1. Introduction

In Slovenia, the implementation of the Energy Performance of Buildings Directive (EPBD) is the overall responsibility of the Ministry of Infrastructure. The EPBD was transposed into national legislation by the already existing Building Construction Act (giving the legal basis for Building Codes with minimum requirements and the calculation methodology), the Environmental Protection Act (addressing the inspection of boilers), and by the Energy Act which on 17 November 2006 was amended to include the rest of the EPBD requirements. The secondary regulation announced in 2008, set out new minimum requirements, the calculation methodology, feasibility studies, and regular inspection of Air-Conditioning (AC) systems, while the regulation on energy performance certification was adopted in 2009. The training and licensing of independent experts working on the energy performance certification and AC system inspections of buildings, as well as the protocols relating to the registry of the Energy Performance Certificates (EPC) were defined in detail in the 2010 Regulation on training of independent experts\(^1\). The regular inspection of boilers was implemented in 2004 under an existing scheme for chimney sweeper services\(^2\) and upgraded with details on concessions in November 2007.

A revision of the relevant legislation was initiated in mid 2010 in order to comply with the requirements of the Directive 2010/31/EU, which on 22 February 2014 resulted in the adoption of a new Energy Act. In December 2014, a new regulation on the methodology for energy performance certification was adopted, while revision of other regulations is planned in 2015/2016. This includes the Building Codes PURES 2010 which on 1 January 2015 put in place more severe minimum energy performance requirements according to the existing transitional provisions. Further changes are planned in line with the new set of CEN EPBD standards and the results of the cost-optimal study. Furthermore, the national plan for Nearly Zero-Energy Buildings (NZEBS) was adopted on 22 April 2015. Slovenia is also in the process of improving the energy performance certification process by developing an official electronic registry which is due by the end of 2015.

This report presents an overview of the status of the EPBD implementation in Slovenia in 2015 and outlines the plans for successful completion of pending topics.

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\(^1\) Rules on the training, accreditation and register of accredited independent experts for energy performance certificate production www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV10090

\(^2\) Decree amending the Decree on the method, subject and conditions for the performance of the compulsory public utility service of measurement, inspection and cleaning of combustion installations, flue ducts and ventilation shafts for the purpose of environmental protection and efficient use of energy, health protection and fire protection www.uradni-list.si/1/content?id=52301
2. Current status of Implementation of the EPBD

I. ENERGY PERFORMANCE REQUIREMENTS

I.i. Progress and current status

In order to implement the Directive 2010/31/EU, Slovenia updated the minimum energy performance requirements for new energy-efficient buildings and, if relevant, existing buildings upon major renovations and maintenance works, in the 2010 Building Codes (PURES 2010). After the announcement of the regulation in July 2010 and the corresponding transitional period, the requirements came fully in force on 1 January 2011. The 2008 Regulation (PURES 2008) had already introduced an intensive reduction of transmission losses through the building envelope, as well as a mandatory 25% use of Renewable Energy Sources (RES) in the final energy used. The 2010 Building Codes built on the 2008 version, placed the focus on the calculation of primary energy and CO₂ indicators, set additional minimum requirements for energy systems, as well as for primary energy for heating, and limited the heating and cooling needs both in terms of useful and primary energy. The 2010 Regulation added also many new minimum requirements for technical building systems.

In line with Directive 2010/31/EU and according to the long term planning integrated in the rules of PURES 2010, as of January 2015 more severe minimum requirements for maximum energy needs for heating have entered into force[3]. This change had already been integrated in the transitional provisions of PURES 2010. Minimum requirements are expressed using performance-based and energy-related requirements, and detailed technical requirements for building components and systems. In 2015 the Building Codes were put under revision in order to take into account the outcome of the cost-optimal study, to include further details associated with the national definition of NZEB, and to make the necessary changes in the calculation methodology pursuant to the new CEN EPBD standards. The revision process shall be finalised by the end of 2016.

I.ii. Format of national transposition and implementation of existing regulations

Performance-based minimum requirements in the PURES 2010 are focused on bioclimatic architectural concepts and on low energy losses in building envelopes with high airtightness. They also treat thermal bridges by limiting the linear thermal transmission coefficients (therefore, the simulation of thermal bridges is becoming a frequent design practice). A special set of minimum requirements refers to the energy efficiency of components and systems. As required by Directive 2010/31/EU, before the design of Heating, Ventilation and Air-Conditioning (HVAC) systems, the potential of shading, passive cooling and night ventilation must be utilised to reduce the energy needs below the required levels. Fixed shading devices and automatically controlled shading are considered in energy performance calculations. Mechanical ventilation with heat recovery is not a mandatory technology (natural ventilation is also allowed), but in practice it is needed for buildings with an Energy Performance Certificate (EPC) of class B or higher. If mechanical ventilation is used, then heat recovery is mandatory. Thermal comfort and indoor air quality requirements are given in the Regulation on ventilation and AC systems of buildings (2002), together with the relevant design rules.

Compliance with PURES 2010 must be demonstrated by fulfilling minimum requirements related to the maximum allowed specific transmission heat losses (H′ₜₐₚ), maximum annual heat demand for space heating (Qₕₐₚ) and, for residential buildings only, maximum energy needs for cooling (Qₜᵢₑₜ) and maximum primary energy for the energy systems operation (HVAC and lighting). Maximum U-values of the envelope elements are prescribed for all buildings (Table 1).

<table>
<thead>
<tr>
<th>minimum requirements for U-values of the envelope elements (PURES 2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>walls</td>
</tr>
<tr>
<td>floors between flats</td>
</tr>
<tr>
<td>flat roofs</td>
</tr>
<tr>
<td>windows</td>
</tr>
<tr>
<td>glazing</td>
</tr>
<tr>
<td>doors</td>
</tr>
</tbody>
</table>

[3] www.uradni-list.si/1/content?id=98727
The gradual reduction of minimum requirement values over time is presented in Figure 2.

The use of RES is mandatory for all new buildings since 2008, i.e., a minimum of 25% of the total final energy used for the building’s energy systems’ operation must be covered by RES. Alternatively, the RES requirement is considered to be fulfilled if the share of RES used for space heating, space cooling and Domestic Hot Water (DHW) is obtained in one of the following ways: 25% from solar energy, 35% from gas biomass, 50% from solid biomass, 70% from geothermal energy, 50% from heat from the environment (through heat pumps), 50% from Combined Heat and Power (CHP), or 50% from energy efficient district heating/cooling. The requirement is also considered fulfilled if the building demonstrates at least 30% lower annual heat demand than the demand defined in the minimum requirements, or if solar collectors for hot water are installed (minimum 6 m²/residential unit).

The additional minimum requirements refer to the maximum U-values of the building envelope and windows, and to the airtightness of the envelope \(n_50 < 3 \text{ h}^{-1}\) for naturally ventilated buildings, and \(n_50 < 2 \text{ h}^{-1}\) for buildings with mechanical ventilation and obligatory heat recovery). Blower door tests are not obligatory under the 2010 Building Code. However, if implemented, a specific protocol (SIST EN 13829) is prescribed. In practice, the airtightness tests are done frequently as they are also a prerequisite to be eligible for the Eco fund[4] subsidy for passive buildings \(n_50 \leq 0.6 \text{ h}^{-1}\) and for the low energy renovation of existing buildings \(n_50 \leq 1.2 \text{ h}^{-1}\).

At the design stage, it is obligatory to prepare a summary of the building thermal characteristics, where the main building and system characteristics, as well as the energy and CO\(_2\) indicators are given. After the building is completed, the calculation and the summary have to be repeated (by the designer, for the building as it was actually built). This is the proof for the final control of compliance with the regulation. This final proof is part of the building certificate of compliance with the essential requirements, and it is a precondition for obtaining the use permit. Fulfilment of the minimum requirements has to be

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[4] Slovenian environment public fund, a subsidy system that requires blower door tests www.ekosklad.si/information-in-english
demonstrated at the design stage in order to obtain a building permit, and after the building is completed, when applying for a use permit. This is the core technical documentation used by the independent expert in the next step, when preparing the EPC.

Minimum requirements apply to all new buildings, as well as to major renovations, i.e., if at least 25% of the area of the building envelope is subject to renovation.

In case of maintenance works on the building envelope, if a renovation (when a building permit is needed) is less than 25% of the thermal envelope area, and for buildings with a floor area smaller than 50 m², only the minimum requirements for the U-values of the envelope must be considered (i.e., an additional insulation layer will be mandatory).

For major renovations of the heating system, and in case of maintenance and replacement works, minimum requirements for the systems, subsystems and elements are of the same level as those required for new buildings.

I.iii. Cost-optimal procedure for setting energy performance requirements

The conclusions from the revised national cost-optimal study submitted to the EC in December 2014 showed that, for new buildings, the deviation between the calculated cost-optimal levels of minimum performance requirements and those in force from 2010, based on the selected financial perspective and the primary energy as a performance indicator, is -14%. For existing buildings, the gap was evaluated based on the same principles, but presented at the level of building elements, whereas the mean envelope thermal transmittance $H_T$ (W/m².K) was used as a performance indicator. The deviation varies between -26% and 5%, with an average of -14%.

Current maximum U-values and $H_T$ are presented in Table 1 and Figure 3 respectively.

The calculation of cost-optimal minimum requirement levels was done for 18 reference buildings representing the typical building stock in Slovenia (Figure 4), i.e., two types of a single-family house (small and large), an apartment building, a non-residential/office public building, and two alternatives of a non-residential/commercial building (with different amounts of glazing in the envelope). In the case of new buildings, the reference buildings used reflect PURES 2010 minimum requirements. For existing buildings, the reference buildings were defined according to the 1960 (old existing buildings) and 1980 (old buildings, equivalent to partly renovated buildings from the sixties) building practices. The revision of PURES, which started in 2015 and is expected to be completed in 2016, will consider the findings of the cost-optimal study and improve minimum requirements in a way that makes a smooth transition between 2010 levels and NZEB minimum requirements.

I.iv. Action plan for progression towards Nearly Zero-Energy Buildings (NZEBs)

National application of the NZEB definition

The national definition of NZEB is based on the cost-optimal study for reference buildings where the primary energy as a core performance indicator of NZEB, is complemented by the requirement of a 50% share of RES in the final energy use.

Figure 3: Evolution of the maximum allowed specific heat transfer coefficient of the building envelope according to Slovenian Building Codes.

Figure 4: Reference buildings used for the cost-optimal study in Slovenia.
RES are selected with consideration to their availability and the NZEB acceptable technologies. In the future, the use of RES will be increased due to the growing share of RES in district heating systems which are subject to comply with the 2020 energy efficiency targets set in the Energy Act. In addition to that, the nearly zero or very low amount of energy required is achieved by further limitation of energy needs for heating to a maximum value between 25 kWh/m².K and 15 kWh/m².K, depending on the shape factor[5] and the local climate. Although not directly prescribed, the very high energy performance of NZEB will be demonstrated with NZEB buildings ranked in class A1, A2 or B1, according to each building’s heating needs.

According to EPBD Annex I, the NZEB definition provides minimum requirements for primary energy for all energy use in new buildings (including lighting in residential buildings), major renovations, single-family houses, apartment buildings and non-residential/office buildings. The NZEB action plan with the national definition of NZEB passed the consultation process successfully and was adopted on 22 April 2015 (Table 2).

Intermediate targets for early implementation of the NZEB standard in new buildings and the renovation of existing buildings are presented in Table 3[6].

**Figures and statistics on existing NZEBs**

There are no statistics available on the number of existing NZEBs. However, based on the data from the national Eco fund[7], over 800 new passive and low energy buildings were subsidised since 2008. Most frequently, single-family houses are built as NZEBs. In 2014, a NZEB high-rise apartment building was also built (Figure 5).

<table>
<thead>
<tr>
<th>Building category</th>
<th>Maximum primary energy per conditioned floor area** per year (kWh/m².year)</th>
<th>Minimum share*** of RES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New buildings</td>
<td>Renovation</td>
</tr>
<tr>
<td>Single-family houses</td>
<td>75</td>
<td>95</td>
</tr>
<tr>
<td>Apartment buildings</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Non-residential buildings*</td>
<td>55</td>
<td>65</td>
</tr>
</tbody>
</table>

* for non-residential/office buildings and for EPBD related energy use
** conditioned floor area – i.e. closed heated/cooled net floor area
*** in final energy use

Table 2: National definition of NZEB as given in the national plan for NZEB (April 2015).

Table 3: Intermediate targets for early implementation of NZEB standards in new buildings and in renovation of existing buildings according to the national plan for NZEB (NP NZEB) (April 2015).

**NP NZEB intermediate targets – new buildings (m²)**

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2018</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family houses</td>
<td>76,850</td>
<td>267,500</td>
<td></td>
</tr>
<tr>
<td>Apartment buildings</td>
<td>9,753</td>
<td>73,650</td>
<td></td>
</tr>
<tr>
<td>Public buildings</td>
<td>53,320</td>
<td>84,126</td>
<td></td>
</tr>
<tr>
<td>Other non-residential buildings</td>
<td>50,030</td>
<td>115,970</td>
<td></td>
</tr>
</tbody>
</table>

**NP NZEB intermediate targets – major renovation of existing buildings (m²)**

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2018</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family houses</td>
<td>241,000</td>
<td>2,395,000</td>
<td></td>
</tr>
<tr>
<td>Apartment buildings</td>
<td>86,000</td>
<td>596,000</td>
<td></td>
</tr>
<tr>
<td>Public buildings</td>
<td>123,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other non-residential buildings</td>
<td>190,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3% of buildings owned and occupied by central government (Art. 5 of Directive 2012/27/EU)</td>
<td>2,000</td>
<td>20,000</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5: The residential highrise NZEB demonstration building Eco Silver House with 128 flats, built in 2014 in Ljubljana. EPC class A1, standard annual heat demand 8 kWh/m².year, total delivered energy 48 kWh/m².year and primary energy 76 kWh/m².year with additional 6.5 kWh/m².year of exported (primary) electricity from PV (FP7 EE-HIGHRISE, www.ee-highrise.eu).

[5] Ratio between the area of the envelope and the volume (m⁻¹).
In the public sector it is common practice for kindergartens to be built according to NZEB principles and with significant share of wood, while environmentally conscious investors in the tertiary and commercial sectors occasionally follow NZEB principles in spite of the higher initial costs involved. The shift towards NZEB in the national building practice in the last decade is presented in Figure 6.


The long-term strategy for mobilising investment in the renovation of the national building stock in Slovenia was adopted on 29 October 2015. The intermediate objectives of the long-term strategy for renovation of buildings by the year 2030 are:

> a 15% reduction of the final energy used in buildings by 2020, and 30% by 2030, when compared to 2005;
> at least 2/3 of energy use to be covered by RES;
> a 60% reduction of greenhouse gas emissions in the building sector by 2020, and at least 70% by 2030, when compared to 2005;
> the energy renovation of 26 million m² of buildings, or between 1.3 and 1.7 million m² per year, one third from that reaching NZEB standard.

The operative measurable goals of the long-term strategy for the renovation of buildings by the year 2020 and 2030 comprise, respectively:

> 3% of annual renovation of buildings owned and occupied by the central government (i.e., between 15,000 m² and 25,000 m² per year, and 180,000 m² in total, in the period 2014 - 2023);
> deep renovation of 1.8 million m² of public buildings within the 2014 - 2023 period;
> improved ratio (1:3) between invested public resources and initiated investments in energy renovation in the public sector;
> the implementation of five demonstration projects of energy renovation of different building types.

According to the long term strategy, the renovation rate of residential buildings is planned to be 1.7% in the period 2016 - 2020, 1.8% in the period 2031 - 2040.

Figure 6: The shift towards NZEB in the national building practice based on calculated energy indicators (energy needs for heating and specific heat transfer coefficient) for real buildings constructed in 2003-2010 and 2011-2015. Source: ZRMK.
and 2.3% in the period 2041 - 2050. The planned renovation rates for buildings in other sectors are presented in Figure 7.

By 2030, 12.8 million m² of single-family buildings, 4.1 million m² of apartment buildings, 3.1 million m² of public buildings (including governmental buildings) and 4.9 million m² of buildings in the tertiary sector will be renovated. Five demonstration projects for deep and NZEB renovation are planned for different types of public buildings in order to demonstrate renovation of heritage buildings, energy performance contracting and NZEB renovation, respectively.

The necessary investments in energy renovation are estimated to a total of 6,700 M€, three quarters of which are in the residential sector, 10% in the public sector and 15% in the private tertiary sector. Annually, between 350 and 400 M€ will be invested in energy restoration of existing buildings, around 300 M€ in the residential sector and 100 M€ in non-residential buildings (from which 40 M€ in the public sector and 60 M€ in the private sector).

Due to the building renovation, the energy use for heating and for preparation of hot water will be reduced by 10% by 2020, and 25% by 2030. It is estimated that deep renovation of existing buildings shall contribute around half of the targeted 27% increase of energy efficiency by 2030.

Financial resources for renovation of public buildings, mitigation of fuel poverty in households and demonstration projects are planned in the Operational Programme for the implementation of the European cohesion policy in the period 2014 - 2020. A strong focus is placed on the mobilisation of private resources.

Therefore, a budget line in the operational programme is also planned to support the development of energy performance contracting. The Eco fund will further provide grants and soft loans for the renovation of existing residential buildings, while new financial products are available as soft loans from commercial banks for the renovation of residential buildings. Energy renovation of existing buildings will rely to a great extent on the funds from the European Investment Bank (EIB), the funds of the Republic of Slovenia, private funds, and on the European Fund for Strategic Investments (EFSI).

II. REQUIREMENTS FOR TECHNICAL BUILDING SYSTEMS (TBS)

II.i. Coverage of heating, domestic hot water, air-conditioning and large ventilation systems

In PURES 2010 and in the corresponding Technical guidelines TSG-01-004,[9], requirements refer to energy efficiency characteristics of installations in new buildings and major renovations. The requirements are given for heating, hot water systems, AC and large ventilation systems. The system energy efficiency is achieved by selecting products that fulfil the energy efficiency requirements, with corresponding design and construction rules for sub-systems. Overheating must be reduced through passive measures (fixed and movable shading, night ventilation), and the remaining cooling needs must be covered by energy efficient cooling systems. Heat recovery in mechanical and hybrid ventilation systems is mandatory.

Figure 7:
Renovation rates per building type according to the long-term strategy for mobilising investment in the renovation of the national building stock in Slovenia.

II.ii. Regulation of system performance, distinct from product or whole building performance

The regulation has imposed system performance requirements via many rules on product and sub-system energy efficiency.

Heat recovery in ventilation must be used in line with strict requirements for the maximum allowed heat losses through ventilation. The required airtightness of ventilation ducts is defined and must be controlled. The minimum required heat recovery in ventilation and/or AC systems is 65%, and 75% in low-energy buildings. Individual electrical heaters for DHW are not allowed unless they are economically reasonable.

Low temperature heating systems (max. 55°C), as well as condensing gas boilers or, alternatively, high efficiency gas heat pumps, are obligatory in new buildings. As a rule:

> heat generators must be placed inside the thermal envelope;
> thermal losses of the distribution system must be less than 5%;
> specific use of electricity for transport in the heat exchanger must be below $16 \text{ W}_{\text{electricity}}/\text{KW}_{\text{heat}}$;
> variable speed drives are obligatory;
> automatic control of operation of heating devices and distribution systems is required;

IV. Table 4: Minimum allowed efficiency of cooling generators (CG) required by the PURES 2010 Building Code.

<table>
<thead>
<tr>
<th>Type of cooling generator (CG)</th>
<th>EER</th>
<th>COP</th>
<th>ESEER</th>
<th>COP*</th>
<th>IPVL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test by:</td>
<td>SIST EN 14511</td>
<td>SIST EN 14511</td>
<td>Euro vent</td>
<td>ARI 550/560/590</td>
<td>ARI 550/560/59</td>
</tr>
<tr>
<td>air-cooled CG</td>
<td>2.9</td>
<td>3</td>
<td>3</td>
<td>2.8</td>
<td>3.1</td>
</tr>
<tr>
<td>air-cooled CG with connection channels</td>
<td>2.5</td>
<td>2.8</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>air-cooled CG for radiant heating / cooling</td>
<td>3.7</td>
<td>3.9</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>water-cooled CG - all up to 1,500 kW</td>
<td>4.7</td>
<td>4.2</td>
<td>4.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>with GC piston compressors</td>
<td></td>
<td></td>
<td></td>
<td>4.5</td>
<td>5.1</td>
</tr>
<tr>
<td>water-cooled CG – helical, screw compressor up to 500 kW</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>4.5</td>
<td>5.2</td>
</tr>
<tr>
<td>water-cooled CG – screw compressor 500 kW – 1,000 kW</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>4.9</td>
<td>5.6</td>
</tr>
<tr>
<td>water-cooled CG – spin. compressor up to 500 kW</td>
<td>-</td>
<td>-</td>
<td>5.2</td>
<td>5</td>
<td>5.3</td>
</tr>
<tr>
<td>500 kW – 1,000 kW</td>
<td>-</td>
<td>-</td>
<td>5.8</td>
<td>5.6</td>
<td>5.9</td>
</tr>
<tr>
<td>above 1,000 kW</td>
<td></td>
<td></td>
<td>6.3</td>
<td>6.1</td>
<td>6.4</td>
</tr>
<tr>
<td>air-cooled CG for radiant heating / cooling</td>
<td>4.9</td>
<td>4.2</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CG with remote condenser</td>
<td>3.4</td>
<td>-</td>
<td>3.6</td>
<td>3.1</td>
<td>3.5</td>
</tr>
<tr>
<td>absorption - air/water-cooled single-stage</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.6/0.7</td>
<td>-</td>
</tr>
<tr>
<td>two-step</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

* COP is valid for measurements according to ARI (The American Refrigeration Institute), and it is equivalent to EER – Energy Efficiency Rating without taking into account the additional electrical power.

ESEER – European Seasonal Energy Efficiency Ratio

IPVL – Integrated Part Load Value
permit local adjustment in the range of 1.5 K, and central control is obligatory for large cooling systems.

The minimum requirement for lighting defines the maximum allowed specific power of lighting devices per building category (Table 5). Energy-saving lamps are obligatory. A maximum of only 20% of lighting may be provided by incandescent light bulbs.

II.iII. Applicability to new, replacement and upgraded systems in existing buildings

The systems’ requirements are binding for all new buildings and for major renovations requiring a building permit if the old building’s energy systems are replaced. In existing buildings, the compliance with relevant systems’ requirements must also be achieved in case of maintenance works on systems, and also when components or whole systems are replaced. The general rules are given in PURES 2010, while the technical details are listed in the accompanying Technical guideline TSG-01-004, from July 2010.

II.iv. Provisions for installation, dimensioning, adjustment and control

The dimensioning of heating systems is done based on the SIST EN 12831 standard, replacing DIN 4701 since 2003. PURES 2010 brings additional energy efficiency requirements, while for sizing various components the engineers use mostly German technical guidelines (e.g., VDI 2050, VDI 2067). The ventilation and AC systems are sized according to the regulation for ventilation and AC (2002), keeping in mind the specific energy efficiency requirements from PURES 2010.

II.v. Encouragement of intelligent metering

Slovenia encourages intelligent metering in existing programmes with incentives for energy efficiency investments in public buildings (financed in the frame of cohesion funds) and the residential sector (financed by Eco fund), in a way that the installation of meters, devices and related software is an eligible cost of the renovation investment. The National Energy Efficiency Action Plan (NEEAP 2020) has provided for the optimisation of the operation of energy systems (retro-commissioning) in public buildings, for which also an alternative financing option exists in the form of energy performance contracting. According to the Operational Programme for the implementation of European cohesion policy, in the period 2014 - 2020, the introduction of energy management, including e-info points, will be supported, along with the automatic monitoring of consumption (energy monitoring) that facilitates the monitoring of performance indicators associated with an investment.

II.vi. Encouragement of active energy-saving control (automation, control and monitoring)

The Decree on energy management in the public sector passed the public consultation in mid March 2015 and introduced obligatory monitoring and targeting of measured energy indicators in public buildings. By December 2015, all public buildings over 250 m² are obliged to have energy management in place. The energy data shall be collected electronically by special applications for energy management and then stored in a national e-registry.

III. ENERGY PERFORMANCE CERTIFICATES (EPCs) REQUIREMENTS

III.i. Progress and current status on sale or rental of buildings

Overview and administration system

The EPC was first introduced by the Energy Act of 2006 (revised in 2012). The current system is prescribed in the most recent Energy Act (EZ-1) adopted in February 2014 (Articles 333 to 347)[10]. The current regulation on the certification methodology was adopted in December 2014[11].

<table>
<thead>
<tr>
<th>Table 5: Maximum allowed lighting power density required by the PURES 2010 Building Code.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of the space</strong></td>
</tr>
<tr>
<td>Residential buildings</td>
</tr>
<tr>
<td>Hotels, office buildings</td>
</tr>
<tr>
<td>Restaurants</td>
</tr>
<tr>
<td>Libraries, industrial buildings</td>
</tr>
<tr>
<td>Conference rooms, courts, pavilions, educational and research buildings, health buildings</td>
</tr>
<tr>
<td>Post offices, dancing halls, museums, galleries, sports halls</td>
</tr>
<tr>
<td>Small shops</td>
</tr>
<tr>
<td>Shopping malls</td>
</tr>
<tr>
<td>Garages</td>
</tr>
</tbody>
</table>

[10] www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO6665
The certificates are completed by licenced independent experts and issued by authorised organisations. The database of issued EPCs is maintained by the Ministry of Infrastructure. All EPCs are stored in an electronic registry, currently available in beta version, while the official e-registry linked to the national real estate database is in testing phase. From the beginning of 2015, all issued EPCs are also publicly accessible via the national real estate registry at the Geodetic Administration of the Republic of Slovenia[12] (Figure 8).

An EPC is obligatory for new buildings, where it is part of the documentation of the completed construction works. All existing buildings must have an EPC when sold or rented and, by law, the building owner must show the EPC to the buyer/tenant before the contract is concluded. Display of the energy performance indicator is obligatory in advertisements, and, in all public buildings with more than 250 m² floor area, the EPC must be displayed in a clearly visible place.

The Energy Act EZ‐1 defined the penalties for non-compliance with EPC rules. On 24 February 2014 penalties between 1,000 € and 10,000 € were introduced for public building owners/users if an EPC is not displayed. A fine is also set for the person responsible for the task (from 100 € to 500 €). The penalties (250 €) for building owners advertising the selling/renting of the building without displaying the energy indicators from an EPC are in place from 1 January 2015, while as of 24 February 2015 the penalty for selling/renting a building without an EPC is 300 €.

**How flats are certified in apartment buildings**

For residential buildings, there is provision only for calculated EPCs. Residential buildings can be certified as a whole, or per apartment. In existing buildings both options are used, depending on the decision of the building owners and their interest in further building renovation. The new EPC methodology from 2014 defined an adjusted method for certification of apartments in a building with a common heating system. The EPC issued for a building as a whole cancels the previously issued EPC for an apartment: once the whole building is certified, an EPC for an individual apartment is no longer possible.

**Format and content of the EPC**

The ‘calculated’ EPC contains four calculated indicators (based on the SIST EN ISO 13790):

> A first indicator ranks the energy needs for heating (kWh/m².year) during one year in 7 energy efficiency classes ranging from A to G, whereby classes A and B are further divided into two sub-classes (Table 6).

> A second indicator covers the final energy (kWh/m².year) delivered for space heating and space cooling, hot water preparation, operation of ventilation systems, (de)humidification and lighting.

> The third and fourth indicators describe primary energy (kWh/m².year) and CO₂ emissions (kg/m².year), calculated from the primary energy demand.

<table>
<thead>
<tr>
<th>Table 6: The classes for annual energy needs for heating reflect the thermal quality of the building and the building envelope.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>A1</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>B1</td>
</tr>
<tr>
<td>B2</td>
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<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>G</td>
</tr>
</tbody>
</table>

All four indicators are presented on the front page of the certificate, in a coloured scale.

For existing non-residential buildings, there is the alternative of a ‘measured’ EPC (based on the SIST EN 15603) if the energy consumption data are insufficient, or not reliable. The final decision is made by the independent expert. In residential buildings only calculated EPCs are provided for.

The core indicators in the operational rating are: final energy for heating (kWh/m²·year), electricity consumption (kWh/m²·year), primary energy (kWh/m²·year) and CO₂ indicator (kg/m²·year). The indicators are presented with the use of a sliding scale.

In both versions of the EPC (Figure 9), the other pages contain a detailed structure of the energy use, a description of the building and its systems, and recommended energy efficient measures with a link to more information on financing options.

**EPC activity levels**

The full implementation of the EPC started in July 2013. By the end of 2015, almost 28,000 EPCs were issued, 77% for residential and 23% for non-residential buildings and building units (Figures 10 and 11).

The crisis in the construction sector is reflected in the relatively low number (approximately 500) EPCs for new buildings. Over 2,200 EPCs were issued for public buildings due to the obligatory display of the certificate. The increase of EPCs issued since December 2014 (Figure 12) is a consequence of the penalties imposed for failure to present EPC indicators in advertisements and in the selling/renting process.
Typical EPC costs

The price of an EPC is defined by the market and it is not monitored systematically. The typical cost of the EPC for a single-family house is by rough estimation between 150 € and 400 €, depending on the quality of the available technical documentation and the location of the building. For a single apartment, the EPC price varies between 80 € - 200 € and for a whole apartment building the price is between 20 €/apartment and 50 €/apartment. The price of a measured EPC in public buildings is part of the public procurement process and is subject to building complexity and competition. Sometimes the assessor’s expected amount of work is underestimated, resulting in very low prices of EPCs.

Assessor corps

In the period 2011 - 2014, the training courses and exams for Qualified Experts (QEs) were conducted by an authorised organisation (the Building and Civil Engineering Institute - ZRMK). For the period 2014 - 2019, an additional organisation is authorised to provide these courses and conduct the exams (ZRMK and Chamber of Architects - ZAPS). The obligatory training (27 hours in classes and 2 weeks of homework for both ‘calculated’ and ‘measured’ EPCs) covers regulations for energy performance certification, special topics relating to the energy efficiency of building elements and systems, brief information on the calculation and measurement rules, evaluation of the energy efficiency data for the certificate, recommended measures, as well as certification protocols and issuing procedures. Basic knowledge about energy flows in buildings is not a subject of the training, as candidates are professionals with a technical university degree in architecture or engineering. The preparation of the training material is coordinated at state level. By the end of 2015, around 360 persons had been trained as independent experts on energy performance certification and they were granted the state licence, and 444 institutions were authorised to issue EPCs prepared by licenced independent experts.

The experts are offered further technical support from the ministry and the authorised training providers.

There are periodic workshops organised by the Association of independent EPC experts and the training provider ZRMK on the occasion of new regulations or technical novelties.

The ministry prepared a web page with information on frequently asked questions for the general public.

Compliance levels by sector

EPCs for new buildings are part of the technical documentation of the building once constructed. They are submitted as part of the process of obtaining permission for use of the completed building. As an EPC is a precondition for permission to use the building, the
compliance rate in new buildings is good. In other sectors, compliance is growing due to intensive information and awareness campaigns, strong publicity on EPCs in the period 2013 - 2015, and also due to the imposed penalties for non-compliance in 2014.

Enforcement with building owners and real estate actors

In case of existing buildings put on the market, the real estate agents play an important role in informing and raising the awareness of sellers and buyers/tenants. The rental market is quite small in Slovenia due to the fact that most of the houses/apartments (over 90%) are occupied by the owners themselves.

Compliance with EPC requirements in case of a sale or rental is checked during the building inspection. The ministry can cross-link the database of real estate transactions with the EPCs’ database and verify the compliance. Upon completion of the e-registry of EPCs (due by the end of 2015), such control will be obligatory.

Quality Assurance (QA) of EPCs

In 2013, the Ministry of Infrastructure first checked the validity of the input data for 234 EPCs, and then also verified the results and recommendations for 5 EPCs. The Quality Assurance (QA) in 2014 and 2015 was focused on the control of all basic data in EPCs and it was supported by the beta version of the e-registry, which allowed the plausibility check of input data and energy indicators in EPCs. The building’s spatial data in all EPCs were checked by the ministry when the link with the real estate database for public access to EPCs was established. With the electronic registry of EPCs fully operative, from 2016 the ministry will be able to perform an automatic quality check supported by a system software, where the credibility of the input data and the plausibility of selected indicators will be checked in order to avoid potential mistakes even before issuing the EPC.

Slovenia is establishing an additional QA check step after the EPC is issued. This will be the last step in the QA check process of selected EPCs, to become operational in 2016. By legislation, the ministry can hire technical support to implement a full data review of the calculations, as well as a building audit in order to check the accordance with the requirements and methodologies. The e-registry will facilitate the selection of EPCs for a thorough QA procedure.

III.ii. Progress and current status on public and large buildings visited by the public

Overview

The Slovenian regulation (Energy Act EZ-1 and Regulation on EPC methodology) defines in detail the type of public buildings visited by the public and thus subject to public display of the EPC. From approximately 25 million m² of non-residential buildings, 35% are public buildings. The EPC must be displayed in all public buildings used by public authorities for health care (e.g., hospitals), education and research, and for culture and entertainment (Figure 13). These buildings represent over 6 million m², or 25% of the non-residential building stock. The public authorities are rigorously implementing the necessary procurement steps in order to comply with the energy performance regulation, as penalties are in place since February 2014. Most of the EPC procurement processes were completed in 2014, but additional ones are in progress to cover also the display of EPCs in public buildings with a floor area between 250 m² and 500 m², as required by legislation after July 2015.

Displayed EPCs are also valid for a maximum of 10 years. However, with the anticipated centralisation of the energy related data in the electronic registry, the energy monitoring in the public sector required by the forthcoming decree on energy management (drafted in 2015, adoption planned for 2016) will give new options for further development of display certificates (e.g., annual update of the display EPCs based on the energy consumption figures from energy management data).

Since the same QA rules are used for EPCs in public buildings as in other buildings, no separate statistics are available.

Figure 13: Number of displayed EPCs per building type.
Format and content of the EPC

The measured EPCs defined for public buildings have the same format as EPCs for non‐residential buildings. Only the first page has to be displayed.

Activity levels

By now, up to 8% of all EPCs (over 2,200) are issued for large public buildings visited by the public. Most of these EPCs were issued for buildings that were renovated.

Costs

The actual costs of the EPCs in public buildings are not available. However, in practice, the price of the cheapest bid winning the public procurement is very low.

Assessor corps

Formally, the same licence is required for independent experts issuing EPCs in housing and in large buildings. So, there are no differences in qualification from sector to sector. Experience and references are listed by the bidders, but they are usually not evaluated in the procurement process, with a selection made based mostly on the lowest cost.

III.iii. Implementation of mandatory advertising requirement

Display of the energy performance indicator of the EPC is obligatory in case of advertising. For calculated EPCs the energy class must be presented in advertisements, while for metered EPCs the annual primary energy must be shown. The Energy Act includes certain exemptions to the requirement for displaying the EPC. These exceptions are valid for heritage, religious and worship buildings, industrial buildings and warehouses, non‐residential agricultural buildings if unheated, buildings not intended for living and therefore with no demands for heating or AC, and all self‐standing buildings with a floor area below 50 m². All of the above buildings are also exempted when rented as a whole or in part for a period shorter than one year. If the building is exempted in the Energy Act, this must be clearly indicated in the advertisement.

Approximately 20% of advertised buildings and apartments were withdrawn from the real‐estate web portals for not fulfilling the requirements of EPC advertisement. After a transitional period in 2014, on 1 January 2015 penalties for non‐compliance with the mandatory advertising of the EPC came in force (250 € fine for a building owner). Enforcement of the requirement on obligatory display of the EPC in advertising is the responsibility of the building inspector. Currently, approximately 2,500 EPCs are issued per month, 20,000 units are advertised on the real estate market and 10,000 units are sold per year. Therefore the progress of compliance with the regulations is considered good.

III.iv. Information campaigns

In spite of the fact that the ministry did not implement an information campaign to launch EPCs and support their implementation, various information and awareness raising activities in the last few years familiarised building owners with the EPC. Workshops, lectures, numerous articles, student’s theses, web sites, forums, round tables, interviews on radio and television, even political discussion, as well as negative publicity in the media (additional financial burden and time barrier for owners selling the building, complaints about very high prices of EPCs on one side and very low prices on the side of experts), made the EPC known to practically everyone in the country. Many persons loudly opposed to it, while on the other hand there are also many supporters that understand the EPC as a trigger for investments in renovation, as well as a business opportunity. The imposed penalties had a deterrent effect and initiated a massive certification process in 2014 and 2015 as buyers started to ask for EPCs. Incentives for having an EPC issued for an apartment building as a whole are planned in the frame of a longterm strategy for deep renovation of existing buildings, where EPCs are also considered a precondition in the deployment of energy performance contracting.

III.v. Coverage of the national building stock

EPCs are issued for every new building since, under PURE 2010, the design certificate is followed by an EPC reflecting the building ‘as built’ for obtaining the permit for use. It is estimated that nearly 60% of the new buildings (in terms of total floor area) are checked for compliance when the building is finished, and that also includes an EPC. Around 40% of new buildings are single‐family houses and, if built for investors’ personal use, they do not need a permission to use. Consequently, such a single‐family house will get an EPC only if put on the real estate market. The 40% share is relatively high, but in the period 2013 – 2015 there was significant reduction of construction of
new apartment buildings due to the saturated market after the real-estate crisis in 2009. Almost 28,000 issued EPCs for all building types (at the end of 2015) approximately correspond to as much as 4.4% of the total number of apartments certified, and to at least 4.5% of certified residential buildings in total (houses and apartments) (Tables 7 and 8). Public buildings subject to EPC for display have been successfully certified according to the legal requirements. The share of EPCs issued in the non-residential sector has not been assessed yet due to difference in the data structure.

IV. INSPECTION REQUIREMENTS – HEATING AND AIR-CONDITIONING (AC) SYSTEMS

Slovenia has a combined system including inspections and alternative measures in the inspection of heating systems. A mandatory inspection of the installations of heat generators with a power above 600 kW is required, undertaken by qualified independent experts (in 2015 the new regulation on this topic has successfully passed the public consultation, with the adoption expected in 2016). For nominal heat output of the generators between 20 kW and 600 kW, the use of alternative measures is in place under the existing scheme of chimney sweepers’ inspections.

Inspections are required for AC systems with more than 12 kW nominal power. The methodology is defined in the regulation for regular inspections of AC systems (adopted in 2008).

IV.i. Progress and current status on heating systems

In Slovenia, the owner of a building or building unit shall ensure the carrying out of regular inspections of accessible parts of systems used for heating, with boilers of an effective rated output for space heating purposes above 600 kW. As a minimum, inspections shall include the heat generator, control system and circulation pumps. The inspections must also include an assessment of the efficiency of the heating systems and their suitability to the use of the building.

The ministry drafted a regulation on the systematic inspection of heating systems that passed public consultation in 2015 and is expected to be finalised and published in 2016. It defines the content, type and time intervals of regular inspections of heating systems, the data to be collected, the method for keeping the register and for reporting new entries, the method of training of experts, as well as criteria for determining the price of the inspection report, though the price itself will be subject to the market.

The inspections of heating systems must be carried out by independent experts with a state licence, as defined in Article 341 of the Energy Act. During the inspection, independent experts authorised by the ministry shall take into account the methodology laid down in the regulation governing regular inspections. Based on the inspections carried out, when drawing up the inspection report independent experts must advise users on possible improvements or replacement of parts of the heating system. The inspection report on the heating system shall be handed over to the owner of the building or building unit, and must be submitted by the independent expert for entry in the register of inspection reports on heating systems.

As the inspections of heating systems are carried out by the open market, the prices are neither regulated nor monitored.

By 2015, a total number of more than 80 pilot inspections of heating systems were carried out in Slovenia in the frame of various projects (e.g., Energy Advisory ENSVET, IEE Movida[16], etc.).

Table 7: Number of issued EPCs by December 2015 according to building type.

<table>
<thead>
<tr>
<th>Building type (CC-SI classification of buildings*)</th>
<th>Number of EPCs (December 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family house</td>
<td>7,076</td>
</tr>
<tr>
<td>Apartment buildings (incl. apartments)</td>
<td>14,288</td>
</tr>
<tr>
<td>Residential buildings for special social groups</td>
<td>142</td>
</tr>
<tr>
<td>Restaurants</td>
<td>615</td>
</tr>
<tr>
<td>Office buildings</td>
<td>1,895</td>
</tr>
<tr>
<td>Commercial buildings</td>
<td>1,474</td>
</tr>
<tr>
<td>Buildings for telecommunication</td>
<td>26</td>
</tr>
<tr>
<td>Industrial buildings</td>
<td>180</td>
</tr>
<tr>
<td>Tertiary public buildings</td>
<td>1,920</td>
</tr>
<tr>
<td>Other non-residential buildings</td>
<td>140</td>
</tr>
</tbody>
</table>

* CC-SI – Classification of types of Construction in Slovenia (EUROSTAT)

Table 8: Residential buildings in Slovenia (single-family houses and apartment buildings) according to the Census 2012.

<table>
<thead>
<tr>
<th></th>
<th>Single-family houses (1 or 2 flats)</th>
<th>Apartment buildings</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings (number)</td>
<td>493,283</td>
<td>25,315</td>
<td>518,598</td>
</tr>
<tr>
<td>Apartments (number)</td>
<td>526,825</td>
<td>325,868</td>
<td>852,693</td>
</tr>
<tr>
<td>Useful floor area (1,000 m²)</td>
<td>50,349</td>
<td>16,814</td>
<td>67,163</td>
</tr>
</tbody>
</table>

[16] www.movida-project.eu/
Arrangements for assurance, registration and promotion of competent persons

The Ministry of Energy is responsible for the database of inspectors and inspected heating systems.

Qualification requirements for entrance in the scheme are defined in accordance with Article 341 of the Energy Act, i.e., independent experts shall be accredited for inspections of heating systems provided they meet the following requirements:

- they have at least a high professional education degree, with the subjects of study falling within a specific field of engineering, (except specific fields of chemical engineering and process engineering or the field of motor vehicles, vessels and aircraft), in accordance with the regulations governing higher education;
- they have at least two years of appropriate work experience in the professional field of heating systems, after attaining the educational level referred to in the preceding requirement;
- during the last five years prior to their application for the accreditation, they have successfully completed a training course for independent experts for inspections of heating systems.

Candidates who pass the training course and examination shall be accredited at their request upon proof of successful completion of training and they will receive the license for inspector of heating systems by the ministry.

The Ministry of Infrastructure prescribed the training programmes which independent experts should complete in order to produce EPCs or carry out regular inspections of AC systems. A more comprehensive monitoring system for quality control is planned in 2016.

Penalties and promotional activities

Promotional activities are carried out through web portals, various brochures and presentations at events. A stronger promotional campaign effort is envisaged for the future.

Penalties are prescribed by the Energy Act, and the energy inspection is responsible for checking compliance. A penalty of 300 € is foreseen when the owner of a building or building unit fails to ensure regular inspections as provided in Article 338 of the Energy Act.

IV.ii. Progress and current status on AC systems

In Slovenia, the owner of a building or building unit must ensure regular inspections of every AC system with more than 12 kW nominal power. The methodology is defined in the regulation on regular inspections of AC systems (adopted in 2008). Inspections of AC systems shall include at a minimum: an inventory and review of documentation, visual and functional check of the AC system and air-conditioned rooms, preparation of proposals for improvement and alternatives, and creation of the inspection report.

The ministry defined the details concerning the content, type and time intervals of regular inspections of AC systems (every five years), the type of data to be collected, the method for keeping the register and for reporting new entries, the method of training of experts, as well as criteria for determining the price of the inspection report, though the price itself will be subject to the market.

AC system inspections must be carried out by independent experts with a state licence, as defined in Article 341 of the Energy Act. During inspection these experts, authorised by the ministry, shall take into account the methodology laid down in the regulation governing regular inspections of AC systems.

As the inspections of heating systems are carried out in an open market, the prices are neither regulated nor monitored.

Arrangements for assurance, registration and promotion of competent persons

The qualification requirements for obtaining the licence and registration of AC inspectors in the national database are the same as described for inspectors of heating systems.

The registry of accredited independent experts with licence from the state is kept by the ministry along with the registry of inspection reports for AC systems.

Promotional activities are carried out through web portals, various brochures and presentations at events. In the future, the ministry plans to organise a stronger promotional campaign.

Inspections of AC systems in Slovenia have been carried out in the form of pilot projects in the tertiary building sector in...

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[17] A 3-year university degree. At least Bachelor degree: B.Eng. (professional) or B.Sc. (scientific).
the framework of the IEE HARMONAC project[19]. So far, from the period 1978 – 2001, 25 inspections of AC systems were performed in buildings sized between 720 m² and 36,000 m². The outcomes from such pilot inspections were integrated in the current regulation on inspection of AC systems.

**Enforcement and penalties**

Penalties are set by the Energy Act. A penalty of 300 € is foreseen when the owner of a building or building unit fails to ensure regular inspection of the AC systems of buildings or parts of buildings in which AC systems of a nominal output capacity exceeding 12 kW are installed. The first formal quality controls of AC inspection reports will be finished in 2016.

**IV.iii. Alternative measures**

The mandatory inspection of heating systems is prescribed for heating systems of 600 kW and more, while the use of alternative measures is in use for heating systems with power between 20 kW and 600 kW. One of the alternative measures is the existing scheme of chimney sweepers’ inspections, a public service that includes an examination of small boilers, chimneys and vents. Other alternative measures are under development.

**3. A success story in EPBD implementation**

The web platform *Energetskaizkaznica*[19], which was instrumental in supporting the further development of EPCs, is dedicated to professional training of EPC experts and support to licenced independent experts in completing EPCs, as well as to building owners. The web platform acts as an e-learning environment, a simulated e-registry of EPCs, an e-club supporting licenced independent experts for issuing certificates, and an e-advisory corner for building professionals.

The web platform was developed to support an effective implementation of the EPC by upgrading the traditional training process with complementary e-training of experts (Figures 14 and 15). This was achieved by developing a mock-up tool for issuing EPCs and by implementing the electronic registry of issued EPCs. The training part of the web platform enables the elaboration of a school certificate, with the presentation of the building assessment in ten slides. This ensures an interactive e-communication within the team of trainees on technical elements of EPCs. Optimisation of the training by e-learning elements facilitated the exchange of trainees’ experiences gained by doing the certificates on actual buildings. The service was evaluated very positively by the candidates during the training.

Stakeholders obliged to comply with the EPC regulation (independent experts, private and public building owners, buyers and tenants, general public), are supported via the web platform with the following information and services: information on EPC legislation and resulting obligations, structured database of licenced independent experts amended with professional references and regional coverage information, as well as a frequently asked questions section. Experts are offered technical details on filling out and issuing EPCs through a training environment that simulates the

![Figure 14: Registry of EPCs used for the training of EPC experts.](image)

![Figure 15: Independent experts training for energy performance certification in January 2015.](image)

[20] energetskaizkaznica.si/
completion and issuing of EPCs, as well as a club of independent experts with a web forum on actual topics relating to EPCs and building renovation. A special part of the web platform is an advisory section dedicated to the improvement of buildings’ energy efficiency. In that section, there is commercially independent information available, concerning the application of cost-effective measures on buildings and building systems, the potential use of renewables, as well as cost-optimal measures that lead to NZEB. Building owners are provided with comprehensive information on the references and professional specialisation of independent experts who may further cooperate with the building owner during the implementation of recommended measures in an EPC.

The e-registry of EPCs in the Energetskaizkaznica web platform is informally and provisionally used as a national electronic database of EPCs in Slovenia. Within 2015, the data from this tool was integrated in the official e-registry of EPCs linked to the building cadastre. The web platform has a public part and an internal part, used daily by approximately 300 licenced independent experts, and periodically by almost 1,000 interested stakeholders and trainees in energy performance certification.

4. Conclusions, future plans

The implementation of the Energy Performance of Buildings Directive (EPBD) has been a complex process for Slovenia. Certain parts of the requirements, e.g., energy performance certification and EPBD-based building codes, were successfully implemented and are already well accepted by professionals and the general public, while for other elements there is still progress to be booked.

Further plans are oriented to optimising certain parts in the regulation, e.g., upgrade of the energy performance calculation methodology in accordance with the new CEN EPBD standards, energy performance certification for complex non-residential buildings, as well as inspection of heating and Air-Conditioning (AC) systems, and to finding a balance between more effective implementation procedures, reasonable application of penalties in case of non-compliance and creating a high level of acceptance of EPBD obligations.