics or roofs
France	Insulation of walls
Greece	Energy upgrade of the building envelope in buildings of the residential and tertiary sectors
Hungary	Simplified accounting for complex renovation of a condominium in two steps using a factor "k"
Latvia	Methodology for Calculating Energy Savings from Buildings' Thermal Properties Improvement
Lithuania	Methodology for calculating energy savings from renovation / modernisation of residential buildings
Poland	Deep renovations in residential non-residential buildings
Slovakia	Improvements in the thermal performance of residential buildings
Slovakia	Improvements in the thermal performance of non-residential buildings
Slovenia	Deep renovation of residential and non-residential buildings

The methodologies in Austria address energy savings from both major renovations and component-level retrofits in residential and non-residential buildings. These measures aim to improve the thermal performance of building envelopes and, in some cases, heating systems. For major renovations, energy savings are calculated ex-ante by comparing heating demand and hot water demand before and after renovation, adjusted by system-specific effort coefficients. In residential buildings, calculations distinguish between single-family and multi-family houses, while non-residential renovations use project-specific values. Retrofitting individual components such as walls, roofs, windows, or doors uses simplified formulas based on changes in thermal transmittance (U-values), component area, and heating degree days. Standard values for U-values and climate factors ensure consistency across building types. All methodologies assume a 30-year measure lifetime and do not account for rebound, spill-over, or free-rider effects, ensuring a conservative and standardised approach to estimating annual final energy savings.

The methodology in Croatia focuses on integral renovation of residential and service sector buildings by improving both the building envelope and heating systems. Energy savings are calculated ex-ante by comparing the specific heat demand and system efficiency before and after renovation. The calculation considers the building's useful area and uses either project-specific or standardised values, corrected for climatic conditions. It is applicable to cases where both envelope and system upgrades are implemented, as well as projects addressing only the envelope. The method ensures a comprehensive evaluation of energy performance improvements and supports consistent energy savings reporting.

The methodologies in Cyprus target energy efficiency improvements in residential, tertiary, and public sector buildings through envelope upgrades, insulation measures, and deep renovation interventions. For building envelope upgrades, energy savings are estimated by comparing final energy consumption values before and after renovation, based on Energy Performance Certificates and the heated surface area of each building. This method applies to both residential and tertiary buildings. For insulation of structural elements like roofs, walls, and windows, the methodology uses thermal transmittance values (U-values), climate-specific heating and cooling degree days, and correction factors that account for system performance and operation. It enables a flexible yet standardised assessment across different climates and building types. In public sector buildings, energy savings from deep renovations or specific measures are also calculated ex-ante by comparing energy consumption per square metre before and after intervention. This approach supports a consistent evaluation of energy savings across various building types, including offices, hospitals, and schools.

The methodology in the Czech Republic for energy savings in deep renovations of buildings is embedded within broader national frameworks rather than defined as a standalone procedure. It applies to both residential and non-residential buildings and draws on energy assessments, audits, energy performance certificates, and service contracts regulated by national legislation and technical standards. Although deep renovation is not officially defined in Czech law, energy savings are typically calculated using standardised procedures outlined in regulations such as Decree No. 264/2020 and ISO standards like ISO 52016-1. The methodology uses a combination of theoretical (ex-ante) and measured consumption (ex-post) approaches, depending on the documentation used. Final energy savings are calculated by comparing energy consumption before and after the renovation. In practice, the scope includes the building envelope and technical systems, with the potential to extend to appliances when an audit is used. Some subsidy programmes define deep renovation based on performance thresholds, such as significant reductions in non-renewable energy use. The approach accommodates various tools and is applied across all end-use sectors.

The methodologies in France promote energy efficiency through comprehensive renovations and targeted insulation measures in residential and tertiary sector buildings. For multi-family and single-family homes, the methodology applies to complete thermal renovations. An energy audit is mandatory before any intervention, and works must achieve a substantial reduction in primary energy consumption and greenhouse gas emissions. Energy savings are calculated ex-ante using the difference between pre- and post-renovation energy consumption per square metre and the habitable surface area. Any increase in surface area due to conversions or extensions is excluded from the calculation. For tertiary sector buildings, specific methodologies address the insulation of attics, roofs, and walls. These require compliance with minimum thermal resistance values and must be implemented by qualified professionals. Energy savings are estimated using standardised unit savings per square metre, adjusted by climate zone and sector-specific correction factors. All methodologies adopt a standardised ex-ante calculation approach, ensuring transparent and consistent assessments of final energy savings across building types and renovation scopes.

The methodology in Greece targets energy efficiency improvements in residential and tertiary buildings by upgrading the building envelope. This includes specific interventions aimed at reducing space heating and cooling demand, thereby improving the overall thermal performance of buildings. The approach uses scaled savings based on standardised calculations, comparing energy performance before and after the renovation using data from Energy Performance Certificates (EPCs). Final energy savings are estimated ex-ante, using the heated surface area and the change in energy consumption per square metre for each renovated building. The methodology ensures a consistent and structured assessment of the impact of envelope-related energy efficiency measures across multiple buildings.

The methodology in Hungary calculates energy savings from complex renovations of condominiums carried out in two stages: thermal renovation and heating system modernisation. It applies to buildings that are either thermally unrenovated or already renovated but still operate with outdated heating and domestic hot water (DHW) systems. In the first step, thermal renovation must meet minimum insulation standards for walls, windows, and ceilings. The second step involves upgrading the heating system, either through modern boiler replacement or connection to an efficient district heating network. Energy savings are calculated using specific annual energy consumption and an energy efficiency factor (k), which reflects the performance of the heating and DHW systems. The final energy savings are the sum of the savings from both steps. Standardised reference values are provided for heat demand, efficiency factors, and boiler types. The method offers a detailed and structured approach, adaptable to different renovation paths and levels of building performance.

The methodology in Latvia focuses on improving the thermal properties of buildings through measures such as wall and roof insulation, as well as window replacement. It follows an ex-ante approach to estimate final energy savings based on improvements in heat transfer performance. Energy savings are calculated using standardised formulas that consider the area of renovated elements, heating degree days, and the change in thermal transmittance (U-values) before and after intervention. The methodology accounts for the efficiency of the heating system and the lifetime of each measure, with predefined values used to ensure consistency. It is tailored to Latvian climatic conditions and is based on national building standards.

The methodology in Lithuania focuses on improving energy efficiency in residential buildings through renovation and modernisation measures. These include better insulation, efficient heating systems, and the replacement of windows and doors. The goal is to achieve energy class B, cut energy consumption by at least 40%, and enhance comfort and sustainability. Energy savings are calculated by comparing annual consumption before and after renovation, using data from energy audits, utility bills, or smart meters. The methodology relies on performance indicators from energy performance certificates and follows national regulations to ensure consistency and accuracy. It adopts an ex-ante approach, estimating first-year savings while accounting for improved efficiency and reduced losses.

The methodology in Poland addresses deep renovations through several national programmes, although no single unified definition or dedicated method is applied. Deep renovations are generally guided by energy audits and are supported through measures such as the Thermo-modernisation and Renovation Fund, the Housing Buildings Energy Efficiency Programme, and schemes for the public sector. These programmes require comprehensive upgrades to building envelopes and technical systems, aiming to meet the national Technical Conditions Regulation, often targeting nearly zero-energy building standards. Deep renovation is typically characterised by achieving substantial energy savings or meeting specific performance thresholds, such as a 60% energy reduction or a primary energy demand below defined limits. Energy savings are calculated using an ex-ante approach, based on mandatory or simplified energy audits. Various formulas are used depending on the programme, often considering factors like total energy use, surface area, or unit savings. While rebound, spill-over, and free-rider effects are not included, these methodologies rely on audit-based data and regulatory benchmarks to ensure consistent and scalable energy savings assessments.

The methodology in Slovakia addresses energy savings from major renovations in residential buildings, particularly single-family homes and apartment blocks. The focus is on improving thermal performance and modernising building systems to meet national energy efficiency requirements. Energy savings are calculated ex-ante by comparing the building's energy performance before and after renovation, based on energy performance certificates or technical project assessments. In apartment buildings, ex-post calculations using measured consumption over a three-year baseline may also be applied. Deep renovation projects must achieve a significant reduction in heating demand—typically at least 35%—and may include additional upgrades such as insulation, efficient heating systems, hot water production, or use of renewable energy. When specific baseline data is unavailable, estimations rely on historical norms based on construction year and building category. The approach uses standardised national methods and climate data to ensure accuracy and consistency in reported energy savings.

The methodology in Slovenia estimates energy savings from deep renovation of residential and non-residential buildings. This comprehensive approach targets both the building envelope and technical systems (e.g. heating, cooling, ventilation, and domestic hot water), aiming to exploit all cost-effective energy saving potentials in a single coordinated intervention. Energy savings are calculated ex-ante as the difference in annual heating demand before and after renovation, adjusted based on the type of new heating system installed—such as a boiler, heat pump, thermal substation, or district heating. Standardised values and performance factors for different systems are used to ensure consistency. The methodology follows national and EU standards, offering tailored formulas for various renovation configurations and technologies, including efficiency gains and system-specific characteristics.

IT Equipment in Data Centres

Table 20 presents the newly identified methodology related to IT equipment in data centres.

Table 20 –Identified methodologies related to IT equipment in data centres.

Country	Methodology
Czechia	Data centres - IT equipment

The methodology in the Czech Republic for calculating energy savings from IT equipment in data centres is not defined in a dedicated document but follows general procedures outlined in national legislation. These procedures are described in a broader methodology for reporting energy savings under the Energy Efficiency Directive and rely on tools such as energy audits, assessments, and performance certificates. Energy savings are typically calculated by comparing electricity consumption before and after the replacement or upgrade of IT equipment. Although the approach is flexible, it follows legal and technical standards established in decrees related to energy assessments and audits. The system boundary is the data centre itself, and while no specific values are standardised, savings are calculated ex-ante based on known consumption differences. This allows the methodology to be applied across various equipment types and end-use sectors.

Cooling in Data Centres

Table 21 presents the newly identified methodology related to cooling in data centres.

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Table 21 –Identified methodologies related to cooling in data centres.

Country	Methodology
Czechia	Energy assessment (according to legislation) - Data centres - Cooling
France	Hot aisle and cold aisle containment system in a data centre
France	Free-cooling by cooling water replacing a chiller for air
Luxemburg	Improvement of the energy efficiency of a data centre

The methodology in the Czech Republic for calculating energy savings from data centre cooling systems follows general legislative procedures used for energy assessments and audits. These assessments are governed by national decrees and technical standards and apply across all end-use sectors. Energy savings are calculated by comparing energy consumption before and after implementing cooling efficiency measures. The method primarily uses electricity consumption data and is based on an ex-ante approach. While no specific standard values are provided, the approach relies on consistent system boundaries and established energy auditing practices to estimate first-year savings. This allows flexible application across different cooling technologies within data centres.

The methodologies in France aim to improve energy efficiency in data centres by optimising cooling systems. Two main approaches are addressed: the installation of hot and cold aisle containment systems, and the integration of free-cooling systems using outside air. One methodology focuses on separating hot and cold airflows using rigid, airtight partitions. This containment system must follow a preliminary dimensioning study to ensure proper design and must result in a controlled supply air temperature. Only new installations or expansions are eligible, and savings are estimated based on the increase in setpoint temperatures and the nominal cooling power. The free-cooling methodology applies to air-conditioned buildings where a chiller unit is replaced or complemented by a system that uses outdoor air and water to meet cooling demands. The system must be capable of covering all nominal cooling needs under specified outdoor conditions and must include automation and control. Energy savings are calculated in advance using parameters such as climatic region, nominal cooling power, and the type of application. Both methodologies rely on ex-ante estimations of final energy savings, using standard formulas and predefined correction values tailored to climate zones and building types.

The methodology in Luxembourg focuses on improving the energy efficiency of data centres by reducing the Power Usage Effectiveness (PUE) indicator, which measures the ratio of total energy consumption to the energy used by IT equipment. This approach applies to both the industrial and tertiary sectors, particularly when IT infrastructure is migrated to more efficient data centres. Energy savings are calculated ex-ante based on the difference in PUE values before and after the intervention, assuming that the energy consumption of IT equipment remains stable. The calculation follows the Green Grid’s PUE Category 2 methodology, using 12-month energy data and consistent measurement boundaries. When post-intervention PUE values are not available, standardised reference values by year can be used. The method ensures reliable and comparative energy performance assessment for data centre efficiency upgrades.

Heat Recovery in Ventilation

Table 22 presents the newly identified methodology related to heat recovery in ventilation.

Table 22 –Identified methodologies related to heat recovery in ventilation.

Country	Methodology
Czechia	Energy assessment (according to legislation) - Heat recovery & ventilation
France	Single flow ventilation with constant modulated air flow
France	Double flow mechanical ventilation with constant or modulated air flow exchanger
Hungary	Replacement of heat recovery integrated into ventilation systems

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Latvia	Methodology for Calculating Energy Savings from Installation of a Ventilation System with Heat Recovery
Lithuania	Methodology for auditing energy consumption in buildings
Luxembourg	Implementation of Controlled Mechanical Ventilation with Heat Recovery
Slovenia	Heat recovery systems in buildings

The methodology in the Czech Republic for calculating energy savings from heat recovery and ventilation systems follows national legislative procedures and technical standards. It applies to all end-use sectors and covers various building technologies, using energy assessments and energy performance certificates as key tools. Final and primary energy savings are calculated using ex-ante methods by comparing energy consumption before and after implementing the measures. These calculations consider individual energy carriers such as electricity or natural gas and follow standardised formulas. While no fixed values are provided, primary energy factors are defined by national regulation. The approach ensures consistency in evaluating the energy impact of heat recovery and ventilation upgrades.

The methodologies in France aim to improve energy efficiency in the tertiary sector through the installation of single-flow and dual-flow mechanical ventilation systems. These systems can operate with either constant or modulated airflow rates and are designed to optimise ventilation according to occupancy. For single-flow systems, ventilation may be constant or modulated based on occupancy sensors or CO_2 levels. The systems must meet strict energy performance criteria, including limits on electrical power consumption. Energy savings are calculated in advance, based on ventilated area, airflow control type, climate zone, and sector-specific correction factors. Dual-flow systems include heat exchangers to recover energy from exhaust air. They can also be modulated and must achieve high exchanger efficiency and low electrical consumption. Like single-flow systems, energy savings are estimated ex-ante using standardised formulas and regional correction values, with separate factors for different building uses and control strategies.

The methodology in Hungary estimates energy savings from replacing heat recovery units integrated into ventilation systems, focusing on the heating function. It applies to a wide range of buildings, including residential, educational, healthcare, and industrial facilities. Energy savings are calculated ex-ante using technical parameters such as air change rate, heat recovery efficiency (old and new), ventilated volume, and operating hours during the heating season. Two cases are considered: early replacement and replacement after the end of the old unit's lifetime. In the latter case, savings are only counted above the Ecodesign minimum efficiency. The calculation follows EU regulations and assumes standardised values when documentation is unavailable, ensuring consistent and transparent assessments of ventilation system upgrades.

The methodology in Latvia focuses on calculating energy savings from the installation of ventilation systems with heat recovery, such as recuperators. It applies an ex-ante approach and is designed to estimate long-term energy savings based on the thermal recovery of heated indoor air. Savings are calculated using parameters including the number of units installed, building volume, ventilation duration, air properties, and the temperature difference during the heating season. A standard heat recovery efficiency is assumed, and the measure's lifetime is considered in the final calculation. This approach provides a structured and scalable method to assess the impact of heat recovery ventilation on building energy performance.

The methodology in Lithuania calculates energy savings from the installation of heat recovery units in mechanical ventilation systems. It uses an ex-ante approach based on the monthly heat demand difference between systems with and without recuperators. Key parameters include air flow rate, air density, temperature difference, specific heat of air, heat recovery efficiency, and operational time. The method follows national technical standards and considers both measured and standardised inputs. Energy savings are estimated as monthly values, accounting for technical heat losses and system-specific characteristics, providing a reliable way to assess ventilation efficiency improvements.

The methodology in Luxembourg calculates energy savings from implementing or improving controlled mechanical ventilation systems with heat recovery in residential and functional (non-residential) buildings. It covers new installations as well as efficiency upgrades to existing systems. The calculation distinguishes between residential buildings (using reference surface area) and functional buildings (using airflow rate). Energy savings are estimated ex-ante based on specific useful energy savings and adjusted using an expenditure factor that reflects the type of heat production system. The methodology uses standardised values for fan electricity consumption and heat production efficiency, and assumes a 25-year lifetime for the measure. This approach offers a structured and adaptable framework for assessing the impact of mechanical ventilation with heat recovery across various building types and heating technologies.

The methodology in Slovenia calculates energy savings from heat recovery systems in buildings by estimating the heat transferred from exhaust to supply air in ventilation systems. It applies to both centralised and local ventilation configurations in residential and other buildings. Energy savings are determined ex-ante using standard parameters such as building area, room height, air exchange rate, operating hours during the heating season, air temperature difference, air properties, and heat recovery efficiency. Normalised values are used to simplify the calculation, ensuring consistent estimates across similar building types. This method provides a reliable assessment of annual energy savings from waste heat recovery in ventilation systems.

Public Traffic Management

Table 23 presents the newly identified methodology related to public traffic management.

Table 23 –Identified methodologies related to public traffic management.

Country	Methodology
Cyprus	Methodology used to calculate savings from the use of GPSs in vehicles
Poland	Public traffic management
Slovakia	Support for public passenger transport

The methodology in Cyprus estimates energy savings from the use of GPS systems in vehicles across various categories, including passenger cars, light and heavy-duty vehicles, and buses. It uses an ex-ante approach based on the reduction in fuel consumption due to more efficient routing and driving behaviour facilitated by GPS. Savings are calculated using the number of GPS-equipped vehicles, average energy consumption per kilometre, annual mileage, and a fixed energy savings factor. The methodology also accounts for the rebound effect from potentially increased vehicle usage. Standardised values are provided for different vehicle types, making the method applicable across the transport sector.

The methodology in Poland for calculating energy savings from public traffic management lacks a dedicated and unified framework but draws from broader policy documents such as the National Energy Efficiency Action Plan and the Operational Programme Infrastructure and Environment. The most relevant measure is the "Development of public transport in cities," which includes infrastructure upgrades and intelligent transport systems. Energy savings are generally estimated using deemed or scaled savings methods, and a formula from the older Operational Programme Infrastructure and Environment is referenced. This approach calculates savings based on investment in traffic management systems, adjusted by unitary savings rates and conversion factors. However, detailed guidance on quantifying non-vehicle-specific savings is limited, and the methodology mainly supports high-level policy analysis rather than detailed project-level evaluation.

The methodology in Slovakia for supporting public passenger transport focuses on enhancing sustainable mobility through infrastructure modernisation, vehicle upgrades, and improved management systems. It includes measures such as developing transport terminals, introducing alternatively powered vehicles, and implementing intelligent transport systems. Energy savings are calculated by comparing annual fuel consumption before and after project implementation. The approach relies on survey-based data, as outlined in Decree No. 327/2015, with specific energy saving factors applied depending on the type of survey conducted. The methodology estimates first-year savings and is used to track cumulative energy savings across all implemented projects, supporting national energy efficiency targets.

5. Conclusion

The streamSAVE+ project builds on the H2020 streamSAVE initiative to support EU Member States (MSs) in improving energy savings calculations and aligning with the Energy Efficiency Directive (EED) recast. Despite previous efforts, challenges remain in ensuring accurate methodologies and high-quality data. StreamSAVE+ addresses these gaps by promoting best practices and focusing on key EED requirements, strengthening national capacities for policy implementation and reporting.

This report provided an overview of bottom-up energy savings methodologies across MSs, evaluating the need for updates to the 10 Priority Actions (PAs) from streamSAVE and characterising methodologies for five newly identified PAs. The data collection process, involving all project partners, updated and translated methodologies while ensuring consistency in descriptions, equations, and cost-effectiveness assessments. The review also examined situational correction factors to improve reliability.

A total of 24 catalogues containing 773 methodologies across 22 countries and two research projects were analysed. The residential sector had the highest number, followed by the commercial, industrial, and transport sectors, while agriculture, forestry, and fishing remained underrepresented. Although space heating and cooling are well covered, areas like building automation, domestic hot water, and energy poverty require further methodological development.

Among the 235 new methodologies identified, 66 relate to the 10 streamSAVE PAs, with electric vehicles, lighting, energy poverty, and behavioural changes being the most represented. These methodologies were compared with those developed in streamSAVE to assess their alignment and improvements. The findings confirm that streamSAVE methodologies provide a structured, standardised, and scalable framework for energy savings calculations, integrating EU-wide data sources, correction factors, and cost assessments. Their broad applicability enhances comparability across MSs, supporting effective policymaking and progress toward energy efficiency targets.

The same approach was applied to five new Priority Actions introduced in streamSAVE+, identifying and characterizing relevant existing methodologies for the areas of deep renovations in buildings; IT equipment in data centres; cooling in data centres; heat recovery in ventilation; and public traffic management. Such methodologies will constitute the baseline for the development of the methodologies for the five new PAs.

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List of tables

Annex I. Template for Calculation Methodologies

1. [Exact name of the calculation methodology – Name of MS]

[Short explanation of what this calculation methodology is about.

Application area: What is its application area? For example, for which type of technology, end-use, or sector can this methodology be used?

Boundary conditions: Under which conditions (which sector, which geographical or climate coverage) can it be used? Are there other restrictions from using this formula or the values prepared? (e.g., values are only prepared for retrofitted/non-retrofitted buildings, etc.)]

2. Calculation of Final Energy Savings

2.1 Formula

State the formula - please use the formula editor, regardless of whether it is necessary or not in your case, as this will lead to a consistent look in the final documents

Afterward, explain all terms used in the formula in the table below – including the units. For terms without unit (e.g., number of appliances affected), state [-]. Check the example below.

The template also features correction factors for the rebound, spill-over, and free-rider effects. In case they are not used in the specific methodology within a MS, enter (=1) in the table. Otherwise, state the value for the correction factor in the table.

In case the formula calculates cumulative savings, indicate how this is done as well (factor “lt” has been added for this purpose, of course, you can change this according to the actual calculation).

This formula calculates [first-year savings / cumulative savings – Choose one].

$$TFES = (FEC_{before} - FEC_{after}) \times rb \times so \times fr \times lt \quad (1)$$

Parameters used in the formula for final energy savings

Parameter	Description
TFES	Total final energy savings [kWh/a]
FEC_{before}	Final energy consumption before implementation of the action [kWh/a]
FEC_{after}	Final energy consumption after implementation of the action [kWh/a]
rb	Factor to calculate a rebound effect
so	Factor to calculate a spill-over effect
fr	Factor to calculate a free-rider effect (=1)
lt	Factor for the lifetime of savings

2.2 Standardized Calculation Values

If possible, please try to summarize the values given in a certain MS in a table. The next table has a quick example of how this could be done.

If there are no calculation values available for the MS, simply state: “No calculation values available for this methodology.”

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Indicative values for calculation of final energy savings

Parameter	Value	Unit
FEC_{before}		
FEC_{after}		
rb		
so		
fr		
lt		
…		

In case there are calculation values available, please also explain (in a short and concise manner) how they were defined. What data was used? Where was this data taken from? How often are the values updated? This does not need to be a long explanation but should only be an "inspiration" on how to identify data for calculation values.

3. Calculation of Primary Energy Savings

3.1 Formula

State the formula - please use the formula editor, regardless of whether it is necessary or not in your case, as this will lead to a consistent look in the final documents

Afterward, explain all terms used in the formula in the table below – including the units. For terms without unit (e.g., number of appliances affected), state [-]. Check the example below.

The following formula is used to calculate the annual primary energy savings:

$$\mathrm{APES} = TFES \times PEF_{Electricity} \qquad (2)$$

Parameters used in the formula for primary energy savings

Parameter	Description
APES	Annual primary energy savings [kWh/a]
TFES	Total final energy savings [kWh/a]
$PEF_{Electricity}$	Primary Energy Factor for electricity [dmnl]

3.2. Standardized Calculation Values

MS as well as calculation methodology. If possible, please try to summarize the values given in a certain MS in a table. The next table has a quick example of how this could be done.

If there are no calculation values available for the MS, simply state: "No calculation values available for this methodology."

Indicative values for calculation of primary energy savings

Parameter	Value	Unit
$PEF_{Electricity}$		

In case there are calculation values available, please also explain (in a short and concise manner) how they were defined. What data was used? Where was this data taken from? How often are the values updated? This does not need to be a long explanation but should only be an "inspiration" on how to identify data for calculation values.

4. Calculation of Greenhouse Gas Savings

4.1. Formula

If available, please include information regarding the greenhouse gas savings calculations.

Bellow you can find an example.

$$GHGSAV = TFES \times f_{GHG,electricity} \times 10^{-6} \quad (3)$$

Parameters used in the formula for greenhouse gas savings

Parameter	Description
GHGSAV	Greenhouse gas savings [t CO_2 p.a.]
TFES	Total final energy savings [kWh/a]
$f_{GHG,electricity}$	Emission factor for electricity [g CO_2/kWh]

4.2. Standardized Calculation Values

If possible, please try to summarize the values given in a certain MS in a table. The next table has a quick example of how this could be done.

If there are no calculation values available for the MS, simply state: “No calculation values available for this methodology.”

Indicative values for calculation of greenhouse gas savings

Parameter	Value	Unit
Electricity		
Natural Gas		

In case there are calculation values available, please also explain (in a short and concise manner) how they were defined. What data was used? Where was this data taken from? How often are the values updated? This does not need to be a long explanation but should only be an “inspiration” on how to identify data for calculation values.

5. Overview of Costs Related to the Action

5.1. Cost-Effectiveness

Please state information on cost related to the action and/or on the cost-effectiveness calculation. Is there information regarding the costs of the actions? How has this information been calculated? What costs were included in the analysis? What criteria were used to evaluate the cost-benefit (e.g., NVP, payback time)? If available, also explain what sources were used for the calculation, including which year(s) the data was taken from.

If there is no information on cost-effectiveness available for the MS, simply state “No information on cost-effectiveness available for this methodology.”

The costs related to the action are as follows:

- Initial investment with the purchase of efficient equipment = 250€/equipment;
- Maintenance costs = 5€/year/equipment;
- Operating costs, mainly with electricity consumption = 15€/year/equipment.

Estimation of cost-effectiveness

$$\boldsymbol{CE} = \frac{PV}{eff} \tag{4}$$

$$\boldsymbol{PV} = \frac{V_y}{(1+r)^t} \tag{5}$$

Parameters used in the estimation of cost-effectiveness

Parameter	Description
CE	Cost-effectiveness
PV	Present value
eff	Effectiveness, e.g. savings achieved
Vy	Value in a particular year
r	Discount rate
t	Litefime
…	…

5.2. Standardized Values

If possible, please try to summarize the values given in a certain MS in a table (using the template's design for tables). The next table has a quick example of how this could be done.]

If there are no calculation values available for the MS, simply state: "No calculation values available for this methodology.

Indicative values for cost-efficiency evaluation

Parameter	Value	Unit
Investment		
Maintenance		
Operating		
…		

In case there are calculation values available, please also explain (in a short and concise manner) how they were defined. What data was used? Where was this data taken from? How often are the values updated? This does not need to be a long explanation but should only be a "inspiration" on how to identify data for calculation values.

6. Methodological Aspects

Refer here to the methodological aspects of the formulas.

You can also state whether this methodology was taken from officially published legal documents or suggestions made by the government or if this methodology is common practice in the relevant country. If there is a document available online, also include a weblink.

Additionally, state the language(s) of the original document.]

7. Bibliography

[List all the references cited in bibliography style

Use the APA citation style – see https://www.library.cornell.edu/research/citation/apa for details]

Annex II. List of BU Methodologies (attached bellow)

Annex III. New methodologies in scope of streamSAVE Priority Actions (attached bellow)

Annex IV. Methodologies in scope of streamSAVE+ Priority Actions (attached bellow)

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