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## **BUILD UP Skills Slovenia**

National Roadmap  
Permanent Education and Training of On-Site workers  
in Construction

May 2013

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### Further information

More details on BUILD UP Skills can be found at [www.buildupskills.eu](http://www.buildupskills.eu)

More details on the IEE programme can be found at <http://ec.europa.eu/intelligentenergy>



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## INTRODUCTION

In the framework of BUILD UP Skills initiative, the European Union has supported development of national roadmaps, which should explain how to overcome barriers and identify skills gaps in the building sector, and how to provide a lifelong learning training system of craftsman, on-site construction workers and system installers in order to support the achievement of requirements concerning the implementation of energy efficiency, nearly zero-energy buildings (hereinafter called nZEB<sup>1</sup>) in renovation and new construction. BUILD UP Skills initiative has been supported in thirty EU countries and EU accession countries. IEE BUILD UP Skills Slovenia Consortium Project is composed of the Slovenian Building and Civil Engineering Institute (ZRMK) as the Coordinator, Construction Cluster of Slovenia (SGG), Chamber for Crafts and Small Business of Slovenia (OZS), the Slovenian Chamber of Engineers (IZS), the Institute of the Republic of Slovenia for Vocational Education and Training (CPI) and School Centre Novo mesto (ŠCNM) together with over thirty supporting institutions<sup>2</sup>. They are all preparing an overview of the situation in the field of education and training of nZEB as well as a needs analysis for additional education and training of staff, under which the partners drafted a proposal of the system supporting the lifelong learning of nZEB providers ([www.buildupskills.si](http://www.buildupskills.si)).



**Figure 1: Timetable for implementing better qualified on-site workers in the field of nZEB integrating construction sector, the sector of the efficient use of energy and in the field of education and training**

<sup>1</sup> nZEB acronym is used for the English term nearly zero energy buildings

<sup>2</sup> ministries, educational institutions, experts, energy advisors, energy and development agencies, construction industry, equipment suppliers, social partners, trade associations and chambers of commerce, financial institutions, real estate and housing funds etc.



# 1 Climate- energy policy and objectives by 2020

## 1.1 Targets 20-20-20 by 2020

Binding targets for climate and energy savings adopted in National Action Plan for Energy Efficiency are based on EU legislation which has been implemented into domestic law by the Member States:

- **EU Directive EPBD (2002/91/EC)** – on the energy performance of buildings (repealed);
- **EU Directive EPBD Recast (2010/31/EU)** – on the energy performance of buildings (recast);
- **EU Directive on energy end-use efficiency and energy services ESD (2006/32/ES)** –provided for achieving **9% of final energy savings** in the period **2008 to 2016 (2 % already by 2010)** (repealed)
- **EU Directive EE (2012/27/EU) on the energy performance** – **provided for achieving energy renovation of 3 % of the buildings owned annually by the public sector;**
- **EU Directive RES (2009/28/EC)** on the promotion of the use of energy from renewable sources (4/2009) with the national overall share of RER in the final energy consumption in 2020. For Slovenia: 25% (2005 – 16 %).

Buildings play an important role in achieving climate and energy efficiency targets. Energy use in buildings represents approximately 40% of total final energy consumption in the EU, constituting 36% of carbon dioxide emissions. The majority of this energy is used to provide adequate living and working conditions and for generating hot water in buildings. Therefore, the task of the state is to provide high energy efficiency for new buildings on the principle of nearly zero energy buildings. At the same time, the State should, encourage the renovation of existing facilities. Analyses show that it is possible to save around 22 % of energy in buildings with economically viable measures. Such measures may include more stringent requirements on the thermal properties of the building envelopes, energy-efficient systems for heating, ventilation, cooling, hot water and lighting facilities as well as the use of renewable energy in buildings.

In the spirit of comprehensive climate and energy policy, Slovenia joined the EU objectives (20/20/20 by 2020): 20% improvement in energy efficiency, 20% increase in the share of renewable sources and a 20% reduction in greenhouse gas emissions. In 2009 the EU climate and energy policy received its legal basis on the European level through the EU climate and energy package of measures, providing four common commitments for Member States:

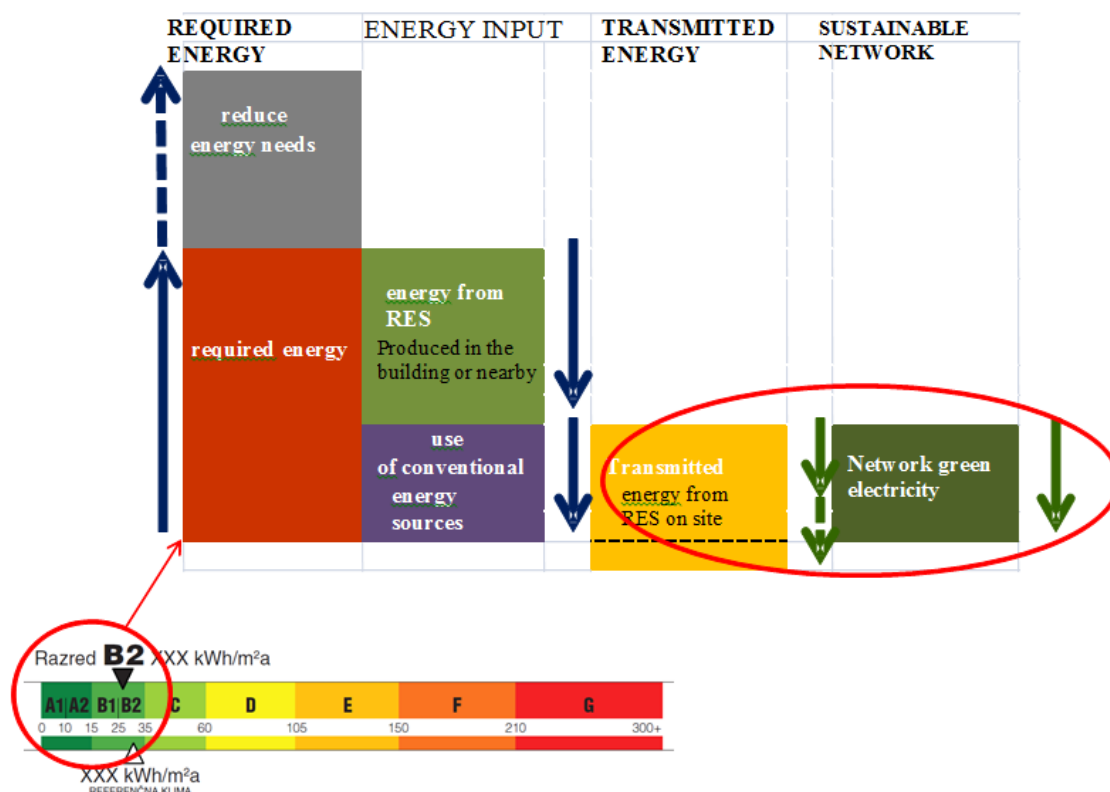
- a revised scheme for emissions trading;
- in the areas which are not involved in the EU Emissions Trading Scheme (this includes households, construction, transport, agriculture and waste), EU Member States must take the burden of reducing emissions relative to the Gross Domestic Product (GDP). Each EU Member State has statutory allowances to increase or decrease greenhouse gas emissions by up to 20% between 2013 to 2020, compared to 2005. Slovenia is, for example, allowed to increase the release of gas by up to 4%;



- Member States need to incur the share of renewable energy sources in total energy consumption introduced by the Directive on the Promotion of Energy from Renewable Sources. For Slovenia, EU legislation requires increasing the share of renewable sources in final energy consumption in 2020 to 25%. In the year of reference 2005, this share stood at 16%;
- establishment of a new legal framework for carbon capture and underground storage of carbon.

## 1.2 Nearly Zero Energy Buildings (nZEB)

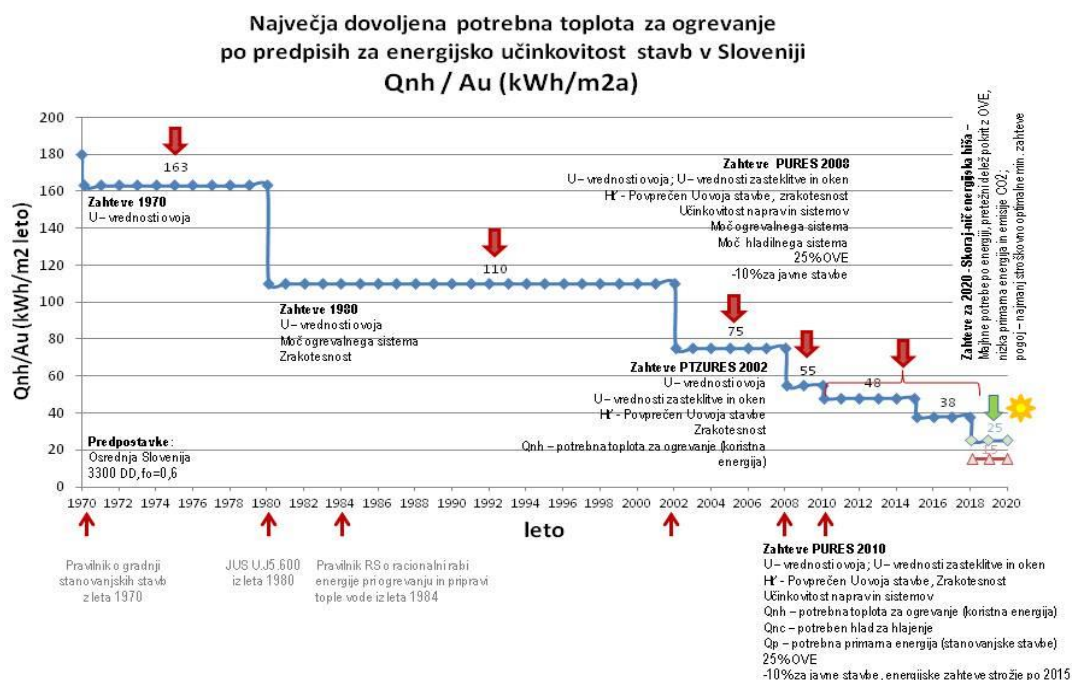
According to the revised EU Energy Performance of Buildings Directive - EPBD recast (31/EU/2010), a system needs to be established by which all new buildings shall meet the criteria of the nearly zero energy building gradually by the year 2020; Public buildings must meet these criteria by 2018. Renovation of existing buildings, as far as it is technically possible, should follow that principle. In practice, this means that the buildings for their operations should consume as little energy as possible. They have to use the most energy-



efficient technology and more renewable energy sources to meet these needs.

Figure 2: The nearly Zero Energy Building concept as established by the Recast EPBD





**Figure 3: Display time of the tightening of legislation on energy performance of buildings, with a view ahead to 2020**

### 1.3 Second Energy Efficiency Action Plans (2nd NEEAP) 2011 – 2016

Second National Energy Efficiency Plan 2011-2016 (2nd NEEAP) has provided a series of measures which will contribute to achieving the objectives of the climate and energy package in the field of the building sector.

**Financial incentives for energy efficient renovation and sustainable residential buildings:** in the period from 2010 to 2016 financial incentives (subsidies and soft loans) are planned for a comprehensive energy reform of 3.7 million square metres of residential space in single dwelling residential buildings and 1.2 million square metres in multiple dwelling residential buildings and the construction of 0.2 million square metres of low energy passive residential buildings are included in the scope of the obligations of nearly zero energy new buildings. The planned volume of energy-renovated buildings represents 8% of the total housing stock in 2010, while newly constructed nZEB represent a 3% increase between 2011-2016.

#### **Financial incentives for energy-efficient heating systems - residential buildings:**

In the period from 2010 to 2016 (inclusive), with the assistance of financial incentives (subsidies and soft loans), it is planned to replace existing heating systems with 14,000 modern gas boilers, 11,000 modern heat pumps and 29,000 modern wood/biomass boilers. The intended scope of the replacement of boilers represents 12% of the existing boilers in 2010. In addition, the installation of additional 134,000 square metres of solar collectors is planned, representing a 90% increase in the area of installed systems up to 2010.



**Financial incentives to improve energy efficiency in industry and services sectors and a substantial increase in production from Renewable Energy Sources (RES) and Combined Heat and Power (CHP):** Financial incentives in the form of soft loans for a wide range of measures are provided (biomass heating systems, solar or geothermal energy, CHP units, units for the production of electricity from renewable energy sources, reconstruction, or replacement of heating, cooling and ventilation systems, retrofit lighting, energy-saving renovation of existing facilities, construction of new facilities in low-energy and passive technologies) as well as electric and hybrid vehicles.

**Green Public Procurement - Public Sector:** Green Public Procurement (adopted in 2011) is implemented, which involves the area of green design of new buildings in the public sector, investment and regular maintenance of public buildings (e.g. lighting facilities, air conditioning, ventilation, heating and office equipment, small scale building reconstruction) in accordance with the principles of energy efficiency and the use of renewable and sustainable component selection.

**Financial incentives for energy efficient renovation and sustainable building in the public sector:** There are planned subsidies from the cohesion fund intended for energy rehabilitation. Financial incentives are intended as a comprehensive rehabilitation, not just for changing a single element (e. g. doors and windows, heating system, interior lighting). In particular, it is desirable to complete the energy renovation of public buildings by installing the utilization of renewable energy sources. Incentives shall be devoted to public buildings owned by municipalities (kindergartens, schools, retirement homes, medical centres, administrative buildings and other public buildings), hospitals, public institutions of higher education and research, secondary schools and public administration buildings. It is also planned to promote the development of energy contracting projects to implement RES and RUE projects in public buildings and as well as supporting drawing loans from international financial institutions (e.g. EIB), and using funds for project preparation (ELENA). Demonstration projects will have a special role in the public sector as well.

#### 1.4 The potential for low-energy construction and renovating buildings

According to the surface of existing buildings, the residential sector has dominance in Slovenia over the non-residential sector. The data from the Real Estate Register RS (REN 2009) [4] show that there is a predominance of family houses with one or two dwellings, while the number of dwellings in family houses represents about 62% of the existing housing stock with 38% of apartments located in apartment houses.

For single dwellings properties that were constructed before 1980, 29% has undergone no energy renovations. 26% has been partly renovated to conserve energy. The same applies to properties with multiple dwellings (23 % without any renovation and 28 % partly renovated).

	One-family houses (1 or 2 dwellings)	More dwelling residential houses	Total
<b>Number of Buildings</b>	493.283	25.315	518.598
<b>Number of Residential Buildings</b>	526.825	325.868	852.693
<b>Usable Area of Buildings Au (1000 m<sup>2</sup>)</b>	50.349	16.814	67.163

Table 1: Balance of buildings, dwellings and usable area of residential buildings in Slovenia. (Source: REN 2009 and IEE TABULA)

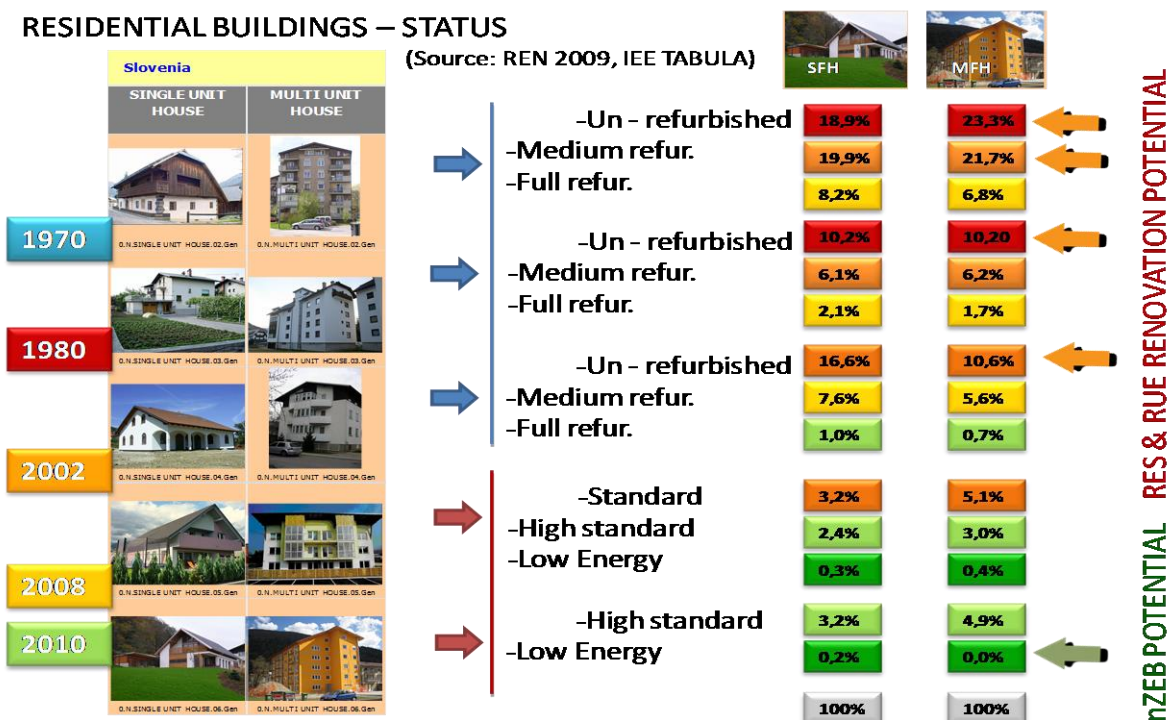


Figure 4: Types of buildings in Slovenia and the potential sub-groups of buildings for upcoming renovation. (Source: IEE TABULA)

Single Unit Buildings	Floor area in 1,000 m <sup>2</sup>	Tabula reference area in 1,000 m <sup>2</sup>	% of SUH	Multi-Unit Buildings	Floor area in 1,000 m <sup>2</sup>	Tabula reference area in 1,000 m <sup>2</sup>	% of MUH
SUH.01.Un_refur	9.790	10.769	18,9%	MUH.01.Un_refur	4.070	4.477	23,2%
SUH.01.Med_refur	10.314	11.345	19,9%	MUH.01.Med_refur	3.803	4.183	21,7%
SUH.01.Full_refur	4.238	4.661	8,2%	MUH.01.Full_refur	1.201	1.322	6,8%
SUH.02.Un_refur	5.302	5.833	10,2%	MUH.02.Un_refur	1.752	1.927	10,0%
SUH.02.Med_refur	3.137	3.450	6,1%	MUH.02.Med_refur	1.094	1.203	6,2%
SUH.02.Full_refur	1.101	1.211	2,1%	MUH.02.Full_refur	293	322	1,7%
SUH.03.Un_refur	8.615	9.476	16,6%	MUH.03.Un_refur	1.866	2.052	10,6%
SUH.03.Med_refur	3.947	4.342	7,6%	MUH.03.Med_refur	985	1.084	5,6%
SUH.03.Full_refur	518	570	1,0%	MUH.03.Full_refur	123	135	0,7%
SUH.04.Standard	1.673	1.840	3,2%	MUH.04.Standard	894	984	5,1%
SUH.04.High_stand	1.216	1.338	2,4%	MUH.04.High_stand	522	574	3,0%
SUH.04.Low_E	152	167	0,3%	MUH.04.Low_E	75	82	0,4%
SUH.05.High_stand	1.668	1.835	3,2%	MUH.05.High_stand	864	950	4,9%
SUH.05.Low_E	88	97	0,2%	MUH.05.Low_E	9	10	0,0%
	51.758	56.934	100%		17.549	19.304	100%

Source: REN 2009 – Real estate registry and IEE TABULA

Table 2: Representation of existing buildings in various categories depending on the year of construction, the architectural design of buildings, dwellings and usable area of residential buildings in Slovenia. (Source: REN 2009, IEE TABULA)



Construction of nZEB, energy-efficient renovation of existing buildings and the use of renewable energy sources in buildings is one of the most important opportunities to revive the construction sector in Slovenia. The Slovenian construction sector requires proper trained to be able to implement quality documents outlined in the strategic programs of low-energy construction and renovations, especially for providers of construction and finishing works so that resources can be maximised, ones that are devoted to encouraging such internal -investment , and ones that are from the EU.

### **1.5 Better trained on-site workers in the area of RES and EE**

The RES, EE and EPBD Directives delve into the area of better training of on-site workers in the areas of RES and EE.

- Directive on the promotion of renewable energy sources RES (2009/28/EC) – Article 14 requires a system of certification or qualification schemes for installers of RES technologies - installers of biomass boilers and stoves, heat pumps, shallow geothermal systems, solar thermal installers and solar photovoltaic installations.
- Directive on the Energy Performance of EE (2012/27/EU) - provides the introduction of certification schemes and training providers of energy services, energy audits, suppliers, and measures to improve energy efficiency, including installers of building elements (envelope and systems) according to the EPBD.
- Directive on the Energy Performance of Buildings Directive EPBD recast (31/2010/EU) – regulates the training of individuals who check and certify air conditioning systems.

At the end of 2012, the Ministry of Infrastructure and Spatial Planning prepared draft rules for the certification of installers for the RES Directive, providing comprehensive content for training programs. At the same time, the preparation of occupational standards for National Vocational Qualifications (NVQs) is being carried out for (installers of PV systems, heating systems installers, installers of solar systems and, energy managers).

### **1.6 The effects of the crisis on the labour force in the construction industry**

Statistical data from the Statistical Office of the Republic of Slovenia (SORS) show [1] a 35% decline in the number of building permits issued in the period from 2008, i.e. when construction activity was at its peak, to 2011. In the same period, a 21% drop in the number of employees was recorded. The Employment Service of Slovenia (ESS) states [2] that in 2011, there was about the same amount of employees in the construction industry (70,000) in 2011 as they were in 2006. The cyclical peak was in 2008, when the industry employed as many as 88,000 people. In 2011, the share of employees in the construction industry amounted was 8.4% of total employment (10.1% in 2008). The most common person unemployed in the construction industry tends to be about 45 years old and have a below-average education. Workers, who have lost their jobs, have been carrying out a range of skills that they have acquired through years of work.

Currently construction sector is undergoing a restructuring process. According to the ESS an increasing trend in the number of vacancies in the construction industry was once again apparent for the first time in 2011 but it is characterised by smaller employers looking for workers to work abroad. Advertised posts for a limited time, usually for six months, are dominant (80%). Estimates indicate that in 2011, 76% of the available jobs in the construction sector were potentially associated with energy-efficient construction and renovation in 2011 (only 45% in 2008). The finding that the demand for labour shifted from the prevailing demand for workers without qualifications (in 2008) to those who have completed secondary vocational school is promising indeed. Enrolment in secondary



vocational training programs has been decreasing each year, which, in turn, means that a large proportion of workers will be taken from abroad e.g. from the former Yugoslav republics, about half of them coming from Bosnia and Herzegovina.

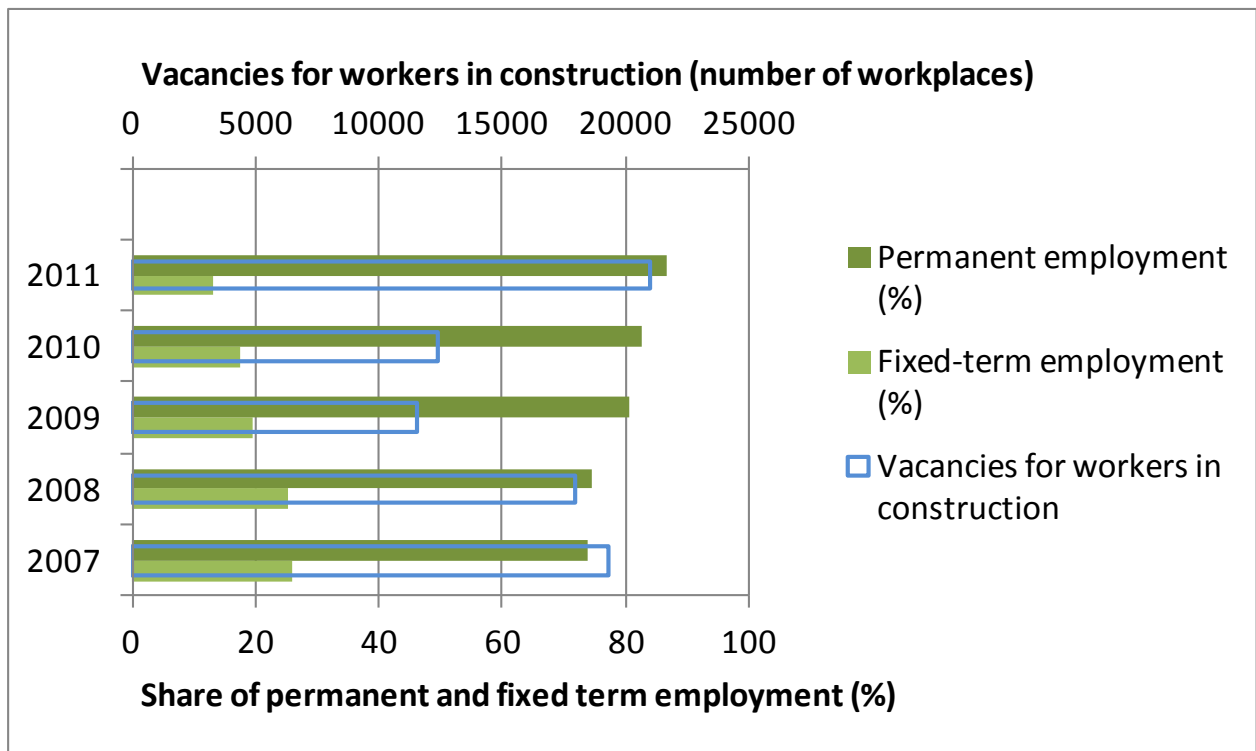


Figure 5: Vacancies for workers in construction. (Source: ESS and CPI)





## 2 Training for on-site workers for better understanding of nZEB

Analyses in the EU show that most of the necessary technology is already available on the market. Specialised planners increasingly dominate the design of very low-energy buildings and the weak side is a high-quality implementation of such facilities. Therefore, the recent emphasis is on the training of the implementing staff who carry out on-site construction, especially finishing works (facades, installation of doors and windows, lightweight work, floor and wall coverings, painting works, installing of indoor installations, electrical installations and other works, related to energy efficiency).

In Slovenia, just like those abroad, the workers can be trained for this type of work in formal vocational training or as part of a system of certification of National Vocational Qualifications (NVQs). The link is represented by professional standards which are for some very relevant occupations in the RES and RUE area (the installer of PV systems, heating systems installer, installer of solar systems, energy manager). Training for professionals in these occupations is required by other European directives in the area of energy efficiency and the use of renewable energy sources. Informal training is a special kind of training area, particularly among older workers where there is a key element of lifelong learning.

### 2.1. Important elements of the training in the future

- in the future nZEB will require more and more interdisciplinarity by craftsman and on-site workers. They will need to be at least familiar with other areas of work;
- the development of communication and language skills as well as competencies in Information Technology (IT) will be required;
- new, practical training sessions, at work, in specific areas and short training course will be a priority which will be free of charge for employees;
- a certified evaluation system of informal training as a key component of lifelong learning;
- a comprehensive quality assurance system to establish nZEB, where, the elements of the quality of each profession are going to be specified in detail by the Commissioning Protocol..

### 2.2. Needs for training of on-site workers in nZEBs

The annual number of employees requiring training can be estimated on the basis of the evaluation of people who have been on the labour market for a long time, but they are not adequately trained in terms of nZEB content. Furthermore, assessing the training is important to evaluate the number of new employees that come directly from school. It is assumed that they will be in need of some additional training, according to the findings of 15% representation of the RES and RUE in the curriculum. The workers from abroad also represent a large part of training.



Figure 6: Structure of the labor market to assess the training needs of craftsmen and on-site workers

Estimates of the annual number of training needs were made on the basis of cross-checking needs:

- a) resulting from the 2<sup>nd</sup> NEEAP, 2011 to 2016 projected annual volume of subsidised RES and RUE in the residential and service sectors;
- b) resulting from the register of areas of work and employment in craft and the other major construction companies and
- c) on the basis of a review of the labour market and the structure of workers in origin.

The reference period of data	Needs for training of workers/per year	Basis for the evaluation	Source
per year (2011-2016)	5458	a) Estimate based on 2nd NEEAP	Status Quo page 83
per year (2011)	6023	b) Assessment based on statistics of CCS activities in craftsmen employees in the construction sector	Status Quo page 78
per year (2011-2020)	4810 to 5770	c) Estimate based on origin of the workers who enter the labour market in nZEB field (taking the growing demand up to 2020 into account)	Status Quo pages 84, 85



Examination requirement for certain qualifications in the context of training needs is assessed in two ways:

- a) on the basis of the measures envisaged in 2nd NEEAP 2011-2016 and the required profile of the implementing staff (4175 on-site workers in construction, 757 installers and 526 PV installers) and
- b) based on the demand for workers in the construction industry (Source: ESS).

On-site workers needed per year (based on "Second NEEAP 2011-2016")	Skills needed / Trainers	Workers needed on-site per year (by 2016)	Trainers needed Per year (by 2016)
	Construction workers / Trainers	4175	209
	System installers / Trainers	757	38
	PV installers / Trainers	526	26

Table 3: Needs for individual qualifications within the training needs for nZEB.

According to the ESS, the most sought-after professions in the construction industry in 2010 were as follows:

9313.01 building workers for simple works  
 7112.01 mason  
 9312.01 worker at civil engineering simple works  
 7115.01 carpenter  
 7412.02 Electrical fitter  
 7214.01 installer of metal structures  
 7131.01 decorator  
 7411.01 Electrician  
 8342.01 manager of engineering construction machinery  
 7212.01 welder

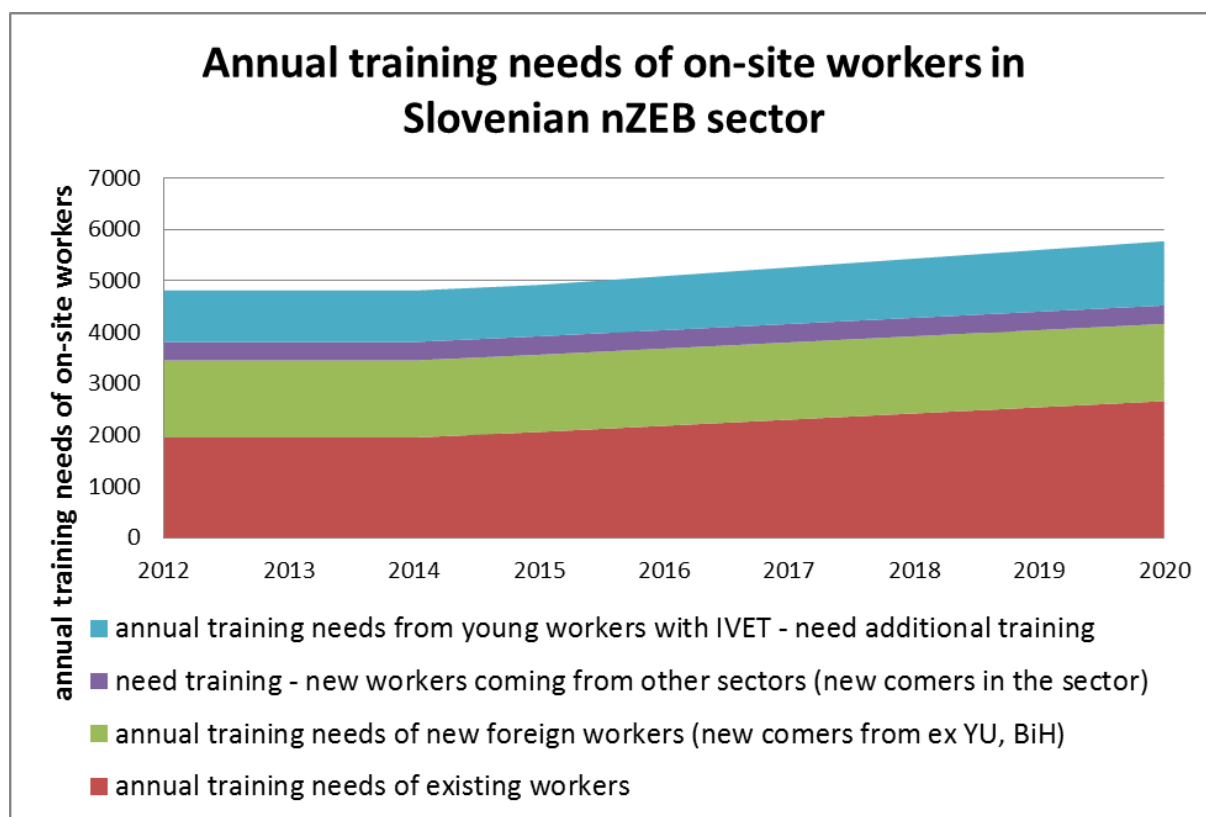
Temporary dynamics of the training needs for staff to implement nZEBs in Slovenia are shown in the table and in the diagrams below. At the same time a preliminary scenario of possible methods of formal and informal education and training to meet the needs for better professional competence is also shown.



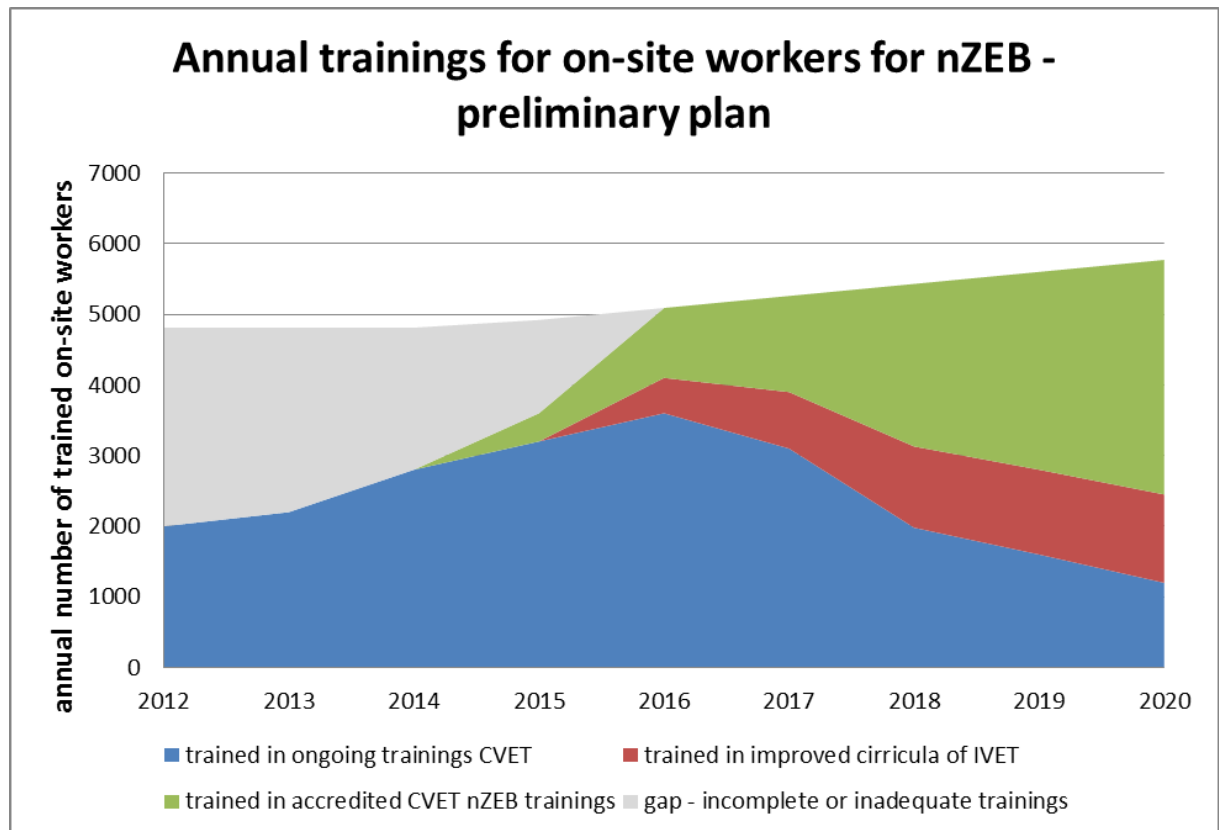


Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
Annual training needs of existing workers	1950	1950	1950	2060	2180	2300	2420	2540	2660
Annual training needs of workers from abroad (new ones from ex YU and Bosnia and Herzegovina)	1500	1500	1500	1500	1500	1500	1500	1500	1500
Annual training needs - workers from other sectors and from other employers – new ones in sector	360	360	360	360	360	360	360	360	360
Annual training needs of young people with initial vocational education - additional training	1000	1000	1000	1000	1050	1100	1150	1200	1250
Annual training needs	<b>4810</b>	<b>4810</b>	<b>4810</b>	<b>4920</b>	<b>5090</b>	<b>5260</b>	<b>5430</b>	<b>5600</b>	<b>5770</b>
Trained in the existing forms of non-formal learning	2000	2200	2800	3200	3600	3100	1980	1600	1200
Trained in the upgraded curricula of initial vocational education and training					500	800	1150	1200	1250
Trained in accredited form of additional training for nZEB				400	990	1360	2300	2800	3320
<b>Trained per year</b>	<b>2000</b>	<b>2200</b>	<b>2800</b>	<b>3600</b>	<b>5090</b>	<b>5260</b>	<b>5430</b>	<b>5600</b>	<b>5770</b>
Deficit - incomplete or inadequate training programs	<b>2810</b>	<b>2610</b>	<b>2100</b>	<b>1320</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Table 4: Estimated annual number of training needs for craftsmen and on-site workers in nZEB.



Graphicon 1: Annual training needs of on-site workers in Slovenian nZEB sector



Graphicon 2: The annual number of skilled workers – on-site workers for nearly zero energy building - preliminary estimate



### 3 Basis for systematic support of lifelong learning in the construction sector

BUILD UP Skills Slovenia project with its roadmap proposal for systematic support in the field of construction sector training will create the conditions for developing and implementing vocational education and training, as well as training for professional development and training of workers in the field of nZEB in accordance with the requirements of EPBD and the 20 20 20 objectives.

The objective of the aforementioned proposal is to identify all the targeted activities in providing the opportunities of potential nZEB on-site workers to acquire competencies for quality work in this area. A proposed plan is based on the written report "Status quo report," and discussions of consortium partners and the wider public.

Analyses have shown that the most common obstacles for adults to participate in education are the lack of time and money. Statistics indicate that adult participation in secondary vocational and technical education has been decreasing in recent years because of unsuitable incentives and supporting measures. Adults are more widely involved in non-formal vocational training and retraining mainly due to career or regulatory and technological requirements. Usually, this training is not interpreted as formal education and does not provide clear information on the achievement of competencies. Non-formal education (especially education that does not take place in a traditional school setting) in the national education system does not receive adequate attention. This lack of attention is reflected in low systemic links between formal and non-formal education. Despite the guaranteed formal basis, evaluation and recognition have not developed into a comprehensive system. Consequently, obtaining NVQs has yet to play its full and proper role.

In implementing lifelong learning strategies its success will ultimately be determined on how the development of responsible individuals, the culture of learning organisations and the systematic development of human resources are encouraged. In the absence of these processes lifelong learning remains more of an obligation as opposed to a necessity as the learning culture in Slovenia has yet to be developed sufficiently.

On the one hand the programs of formal education and training system follow a rather rigid method that is slowly adapting to development of new technologies. The advantage of formal education and training system lies in the transparency of programs which are clearly defined in professional standards. Furthermore the initial education and training are organised within a transparent school network. Network of schools is defined by the Slovenian Ministry for Education. Finally, formal education and training leads to the acquisition of a certificate and is placed within the National Qualifications Framework. It should be pointed out that it is also an important priority in terms of funding, as training for the educational attainment is funded by the state.

The exception is master craftsmen and foreman exams which are funded by the candidate him/herself, but the state allocates funds for reimbursing the cost of obtaining the master title for a craftsman or foreman position.

On the basis of these findings, the National Roadmap Strategy of the Build Up Skills Slovenia project has been divided into two equally important fundamental parts:

- Formal education and training
- Informal education, further education and training



**In the context of formal education and training of students in implementing nZEB in renovation and new construction, the following issues have been identified:**

- the scope of upper - secondary vocational and upper- secondary technical education and training,
- national Vocational Qualifications (NVQs),
- the review of Slovenian qualifications framework,
- the structure of qualifications in the field of constructing the energy-efficient buildings, energy rehabilitation of buildings and energy efficiency in buildings,
- professional standards,
- structured solutions and a proposed action plan for implementation:
  - revamp of educational programs and professional standards respectively,
  - formation of new educational programs and professional standards respectively,
  - options of integrating of the opened curricula of the educational programs,
  - revamp of master craftsmen and foremen examinations,
  - training of teachers in the process of practical training (Train the Trainers).

**In the context of non-formal education and training of on-site workers in implementing nZEB in renovation and new construction, we have identified the following issues:**

- systematic support for lifelong learning for craftsmen and on-site workers in the field of new construction and complete renovations in accordance with the requirements of nZEB,
- defining of key competencies of craftsman and on-site workers in the area of new construction and complete renovations in accordance with the requirements of nZEB,
- justification and definition of key competencies in the field of new construction and complete renovations in accordance with the requirements of nZEB,
- comprehensive system of development and training of craftsman and on-site workers in the field of new construction and complete renovations in accordance with the requirements of nZEB, accreditation, certification and evaluation:
  - system of informal training and the training of craftsman and on-site workers in the field of new construction and complete renovations in accordance with the requirements of nZEB,
  - system of accreditation and certification in the scheme of informal training and the training of craftsman and on-site workers in the field of new construction and complete renovations in accordance with the requirements of nZEB,
  - evaluation system in the scheme of informal training.



### 3.1 Formal education and nZEB

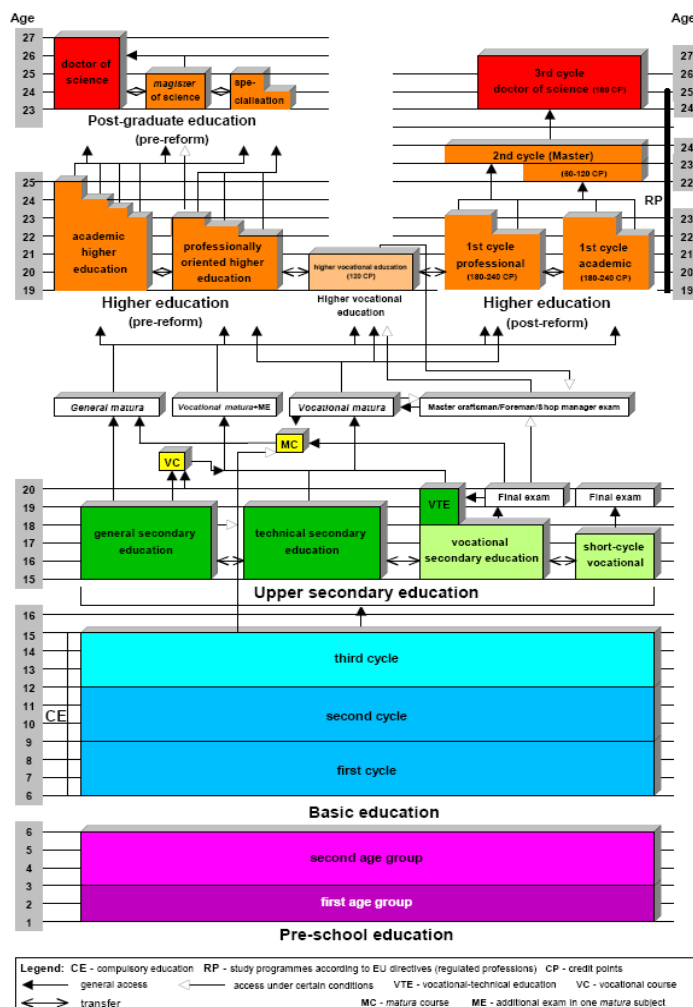
#### 3.1.1 The field of secondary vocational and secondary professional education

Education and training system in the Republic of Slovenia is based on the statutory basis regulating formal education, the recognition of non-formal knowledge and lifelong learning.

Education and training is regulated by comprehensive legislation. There are laws with a direct impact on the educating and training personnel who are going to plan and implement projects related to energy -efficient construction, energy rehabilitation of buildings and the efficient management of energy technologies. These are:

- Organization and Financing of Education Act,
- Vocational Education Act,
- National Professional Qualifications Act.

Legal regulations are based on the development strategies being prepared by the Expert Group on the results of evaluations and recommendations of the European Union, ones which are compared with the trends in the development of education in comparable European countries. Establishing a system of education is a delicate process, where rapid changes are generally unsuccessful, while partial changes can cause quite the opposite effect owing to unforeseen impacts on the system.



Here we present the scheme of education system in the Republic of Slovenia, giving the vertical and horizontal links that are particularly important in vocational education and training in areas referring to the contents of the BUILD UP Skills Slovenia project.

Figure 7: Education system in Slovenia (Source: Ministry of Education, Science and Sports)



### 3.1.2 Foundation of the vocational education system and training in Slovenia

The foundation of the system of vocational education and training in Slovenia was set in the White Paper on Education and Training in Slovenia in 1995 and is based on the following principles:

The principle of social partnership, is regarded as the systemic regulation of vocational education and training in reconciling the interests of employers, employees and government ministries. Employers expect to receive adequately skilled workers for the labour market after vocational education and training, but employers need to train the employees constantly. Workers organised in trade unions should be interested in the educational system, providing them enough basic and general skills to enable them to realise their career and educational aspirations and to increase their competitive advantage on the labour market. Government departments act as a carrier for the wider interests of the state to implement the broader concept of lifelong learning and can ensure adequate general knowledge to develop awareness of national belonging and the ability to live in a democratic society.

The principle of lifelong learning in vocational education and training is a challenge to establish a uniform system of education for young people and adults, which means that individual learning paths are provided in all systems to assert greater choice and recognition of previously acquired (even informal) knowledge.

The principle of different routes towards the same destination is about implementing different options to achieve professional competencies that are necessary for success at work and for the integration in the continuous professional development and tracking new developments in the professional field.

Evaluation of programme solutions, which took place in the context of the European Phare Mocca Project showed that many of the principles of the 1995 White Paper were not implemented consistently enough; in particular, the solutions were often followed by known and established models from the past, or were even dismissed as inappropriate. The results of this evaluation contributed to the emergence of new platforms to prepare educational programs for lower and upper secondary vocational education and secondary vocational education.

Based on the adopted platform significant changes were introduced to vocational education and training, such as the integration of general, professional theoretical and practical knowledge, module-based design of education programs, practical training involving work practice as important part of education, and the introduction of the open curricula of the program, which is laid down by the school in accordance with the interests of the social partners and the economy in the respective local environment.

Within the labour force structure in enterprises organised along contemporary lines, there is also the need to upgrade vocational training to a higher level. However, the present roadmap does not consider higher education programs as craftsmen and on-site workers are basically educated to secondary vocational and secondary professional level, and they can be regarded as a target group which will be trained on the basis of the results of the BUILD UP Skills Slovenia Project.

Social and economic changes and the downward trend in enrolment in technical and vocational education have prompted a rethinking of the education and training system, and in designing strategies introduced in the 2011 **White Paper on Education in the Republic of Slovenia**.



A correlation analysis performed on the systems of vocational and technical education in the European Union shows the presence of the following trends:

- Strength of the integration of vocational and technical education to the labour market,
- Raising the level of knowledge needed to obtain a professional qualification,
- Integration between the different educational paths (general - professional, young - adults),
- modernization of qualification system in the sense of adapting of qualification frameworks and simplifying the qualification structure.

Vocational education, especially secondary vocational education is facing a trend of decreasing enrolment right across Europe. In addition this type of education is losing its primary purpose, to prepare graduates for direct transition to the labour market. The proportion of students choosing to continue their education in technical secondary education has been growing, (in recent years over 70%). The reason probably lies in a low regard of vocational education and jobs in certain industries, which does not stimulate enrolment in this kind of education programmes. On the other hand, labour market analyses show high demand for profiles with secondary vocational education, which is even higher than the demand for profiles of secondary education in all technical areas.

Education at the level of secondary vocational and secondary professional education is also designed for adults. The participants are mainly unemployed, high school seniors, adults with a wide education in various fields of social sciences, or, alternatively, seeking opportunities for re-training and increasing their employability or to open their own business.

### **3.1.3 National Vocational Qualifications (NVQs)**

Increased demands of employers for well-educated and skilled personnel are increasing competition between individuals to gain and maintain employment. This has led to the search for a potential system to recognise knowledge and skills, regardless of how they were acquired.

A certification system for knowledge acquisition and evaluation of informal and occasionally obtained professional knowledge, skills and experience was introduced by the National Vocational Qualifications Act. It is possible to obtain professional qualifications by a system of knowledge, skills and competences examination. More rapid development of the economy, especially in new technologies and services promote the development of new vocational qualifications in new occupational areas, the development of non-formal and informal learning and the development of key competencies. National Vocational Qualifications are intended for adults and do not constitute a formal education, but a valid public document in which an individual exhibits professional competence in a particular field.

### **3.1.4 Overview of the Slovenian Qualifications Framework**

The basic purpose and objective of the European Qualifications Framework (EQF) is to act as a converter between different qualifications systems. It contains eight reference levels defined by the expected academic performance -knowledge, skills and competencies. As an instrument for promoting lifelong learning and mobility EQF comprises the full range of skills - from basic to doctoral. Each level should be reached through different education pathways and career development.

A proposal of the Slovenian Qualifications Framework (SQF) is compliant with the European Qualifications Framework and is committed to the transparency of qualifications systems in the country, taking the national context into account, and is based on the classification system of education and training (KLASIUS). It consists of ten levels and allows the





connection of educational and qualification structure in Slovenia. It includes a concept of educational activities (Concept of Input) and learning outcomes (Concept of Output), consistent with the central role of the EQF. Formal education programs are classified into ten levels by SQF. SQF is facing the challenges of placing informal knowledge and additional skills, (such as the bar exam and other professional examinations).

### **3.1.5 Structure of qualifications in the field nZEB**

Professional standards are classified into eight broad sections based on the International Standard Classification of Education (ISCED), further subdivided into sub-groups. Inside the classification of professional standards into various the group it is difficult to put a professional standard in one single area. Professions are increasingly becoming interdisciplinary.

In the field of constructing nZEB, energy recovery and energy recovery and energy efficiency, a combination of multiple disciplines are encountered, which is why the aforementioned problem is even greater. In addition to traditional occupations, new occupations have also emerged.

The field of energy-efficient construction and energy rehabilitation of buildings in Slovenia was not addressed uniformly. It appears therefore in educational programs as a multidisciplinary field. It falls into the professional field of engineering, mechanical engineering, electrical and woodwork.

If the structure of qualifications is to be designed for the field of constructing nZEB, energy recovery buildings and energy efficient buildings, then the cross-sectional pre-existing content qualifications structures based on traditional division need to be connected together. The ISCED classification is mapped to the newly formed structure of qualifications, we connecting to building, rebuilding and efficient use of energy.

### **3.1.6 Professional standards**

Professional standard is a document containing generic and key competencies, typical work, knowledge and skills characteristic of a particular vocation. It is the basis for the preparation of educational program or NVQs. The decision is adopted by the responsible sectorial committee, taking account of the proposal submitted by the vocational standard proposer.

When surveying the Occupational Standards Database, the following occupational standards related to energy-efficient construction and energy saving building restoration were encountered:

Professional standards at exigency level IV:

- Bricklayer,
- Carpenter,
- Insulation installer,
- Floor layers,
- Painter,
- Tiler,
- Roof plumber,
- Joiner,
- Glazier,
- Fitter of ventilation and air conditioning equipment,





- Fitter of mechanical installers,
- Fitter of intelligent installations,
- Electrician,
- Electronics technician.

#### Occupational standards at Exigency Level V:

- Construction technician,
- Operator of automatic compounds,
- Systemic electrician,
- Operator of energy equipment and systems,
- Wood technologist,
- Master craftsman's certification examination in individual areas of expertise<sup>3</sup>,
- Construction foreman.

#### Characteristics of educational programs:

- module-based structure of education programmes means that modules contain closely intertwined knowledge and practical skills or know-how. Integration of knowledge and skills facilitates the development of generic and professional competences;
- competence-based programmes are based on knowledge and skills listed in occupational standards as the fundamental document for preparing education programs. The implementation of programs is participant-oriented and focused on attaining of his/her learning outcomes and the developing his/her capabilities for the performance of tasks in a particular vocational or technical field;
- the open curricula of education programmes is not determined on the national level and encompasses 20% of the entire programme. The education programmes providers are left to decide on the contents of the open curriculum in accordance with the interests and needs of the local environment and economic sector. In this way the flexibility of education programmes is provided by enabling the incorporation of contemporary knowledge and new technology developments in the programme adoption procedures on the national level;
- credit validation of the program units facilitates their recognition and transfer to the formal education system. One credit point corresponds to a 25- hours of work input by the participant;
- practical training with employers is a mandatory part of all of secondary vocational and education programmes. The purpose of this training is mainly to learn about the real working environment and vocational socialisation.

In Slovenia, there are several levels of educational programmes which relate to the construction of energy-efficient buildings, energy-saving building restoration and efficient energy use in buildings.

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<sup>3</sup> The professional standards are not designed in the field of master craftsman and foremen exams. This area is planned to be renewed in accordance with other policies in education related professional standards will be written.



The level of secondary vocational education in which, education programmes last three years:

- Bricklayer
- Carpentry
- Prefabricated builder
- Mechanical installations fitter
- Electrician
- Joining
- Tiler – setter of ceramic claddings
- Roof plumbing
- Painter
- Glazier
- Chimney sweeping

The level of technical education in which education programmes take four years with vocational and technical education, taking an two additional years and are attended by the students who have successfully completed the secondary vocational education: are listed below. These courses require candidates who have successfully completed secondary vocational education:

- Construction technician,
- Mechanical technician,
- Electrical technician,
- Wood technician.

Master craftsmen and foremen exams (secondary technical education level):

- Master mechanical
- Master glaziers,  
Master electrical fitter
- Master mason
- Master painter
- Master plumbers
- Master tiler
- Master woodwork joiner
- Stone master
- Master tiler setter of ceramic claddings
- Master chimney sweep
- Master Foreman and Construction



## Survey of enrolment in educational programmes from the 2007/08 school year

SCHOOL YEAR	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012
Sign up 1.year of secondary school	22544	21915	21737	21266	20949
<b>SECONDARY VOCATIONAL EDUCATION (SVE)</b>					
Mason	38	46	53	31	4
Carpenter	25	19	14	19	6
Contractor of lightweight construction	9	10	8	3	11
Tiller- Layer of ceramics	101	78	81	81	87
Painter	39	41	41	41	31
Carpenter	284	257	280	296	242
Plumber	4	1	8	11	10
Master of mechanical installations	123	131	133	158	146
Electrician	317	291	241	239	221
Together SVE	940	874	859	879	758
%	4,17	3,99	3,95	4,13	3,62
<b>SECONDARY TECHNICAL EDUCATION (STE)</b>					
Construction technican	256	291	253	193	167
Mechanical technican	635	739	666	566	587
Electronic technican	368	372	420	375	406
Woodworking technican	92	119	109	118	82
Together STE	1351	1521	1448	1252	1242
%	5,99	6,94	6,66	5,89	5,93
<b>VOCATIONAL AND TECHNICAL EDUCATION (VTE)</b>					
Construction technican	94	81	86	95	89
Mechanical technican	568	467	524	452	364
Electronic technican	400	377	323	217	263
Woodworking technican	240	167	174	138	173
Together VTE (3+2 years)	1302	1092	1107	902	889
Together 1. year - all	3569	2953	2895	2753	2446
%	36,48	36,98	38,24	32,76	36,34

Table 5: Enrolment of students in the first year for the educational program related to energy-efficient construction and energy rehabilitation of buildings.

The data show that enrollment in educational programs, vocational schools, technical and vocational and technical education related to energy-efficient construction, energy rehabilitation of buildings and energy efficiency has been decreasing over the last five years, similar to other programs of vocational schools, technical and vocational and technical education.

Trends in enrollment in secondary vocational education and training are comparable to those in comparable countries in the European Union. Development documents of the Republic of Slovenia recognise the importance of vocational education and training that allows the further development of industries, so measures to help retain this kind of education at least at the current level would be expected.



Master craftsmen title	2007	2008	2009	2010	2011	2012	Together
Master carpenter	2	3	4	2	1	1	13
Master mason	6	4	4	1	5	0	20
Master glazier	0	0	0	1	0	0	1
Master sweep	3	4	7	1	5	1	21
Master of hardware installation	10	12	21	11	9	10	73
Master electrician	11	6	13	7	9	5	51
Master painter	14	1	0	0	5	2	22
Master plumber, roofer	8	3	2	2	3	1	19
Master stonecutter	3	2	0	0	0	0	5
Master furnace	2	0	0	0	0	0	2
Master tiller setter of ceramic claddings	2	0	2	0	0	0	4
<b>Together</b>	<b>61</b>	<b>35</b>	<b>53</b>	<b>25</b>	<b>37</b>	<b>20</b>	<b>231</b>

Table 6: Sign up for a master craftsmen exams connected to EE and RES

## 3.2 Structured solutions and a proposal for actions to reach the nZEB goals in the context of formal education

### 3.2.1 Renewal of educational programs / professional standards

Educational programs at the level of secondary vocational and secondary professional education are renewed periodically in accordance with the methodology prescribed by the guidelines for the development of educational programs. With the next renewal all the previously stated occupational standards or competences in the field of energy efficiency (EE) and renewable energy sources (RES), shall be brought together, leading to achievement of 20 20 20 goals. The contents will be the same for all professional levels where interdisciplinarity is a necessity. So it makes sense that students, regardless of the grade, acquire the same basic knowledge of EE and RES. In doing so, the students will understand the integrity of nZEB as well as becoming educated in low-energy building.

### 3.2.2 New educational programs / professional standards

In accordance with the objectives and policies in the field of secondary vocational and secondary professional education new professional standards can be shaped.

In the program Install + RESS professional standards are pre-prepared and they will embed the contents of EE and RES in accordance with the guidelines of the BUILD UP Skills project, adapted to the following professional titles:

- Installer of photovoltaic systems,
- Operator of photovoltaic systems,
- Operator of energy devices and systems (supplemented with thermal solar systems),
- Energetic manager.



The need for new professional standards is recognised, potentially serving as a basis for National Qualifications Standards:

- Repairman of burners,
- Isolation tiler of heating and ventilation installations.

### **3.2.3 The possibility of using open curricula of the educational programs for nZEB content**

Educational programs at the national level give the particular school an opportunity to include the contents of all the latest fast-moving areas of expertise in an open curricula as part of the school programme.

The open curricula of the program allows the integration of news and the latest modern trends in the particular area of expertise, and therefore, adapts students quicker to the needs of the labour market. Many of these contents have been implemented since 2008. The creation of moduls with open work programs for students has also shown positive results.

An analysis of the programs of secondary vocational and secondary professional education has shown some modules of the open curriculum, which, judging by the titles, discuss themes of energy-efficient construction and energy rehabilitation of buildings, such as: solar systems, renewable energy sources, green house, bio and passive house, effective energy use, design joinery, alternative energy and new materials in construction.

The proposal will be made to the responsible institutions and, the competent ministry, that all providers of educational programs in the field of low-energy construction add to the open part of the curriculum sections in which students will gain the skills necessary to perform the tasks in the field of nZEB.

Until the revamping action of each professional standard, the contents included in the open curriculum, allow the students to obtain a basic knowledge in the field of EE and RES. Once this content, has been embedded in the content of revised professional standards or educational programs, i.e. after the revamping of the various professional standards and key competencies, the open part of the curriculum shall be designed to obtain specific professional competencies in specific areas.

### **3.2.4 Overhaul of master craftsmen and foreman exams**

In 2000, Slovenia introduced the implementation of the master exams and integrated them into the national educational system at the of secondary vocational level.

From the period of beginning of master craftsmen and foremen exams to the preparation of this plan, the implementation of the master craftsmen system and foremen exams has remained un changed. European countries that have placed master craftsmen exams in their education system, made the changes over the last years. Slovenia must do the same. Renewing the master craftsmen exams offers the opportunity to combine the contents that are needed to get the competencies of EE and RES, relating to the master craftsmen title connected to low-energy buildings an updated in occupational standards.

Master craftsmens and foremen as a part of the BUILD UP Skills project represent the major target groups, representing contractors, on-site workers, top experts in their fields, responsible construction leaders and also mentors during the compulsory practical training.



### **3.2.5 Train the trainers -Training of teachers in the process of practical training**

Each academic year, programs of further education and training for professionals in education are announced by the Slovenian Ministry of Education, Science, Culture and Sports. In the catalogue of programs, received by all school principals, updates for disciplinary and expertise knowledge can be found in relation to the didactic training for innovation in educational work and programs designed to acquire new knowledge, skills and qualifications to teach individual subjects or to pursue specific educational work.

In agreement with the Ministry of Education there is the possibility to announce training programs in the field of low-energy building, which will be devoted to teachers of professional-theoretical subjects, such as teachers involved in practical training and master craftsmen which will act as mentors for students during their practical training with an employer in the wider process of regular education. For all participants this training co-funded by the Ministry and partly by the school itself.

This action allows the implementation of content within the regular education programs that will be included in the first part of the open curriculum. Teachers are interested in this kind of education, because they also gain points for promotion.

### **3.3 Informal education and training of craftsmen and on-site workers in the construction of low-energy buildings and the whole-scale renovation of buildings**

In the field of informal education as part of the status quo section of this report a large number of training companies with existing courses, prices and approaches were found. The study was focused exclusively on identifying training companies and the contents of the training programs related to the training in the area of nZEB.

The implementation of informal education initiatives is left to individual training companies mainly pursuing their own commercial interests:

- Occupational schools,
- Inter-company training centres,
- Chambers of Commerce and other professional organisations,
- Private educational institutions and businesses,
- Manufacturers and suppliers of materials and equipment.

#### **3.3.1 Legal and technical framework for the preparation of non-formal education of on-site workers in nZEB**

As a professional basis in preparing the framework of informal education of on-site workers in nZEB construction and of complete renovation of buildings both European as well as national documents and regulations pertaining to the field of engineering education and training for adults are taken into account.

#### **Important directives in the field of the construction sector:**

- EU EPBD Recast Directive(2010/31/EU) - recast Directive on the Energy Performance of Buildings
- EU-EE Directive on Energy Efficiency (2012/27/EU), which is 3% of the planned renovation of buildings owned by public administration annually



- EU RES Directive (2009/28/EC) on the promotion of the use of energy from renewable sources (4/2009), which sets the overall national share of renewables at the final energy consumption stage in 2020 at- 25% for Slovenia. (In 2005, by comparison energy consumption in Slovenia 16%)
- Directive - EPBD recast (31/EU/2010) on the energy performance of buildings

#### **International documents in the field of adult education:**

- The Europe 2020 strategy for smart, sustainable and inclusive growth; the document emphasises that lifelong learning and skills development are the key component in overcoming the current economic and social crisis.
- UNESCO World Report (2010) emphasises the role of cultural borrowing through mobility, language learning and the management of technological progress as well as the role of culture as the foundation of creativity.
- The resolution of the Council on a renewed European agenda for adult education; the document points out that adult education is the weakest link in establishing of national systems of lifelong learning. The main message of the document is that "adult education can support the strategy Europe 2020 ", but this requires major additional efforts to establish effective and efficient financing conditions for the provision of 'second chance' possibilities and the acquisition of basic skills such as language, mathematical and digital literacy, with target learning for migrant people who are early school leavers; young people who are neither in education or employment; disabled and also elderly people.
- Recommendations of the European Parliament and of the European Council on key competences for lifelong learning; the document points out that Member States develop the provision of key competences for everybody as part of their lifelong learning strategies, including strategies for achieving universal literacy and the use of 'Key Competences for Lifelong Learning - European Framework of Reference '.
- Draft Council conclusions on literacy; the draft is the first step in reducing the problem of literacy with young people and adults. According to EUROSTATA for the year 2010, 22.2% of fifteen year olds had with low levels of literacy in the EU. As a solution, political commitments in these areas have been put on the table. The basic purpose is to reduce the proportion of young people with poor literacy skills in reading, mathematics and science (below 15%).
- European Cohesion Policy (2012) and General Environmental Action Programme (2013); both emphasise the need for skills in the field of energy, natural resources, community action and knowledge and values of sustainable management.
- Resolution of the Renewed European program for adult education Council 2012-2014 (EK, 2011): In the first priority area, performing lifelong learning and mobility, istated as a recommendation in writting members of the EU should focus on "encouraging demand and establishing versatile and easy to access systems for informing and orientation, which should be accompanied by effective intelligence strategies for better familiarity and motivation of potential participants in education, emphasising on deprived groups; especially those who drop out, young who are not educated, trained or employed, underqualified adults, especially those who have trouble with literacy" (page 5) and "establishing flawless systems for evaluating informal and non-regular education, and encouraging their usage among adults of all ages and qualification levels, also in companies and other organisations" (page 5).
- Recommendations of the non-formal and informal education evaluation Council (EK 2012): The council has prepared suggestions for action that include practical recommendations for EU members, so that they would assure a possibility of confirming non-formally and informally acquired knowledge to every citizen. The EK suggestion is focused on the benefit of EU citizens, so that with confirmation of their knowledge, be it non-formal or informal, they could gain a full or partial qualification. Giving recognition to deprived groups is emphasised; professional staff must be





appropriately trained so that these procedures are clear and can be carried out professionally and to a high quality.

- Recommendation of UNESCO for evaluating non-formal and informal education (UNESCO Institute for Lifelong Learning, 2012): Recommendations from UNESCO were issued with the purpose to ease EU members' development and upgrading the system of evaluation and recognition of knowledge, especially the sort gained through non-formal and informal education; UNESCO sees the process of evaluating non-formally and informally acquired knowledge as a key factor in asserting lifelong learning.

### **National documents on the field of adults education and training**

Beside the Slovenian Law of Education of Adults, adult education is also governed by other laws from the field of education – Law of Organisation and Financing of Education (ZOFVI, 2003), Law of Elementary Schools (Ur. l., 2006), Law of Vocational and Professional Education (Ur. l. št. 79/2006), Law of High Schools (Ur. l. št. 1/2007), Law of National Vocational and Professional Qualifications (Uradni list RS, št.1/07 and 85/09), Law of the Matura Examination (Uradni list RS, št. 1/07), and the Law of Higher education (Ur. l. št. 119/2006). Adult education is also governed by laws from other fields (e.g. work, employment, social care and various fields of activity and professions), and secondary legislations. Education and training of adults are covered in other legal and strategic documents in various economic sectors.

The Resolution of the national adult education program up to year 2010 (Ur. l. št. 80/2004) is a strategic development document, with which the Slovenian National Council determines the public interest in adult education, areas of priority, it defines activities needed for executing adult education and assures stable financing from public funds. The program is a basis for annual operative planning. The national program is realised via an annual program, which is passed by the government of the Republic of Slovenia. This annual program assigns educational programs which are financed from public funds with funds allocated in and assured from the state budget, and ministries responsible for executing the program. These two documents govern adult education in public interest. A draft of the Resolution of National Adult Education Program has been published for the 2012-2020 period.

Funds for financing adult education are assured from different sources; the state budget, the local community budget, adult education funds, the employers' funds, donations and gifts, and participant -contributions of participants (tuition fees). Another important source of adult education financing are European funds (European Social Fund).

### **Taking into account good practices and conclusions of the Status quo report.**

The advantages of regular professional education are taken into account in this plan. Benefits of studying in the Slovenian educational system inform the report and they shall be applied, in an adjusted form into the system of informal training. Monitoring of workers, contents and methods of work shall be ensured and embedded into this report.. On the other hand a system for testing knowledge and acquisition of informal licensing shall be placed in the report, which can, from experience, grow into the National Vocational qualification system or program of regular education.

The suggested model will take into account good practices from executing informal education up to now, so it will include all interested groups of performers who have been operating in this field. Analyses undertaken in the Status Quo report, show big restrictions on the side of employers, connected with financing education and time consumed for it. At the same time employees and employers do not show interest mostly because these are employees with a lower education level who regard as a burden.





#### **4 Complete system of informal education and training of on-site workers for new constructions and renovations in accordance with nZEB**

The Republic of Slovenia has written its development directions for lifelong learning in the Lifelong Learning Development Strategy in Slovenia. Lifelong learning is a process which covers all forms of learning; formal, non-formal and informal. It takes place in various learning circumstances with the goal of improving knowledge and skill. When learning the individual gains personal traits and shape hi/her virtues. Evolution of the interpretation of lifelong learning represents a movement from education to learning, that individuals also use other options of learning that are not a core component of their education to reach their goals.

Goals for the lifelong learning strategy are founded on strategic goals of the European Union on the field of education and training, focussing on improving quality and effectiveness of systems of education and training; easing and increasing the accessibility of education and training, and opening these systems to a broader environment.

The field of learning for successful and quality work as well as a professional career seems to be one of the most important factors because it covers elementary, continued vocational and professional education. While defining the need for education and shaping an appropriate proposition, connections between schools and employers have to be encouraged, as well as coordinating the interests of employees, employers, institutions and local communities.

Establishing the model of developing human resources into work processes and the principle that every work station is also a learning station, have made lifelong learning possible even at one's own work station. With this in mind, it is important for employers and employees to realise the responsibility for their work and promotion. It is also important that employers understand the importance of encouraging motivation for learning and work, and offer their employees additional tutoring, education and professional development.

The employer should not monitor the employee's progress passively as education is more successful when the organisation adapts appropriately and develops a learning friendly environment. The system of progress at work has to be connected with constant education and training which is not based exclusively on formal education, mostly because of development of new technologies and their impact on work.

Sharing knowledge among co-workers is also very important, especially with the newly employed youth without little work experience. The size of the company is a big influence on the method and organisation of education. In small and medium sized companies it is completely specific as, opposed to education in larger companies. Smaller companies encounter more issues because business conditions often do not allow longer forms of education and training, causing inequality in accessibility of knowledge and weakening their ability to stay competitive as a company. When preparing the whole system of perfecting and training of workers for construction of low energy buildings, we used the strategy of lifelong learning in Slovenia as a basis, fashioning it on principles of openness and accessibility, independence of participants, adaptability, actuality, individuality and interdisciplinarity

Taking into account the aforementioned principles in the system of perfecting and training suggests:

- dismissing schemes and moulds, which limit the activity of education with pedagogic-didactic and school-institutional schemes;



- recognising forms and methods based on activity of the participants themselves, their inner interest and creative cooperation;
- optimal versatility without stereotypes of time, space, contents and form;
- openness and rational organisation;
- recognising new possibilities like long distance education, multimedia education, experience learning and alternative learning and teaching models and;
- interdisciplinarity.

The whole system consists of three subsystems, among which there is a high level of compatibility, coordination and connection. It was prepared by a group of project experts from the Chamber for Crafts and Business of Slovenia<sup>4</sup>.

It consists of a

- system of informal education and training of workers for new constructions and renovations in accordance with nZEB,
- system of accreditation and certification in the scheme of informal education and training of workers for new constructions and renovations in accordance with nZEB, and
- system of evaluation in the scheme of informal perfecting and training of workers for new constructions and renovations in accordance with nZEB,

#### 4.1 Selecting the approach to shape the lifelong learning model of nZEB

In designing and forming the complete system of perfecting and training of workers on nZEB the starting point of the BUILD UP Skills Slovenia is the results of analysing the current state, analysing the need of direct experience and experience of good and bad practices,

The Adult Education Centre of Slovenia developed two examples of planning educational programs for adults<sup>5</sup>:

- partnerships, when identifying needs and development of new educational programs for adults. This methodology was first implemented in 2010 and 2011. Three new training programs for specific groups of unemployed were developed on its basis<sup>6</sup>. This methodology covers all key phases of the adult education cycle with planning new program offers. It also includes modern grips on curricular planning that includes goal specific learning and competence forming of education programs, training and perfection;
- competent forming of perfecting programs, which was used for program development, meant for workers in adult education<sup>7</sup>. This approach is based on the terminology of defining specific tasks which are performed by adult education workers in a specific role (i.e. teacher, adult education organiser, program supervisor). A reflection is performed on which skills the individual should possess to successfully carry out these tasks. Within the BUILD UP Skills Slovenia project the methodology of key competent approach was implemented when forming the complete model.

<sup>4</sup> Barbara Vrhovnik; Janko Rozman; Janez Mekinc; Matjaž Valenčič; Andrej Papež; Bojan Žnidaršič.

<sup>5</sup> More about project: [http://kakovost.acs.si/aktualni\\_projekti/index.php?nid=1040&id=425](http://kakovost.acs.si/aktualni_projekti/index.php?nid=1040&id=425), <http://tvu.acs.si/paradaucenja/video1/>,

<sup>6</sup> More about project: [http://kakovost.acs.si/aktualni\\_projekti/index.php?nid=1040&id=425](http://kakovost.acs.si/aktualni_projekti/index.php?nid=1040&id=425), <http://tvu.acs.si/paradaucenja/video1/>,

<sup>7</sup> More about project: [http://izobrazevanje.acs.si/knjizna\\_polica/index.php?id=770](http://izobrazevanje.acs.si/knjizna_polica/index.php?id=770)



## **4.2 Defining key competencies of new construction and renovation for on-site workers in accordance with nZEB**

In re-aiming to nZEB construction, as dictated by the Directive on the Energy Performance of Buildings (2010/31/EU, EPBD recast from 2010), a greater emphasis is placed on informal training of the on-site workers who will construct nZEB extensive energy renovations of existing building. Informal education and training of the on-site workers is crucial in assuring quality implementation of energy efficient technology and systems for usage of renewable sources of energy.

These are the starting points on which key competences, required by the on-site workers to carry out quality constructions of low energy building, were defined. New skills from fields of renewable sources energy and efficient energy usage were a key factor in shaping the key competencies.

Basic knowledge represents the need for knowledge, skills and qualifications that are required for new constructions and renovations in accordance with nZEB needs:

- Constructors of nZEB will become more interdisciplinary, they will have to know other work areas, at least informatively;
- they will have to develop communication skills, knowledge of languages and information technology;
- new, practical forms of education at work (on real tasks, short-term but multiple timed training will have the advantage that it will be free of charge for employees) will be required;
- a system for certification of evaluation of informal training will have to be established, as a key part of lifelong learning;
- we will have to establish a complete system for ensuring quality construction of nZEB. Based on protocol of commissioning, elements of quality guarantee in individual disciplines will be defined in detail.

## **4.3 Model of informal permanent education and training of new construction and renovation performers in accordance with nZEB**

One of the core conditions for ensuring set goals of BUILD UP Skills Slovenia is to establish a professional and efficient system for informal perfecting of knowledge and training, learning skills and the art of nZEB. Parallel to shaping and preparation of an informal perfecting and training system, a licensing system needs to be prepared, one which will make quality execution of programs of perfecting and training possible, as well as ensuring competencies needed for participants and maintaining high standards in executing nZEB requirements.

When forming the whole system of informal permanent education and training the following principles were followed:

- contents and professional areas with which nZEB deals will be included in perfecting and training programs;
- competencies gained by the participants in perfecting and training programs were deemed necessary on the basis of current state analysis;
- only the skills and arts that are needed for ensuring and executing nZEB requirements will be taught to participants of perfecting and training programs;
- training programs will be meant for those, who already possess core knowledge and skills from their own respective professional fields;
- the informal education and training system has to be transparent and accessible to the widest possible group of interested participants;



- the informal education and training system has to be compatible and coordinated with the licensing system of participants who successfully complete the perfecting and training program;
- a process of evaluating and follow up analysis of contents, goals and performers must be included in the informal perfecting and training system in a transparent manner. This way a constant quality execution of perfecting and training programs will be ensured;
- the system is designed so that programs go from general to specific in terms of content.

To ease understanding of the whole permanent education and training system, a model has been developed (picture below). The system is based on three levels which will be implemented as content modules and sub-modules.

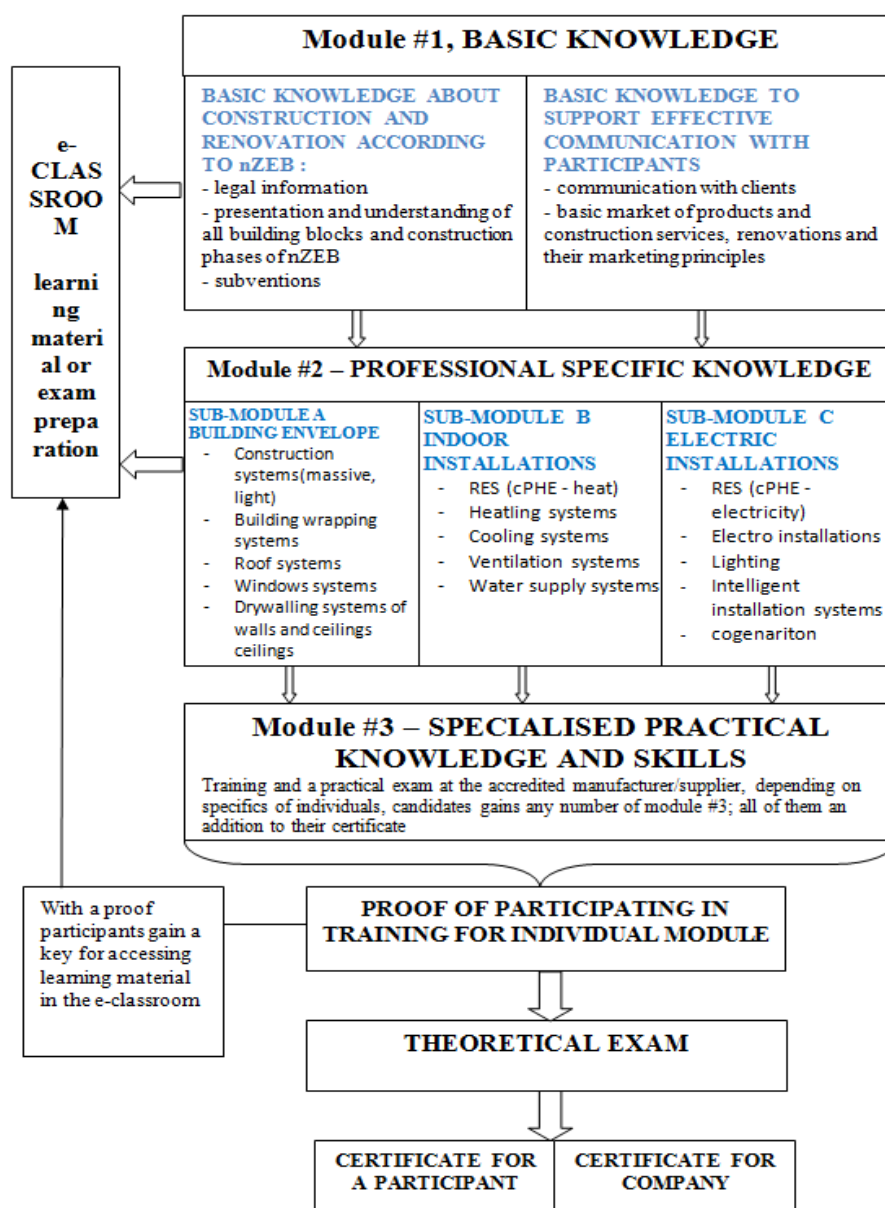


Figure 8: Informal permanent education and training system model – BUILD UP Skills Slovenija (Mekinc, Vrhovnik, Rozman, 2013.) CPHE-coproduction of heat and electric energy, RES-renewable energy sources



The target group of participants of the permanent education and training program was divided in two groups. The first are all on-site workers dealing with direct execution of tasks and services. The second are foremens and master craftsmen. In defining the segment of foremens and master craftsmens, craftsmen with a self-employed status were added to the second group. All construction and product managers dealing with nZEB technology were also added to this group.

When forming the comprehensive permanent education and training system, it was based on analyses of the current state, analyses of needs of direct performers and experience of good and bad practices. The main conclusion, kept in mind during system development, was a need for participants interdisciplinary knowledge on the perfecting and learning program. This means that a participant, who in practice executes tasks or services of a specific profession, also needs knowledge and understanding of the behaviour, standards and demands of other profession specific areas connected with nZEB. An interdisciplinary approach is needed with new construction or renovations according to nZEB, where various construction, craft and installing professions complement and upgrade each other. Understanding and familiarity of comprehensive construction and renovation according to nZEB is key to an effective execution of tasks and services.

#### **4.3.1 Module #1 – BASIC KNOWLEDGE**

Basic knowledge concerning new construction and comprehensive renovation according to nZEB are covered in Module #1. Permanent education and programs training basic knowledge will be prepared and implemented in such a way, that participants will gain the next set of key competencies:

- understanding of the meaning of low energy construction,
- understanding of the meaning of an interdisciplinary approach for the effectiveness of construction,
- understanding and knowledge of construction, maintenance and operation costs (in its lifespan),
- understanding and knowledge of technical regulations and legislation from field of nZEB,
- understanding and knowledge of the meaning of a good living environment,
- understanding and knowledge of the details in the project documentation,
- understanding and knowledge of EUE (effective use of energy) actions and their impact on primary energy consumption,
- understanding and knowing the possibilities of passive and active RES (renewable energy source) usage, along with affiliated systems
- understanding and knowledge of construction physics of new constructions and adaptations,
- understanding the meaning of quality inside air and hygiene demands in ventilation,
- understanding the meaning of airtightness,
- understanding and knowledge of problems relating to fire safety,
- understanding the meaning of effective communication with clients and knowledge of skills and types of communication
- understanding and knowledge of basic principles and behaviour of the market of products and services connected with construction, renovation and their marketing.

Participants, from both target groups, wanting a BUILD UP Skills Slovenia license or a confirmation of attendance in the basic BUILD UP Skills Slovenia perfecting and training



course, will attend the first module. Participants receive a proof/confirmation of attendance after they complete the first module of training.

#### **Definition of first module's goals:**

##### **1. Low energy construction, actions of effective energy usage and their influence on primary energy consumption**

In this section participants gain basic information about low energy construction sensibilities. They gain an understanding, that the introduction of effective energy and renewable energy sources actions is unavoidable. They participants get to know basic energy sources according to their source and understand what using renewable sources of energy means – from a professional and environmental standpoint. Participants understand the meaning of low energy construction and constructing nZEB. When carrying out tasks, they encounter various new materials and technologies. If they fail to realise the logic of low energy construction, some processes may seem unnecessary or too complicated, so they might decide to simplify them. It has to be considered that items such as these the system of low energy construction could fail. Almost 40% of total energy is used for buildings. Effective energy usage actions are needed to reduce primary energy consumption.

##### **2. An interdisciplinary approach to energy efficient construction (nZEB)**

Attendees realise that all elements or devices, that were installed, are there for a reason and have their role in ensuring energy efficiency. They must know that while carrying out their tasks, they cannot interfere with products or procedures of others and must perform their part in such a way, that enables other workers to continue their work too. A building is a complex whole that has to offer, besides a quality living environment and energy efficiency, at least some basic demands: mechanic resilience and stability, fire safety, hygiene, safe usage and noise protection. To fulfill these demands an interdisciplinary approach is required when discussing the building and the environment it which it is set. Only a building that is well planned, constructed and set in its space can be effectively used.

##### **3. Construction, maintenance and operating costs**

Participants realise that energy efficient construction is also cost efficient in all construction phases and usage of the building. Only a cost efficient construction can be also energy efficient. This is why an understanding and optimising construction, maintenance, usage and disassembly costs when planning to build is needed.

##### **4. Technical regulations and legislations from the field of energy efficient construction with details in project documentations**

Participants are acquainted with existing regulations that shape energy efficient building construction and their usage of renewable energy sources in Slovenia and in the EU. They realise that regulations for individual fields of efficient energy usage and renewable sources of energy exist. This way they will know them in practice and be able to search for them. They are acquainted with project documentation and the most frequent details, which they encounter at work.

##### **5. Principles of a thermal comfort environment**

Participants are reminded that the building offers a home or work environment, protection from weather influences and safety. Staying in the building must enable more than just core human needs; it must also be safe, healthy, comfortable, all in all - quality living. Living conditions in buildings change with time. They develop and follow the state of technology for





ensuring medical, biological, psychological, physiological, sociological, ecological, economical and other needs. The goal of low energy construction is to ensure a comfortable living environment as well as ensuring functionality in living and business buildings. Every building must be energy efficient, but not at the expense of quality living or functionality.

## **6. Use of passive and active renewable energy sources**

Participants are acquainted with renewable energy options. They realise that we can rely mostly on renewable energy sources according to natural resources. Directly from the sun and indirectly from tidal and wind power as well as biomass and other. They will know that it will be necessary to adapt to renewable energy sources shortly, since our need and their availability are not always synchronised. Sun radiation is least available when we most need heat; wind energy is neither stable nor predictable; water currents still have season changes despite good retaining ability; and there is not enough biomass to provide for the energy consumption of buildings. That is why we have to use all possible ways of acquiring energy in the winter; direct sun radiation for heat, sunlight for lighting, sun radiation for converting into heat or electric energy, and so forth. Summertime is similar, when we need to prevent overheating of living quarters with shading, ventilating at night or with passive cooling.

## **7. Construction physics and their impact on new constructions and adaptations**

Participants realise that construction physics that is based on laws of physics giving us important physical quantities and suggesting corrective action that ensures an individual's functionality and living in buildings, built according to standard, is actually favourable. This means that project architectural solutions have to be suggested. Technology of materials used and construction has to be implemented so that standard demands are fulfilled in terms of design, construction and functionality, especially with adaptations when a large part of the existing building is used. Users do neither think of the consequences of individual actions, nor do they take warnings seriously. Not changing to mechanic ventilation after switching from non-airtight to airtight windows is a classic case. The goal of calculating construction physics of individual actions is also explaining the impact these actions on quality living and functionality of the building.

## **8. Ensuring inside air quality and hygiene demands of ventilation in accordance with the need for airtightness**

Participants get to know how substantial energy losses can result from non-airtight buildings. They realise the importance of making buildings airtight for achieving energy efficiency – buildings that are not tight are also not energy efficient. At the same time the quality of air constantly drops because of user activity and equipment or the construction itself. Air needs to be changed so that we can achieve good quality of air with efficient energy usage and minimising energy losses.

## **9. Ensuring fire safety**

Participants learn one of the basic building demands – fire safety. They know that new technologies and materials can affect fire safety of buildings. Planning appropriate materials and technologies can prevent the risk of fire. Even though energy efficient buildings with built-in flammable materials and devices for conversion or storing energy, exist, they are much more exposed to fire hazards than non-energy efficient buildings. They learn the impact of careful selection and installation of isolation materials, among which many are flammable. All systems are fire-proof only if they are correctly planned, executed and maintained. Lightning-induced fires require particular attention, too.



#### **10. Participants understand the meaning of effective communication with clients and know skills for successful communicating**

Participants gain knowledge and skills that enable them to be direct at dealing with clients and recognising their demands. Using communicating skills correctly, they will establish good contact with the client and will be in a position to present products and services effectively, clearly and understandably. Since the work of the participants is usually very stressful, they will gain knowledge and skills of successful work and communicating in stressful conditions.

#### **11. Participants know and understand the behaviour of the market of products, constructions and their maintenance**

Participants learn basic characteristics and tools of marketing, and deepen their knowledge and understanding of products and services as market products. They gain knowledge and understanding of basic methods and tools of marketing communication, also personal/direct promotions and selling products/services. They learn basic marketing way of thinking (marketing philosophy) and the functioning of a company on the market. They also learn to connect and use basic knowledge of products, services and general marketing in a specific field of construction as well as renovation of nZEB.

### **4.3.2 MODULE #2 – PROFESSIONAL SPECIFIC KNOWLEDGE**

The second module is designed to deepen professional specific knowledge, skills and arts. Participants who completed the first module can follow this module. The second module was divided into three sub-modules, according to trade specific contents:

- Sub-module A includes knowledge, skills and arts connected with building envelope,
- Sub-module B includes knowledge, skills and arts connected with indoor installations,
- Sub-module C includes knowledge, skills and arts connected with electric installations.

Programs for permanent education and training on professional specific knowledge will be prepared and executed in such a way as to give participants the following professional specific knowledge:

#### **SUBMODULE A – BUILDING ENVELOPE**

This knowledge concerns new construction and comprehensive renovations in accordance with nZEB:

- knowing and understanding appropriate construction systems,
- knowing and understanding appropriate foundation isolation and pressure on the soil,
- knowing and understanding appropriate facade isolations,
- knowing and understanding appropriate roof systems,
- knowing and understanding appropriate roof isolations (cold attic, sloping warm roof, flat roof),
- knowing and understanding appropriate windows and shades,
- knowing and understanding appropriate building envelope tightening systems,
- knowing and understanding the comprehensive construction on a passive house case,
- knowing and understanding the comprehensive energy renovation of an older building.



**Objectives:**

- 1. Trainee participants gain knowledge about appropriate construction systems, with which they will successfully execute tasks when constructing nZEB or renovating of older buildings.**

Participants must know basic statics and construction physics, especially the heat-isolating roles of individual construction elements of the building and ensuring their airtightness. This includes knowing technical executions on areas where various installations (water, electricity, phone, sewer, ventilation) or construction elements (chimney) enter the building. To ensure effective construction, the performer must know how to pick the optimal material for isolation for each construction element and install it according to technical standards. Special attention will be paid to constructions made out of wood and isolating bricks which are the optimal building blocks for nZEB.

- 2. Trainee participants gain knowledge and information about appropriate founding and inner pressure systems for a successful execution of tasks when building nZEB from all known materials and constructions as well as when renovating older sites.**

Participants must know basic statics and construction physics, especially airtight, hydro and heat isolation roles of individual layers of the foundation platform or layers of foundations of older buildings, including inner pressures. To ensure for a successful construction each performer must know how to choose an optimal material for every element of the building for airtightness and heat and hydro isolation. All of this has to be installed according to technical standards.

- 3. Trainee participants gain knowledge and information about appropriate heat isolating systems and finishing layers of facades for light and massive walls when renovating older building and constructing nZEB. Aside from ensuring paratransparency and airtightness, special care will be given to treatments around installation of windows and the contacts of facade with foundations in roofs, as well as various finishing layers of contact of ventilating facade, including green facades.**

Participants must know various ways of affixing or spraying heat insulation, especially airtight and heat insulating role of individual layers for facades on nZEB or older buildings. Special attention will be paid to treatment around the installation of windows and the contacts with foundations and roof with nZEB. All possible heat bridges must be conserved when renovating older buildings in terms of energy. They have to know the principles of operating of contact and ventilating facades. Various materials and ways of affixing must be known with ventilating facades. Ecology of plants and technology of green walls must be known when dealing with green facades.

- 4. Trainee participants gain knowledge and information about appropriate systems for covering flat and sloped roofs as well as heat and hydro insulations under the roof. With this, they will successfully executed tasks when constructing or renovating according to nZEB.**

Participants must know and use various systems of covering sloped and flat roofs, including extreme weather protection and the weight of snow, systems and insulating roofing, which will ensure the optimal performance of nZEB with appropriate layers for holding and discharging moisture, and an appropriate heat insulation under the roofing. Special attention will be paid to correct execution of all contacts of various construction elements, because there is a big risk of heat bridges and reduced airtightness.



- 5. Participants must be able to choose the appropriate system of affixing building furniture and install it into the walls according to standards. Meanwhile, they have to ensure appropriate airtightness, heat insulating treatments and installment of shaders and outer shelves.**

Participants must be familiar with and know how to use various systems of affixing building furniture into or from the outer wall and roof as well as systems for airtight installment. They must know various shaders and outer shelves, as well as the technical requirements for their installment without heat or airtight bridges. When dealing with roof windows they must know the role of the ventilation layer and way by which to ensure heat insulation and airtightness. With this information, they will successfully execute tasks when building nZEB or renovating older buildings.

- 6. Trainee participants gain knowledge and information about appropriate systems tightening on different element of building wrapping and installment breakthroughs, materials and ways of checking for all types of new constructions and renovations of buildings.**

Participants must know how to implement demands of airtight building individually, as a group work or with clients. Airtightness of the building wrapping is a key criteria of defining the quality of nZEB or a renovated older building. It must be achieved on every element of the building wrapping, especially on contact points with foundations, walls, roofs and building furniture, also with breakthroughs through the airtight shell.

- 7. Trainee participants gain information and knowledge about passive house (nZEB) standards and knowledge about the comprehension and interdependence of all procedure of planning, execution and construction quality checking for all components of the passive house.**

Participants must understand the principle of the passive house as a chain, where the strength is determined by the weakest link. They must know standards and all phases from planning to handing the product to the buyer as well as all demands, technologies and construction procedures of the passive house and upgrading to a nZEB. Interdependence of all wrapping components, installations and use of renewable energy sources must be understood. They know how to implement their knowledge independently, as well as cooperating with other groups and clients.

- 8. Trainee participants of training gain information about energy renovations of buildings of all ages and purposes according to nZEB standards. They can bring knowledge of comprehension and interdependence of all planning procedures, execution and construction quality checks into practice.**

Participants must know the principles of static, installation and heat insulating building constructions in various time periods. When renovating, they must be able to implement nZEB's standards of construction into all phases, from planning to handing the building to the buyer. They need to master all demands, technologies and procedures of constructing passive houses in upgrading to nZEB. They must know the interdependence of all components of building wrapping, installations and use of renewable energy sources. They must be able to use their knowledge independently, in groups or cooperate with other groups and with customers.



## SUBMODULE B – INDOOR INSTALLATIONS:

The key competencies are related to new constructions and complete renovations in accordance with the requirements of nZEB:

- knowledge and compliance of fundamental knowledge, regulations and standards in the field of EE relating to the installation of heating systems and equipment,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of RES relating to the installation of heating systems and equipment,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of installation of safety devices for the installation of heating systems,
- compliance of the guidelines for fire protection and the use of prescribed details in the execution of mechanical installations in accordance with the guidelines of fire safety (fire protection design breakthroughs, the use of combustible materials, etc.)
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of installation of appropriate systems for heating and cooling of nZEB,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of installation of adequate ventilation systems for nZEB,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of installation of appropriate systems of heat pumps for nZEB,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of installation of appropriate systems of biomass needs for nZEB,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of installation of solar thermal systems for nZEB,
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of cogeneration systems of nZEB,
- installation and connection of measuring devices for the needs of energy monitoring
- knowledge and compliance of fundamental knowledge, regulations and standards in the field of drinking -water management, water waste and rainwater.

### Definition of goals:

1. **The participants of the course get knowledge and information for the implementation of energy systems in accordance with the rules and principles of EE, the use of technologies for the exploitation of RES to provide energy in accordance with the rules of nZEB.**

Participants should be aware of the importance of implementing EE measures and the use of techniques for using RES to achieve the prescribed objectives of final energy consumption in nZEB. They need to know all the effects of end-use energy for heating, cooling, ventilation and lighting as well as measures to reduce energy consumption and possible techniques for its production. They should know the requirements of the legislation and technical standards for nZEB and fixtures and also know how to install nZEB in buildings. They should know the energy and environmental labeling of the products. They should know how to properly design and install safety devices for the protection of heat and plumbing systems. They should be able to install equipment and implement measures to protect human health. They know the rules and techniques of regular periodic inspection and maintenance of installations and equipment for heating, cooling and ventilation. They know the equipment, technology, materials and know how to implement measures to ensure fire safety due to the operation or installation of utility systems and the spread of fire through the fixtures and appliances. They know the importance and proper way of fixing fixtures appliances and installations, proper



sealing of the construction and building envelope to prevent thermal bridging, ingress of water and moisture, ensuring the fire penetration resistance and air tightness.

**2. Participants gain information and knowledge for the selection of such systems of heating, cooling and ventilation in nZEB, which provide a healthy living environment. Heating, cooling and ventilation systems should be adapted to the design characteristics of the building envelope and heat source for generating heat or cold.**

Participants learn the parameters of healthy living, comfort and regulations for the protection of human health. They also learn about the thermal response of buildings by type of construction and type of thermal envelope. They learn techniques of radiant heating and cooling systems installed in floors, walls and ceilings of drywall and masonry. They know how to install floor, wall and ceiling systems in various building structures and construction type (brick or prefabricated). They know the impact of a radiant heating and cooling system to thermal comfort and well-being of people and the strengths and limitations of these systems. They can learn about different techniques of convective heating and cooling. They know their installation in accordance with the type of building structure or construction type (brick or prefabricated). They learn about the impact of a convective cooling and heating system to thermal comfort and well-being of people and the strengths and limitations of these systems. They understand the different techniques of mechanical, natural and hybrid ventilation of the building. They know local and central ventilation systems engineering principles of preheating and cooling and also heat recovery and humidity. Installation of ventilation is known by the type of building structure or construction type (brick or prefabricated). They are familiar with the principles of the ventilation system installation that promises a healthy living comfort and well-being and the strengths and limitations of these systems. They understand and know the importance of proper planning and implementation of systems in accordance with the design documentation. They know the importance of measuring and adjusting the design parameters of the systems of heating, cooling and ventilation. They cooperate in the implementation of measurements and set design parameters for the optimization of operating systems. They know the methods and devices for measuring flow, pressure, temperature and heat and the proper place of installation of measuring devices for the purpose of setting systems or energy monitoring. All their work is carried out in accordance with the design documentation and detailed design of the building in accordance with the manufacturers' instructions. They are aware of the risk of inconsistencies in some aspects.

**3. Participants gain information and knowledge about heat pumps to generate heat or cold systems, which are compliant with the laws nZEB and binding standards.**

Heat pump system must be adapted or consistent with a heating or cooling system in a building that can provide the needs of the building for heat or cooling in a safe energy efficient and environmentally friendly manner. Operators learn the rules of minimum efficiency appliances and regulations applicable to environmental laws related to coolant materials. They know different ways and types of plants for the production of heat from the environment (in air, soil, groundwater, waste heat, etc). They know the law governing the ways of using heat sources. The on-site workers must be able to install a system for using heat from the soil and groundwater in accordance with standards and regulations. They are familiar with the technical requirements and restrictions for the safe and efficient operation of systems for the use of heat. They learn about the importance of a coordinated dimensioning and operation of cooling and heating system heat pump. They know the heat pump system and associated control systems and other related systems for the implementation of the optimisation of the entire thermal system of the building. All work carried out in accordance



with the detailed design of the building and project documentation in accordance with the PZI instructions.

#### **4. Participants gain information and knowledge about the use of biomass for heating.**

Biomass is a domestic and carbon dioxide-neutral energy source. Heating buildings with biomass must be done with devices that ensure minimal emissions of particulate matter and in accordance with the highest standards, providing a higher normalised efficiency. Participants recognize different forms of biomass, which can be used to generate heat. They know the rules and standards governing the quality of biomass and regulations and standards governing their storage. They learn about the regulations that prescribe the energy efficiency and emission levels of flue gases. They learn about the technical guidelines for the selection of the boiler depending on the energy needs of the building, spatial conditions and the type of heating system in the building. They know how to install the necessary security features and are familiar with fire safety requirements for the transport system and the biomass boiler room and storage room. They know about the implementation of applicable regulations, standards, project documentation and manufacturer's instructions and understand the risk of inconsistencies.

#### **5. Participants gain information and knowledge to harness solar energy in nZEB**

Harnessing solar energy is the most important segment of the RES, and significantly contributes to the SENS energy balance. Utilisation of this resource is vital to achieve the parameters defining nZEB. Operators learn the rules and standards for the installation of solar systems. They also learn about energy and environmental labeling of the products. They obtain information and specific knowledge in the field of radiation. They get in contact with, and understand the possible scope of solar energy in the building. They learn a variety of devices and systems for capturing solar energy. They are able to use different types of solar systems according to the required temperature level required to heat the building. They are familiar with the various options and techniques for the preservation of energy production. They also know a variety of hydraulic systems and components of solar systems and the installation of the necessary safety elements of the systems. They also learn about different ways of mounting solar collectors on the roof and a variety of load-bearing structures, so as to ensure the safety of structures due to wind load, snow and temperature strains. They are aware of regulations, standards, project documentation and manufacturer's instructions and understand the risk of inconsistencies.

#### **6. Participants gain information and knowledge for connecting devices for co-generation of electricity**

Co-generation of electricity and heat increases the efficiency of utilisation of fossil fuels for energy supply of buildings. By producing electricity less valuable energy is used for the needs of the building. The resulting waste heat can be used for heating or as sanitary water for the building. Participants recognise the thermodynamic conditions for the optional installation of a co-production of electricity and heat. They learn about the possible sources of fuel, which can be used for the process of co-production. They learn about the mode of operation of the entire system co-generation of heat and electricity. They know the rules and technical standards for connection to the heat-house heating system. They know about the rules and procedures for connection to the electricity grid. They are familiar with the procedures for obtaining grants and operating grants. They master the technical requirements and formal procedures to connect devices to the existing electricity grid. In the implementation they observe applicable regulations, standards, project documentation and manufacturer's instructions and understand the risks associated with inconsistencies.





## **7. Participants gain information and knowledge for the rational use of waste water and its heat, and for the use of rainwater**

The life cycle of water in buildings is a very short, and thus a very wasteful. It is necessary to introduce a system of multiple use hot water, use its waste heat recovery and the use of biological systems for its purifying and returning to nature. The use of rainwater should be increased. Participants learn about the principles of multi-usage water. Familiar elements and mode of operation and installation of systems for this gray water (drain water from sinks, showers, washing machines might be useful for flushing cisterns) and exploit its waste heat. They know about the operation, components and connection type biological treatment plants. They also know the systems to store and use rainwater. They are aware of the sanitary regulations and standards for the use and installation of utility systems for waste water use gray water, rainwater and biological cleaning systems.

### **SUB-MODULE C – ELECTRIC INSTALLATIONS:**

Key competencies regard new construction and comprehensive renovation in accordance with nZEB standards:

- a) knowing and regarding regulations and standards for economical and safe working of electric installation in nZEB,
- b) knowing and regarding standardised details of electric installation affixing and breakthroughs,
  - correct affixing of lightning protection in correlation with the building wrapping (heat bridge, tightening the building),
  - knowing and regarding regulations and standards connected with installing solar electric plants and their implementation into the electric energy network,
  - knowing and regarding regulations and standards connected with congregation equipment and their implementation into the electric energy network,
  - knowing the principles of economic lighting of space,
  - usage of intelligent installation systems for more efficient energy usage in nZEB,
  - usage of elements for ensuring active fire protection,
  - installing meters for energy monitoring demands,
  - acquisition of knowledge and techniques for correct execution of periodic electric installation and device measurements.

### **Goal definitions:**

#### **1. Participants acquire information and knowledge for safe and effective operation of all electric systems in the building with regulations and standards in effect**

Participants know regulations and standards for safe operation of installations in accordance with fire safety regulations. They know regulations and standards for safe and efficient electric installation systems. They know the newest technical indicators and regulations for AC and DC electric systems, steering and telecommunication system, electromagnetic interference safety and lightning strikes. They know the meaning of correct system execution of economic and efficient operation of electric installations in nZEB.



## **2. Participant acquire information and knowledge to perform electric installations in nZEB**

Installations must be performed in such a way, that water entering, moisture spreading and heat bridges are prevented. Airtightness and fire safety of the building must be ensured, as well as installation breakthroughs between fire sectors. Participants are acquainted with consequences of incorrect installation affixing and piercing through hydro and heat insulations, steam blockades, airtight elements and firewalls. They get to know standardised details of installation affixing and protection at construction breakthroughs. They are acquainted with ways of installing system elements for hydro and heat insulation passages, and ensuring airtightness installations and fire safety related to breaking through the firewall.

## **3. Participants acquire information and knowledge of solar plant installation options and their safe and efficient operation on nZEB**

Participants know regulations and standards for setting up systems of solar energy plants. They know the regulations and procedures for adding devices to the electro-distribution network. They know the regulations and procedures for acquiring subventions and operation supports. They know the functions of all components of the system, affixing to the roofing, wiring, connecting and starting the system according to the project documentation and the system manufacturer's instructions. They master the technical conditions and formal procedures for connecting devices to the electro-distribution network.

## **4. Participants acquire information and knowledge about installing congregation devices and connecting them to the electro-distribution network**

Participants are familiar with thermodynamic conditions for the possibility of installing a congregation device. They are acquainted with regulations and procedures for connecting devices to the electro-distribution network. They know the regulations and procedures for acquiring subventions and operations supports. They are familiar with the working principle of the whole system of congregation devices. They are acquainted with technical conditions and formal procedures for connecting devices to the electro-distribution network.

## **5. Participants acquire information and knowledge about building lighting according to standards and regulations of effective energy usage, protecting the environment and health**

Participants know the regulations of efficient energy usage in the field of lighting. They know the influence of installing economic lighting and system of steering lighting on energy usage in nZEB. They are acquainted with standards and technical solutions for health friendly and energy efficient space lighting. They understand usage of various types of lighting according to lighting needs and steering. They know and understand energy and environment lighting tags.

## **6. Participants acquire knowledge and information about the operating of intelligent system instalments**

Usage of the intelligent installation system with a central operation and management control of devices contributes to reducing energy usage and greater quality of residing in the building. This system is also used for device operation monitoring and reporting possible malfunctions, fire and security alarms. It is very useful for monitoring and controlling energy usage in the building. Participants are acquainted with the meaning of using this system for increasing quality of living in nZEB. They get to know and understand key steering and communication building blocks of the intelligent installation system. They get to know and





understand various standards of communication protocols and techniques of connecting energy devices, shading, lightings and so forth onto the building's central management system. They understand the importance of a coordinated regulation and telecommunication system. They get to know and understand the operating principle of various sensors, feelers and energy meters. They understand the importance of a correct installation location and ways of connecting them to the steering system. They understand the principle of the operation of the comprehensive intelligent system and program equipment.

## **7. Participants acquire information and knowledge for performing frequent inspections and measurements**

With this safe, reliable and efficient operation of electric installation and device systems. Participants know the regulations and standards for inspection and maintenance of installations and devices currently in effect. They know and understand measuring methods and instruments. They know the importance of measurement results and can connect them through interdisciplinarity. With help of these measurements they can locate system errors. They understand the importance of performing preventive inspections and regular maintenance for safety and energy efficiency of electric and intelligent systems and electrical devices.

As written in the introduction of the comprehensive system of perfecting and training, participants must conquer competencies in understanding and know the whole profession-specific knowledge spectre of construction or renovation according to nZEB demands. This is why participants participate in all three sub-modules. In the module involving the participant's profession, s/he is included in an in-depth program level, where concrete knowledge, skills and arts will be addressed, as well as good practices, and learning how to eliminate common mistakes in execution of tasks or services. In the other two modules, which are not directly tied to their profession, they participate on a basic level. This is how they acquire additional competencies of knowing and understanding of interdisciplinarity in construction and renovating according to nZEB standards.

Participants gain a certificate of participation after completing the 2nd module of perfecting and training.

### **4.3.3 Module #3 - Skills and competences in nZEB**

In the third module, participants upgrade the skills acquired in first and second module through practice in the use and installation of materials, installation and servicing of equipment. Training providers in the third module will be primarily producers or suppliers of materials and equipment to be acquired pre-accreditation, which will be argued that the implementation of practical training meets the requirements, conditions and standards, which will be pre-set for the commission of the accreditation body. Participants will select the content and training provider individually, according to the activity that carry out.

The content of the training and advanced training in the third module is specific and related to the acquisition of practical occupation-specific competencies. Individuals in the development and training of the third module after completion of training also carry out a practical examination. The condition of the training in the third module is prior participation in the first or second module. The participants at the end of the third module receive a proof of attendance and completion of the practical examination. After getting all proofs of participation in all three modules, the participant approaches the theoretical examination. A participant, who has successfully passed the theoretical exam, obtains an appropriate certificate as well as one from the company with whom s/he is employed. The system of accreditation for the trainers and the system of certification of the participants will be presented in detail in the next section.



#### 4.4 A system of accreditation and certification in the scheme of informal training and the training of on-site workers of new construction and renovation in accordance with the requirements of nZEB

The system of non-formal training is supported by a system of accreditation of training providers and certification of learners and businesses. It is divided into several levels. A system of accreditation and certification is designed on the basis of professional criteria and standards. An important feature of the system of accreditation and certification will be given to the Commission, which will review the knowledge and competencies, conditions, criteria, requirements and standards, lead the accreditation process and issue certificates.

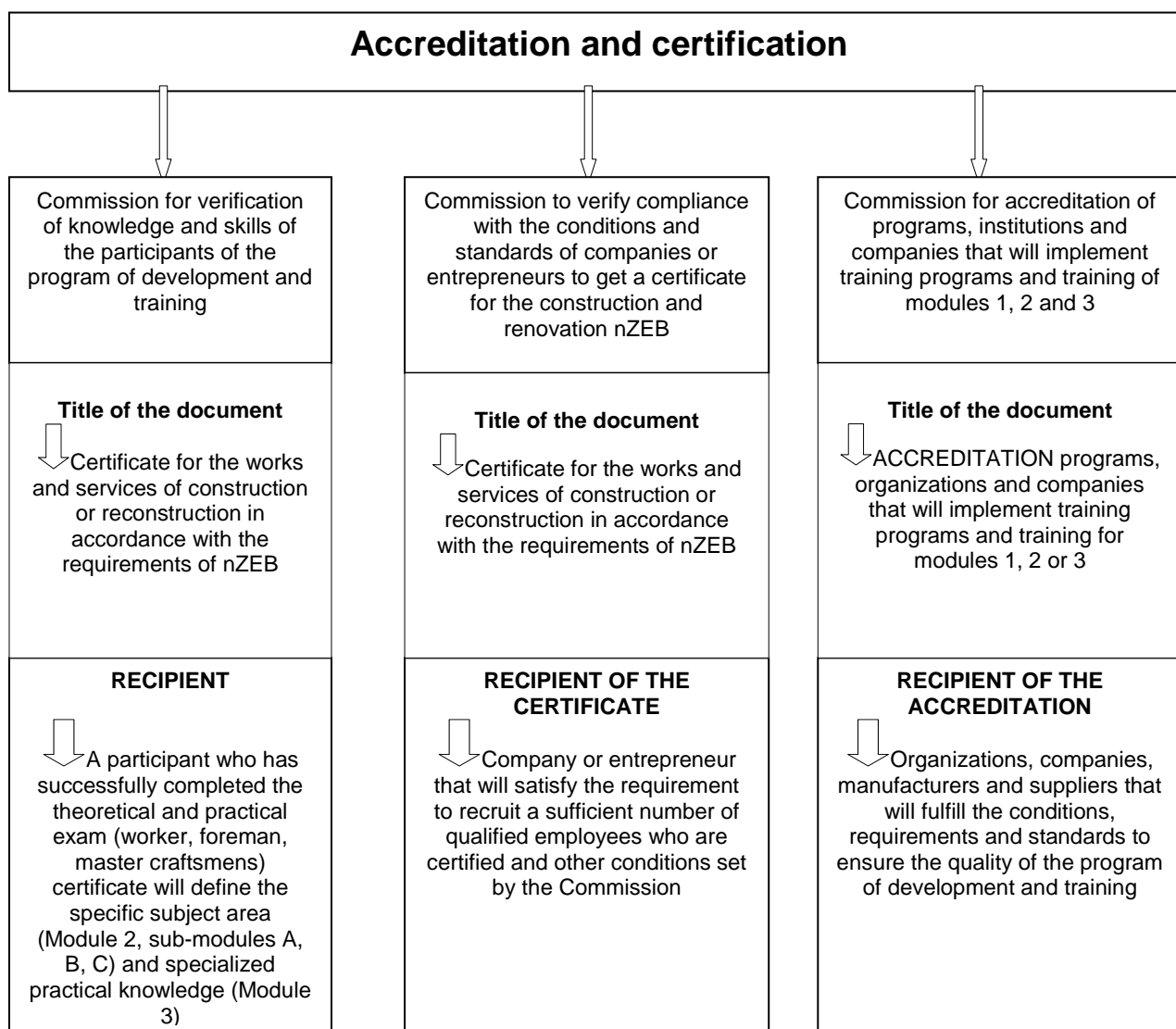


Figure 9: Model of accreditation and certification (Mekinc, Vrhovnik, Rozman, 2013)



The participants of the development and training will be certified to verify the knowledge and skills of the participants of the program. They will be responsible for:

- the definition of the required level of knowledge, practical experience and skills that will ensure that the individual (worker, foreman or master craftsmen) possesses skills that can confidently carry out work in the construction or renovation of nZEB in their specific field;
- identify ways and forms of assessment for participants;
- implement of the evaluation system;
- the process of changing the content of programs of training on the basis of findings and results of the evaluation system;
- the process of changing the content of programs of training on the development of new technologies;
- verification of certificates of recognition to workers from EU member states, which the Slovenian market may act as renovations and construction nZEB; the granting of certificates.

In the system of development and training, observations have been made in that it is necessary for the examination to obtain a license for all three certificates of participation in the program of development and training of modules 1, 2 and 3 and in the context of training in the third module, the practical examination.

Due to the development of new technologies the certificate is valid for four years.

Commission to verify compliance with the conditions and standards of companies or entrepreneurs to obtain a certificate for the construction and renovation nZEB.

In addition to individual workers, foremen, craftsmen and entrepreneurs (craftsmen), companies will be able to obtain a license .The Commission will be responsible for:

- setting and regulating conditions, requirements and standards for obtaining a license;
- the modification of the terms, requirements and standards for obtaining a license and change the accreditation process;
- the verification of compliance with the conditions, requirements and standards of commercial legal entities, which will be a request for a certificate;
- verification of certificates of recognition to companies from EU Member States, the Slovenian market may act as renovations and construction nZEB;
- the granting of the certificate.

This certificate will attest that the company has employed skilled workers with certified nZEB and has registered the corresponding activity. The certificate can demonstrate that it meets other requirements, specifications and standards (eg business license, references, different quality standards, etc.) to provide more quality works and services for the construction or renovation nZEB and identified as important area by the Commission.

Due to the development of new technologies the certificate is valid for four years, then the company or the sole trader will have to re-submit an application for a certificate. Companies and entrepreneurs with the certificate authority will publish the certification and accreditation on the website.

**Commission for accreditation of programs of institutions and companies which will carry out training programs and training modules 1, 2 and 3 and practical exams under module 3.** Development and training programs 1, 2 and module 3 and practical examination



in the third module can be implemented by organisations or associations, schools and businesses with the acquired accreditation. The Commission will be responsible for:

- prescribing the manner and procedure of accreditation of organisations and businesses;
- defining the conditions, requirements and standards which must be met in the accreditation process of improvement and training providers as well as the practical part of the exam;
- verifying compliance with the conditions, requirements and standards of the investors in the process of obtaining accreditation; and
- granting accreditation.

Accreditation will show that an organisation or company fulfills all the conditions, requirements and standards that can ensure quality implementation of the program of development and training (technical and material conditions, adequate staffing, etc.). Accreditation will not be transferable and will be due to the development of modern technologies and regulations in this field. It is to be valid for four years. After four years, a company or sole proprietor must submit a new application for re-accreditation.

All organisations, businesses, manufacturers and suppliers will be invited to send their designated representatives responsible for implementation of training programs and training, to attend a seminar, and they will acquire all the necessary information and knowledge for successful preparation of an application for accreditation, as well as the implementation of the programs themselves. The seminar will be organised on the basis of the method train the trainer (Training for Trainers), where each participant will know the entire system of non-formal training and training requirements, standards, and requirements with which operators must comply for the awards program accreditation.

#### **4.5 The evaluation system of training programs in the system of informal training of on-site workers of new construction and renovations in accordance with the requirements of nZEB**

To ensure the necessary quality and efficiency of knowledge, an evaluation system was designed. It will measure (see table) the quality and relevance of the acquired knowledge and skills of the participants.

The process of assessing the quality and relevance of the acquired knowledge and skills of the participants will be carried out in two stages:

- the first stage will be carried out through evaluation questionnaires immediately after the execution of the program of development and training of each module and the application for the exam. In the first stage the evaluation of the quality and appropriateness of content knowledge is determined as well as the skills that the participants have acquired;
- the second stage will involve the analysis of follow up, three months after the successful completion of the exam - with the help of questionnaires and semi-structured interviews with randomly selected participants who have successfully obtained the license. This analysis will determine whether the knowledge and skills acquired by the participants are practically useful for their work.

On the basis of the present process, effective control exists over the quality and adequacy of the design and content of the training programs.



**Quality and relevance of performance improvement and training programs in all three modules.** Evaluation will be carried out in the first instance. The questionnaire designed for the participants, in addition to issues related to the quality and adequacy of knowledge and skills, also include questions about the quality and relevance of operators on the adequacy of the methods and forms of implementation of the programs and the adequacy of the premises and facilities of the implementation of programs of development and training.

	FIRST STAGE		SECOND STAGE
GRADING	Questionnaire		Follow up analysis - half a structured questionnaire and interview
GRADED	All participants of all three modules		Randomly selected participants with licence
TIME OF GRADING	Right after each program and if somebody signed up for it.		Three month after successfully passing the exam
CONTENT AREAS OF ASSESSMENT	<ul style="list-style-type: none"> <li>• Quality and appropriateness of content knowledge and skills</li> </ul>	<ul style="list-style-type: none"> <li>• Quality and relevance of program implementation;</li> <li>• Quality and relevance of the operators;</li> <li>• The adequacy of the methods and forms of implementation of the programs;</li> <li>• Adequacy of rooms and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Practical value of the new knowledge, skills and competences</li> </ul>

Table 7: Tablet display model evaluation system– BUILD UP Skills Slovenija. (Mekinc, Vrhovnik, Rozman, 2013)

On the basis of the presented process, effective control exists over the quality and relevance of accredited training and non-formal training, in accordance with the envisaged system.

The Commission for the verification of knowledge and skills of the participants of the program of development and training is responsible for the evaluation of the system, analysis and interpretation of the results and findings.



## 5 The key messages of the project

### 5.1 To achieve the 20 20 20 objectives in nZEB a clear support of the country is needed

EU requirements in relation to the achievement of objectives in the field of nZEB are high. Without the support of the national legislative policy, the objectives are difficult to achieve. In the context of implementation of the project based on research and discussions proposals for inclusion in the relevant regulations at the national level were made:

- a precise definition of what is "nearly zero energy building / construction - nZEB;"
- provide the need for proper training for all participants in the construction of buildings - design, construction and supervision in the field of nZEB;
- for the spatial and building legislation and planning documents it is necessary to set the reconstruction and construction of new buildings from 2018 onwards, in accordance with the EU Directive;
  - provide the obligation to obtain operating permits for all facilities. Operating permits have to be proved (like CE certification of products), that the building is built in such a way as it was planned (and projected). In this case, it this would be evidence that it was built as a nearly zero-energy building;
  - it should be written into the planning documents that after the year 2018/2020 new buildings have to be built like nearly zero-energy buildings. A provision in the law on spatial planning would be welcome,
  - by 2018 the administration for public buildings or 2020 for private buildings should not issue building permits if not designed as nearly zero-energy buildings. We would welcome a provision in the law on construction;
  - changes to the construction act are needed so as to know that where is a provision for 20-20-20 targets;
  - sources of informal education and training funding (state, manufacturers, insurance companies).

### 5.2 Building sector companies need to see clear reasons and benefits to decide for education and training

Better trained on-site workers usually make fewer mistakes and are more reliable, so companies have certified nZEB advantages and benefits:

- on the acquisition of invitations to public calls,
- on the acquisition of loans and grants ECO Fund for action in the field of EE and RES,
- of obtaining credit for the renovation and new construction nZEB,
- of ensuring insurance take into account in the Insurance Act,
- training should be on a smaller scale in theory with, the emphasis placed on practical training,
- teaching materials should contain arguments, the data examples and comparative calculations that can be complemented with examples on their own and will be used as a guide at work.

### 5.3 Promotion and Awareness

An important role in achieving goals related to energy efficiency requirement also has the financial capacity of public and individual subscribers, awareness of designers, architects and supervisors, as well as energy consultants and traders. Therefore, a lasting promotion and awareness of all target groups regarding the benefits of nZEB is required, which is tailored to the target group. Promotion is carried out in the context of the contact point, represented by the accreditation and certification body.



## 6 Conclusion

Informal permanent education and training of on-site workers, master craftsmens and foremen workers in nZEB represent a complex challenge. A number of parties are interested in the process of preparing a comprehensive system of non-formal education and training providers of new construction and renovation in accordance with the requirements of nZEB in the context of meetings, conferences and national qualification platforms a ([www.buildupskills.si](http://www.buildupskills.si)). With the active involvement and contribution of all involved stakeholders<sup>8</sup>, many different interests were connected together and numerous obstacles were overcome, which will facilitate the achievement of the objectives in this area, particularly in follow-up activities associated with implementing nZEB staff training.

In the second part of the call, which will be followed in this document establishing guidelines, the foundations shall be shown, including the national qualification platform developed to such an extent that it will be a single point of contact enabling effective nZEB promotion for the interested public, quality inspection of health education and effective training program for implementing nZEB personnel, as well as a list of certified nZEB companies. For efficient operation of the entire installed system appropriate organisational form and regulation of the financing of operations need to be ensured.

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<sup>8</sup> Various ministries, agencies, government departments, educational institutions, professional institutions for EE and RES in buildings, energy and development agencies, building industry - manufacturers, construction on-site workers and providers, manufacturers and installer URE/OVE systems, trade associations, professional associations, private and public investors, and others.





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