streamSAVE+

Calculation methods for energy poverty measures

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Agenda

✦ **Brief overview**

✦ **Calculation platform**

✦ **Energy poverty calculation**

✦ **Q&A, Discussion**

Co-funded by the
European Union

Goals and Objectives

✈ streamSAVE+ supports the selected Member States in improving their capacity to identify, adapt and implement new methodologies to calculate energy savings resulting from existing policies

✈ To enhance the implementation of **EED articles 4, 5 and 8**.

Improve Capacity for Energy Savings Calculation

Enhance the ability of EU Member States to calculate and report energy savings, particularly under the updated Energy Efficiency Directive (EED).

Develop the Knowledge Hub

Create a central repository of methodologies, tools, and best practices to streamline energy savings calculations.
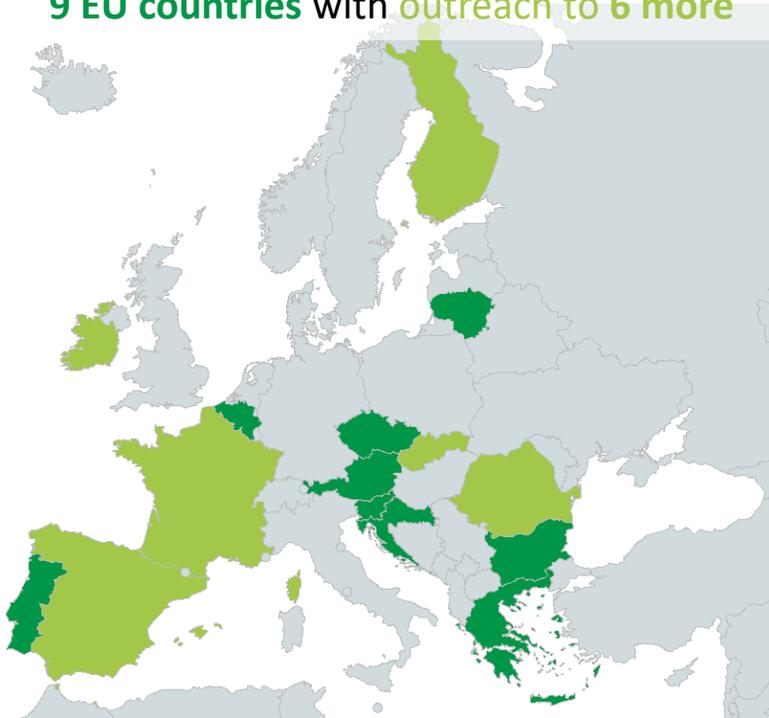
Facilitate Peer-to-Peer Cooperation

Encourage cooperation among nine Member States and six additional countries, focusing on policy improvements and knowledge sharing.

Our results, target Areas and Coverage

stream SAVE

Member States Participation

9 EU countries with outreach to **6 more**

(Austria, Belgium, Bulgaria, Czech Republic, Greece, Croatia, Lithuania, Portugal, Slovenia)

(Spain, Finland, France, Ireland, Romania, Slovakia)

Energy savings focus in

Target Sectors

Transport

Heating in buildings

Industrial technologies

Deep renovations

Public Sector and Energy Communities

Special focus on emerging **energy communities**, **public buildings**, and **positive energy districts**.

Four axes of the streamSAVE+

Development of a **Knowledge hub**

- **Guidance and recommendations** for standardized energy savings methodologies and indicative values
- Focus on **bottom-up calculation** methodologies
- Outcome:
  - **200 participants**
  - **10 updated Priority Actions**
  - **5 new Priority Actions developed**

Facilitation of **Dialogue meetings and peer exchange**

- **Knowledge sharing** and member states **cooperation**
- **Facilitated dialogues** with key stakeholders
- Outcome:
  - **200 participants**
  - **web-meetings**
  - **1 in-person meeting**

Capacity support tailored to national needs

- **Country-specific support** for calculation methodologies and professional advice **for the public sector**
- Direct support to partner Member States **(10 countries confirmed, 27 Capacity support actions)**

Policy and trend analysis to support achieving EED objectives

- **Policy insights to improve MS's reporting, policy impacts and projections**
- Impact assessments for policies
- Outcome:
  - **Policy evaluations and trends in 9 countries**
  - **peer-to-peer support**

10 updated Priority Actions

Refrigeration systems

Building Automation & Control Systems

Electric Vehicles

Lighting systems

Heat recovery

Motor Replacement

Behavioural Changes

Modal Shift in Freight Transport

Small-scale renewable heating technologies

Energy Poverty

5 new Priority Actions developed

Deep renovation

Data centers – IT equipment

Data centers - Cooling

Heat recovery and ventilation

Public Traffic Management

New Methodologies in the Scope of PA

✈ Overview of the identified methodologies related to the previous Priority Actions

Heat Recovery	BEMS&BACS	Refrigeration	Electric Vehicles	Lighting	Small-Scale Renewable Central heating	Energy Poverty	Motor replacement	Behavioural changes	Modal Shift in Freight Transport	
1	3	3	10	13	8	13	3	11	1	66
FR	HR, LV, SK	HR, HU, SK	AU, HR, HU, IE, IT, LT, LV, PL, SK	HU, HR, IT, LT, LV, PL, SK	AU, HR, FR, LT, LV	LT, LV, PL, SK	HR, HU, LT	AU. BG, FR, LT, LV, PL	HU	

✈ Existing Practices for New Priority Actions

Deep renovations in buildings	IT equipment in data centers	Cooling in data centres	Heat recovery in ventilation	Public traffic management	
22	1	4	8	4	39
AU, CY, CZ, FR, HR, EL, HU, LV, LT, PL, SI, SK	CZ	CZ, FR, LU	AU, FR, HU, LV, LT, LU, SI	CY, LV, SK	

Platform overview

To work with streamSAVE+ platform
please use: https://streamsaveplus.eu/

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streamSAVE+ platform

Original approach:
MS Excel → sharing, website form

New approach:
website form → sharing

✦ Advantages:
- sharing just by sending unique link
- possibility to change all parameters online
- results could be stored and shared in computer readable format (JSON)
- reusable and sharable datasets of energy carriers

✦ Website + calculation platform in one place

✦ Website:
- Project information
- Results including Dialogue Meetings summaries
- Priority Actions and calculations
- Contact Information
- Graphic layout (PDF)

✦ Calculation Platform
- Registration/login page
- Original 10 StreamSAVE Priority Actions + 5 new StreamSAVE+ Priority Actions
- Newly developed on website including all advantages

streamSAVE+ platform
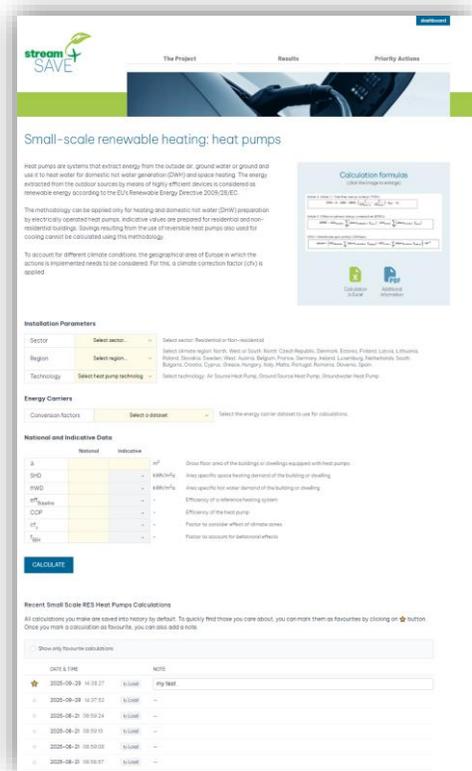
Small-scale renewable heating: heat pumps

Heat pumps are systems that extract energy from the outside air, ground water or ground and use it to heat water for domestic hot water generation (DWH) and space heating. The energy extracted from the outdoor sources by means of highly efficient devices is considered as renewable energy according to the EU's Renewable Energy Directive 2009/28/EC.

The methodology can be applied only for heating and domestic hot water (DHW) preparation by electrically operated heat pumps. Indicative values are prepared for residential and non-residential buildings. Savings resulting from the use of reversible heat pumps also used for cooling cannot be calculated using this methodology.

To account for different climate conditions, the geographical area of Europe in which the actions is implemented needs to be considered. For this, a climate correction factor (cfx) is applied.

Calculation formulas
(click the image to enlarge)

Article 3, Article 7 | Total final energy savings (TFES)

$$TFES = A \cdot (SHD + HWD) \cdot \left(\frac{1}{eff_{baseline}} - \frac{1}{eff_{action}} \right) \cdot f_{REH} \cdot cf_x$$

Article 3 | Effect on primary energy consumption (EPEC)

$$EPEC = FEC_{Baseline} \cdot \sum_{ec} (share_{ec,Baseline} \cdot f_{PE,ec}) - FEC_{Action} \cdot \sum_{ec} (share_{ec,Action} \cdot f_{PE,ec})$$

GHG | Greenhouse gas savings (GHGsav)

$$GHGsav = \left[FEC_{Baseline} \cdot \sum_{ec} (share_{ec,Baseline} \cdot f_{GHG,ec}) - FEC_{Action} \cdot \sum_{ec} (share_{ec,Action} \cdot f_{GHG,ec}) \right] \cdot 10^{-6}$$

Calculation in Excel   Additional information

Dialogue meetings and workshops

The streamSAVE+ is highly participatory (10/18)

- aims to **foster collaboration**, **capacity building**, and dissemination activities
- among **public authorities**, **technical experts** and **market stakeholders**

Survey
Countries challenges and needs

✦ Assessing energy savings from **deep retrofit programmes**
✦ Assessing energy savings from **water conservation measures**
✦ Energy savings in **companies**: technology-focused vs. system approach
✦ Local energy savings in **national monitoring**
✦ **Data centres & savings data**: from potential to action
✦ Energy savings from **heat recovery in ventilation systems**
✦ Energy savings from **public traffic management**
✦ Energy savings from **deep renovations in buildings**
✦ Energy performance and **savings in data centres**
✦ Data for energy savings calculations: **insights from key databases at EU and national level**

19 countries expressed preferences via https://myconvento.com/public/event_register/do_register/6858937

streamSAVE+ platform

Installation Parameters

Sector	Select sector... ⌄	Select sector: Residential or Non-residential
Region	Select region... ⌄	Select climate region: North, West or South. North: Czech Republic, Denmark, Estonia, Finland, Latvia, Lithuania, Poland, Slovakia, Sweden; West: Austria, Belgium, France, Germany, Ireland, Luxemburg, Netherlands; South: Bulgaria, Croatia, Cyprus, Greece, Hungary, Italy, Malta, Portugal, Romania, Slovenia, Spain.
Technology	Select heat pump technolog ⌄	Select technology: Air Source Heat Pump, Ground Source Heat Pump, Groundwater Heat Pump

Energy Carriers

Conversion factors	Select a dataset ⌄	Select the energy carrier dataset to use for calculations.

National and Indicative Data

	National	Indicative		
A			m^2	Gross floor area of the buildings or dwellings equipped with heat pumps
SHD		-	kWh/m^2a	Area specific space heating demand of the building or dwelling
HWD		-	kWh/m^2a	Area specific hot water demand of the building or dwelling
$eff_{Baseline}$		-	-	Efficiency of a reference heating system
COP		-	-	Efficiency of the heat pump
cf_x		-	-	Factor to consider effect of climate zones
f_{BEH}		-	-	Factor to account for behavioral effects

[CALCULATE]

Moura at al. Translated Existing Bottom-up Methodologies in EU-27, https://streamsaveplus.eu/article/7-reports

Calculation Results

Calculation Results	National		Indicative	
TFES Article 8	-	kWh/a	12 400.718	kWh/a
TFES Article 4	-	kWh/a	12 400.718	kWh/a
EPEC Article 4	-	kWh/a	15 035.797	kWh/a
GHG_{eq}	-	tCO_2	2.159	tCO_2

Costs related to original StreamSAVE project

[euro2020]	Investment costs	
	SFH existing stock	SFH newly built
District heat	14.731	14.731
Gas condensing boiler	9.223	8.607
Oil condensing boiler	14.615	12.993
Firewood boiler	15.286	no data
Wood pellet boiler	16.655	15.899
Heat pump - air	15.785	12.372
Heat pump - ground probe	25.426	20.002

[euro2020/a]	Variable operational costsPA
Costs of reduced fuel input	Sources can be found in chapter 1.2.1 of the "Standardized saving methodologies" report

Priority Actions: Energy Poverty

Calculations:

Feedback and tailored advice (behavioural changes)

+ The methodology specifically addresses behaviour measures that are based on "feedback" (direct feedback) and "feedback including tailored advice" (indirect feedback).

Small scale renewable heating system

+ The scope of this methodology is to estimate the annual energy and emission savings that can be achieved with the installation of small-scale renewable energy systems in dwellings occupied by energy poor households.

Thermally refurbished buildings (thermal refurbishment)

+ This methodology allows evaluating the annual energy savings of measures related to the thermal refurbishment of existing residential buildings.

streamSAVE+ - | Energy Poverty: Behavioural Changes

Energy Poverty: Behavioural Changes

Measure Configuration

Sector	Residential – EPOV ⌄
Heating type efficient building	Select heating type... ⌄
Type of replacement	Regular Replacement / New ⌄

Select residents group: "Residential in Energy poor situation" or "Average residential"

Choose between different types of Heat pumps and Biomass boilers to improve efficiency

Different baselines have to be applied depending on the time of the replacement. For more information, see the respective chapter in the Practical Guidance Report.

https://streamsave.eu/wp-content/uploads/2022/09/D2-2_PracticalGuidance_final_June23.pdf

Energy Carriers

Conversion factors	Default StreamSAVE+ 2023 (Public) ⌄

Select the energy carrier dataset to use for calculations.

Energy Carrier	Before (%)	After (%)	
Natural gas	100	100	✕
Select energy carrier... ⌄	–	–	
Total:	100.0%	100.0%	

https://streamsaveplus.eu/ep-behavioural-changes

National and Indicative Data

	National	Indicative	
n	4	4	–
UFEC	12 500	11 458.61	kWh/a
f_{EPOV}	0.65	0.65	–
S	3.4	3.4	%
dc	100	100	%

Number of households or units participating in the behavioral measure

Unit Final Energy Consumption per household/unit

Factor to account for energy poverty effects (0 = no energy poverty, higher values = more energy poverty)

Expected energy savings percentage from the behavioral measure

Double-counting factor

Calculation Results

Calculation Results	National Results		Indicative Results	
TFES Article 8	1 105	kWh/a	1 012.941	kWh/a
TFES Article 4	1 105	kWh/a	1 012.941	kWh/a
EPEC Article 4	1 112.735	kWh/a	1 020.032	kWh/a
GHG_{eq}	0.223	tCO_2	0.205	tCO_2

Energy poverty: Small scale renewable heating system

Installation Parameters

Sector	Residential - EPOV ▾
Heating type efficient building	Select heating type... ▾
Type of replacement	Regular Replacement / New ▾

Select residents group: "Residential in Energy poor situation" or "Average residential"

Choose between different types of Heat pumps and Biomass boilers to improve efficiency

Different baselines have to be applied depending on the time of the replacement. For more information, see the respective chapter in the Practical Guidance Report.

Energy Carriers

Conversion factors	Default StreamSAVE+ 2023 (Public) ▾

Select the energy carrier dataset to use for calculations.

Energy Carrier	Before (%)	After (%)	
Natural gas	100	100	✕
Select energy carrier... ▾	–	–	
Total:	100.0%	100.0%	

https://streamsaveplus.eu/res

Calculation Parameters

	National	Indicative	
A			m^2
SHD		–	kWh/m^2a
HWD		–	kWh/m^2a
$eff_{Baseline}$		–	–
eff_{Action}		–	–
$f_{prebound\ EPOV}$		–	–
f_{BEH}		–	–

Useful floor area of the dwelling

Area specific space heating demand of the dwelling

Area specific hot water demand of the dwelling

Area specific hot water demand of the dwelling

Conversion efficiency of the RES installation – heat pump or biomass boiler

Factor for adjusting the baseline consumption of average household to energy poor household

Factor to calculate for rebound effects of the action

Energy Poverty: Thermal Refurbishment

Sector Selection

Sector	Residential – EPOV ⌄

Select residents group between: "Residential in Energy poor situation" or "Average residential"

Calculation Parameters

	National	Indicative		
A	120	120	m²	Area of dwelling/unit or number of units for which the action is implemented
$SHD_{baseline}$	100	92.1	kWh/m²a	Baseline space heating demand per unit area or per unit
SHD_{action}	50	50	kWh/m²a	Post-action space heating demand per unit area or per unit
HWD	19.2	19.2	kWh/m²a	Hot water demand per unit area or per unit
eff	0.63	0.63	-	Efficiency of the heating system (fraction between 0 and 1)
f_{EPOV}	0.35	0.35	-	Factor to consider energy poverty effects (fraction between 0 and 1)
f_{BEH}	0.25	0.25	-	Factor to consider behavioral effects (fraction between 0 and 1)

Energy Carriers

Conversion factors	Default StreamSAVE+ 2023 (Public) ⌄

Select the energy carrier dataset to use for calculations.

Energy Carrier	Before (%)	After (%)	
Natural gas	100	100	✕
Select energy carrier... ⌄	–	–	
Total:	100.0%	100.0%	

https://streamsaveplus.eu/thermal-refurbishment

Calculation Results

Calculation Results	National Results		Indicative Results	
TFES Article 8	2 142.857	kWh/a	1 409.286	kWh/a
TFES Article 4	2 142.857	kWh/a	1 409.286	kWh/a
EPEC Article 4	2 157.857	kWh/a	1 419.151	kWh/a
GHG_{eq}	0.433	tCO_2	0.285	tCO_2

Energy Poverty: Behavioural Changes

Total final energy savings (TFES)

$$TFES = N \cdot UFEC \cdot S \cdot dc$$

$TFES$	Total final energy savings [kWh/a]
N	Number of participants [dmnl]
$UFEC$	Unitary Final Energy Consumption per household (electricity or gas) [kWh/a]
S	Energy saving factor [%]
dc	Double-counting factor [%]

Energy Poverty: Behavioural Changes

Effect on primary energy consumption (EPEC)

$$EPEC = FEC_{baseline} \cdot \sum_{ec}(share_{ec.baseline} \cdot f_{PE.ec}) - FEC_{action} \cdot \sum_{ec}(share_{ec.action} \cdot f_{PE.ec})$$

$EPEC$	Effect on primary energy consumption [kWh/a]
FEC	Annual final energy consumption [kWh/a]
$share_{ec.}$	Share of final energy carrier on final energy consumption [dmnl]
$f_{PE.ec}$	Final to primary energy conversion factor of the used energy carrier [dmnl]
$Baseline$	Index for the baseline situation of the action
$Action$	Index for the situation after the implementation of the action
ec	Index of energy carrier

Energy Poverty: Behavioural Changes

GHG| Greenhouse gas savings (GHGSAV)

$$GHHSAV = \left[FEC_{baseline} \cdot \sum_{ec}(share_{ec.baseline} \cdot f_{GHG.ec}) - FEC_{action} \cdot \sum_{ec}(share_{ec.action} \cdot f_{GHG.ec}) \right] \cdot 10^{-6}$$

$GHHSAV$	Greenhouse gas savings [t CO2/a]
FEC	Annual final energy consumption [kWh/a]
$share_{ec.}$	Share of final energy carrier on final energy consumption [dmnl]
$f_{GHG.ec}$	Emission factor of final energy carrier [g CO2/kWh]
$Baseline$	Index for the baseline situation of the action
$Action$	Index for the situation after the implementation of the action
ec	Index of energy carrier

Energy poverty: Small scale renewable heating system

Total final energy savings (TFES)

$$TFES = A \cdot \left(SHD \cdot \left(1 - f_{prebound\ EPOV}\right) + HWD\right) \cdot \left(\frac{1}{eff_{baseline}} - \frac{1}{eff_{action}}\right) \cdot (1 - f_{BEH})$$

$TFES$	Total Final Energy Savings [kWh/a]
A	Useful floor area of the dwelling [m2]
SHD	Specific space heating demand of the dwelling [kWh/m2/a]
HWD	Specific domestic hot water demand of the dwelling [kWh/m2/a]
$eff_{baseline}$	Conversion efficiency of the reference heating system [dmnl]
eff_{action}	Conversion efficiency of heating system after the action [dmnl]
$f_{prebound\ EPOV}$	Factor for adjusting baseline consumption of average household to energy poor household [dmnl]
f_{BEH}	Factor to adjust for rebound effects of the action [dmnl]

Energy Poverty: Thermal Refurbishment

Article 3, Article 7 | Total final energy savings (TFES)

$$TFES = A \cdot \left(\frac{SHD_{baseline} \cdot \left(1 - f_{prebound\ EPOV}\right) + HWD}{eff} - \frac{SHD_{action} + HWD}{eff} \right) \cdot \left(1 - f_{BEH}\right)$$

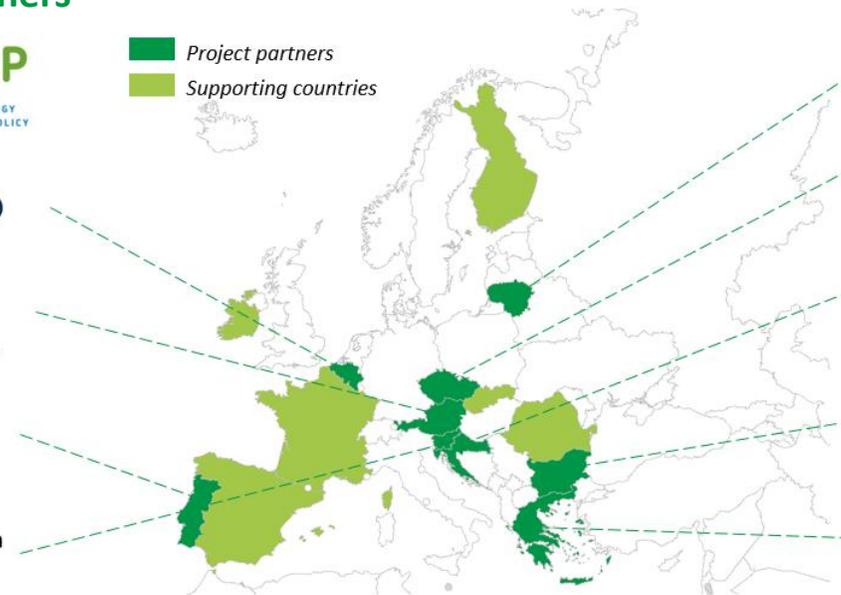|	
$TFES$	Total Final Energy Savings [kWh/a]
A	Useful floor area of the dwelling [m2]
$SHD_{baseline}$	Specific space heating demand of the reference building [kWh/m2/a]
SHD_{action}	Specific space heating demand of the efficient building [kWh/m2/a]
HWD	Specific domestic hot water demand [kWh/m2/a]
eff	Conversion efficiency of the heating system [dmnl]
$f_{prebound\ EPOV}$	Factor for adjusting baseline consumption of average household to energy poor household [dmnl]
f_{BEH}	Factor to adjust for rebound effects of the action [dmnl]

Summary

✦ streamSAVE+ assistance to the Member States

✦ 15 Bottom up calculation methodologies

✦ Use of streamSAVE+ platform

✦ Capacity Support Facility

Project partners

Project partners
Supporting countries

IEECP
INSTITUTE FOR EUROPEAN ENERGY AND CLIMATE POLICY

vito

eA AUSTRIAN ENERGY AGENCY

ISR

Jožef Stefan Institute

LITHUANIAN ENERGY AGENCY

SEVEn7

EIHP ENERGY INSTITUTE HRVOJE POŽAR

EnEffect

KAΠE CRES

Thank You

Get in touch for more information!

Project coordinator – Jiří Karásek, SEVEn

All project reports and the platform are available on the streamSAVE+ website **Streamsaveplus.eu**

Email the project at **jiri.karasek@svn.cz**

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