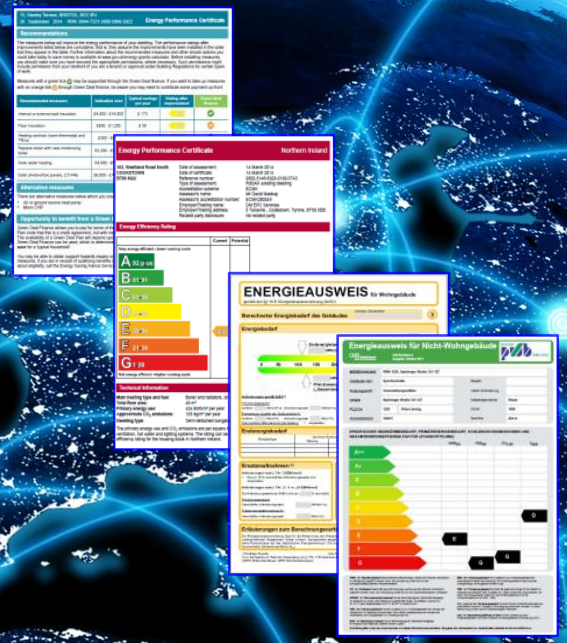
EU4Energy

ENERGIE MARKT ANALYSE

Energy Community

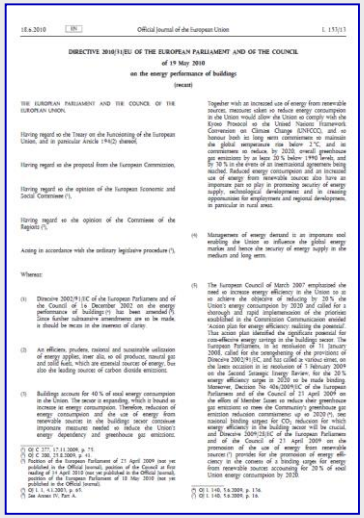


Energy Performance Certificate SW for Buildings

Session II: From “good intentions” to realization (panel discussion)

e of the Event

Energy Performance of Buildings Directive



DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 19 May 2010
on the energy performance of buildings
(recast)

"… to make it possible for owners or tenants of the building or building unit to compare and assess its energy performance."

- *Article 12* ***Issue of energy performance certificates***

  1. ***Contracting Parties*** *shall ensure that an energy performance certificate is* ***issued*** *for:*

  (a) buildings or building units which are constructed, sold or rented out to a new tenant; and

  (b) buildings where a total useful floor area over 500 m² is occupied by a public authority and frequently visited by the public.

- *Article 3* ***Energy performance indicators*** *are based on a methodology for calculating the energy performance of buildings adopted in national or regional level.*

  Energy demand for heating, hot water, ventilation, cooling and lighting

Essentials of Energy Performance Certificates

- *Ensures **Legal Security** for Building Owners, Buyers, Tenants and Authorities granting EE incentives*
- ***Correct EP Calculation** is paramount, there should be no doubt on the EPC energy indicators - based on a **validated** EPBD compliant **Calculation Kernel***
- *A well-functioning and **reliable** EPC system depends to a large extent on the **certifiers' skills**. Therefore, the **quality** of the **accreditation process, education** for Building Energy **Experts** are major quality characteristics*
- ***Quality Assurance** system for EPCs is increasing value and trust for the EPC stakeholders*
  - *Specific scoring system to assess plausibility of calculation/input*
- *EPCs are crucial for a functioning **Minimum Performance Requirements** introduction and for EP related incentive programmes*

Introduction (history of events)

EPC
SOFTWARE

Calculator/Evaluator registration

▼

Energy Performance **Calculation**
EPBD compliant

▼

Energy Performance Certificate

▼

Independent verification

▼

EPC in database

▼

Public view of EPC in database

- *In the course of an **EBRD Policy Dialogue Project in UA** an **EPC concept** was designed and comprehensive **EPC Software** for Calculation and Certification/Verification was developed*
- ***E7** and **Quarto** (Vienna based EE Consulter and SW house) developed jointly with 2 Ukrainian Institutions the EPC Application*
  - ***NDIBK** (National Research Institute), lead partner for Calculation Methodology*
  - ***SAEE** (State Agency for EE) , lead partner for Certification, verification, databases*
- ***SW architecture** and design was based on*
  - ***best practice** research in Europe*
  - *'straight-through-processing' approach (Calculation → final EPC)*
  - ***Web based service** technology, only **browser** at front end is required*
- *Focus on **integrated Quality Assurance** functionality for Certificates in implementing recommendations considered to be 'state-of-the-art' on European Level*

Integrated software for the whole EPC process

REGISTRATION	**Registration of Calculators and Auditors**
CALCULATION	**Calculation of the Energy Performance of Buildings**
PAYMENT Option	**Payment of each calculation (if required)**
PLAUSIBILITY CHECK	**Automatic plausibility check of calculation, support for Auditors**
CERTIFICATION	**Certification of Calculation by Auditor**
VALIDATION	**Independent validation of Energy Performance Certificate**
DATABASE	**All calculation data and Energy Performance Certificates stored in database**
PUBLIC VIEW	**Key Data of Energy Performance Certificate on public website**

Functional Benefits of EPC Software

EPC
SOFTWARE

Calculator/Evaluator registration

▼

Energy Performance **Calculation**
EPBD compliant

▼

Energy Performance Certificate

▼

Independent verification

▼

EPC in database

▼

Public view of EPC in database

- Managed **straight through EPC processing**: Calculation, Plausibility Check, Verification, Certification, Publication
- **Convenient, structured and guided input** of building data, elements, materials and building services
- Integrated **database** for **Auditors** and **Calculators**
- Common **EPC database** with **key data** as source for reports (Efficiency Class by city, building type etc.)
- **Integration** of **Inspection Reports** for heating and air-conditioning system **possible**
- Optional: charging (Credit Points) for Calculation and/or Certification
- Easily **customisable templates** for Certification documents (Excel template), no programming skills needed
- **Multi language support:** built-in design

EPC – Based on European Best Practice

***EPC Quality Assurance** elements*

Qualified Experts Competence	▪ ***Minimum requirements*** *for qualification of Auditors*	✓
Control of Qualified Experts	▪ ***Database of Auditors*** *publicly available* ▪ ***Penalties*** *for non-compliance*	✓
Energy Performance Certificate Issuing	▪ *National standard for calculation procedure* ▪ *Nationwide* ***unique calculation kernel***	✓
Energy Performance Certificate Quality Control	▪ *AEE in charge of EPC Quality Control* ▪ ***Automatic validation*** *of input values* ▪ ***Automatic plausibility check*** *of results* ▪ ***Random*** *verification of certificates – second assessment*	✓
Energy Performance Certificate Registry	▪ *Database for Certificates and data of calculation* ▪ ***Public access to Certificates***	✓

Source: BPIE, Energy Performance Certificate Across The EU, A Mapping of National Approaches, 2014

Technical features of EPC Software

EPC
SOFTWARE

Calculator/Evaluator registration

▼

Energy Performance **Calculation**
EPBD compliant

▼

Energy Performance Certificate

▼

Independent verification

▼

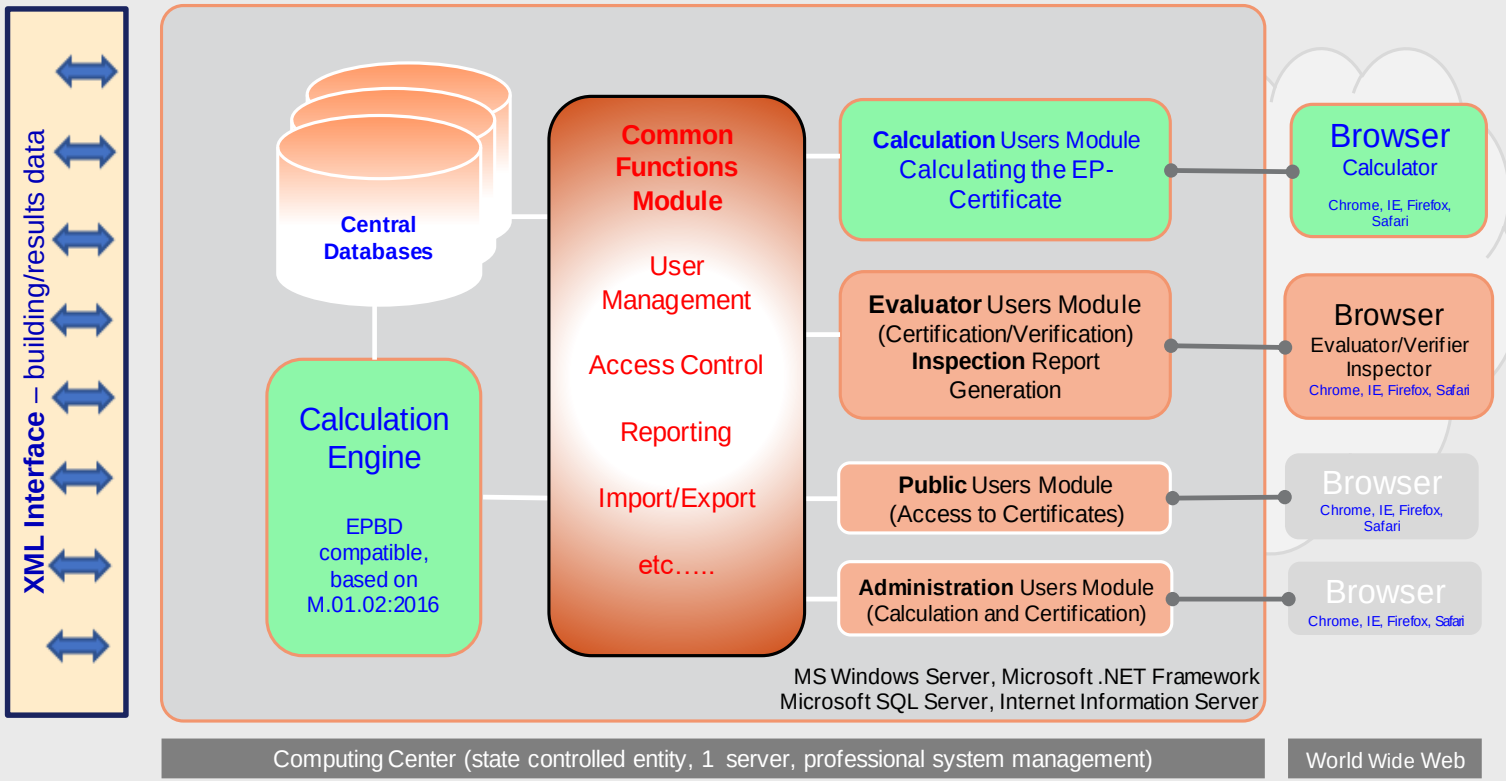
EPC in database

▼

Public view of EPC in database

- ***Centrally hosted Web Application,*** *no need for users to install any software on workstation, based on industry standards*
- *End users just need a* ***web browser*** *to use software*
- ***One universal Calculation Engine for all Calculators***
- ***Calculation Kernel***
  - Adaptation to national calculation method, based on European standards
  - Just one calculation kernel implemented for the whole country - validation of correct calculation just for one calculation kernel required
  - Interface for third party software tools via web service possible
- *All* ***EPC input data*** *and results stored in* ***database*** *as well as* ***calculators/auditors work in progress, projects***

EPC-SW Application Architecture



How to use Unique Calculation Kernel

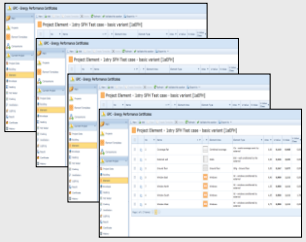
Calculation Kernel

Based on European standards and norms (implemented and maintained by standard setting body)

Unique, country-wide **Calculation Kernel***, leaves **no room for interpretation** of formulas

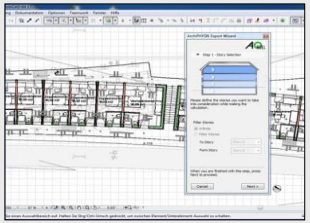
No need for SW **validation** process

Option 1 manual entry:



- ***Controlled*** *access (via* ***web browser****)*
- ***Manual*** *entry of building data - Calculation of Energy Performance Certificate by means of* ***Unique Calculation Kernel***
- ***Registration*** *of energy evaluators, inspectors at AEE is required based on professional qualifications*

Option 2 automised input:



- ***Open to any software vendor, provider*** *(architectural design software, energy performance calculation tools),* ***fast calculation during design***
- *Transparent definition and publication of* ***XML interface*** *for transmitting of building geometry data and rsults*
- *Option to integrate XML interface in design software applications (e.g. AutoCad, ArchiCad, …)*
- *Thus, convenient* ***automated EP Calculation*** *is possible for new buildings*

* *Can be used for both EP Certificates and design documentation*

Gap Analysis project of the Energy Performance of Buildings Law for Moldova (EU4Energy)

- *"**Gap analysis** with Directive 2010/31/EU, in the area of EE of buildings, focus on EPCs for buildings, **Roadmap** for the subsequent EPC SW implementation", focus on secondary laws*
  - ***Legal assessment** of duties and responsibilities of national authorities defined in the LEPB, assessment of **existence of secondary legislation***
  - ***Technical assessment** of existing secondary legislation and drafts of the calculation method of the EP of buildings, the method for **MEPs,** the **content and layout** of the Energy Performance **Certificate, inspection** of heating and A/C systems*
  - ***Organisational assessment**: appropriate institution identification*
- *A **Roadmap** to define implementation path of the EPC software in Moldova together with an estimate of timelines and required resources*
  - *This will align the creation of missing secondary laws and the SW development process and will visualise interdependencies between secondary laws and SW development*

Gap Analysis – key findings (EU4Energy)

- *Primary law is **clearly structured** and covers all elements of EPBD; a few elements are not EPBD compliant (see EnCS analysis)*
- ***Existing secondary legislations** and drafts are comprehensive and precise, calculation methodology, certificates and MinReqs **not fully compliant** with EPBD*
- *Many required definitions in secondary legislation according to primary law are **still not in place** (eg. Independent Control System for certificates, inspection reports; content and layout of inspection reports, procedure and method for registry of companies, energy evaluators and inspectors)*
- ***Quick start** for EPC-SW development needs activities in certification, inspection and registration of companies and experts*
- *The **new structure** and proper staffing of **Public Authority (NISE)** is needed to host the development and management National Information System for EPCs - the planned merger of AEE and FEE*

Who are we?

e7 Energie Markt Analyse GmbH

- ***Private research and consulting company***
- ***Located in Vienna, Austria***
- ***Expertise in***
  - Research and consulting regarding energy efficiency and renewable energy systems
- ***Special expertise in implementation of EPBD***
  - minimum energy performance requirements
  - calculation method for energy performance of buildings
  - Cost-optimum calculation

Quarto GmbH

- **Private software company**
- **Located in Vienna, Austria**
- **Expertise in**
  - Software Architecture
  - Software Design & Development
  - System Integration
  - Transposition of Business Requirements into Software
  - Project Management

Contact

e7 Energie Markt Analyse GmbH

Gerhard Hofer
1020 Vienna - Austria

T +43 1 907 80 26
M gerhard.hofer@e-sieben.at
W www.e-sieben.at

Quarto GmbH

Peter Zugmann
1140 Vienna - Austria

T + 43 1 982 27 40 0
M peter.zugmann@quarto.at
W www.quarto.at

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Energy Community

Thank you for your attention!

www.energy-community.org

Gap Analysis – missing sec. laws list (1)

1. Art. 9 (3): Report on cost optimality calculation, basis for setting minimum energy performance requirements in NCM M.01.01:2016 for primary energy demand
2. Art. 13 (5): Technical specification for feasibility studies of using alternative system
3. Art. 14 (1): Methodology to calculate the minimum amount of energy from renewable sources
4. Art. 14 (1): Minimum requirements for the amount of energy from renewable sources
5. Art. 15 (3): National plan to increase the number of nearly zero-energy buildings,
6. Art. 15 (3): Definition of nearly zero-energy building.
7. Art. 16 (3): Specialised software to calculate and issue energy performance certificates.
8. Art. 16 (4): Electronic register for energy performance certificates
9. Art. 24 (3): Specialised software to issue reports on regular inspection of the heating system
10. Art. 24 (6): Template for the standard report on the regular inspection of heating systems.
11. Art. 25 (3) + (4): Approval of draft GD on air-conditioning system.

Gap Analysis – missing sec. laws list (2)

12. Art. 26 (6): Template for the standard report on the regular inspection of air-conditioning systems.
13. Art. 27 (3) + (4): National information system on energy efficiency of buildings: establishment of information system and preparation for the management of operation
14. Art. 28 (1): Definition of the independent control system
15. Art. 29 (2): Method of registration of companies
16. Art. 30 (1): Authorization procedures for energy evaluators, inspectors of heating systems and inspectors of air conditioning systems
17. Art. 30 (4): Training procedures and training of energy evaluators, inspectors of heating systems an inspectors of air conditioning systems
18. Art. 30 (5): Procedures for examination and examination commission of the professional competence already established
19. Art. 30 (8): Authorizations procedures of evaluators, inspectors of heating systems and inspectors of air conditioning systems

Bullets in green fonts are needed for NIS development, at the latest after stage 1 (Project Definition Phase)

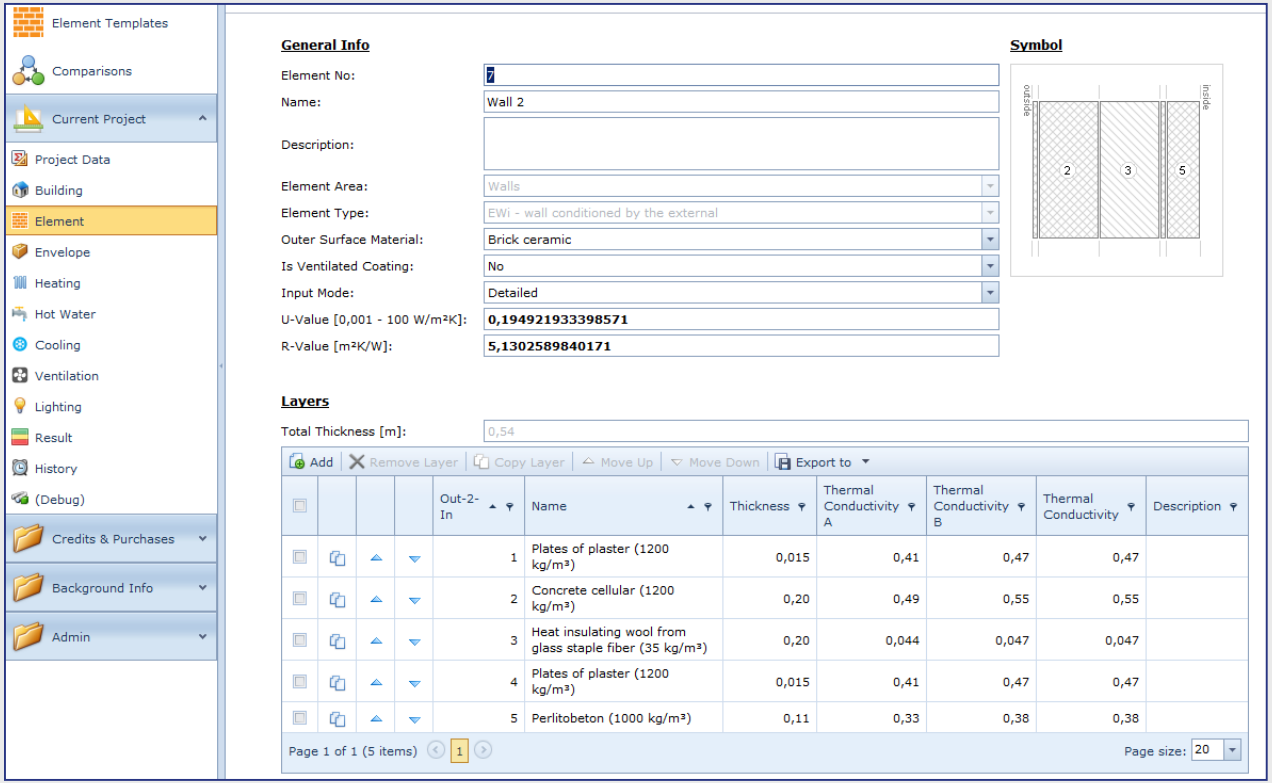
Table 17: Consolidated secondary legislation and SW development network plan

No	activities insecondary laws creation	Phase I Quarter of a year	1	2	3	4	5	6	7	8
4	**Energy performance certification (EPC)**									
4.1	Review existing definition of form and content of the energy performance certificate and implement missing items									
4.2	Development of a report template as annex which is integral part of the certificate									
5	**Inspection of heating systems**									
5.1	Development form and content for the inspection report (report template)									
6	**Inspection of air conditioning systems**									
6.1	Approval of draft governmental decision on inspection of air conditioning systems									
6.2	Development form and content for the inspection report (report template)									
8	**Independent Control System (ICS)**									
8.1	Definition of the Independent Control System for certificates and inspection reports of heating and air conditioning systems									
9	**Registry of independent experts and companies**									
9.1	Development of method of registration of companies									
9.2	Development of authorisation procedures for energy evaluators, inspectors of heating systems and inspectors of air conditioning systems									
11	**National Institution for Sustainable Buildings**									
11.1	Merge of *FAEE* and *AEE* to the new *NISE*									
12	**NIS Project Definiton and Planning Stage 1**	Stage 1 (of Phase I) Quarter of a year	1	2	3	4	5	6	7	8
12.1	**SRS Definition (SW requirement specification)**									
12.1.1	Calculation Kernel Definition, itemised formula descriptions									
12.1.2	User interface / User experience									
12.1.3	Calculation and Certification/Verification Process Design									
12.2	**Acceptance Criteria Setting**									
12.3	**contracting Budget definition for Stage 2**									
Result	**Fully fledged Software Requirement Specification Document**									
13	**NIS Project SW development Stage 2**	Stage 2 (of Phase I) Quarter of a year	1	2	3	4	5	6	7	8
13.1	**Detail Design**									
13.2	**Prototyping**									
13.3	**Solution Devoloping and Testing**									
13.3.1	Calculation kernel development									
13.3.2	User Interface development									
13.3.3	Process development									
13.3.4	Development of Moldovan Validation Tool									
13.4	**Acceptance**									
13.4	**Installation Training**									
Result	**Finalised NIS according to SRS document**									

Energy Performance of Buildings

Example Screenshots of Software (1)

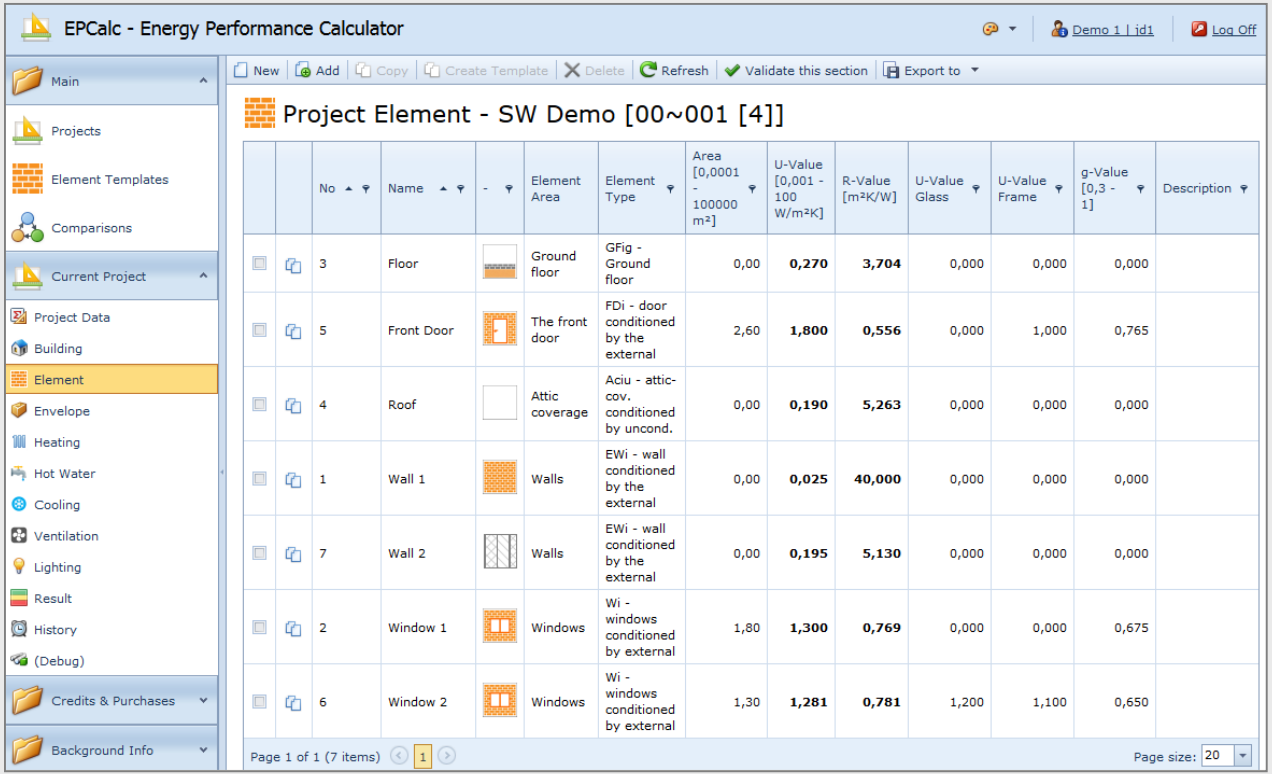
Detailed input of layers for building elements



Energy Performance of Buildings

Example Screenshots of Software (2)

Overview of building elements



No	Name	-	Element Area	Element Type	Area [0,0001 - 100000 m²]	U-Value [0,001 - 100 W/m²K]	R-Value [m²K/W]	U-Value Glass	U-Value Frame	g-Value [0,3 - 1]	Description
3	Floor		Ground floor	GFig - Ground floor	0,00	**0,270**	**3,704**	0,000	0,000	0,000	
5	Front Door		The front door	FDi - door conditioned by the external	2,60	**1,800**	**0,556**	0,000	1,000	0,765	
4	Roof		Attic coverage	Aciu - attic-cov. conditioned by uncond.	0,00	**0,190**	**5,263**	0,000	0,000	0,000	
1	Wall 1		Walls	EWi - wall conditioned by the external	0,00	**0,025**	**40,000**	0,000	0,000	0,000	
7	Wall 2		Walls	EWi - wall conditioned by the external	0,00	**0,195**	**5,130**	0,000	0,000	0,000	
2	Window 1		Windows	Wi - windows conditioned by external	1,80	**1,300**	**0,769**	0,000	0,000	0,675	
6	Window 2		Windows	Wi - windows conditioned by external	1,30	**1,281**	**0,781**	1,200	1,100	0,650	

Energy Performance of Buildings

Example Screenshots of Software (3)

Rating of Plausibility Check

Project Name:	SW Demo [00~001 [3]]		
Status:	Certified	Assigned Auditor:	AT01
Rating:	Green	Construction Year:	2016
Rating Points:	31	Building Purpose:	Houses for one family
Certificate Number:	20180307000001	Building Compactness Index:	
Attachment:	N/A	Building Facade Glazing Coefficient:	

Audit Data | Verification | Rating Details | Certification | Project Data (Database) | History

Rule ID	Rule Description	Applicable	Rule Points	Points	Value	Multi Value	Range From	Range To
1.01	Length of building	Yes	1	1	10.000	No	3	150
1.02	Width of building	Yes	1	1	8.000	No	3	150
1.03	Gross floor area	Yes	1	1	110.000	No	30	400
1.04	Floor height of building	Yes	1	1	2.600	No	2.2	4
1.05	Heat transfer coefficient U	Yes	1	0	-	Yes	(3 Violations)	-
1.06	GValues of windows	Yes	1	1	-	Yes	-	-
1.07	Share of window frame area	Yes	1	1	-	Yes	-	-
1.14	Input of ground floor type	Yes	1	1	1.000	No	1	1
2.01	Share of window area	Yes	2	2	0.118	No	0.1	0.3
2.02	Share of facade area against unconditioned space	Yes	2	2	0.000	No	0	0.3
2.03	Factor of compactness	Yes	2	2	0.905	No	0.9	1.5
2.04	Envelope area in relation to number of floors	Yes	2	2	235.300	No	40	400
2.05	Pipe length heating	Yes	2	0	-	Yes	(1 Violation)	-

Energy Performance of Buildings

Example Screenshots of Software (4)

Energy Performance Certificate