streamSAVE+ Dialogue Meeting #01

Streamlining Energy Savings Calculations

Assessing energy savings from deep retrofit programmes

MINUTES OF THE MEETING

Date: 22 October 2024 **Duration:** 11:00 – 12:30 (CET)
Online

Short summary:

This first dialogue meeting of streamSAVE Plus discussed how energy savings from deep retrofits of buildings can be assessed. Examples from the Czech Republic, Croatia and Ireland, covering non-residential, public and residential buildings showed a diversity of approaches, each with pros and cons.

The Czech example requires an energy assessment that is an intermediate approach between a detailed energy audit and Energy Performance Certificates. The baseline energy consumption is defined from metered energy consumption data. Energy savings are then calculated against this baseline energy consumption, based on the gains estimated for the actions recommended in the energy assessment.

The Croatian EMIS online information system enables to monitor buildings' energy consumption based on metered data, and then to assess energy savings by comparing the metered energy consumption after retrofit with a baseline energy consumption defined from the metered consumption before retrofit, with weather adjustments (using heating degree days). However, a metering point may include data from several buildings, and more parameters would be needed to understand unexpected trends (e.g. changes in occupancy). Further improvements are under development.

The Irish example assesses energy savings from the difference in the Building Energy Rating (Irish Energy Performance Certificate) before and after retrofit, by connecting the EEOS database (ECMS) with the BER database. A correction factor is applied to take into account uncertainties in the BER data.

These examples show that the design of the scheme and the use of online platform enable data collection and monitoring of energy savings in a systematic way.

A key discussion point was then whether to choose metered data or engineering estimates to assess energy savings from deep retrofits. While metered energy consumption data provide results in terms of actual reduction in energy consumption, they require complementary data more or less easy (weather data) or difficult (behaviours) to monitor. Engineering estimates include uncertainties related to the assumptions made in the calculations but are not sensitive to changes in buildings' occupants. Overall, assessments aim at being as close to reality as possible, either by applying correction factors (to engineering estimates) or adjustments (to metered data), while acknowledging that some factors are outside of what the policy can control. The objective is to provide results that are reliable enough so that stakeholders can trust them.

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Agenda

11:00 – 11:10	Official opening and short introduction to the project
	PART 1: Czech programme for non-residential buildings
11:10 – 11:25	Presentation of new parameters within the supporting scheme for non-residential buildings focusing on deep renovations **Miroslav Honzík** (Czech Ministry of Industry and Trade) & **Jiří Karásek** (SEVEn)
11:25 – 11:30	Q&A
	PART 2: Croatia's programme for public buildings renovation
11:30 – 11:45	Monitoring energy consumption in renovated public buildings in Croatia through Energy Management Information System (EMIS) **Valentina Madžarević**, Croatian Real Estate Agency (APN) and **Vanja Hartman**, EIHP
11:45 – 11:50	Q&A
	PART 3: Deep renovation of residential buildings in Ireland
11:50 – 12:05	Monitoring energy savings from deep retrofits in domestic buildings **James Palmer** (SEAI)
12:05 – 12:10	Q&A
12:10 – 12:15	Open discussion and closing

Introduction and welcome to the participants

Introducing streamSAVE+ and the dialogue meetings, by Jiří Karásek (SEVEn)

(see also presentation file available on the streamSAVE+ website)

streamSAVE Plus aims at supporting the development of new policies and harmonisation of methodologies to calculate energy savings. It will broaden the scope of energy efficiency actions that can be monitored and reported to the EED, and more specifically Article 8 EED.

The key components of the project include the Knowledge Hub (collecting calculation methodologies and developing new ones), Knowledge Exchange (= the dialogue meetings and workshops), Capacity Support (direct exchanges with Member States) and Policy Analysis (new component in this project).

Project partners include the Czech Energy Efficiency Center (SEVEn), the Flemish Institute for Technological Research (VITO), the Institute for European Energy and Climate Policy (IEECP), the Austrian Energy Agency (AEA), Slovenia's Jožef Stefan Institute (JSI), Greece's Centre for Renewable Energy Sources and Saving (CRES), Portugal's Institute of Systems and Robotics – University of Coimbra (ISR-UC), Croatia's Energy Institute (EIHP) and the Bulgarian Center for Energy Efficiency (EnEffect).

Website: https://www.svn.cz/streamsaveplus

Part 1 - Czech programme for non-residential buildings

Support of energy savings in the Framework of OP TAC 2021 – 2027: Czech programme for non-residential buildings, by Miroslav Honzík (Czech Ministry of Industry and Trade) and Jiří Karásek (SEVEn)

(see also presentation file available on the streamSAVE+ website)

Miroslav Honzík introduced the Operational Programme Technology and Application for Competitiveness (programming period 2021-2027), focusing on its priority 4 (shift to low carbon technology). The programme is implemented by the Czech Ministry of Industry and Trade, with a budget of EUR 3.1 billion, providing grants and financial instrument primarily meant for SMEs. As it provides financial incentives to companies, the programme needs to comply with the EU State Aid regulation.

Specific axis 4.1 of the programme is about the support of energy efficiency (energy savings) and reduction of CO2 emissions, with a budget of 500 million euros, aiming at achieving 3.3 PJ energy savings. Deep renovations have been newly introduced among the eligible projects, during the 2nd call of axis 4.1 (200 million euros), running until 31 October 2025 (projects need to be completed by end of October 2026). As of October 4th 2024, a total of 136 applications amounts to total eligible expenses of about EUR 117 million and with a requested contribution of about EUR 57 million.

Eligibility criteria include a maximum ratio of cost per energy saving. The maximum amount of specific eligible cost per annual energy saving in final energy consumption for calculating the subsidy is 1 000 EUR/GJ per year (i.e. 3 600 EUR/MWh).

The grant rates include bonus rates according to the size of the companies, and the location/region. A special bonus rate is applied for building renovations achieving at least 40% primary energy savings.

Applications need to submit an Energy Assessment, done by a qualified assessor (i.e. registered with the Ministry of Industry and Trade). The assessment defines the baseline energy consumption based on actual energy consumption data, averaged over 2 years, and includes a cost-benefit assessment, economic and ecologic feasibility assessments, evaluation of the proposed project according to the specifications of the managing authority and evaluation of the measures recommended or implemented. Expenses for the Energy Assessment are eligible cost.

The evaluation of the applications includes 10 criteria that applications need to comply with. Projects need to achieve energy savings in final energy consumption, minimum primary energy savings of 20 to 40% depending on the application type (30% for building renovations), meets all relevant conditions of the call, and an additionality / cost-effectiveness criteria (IRR value before tax and without subsidy shall be less than 20%). The calculation of the subsidy does not exceed 25 000 CZK (about EUR 985)/GJ per year.

For projects dealing with building renovations, specific technical requirements apply, considering two options. The new second option, for deep renovation, requires to achieve a primary consumption of non-renewable energy of not more than 80 kWh/m².year.

Q&A

— *Do you use Energy Performance Certificates or another different certificate for the energy assessment?*

The preferred assessment is an energy audit based on actual energy consumption (2 years average, invoiced consumption/metered data from the energy bills). If not available (e.g. for a new site), applicants may use the Energy Performance Certificate (1.2 times reference building value of primary consumption).

— *Do you perform economic feasibility analysis or financial feasibility analysis?*

The ministry requires an economic analysis (before tax), without including the subsidy. It is based on an energy assessment in line with energy audit criteria set in the EED, including the criteria for economic evaluation of the savings.

Part 2 - Croatia’s programme for public buildings renovation

Monitoring and reporting on energy consumption and savings in renovated public buildings in Croatia through EMIS System, by Valentina Madžarević (Croatian real estate agency - APN) and Vanja Hartman (Energy Institute Hrvoje Požar - EIHP)

(see also presentation file available on the streamSAVE+ website)

Valentina Madžarević presented EMIS (Energy Management Information System) used to monitor and analyse energy and water consumption in public buildings in Croatia, being used for systematic energy management (as set in the Energy Efficiency Act of 2014). It is a web-based system.

Clarifications that the metering points do not always correspond to a single building. Several buildings (for example, the complex of buildings in the hospital) can be monitored by the same metering point under the Energy Consumption Center (ECC = point where the consumption is monitored). In total, the

EMIS includes almost 46 000 ECCs of which 21 000 are for buildings stock and almost 24 000 for public lighting.

EMIS includes various modules to enable users compile data in different ways and make the analyses they need to improve their energy management. Data is collected monthly via monthly bills, but EMIS also allows more frequent meter readings. EMIS also allows monitoring data for other parameters (e.g. indoor temperature, CO_2, indoor humidity, VOC). Preference for data remotely sent (by energy and water suppliers, and from smart meters), to avoid human errors. But manual entries are possible.

The Advanced Analyzer provides data overviews and customized data exports (in different formats), including achieved savings. More specifically, the Advanced Analyzer includes a functionality to verify energy savings, by calculating a baseline (average consumption for the reference period, considering electricity consumption and heating consumption) and comparing with the consumption in following years. The user can select the reference period. The methodology makes use of data on heating degree days and heated areas.

Out 810 building renovations done between 2016 and 2019, 229 metering points have been selected and examined to monitor the resulting energy savings. Selection criteria for these metering points include having complete and checked data series from 2015 to 2023, and having a sample of buildings covering the different Croatian regions.

Vanja Hartman presented the analyses done on these metering points and buildings. These buildings include mostly buildings for educational purposes (55% of the areas in the sample), but also include hospitals (23%), mutiapartment buildings (10%), office buildings (9%) or sport-halls (2%).

One can analyze and report on a single ECC or group of ECCs (e.g. the municipality level, the company level), depending on the user´s preference. Also, the user can choose the type of analysis to perform, and the format displayed (tables, maps or charts), with different level of aggregation.

The second specific functionality of the advanced analyzer is the verification system. The model includes the calculation of achieved savings with adjustments to final consumption. This analytical module is currently under development in which the methodology for calculating energy savings is integrated. Reference period corresponds to the three years before the retrofit.

The results showed decrease of the energy consumption. But a new increase in energy consumption was observed in some ECCs after some years, which could be because of higher standard of comfort or higher occupancy, according to verification with energy bills. It is therefore important to examine each building separately when investigating the reasons for unexpected trends. A new module with additional factors is being developed.

Q&A

— *Do you perform other adjustments factors than weather conditions, such as occupancy?*

Currently we use adjustment factors for heating degree days and type of building. We are developing a new model which will include also cooling degree days as well. This implies to allocate energy consumption from the metering points (ECCs) to the corresponding buildings, and to separate heating consumption and cooling consumption.

— *Does the adjustment for heating-degree-days (HDD) include an analysis of the correlation between HDD and energy consumption?*

Adjustment in EMIS analytics is done is such way that consumption of heating energy of an ECC is divided by HDD. And we get HDDs from Croatian meteorological and hydrological institute and is adjusted according to the meteorological station that is closest to the ECC's location.

— *Do you monitor fleet vehicle/transport in such information system?*

We are currently testing a transport module developed in EMIS. We want to include the data and track transport consumption not only for vehicle fleet but for public transport too.

Part 3 - Deep renovation of residential buildings in Ireland

Monitoring of energy savings from domestic deep retrofit: Ireland's EEOS, by James Palmer (Sustainable Energy Authority of Ireland - SEAI)

(see also presentation file available on the streamSAVE+ website)

James Palmer presented briefly the current context of Ireland's EEOS (Energy Efficiency Obligation Schemes), setting energy savings targets to energy suppliers. 10% of the energy savings need to be achieved in the residential sector, and a further 5% in the 'energy poverty' scope. James reminded the possibility to cumulate financial incentives offered by the energy suppliers with public grant schemes (e.g. for deep renovations: 'One Stop Shop' scheme, and 'Communities Energy Grants' scheme). The current rules of the EEOS have been adopted in 2022.

The National Retrofit Plan adopted in 2021 set the specific target of 500,000 home energy upgrades to B2 Energy Rating by 2030, in line with the overall target of Ireland's Climate Action Plan to reduce GHG emissions in the residential sector by 40%. The National Retrofit Plan aims at shifting from shallow renovations to deep retrofits, to achieve substantial impacts on the residential energy consumption and on tackling energy poverty.

Key tool for monitoring is the Building Energy Rating (BER) (Irish Energy Performance Certificates for Buildings, using the Dwelling Energy Assessment Procedure – DEAP standard). BERs allow for the comparison of energy performance of dwellings on a like-for-like basis.

BER is also used to set minimum requirements for renovation projects to be eligible to the EEOS. Renovation to achieve the minimum of B2 rating can be done at once or stepwise (then meeting the B2 pathway requirements). Requirements are more stringent in case of renovation tackling energy poverty (cf. 5% 'energy poverty' sub-target in the EEOS), to focus on the least efficient buildings (rating before works should be D2 or worse) and dwellings owned by social welfare recipients or local authorities (equivalent to social housing).

Final energy savings are calculated as the difference between the BER pre- and post-work, multiplied by the correction factor.

The Energy Credit Management System (ECMS) gathers the data reported online by the obligated parties, including the types of actions implemented and an identifier ('MPRN') for each house, that prevents double counting and enables linking with the BER database. ECMS then automatically calculates the energy savings. ECMS enables obligated parties to track their results and progress against targets, and SEAI to monitor the results of the EEOS.

Based on ECMS data, obligated parties have provided support to 5300 deep retrofits between January 2023 and October 2024 (3900 under residential target, 1300 under the energy poverty scheme).

Q&A

— *You showed us a formula for calculating the final energy savings. What is the correction factor used?*

The correction factor is based on the recommendation done by external consultants from a study comparing BER data with actual energy consumption.

— *How do you assess energy consumption in BER*?

The BER makes use of data specific to the building assessed, to estimate its conventional energy consumption (according to the DEAP standard). From the linkage between ECMS and the BER database, we have data on conventional energy consumption before and after renovation. We do not include data on occupation of the house etc. Some specificities of the building can be included in the correction factor.

— *What is the reporting success rate for residential sector? How difficult is it to collect the data?*

Obligated parties shall upload all the projects/actions. So there is no big difficulty so far. Data completion and compliance are directly checked by the online platform, projects cannot be recorded if data is not complete.

— *You showed us results of 5 300 deep retrofits in residential buildings, to be compared with Ireland's target of 500 000 deep retrofits. What are the additional measures to meet the target?*

The 5 300 reported buildings are since January 2023 up to October 2024 under the EEOS only. The target of 500 000 is for the results from all schemes together, including public scheme grants, and it is to be achieved by 2030 (so 6 more years).

Open discussion

The main discussion point was about whether it is better to monitor energy savings from deep retrofits based on metered energy consumption data (like with EMIS in the Croatian example) or based on estimated energy consumption (like with BERs in ECMS in the Irish example) or a combination of both (like in the Czech example with the baseline based on metered data and energy savings based on the gains estimated in the energy assessment for the recommended actions).

Energy savings are sometimes calculated by comparing real (i.e. metered) energy consumption before and after the retrofit. However, in many cases, it is not possible to know detailed parameters about the dwelling prior to the retrofit, such as how it was used or how many people lived in it. And it is also difficult to know how the building is used after the retrofit. The calculations most often include data on energy consumption and no other factors/measurements, such as behavior-related parameters that are indeed difficult to monitor or measure.

This is why it is often preferred to assess energy savings from engineering estimates, considering a typical (standard) use of the building to determine conventional energy consumption.

The choice between metered data and engineering estimates indeed depends on the objective of the scheme and what should be monitored. When using engineering estimates, the objective is to assess energy savings from the improvement of the building's energy performance, assuming a standard use of the building. When using metered data, the objective is to assess the actual reduction in energy consumption, which takes into account possible changes in occupants' behaviours, or more generally in the use of the buildings. Which can also be used to improve energy management in buildings. It is also more relevant when assessing cost-effectiveness from the building owner's or occupant's viewpoint.

Another point is that the occupants of the buildings can change over time. For example, if a dwelling was occupied by an elderly person and is then occupied by a student, this can significantly change the actual energy consumption (metered data), while the dwelling remains the same. Therefore, when evaluating a policy, this can argue in favour of using estimates of conventional energy consumption.

Nevertheless, assumptions made on behaviours can have a significant impact on the estimates. More generally, the question of how to measure the actual impacts is essential. When using an engineering method, the objective should therefore be to get the estimates as close to reality as possible, by refining the assumptions and applying correction factors when relevant (e.g. rebound effect). Meanwhile, it is important to acknowledge that some factors are outside of what the policy can control (as it is done when correcting for weather conditions), while providing results that are reliable enough so that stakeholders can trust them.

List of participants:

49 participants from 18 countries:

Name	First name	Organisation	Country
Bakas	Rimantas	LEA	Lithuania
Bergé	Nathan	Brussels Environment	Belgium
Broc	Jean-Sébastien	IEECP	France
Bukarica	Vesna	EIHP	Croatia
Čiuprinskas	Kęstutis	VILNIUS TECH	Lithuania
Condell	Aidan	SEAI	Ireland
Čuljak	Predrag	FZOEU	Croatia
Dimitrova	Pavlina	BACIV	Bulgaria
Ellul	Noel	BCA	Malta
Fakin	Iva	APN	Croatia

Gerbelová	Hana	SEVEn	Czechia
Giaux	Violaine	ECO	Luxemburg
Grinsted	Oskar	Danish Energy Agency	Denmark
Hammenecker	Jules	Leefmilieu Brussel	Belgium
Hartman	Vanja	EIHP	Croatia
Holmberg	Rurik	Swedish Energy Agency	Sweden
Honzík	Miroslav	MPO	Czechia
Hudetz	Lana	SEAI	Ireland
Hunjadi	Eva	APN	Croatia
Jaciničienė	Rasa	LEA	Lithuania
Karásek	Jiří	SEVEn	Czechia
Kirkinen	Johanna	The Finnish Energy Authority	Finland
Kreišmonas	Matas	LEA	Lithuania
Madžarević	Valentina	EIHP	Croatia
Martin	Laetitia	Brussels Environment	Belgium
Melmuka	Angelika	AEA	Austria
Meynaerts	Erika	VITO	Belgium
Mikušová	Martina	MPO	Czechia
Mizutavicius	Mindaugas	LEA	Lithuania
Moura	Pedro	IRS-UC	Portugal
Najos	Fabien	ATEE	France
Palmer	James	SEAI	Ireland
Picone	Sara	AESS	Italy
Pinturić	Davor	APN	Croatia
Pusnik	Matevz	JSI	Slovenia
Radeva	Diana	Argus 91A Ltd	Bulgaria
Raklevičiūtė	Alina	UAB	Lithuania
Renders	Nele	VITO	Belgium
Samulienė	Ginta	LEA	Lithuania
Šebek	Václav	SEVEn	Czechia
Sijaric	Denis	ECO	Luxemburg
Simader	Guenter	AEA	Austria
Solujic	Antonela	PKS	Serbia
Staničić	Damir	JSI	Slovenia
Staša	Michal	SEVEn	Czechia
Stojkov	Svetoslav	Za Zemiata	Bulgaria
Stonienė	Agne	LEA	Lithuania
van den Heuvel	Joris	RVO	The Netherlands
Vella	Annabel	VITO	Belgium