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The European Portal for Energy Efficiency in Buildings

WEBINAR



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The Commission is in the process of updating some of the content on this website in light of the withdrawal of the United Kingdom from the European Union. If the site contains content that does not yet reflect the withdrawal of the United Kingdom, it is unintentional and will be addressed.

WEBINAR



NEWS

EPB standards overview: why, how, what!

19 March 2020

This webinar series is organized by BUILD UP in cooperation with EPB Center's experts under the scope of Service Contract ENER/C3/2017-437/SI2-785.185 "Support the dissemination and roll-out of the set of Energy...

Webinar series: Energy Performance of Buildings standards (EN/ISO) supporting the implementation of EPBD This webinar took place on the 19th March, 12.00 to 13.30. Watch it now.

WEBINAR



NEWS

Holistic and reliable European Voluntary Certification Scheme to trigger deep renovation of non-residential buildings

3 March 2020

Following the very successful ALDREN event organised in the European Parliament on 22nd January 2020, this webinar provides an overview about the holistic, reliable, transparent European Voluntary Certification Scheme (EVCS...

Date: 3 March 2020, 12.00 – 13.30 CET Venue: BuildUp platform. Watch the webinar. Follow ALDREN project: Web, Twitter, Facebook, LinkedIn / Sign-up here to ALDREN's e-newsletter

Recommended in Learn Recommended in BUILD UP

Webinar | EPB standards overview: why, how, what!

19 Mar 2020 / Undefined

Webinar on ALDREN project | Holistic and reliable European Voluntary Certification Scheme to trigger deep renovation of non-residential buildings

3 Mar 2020 / Undefined

Webinar | Guidance and examples for the EPB standards' flexibility

10 Jan 2020 / Undefined

Webinar | 5 European projects with its innovative ICT solutions for energy savings in the spotlight

3 Jan 2020 / Undefined

Webinar: "Are we ready for BIM in construction sites? A reality check: Experiences from the ground"

3 Dec 2019 / Undefined

Webinar on RELETED project: Integration of Industrial Waste Heat in District Heating

2 Dec 2019 / Undefined

Webinar: CRAVEzero pinboard

14 Nov 2019 / Undefined

Webinar: Using ENERFUND to identify Energy non-Efficient buildings

20 Oct 2019 / Undefined

Webinar on the STUNNING project: conclusions and important results for promoting energy-efficient building renovation

20 Sep 2019 / Undefined

The Templater tool

6 Sep 2019 / United Kingdom

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018.

Upskilling building sector professionals: CEN-CE scheme

WEBINAR



Upskilling building sector professionals, the
linchpin for an effective renovation wave:
showcasing CEN-CE scheme

5th May | 12.00H

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Build Up portal webinar

5th May 2020

12h00 – 13h30 CEST

 **BUILD UP** The European Portal For Energy Efficiency in Buildings

CEN-CE✓
CEN EPB Standards Certified Experts

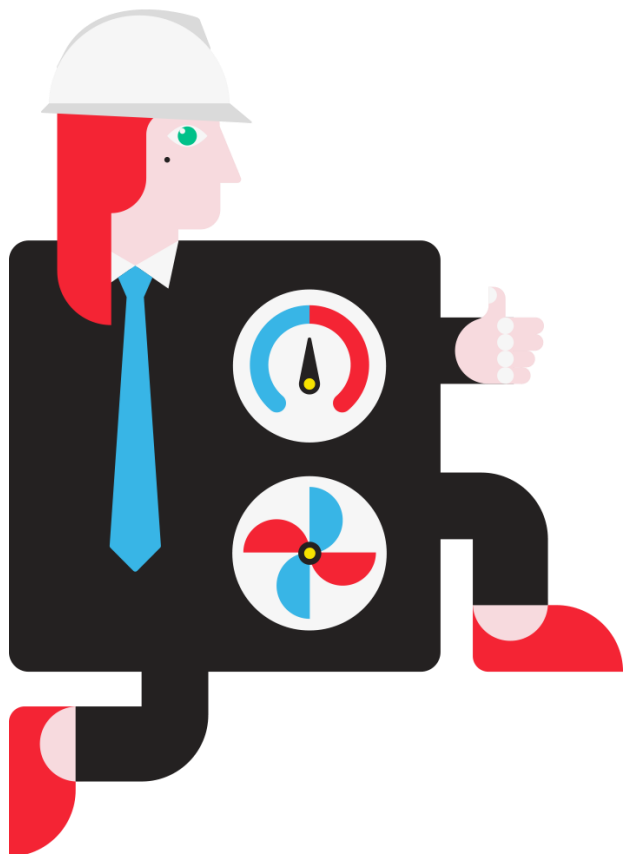


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018.

AGENDA

Moderator

Giulia Leghissa



12h00 *Introduction by the moderator*

12h05 **CEN-CE in a nutshell**

Johann
Zirngibl

12h15 **CEN-CE certified experts**

Jana
Bendžalová

12h25 **CEN-CE training: why, how, what?**

Damir
Dović

12h40 **Professional tools integrating EPB standards**

Laurent
Socal

12h50 **Online pilot training and LMS**

Andrei
Lițiu

13h00 *Moderated Q&A*

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CEN-CE in a nutshell

Johann ZIRNGBL, Emilien PARON, CEN-CE coordinator

johann.zirngibl@cstb.fr; emilien.paron@cstb.fr



10h20

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04/05/2020

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Short CV of presenter:

Name: Johann ZIRNGIBL

Current position:

H2020 projects, CEN and ISO standardization

Previous work experience:

Director International Development CSTB / France

Head of Division Energy Systems CSTB / France

Academic degree(s) / title(s) completed studies:

Engineer, Senior Scientist / Energy efficiency of Building (HVAC)

Responsibilities:

Project manager in national, international research projects

Expert for the European Commission, World Bank, EBRD

Convenor in European (CEN) and International (ISO) standardization



1) What is CEN-CE – the key aims



H2020 - Project on increase Construction skills of professionals
related to

Reducing energy consumption and carbon footprint (climate change)
EU commitments and related EU Directives (e.g. EPBD)

CEN-CE: CEN standards Certified Experts

EU-wide training / certification scheme based on EPBD mandated CEN standards

CEN-CE is focused on use of **CEN (European) standards** developed in:

- **CEN/TC 228 Heating and waterbased cooling systems (HVAC);**
- **CEN TC/371 Overarching standard for global indicator.**

- CEN-CE should be run as a **self-funded business case** after the H2020 project;
- **Training and certification materials** could be used in cooperation with existing scheme providers including recognition.



The CEN-CE team



CSTB
France



ENBEE
Slovakia



REHVA
Belgium



FSB
Croatia



SLR
Italy

5 partners;

5 Member States;

Scientific, educational, technical and professional background.

2) Why CEN-CE now?

- **EU Commission** mandate **CEN** to develop standards supporting **Member States** to implement the **EPBD** (Energy Performance of Building Directive);
- Standards positively voted in **January 2017** and published in 2017;
- Training is needed to **bring them into application**.



CEN-CE is 1st EU wide common training and certification scheme based on these mandated CEN standards



3) Setting the scene – CEN-CE ecosystem

The EU building stock

- ~ **35 %** of all buildings in the EU are older **than 50 years**;
- ~ **75 %** of these building are **energy inefficient**;
- **Only 15%** incorporate significant energy efficiency upgrade in renovation.

The EU commitments

- **EBPD**: new constructions **nZEB buildings** <31.12.2020;
- **EU Green Deal**: **carbon neutrality by 2050**.



To **bridge the gap** between the EU Building stock and EU commitments **qualified workforce** is needed

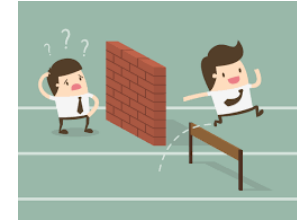
HVAC professionals will **play an important role** in implementing energy efficient solutions, because HVAC systems are replaced in shorter intervals

4) The game changer – New challenges for HVAC

Fulfilling the EU commitments is a **new challenge** and **request skills** to be able to perform high quality energy and low carbon renovation

HVAC professionals must be able to:

- provide a **reliable** estimation of the savings (keep the promises made);
- design for **performance** (not only for **compliance**), be able to communicate on performance (common indicators);
- improve **significantly** the **energy performance**, **switch to low carbon**;
- upgrade installation to be “**2050 compatible**” (avoid lock-in effect by sub-optimal installation) .



Higher degree of technical skills – training is needed

5) What is the CEN-CE added value ?



- CEN-CE scheme addresses a **strong market request** (support of stakeholders including the EU Commission);
- Certification / training based on **European and ISO standards** is an advantage for **recognition** of skills among different countries;
- **Standardization** is also key to create **level playing field** for **products** European wide (technical neutral assessment, fair competition);
- **EU Green Deal** could be the **linchpin**. Need for a standardized EU building quality benchmark. Eu funding based on EU standardized rules;
- CEN standards are already used by many EU Member States (mandatory) and existing certification schemes (voluntary);
- **Recognition of the market on quality, visibility** because based on best **recognized know-how**.

6) The next steps – market demand and roll-out

Where is the market demand?

- **Increased Professional skills in sizing and energy use**
CEN-CE experts will be better prepared for the new challenges (nZEB's, cost optimum, integration of renewables, Green Deal);
- **Industrials (front runners)**
Modular structure of standards related to products (e.g. Heat pumps),
CEN-CE training could complete existing industrial training.
Trainees will get at the same time recognized know-how and be certified;
- **Existing Voluntary (e.g. environmental) / mandatory (e.g. EPC's)**
Member States using more and more standards.



**Practical roll-out of the CEN-CE scheme :
Stand alone or complete existing schemes**



Thank you for your attention

CEN-CE certified experts

Jana BENDŽALOVÁ

bendzalova@enbee.eu



ENBEE

Environment & Building Energy Efficiency



CEN-CE

is a piece of the EPB puzzle supporting the EPBD implementation

by set up a large-scale training / qualification scheme
to prepare certified experts on CEN standards for
calculation of energy performance of building (M480)



✓ Could stand alone or can be included as a module in existing training scheme

Business case



depending on the demand

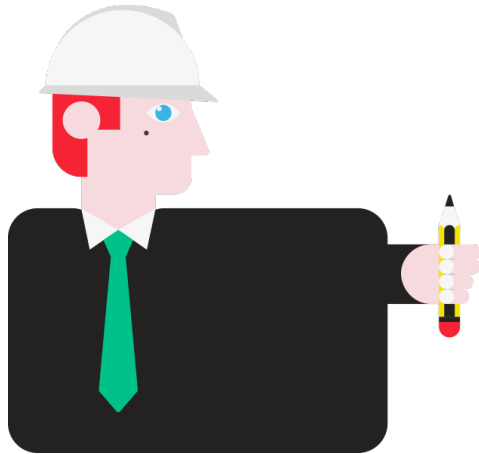
→ mandatory or voluntary use of CEN standards

Part of the business strategy is the promotion of CEN standards.

→ CEN-CE provides feedback to CEN/TC 228, CEN/TC 371 for revision

The European Qualifications Framework (EQF)

Makes qualification achieved more **readable and understandable** across different countries and systems



Knowledge – Skills - Competences

Level 4

- **skills required to generate solutions**
- self-management within the guidelines, supervise a routine work

Level 5 + 6

- **Comprehensive specialist, advanced knowledge,**
- skills required to develop **creative solutions to abstract problems demonstrating mastery and innovation, solve complex and unpredictable problems**
- management and supervision of work with unpredictable change, develop performance
- manage complex activities, decision making in unpredictable work or study.

CEN-CE certified experts – demand drivers



Gain recognition for performance, comparability, reliability by using the **best know-how** based on **European standards**.

Industry



Correct consideration of products in EP of building - level playing field for products - **participated in development of CEN standards**-occassion to bring them into practice

Education / training institutions



Part of trainings/ education on EP at Universities, vocational trainings

Certification / accreditation schemes for EPB



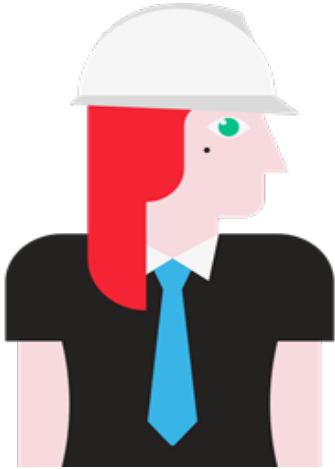
Reliability, **quality** of experts for voluntary or mandatory schemes (EPC, energy auditors)

Professionals



New skills, know-how, recognition by market

CEN-CE certification context



Based on

✓ **survey of existing schemes**

IngReeS, Build Up Skills Pillar II, Passive house, ASHREA, how to keep the quality of operators EU / World wide,

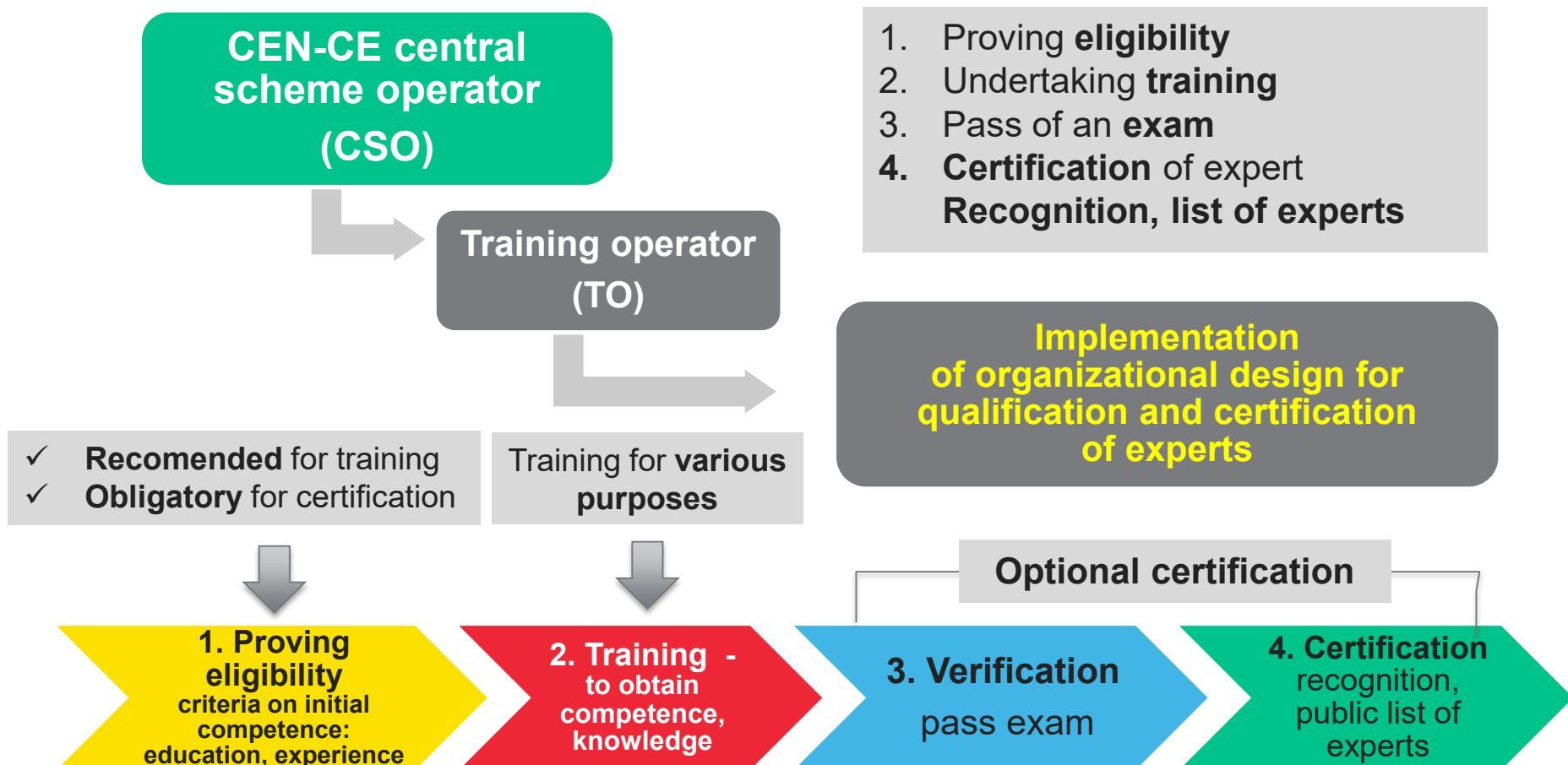
✓ **market needs**, requirements of the industry, national mandatory accreditation of experts, **Voluntary certification schemes e.g. EPBD Art. 11(9)**

Modular structure

- expert can be trained only for **selected standards** (e.g. heat pumps, PV, measured energy, economic) that allows:
 - ✓ different background of experts
 - ✓ specific product based interest by industry
- offers training courses in a **short format** to enable **acquiring skills on a step-by-step basis**



Operational and organizational structure of the CEN-CE scheme



The CEN-CE scheme



1. Proving eligibility

- **only recommended** for undergoing training for understanding the content of the training
- **obligatory** for certification to ensure the quality and reliability of CEN-CE certified expert

Levels of professionals (EQF):

- Lower level
Level 4 – installers
- Higher level
Level 5 - designers,
Level 6 - engineers,
architects,

The criteria on initial competence:

- ✓ **Education:**
 - Level 4 – lower education
 - Level 5 - upper secondary school leaving certificates
 - Level 6 – university degree
- ✓ **Relevant experience**
2 years during the last 6 years.

The CEN-CE scheme



2. Training

provides knowledge, skills, competence.

Training materials:

- ✓ modular structure (per standard)
- ✓ common templates
- ✓ Handbook, Excel, ppt, matrix of slides for two EQF levels, didactic, e-learning

Expert can be trained **for dedicated level** (lower, higher level professionals).

The length of training: 2 - 4 h / standard depending on the complexity of the standard.

Initial competence (education, experience) just recommended for training for understanding topic

The CEN-CE scheme



3. Pass of an examination - assessment of learning outcomes

According to the benchmark of exiting schemes the options for exam are:

- ✓ presence
- ✓ remote, e-learning
- ✓ self-assessment (informative)

More options will be possible.

The structure will depend also on the IT tool development and testing.

Set of questions for exam.

Two levels of exam (EQF):

Level 4 - installers

Level 5+6 - engineers, architects ...

The CEN-CE scheme



Levels of professionals (EQF):

- Lower level
Level 4 – installers
- Higher level
Level 5 - designers,
Level 6 - engineers,
architects,

4. Certification, recognition of experts

The eligibility criteria for certification:

- 1) initial education and relevant experience
- 2) mandatory training
- 3) the successful exam

The CEN-CE scheme

Certification, recognition

CERTIFICATE

- after passing successful exam
- common template of certificate
- all standards will be listed, relevant will be highlighted (as a driving license)



A		A1	
B		B1	
C		C1	
D		D1	
BE			
CE		C1E	
DE		D1E	

- **differentiation of experts according to competence** (few vs. all standards)
- public list of CEN-CE certified experts on website of CSO

EN ISO 52000-1 – Overarching standard		✓
EN 15316-1 - General		✓
Heat load EN 12831- 1	✓	Emission & controls EN 15316-2
DHW needs EN 12831- 3	✓	Distribution EN 15316-3
Meas. performance EN 15378-3		Gen – Boiler EN 15316-4-1
System design EN 12828	✓	Gen – Heat pump EN 15316-4-2
Installation & comm EN 14336		Gen – solar EN 15316-4-3
Instructions EN 12170 / 1		Gen – Cogen EN 15316-4-4
Economics EN 15459	✓	Storage EN 15316-5
		EQF level 4

The CEN-CE scheme

Certification, recognition

CERTIFICATE

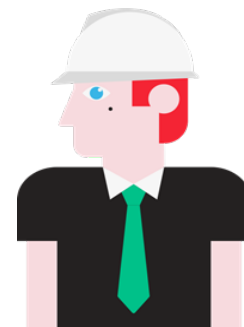
EQF level according to:

- **Level of training** (two levels based on complexity: EQF 4, EQF 5+6)
- **Level of initial education:**
 - EQF 4 – installers, managers, any education
 - EQF 5 – designers – high school - leaving certificates
 - EQF 6 – engineers, architects - university degree

EN ISO 52000-1 – Overarching standard		✓
EN 15316-1 - General		✓
Heat load EN 12831- 1	✓	Emission & controls EN 15316-2
DHW needs EN 12831- 3	✓	Distribution EN 15316-3
Meas. performance EN 15378-3		Gen – Boiler EN 15316-4-1
System design EN 12828	✓	Gen – Heat pump EN 15316-4-2
Installation & comm EN 14336		Gen – solar EN 15316-4-3
Instructions EN 12170 / 1		Gen – Cogen EN 15316-4-4
Economics EN 15459	✓	Storage EN 15316-5
		EQF level 4

Training scheme operators

CEN-CE scheme can be overtaken by any organisation



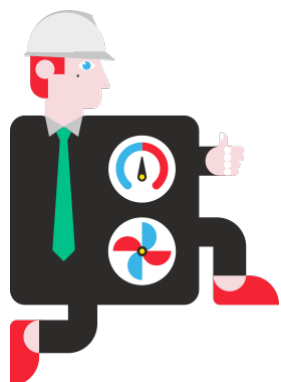
**CEN-CE central
scheme operator
(CSO)**

**Training operators
(TO)**

Quality control

- launch training, master training materials in EN
- **issuing licenses** for TO
- monitoring, surveillance
- issuing certificates
- registration, databases
- public list of CEN-CE experts
- on-line platforms

- market uptake
- provide trainings
- **localization of training**
- ensures that experts achieve learning outcomes
- **reporting to CSO**



The Learning Management System – on-line e-learning and exam - under development.

The **self-financing of the scheme** is important for quality assurance.

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CEN-CE certified experts
Jana BENDZALOVA

04/05/2020

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CEN-CE training



Why, how, what?

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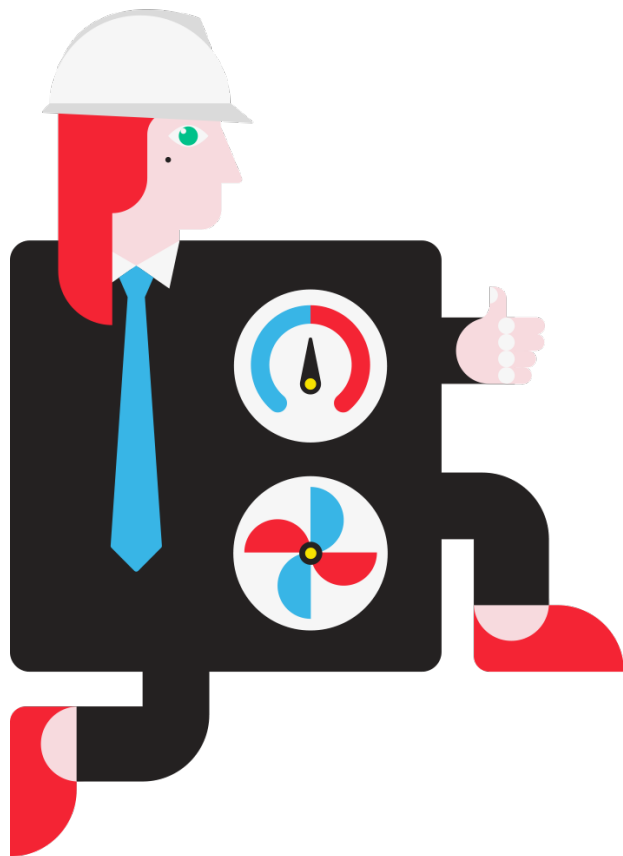
5th of May 2020

Damir Dović



This project has received funding from the under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018

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2. How?
3. Examples
4. What?

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CEN EPB Standards Certified Experts

CEN-CE training
Damir DOVIĆ

04/05/2020 3



This project has received funding from the under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018

Why?

- To reach EU 2030 climate/energy targets, a successful implementation of nZEB standards in new and renovated buildings is crucial
- Design of nZEBs requires more detailed/accurate calculations taking into account all technical system components and optimization of tech. solutions
- Implementation of nZEB standards is a challenge for engineers, installers and national methodology developers
- There is a lack of knowledge among engineers in EPB calculations (only energy certifiers are obliged to enroll the training courses)
- An adequate training supported by the calculation tool (software) is needed
- The experience of the consortium members show that the training on individual technical topics is not enough to ensure good quality of installation
- The awareness raising of professionals specialised in one of the skills on other skills (e.g. the sizing and the energy calculation) will help to increase the quality

Why?

EN 15316 standards can be used for:

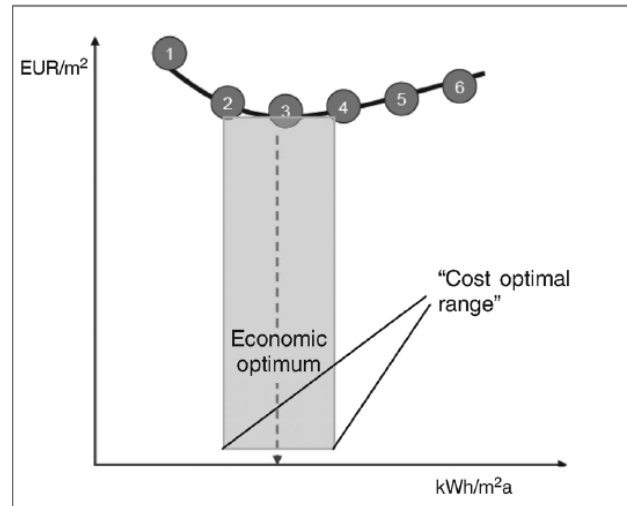
a) Performing energy performance calculations:

- verification of national min. energy performance requirements
- issuing EPC
- optimizing tech. systems at design stage (cost. optimal solutions)

b) Sizing of the system components (e.g. solar collectors, PV, boilers)

c) Comparison with measured and simulated energy consumption

Data input to calculation tool (spreadsheets, software) can be implemented in a relatively fast and simple way, most of input values are available as default ones.



nZEB 2018 [nZEB_kotao&solar.ecp] - MGIPU Energetski Certifikator [v1.8.0.3]

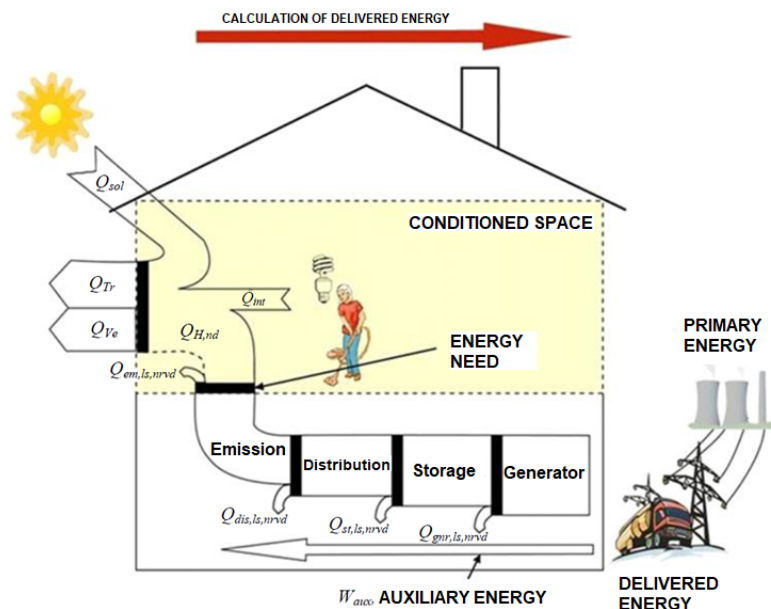
Datoteka	Projekt	Zone	Podaci i proračuni	Termotehnički sustavi	Rasvjeta i fotonaponski	Energ
Pregled energetskog certifikata						
Vrsta zgrade (prema Propisniku)		Obiteljske kuće				
Vrsta zgrade prema sličnosti tehničkih sustava		zgrada s jednostavnim tehničkim sustavom				
Vlasnik / investitor		k.o.				
k.č.br.		Godina izgradnje / rekonstrukcije				
Plošna korisna površina grijanog dijela zgrade A_k		154.21	0			
Građevinska (bruto) površina zgrade $[m^2]$		262.69	Mjerska meteorološka postaja Zagreb Maksimir			
Faktor oblika $f_o [m^{-2}]$		0.77	Referentna klima kontinentalna			
ENERGETSKI RAZRED ZGRADE						
Specifična godišnja potrebna toplotna energija za grijanje $\alpha_{H,nd} [kWh/(m^2 \cdot a)]$		21.12	Specifična godišnja primarna energija $E_{prim} [kWh/(m^2 \cdot a)]$			
			39.40			
A+		A		A+		
A						
B						
C						
D						
E						
F						
G						
Specifična godišnja isporučena energija $E_{del} [kWh/(m^2 \cdot a)]$		33.10				
Specifična godišnja emisija $CO_2 [kg/(m^2 \cdot a)]$		7.38				
Upisao „nZEB“ ako energetsko svojstvo zgrade (E_{prim}) zadovoljava zahtjeve za zgrade gotovo nulte energije propisane važećim TPRIJETZ		nZEB				

How?

The training comprises EN 15316 series related standards

modular approach - expert can be trained separately for selected standards

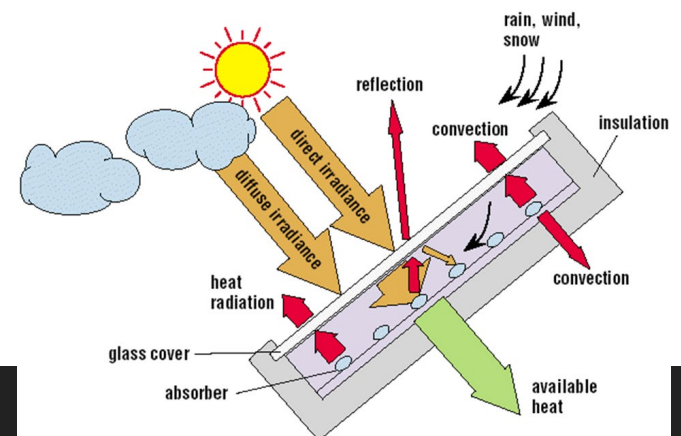
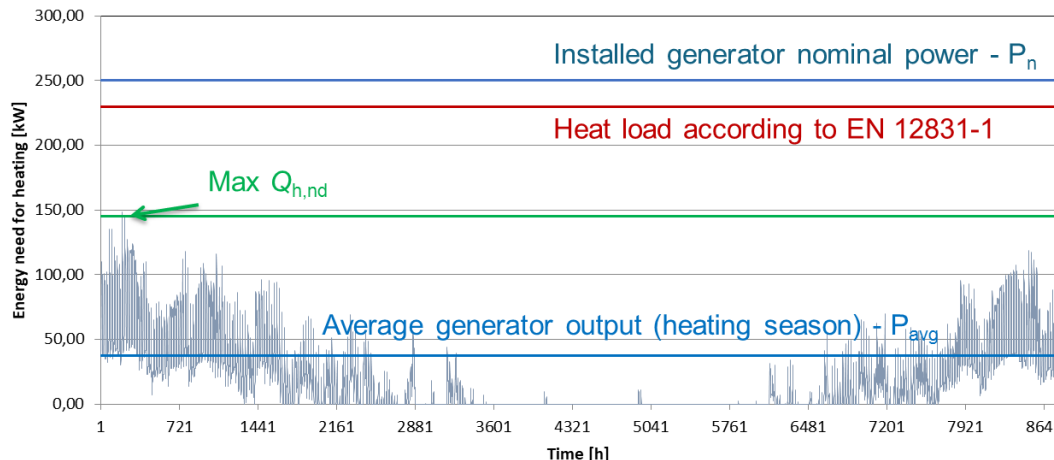
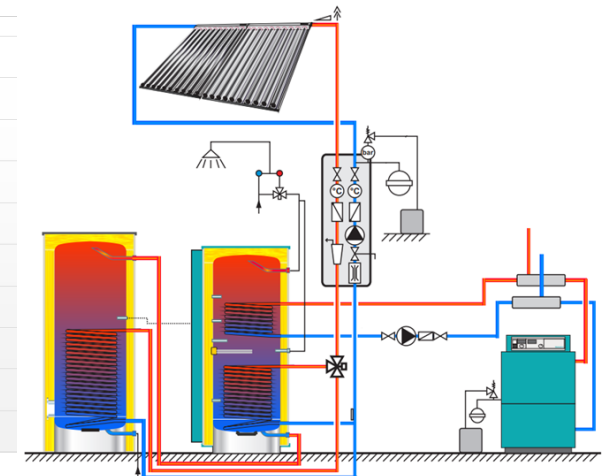
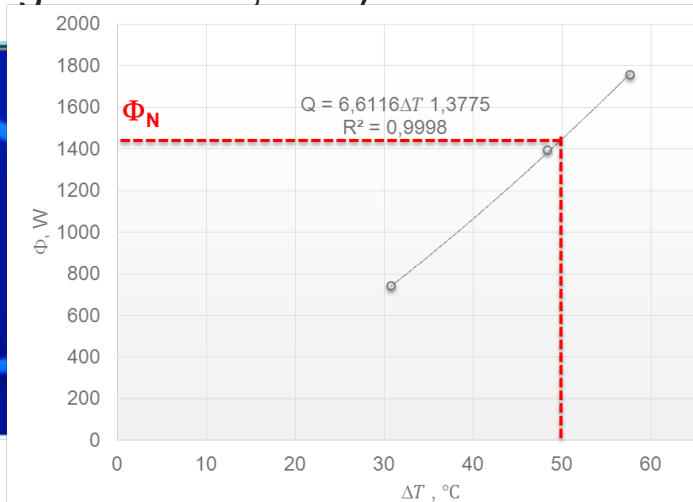
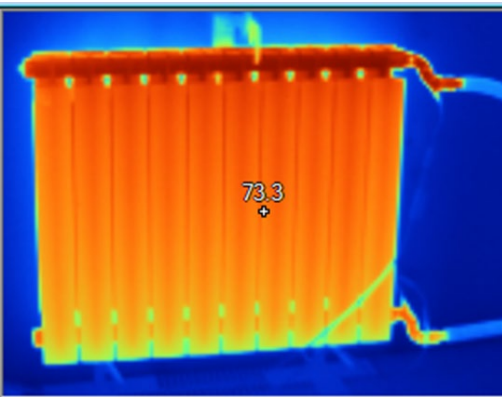
Heating&DHW systems



Heat load EN 12831- 1	EN 15316-1 - General	Emission & controls EN 15316-2
DHW needs EN 12831- 3		Distribution EN 15316-3
Meas. performance EN 15378-3		Gen – Boiler EN 15316-4-1
System design EN 12828		Gen – Heat pump EN 15316-4-2
Installation & comm EN 14336		Gen – solar EN 15316-4-3
Instructions EN 12170 / 1		Gen – Cogen EN 15316-4-4
Economics EN 15459		Storage EN 15316-5

How?

1. First part of each Module lecture is devoted to fundamentals and physics (e.g. types of solar collectors, influencing parameters on thermal output and efficiency, connecting schemes, etc.)



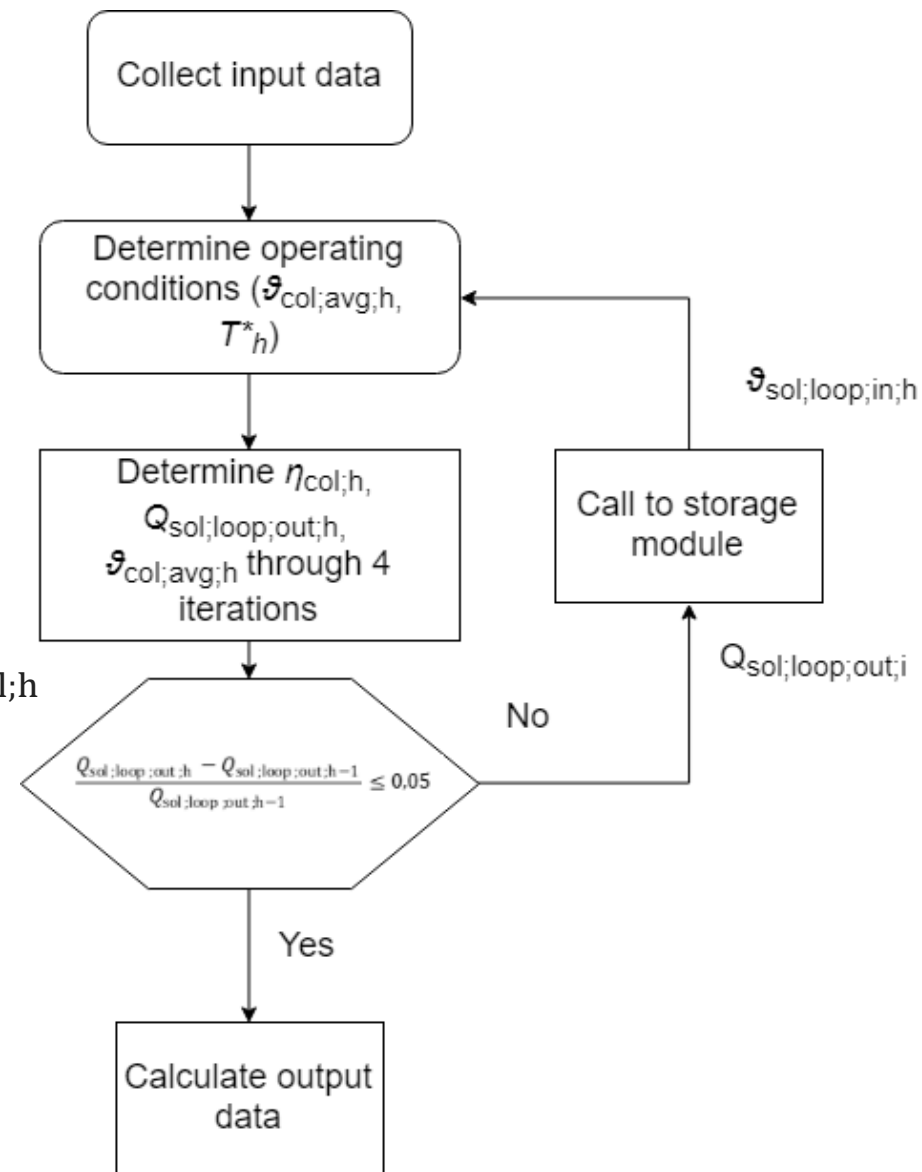
How?

3. In the third part the calculation procedure is explained where calculation flow chart and basic equations are presented

$$\eta_{col;h} = \eta_0 \cdot K_{hem}(50^\circ) - a_1 \cdot T_h^* - a_2 \cdot T_h^* \cdot I_{sol;h}$$

$$Q_{sol;out;h} = \eta_{col;h} \cdot I_{sol;h} \cdot A_{sol} \cdot t_{ci} \cdot 0,001$$

$$\vartheta_{col;avg;h} = \vartheta_{sol;loop;in;h-1} + \frac{0,4 \cdot I_{sol;h} \cdot A_{sol}}{\dot{m}_{col} \cdot C_W \cdot 2}$$



How?

4. In the fourth part the output values are discussed

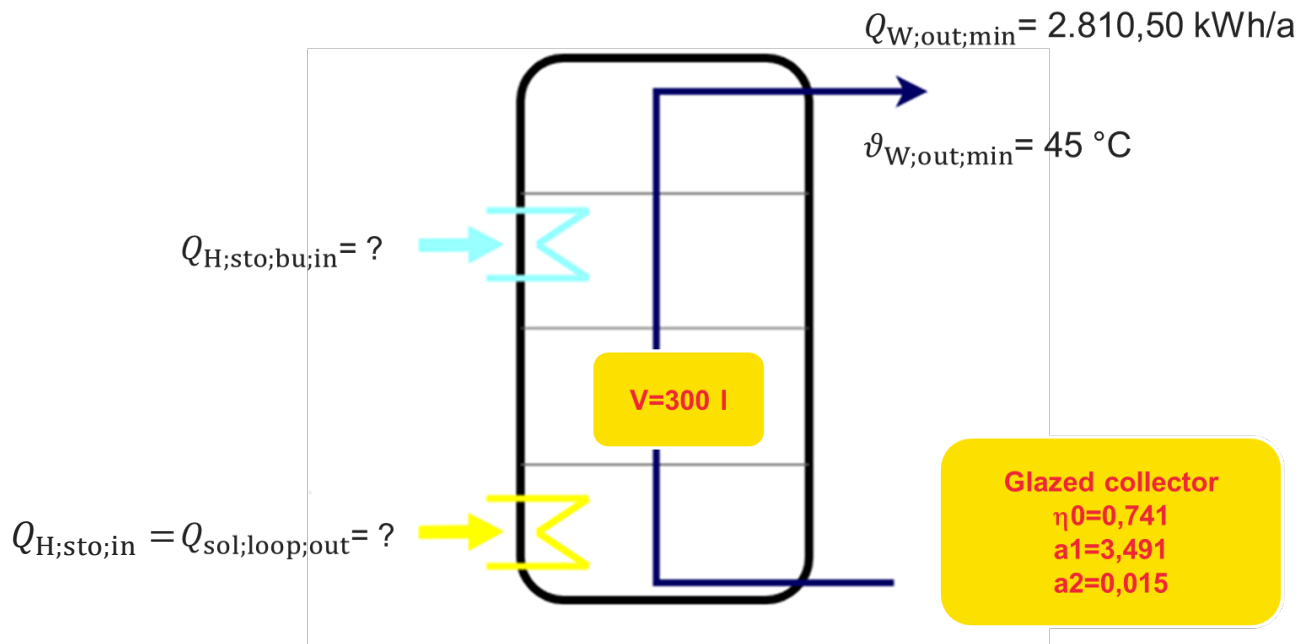
Name	Symbol	Software name	Unit	Value	Range	Intended designation	Varying
Energy flow data							
Heat generated in the collector absorber	$Q_{sol;gen}$	Q_sol_gen	$W/(m^2.K)$		$[0 \dots \infty]$	M1-9	YES
Collector heat output	$Q_{sol;col;out}$	Q_sol_col_out	kWh		$[0 \dots \infty]$	M1-9	YES
Collector loop heat output	$Q_{sol;loop;out}$	Q_sol_loop_out	kWh		$[0 \dots \infty]$	M1-9	YES
Collector loop heat losses	$Q_{sol;loop;ls}$	Q_sol_loop_ls	kWh		$[0 \dots \infty]$	M1-2	YES
Recoverable heat losses of collector loop	$Q_{sol;loop;ls;rbl}$	Q_sol_loop_ls_rbl	kWh		$[0 \dots \infty]$	M1-2	YES
Auxiliary (electrical) energy consumption in the collector loop	$E_{sol;aux}$	E_sol_aux	kWh		$[0 \dots \infty]$	M1-9	YES

$$W_{sol;aux;h} = (P_{sol;crt} + P_{sol;pmp}) \cdot t_{ci} \quad [kWh]$$

$$Q_{sol;loop;rbl;h} = Q_{sol;loop;ls;h} \quad [kWh]$$

How?

5. The fifth part is devoted to the work with spreadsheets through examples
For this purpose trainers will use handbooks which provide array of equations following the order they are implemented in spreadsheets, along with the explanations that facilitate use of spreadsheets and understanding of calculation procedure



5.4 Energy calculation – Method B

Table 9. Inputs to thermal loss calculations

Name	Symbol	Unit	Origin
Ambient temperature	ϑ_{amb}	°C	Table 7
Part of the thermal losses transmitted to the room	$f_{sto,dis}$	-	Table 7
Stand-by losses coefficient	H_{sto}	W/K	For default data Eq. (1a) For EcoDesign data Eq. (1b)

Storage tank thermal losses are calculated by:

$$Q_{sto,ls} = f_{sto,dis} \cdot \frac{H_{sto}}{1000} \cdot (\vartheta_{sto,station} - \vartheta_{sto,amb}) \cdot t_{ci} \quad [\text{kWh}] \quad \text{EN 15316-5:2017} \quad (57)$$

Note: $f_{sto,dis}$ is defined in 5.2.10.

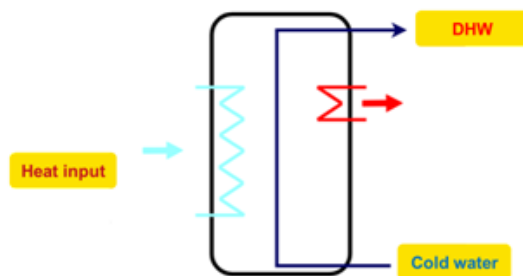


Figure 6. Graphical representation of a storage module mathematical model (Method B)

Storage tank water content temperature after the withdrawn of energy for DHW and thermal losses is calculated by:

$$\vartheta_{sto,tmp1} = \vartheta_{sto,t-1} + \frac{(-Q_{W,out} - Q_{sto,dis,ls} - Q_{W,dis,consum}) \cdot 1000000}{\rho_W \cdot C_{p,W} \cdot V_{sto,tot}} \quad [^{\circ}\text{C}] \quad \text{(CEN-CE)} \quad (58)$$

where $Q_{W,out} = \min(Q_{W,sto,out,req}; \rho_W \cdot C_{p,W} \cdot V_{sto,tot} \cdot (\vartheta_{sto,t-1} - \vartheta_{W,cold}) / 1000000$.

NOTE: If $\vartheta_{sto,t-1} < \vartheta_{W,out,min}$ $Q_{W,out} = 0$.

Energy to be supplied by other system is calculated:

5.1.2 Energy calculation

Table 9. Inputs to the calculation

Name	Symbol	Unit	Origin
Peak collector efficiency	η_0	-	Table 11 or Ecodesign data
First order heat loss coefficient	a_1	W/(m ² ·K)	Table 11 or Ecodesign data
Second order heat loss coefficient	a_2	W/(m ² ·K ²)	Table 11 or Ecodesign data
Hemispherical incidence angle modifier	$K_{t,amb}(50^{\circ})$	-	Table 11 or Ecodesign data

The flowchart of the calculation procedure is shown on Fig. 1.

The air temperature surrounding the collector loop is determined in relation to its location by:

$$\begin{aligned} \text{SOL_LOC_HS (heated space): } \vartheta_{sol,amb,h} &= \vartheta_{i,hr} \quad [^{\circ}\text{C}] \\ \text{SOL_LOC_NHS non-heated space: } \vartheta_{sol,amb,h} &= (\vartheta_{i,hr} + \vartheta_{e,h}) / 2 \quad [^{\circ}\text{C}] \\ \text{SOL_LOC_OUT (outside): } \vartheta_{sol,amb,h} &= \vartheta_{e,h} \quad [^{\circ}\text{C}] \end{aligned} \quad \text{EN 15316-4-3:2017} \quad (49)$$

where:

$\vartheta_{i,hr}$ – air temperature in heated room [°C];

$\vartheta_{e,h}$ – outside air temperature [°C].

The installed collector area is calculated by:

$$A_{sol} = A_{sol,mod} \cdot N_{col} \quad [\text{m}^2] \quad \text{EN 15316-4-3:2017} \quad (6)$$

NOTE: $A_{sol,mod}$ should be referred to the area (gross or aperture) used for determining collector efficiency parameter - EN 12975-2 (aperture area) or the current EN ISO 9806 (gross area).

5.1.2.1 Initial calculations

Table 10. Constants and physical data

Symbol	Value	Unit
S_{sk}	4186	J/(kg·K)

The first estimation of the average collector water temperature determined by:

$$\vartheta_{col,avg,h} = \vartheta_{sol,loop,in,h-1} + \frac{0,4 \cdot I_{sol,h} \cdot A_{sol}}{\dot{m}_{col} \cdot C_W \cdot 2} \quad [^{\circ}\text{C}] \quad \text{EN 15316-4-3:2017} \quad (7)$$

where

$\vartheta_{sol,loop,in,h-1}$ – storage outlet temperature to the collector loop from previous time step [°C], see Handbook on EN 15316-5

When $h=1$ (start of calculations) $\vartheta_{sol,loop,in,h-1}$ is equal to the initial temperature of the bottom volume of the storage tank

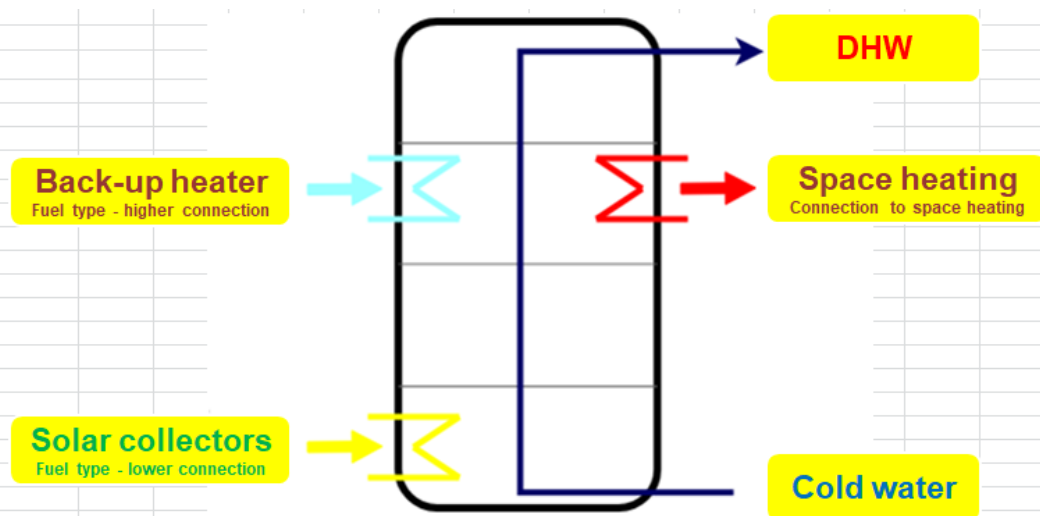
Example of input data

Spreadsheet interface for storage tank (Method A)

PRODUCT DATA		
Product descriptive data		
Storage unit type		
Solar storage	STO_H_TYPE	
Storage unit use		
Domestic hot water	STO_H_USE	STO_USE_W
Fuel type - lower connection		
Direct connection	STO_H_FUEL_VOL1	STO_FUEL_NOEXC
Fuel type - higher connection		
No heat source	STO_H_FUEL_VOL3	STO_FUEL_NO
Hydraulic connection to space heating		
Exchanger (hot water)	STO_HCONN	STO_H_CONN_HEX

Product technical data				
Volume total	$V_{sto,tot}$	$V_{sto,tot}$	L	300
Stand-by losses coefficient	$H_{sto,ls}$	$H_{sto,ls}$	W/K	2,77128129
Stand-by losses correction factor	$f_{sto,dis,ls}$	$f_{sto,dis,ls}$	-	1
Set temperature	$\theta_{sto,set,on}$	$\theta_{sto,set,on}$	°C	60
Heat exchanger - lower connection	$H_{sto,H,exh,vol,1}$	$H_{sto,H,exh,vol,1}$	W/K	
Heat exchanger - upper connection	$H_{sto,H,exh,vol,3}$	$H_{sto,H,exh,vol,3}$	W/K	
Heat exchanger - space heating service	$H_{sto,H,exh,out}$	$H_{sto,H,exh,out}$	W/K	4000
Set temperature for back-up heater ON	$\theta_{sto,set,on,bu}$	$\theta_{sto,set,on,bu}$	°C	50

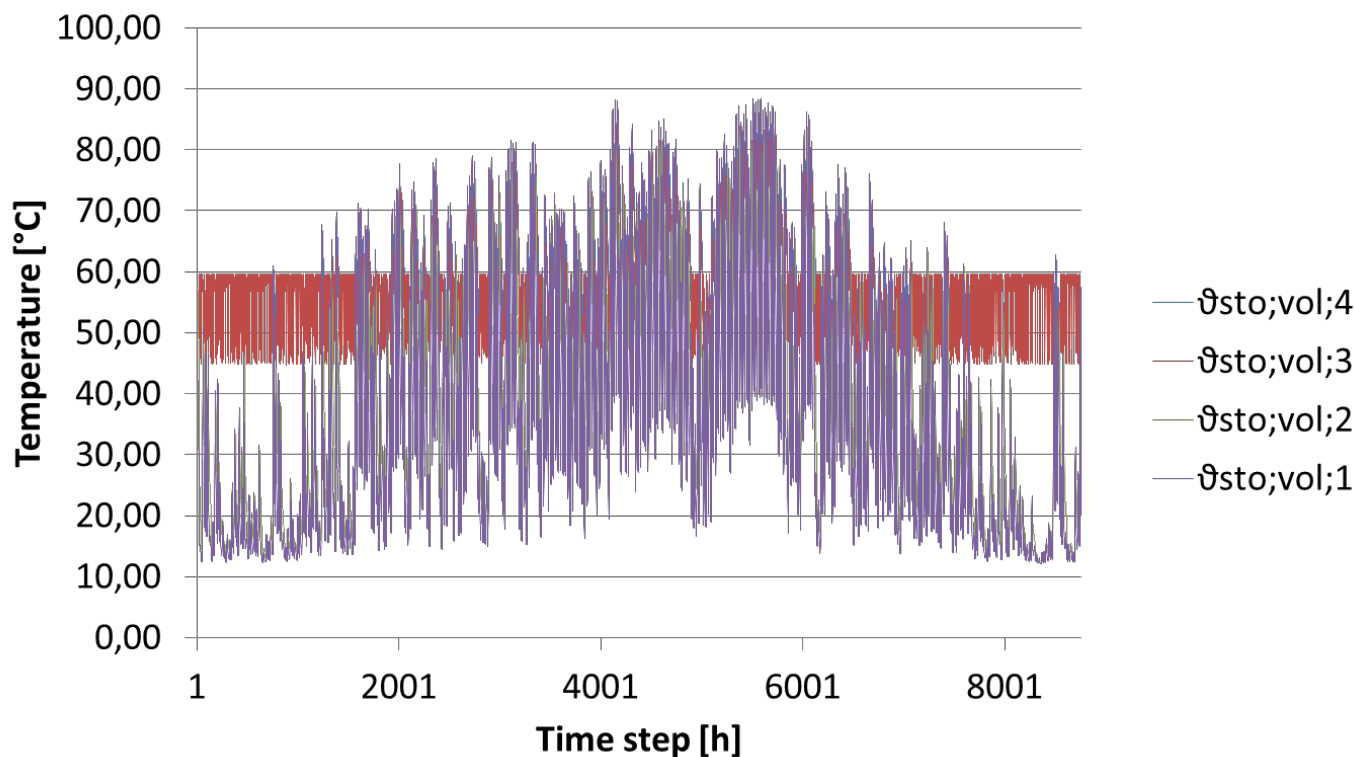
SYSTEM DESIGN DATA		
Storage location		
Boiler room	STO_LOC	STO_LOC_BLR
Stand-by losses correction factor		
		ideal case



Graphical representation of a storage module mathematical model

How?

6. The last part of Module lecture deals with analysis of the most influencing parameters on the intermediate values and final result (sysbstem energy output)



Example of output data - storage tank temperatures

CEN-CE Excel sheet EN 15316_5.xlsm - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW

B8

Evolution of temperatures in the storage through time intervals									
				+					
time step	1234			-					
17%	Layer 4	°C	58,79						
17%	Layer 3	°C	58,79						
33%	Layer 2	°C	38,50						
33%	Layer 1	°C	38,50						

Evolution of temperatures in the storage during the time step									
				Load data for chosen time step					
	Step		Step 1	Step 2 & 3	Step 4, 5 & 6	Step 7	Step 8	Step 10	
	Description		Initial temperatures	DHW Volume withdrawn	Energy withdrawn for DHW circulation system and heating service	Energy inputs (solar + back-up)	Layer melting	Final temperatures	
Layer 4	°C	59,19	59,19	59,19	59,19	59,19	59,19	58,79	
Layer 3	°C	59,19	59,19	59,19	59,19	59,19	59,19	58,79	
Layer 2	°C	28,67	28,67	28,67	28,67	28,67	38,73	38,50	
Layer 1	°C	28,67	28,67	28,67	28,67	48,78	38,73	38,50	

Method_calculation Method_output Output_series Output_interface Output_interface 2

Select destination and press ENTER or choose Paste



Example of output data

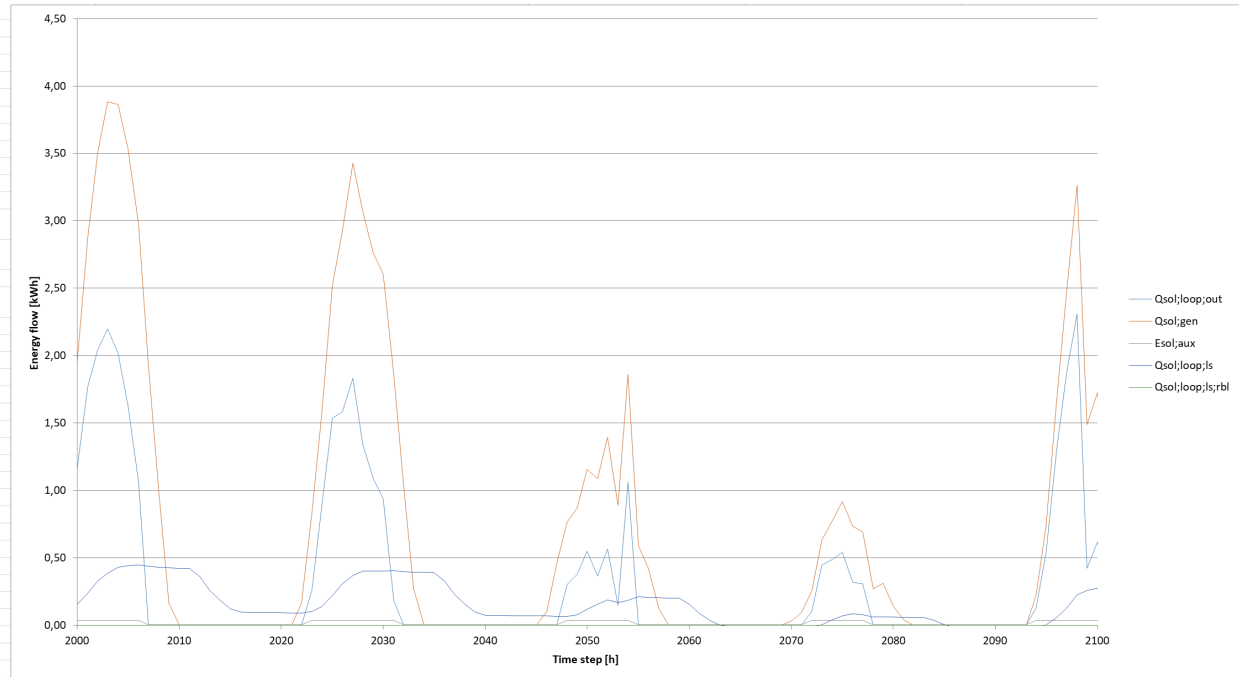
Solar system energy flows

Annual values

Heat generated in the collector apsorber	kWh	$Q_{sol;gen}$	5.218,16
Collector heat output	kWh	$Q_{sol;col,out}$	3.245,20
Collector loop heat output	kWh	$Q_{sol;loop,out}$	2.631,93
Collector loop heat losses	kWh	$Q_{sol;loop;ls}$	1.154,46
Recoverable heat losses of collector loop	kWh	$Q_{sol;loop;ls;rbl}$	0,00
Average solar collector efficiency		$\eta_{col,h}$	0,46
Auxiliary (electrial) energy consumption in the collector loop	kWh	$E_{sol;aux}$	125,03

Time series for chart output	
Settings	
Number of first time steps	2000
Number of last time steps	2100
Apply settings	

Preview settings	
Collector loop heat output	Show
Heat generated in the collector apsorber	Show
Auxiliary (electrial) energy consumption in the collector loop	Show
Collector loop heat losses	Show
Recoverable heat losses of collector loop	Show



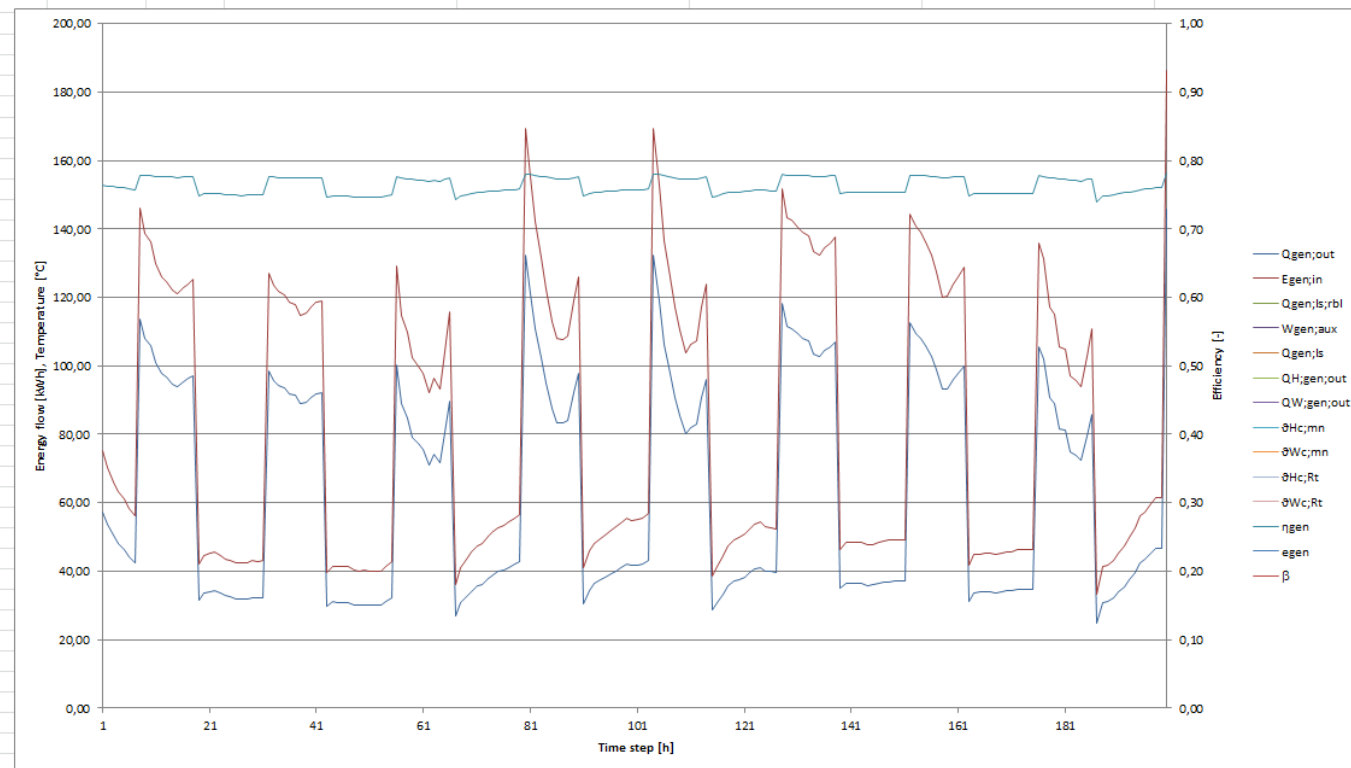
Example of output data

Hot water boiler energy flows

Annual values			
Generator heat output	kWh	$Q_{\text{gen,out}}$	1.478,42
Fuel heat input	kWh	$E_{\text{gen,in}}$	1.928,06
Total heat losses	kWh	$Q_{\text{gen,ls}}$	450,33
Total recoverable heat losses	kWh	$Q_{\text{gen,ls;rbt}}$	30,73
Total auxiliary energy	kWh	$W_{\text{gen,aux}}$	0,91
Total heat output deficiency	kWh	$Q_{\text{gen,bu}}$	0,00
Total load factor	-	β	0,30
Generator efficiency (gross calorific value)	-	η_{gen}	0,77
Expenditure factor	-	ε_{gen}	1,30

Time series for chart output
Settings
Number of first time steps
1
Number of last time steps
200
Apply settings

Preview settings
Total generator heat output
Show
Generator heat output - SH
Dont show
Generator heat output - DHW
Dont show
Fuel heat input
Show
Total heat losses
Dont show
Total recoverable heat losses
Dont show
Total auxiliary energy
Dont show
Generator efficiency (gross calorific value)
Show
Expenditure factor
Dont show
Load
Dont show
Average water temperature - heating
Dont show
Average water temperature - DHW
Dont show
Return water temperature - heating
Dont show
Return water temperature - DHW
Dont show



Example

Solar hot water system - influence of storage tank volume

Lowest energy consumption!		
V=500 l $m_{col}=0.02 \text{ kg/sm}^2$	V=300 l $m_{col}=0.02 \text{ kg/sm}^2$	V=200 l $m_{col}=0.02 \text{ kg/sm}^2$
$Q_{sto;ls} = 1.166,23 \text{ kWh/a}$	$Q_{sto;ls} = 935,96 \text{ kWh/a}$	$Q_{sto;ls} = 782,77 \text{ kWh/a}$
$Q_{H;sto;bu;in} = 1.125,81 \text{ kWh/a}$	$Q_{H;sto;bu;in} = 1.101,48 \text{ kWh/a}$	$Q_{H;sto;bu;in} = 1.138,71 \text{ kWh/a}$
$Q_{sol;loop;out} = 2.840,38 \text{ kWh/a}$	$Q_{sol;loop;out} = 2.631,93 \text{ kWh/a}$	$Q_{sol;loop;out} = 2.449,12 \text{ kWh/a}$

Example

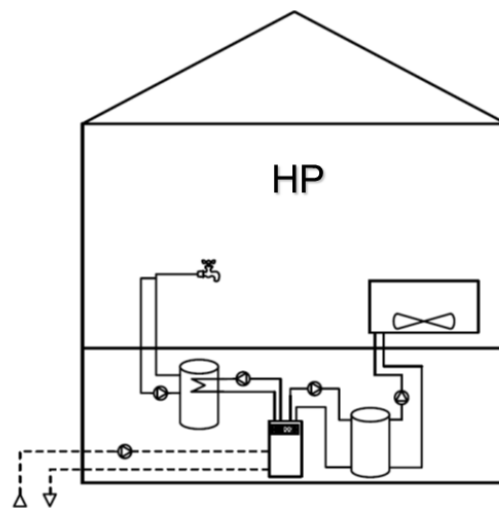
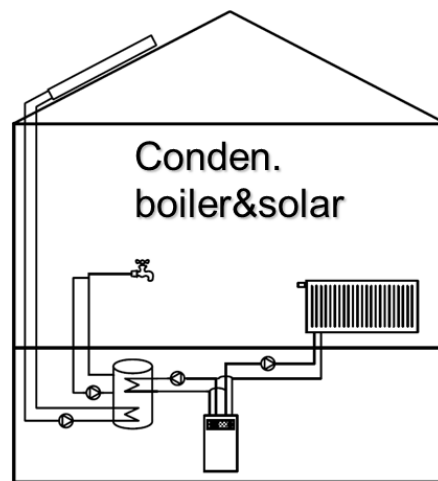
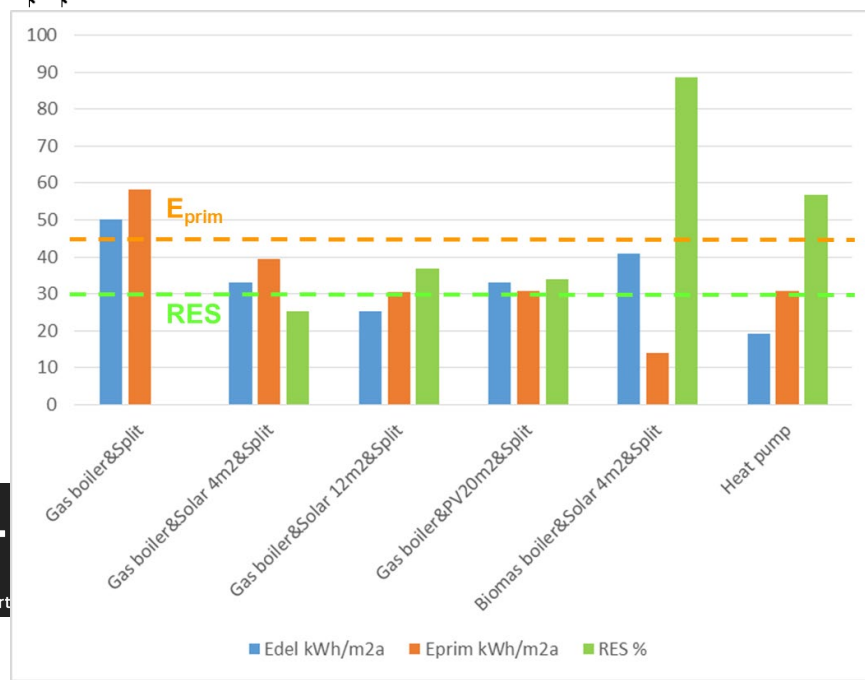
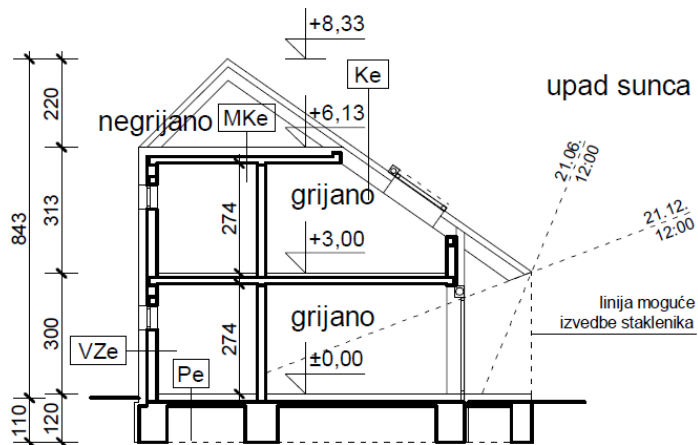
Solar hot water systems - influence of m_{col} and $Q_{W;sto,out,req}$

Basic case

V=300 l $m_{col}=0.02 \text{ kg/sm}^2$	V=300 l $m_{col}=0.01 \text{ kg/sm}^2$	V=300 l $m_{col}=0.02 \text{ kg/sm}^2$ $Q_{W;sto,out,req} =$ 5.621,04 kWh/a (50% increase)
$Q_{sto;ls} = 935,96 \text{ kWh/a}$ $Q_{H;sto;bu,in} = 1.101,48 \text{ kWh/a}$ $Q_{sol;loop,out} = 2.631,93 \text{ kWh/a}$	$Q_{sto;ls} = 921,32 \text{ kWh/a}$ $Q_{H;sto;bu,in} = 1.119,85 \text{ kWh/a}$ $Q_{sol;loop,out} = 2.604,81 \text{ kWh/a}$	$Q_{sto;ls} = 790,78 \text{ kWh/a}$ $Q_{H;sto;bu,in} = 3.124,03 \text{ kWh/a}$ $Q_{sol;loop,out} = 3.279,03 \text{ kWh/a}$

How?

7. At the end of the training, an integral calculation example will be presented in order to demonstrate use of the standards for design, sizing and energy optimization of the technical system solution



How?

- The training is interactive
- Trainees participate in training during spreadsheet exercises, by filling in input data for a given example and by performing parametric analysis
- The emphasis is on nZEBs
- At the end of the training each trainee will define heating/DHW system for a given building of nZEB class
- The proposed technical solution will be discussed in light of technical and economical feasibility as well
- The exams consisting of multiple choice questions will be written after each module
- After completion of the training and passing exams for particular Modules, the trainees will be given a corresponding certificate

EN 15316-4-3 - Microsoft Excel (Product Activation Fail)

File	Home	Insert	Page Layout	Formulas	Data	Review	View
C44							
3	PRODUCT DATA						
4	Product descriptive data						
5	Collector type		Glazed collector				
6							
7	Collector module reference area	$A_{col,mod}$	$A_{col,mod}$	m ²	2,51		
8	Number of collector modules installed	N_{col}	N_{col}	-	2		
9							
10							
11							
12	Name	Symbol	Value				
13	Product technical input data list						
14	Collector module reference area	$A_{col,mod}$	2,51				
15	Peak collector efficiency	η_0	0,741		Product data		
16	First order heat loss coefficient	a_1	3,491		Product data		
17	Second order heat loss coefficient	a_2	0,015		Product data		
18	Hemispherical incidence angle modifier	$K_{t,hem}(50^\circ)$	1		Default value		
19	Mass flow rate collector loop per m ²	$\dot{m}_{col,m}$	0,02		Default value		
20	Power of collector pump	$P_{col,pump}$	33		Default value		
21	Power of collector pump controller	$P_{col,ctrl}$	4		Default value		
22							
23							
24							
25	SYSTEM DESIGN DATA						
26	Storage location						
27	Heated space		HS				
28							
29							
30							
31	Name	Symbol	Value				
32	System design data						
33	Location of the main part of the collector loop piping	SOL_LOC	HS				
34	Number of collector modules installed	N_{col}	2				
35	Tilt angle of the collector	$\alpha_{col,tilt}$	45				
36	Azimuth angle of the collector	$\alpha_{col,az}$	0				
37	Mass flow rate solar loop	\dot{m}_{sol}	0,1004				
38							
39							
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Ready

What?

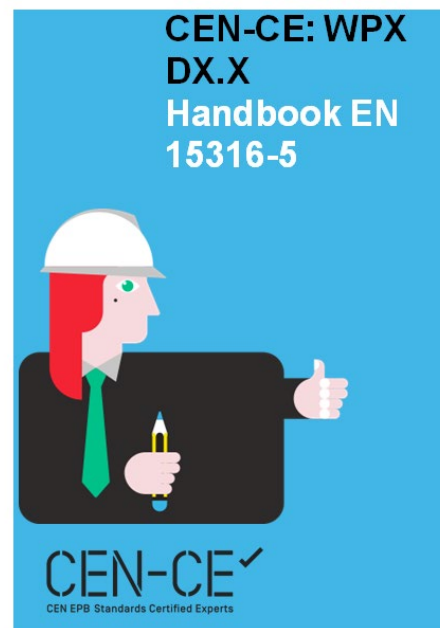
Training outcomes

Provide knowledge – skills – competence – reliability

Training materials (for each standard) :

- handbook
- one page presentation of the topic
- ppt presentation with comments for trainers
- spreadsheets with examples to show the main influences and possibilities
- commented input / output list of data
- didactics for trainers (2 pages/standard).
- questions and answers (correct and 3 incorrect answers) for exam (15 questions/standard)

English version of training materials will be translated as primary in French, Italian, Croatian and Slovak language.



INDEX



1. Introduction
2. Fundamentals
3. Input data
4. Calculation method
5. Output data
6. Example

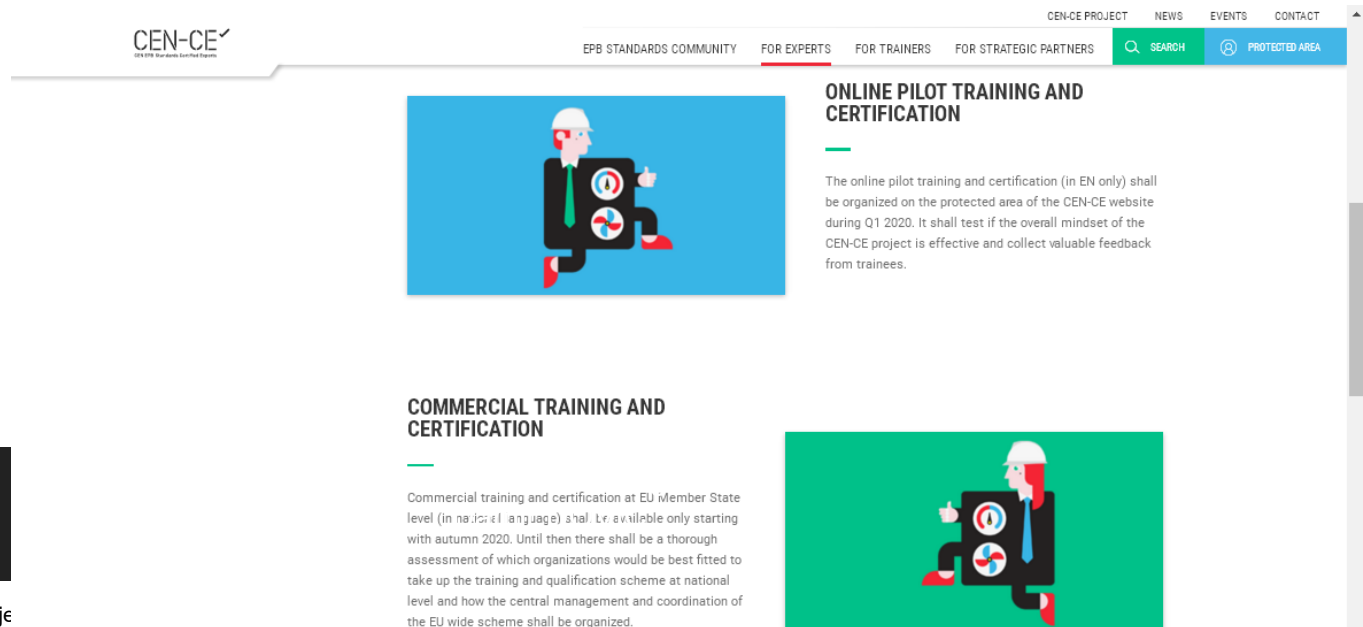
What?

are the steps of becoming a CEN-CE standards certified expert:

- Application and proof of eligibility (initial competence criteria);
- Undertaking training (competence, knowledge);
- Verification (passing examination);
- Certification & recognition (public list)

Targeted groups: designers, installers (level 4 in EQF), engineers, architects, national calculation methodologies developers (level 5, 6 in EQF)

The training and certification is available also online as e-learning.



The screenshot displays the CEN-CE website interface. The header includes the CEN-CE logo and navigation links: EPB STANDARDS COMMUNITY, FOR EXPERTS (highlighted), FOR TRAINERS, FOR STRATEGIC PARTNERS, CEN-CE PROJECT, NEWS, EVENTS, and CONTACT. A search bar and a 'PROTECTED AREA' link are also present. The main content area features a large blue graphic of a person in a hard hat and safety vest, holding a tablet with a circular icon. To the right of this graphic is the section titled 'ONLINE PILOT TRAINING AND CERTIFICATION'. Below this, a paragraph states: 'The online pilot training and certification (in EN only) shall be organized on the protected area of the CEN-CE website during Q1 2020. It shall test if the overall mindset of the CEN-CE project is effective and collect valuable feedback from trainees.' Further down, there is a section titled 'COMMERCIAL TRAINING AND CERTIFICATION' with a green background and a similar graphic of a person in a hard hat and safety vest, holding a tablet. A paragraph below this section states: 'Commercial training and certification at EU Member State level (in national language) shall be available only starting with autumn 2020. Until then there shall be a thorough assessment of which organizations would be best fitted to take up the training and qualification scheme at national level and how the central management and coordination of the EU wide scheme shall be organized.'

CEN-CE
CEN EPB Standards Certified Experts

EPB STANDARDS COMMUNITY FOR EXPERTS FOR TRAINERS FOR STRATEGIC PARTNERS CEN-CE PROJECT NEWS EVENTS CONTACT

SEARCH PROTECTED AREA

ONLINE PILOT TRAINING AND CERTIFICATION

The online pilot training and certification (in EN only) shall be organized on the protected area of the CEN-CE website during Q1 2020. It shall test if the overall mindset of the CEN-CE project is effective and collect valuable feedback from trainees.

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This proje

CONTACT

Damir DOVIĆ

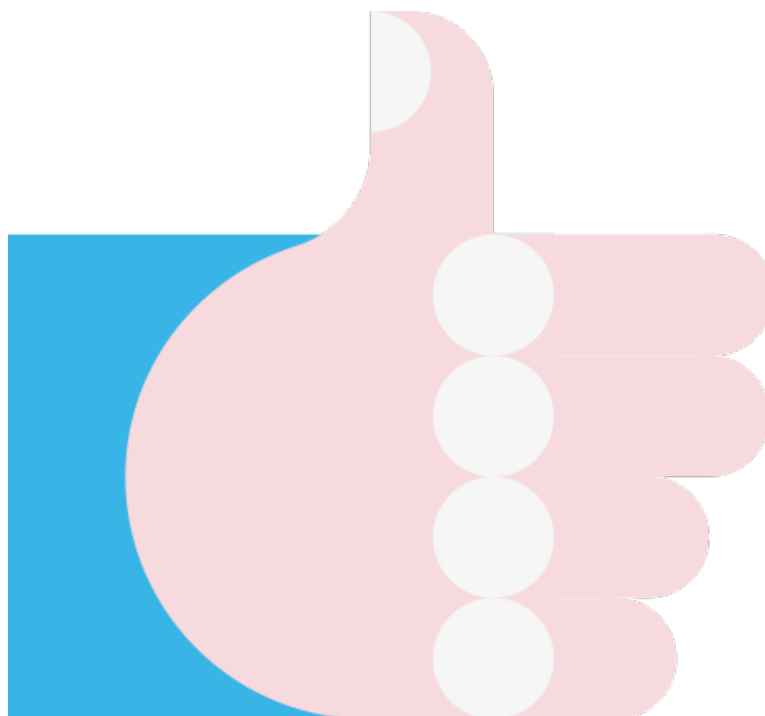
University of Zagreb,
Faculty of Mech. Eng. and
Naval Architecture, Croatia

T : +385 01 6168 174

C : +385 91 6168 174

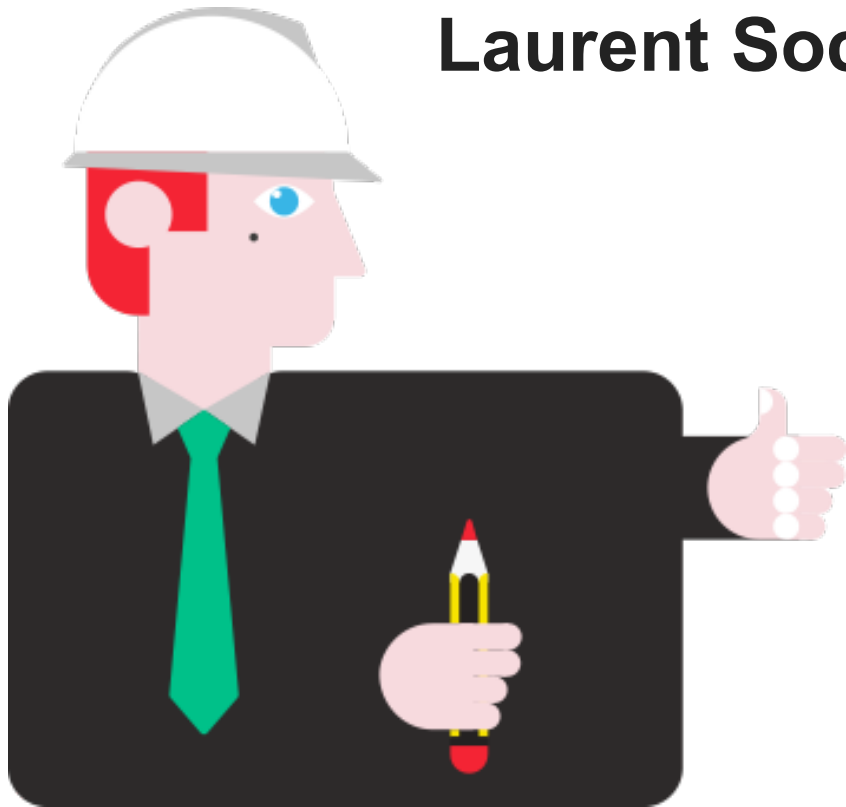
E-mail: ddovic@fsb.hr

THANK YOU



Professional tools integrating EPB standards

Laurent Socal



CEN-CE✓

CEN EPB Standards Certified Experts

**Build-up webinar
Showcasing CEN-CE
scheme**

5th of May 2020

12h00 – 13h30



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018.

Professional tools integrating EPB standards

Laurent SOCAL

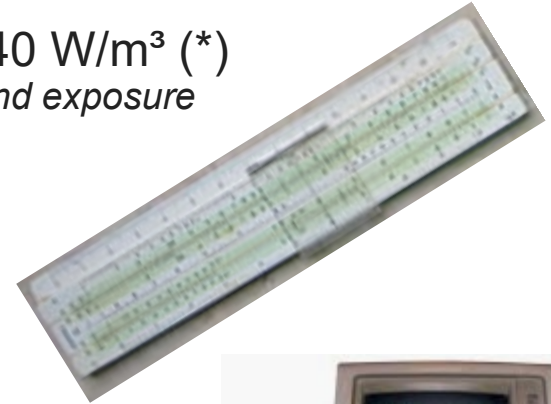
socal@iol.it



11h00

Background

- **Up to \approx the years '70** it was just heat load $\rightarrow 20...40 \text{ W/m}^3$ (*)
(*) values depending on climate, type of building, space position and exposure
- **Then** the worry was energy need for heating
 \rightarrow losses minus useful gains
- **Then** came primary energy and renewables
- **Now** we care about primary energy
for all comfort services (H, C, W, V, HU/DHU, L, ...)
- **Buildings and systems are more and more complex**
- There are new technologies available
- Technical systems are more and more complex
- **Performance requirements are tough**
- **Calculation methods** for legal purposes have to follow to be representative
and to evaluate correctly the effect of the various technologies.



Software calculation tools are needed

Why professional calculation tools

The «**designer**» has two tasks that need calculation:

- **Sizing**: assemble a set of objects and/or devices so that services can be provided even in the worst case operating conditions
- **Energy calculation**: Check how does the whole behave along a reference year of operation and check legal requirements

Professional tools are needed to facilitate the following steps

- **Description** of the building and systems → graphics input
- Finding **data** about components → integrated data-base
- Performing the **calculation** as required by standards → algorithms
- Presenting **results** and giving feed-back → graphic output
- Checking **compliance** with legal requirements → checks
- Compiling standardized **reports** for legal purpose → XML output
(*EPCs, building permits, incentive application, energy audits, ...*)

Basic tool: hand held calculator

- Totally flexible but no predefined algorithm
- Limited computation capability
- No helpful interface
- No data base
- Elementary output
- Requires experienced user, understanding the topic, and knowing benchmarks
- **Typical application:**
 - **Rough sizing**
 - **Screening** for mistakes of software results (rule of thumb calculation)

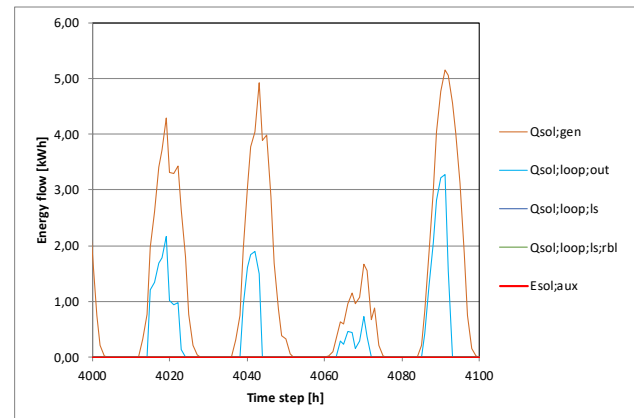


Experimental tool: Excel sheet

- **Totally traceable**
- Some interface capability
- Some data-base capability
- Hard to calculate an entire building + systems
- Slow calculation compared to software
- **Can be customized** but this requires expertise
- **Typical application:**
 - Standards development
 - Software validation (documenting test cases)
 - Teaching and training
 - Calculation of simple cases
 - Custom design approach

Product technical input data list				Default data	
Collector module reference area	$A_{sol,mod}$	m ²	2,51		
Peak collector efficiency	η_0	p.u.	0,741	Product data	0,800
First order heat loss coefficient	a_1	W/m ² K	3,491	Product data	3,500
Second order heat loss coefficient	a_2	W/m ² K ²	0,015	Product data	0,000
Hemispherical incidence angle modifier	$K_{hem} (50^\circ)$	p.u.	0,94	Default data	0,94
Mass flow rate collector loop per m ²	$\dot{m}_{col,h}$	kg/s m ²	0,02	Default data	0,02
Power of collector pump	$P_{sol,pmp}$	W	33	Product data	40,06
Power of collector pump controller	$P_{sol,ctr}$	W	4	Product data	2,51
Collector liquid specific contents		l/m ²	0,2		
System design data				Load default data	

Latent specific heat	$C_{ev,loop}$	kJ/kg	2160,0		
Maximum latent energy stored	$Q_{col,sto,max}$	kWh	0,9		$Q_{col,sto,max} = \frac{C_{ev,loop} \times m_{col,w}}{3600}$
Loss factor at boiling temperature	$a_{\theta,col,boil}$	W/mK	5,6		$a_{\theta,col,boil} = a_1 + a_2 \times (\theta_{col,boil} - \theta_e)$
Radiation needed to keep boiling	$I_{\theta,col,boil}$	W/m ²	1161,5		$I_{\theta,col,boil} = \frac{a_{\theta,col,boil} \times (\theta_{col,boil} - \theta_e)}{\eta_0 \cdot K_{hem}}$
Radiation during the hour	$I_{sol,h}$	W/m ²	0,0		
Stored energy change					
Net solar irradiance above boiling	$I_{sol,ev}$	W/m ²	0,0		IF COLL_STA _{n-1} = TRUE : $I_{sol,ev} = I_{sol} - I_{\theta,col,boil}$ IF COLL_STA _{n-1} = FALSE : $I_{sol,ev} = 0$



**Nowadays
Excel
=
Manual
calculation**

Professional tools: application software

- Well developed interfaces
- Integrated databases
- Fast calculation
- Little modeling skills required
- Declared algorithms
- Some countries require validation
- Cannot be customized beyond integrated options
- **Typical application:**
 - **Professional productive use**
 - **Energy performance calculation of any type building**

Walls: M1 - Parete a cappotto

Code M1 Description Parete a cappotto Type T from conditioned room to external

General data Stratigraphy Thermohygrometric check Graphs Results

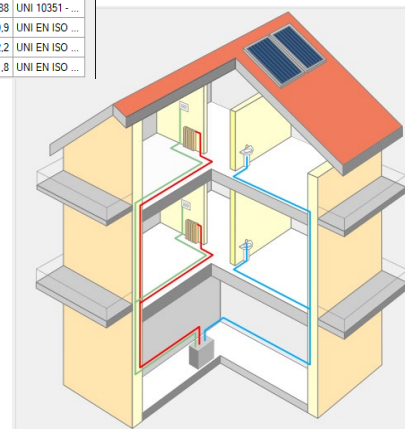
Layers list (from inside to outside)

Code	Description	Thickness [mm]	Cond. [W/mK]	R [m ² ·K/W]	M.V. [kg/m ³]	H.C. [kJ/kgK]	V.R.
e1023	Malta di calce o di calce e cemento	15.00	0.900	0.017	1800	0.84	27
e8111	Blocco forato	300.00	0.319	0.940	693	0.84	7
e109	Barriera vapore in fogli di P.V.C.	1.00	0.160	0.006	1400	1.30	10000
e1813	Polistirene espanso, estruso con pelle	80.00	0.036	2.222	30	1.25	300
e11304	Edilfiber, densità 30 kg/mc	80.00	0.036	2.204	30	0.24	3
e11203	Lastra DIWEM in legnocemento al silicio per este...	15.00	0.240	0.063	1600	0.88	70
e1006	Intonaco di cemento e sabbia	5.00	1.000	0.005	1800	1.00	10

Total thickness 496.00 mm

Code Preview Find

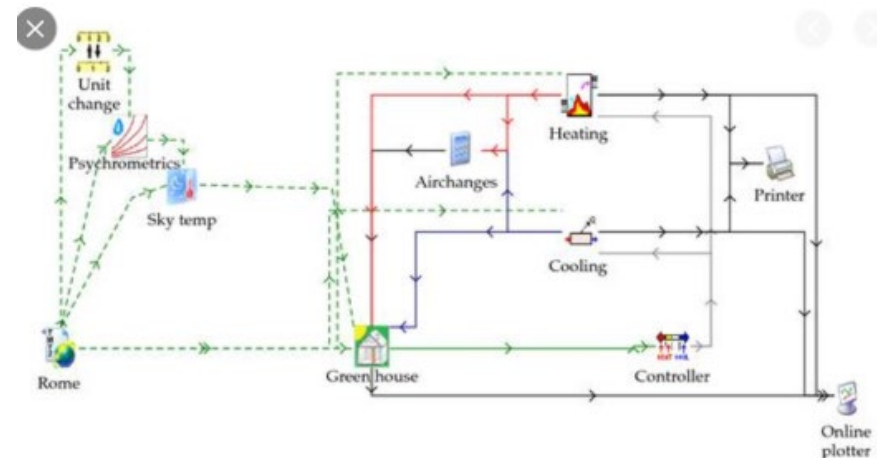
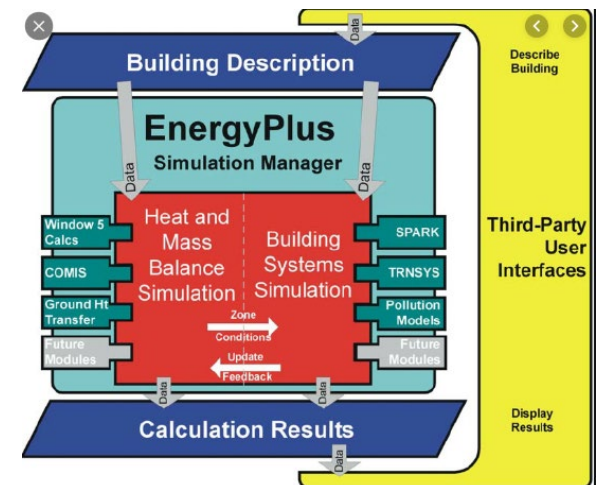
Material type	Code	Description	Th	M.V.	Cond.	V.R.	H.C.	Regulations
Barriera al vapore	e101	Barriera vapore in bitume puro	0	1050	0.170	50000	1	UNI EN ISO
Impermeabilizzazioni	e102	Barriera vapore in carta o cartone ...	0	1100	0.230	2500	1	UNI 10351 - ...
Impermeabilizzazioni in bitume-A.B. ISOL...	e104	Barriera vapore in bitume feltro /fo...	0	1100	0.230	50000	1	UNI EN ISO ...
	e106	Barriera vapore foglio di alluminio (...)	0	2700	220.000	9999999	0.88	UNI 10351 - ...
	e109	Barriera vapore in fogli di P.V.C.	0	1390	0.160	50000	0.9	UNI EN ISO ...
	e110	Barriera vapore in fogli di polietilene	0	920	0.330	100000	2.2	UNI EN ISO ...
	e111	Barriera vapore in fogli di polietilene	0	980	0.500	100000	1.8	UNI EN ISO ...



Professional software is developed for methods in use in a country (need a market)

Simulation tools (E+, TRNSYS, ...)

- General purpose scientific tools
- Text interface or third party interface
- Little traceability, a lot of “black boxes”
- Applies its own algorithm or to be programmed
- Not linked to data bases
- Long calculation time
- Each case shall be developed on its own
- Expert modeling skills required
- Generally intended to cover either building physics or systems
- **Typical application:**
 - **Research**
 - **Design of specific comfort solutions**



EPB standards: software-proof and regulation-fit

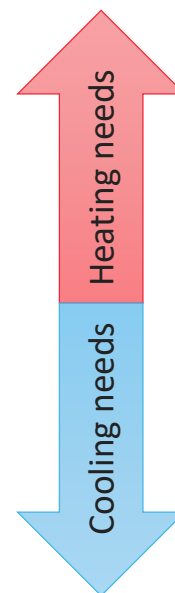
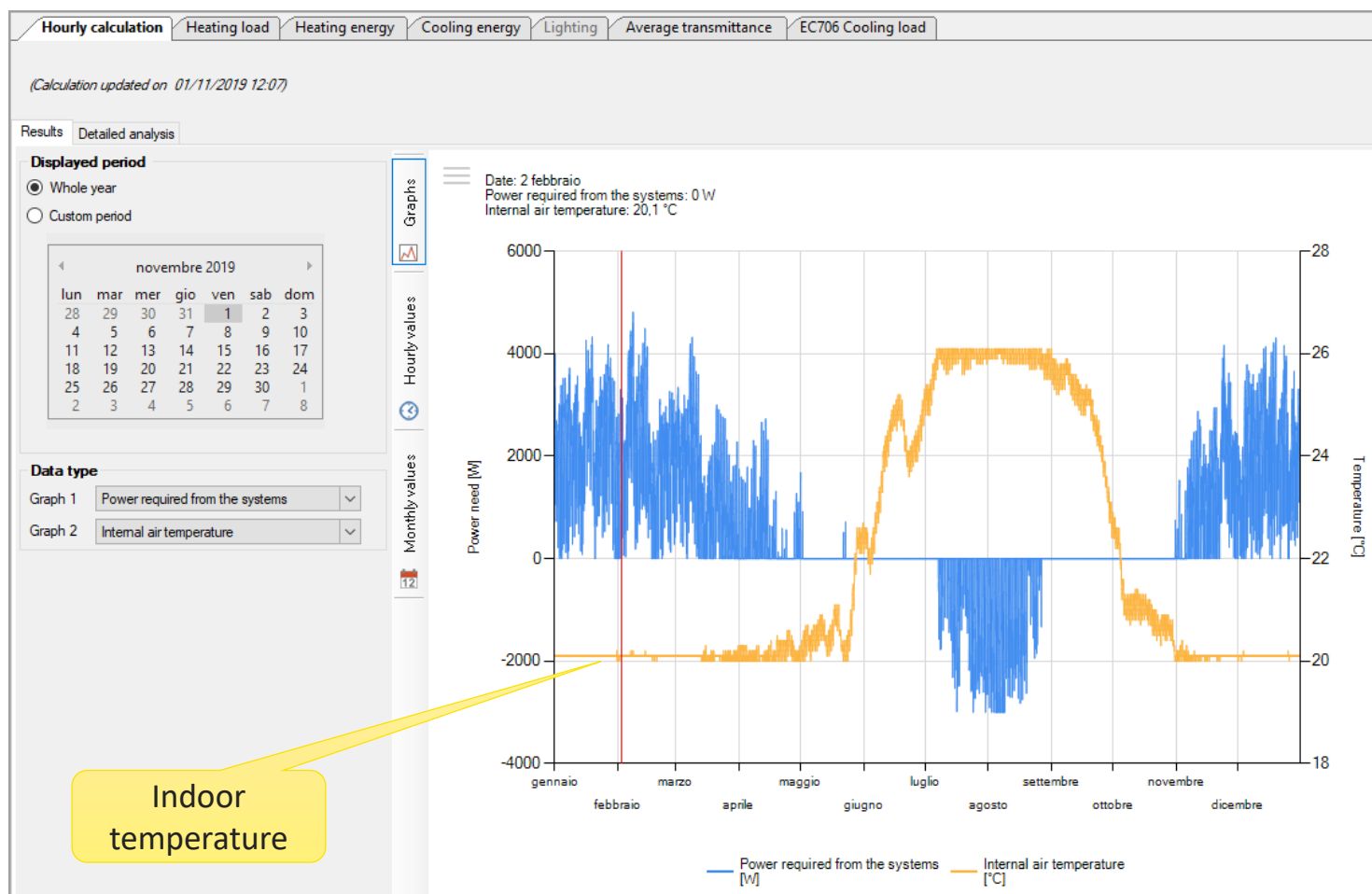
EPB standards are intended to support energy performance regulation and the required application software. DTR (CEN-TS 16629:2014) established a set of rules for that purpose.

Objectives	Solution
Software proof modules	Demonstration Excel
Tested links between modules	Software tool
	Processing several modules together
Use for regulation	Traceable equations
	Traceable options
Application software validation	Demonstration excel to build and document test cases
Connecting with data bases	Type of input data

The link between software and EPB standards

- Without **professional software**, no energy performance calculation scheme can be applied effectively, neither monthly nor hourly.
XLS tools are limited to algorithm testing, test case development and software validation.
- It is a big investment to develop a professional energy performance calculation software from scratch (some millions Euros) and then you have to maintain and update it and support users.
Obviously, you need a significant market to pay the effort
- An EPB professional software is likely to be developed if a large EU country adopts EN-EPB standards
EXAMPLE of such a country: Italy
 - Software based on EPB standards is already being developed
 - Already available: hourly method for needs, systems configuration, etc

Hourly needs calculation according to EN 52016



Defining hourly profiles



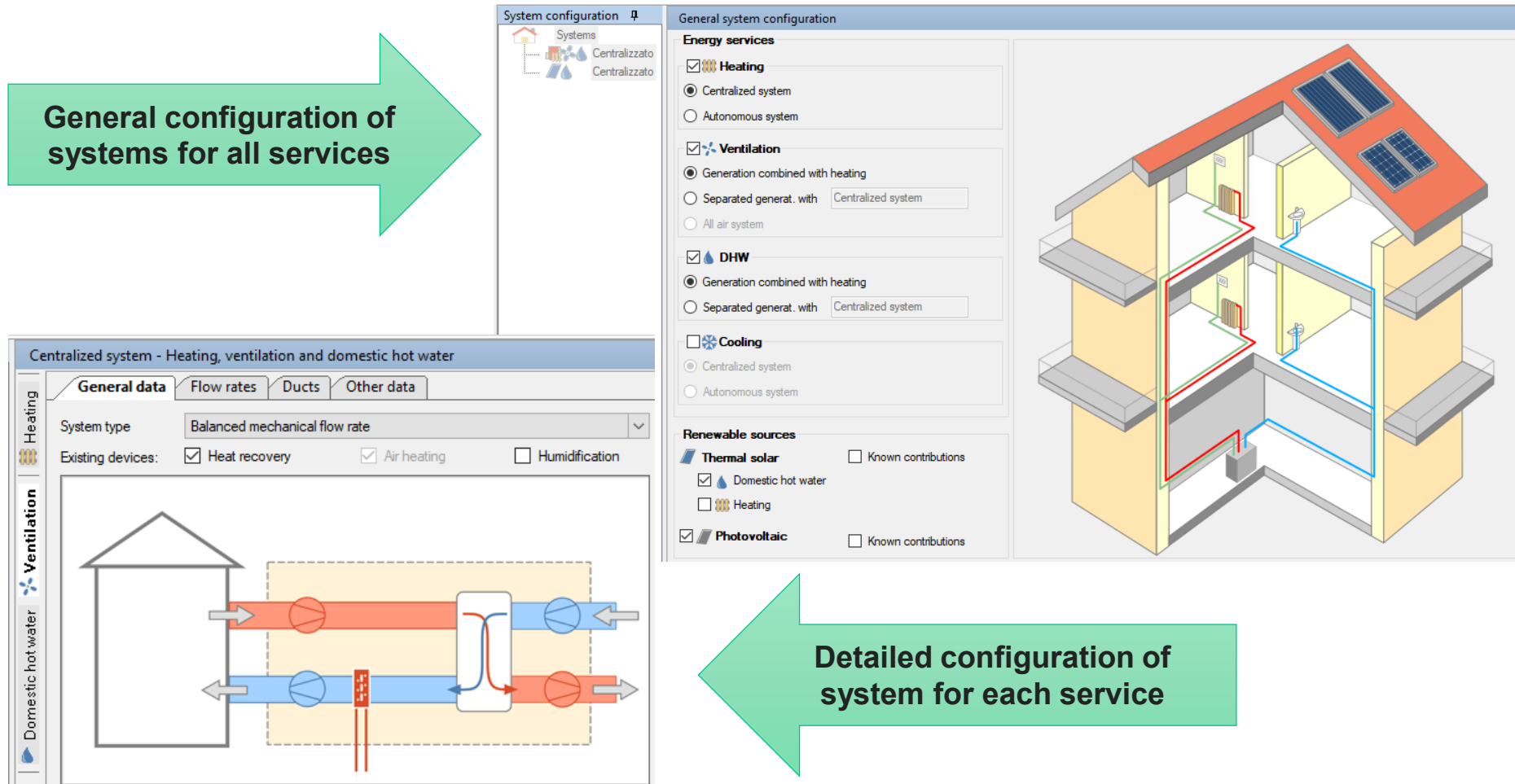
Defining hourly operating conditions means selecting the room category, just like monthly.

If needed, profile can be easily tailored for audit purpose

The graph gives the feed-back

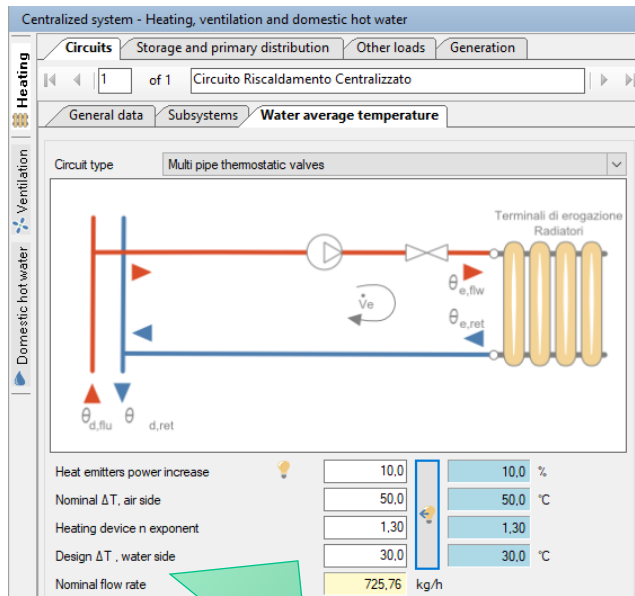
Technical system configuration

General configuration of systems for all services

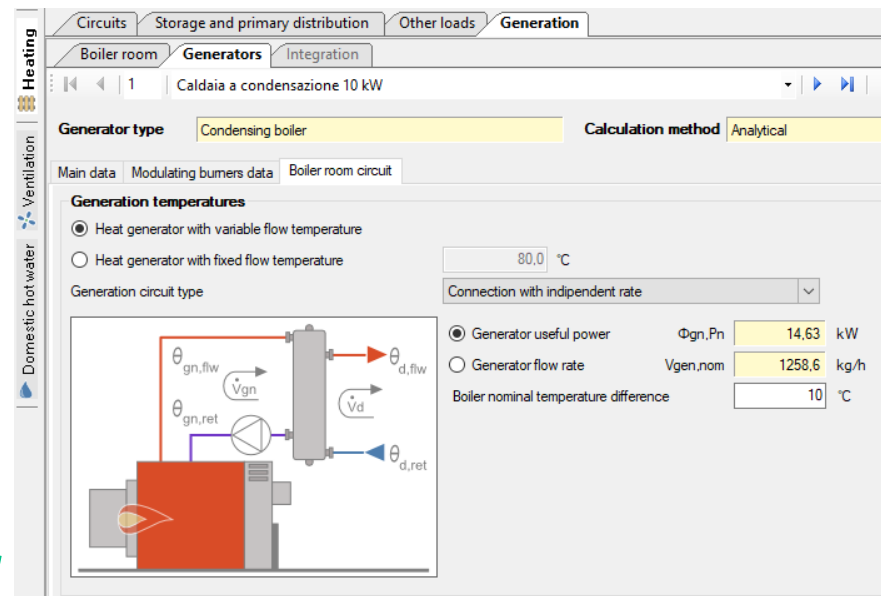


Detailed configuration of system for each service

Calculation of operating conditions: EN 15316-1

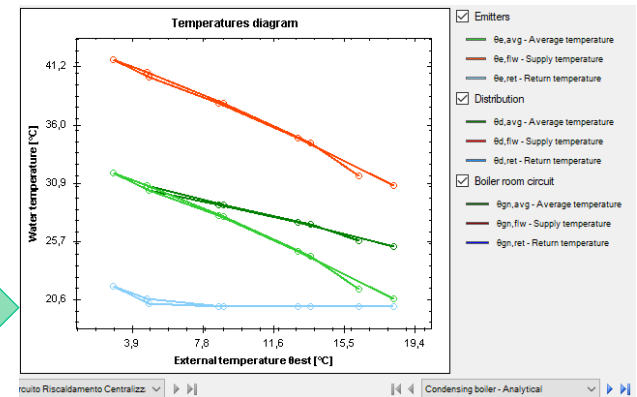


1: Emission and control configuration



2: Generation configuration

3: Operating conditions em, dis and gen temperatures

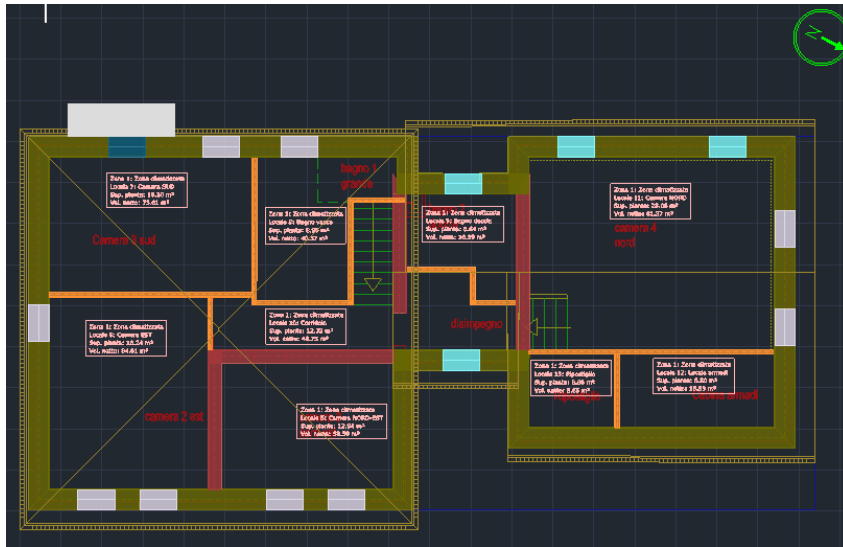


Calculation tools are just big calculators

An energy performance calculation software is just a big calculation machine with an extended keyboard

- **Who uses a calculation tool ...**
 - **shall know** which is the right **input data**
 - **shall always be aware of what is calculated and how**
→ *check intermediate and final results to keep control*
- **The calculation tool**
 - **Shall have a clear interface** to facilitate use ...
“An interface, if you have to explain it, then it is wrong...”
 - **Shall give adequate feed-back** so that
the user knows what's going on and
is always in control of the calculation procedure (avoid black box)

Clear interface...



Drawing 2D with a drawing
in the background.

Simple input of building description.
Less mistakes in inserting building
elements length and area



Result is presented 3D
Feed-back on what has been input
in 2 D like overhangs
and neighboring buildings
Plot on Google maps top check
orientation and obstructions

Data base...


Walls: M1 - Parete a cappotto

Code **M 1** Description **Parete a cappotto** Type **T** from conditioned room to external

General data **Stratigraphy** Thermohygrometric check Graphs Results

Layers list (from inside to outside) Total thickness **496,00** mm

Code	Description	Thickness [mm]	Cond. [W/mK]	R [m²K/W]	M.V. [kg/m³]	H [kJ]
e1023	Malta di calce o di calce e cemento	15,00	0,900	0,017	1800	
e8111	Blocco forato	300,00	0,319	0,940	693	
e109	Barriera vapore in fogli di P.V.C.	1,00	0,160	0,006	1400	
e1813	Polistirene espanso, estruso con pelle	80,00	0,036	2,222	30	
e11304	Edifiber, densità 30 kg/mc	80,00	0,036	2,204	30	
e11203	Lastra DIWEM in legnoemento al silicio per este...	15,00	0,240	0,063	1600	
e1006	Intonaco di cemento e sabbia	5,00	1,000	0,005	1800	

Code Preview  Find

Water vapour barrier Concretes Plasters Insulating materials Bricks Slabs Different Panels Air layers

Material type	Code	Description	M.V.	Cond.	Regulations
Blocchi forati e semipieni (fori vert.)	e1601	Muratura in laterizio pareti interne (u...	600	0,250	UNI 10351 - ...
Mattoni e blocchi forati (fori orizz.)	e1602	Muratura in laterizio pareti interne (u...	800	0,300	UNI 10351 - ...
Mattoni pieni e semipieni	e1603	Muratura in laterizio pareti interne (u...	1000	0,360	UNI 10351 - ...
Murature e pareti in laterizio	e1604	Muratura in laterizio pareti interne (u...	1200	0,430	UNI 10351 - ...
Tavelloni	e1605	Muratura in laterizio pareti interne (u...	1400	0,500	UNI 10351 - ...
Laterizi Alveolater-SIAI SRL - Lateri...	e1606	Muratura in laterizio pareti interne (u...	1600	0,590	UNI 10351 - ...
Laterizi comuni-SIAI SRL - Laterizi ...	e1607	Muratura in laterizio pareti interne (u...	1800	0,720	UNI 10351 - ...
Laterizi classici a fori orizzontali-Wi...	e1608	Muratura in laterizio pareti interne (u...	2000	0,900	UNI 10351 - ...
Laterizi classici a fori verticali-Wien...	e1609	Muratura in laterizio pareti esterne (...)	600	0,360	UNI 10351 - ...
Modulari-Wienerberger S.p.A. Unip...	e1610	Muratura in laterizio pareti esterne (...)	800	0,410	UNI 10351 - ...
Porotherm Bio-Wienerberger S.p.A....	e1611	Muratura in laterizio pareti esterne (...)	1000	0,470	UNI 10351 - ...

EXIT TOOLS SUPPORT

OK Cancel


Edilclima archives

Generators

Edilclima archive User archive

Make	Series	Appliance
PARADIGMA ITALIA SRL	Modula NT	Condensing wall - hung boiler
PARADIGMA ITALIA SRL	ModuPower 210	Condensing floor standing boiler
PARADIGMA ITALIA SRL	ModuPower 310	Condensing floor standing boiler
PARADIGMA ITALIA SRL	ModuPower 610	Condensing floor standing boiler
PARADIGMA ITALIA SRL	ModuStar B	Condensing wall - hung boiler
PARADIGMA ITALIA SRL	ModuStar C	Condensing wall - hung boiler
PARADIGMA ITALIA SRL	ModuVario	Floor standing boiler with dhw conder
PARADIGMA ITALIA SRL	ModuVario Aqua	Floor standing boiler with dhw conder
PARADIGMA ITALIA SRL	ModuVario NT	Floor standing boiler with dhw conder
RIELLO	ALTARESA IN	Condensing wall - hung boiler

Code	Model	Comb. power [kW]	Comb. power red. [kW]	Nom. net pow. [kW]	Red. net pow. [kW]	Eff. 100% [%]	Eff. 30% [%]
54401	Modula NT 10	10,500	3,100	10,100	3,000	96,2	109,7
54402	Modula NT 15	15,000	3,100	14,500	3,000	96,7	109,7
54403	Modula NT 25	25,000	5,200	24,100	5,000	96,4	107,7
54404	Modula NT 35	34,800	6,500	33,700	6,300	96,8	107,7
54405	Modula NT 28C	25,000	5,200	24,100	5,000	96,4	107,7
54406	Modula NT 35C	34,800	6,500	33,700	6,300	96,8	107,7

Picture 

Data base may include simple materials properties and entire product description
 Reduced risk of wrong input, **connection with manufacturer data (EPREL?)**

What is the software doing?

To get the correct results you need to apply ...

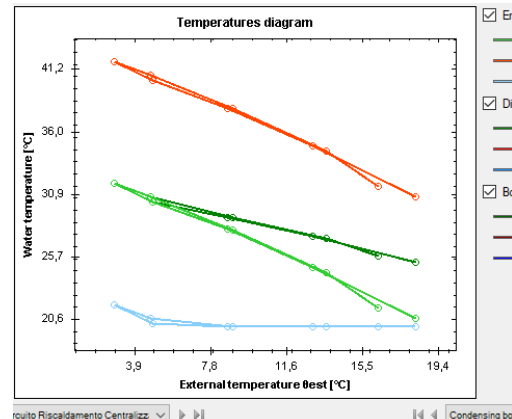
- the right calculation
- to the right input data

Validation of software

- gives some confidence that algorithm is correct
- but doesn't protect against wrong input

The user is responsible for input

- **A good interface** prevents wrong input (feed-back, checks)
- **A good training and experience** are needed to identify the right input and reduce the risk of mistakes



Heating system - monthly details

Hydronic + aeraulic system					
Month	Days	$\eta_{H,em}$ [%]	$\eta_{H,rg}$ [%]	$\eta_{H,du}$ [%]	$\eta_{H,gen,p,nren}$ [%]
January	31	98,0	98,0	97,0	102,3
February	28	98,0	98,0	97,0	102,3
March	31	98,0	98,0	97,0	101,9
April	30	98,0	98,0	97,0	100,6
May	22	98,0	98,0	97,0	72,1
June	-	-	-	-	-
July	-	-	-	-	-
August	-	-	-	-	-
September	4	98,0	98,0	97,0	90,8
October	31	98,0	98,0	97,0	100,2
November	30	98,0	98,0	97,0	101,9
December	31	98,0	98,0	97,0	102,3

Heating

Domestic hot water

Cooling

Thermal solar

Photovoltaic

System

Centralizzato

Number of solar collectors

2

Total openings surface of collectors

4,60

m²

Yearly percentage of domestic hot water need coverage

58,2

%

Actual annual electricity consumption

40

kWh

System results

☐ Individual sub-item
 ☒ Overall system

Subitem

Domestic hot water

Month	Collectors producibility [kWh]	QW _{gn,out} with solar [kWh]	QW _{gn,out} without solar [kWh]	Coverage percentage [%]
January	56	219	275	20,3
February	95	152	247	38,4
March	153	117	270	56,6
April	169	89	258	65,6
May	230	32	262	87,9
June	241	10	251	96,1

The principle: parallel, asymmetric processing

Case study: **PLCs and safety**
(traffic lights, oxygen control, etc.)

«*Safety Integrity Level*»

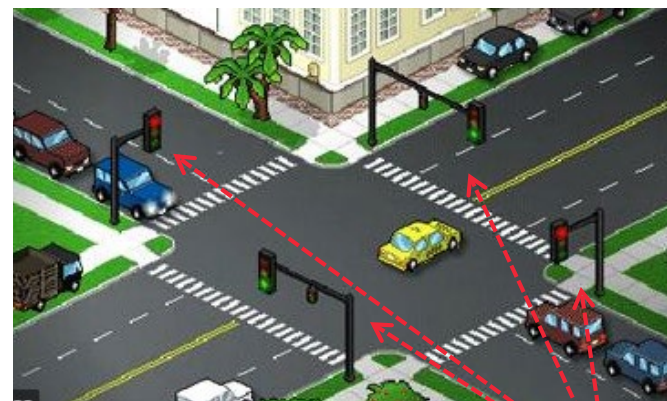
SIL required for safety critical tasks

Basic approach: 2 identical PLCs.

- Protects against hardware failures
- Doesn't protect against software issues and failures

Better approach: 2 different PLCs with different software shall produce the same results/commands.

- Protects against hardware failures (*sync needed to avoid false errors*)
- Good for software issues and failures: it's very unlikely to have the same mistake in two different software programmed by two different people



Parallel, asymmetric processing in action...

Processor 1 Software

Strictly obeys to
input and
algorithm
No fantasy
No initiative
No awareness
Damn fast
Can handle tons
of details
**Shall be
programmed**
Doesn't learn
from experience
(... not yet)



Processor 2 Brain

Evaluates input
Has fantasy
Has initiative
Can invent new
solutions
Should be aware
Damn slow in
calculation
Can handle few
numbers
Shall be trained
Learns from
experience
(... not always)

**For optimum performance
they have to work in parallel**

Procedures, software and training

- **Professional software** based on standards is required for massive application, e.g. EPCs and building permits production.
This is coming in countries that are going to use EPB standards
- **When selecting software...**
... look for ease of input, data base availability and user feed-back
- **When using software, keep your brain on-line:**
always check if intermediate results are consistent
and final result is plausible (parallel asymmetrical processing)
- **Be prepared and trained to understand what happens**
Training is the key to maximize the benefit of experience...

Procedures and software do not replace expertise

Standards, tools and software may help experts, suggest values, guide calculation, define and perform detailed and complex algorithms but there is no automatic design or energy calculation software (at least not yet...)

Conclusion and summary

- **Calculation tools** are needed to support HVAC design activities
→ software
- **Setting legal requirements** requires
→ traceable and comprehensive methods
- **EPB standards** are designed to be software proof and unambiguous
- **Professional software** is the right level of tools for productive use
- **A market** where EPB standards will be used already exists.
Professional software based on EPB standards
is already under development there
- **Software is a tool**,
→ it has to be user friendly and give clear **feed-back**
- **Professionals** using software tools shall keep control of calculations
→ **experience and training**

CONTACT

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Socal Laurent Roberto

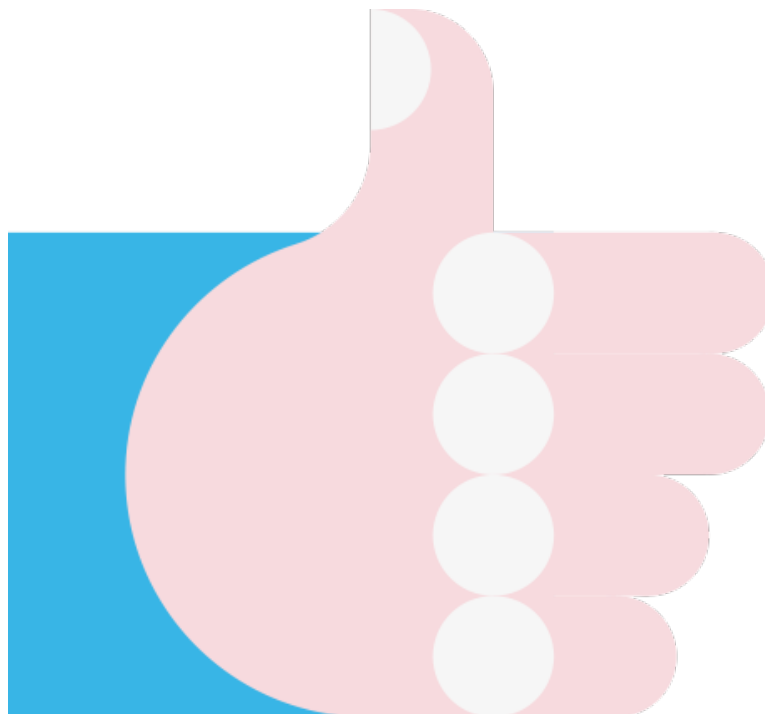
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THANK YOU



CEN-CE online pilot training and Learning Management System

Andrei Vladimir LIȚIU

avl@rehva.eu



Build Up portal webinar

5th May 2020

12h00 – 13h30 CEST

12h50

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CEN EPB Standards Certified Experts



EPB standards Community



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EPB Standards Community

EPB STANDARDS COMMUNITY

Community is everything: be part of the EPB Standards tribe (#EPBstandards)

CEN-CE team encourages you to join the dedicated [LinkedIn group EPB Standards Community \(#EPBstandards\)](#) and the [Build Up thematic topic energy performance calculation procedures and CEN standards](#).



Be sure to share and connect others to the EPB Standards Community and remember to use the hashtag #EPBstandards.

The EPB Standards Community aims at becoming the ideal place for dissemination and communication about initiatives and ongoing activities focusing on the promotion and exploitation of the set of EPB standards at EU, national and regional levels.

CEN-CE is facilitating the community building around the EPB standards developed by CEN related to the Energy Performance of Buildings under mandate M480 of the European Commission for support of implementation of EPBD recast (Directive 2010/31/EU). The 2nd generation EPB Standards have been published during 2017 and the whole package contains around 50 standards with new innovative structure, focusing on the integration of renewable energy sources, new systems and processes.

CEN-CE project is actively contributing to the EPB Standards Community by sharing project developments and engaging relevant stakeholders for collecting valuable feedback and developing **high-quality and professional EU-wide common training and qualification schemes** that could sustainably operate in CEN-CE project's afterlife and **ultimately arrive in the future at covering the complete set of EPB Standards**. CEN-CE project is covering to begin with the CEN standards related to **HVAC systems** developed in the technical committee **CEN/TC 228** related to building technical systems and overarching standard in **CEN TC/371** for global indicator calculation.



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the internationally harmonized and coherent set of energy performance of buildings (EPB) assessment methods

[New on this website?](#)

EPB General

Frequently asked questions, highlights, documents,
... on the set of EPB standards as a whole

M1 Overarching

Frequently asked questions, highlights, overview of
EPB standards and technical reports, tools and tips,
...

M2 Building as such

Frequently asked questions, highlights, overview of
EPB standards and technical reports, tools and tips,
...

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#EPBSTANDARDS ON HEAT PUMPS & MEASURED ENERGY: REGISTER NOW FOR FREE ONLINE PILOT TRAINING!

15.04.2020.

Are you interested to benefit of a head start over your collaborators and competitors? Then register today to the CEN-CE online pilot training and certification for attaining new knowledge on 2 showcased CEN standards (heat pumps & measured energy) part of the improved set of Energy Performance of Buildings standards and actively contribute to the development process of this EU-wide training and certification by providing your valuable feedback.



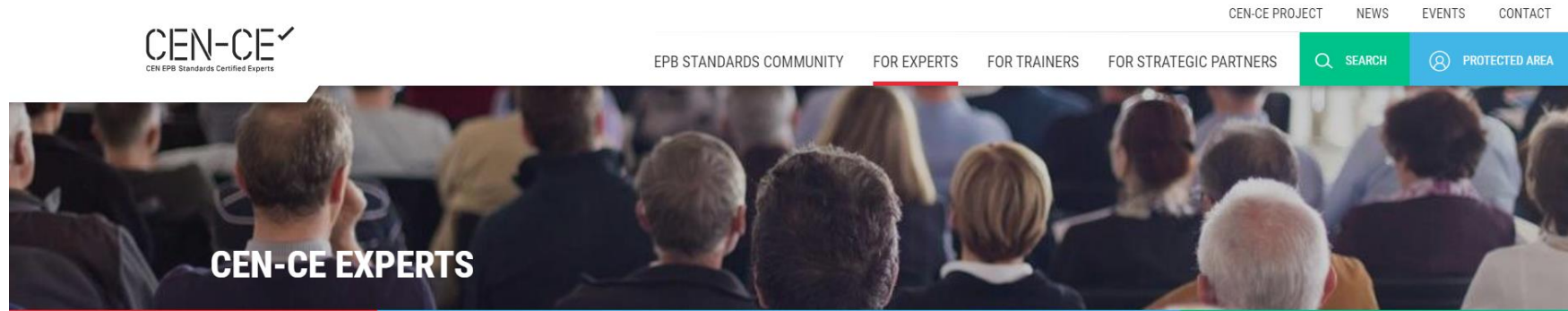
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WHY BECOMING A CEN EPB STANDARDS CERTIFIED EXPERT?

- **Gain recognition** for performance, comparability, reliability by using best know-how based on European standards;
- **Harmonized procedures** (training, tools) allowing professionals to work EU wide;
- **Harmonized databases** (manufacturers, building owners);
- **A coherent and transparent level playing field** (technology neutral assessment of the energy performance of buildings).



Interested in becoming CEN EPB Certified Expert?

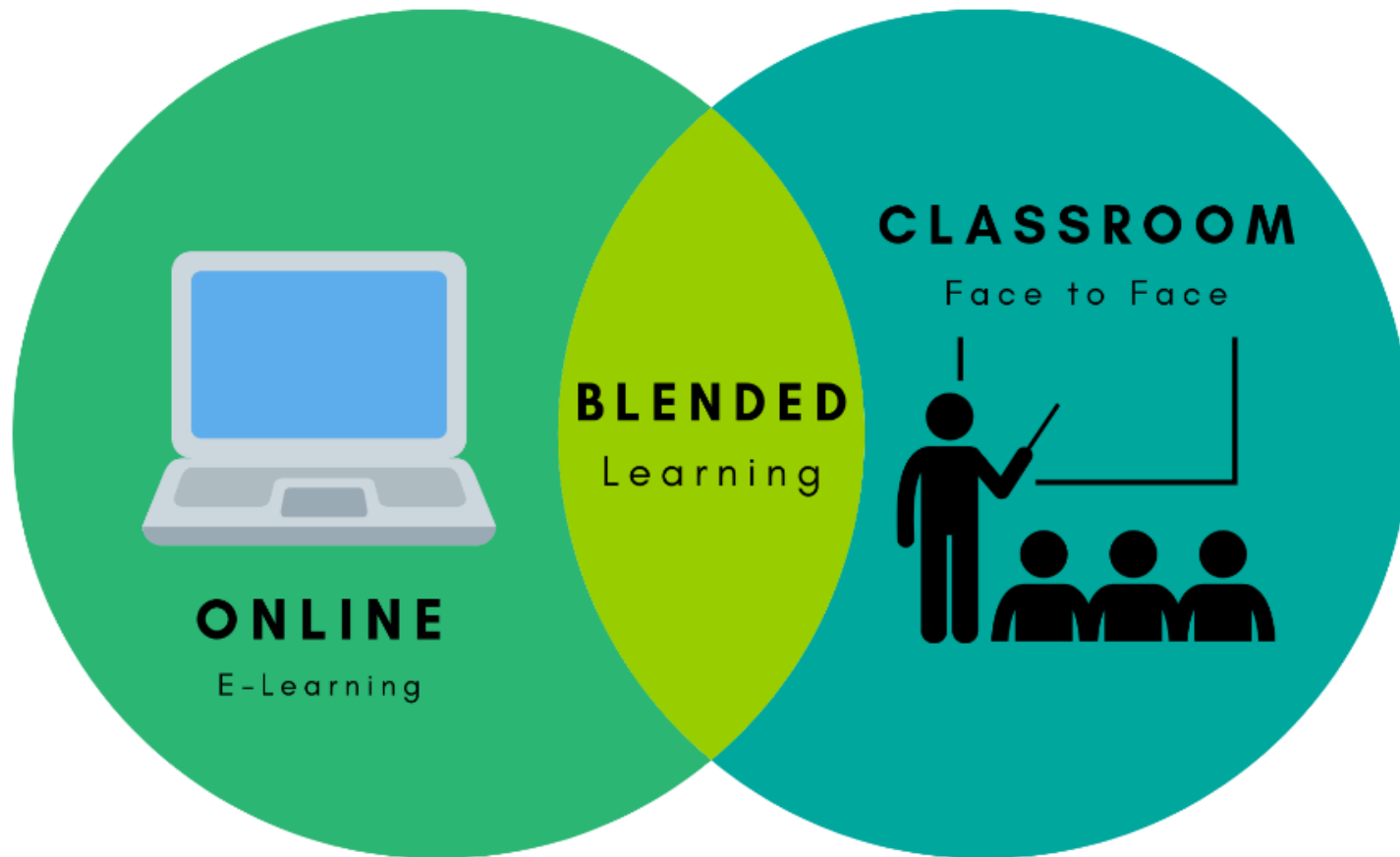
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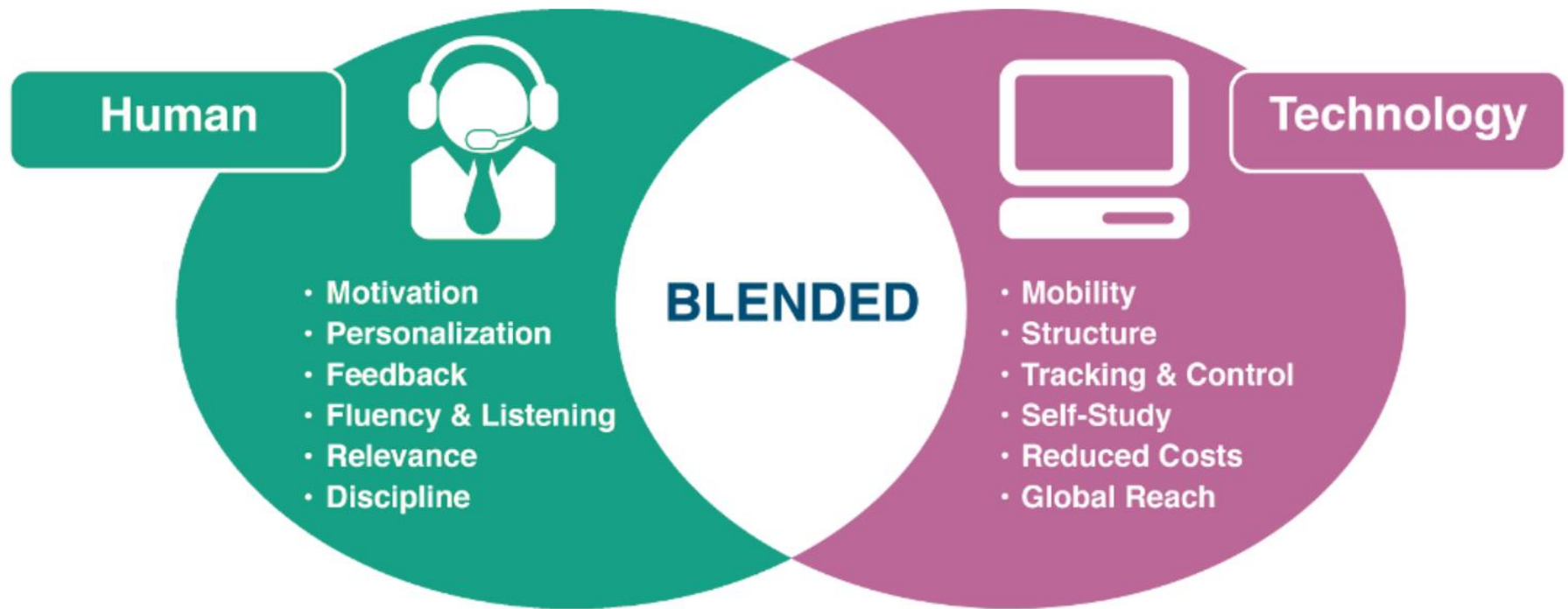
SEND



CEN-CE LMS tailored to the needs of SMEs



CEN-CE LMS tailored to the needs of SMEs



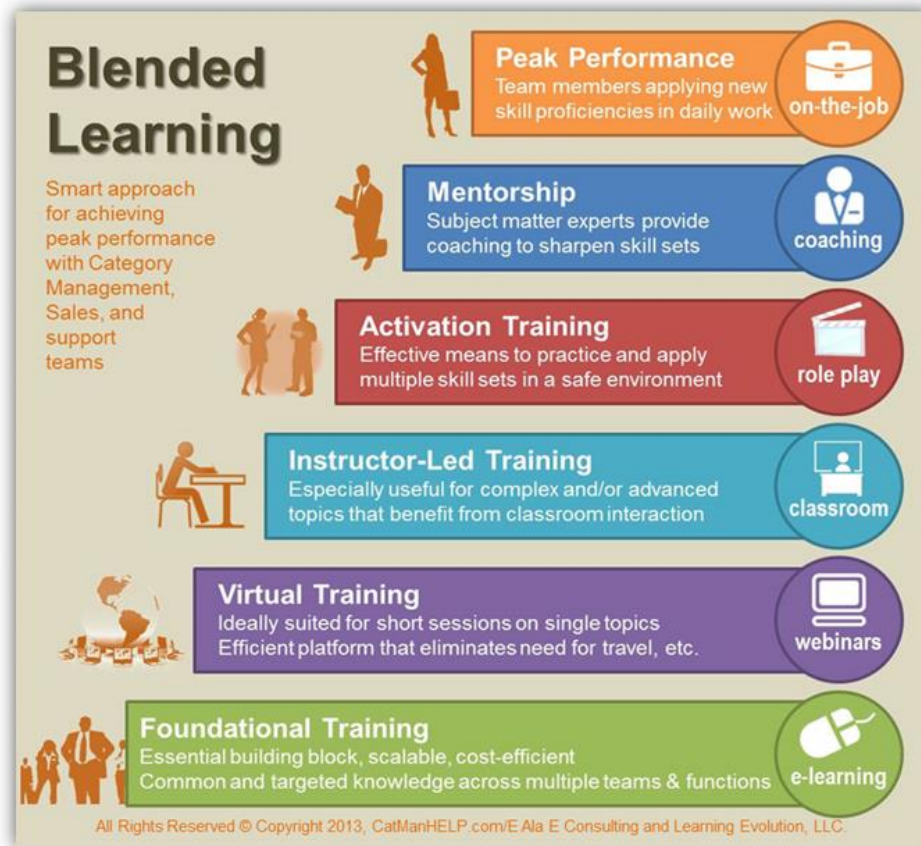
CEN-CE LMS tailored to the needs of SMEs

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4. role play
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6. OTJ



Stats Source: See eLearning Infographics.com



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EU-wide building performance LMS ?!





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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 785018.

Moderated Q&A session

