Energy Performance Certificate SW for Buildings

Session II: From “good intentions” to realization (panel discussion)
“... 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
EPC Concept Implementation

Introduction (history of events)

- 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 Consultant 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.
EPC Concept Implementation

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
EPC Software

Functional Benefits of EPC Software

- 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

EPC Software

Technical features of EPC Software

• **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

- **XML Interface** – building/results data

**Central Databases**

**Calculation Engine**
EPBD compatible, based on M.01.02:2016

**Common Functions Module**
- User Management
- Access Control
- Reporting
- Import/Export
- etc.

**Calculation Users Module**
Calculating the EP-Certificate

**Evaluator Users Module**
(Certification/Verification)
Inspection Report Generation

**Public Users Module**
(Access to Certificates)

**Administration Users Module**
(Calculation and Certification)

**Browser**
- Calculator
  - Chrome, IE, Firefox, Safari
- Evaluator/Verifier Inspector
  - Chrome, IE, Firefox, Safari
- Public Users
  - Chrome, IE, Firefox, Safari
- Administration Users
  - Chrome, IE, Firefox, Safari

**MS Windows Server, Microsoft .NET Framework**
**Microsoft SQL Server, Internet Information Server**

Computing Center (state controlled entity, 1 server, professional system management)

World Wide Web
**EPC Software**

**How to use Unique Calculation Kernel**

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**Option 1 manual entry:**

- **Controlled** access (via **web browser**)
- **Registration** of energy evaluators, inspectors at AEE is required based on professional qualifications

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**Option 2 automated 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 results
- Option to integrate XML interface in design software applications (e.g. AutoCad, ArchiCad, …)
- Thus, convenient **automated EP Calculation** is possible for new buildings

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* Can be used for both EP Certificates and design documentation

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Michael Toth, March 29th, 2018, High Level Political Talks
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

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W www.quarto.at
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,
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.

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 and 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>
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<th>No</th>
<th>activities in secondary laws creation</th>
<th>Phase 1</th>
<th>Quarter of a year</th>
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<td>Energy performance certificate (EPC)</td>
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<td>1 2 3 4 5 6 7 8</td>
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<td>4.1</td>
<td>Review existing definition of the energy performance certificate and implement missing items</td>
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<td>Development of a report template as annex which is integral part of the certificate</td>
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<td>5</td>
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<td>Registry of independent experts and companies</td>
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<td>Development of method of registration of companies</td>
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<td>Development of authorisation procedures for energy evaluators</td>
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<tr>
<td>12.1</td>
<td>SRS Definition (SW requirement specification)</td>
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<td>12.1.1</td>
<td>Calculation Kernel Definition, itemised formula descriptions</td>
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<td>12.1.2</td>
<td>User interface / User experience</td>
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<td>12.1.3</td>
<td>Calculation and Certification/Verification Process Design</td>
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<td>12.2</td>
<td>Acceptance Criteria Setting</td>
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<td>Solution Developing and Testing</td>
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<td>13.3.4</td>
<td>Development of Moldovan Validation Tool</td>
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<td>13.4</td>
<td>Acceptance</td>
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Detailed input of layers for building elements

Example Screenshots of Software (1)
Overview of building elements

Energy Performance of Buildings

Example Screenshots of Software (2)
### Rating of Plausibility Check

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<th>Rule ID</th>
<th>Rule Description</th>
<th>Applicable</th>
<th>Rule Points</th>
<th>Points</th>
<th>Value</th>
<th>Multi Value</th>
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<td>1</td>
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<td>1.02</td>
<td>Width of building</td>
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<td>1</td>
<td>8.000</td>
<td>No</td>
<td>3</td>
<td>150</td>
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<td>1</td>
<td>1</td>
<td>110.000</td>
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<td>30</td>
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<td>Floor height of building</td>
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<td>1</td>
<td>2.600</td>
<td>No</td>
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<td>Heat transfer coefficient U</td>
<td>Yes</td>
<td>1</td>
<td>0</td>
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<td>Yes</td>
<td>(3 Violations)</td>
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<td>GValues of windows</td>
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<td>Share of window frame area</td>
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Energy Performance Certificate