CONCERTED ACTION
ENERGY PERFORMANCE OF BUILDINGS

Implementation of the EPBD Slovenia

Status in 2020

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NATIONAL WEBSITES
https://www.gov.si/drzavni-organi/ministrstva/ministrstvo-za-infrastrukturo/, https://www.energetika-portal.si/, https://www.ekosklad.si/, https://www.eu-skladi.si/, https://www.energetika-portal.si/podrocja/energetika/energetska-prenova-javnih-stavb/

1. Introduction

The transposition of the EPBD in Slovenia is the overall responsibility of the Ministry of Infrastructure and was primarily transposed by the Energy Act[1] (EZ-1), covering the topics of NZEB, energy performance certification, inspection of heating and AC systems and energy efficiency information programmes. In late 2020, the Act on Energy Efficiency[2] (ZURE) will come into force and integrate the EZ-1 articles related to the EPBD. In addition, the Building Construction Act gives the legal basis for building codes (with minimum requirements for building energy performance, technical building systems and the calculation methodology), while the Environmental Protection Act addresses the inspection of boilers.

Before the publication of the Act on Energy Efficiency, the Energy Act was amended in 2019. The changes established the obligation for public display of the EPC for all buildings (not only public) frequently visited by the public. The proposed amendment also gave the grounds and conditions to extend the validity of licenses of independent experts.

In the secondary EPBD regulation (since December 2015), only minor changes have been implemented, among them the most important being an update to the rules on the training, accreditation and register of accredited independent experts for regular inspection of AC systems[3], published in January 2016.

The revision of the building codes (PURES) is still in progress and planned for publication in late 2021. It will contain detailed technical requirements for NZEB based on the technical definition given in the national NZEB action plan (April 2015), and the revision of the calculation methodology according to a new set of CEN EPBD standards.

Important recent steps in EPBD implementation are the application of the central national electronic register of EPCs and associated software, the independent control system for EPCs, first steps in the cross-linking of e-registries for EPCs, inspections and public buildings, as well as wide information activities implemented by the Eco Fund[4] concerning financial instruments available for the energy renovation of buildings.

2. Current Status of Implementation of the EPBD

2.I. Energy performance requirements: NEW BUILDINGS

2.I.i. Progress and current status of new buildings (regulation overall performance)

In line with the EPBD and according to the long-term planning integrated into the building codes PURES 2010, as of January 2015 more severe minimum requirements for maximum energy needs for heating have entered into force[6]. This change had already been integrated into the transitional provisions of PURES 2010 and is compliant with the cost-optimal study outcome. Minimum requirements are expressed using performance-based and energy-related requirements as well as detailed technical requirements for building components and systems.

In 2015/2016, the building codes were put under revision in order to take into account the outcome of the cost-optimal study (2013, 2018), and mainly to include further details associated with the national definition of NZEB, as well as to make the necessary changes in the calculation methodology pursuant to the new CEN EPBD standards. The revision process is still ongoing and shall be finalised by the end of 2021 with the publication of the updated rules.

The current development deploys detailed energy modelling for new non-residential buildings and the increased use of RES and RES systems, respectively. To support this process, the revised building codes will introduce obligatory (instead of optional) hourly energy calculations for complex non-residential buildings as well as to regulate the quality control of the airtightness of the envelope.

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

The Slovenian building codes PURES 2010, with the more severe minimum requirements in use since January 2015, are valid for all types of new buildings, residential and non-residential, while for public buildings (public investments), 10% more severe minimum requirements are imposed. However, new public buildings are front-runners in energy efficiency due to the financial incentives available for high performance NZEB as well as due to the first Decree on green public procurement[7] that included low primary energy among the selection criteria for bids. However, the 2019 update of the Decree on Green Public Procurement (GPP)[8] now explicitly states energy efficiency (together with the use of RES and low-carbon alternative energy sources) as one of the environmental goals, which shall also be reached when designing and constructing buildings.

Compliance with PURES 2010 must be demonstrated by fulfilling minimum requirements related to the maximum allowed specific transmission heat losses (Ht'), maximum annual heat demand for space heating (Qnh), maximum energy needs for cooling (Qnc) (for residential buildings only), and maximum primary energy for the energy systems operation (heating, ventilation and air-conditioning systems and lighting). Maximum U-values of the envelope elements are prescribed for all buildings. The use of at least 25% of RES is mandatory in all new buildings from 2010; alternatively, solutions that include a comparable impact on the primary energy are possible. The consideration of RES produced on-site is limited to the total final

energy used for the building's energy systems; the consideration of exported RES is subject to the integration of the new CEN EPBD standards into the revised rules.

The detailed minimum requirements and energy performance calculation methodology are given in the corresponding technical guidelines TSG-01-004[9]. A monthly energy calculation is predominantly used in practice, and energy modelling with the CEN EPBD standards validated tools is optional. Other minimum requirements cover thermal bridges, airtightness, shading, ventilation, heat recovery, cooling, lighting for residential and non-residential buildings, boilers and heat pump efficiency.

Compliance checking is done at the building permit stage, during the construction process and at building completion before the permission to use is issued. Full compliance is necessary for permission to use. Advanced control is in place for early NZEB, mostly as a precondition for financial incentives.

The energy requirements for new buildings are:

- Maximum heating need (QNH) per useful conditioned floor area (Au):
    - for residential buildings: QNH/Au ≤ 45 + 60 f0 – 4.4 TL (kWh/(m^{2}year));
    - for non-residential buildings: QNH/Ve ≤ 0.32 (45 + 60 f0 – 4.4 TL) (kWh/(m^{3}year));
    - for public buildings: QNH/Ve ≤ 0.29 (45 + 60 f0 – 4.4 TL) (kWh/(m^{3}year))
- Maximum cooling need (QNC) per useful conditioned floor area (Au):
    - for residential buildings: QNC/Au ≤ 50 kWh/(m^{2}year)
- Maximum primary energy (Qp) per useful conditioned floor area (Au):
    - for residential buildings: Qp/Au = 200 +1.1 (60 f0 – 4.4 TL) kWh/(m^{2}year)

2.I.iii. Action plan for progression to NZEB for new buildings

The Slovenian national plan for NZEB[10] (2015) introduced the technical definition of NZEB based on the cost-optimal study (2014) for reference buildings. A core performance indicator of NZEB is primary energy, which is complemented by the requirement of a 50% share of RES in the final energy use (Table 1).

Building type	Maximum primary energy for NZEBs (kWh/m^2)	Minimum share of RES in final energy use (%)
Single-family houses	75	50
Multi-family houses	80	50
Non-residential buildings	55	50

Table 1: Minimum requirements for new NZEB buildings

RES may be selected in consideration of their availability and acceptable NZEB 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 compliance with the energy efficiency targets already set in the Energy Act. Green transformation of district heating and cooling systems is also considered in the Integrated National Energy and Climate Plan of the Republic of Slovenia (2020). The nearly zero or very low amount of energy required in buildings is achieved by the limitation of energy needs for heating to a maximum value between 25 kWh/m^2.K and 15 kWh/m^2.K (EPC class A1, A2 or B1), depending on the shape factor (envelope area to building volume ratio) and the local climate.

A number of policies support the early construction of NZEB, including the following: the integration of NZEB criteria in revised building codes, the integration of energy efficiency in spatial planning, financial instruments for supporting private and public investments in new NZEB, demonstration projects, incentives for heating from RES (on-site, nearby and/or in district heating systems), the integration of NZEB criteria in green public procurement, energy information and advice, establishing a one-stop-shop portal, and the upskilling of blue collar workers and engineers for NZEB.

The national plan for NZEB also defined the intermediate targets for future NZEB, expressed in the floor area of new NZEB, and diversified by particular building types: single-family houses, multi-family houses, public buildings and other non-residential buildings. Comprehensive monitoring of newly constructed NZEB is not yet in place; the partial data are available only for NZEB supported by Eco Fund subsidies (Table 2).

Single-family houses are the prevailing type of early NZEB in Slovenia; after a decade of experience with constructing passive houses, low energy single-family houses and NZEB, there are several experienced designers, contractors and installers available within the market for single-family houses. Although the stakeholders involved in the building construction of multi-family houses turned out to be less experienced in NZEB, there are some successfully built private and public NZEB multi-family houses. In 2016, the Housing Fund of the Republic of Slovenia completed a NZEB multi-family house with 52 apartments and 4 individual staircases. This demonstration building has an average U-value of 0.26 W/m^{2}K, EPC class A2, a primary energy of 36 kWh/m^{2}year and a 72% share of RES (Figure 1).

Figure 1: NZEB multi-family house F3 Brdo, Ljubljana, built in 2016 as a demonstration project by the Housing Fund of the Republic of Slovenia (SSRS). The F3 Brdo building, with 52 apartments and a useful floor area of 5,708 m^2, holds an EPC class of A2 with a standard annual heat demand of 14 kWh/m^2.year, a total delivered energy of 49 kWh/m^2.year and a primary energy of 36 kWh/m^2.year. The share of RES in delivered energy is 72% (biomass: 48%, electricity: 28%, electricity from PV: 19% and heat from the environment for heat pumps: 5%) (www.brdo.ssrs.si) (Source: SSRS).

Figure 2. Airtightness quality control – Blower door tests for apartments and for the entire building were done in several stages during the construction of the building F3 Brdo, Ljubljana – a NZEB demonstration project of the Housing Fund of the Republic of Slovenia (2016) (Source: GI ZRMK, Photo: Andraž Rakušček).

NZEB national plan intermediate targets – new buildings (m^2)	Target 2015 A_u (m^2)	Target 2018 A_u (m^2)	Target 2020 A_u (m^2)	Target* 2014-2018 No. of NZEBs (-)	Target* 2014-2020 No. of NZEBs (-)	Achieved** 2014-2017 No. of NZEBs (-)
Single-family houses	76,850		267,500		6,300	463
Multi-family houses	9,753		73,650		167	5
Public buildings	53,320	84,126		224		30
Other non-residential buildings	50,030	115,970		189		no data

* Estimation

** The actually achieved number of new NZEB is based on the data of Eco Fund on subsidised investments and on the data from NZEB pilot projects.

Table 2: Intermediate targets for new early NZEB as given in the Slovenian national plan for NZEB (2015) versus actually constructed NZEB by September 2017.

2.I.iv. Requirements for building components for new buildings

Current minimum requirements for systems and building components are defined in PURES 2010 regulations, with the revision of the regulation planned for publication by late 2021.

The study on PURES revisions (2015/2016) recommended complementing the minimum efficiency requirements of technical building systems with specific values for space heaters, combination heaters, packages of space heaters, temperature controls, solar devices and packages of combination heaters, as well as water heaters, hot water storage tanks and packages of water heaters and solar devices based on the requirements of the Eco design Directive and delegated regulations No 811/2013 and No 812/2013.

Based on the cost-optimal study, more stringent minimum requirements were proposed for building components (Table 3). However, the designers should optimise the U-values of the envelope elements in order to ensure that the design specific transmission heat transfer coefficient (HT') remains below the minimum value, as presented in Figure 3, and to comply with energy performance-based minimum requirements. Linear thermal bridges should be kept below Ψe = 0.2 W/(mK).

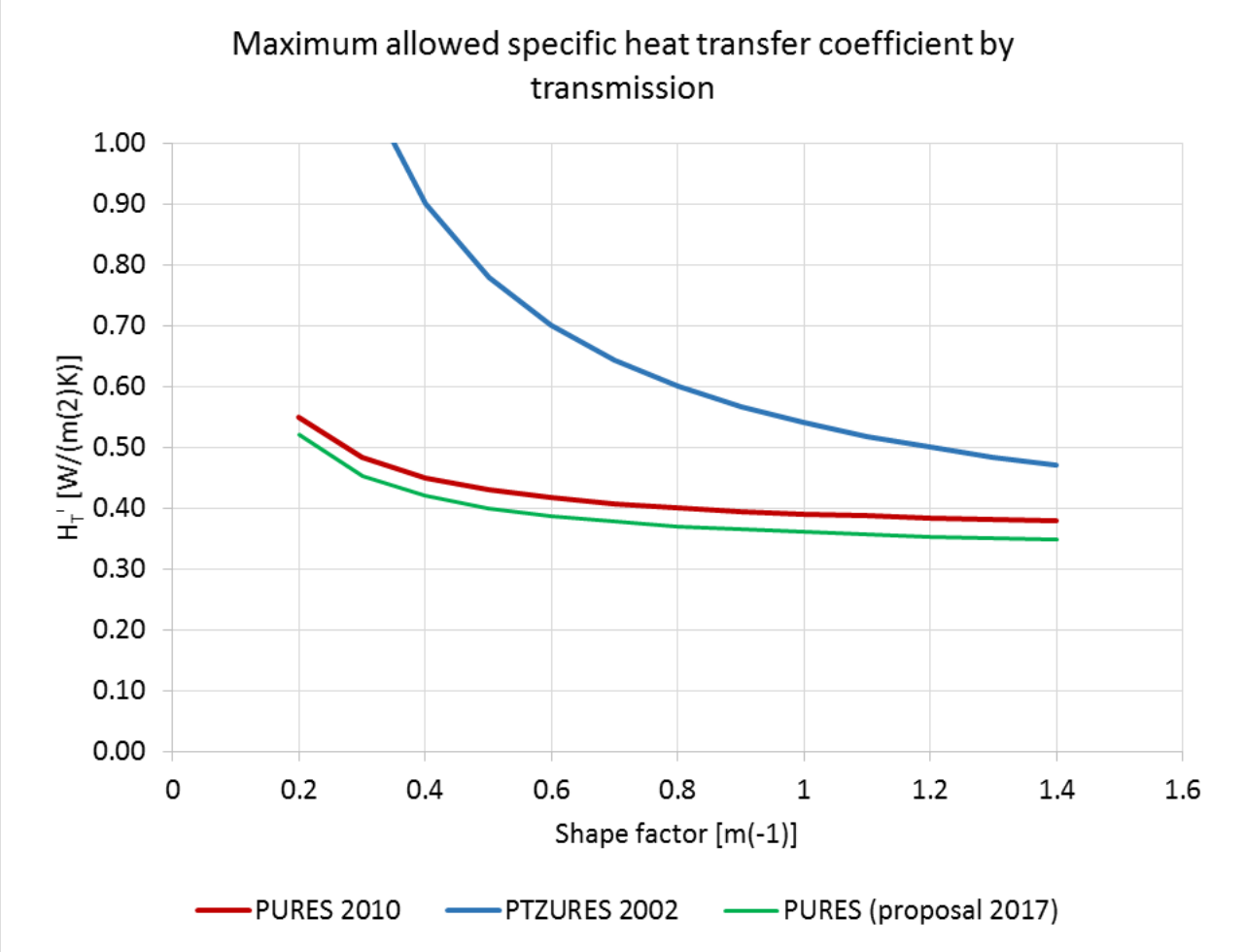

Figure 3. Maximum allowed specific heat transfer coefficient by transmission, development of regulation from 2002 to 2010 and proposal in compliance with cost-optimal study.

Minimum requirements for U-value of the envelope	Status 2020 (as in current PURES 2010)	Proposed new U-values max. (NZEB)
External walls	0.28 W/m².K	0.20 W/m².K
Walls between flats	0.70 W/m².K	0.70 W/m².K
Floors between flats	0.90 W/m².K	0.70 W/m².K
Floors towards ground, unheated basement, or space	0.35 W/m².K	0.35 W/m².K
Ceiling towards an unheated space	0.20 W/m².K	0.20 W/m².K
Pitched and flat roofs	0.20 W/m².K	0.18 W/m².K
Vertical windows	1.30 W/m².K	1.00 W/m².K
Roof windows	1.40 W/m².K	1.40 W/m².K

Table 2. Minimum requirements for the elements of the building envelope; current status (2020) and proposal for revised regulation expected in late 2021.

2.I.v. Enforcement systems new buildings

According to the Building Act (2017), construction includes the design, permitting and construction of facilities, i.e., buildings, civil engineering, or other construction interventions. The building is a result of construction, finishing or installation works and consists of construction products, other products, or natural materials, together with permanently installed installations and devices.

To protect public interest, all facilities must comply with spatial implementation acts and regulations on spatial planning, meet the requirements of construction, technical and other regulations, and be registered. Compliance with the above is the responsibility of investors, designers, competent administrative bodies, supervisors and contractors.

Inspection supervision over the implementation of the provisions of the Building Act relating to construction for which a building permit is prescribed shall be performed by state construction inspectors.

Inspection control over construction for which a building permit is not prescribed by the Building Act, in the part relating to compliance with spatial implementation acts and other regulations of the municipality, is performed within the original competence of the municipality by municipal inspectors or joint municipal inspectors operating within the joint municipal administration.

Inspection supervision over the implementation of the provisions of the Building Act in the part relating to the fulfilment of essential and other requirements that fall within the scope of work of other ministries shall be performed by inspectors operating in the corresponding ministries, unless otherwise provided by law.

2.II. Energy performance requirements: EXISTING BUILDINGS

In Slovenia, minimum requirements for existing buildings are given in the PURES 2010 and the Technical Guidelines TSG-1-004 Efficient Use of Energy, and in case of major renovations, where a building permit is needed, these are similar to the requirements for new buildings. If the works are classified as maintenance works, where a building permit is not needed, then only the minimum requirements for the particular element of the technical building system component are relevant (see also 2.II.i).

In case of NZEB renovations, the minimum requirements for existing buildings expressed in primary energy are less stringent compared to those for new buildings: 95 / 90 / 65 kWh/m^2.year for a NZEB renovation of a single-family house, a multi-family house and a non-residential building, respectively. These requirements are part of the national plan for NZEB and will be integrated into the revised PURES by the end of 2021.

2.II.i. Progress and current status of existing buildings (regulation overall performance)

Minimum requirements for existing buildings have been part of the Slovenian building codes since 2002. Renovation works for which a building permit is required must be done according to the building codes and following the requirements valid for new buildings.

PURES 2010 also transposed the EPBD as regards major renovations. Thus, the minimum requirements apply to all new buildings as well as 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 building envelopes, if a renovation (when a building permit is needed) is less than 25% of the thermal envelope area, or if buildings have a floor area smaller than 50 m^2, only the minimum requirements for the U-values of the envelope must be considered (i.e., only 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 at the same level as those required for new buildings.

2.II.ii. Regulation on individual parts, distinct from whole building performance

The introduction of system performance minimum requirements is being considered in the revision of the building codes PURES, planned for late 2021. The amendment is related to the introduction of the new set of CEN EPBD standards.

Currently (in PURES 2010), system energy efficiency is achieved by selecting products that fulfil the energy efficiency requirements, with corresponding design and construction rules for sub-systems. The regulation has imposed system performance requirements via many rules on product and sub-system energy efficiency. The rules address heating, ventilation, cooling, AC and lighting sub-systems and the energy efficiency of products.

2.II.iii. Initiatives/plans to improve the existing building stock

The strategy for the renovation of existing buildings to NZEB levels is defined in the Slovenian national plan for NZEB (2015). Table 4 details the progress of this plan. About one third of the renovations included in the Long-Term Strategy for Mobilising Investment in the Renovation[11] (2015) was foreseen to reach NZEB levels. Despite this, progress in NZEB renovation is still quite slow. The NZEB renovation goes beyond deep renovations and is in many areas dependent on more sustainable energy supplies and on the deployment of smart energy networks. Deep renovation is thus the first step towards the goal and in many residential, public and non-residential buildings in Slovenia the process of step-by-step renovation has started.

More recently, the Long-Term Renovation Strategy for Mobilising Investments in the Energy Renovation of Buildings until 2050 (2021) predicted the NZEB renovation rate by the year 2050 to be as follows:

- Single-family houses, 98,600 m^2 (2021-2030), 996,900 m^2 (2031-2040), 3,164,100 m^2 (2041-2050) with cumulative heating energy savings (renovation + new built) of 26% (2030) and 45% (2050), respectively, compared to the base year 2020.
- Multi-family houses, 52,600 m^2 (2021-2030), 539,000 m^2 (2031-2040), 1,145,500 m^2 (2041-2050), with cumulative heating energy savings (renovation + new built) of 26% (2030) and 48% (2050), respectively, compared to the base year 2020.
- The total share of public NZEB is predicted to be 25.7% in 2030, and 75.1% in 2050, with cumulative heating energy savings (renovation + new built) of 20% (2030) and 26% (2050), respectively, compared to the base year 2020.
- The total share of private tertiary NZEB is predicted to be 24.4% in 2030, and 72.4% in 2050, with cumulative heating energy savings (renovation + new built) of 16% (2030 and 2050), compared to the base year 2020.

NZEB national plan intermediate targets – existing buildings (m^2)	Target 2015 A_u (m^2)	Target 2018 A_u (m^2)	Target 2020 A_u (m^2)	Target* 2014-2018 No. of NZEBs (-)	Target* 2014-2020 No. of NZEBs (-)	Progress** **until 2020** No. of NZEBs (-)
Single-family houses	241,000		2,395,000		14,655	Deep renovation projects initiated
Multi-family houses	88,000		596,000		333	Minor progress
Public buildings		123,000		94		Projects initiated, many in progress, no detailed data available yet
Other non-residential buildings		190,000		127		No data available yet
Central government buildings	2,000	20,000		11		Projects initiated and in progress, no detailed data of completion yet

* Estimation

Table 4: Intermediate targets for the NZEB renovation of existing buildings in Slovenia.

According to the Long-Term Renovation Strategy (2015), the renovation rate of residential buildings was planned to be 1.7% in the 2016-2030 period, 1.8% in the 2021-2030 period, 2.3% in the 2031-2040 period, and 1.9% in the 2041-2050 period. The update to the long-term strategy (2018) introduced improvements in the field of quality management of renovation, development of holistic financial instruments and the Energy Service Company (ESCO) market. The following operational targets were set for the year 2023: a 3% annual renovation rate of buildings owned and occupied by the central government (between 15,000 m^2 and 25,000 m^2 per year), deep renovation of 1.8 million m^2 of public buildings and an improved ratio (1:3) between invested public resources and initiated investments in renovations in the public sector.

The new Long-Term Renovation Strategy (2021) brings some additional and revised targets. By 2050, 74% of single-family houses and 91% of multi-family houses shall be renovated to reduce energy use, with the final energy being reduced by 45%, and CO_2 being reduced by 75% compared to the base year 2005. Greenhouse gas emissions shall be reduced by 75% (base: 2005), and the share of RES shall be increased to at least two thirds of the energy use (excluding electricity and district heating), until 2030.

Eco Fund offers incentives for households for new NZEB single-family houses and the purchase of apartments in new multi-family NZEBs, as well as for deep renovation of houses and the purchase of apartments in deeply renovated multi-family buildings, according to NZEB standards. Requirements comprise high energy efficiency of the envelope (external walls: $U \leq 0.17$ W/(m^2K), windows: $Uw \leq 0.90$ W/(m^2K), central mechanical ventilation with heat recovery ($\eta t > 80\%$), blower door test ($n50 \leq 1.20$ h-1) and at least 50% of delivered energy from RES or connection to an energy efficient district heating system. Higher incentives are available for thermal insulation from natural and recycled materials. Incentives for new NZEBs are available also for public buildings (municipalities) and other buildings in the private tertiary sector. Subsidies are available also for single renovation measures in the residential sector, where the height of the incentive is progressive depending on the number of implemented measures.

2.II.iv. Long Term Renovation Strategies, status

The goal of the Long-Term Renovation Strategy (2021) (DSEPS 2050) is to have the energy systems of 74% of single-family houses and 91% of multi-family houses renovated by 2050. This will reduce final energy consumption by 45%, and CO_2 emissions by almost 75% compared to 2005. Increased investment in energy efficiency is contributing to the recovery and economic development. In the short term, it contributes directly to an increase of employment in industries that supply energy products and services for renovation of buildings and indirectly throughout the economy. In the long run, with the savings created, it contributes to the recovery and development of other sectors. Two thirds of buildings covered are residential buildings for which the DSEPS 2050 plans new financial instruments. With sustainable renovation decisions, having in mind that they are placed approximately every 30 years, implementation of DSEPS 2050 will have a significant impact on resource efficiency. DSEPS 2050 also plans systemic mitigation measures regarding energy poverty, including the absorption of cohesion funds. DSEPS 2050 directs attention to switch from partial to deep and NZEB renovations. For additional information about goals and targets see sections 2.I.iii and 2.II.iii.

2.II.v. Financial instruments and incentives for existing buildings

Financial resources for the renovation of public buildings, mitigating fuel poverty in households and developing demonstration projects are planned in the Operational Programme for the implementation of the European cohesion policy in the 2014-2020 period[12]. A strong focus is placed on mobilising private resources. A special budget in the operational programme is available to support the development of energy performance contracting, partly (115 million €) with grants and partly (50 million €) with financial instruments.

In several Slovenian municipalities, ELENA technical assistance was supported by the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD), respectively. A number of municipal public buildings and buildings of the central government are subject to calls from promotors or ESCOs. However, the ESCOs market in Slovenia is moderately developed (experiences are limited) and new domestic and foreign private investors are in demand. Low energy prices and much lower profitability of deep renovations compared to certain individual measures are a challenge for new financial instruments in revision of the long-term strategy.

The Eco Fund will further provide grants and soft loans for the renovation of existing residential buildings and to intensify awareness, information and energy advisory activities; new financial products are currently available as soft loans from commercial banks for renovating residential buildings (e.g. factoring, pilot projects of energy performance contracting and loans on behalf of the reserve fund in multi-family buildings are initiated). The energy renovation of existing buildings will rely to a great extent on the funds from the EIB, the funds of the Republic of Slovenia, private funds and on the EFSI.

The National Recovery and Resilience Plan[13] (2021), Component 2: Sustainable renovation of buildings, allocates 86.05 million € for investments in sustainable construction and renovation of buildings. The details have in 2021 not yet been defined. The plan also announces preparation of the legal ground to establish a systemic financial source for energy renovation of central government buildings.

The website of the Ministry of Infrastructure[14] contains a list of the financing options currently available for building energy renovations in all sectors.

2.II.vi. Information campaigns / complementary policies

Based on the Act on Energy Efficiency (2020), the state-owned company BORZEN promotes energy efficiency in all sectors via the web portal 'Trajnostna energija'[15], with events, publications and television broadcasts on energy efficiency and RES.

Eco Fund manages the energy advisory network ENSVET[16] for buildings and households and partly for municipalities. The ENSVET network operates in municipal offices and on major events and fairs; it is free of charge for the end-user. The Eco Fund web portal gives an abundance of information on financing and technical details on the measures.

The LIFE IP CARE4CLIMATE[17] project is a multi-year project (2019-2026) under the coordination of the Ministry of the Environment and Spatial Planning. Among several topics, in cooperation with the Ministry, criteria for the sustainable construction of buildings in Slovenia are being prepared by the Building and Civil Engineering Institute ZRMK and the Slovenian National Building and Civil Engineering Institute (ZAG). The key principle in the development of criteria is the participation of specialists and end-users. Other important actions are the development of new categories of the national green label, Quality Label in Building and Civil Engineering (ZKG), and extensive training sessions for all stakeholders engaged in the sustainable construction process and maintenance of buildings, capacity building for green public procurement, energy management and retro-commissioning. All activities are widely promoted through dedicated information campaigns.

The participation of Slovenian partners in consortia of EU funded projects raises the general knowledge on important topics for EPBD implementation and often stimulates beneficiaries to become front-runners in building renovations and other projects. The building industry and the private sector contribute to the information by establishing energy technology exhibitions and training centres.

2.III. Energy performance certificate requirements

The provisions for the EPC were given in the Energy Act for new and existing buildings as well as for public buildings and transposed to the Act on Energy Efficiency (2020) without major changes. The last change in the Slovenian EPC system was introduced in 2019.

EPCs are completed by licenced independent experts and issued by authorised organisations. The EPC rating can be either calculated or metered. For new buildings and for all residential buildings (new and existing), only a calculated EPC rating is possible. An EPC may be issued for a building as a whole, for an individual part of the building or for an apartment. For non-residential buildings, either a metered or a calculated EPC rating can be given. A metered EPC rating is the first choice and is also simpler and cheaper, but in case of a lack of data, an independent expert may decide that for technical reasons a calculated EPC rating is needed.

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; in all public buildings with more than 250 m^2 of floor area, the EPC must be displayed in a clearly visible place. The Act on Energy Efficiency (2020) defines that the display of an EPC is also obligatory in buildings frequently visited by the public (i.e., commercial buildings such as hotels, banks, shops, etc.).

The database of issued EPCs is maintained by the Ministry of Infrastructure. All EPCs are stored in an electronic registry and linked to the national real estate database. 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. In 2017, the beta version of the visualisation of building energy efficiency was being prepared based on linking the EPC database with GIS data.

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

On average, approximately 11,500 EPCs are issued per year in Slovenia. In total, the number of all EPCs by May 2021 was around 73,250.

The majority (over 80%) of EPCs were issued for the residential sector. Here it must be noted that for multi-apartment buildings there is a distinction between EPCs for a whole building and EPCs for an individual apartment within a multi-family building. The shares for the 2018 – 2021 period are presented in Figure 4.

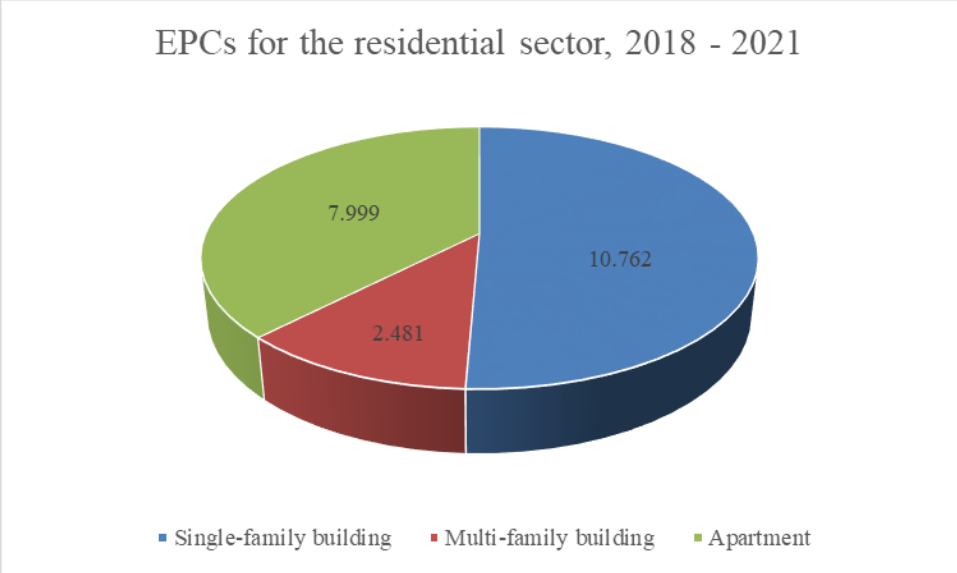

Figure 4: The structure of issued EPCs for the residential sector in the 2018 – 2021 period.

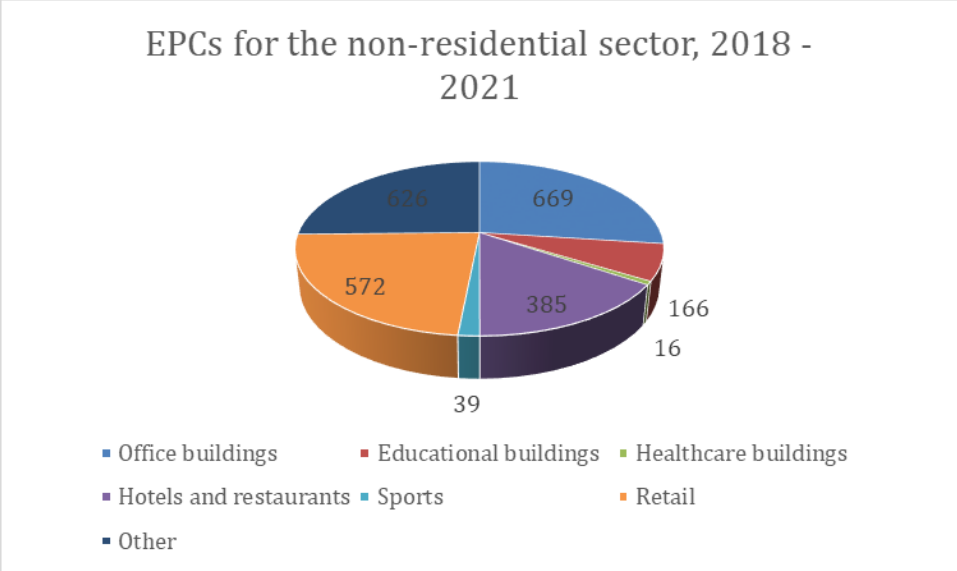

Figure 5: Share of EPCs per non-residential building type in detail, for the 2018-2021 period.

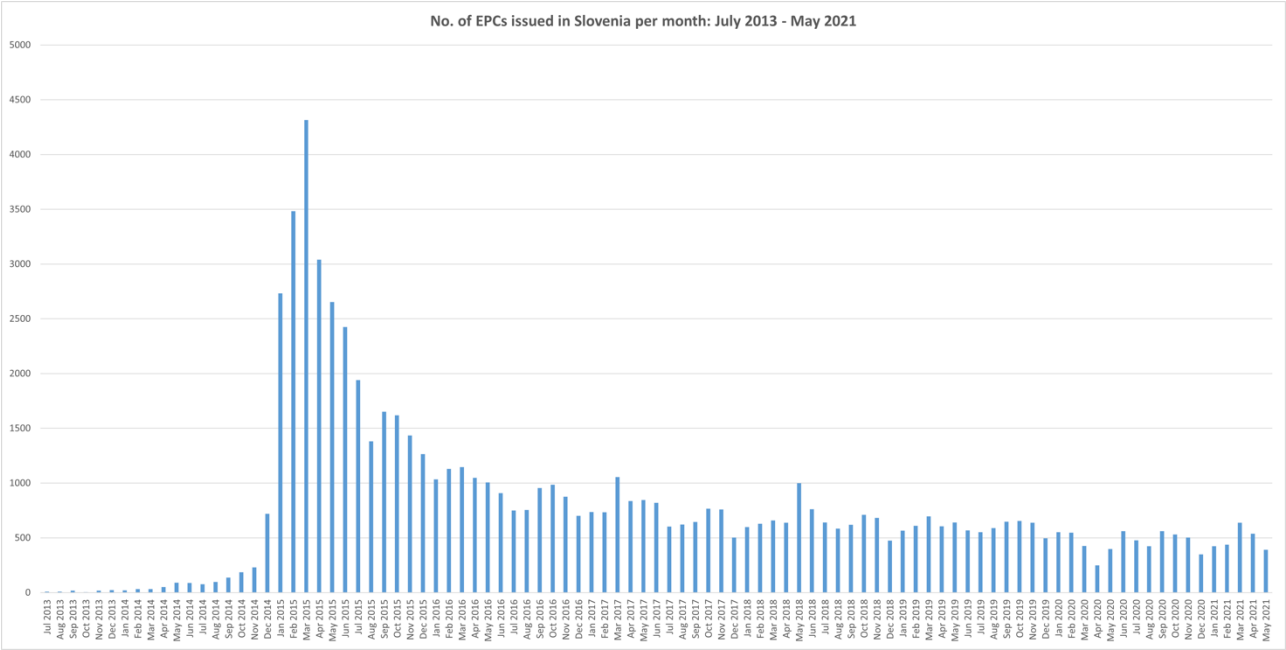

Figure 6: Number of EPCs issued per month from July 2013 to May 2021.

2.III.ii. Quality Assurance of EPCs

Control on technical quality is the responsibility of the Ministry of Infrastructure. First-level control is automatically performed by the EPC electronic registry, during the last step of the EPC entry. Validity and plausibility of data in an EPC are examined by validating the data against the EPC and other public real estate registers. If an EPC does not meet the check, it cannot be issued. Every year, the Ministry makes a random selection of all annually issued EPCs and supervises the selected ones. The sample must be sufficiently large to provide statistically significant conformity results. Second-level control is performed by the Inspectorate of the Republic of Slovenia on behalf of the Ministry of the Environment and Spatial Planning. Whenever a quality problem of an EPC is claimed, the inspectorate checks the status and the issued EPC and then declares its decision regarding the quality with a decision and, if relevant, a penalty. The penalty depends on the mistake, i.e., if necessary, one must correct the EPC as well as issue and store a new EPC in the register.

2.III.iii. Progress and current status of EPCs on public and large buildings visited by the public

The public building stock represents 11% (around 600,000) of the entire number of buildings. Most public buildings and large buildings visited by the public have an EPC, primarily due to the obligation defined in the Energy Act and in the new Act on Energy Efficiency (2020), and secondly due to energy renovation planning processes. An energy audit is a precondition for financing the investment, and for each building for which an energy audit is performed there is also an issued EPC. The progress is good due to a number of financing possibilities. In addition, the 3% annual energy renovation rate of buildings owned and used by the central government contributed to a significant increase of the number of EPCs within 2 years, as all the buildings on this list obtained an EPC.

2.III.iv. Implementation of mandatory advertising requirement - status

In Slovenia, advertising with the inclusion of the EPC energy performance indicator is obligatory when selling and/or renting the building or the building unit. Control is the responsibility of the market inspectorate. Various intensive additional activities are ongoing in this field.

The Ministry of Infrastructure has developed an electronic application for cross-linking a number of databases, i.e., the database on real estate transactions, the rental database, the EPC database and some others, that will be made publicly available, offering a handy insight into several building features in one single step.

The Act on Energy Efficiency defines several types of penalties, among which:

- A fine of 300 € shall be imposed to the owner of a building or an individual part of a building for a misdemeanour if:
  - when selling or leasing a building or an individual part of a building, the owner fails to submit to the buyer or tenant the original or a copy of a valid EPC of the building or its individual part at the latest before concluding the contract;
  - when selling or leasing a building or an individual part of a building, the owner fails to ensure that the energy performance indicators stated in the EPC of the building or an individual part of the building are included in the advertisement. For the same misdemeanour,

- A fine of 100 € shall be imposed to the person made responsible on behalf of a legal person, an individual sole proprietor, or an individual who independently performs an activity, or the person made responsible on behalf of a state body or self-governing local community.

- A fine of 1,000 € shall be imposed to the legal manager of a building or an individual part of a building for a misdemeanour if they fail to ensure the display of a valid EPC in a visible place.

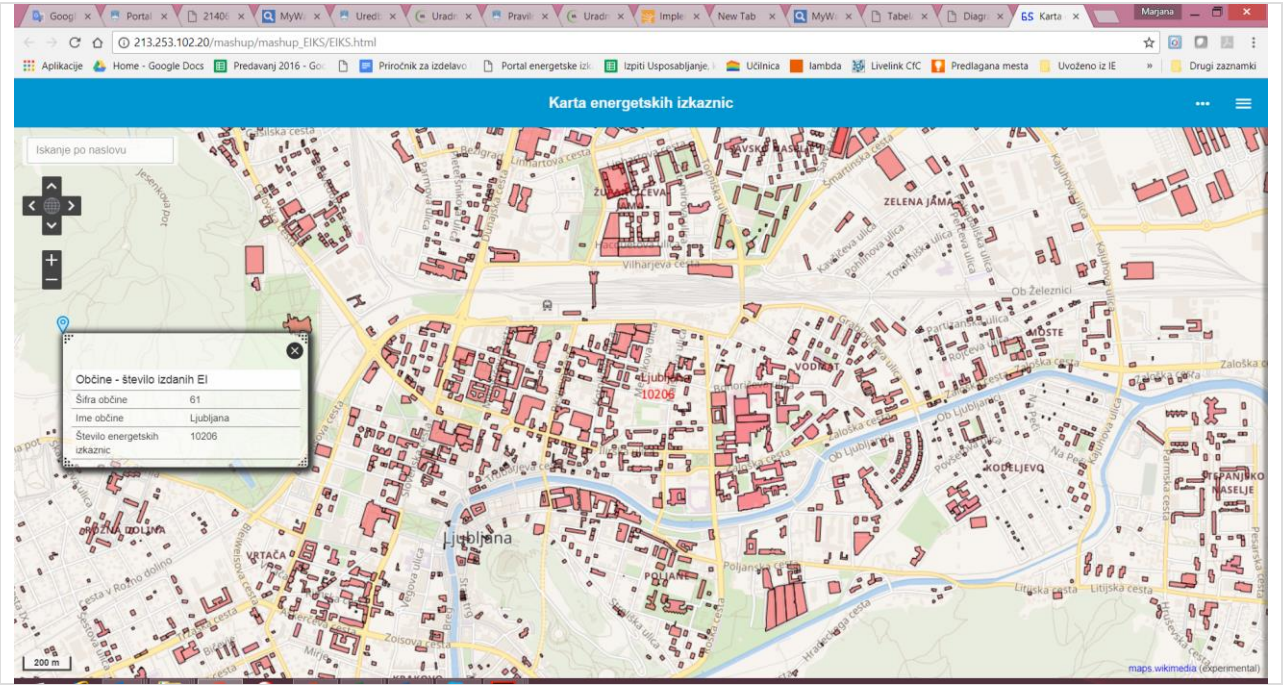

Figure 7: Cross-linking of public databases (upgrade in progress). The map shows the EPCs issued per municipality and visualises the EPC e-register on a GIS map.

2.IV. Smart buildings and building systems

2.IV.i. Status and plans on smart buildings

The Slovenian Smart Specialisation Strategy (S4)[18] (2015) defined national strategic development priorities and niches, which in practice are supported by a targeted, comprehensive and tailored package of measures. At the same time, with the implementation of S4, Slovenia introduced a new model of development cooperation between key innovation stakeholders and managed to significantly improve integration into European and international development and innovation networks, platforms and consortia.

S4 identifies three priority pillars and nine areas of application within the following focus areas and technologies:

I. Digital;
II. Circular;
III. Industry 4.0.

For (smart) buildings, the first priority pillar, i.e., digital, is the most relevant one, consisting of:

I.1 Smart cities and communities
I.2 Smart buildings and home including wood chain.

For example, the Strategic Development Innovation Partnership 'Smart buildings and home including wood chain' focuses on the construction of buildings, interior elements and care and management facilities for buildings as well as their connectivity with the neighbourhood and with smart NZEB.

Renovation projects of public buildings to NZEB level which are being co-financed from cohesion funds are required to include a minimum of smart features, e.g., a building (energy) management system (B(E)Ms) or building automation and control system (BACs) and smart metering. Incentives for advanced BACs in new and renovated residential buildings, for solar power plants for self-supply in stand-alone and for collective investments are available through the Eco Fund. Regulation is also in place for smart meters for heat metering and billing in apartment buildings. The above measures support improved indoor environmental quality and energy performance of buildings.

2.IV.ii. Regulation of system performance

Current minimum energy performance requirements for systems and building components are defined in PURES 2010 rules and the Technical Guidelines TSG-1-004 Efficient Use of Energy, with the revision of this regulation planned for publication by late 2021 (related to the new set of CEN EPBD standards).

The minimum requirements, including requirements for technical systems, also apply for existing buildings in case of major renovations, where a building permit is needed. If the works are classified as maintenance works, then only the minimum requirements for the particular element of the technical building system component are relevant.

The study on the revision of PURES (2015/2016) recommended complementing the minimum efficiency requirements of technical building systems with specific values for space heaters, combination heaters, packages of space heaters, temperature controls, solar devices and packages of combination heaters, as well as water heaters, hot water storage tanks and packages of water heaters and solar devices based on the requirements of the Eco design Directive and delegated regulations No 811/2013 and No 812/2013.

The Act on Energy Efficiency (2020) defined the obligation efficiency of technical building systems. More detailed requirements on technical documentation proving the efficiency of technical building systems will be defined in detailed regulation, which is currently under preparation.

2.IV.iii. Building Automation and Controls (BACs)

Article 37 of the Act on Energy Efficiency defines the obligation to introduce building automation and control systems. Among others, non-residential buildings with a designed or installed heating system, AC system, combined heating and ventilation system or combined AC and ventilation system with a rated output of more than 290 kW must be equipped with building automation and control systems. BACs must meet the following functionality requirements in order to:

- continuously monitor, record and analyse energy consumption and enable the adjustment of energy consumption;
- compare the energy performance of a building against benchmarks, detect the loss of efficiency of technical building systems and inform the persons responsible for the building or the technical management of the building of the possibilities for improving energy efficiency;
- enable communication with connected technical building systems and other devices in the building while being interoperable with technical building systems between different types of technologies, devices and manufacturers.

BACs must meet the minimum requirements in terms of overall energy efficiency, appropriate sizing, adaptation and control of systems prescribed by the Minister. Buildings equipped with BACs are exempted from the obligation of regular inspection of AC and heating systems.

2.IV.iv. Status and encouragement of intelligent metering

Slovenia plans to replace up to 80% of the existing electricity meters with smart meters by the year 2023. Cohesion funding is available specifically for this process. Companies owning electricity networks are eligible for a 33% co-financing of the investment with a total available budget of 13.9 million € in the 2017-2022 period. The Decree on measures and procedures for the introduction and interoperability of advanced electric power metering systems[19] (2015) supported the introduction of intelligent meters.

By the end of 2020, 82.9% of end users have been equipped with smart meters for electricity, while 78.4% have been involved in remote meter reading.

The Act on Energy Efficiency (Part 4) prescribes that the system operator must ensure that end-customers are introduced with advanced metering systems to encourage them to actively participate in the natural gas supply market. The Agency must carry out a cost-effectiveness assessment of the introduction of advanced metering systems, which includes an assessment of the long-term costs and benefits for the market and the individual customer, an economic viability and cost-effectiveness assessment for various advanced metering options, and an assessment of the best timeframe for their introduction.

New multi-apartment buildings and other multi-storey buildings that have a central heating or cooling source or are supplied by district heating or district cooling systems must be equipped with individual meters specifically to measure heat consumption for heating, cooling and domestic hot water. In multi-family buildings and other buildings with at least four individual parts that have a central heating or cooling source or are supplied by a district heating or cooling system, owners must ensure the installation of

individual meters to measure the actual heat consumption of an individual part of the building. Heating cost meters and allocators must be devices with remote reading.

2.IV.v. Progress and current status on heating systems (Inspection / Equivalence)

According to the Act on Energy Efficiency, the owner of a building or part of a building must organise for the regular inspection of accessible parts of heating or combined heating and ventilation systems, such as combustion appliances, heat generator, heat pumps, control systems and circulators with a rated output for space heating above 70 kW. The first inspection of a heating system or combined heating and ventilation system installed in a new building must be carried out within eight years from the issuance of the use permit or within eight years from the installation or renovation of the heating system or combined heating and ventilation system. The inspection must be done by licensed independent experts, which must pass a relevant training and examination in order to obtain the license for the inspection of heating systems.

2.IV.vi. Progress and current status on AC systems (Inspection / Equivalence)

Inspections of AC systems are fully in use. Inspections are performed by licensed independent experts, who underwent the relevant training and examination and obtained a licence for the inspection of AC systems. Periodical upskilling of independent experts is mandatory every five (5) years. All AC inspection reports are registered by the Ministry of Infrastructure. An e-register for reports on the inspection of AC systems is maintained by the ministry.

The inspection of AC systems is promoted through different channels; such information activities are planned to be intensified in the near future.

According to the Act on Energy Efficiency, the owner of a building or part of a building must organise for a regular inspection of accessible parts of AC or combined AC and ventilation systems with a rated output of more than 70 kW to take place by a licensed independent expert at least every five (5) years. The first inspection of an AC system or a system for combined AC and ventilation must be carried out within five (5) years from the issuance of the use permit or within five (5) years from the installation or renovation of the AC system or systems for combined AC and ventilation.

2.IV.vii. Enforcement and impact assessment of inspections

Enforcement and penalties

According to Article 65 of the Act on Energy Efficiency, a fine of 1,000 € to 10,000 € shall be imposed for a misdemeanour on a legal person, being the owner of the building or its individual part in which the AC system is installed, if they do not provide for a regular inspection of the AC system.

- A fine of 1,000 € to 10,000 € shall be imposed on a sole proprietor or an individual who carries out an activity independently for the same offense.
- Additionally, a fine of 100 € to 500 € shall be imposed on the responsible person of a legal person, the responsible person of a sole proprietor, the responsible person of a self-employed individual or a responsible person in a state body or self-governing local community.

The same penalties are foreseen for failing to provide for regular inspections of heating systems.

Quality control of inspection reports

Article 46 of the Act on Energy Efficiency prescribes that expert supervision over inspection reports is carried out by the Ministry. Every year, the Ministry supervises a randomly selected, at least statistically significant share of all annual reports on the inspection of AC and heating systems and verifies these reports. If, in the process of expert supervision, the Ministry doubts the correctness of the inspection report, it shall inform the competent inspectorate of the findings.

The first formal quality controls of AC inspection reports based on the Energy Act were performed in 2016.

Impact assessment, costs and benefits

Impact assessment is not yet available at this stage.

3. A success story in EPBD implementation

Based on the Long-Term Renovation Strategy for existing buildings (2015), Slovenia developed holistic policies for specific building types. This success story is about a set of policies for multi-family buildings. There are around 25,000 old multi-family buildings in Slovenia, mostly built between 1960 and 1980 and privatised in the 1990s. The Residential Act imposed building management as an obligatory service in each multi-family building. A new profile of companies for building (facility) management was developed, which manages the proper operation, maintenance, repair and renovation of existing multi-family buildings on behalf of the building owners. The owners are obliged to contribute a minimum amount (0.2 to 0.3 €/m^2) or more to a 'reserve fund' of the buildings, and this budget can only be used for regular maintenance, urgent repair and renovations, including investments in energy renovations, and to repay the loan for the works. A precondition is an accepted maintenance plan, where a 50% consensus is required to accept such a plan and to use the reserve fund, respectively. On the other hand, for energy renovations, a 50% consensus (elapsed economic lifetime of the element) to a 75% consensus (investment before the end of economic life) is needed.

The most important barriers hindering deep energy renovations of multi-family buildings are the lack of consensus (50%, 75%) for renovation investment (100% if a building permit is needed), the lack of money and/or fuel poverty, the 100% consensus needed to take a loan, the credit worthiness of all building owners – necessary for the approval of the loan – , previously completed single measures that prolong the payback of later planned energy efficiency measures, insufficient information on technical solutions and financing options, insufficient design and planning of the works before commencement, the unreliable control of works, a low level of trust in contractors who unfortunately are not always adequately skilled, and a lack of monitoring and optimisation after the completion of works.

To break through these barriers and allow for deep energy renovations of multi-family buildings to take place, the following package of policies was put into action in 2016:

- information activities for flat owners (web portals, radio and television broadcasts, information events at fairs and in shops);
- free advice for households at ENSVET[16] energy advisory offices;
- special guidelines for renovating heritage buildings;
- training of over 200 building managers (in two full-day training sessions) for facilitating deep renovation of multi-family buildings;

- progressive subsidies for common and individual investments made available by the Eco fund which cover a wide array of possible energy efficiency measures and their combinations from NZEB renovation to energy efficient building components and systems, with specific calls launched according to the approved plan[20];
- the Eco fund programme ZERO 500 to tackle energy poverty[21];
- loans for common renovation works in multi-family buildings made available either through the Eco Fund and through commercial banks via the SID bank[22], through EIB funds or from own bank funds;
- new financial instruments offered by commercial banks – 'factoring', in which the bank buys the claim from the contractor that completed the renovation and accepts monthly payments into the reserve fund for the repayment of debt.

4. Conclusions, future plans

The implementation of the EPBD has been a complex process for Slovenia. Most 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; regarding other elements, there is still progress to be made.

Further plans concern optimising certain parts in the regulation, including:

- upgrading the energy performance calculation methodology in accordance with the new CEN EPBD standards;
- developing a new national calculation tool that adheres to new CEN EPBD standards;
- further support to NZEB constructions and NZEB renovations;
- enabling consideration of NZEB in interaction with the NZEB district energy supply;
- elaborating on EPCs for complex non-residential buildings as well as for the inspection of heating and AC systems;
- cross-linking of databases with EPBD related data;
- finding a balance between more effective implementation procedures and a reasonable application of penalties in cases of non-compliance;
- creating a high level of acceptance of EPBD obligations.

Endnotes

1. Energy Act (Uradni list RS, št. 17/14 in 81/15); www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO6665
2. Act on Energy Efficiency (Uradni list RS, št. 158/20); http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO8136
3. Rules on the training, accreditation and register of accredited independent experts for regular inspection of AC systems (Uradni list RS, št. 18/16); www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV12525
4. Eco Fund, Slovenian Environmental Public Fund (Eco Fund), a subsidy system that requires blower door tests; www.ekosklad.si/information-in-english
5. https://www.energetika-portal.si/fileadmin/dokumenti/publikacije/dseps/dseps_2050_final.pdf
6. Rules on the efficient use of energy in buildings with technical guidelines (Uradni list RS, št. 52/10); www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV10043
7. The decree on green public procurement (Uradni list RS, št. 102/11, 18/12, 24/12, 64/12, 2/13, 89/14 in 91/15 – ZJN-3); www.pisrs.si/Pis.web/pregledPredpisa?id=URED5194
8. The decree on green public procurement (Uradni list RS, št. 51/17 in 64/19); http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7202
9. www.arhiv.mop.gov.si/fileadmin/mop.gov.si/pageuploads/zakonodaja/prostor/graditev/TSG-01-004_2010.pdf
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12. Operational Programme for the implementation of the European cohesion policy for the 2014-2020 period; www.eu-skladi.si/sl/dokumenti/kljucni-dokumenti/op_ang_final_web.pdf
13. National Recovery and Resilience Plan (2021); https://www.eu-skladi.si/sl/dokumenti/rrf/nacrt-za-okrevanje-in-odpornost_dokument_30-4-2021.pdf
14. www.energetika-portal.si/javne-objave/
15. www.borzen.si/sl/Domov/menu1/Trajnostna-energija/Portal-Trajnostna-energija
16. www.ekosklad.si/fizicne-osebe/en-svet
17. https://www.care4climate.si/en
18. https://www.gov.si/assets/vladne-sluzbe/SVRK/S4-Slovenska-strategija-pametne-specializacije/Slovenska-strategija-pametne-specializacije.pdf

19. The decree on measures and procedures for the introduction and interoperability of advanced electric power metering systems (Uradni list RS, št. 79/15); https://ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud?financiranje%5B%5D=subvencija

20. https://ekosklad.si/prebivalstvo/pridobite-spodbudo/zmanjsevanje-energetske-revscine

21. www.pisrs.si/Pis.web/pregledPredpisa?id=URED6907

22. www.sid.si

Annexes -Key Indicators & Decisions

Key Indicators & Decisions – General Background

no	Key Implementation Decisions – General Background	Description / value / response	Comments
01.01	Definition of public buildings (according to article 9 b)	SI: 'owned by Slovenia or managed by local municipalities or used by public sector' EPBD: '…new buildings occupied and owned by public authorities are nearly zero-energy buildings…'	National legislation - Energy Act EZ-1 (Art. 542): 'Za nove stavbe, ki so v lasti Republike Slovenije ali samoupravnih lokalnih skupnosti in jih uporabljajo osebe javnega sektorja…'
01.02	Definition of public buildings used by the public (according to article 13)	SI: "are owned or used by public sector"	National legislation – Act on Energy Efficiency, ZURE (Art. 34): '… so v lasti ali uporabi javnega sektorja'
01.03	Number of residential buildings	63,737,000 m^2	Long-Term Strategy for Mobilising Investments in the ENERGY RENOVATION OF BUILDINGS until 2050[5] (2021)
01.04	Number of non-residential buildings	23,493,000 m^2	Long-Term Strategy for Mobilising Investments in the ENERGY RENOVATION OF BUILDINGS until 2050 (2021)
01.05	If possible, share of public buildings included in the number given in 01.04	9,707,000 m^2	Long-Term Strategy for Mobilising Investments in the ENERGY RENOVATION OF BUILDINGS until 2050 (2021)
01.06	If possible, share of commercial buildings included in the number given in 01.04	13,786,000 m^2	Long-Term Strategy for Mobilising Investments in the ENERGY RENOVATION OF BUILDINGS until 2050 (2021)
01.07	Number of buildings constructed per year (estimate)	8,577	Statistical Office of the Republic of Slovenia, average 2018-2019
01.08	If possible, share of residential buildings constructed per year (estimate, included in the number given in 01.07)	2,501	Statistical Office of the Republic of Slovenia, average 2018-2019
01.09	If possible, share of non-residential buildings constructed per year (estimate, included in the number given in 01.07)	6,076	Statistical Office of the Republic of Slovenia, average 2018-2019
01.10	Useful floor area of buildings constructed per year in million square meters (estimate)	1.8 million m^2	Statistical Office of the Republic of Slovenia, average 2018-2019

Key Indicators & Decisions – New Buildings

no	Key Implementation Decision – New Buildings	Description / value / response	Comments
02.01	Are building codes set as overall value, primary energy, environment (CO_2), reference building or other?	Overall value for residential buildings is represented by primary energy limit, while CO_2 is calculated as an indicator	Reference building approach is expected for non-residential buildings in 2021 revision of building codes
02.02	Requirements for energy performance of residential buildings in current building code	Primary energy <= 200 +1.1 (60 f(0) – 4.4 T(L)) kWh/(m^2year); Every km^2 is a climatic zone; (T(L) – average yearly temperature, f(0) – shape factor)	Energy performance is a mix of values, calculation rules and text
02.03	Requirements for energy performance of non-residential commercial buildings in current building code	Heating need (Qh,nd) Non-residential buildings: $Q_{h,nd}/V_e \leq 0.32$ (45 + 60 f0 – 4.4 TL) (kWh/(m^3year)) Public buildings: $Q_{h,nd}/V_e \leq 0.29$ (45 + 60 f0 – 4.4 TL) (kWh/(m^3year))	Energy performance is a mix of values, calculation rules and text
02.04	Requirements for energy performance of non-residential public buildings in current building code		
02.05	Is the performance level of nearly zero energy (NZEB) for new buildings defined in national legislation?	Yes	In 'Action Plan for Nearly Zero-Energy Buildings' (2015)
02.06	Nearly zero energy (NZEB) level for residential buildings (level for building code)	Primary energy 75 kWh/m^2 (single-family) 80 kWh/m^2 (multi-family) and 50 % RES	
02.07	Year / date for nearly zero energy (NZEB) as level for residential buildings (as indicated in 02.04)	2021	
02.08	Nearly zero energy (NZEB) level for all non-residential buildings (level for building code)	55 kWh/m^2 and 50 % RES	
02.09	Year / date for nearly zero energy (NZEB) as level for non-residential buildings (as indicated in 02.06)	2021 and 2019 (public buildings)	
02.10	Are nearly zero energy buildings (NZEB) defined using a carbon or environment indicator?	No	
02.11	Is renewable energy a part of the overall or an additional requirement?	Yes	
02.12	If renewable energy is an additional requirement to NZEB, please indicate level		
02.13	Specific comfort criteria for new buildings, provide specific parameters for instance for airtightness, minimum ventilation rates	Yes.	Many comfort indicators; described in special technical appendix to the regulations

Key Implementation Decision – Existing Buildings

no	Key Implementation Decision – Existing Buildings	Description / value / response	Comment
03.01	Is the level of nearly zero energy (NZEB) for existing buildings set in national legislation?	Yes	
03.02	Is the level of nearly zero energy (NZEB) for existing buildings similar to the level for new buildings?	Yes	
03.03	Definition of nearly zero energy (NZEB) for existing residential buildings (if different from new buildings)	Primary energy 95 kWh/m^2 (single-family) 90 kWh/m^2 (multi-family) and 50% RES	
03.04	Definition of nearly zero energy (NZEB) for existing non-residential buildings (if different from new buildings)	65 kWh/m^2 and 50% RES	
03.05	Overall minimum requirements in case of major-renovation	Same as for new buildings	
03.06	Minimum requirements for individual building parts in case of renovation	Same as for new buildings Uwall = 0.28 W/m^{2}K, Uroof = 0.20 W/m^{2}K, Uwindows = 1.30 W/m^{2}K	
03.07	National targets for renovation in connection to Long Term Renovation Strategy (number or percentage of buildings)	By 2050, 74% of single-family houses and 91% of multi-family houses shall be energy renovated.	
03.08	National targets for renovation in connection to Long Term Renovation Strategy (expected reductions and relevant years)	A final energy reduction of 45% and a CO_2 reduction of 75% compared to the base year 2005, are planned until 2050. Greenhouse gas emissions shall be reduced by 75% (base year: 2005), and the share of RES shall be increased to at least two thirds of the energy use (without electricity and district heat) until 2030.	

Key Implementation Decision – Energy Performance Certificates

no	Key Implementation Decision – Energy Performance Certificates	Description / value / response	Comment
04.01	Number of energy performance certificates per year (for instance average or values for of 3-5 years)	11,500 (average)	
04.02	Number of EPCs since start of scheme	73,250	
04.03	Number of EPCs for different building types	No distinction among building types; calculated possible for all buildings, measured for existing non-residential	
04.04	Number of assessors	> 300	
04.05	Basic education requirements for assessors	Three-year university degree with technical studies in major, then two years of experience on energy efficiency and RES in buildings	
04.06	Additional training demands for assessors	One-week training, written and oral examination	
04.07	Quality assurance system	Basic quality assurance, in-depth quality assurance in development	
04.08	National database for EPCs	Yes	
04.09	Link to national information on EPCs / Database		

Key Implementation Decision – Energy Performance Certificates

no	Key Implementation Decision – Smart Buildings and Building Systems	Description / value / response	Comment
05.01	Is there a national definition of smart buildings?	No formal definition	In practice, a NZEB equipped with IT (automation, monitoring, control, adaptability, connectivity, user-focused) technologies and systems is considered a smart house
05.02	Are there current support systems for smart buildings?	No systemic ones	Smart features are a requirement for public buildings being renovated to NZEB level when applying for cohesion fund co-financing
05.03	Are there currently specific requirements for technical building systems (for instance in building codes)?	Yes	See section 2.IV.ii
05.04	Are there current requirements for automatics (for instance in building codes)?	Yes	See section 2.IV.iii
05.05	Chosen option A or B for heating systems (inspection or other measures)	A + B	
05.06	Number of heating inspections; reports per year (if option A)	more than 5,000	
05.07	Chosen option A or B for cooling systems (inspection or other measures)	A + B	
05.08	Number of air-conditioning / cooling system inspections; reports per year (if option A)	Approximately 150 per year	Total: 697 since 1 September 2016
05.09	Is there a national database for heating inspections?	Not yet	In development
05.10	Is there a national database for cooling / air-conditioning inspections?	Yes	At the beginning of operation
05.11	Are inspection databases combined with EPC databases for registration of EPCs and inspection reports?	Not yet	
05.12	Link to national information on Inspection / Database		

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