

TRAINING BUILDING WORKFORCE ROADMAP for Energy Efficiency and Renewable Energy Sources

■ strategy ■ overview ■

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Further information

More details on BUILD UP Skills can be found at www.buildupskills.eu

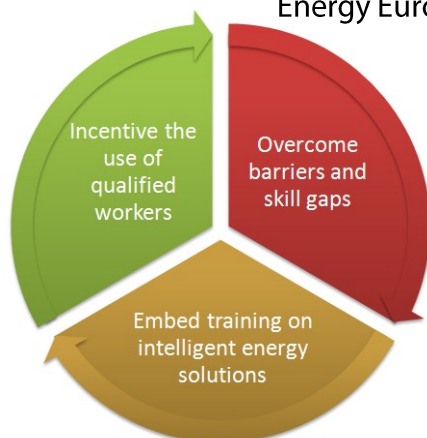
More details on the IEE programme can be found at <http://ec.europa.eu/intelligentenergy>

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OBJECTIVES

The 2014-2020 roadmap for training building sector workers for the energy efficiency (EE) and renewable energy sources (RES) is in the framework of BUILD-UP SKILLS PORTUGAL, a 18 months project financed by Intelligent Energy Europe program¹ aiming at:



- Identifying measures to overcome barriers and skill gaps in the various professions to meet the 2020 targets in the building sector;
- Embed training on intelligent energy solutions through changes in the mainstream curricula and practice;
- Put into practice the necessary measures to ensure that the added value of a more highly qualified workforce is recognized and the use of qualified workers is incentivized or made obligatory.

The strategy overview document precedes the complete action plan and constitutes the first document in preparation of the roadmap by:

- ➔ Presenting the **general strategy** for fulfilling the training needs in order to reach the 2020 energy targets defined in the national action plans for energy efficiency and renewable energy sources (PNAEE and PNAER);
- ➔ Pointing out what could be the **key and priority measures** for the skills considered critical for the PNAEE and PNAER implementation.

This document resulted from the contacts established with different entities representing vocational training centers for building sector, national entrepreneurial or industrial associations, tradesman and professional associations, other public or certifying entities in the building sector.

¹ IEE/11/BWI/473/SI2.604354-FORESEE

2020 TARGETS

The **national action plans** for energy efficiency and renewable energy sources (PNAEE and PNAER, respectively)², are currently being revised, but follow the same line of action as those approved in 2008 and 2009³, updated to the current macroeconomic context conditions, mainly funding restrictions and economy deceleration. In the last decade (2000-2010) the primary energy consumption as well as final energy decreased⁴, while the renewable energy supply increased⁵.

The national action plans, PNAER and PNAEE, establish the following targets for the next years:

- **For 2015**, a decrease of 1.8 Mtoe in final energy, comparing with the average final energy between 2001 and 2005 (9.8% of 18.4 Mtoe);
- **For 2020**, a decrease of 7.5 Mtoe in primary energy, comparing with the energy demand projection of PRIMES model from European Commission (25% of 30 Mtoe).

The targets established by the European Union are slightly less strict:

- **For 2016**, a decrease of 1.65 Mtoe in final energy, compared with the average final energy between 2001 and 2005 (9% of 18.4 Mtoe);
- **For 2020**, a decrease of 6 Mtoe in primary energy, compared with the energy demand projection of PRIMES model from European Commission (20% of 30 Mtoe).

The initial PNAEE and PNAER projected that the building sector, which includes state, residential and services buildings, contributes with 26% for the target of final energy decrease (about 470 ktoe). According to the implementation report of 2010, an energy decrease of 220 ktoe is already achieved, leveraged by the following measures - **Home & Office Renewal, Energy Efficiency System in Buildings, Renewable in the hour and Solar Thermal**, which initially aimed at:

- Program of incentives for sustainable urban rehabilitation, with the purpose of achieving 1 in 15 homes with optimized energy class (equal or higher than B-);

² “Linhas estratégicas para a revisão dos Planos Nacionais de Ação para as Energias Renováveis e Eficiência Energética”, Direção Geral de Energia e Geologia (DGEG), June 2012.

³ Cabinet Resolution no. 80/2008, Plano Nacional de Acção para a Eficiência Energética (PNAEE), Portugal Eficiência 2015. Plano Nacional de Acção para as Energias Renováveis (PNAER), 2009.

⁴ Average annual decrease of 1% for primary energy, and 0.2% for final energy.

⁵ Average annual growth of 19%.

- Program to renew 1 million large electrical appliances;
- Replacement of 5 million lamps with CFL;
- 75 thousand electricity-producing homes (165MW of installed power);
- 1 in 15 buildings with Solar Hot Water.

The revised PNAEE and PNAER reinforce most of the above measures, namely by promoting, until 2020:

- Installation of double glazing windows;
- Application of thermal insulation in external walls and roofs;
- Installation of heat recovery systems in fireplaces;
- Improved construction of new dwellings and new service area;
- Public buildings with energy certification;
- Installation of solar collectors in residential buildings, service buildings and public buildings.

Nevertheless, the current legislation about the use of energy in buildings is also being harmonized with Directive 2010/31/EU (EPBD-RECAST), namely to include the nearly zero-energy buildings, paving the way to the corresponding national action plan.

In synthesis, **building workforce** and other building professionals should be shortly prepared for the **challenge** of:

- Buildings rehabilitation by small or large interventions;
- nZEB buildings;
- Maintenance and management to promote energy efficient buildings;
- Installation of high energy efficient systems;
- Installation of renewable energy systems.

QUALIFICATIONS NEEDS AND GAPS

Skills and qualification needs

In the report of the National Status Quo Analysis, occupations⁶ were analyzed in order to identify which of them would be critical to the achievement of 2020 energy targets.

Relatively to the number of workers for the identified occupations, it should be pointed out that its update is impracticable, due to statistical national constraints. In fact, the most updated data reports to 2009 (Table 1), according to 1994 occupation classification, which does not consider some of the new occupations.

Table 1 – Employed persons in the building sector, by occupation⁷, in 2009.

OCCUPATION	2009
Building Civil Engineering Architectural Technician	2,938
Electrical installation technician	962
Cold Storage & Climatisation Technician	747
Maintenance man (electricity)	104
Electrical network technician	29
Chief draughtsman	290
Draughtsman	634
Mason	41,408
Construction supervisor	8,655
Trim carpenter	5,324
Floor and wall tiler	1,416
Floor coverer	1,698
Plasterer	3,594
Insulator	960
Glazier	121
Plumber	5,596
Pipe fitter	405
Electrical fitter of lifts and similar equipment	1,253
Electrical fitter of HVAC equipment	603
Electrician-assembler of low voltage installations	2,219
TOTAL	78683

Source: Strategy and Planning Office of the Ministry of the Economy and Employment, Permanent Staff Inquiry, 2009.

However, employment growth in the construction sector has followed the trend of decline that occurs at national level, and in 2011 registered a decrease of 8.7% of the employed population, which corresponds to the loss of 42100 workers, from 2010 to 2011. This decline is also reflected in the percentage of the population employed in the construction sector of

⁶ Base group analysis according to ISCO classification and CPP2010.

⁷ 1994 National classification.

the total employed population in Portugal, reaching 9.1% in 2011. In reality, this is a trend that has been following the evolution of employment in this sector in the last decade. The fall in employment in the construction sector is accompanied by a significant increase in unemployment. The registered unemployed (looking for a new job), by economic activity, shows that in the construction sector the growth between 2009 and 2011 was 21%, reaching nearly 70000 subscribers, representing 14.4% of the national total.

A further analysis of the unemployment shows that '*non qualified workers in mining, construction and manufacturing operators*' and '*related workers on mining and construction*' are within the top five categories of applicants, which represent 18% of the total.

On the other hand, the analysis performance on the construction companies holding licence provided by InCI-Institute of Construction and Real Estate, Institute which regulates this activity, with regard to skilled workers, holders of expertise in various areas of construction, attested through ownership of certificate of professional aptitude-CAP, demonstrates, as Table 2, that number has increased in the period of 34,2% in 2012 compared to 2008.

Please note that these skilled workers, technicians considered intermediate-accepted pursuant to ordinance 16/2004, of 10 January, to give technical capacity to construction companies, which hold up to class 3 license, which allows the execution of works up to a value of 664 000€, instead of engineers and technical engineers, which is an incentive for higher qualification such workers.

Table 2 – Number of workers responsible for the technical skills of the companies with license to carry out works to 664 000€, from 2008 to 2012.

OCCUPATION	YEAR				
	2008	2009	2010	2011	2012
Electrical technician ⁸	2248	2406	2553	2661	2767
Gas installer	791	846	874	934	967
Carpenters	167	202	225	232	238
Plasterer	111	145	156	158	162
Floor layers and tile setters	40	47	51	50	54
Bricklayer	21	39	62	72	76
Plumber	0	0	1	1	2
Solar thermal installer	30	58	132	192	242
Air conditioning and refrigeration mechanics ⁹	9	12	10	31	76
TOTAL	3417	3755	4064	4331	4584

Source: InCI, 2012.

In summary, by increasing unemployment and reducing job offers, we can conclude that the mismatch between job demand and job supply have been increasing in the last years. This reinforces the importance and need for better and more qualified employment in the construction sector.

Table 3 comes from the crossing exercise of the occupations previously identified, with the current national qualifications (National Qualification Framework, levels 2 and 4), pointing out shortly what skills upgrades are required.

⁸ Includes GP 3 and 4 from DGEG.

⁹ Includes “Técnico(a) Instalação Manutenção Sistemas Climatização (TIM II and TIM III)”.

Table 3 – Critical skills for meeting 2020 energy targets.

OCCUPATION	QUALIFICATION	SKILLS UPGRADE
Photovoltaic systems installer	Photovoltaic systems installer	Integration with wind systems installer to assign double qualification
Included in Electrical mechanics and fitters	Wind systems installer	Integration with photovoltaic systems installer to assign double qualification
Solar thermal installer	Solar thermal installer	Reinforcement of skills related to plumber occupation; Integration with bioenergy installer to assign double qualification.
Bioenergy installer	Bioenergy installer	Reinforcement of skills related to plumber occupation; Integration with solar thermal installer to assign double qualification
Plumber	Plumber	Enable an upgrade for solar thermal installer and bioenergy installer
Electrical engineering technicians	Electrical technician	Enable an upgrade for wind and photovoltaic systems installer
Included in physical and engineering science technicians not elsewhere classified.	Gas technician	Enable an upgrade for solar thermal installer and bioenergy. Reinforcement of skills/ knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources.
Air conditioning and refrigeration mechanics	Cold Storage and Climatisation Technician/ HVAC Systems Technician	Enable an upgrade for solar thermal installer and bioenergy. Reinforcement of skills/ knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources.
Draughtspersons	HVAC Systems Designer	Enable an upgrade for solar thermal installer and bioenergy.
Building and related electricians	Electrical Installation Electrician-Assembler	Enable an upgrade for wind and photovoltaic systems installer.
Pipe fitter	NO QUALIFICATION ¹⁰	Energy efficiency related to mechanical ventilation
Bricklayers	Bricklayers	Applying thermal insulation and correcting thermal bridges
Carpenters and joiners	Trim carpenter	Windows installer other than wood frames

¹⁰ “No qualification” means that there is no specific qualification program in the National Qualification System.

Roofers	NO QUALIFICATION	
Floor layers and tile setters	Floor layers and tile setters	Applying thermal insulation
Plasterers	NO QUALIFICATION	
Insulation workers	NO QUALIFICATION	
Glaziers	NO QUALIFICATION	
Construction supervisors	Construction supervisors	General approach of energy efficiency in construction
Draughtspersons	Draughtspersons	General approach of energy efficiency in construction
Civil engineering technicians	Building civil engineering architectural technician	General approach of energy efficiency in construction

Electrical renewable systems

The techniques of electricity are essential to the proper installation of wind and photovoltaic systems, which is a cornerstone for training installers of these technologies. Taking into account that electrical technicians have those skills, it would be possible to undertake only specific short duration training units (UFCD) for the installation of renewable power generation (wind and solar photovoltaic systems), in order to provide them with those qualifications.

Additionally, it could be offered the possibility of a double qualification on wind and photovoltaic systems installer by undertaking extra UFCD, complementing the base skills. This is in line with Article 14.5 of the Renewable Energies Directive 2009/28/EC.

Thermal production from renewable energy systems

For the purposes of domestic hot water (DHW) and buildings space heating, solar thermal systems or boilers that use solid, liquid or gas biomass as fuel can be used. On the basis of these systems installation and maintenance are plumbing techniques, such as welding of pipes of various materials, as well as the connection of various equipments with the networks of hot and cold water and central heating of buildings. Considering that plumbers have those skills, it would be possible to undertake only specific UFCD of installation of solar thermal and bioenergy, in order to give them those qualifications.

Additionally, it could be offered the possibility of a double qualification on solar thermal and bioenergy installer by undertaking extra UFCD,

complementing the base skills. This is in line with Article 14.5 of the Renewable Energies Directive 2009/28/EC.

HVAC systems, boilers and other gas equipments

Taking into account the main skills of the group of workers referred above, it would be possible to undertake only specific UFCD with the reinforcement of skills/knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources.

Additionally, it could be offered the possibility of a double qualification on solar thermal and bioenergy installer by undertaking extra UFCD, as a way of complementing base skills. This is in line with Article 14.5 of the Renewable Energies Directive 2009/28/EC.

Other electrical equipments;

Taking into account that Electricians and Electrical Mechanics and Fitters have the above referred skills, it would be possible to undertake only specific UFCD for the installation of renewable power generation (wind and solar photovoltaic systems), in order to give them those qualifications.

Additionally, it could be offered the possibility of a double qualification on wind and photovoltaic systems installer by undertaking extra UFCD, complementing the base skills. This is in line with Article 14.5 of the Renewable Energies Directive 2009/28/EC.

Building construction

Due to the fact that bricklayer skills are strongly related to the external envelope, an upgrade in the qualification is required in order to include the application of thermal insulation techniques, as well as thermal bridges correction.

A general upgrade on thermal insulation is required also for floor layers and tile setters qualification.

Moreover, currently carpenter skills only focus in wood materials. In relation to windows and doors installation, which are important elements for energy efficiency performance, there are two options:

1. Upgrade carpenter qualification to include specific skills on installation of other materials for windows frames,
2. Create a windows installer partial certification (within a double certification qualification).

In what concerns the construction supervisor, draughtspersons and civil engineering technicians, a general approach, common to other qualifications, should be introduced in the qualification skills, namely on thermal insulation, windows, rehabilitation techniques, new components, new façades elements, solar passive systems and shading devices.

It is noteworthy that there are key occupations that do not have a corresponding formal qualification awarded within the National Qualification System:

- Roofers
- Plasterers
- Insulation workers
- Glaziers
- Pipe fitter

Other gaps

- Courses usually have a very extensive theoretical component neglecting practical aspects, especially for younger professionals;
- Need to revise the programmatic contents to include the concept of energy efficiency (e.g. masons ignorance of a thermal bridge);
- Lack of manuals, without basic aspects for the different areas (e.g. construction of fireplaces);
- Gaps in training (e.g. HVAC and refrigeration areas regarding to ventilation).

Barriers

To identify the main barriers, related to the qualification of building workers, meetings were held with several stakeholders, with a constructive exchange of views.

Regarding the training offer it was pointed out that:

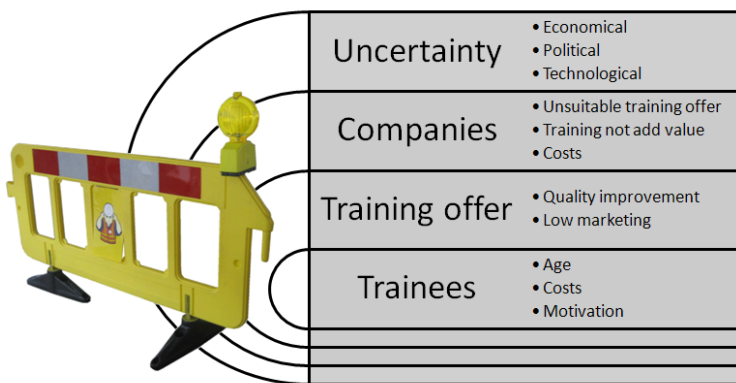
- The training offer exists but sometimes is not adequate to the company's requests;
- Difficult to motivate companies due to the **costs** involved;
- **Quality** of trainers needs improvements;
- Better **marketing**.

Besides the aspects mentioned above, other aspects inherent to the potential **trainees and companies** point of view should be noted:

- Difficulty in being **motivated** to be trained due to **age** barrier;
- Training is not always profitable for companies, as investment in training is not always a driver of competition among companies.

The **uncertainty** about the evolution of some social-economic and political factors was mentioned as critical for the development of the qualifications of the work population:

- The evolution of the **economic** situation: workforce, building stock, fuel and electricity prices;
- Public investment, namely **policy** for building sector, building rehabilitation, training, energy certification;
- Evolution, availability and accessibility of new **technology** solutions.



GENERAL STRATEGY

Context

National action plans for EE and RES point out a set of critical skills in order to achieve the 2020 energy targets, namely building **workers specialized** on:

- Windows installation;
- Thermal insulation;
- Buildings rehabilitation;
- Solar collectors both thermal and photovoltaic;
- Bioenergy systems
- Ventilation ducts;
- Heat recovery systems
- HVAC installation;
- Lighting systems;
- Gas installation
- Electrical installation
- Maintenance of energy systems;
- Management of energy systems.

The basic and general idea to overcome the identified barriers of adequacy, costs, age and uncertainty at economic, political and technological level, is the promotion of training as an added value for companies and persons themselves, specifically by:



- ➔ **Flexibility:** modular training courses, with the possibility of credit accumulation and e-learning;
- ➔ **Companies involvement:** courses within the companies improving the practical component and reducing costs;
- ➔ **Cross-cutting training for energy efficiency:** the concept of energy efficiency in buildings becoming a cross-cutting issue in all building workers qualifications;
- ➔ **Requalification:** specific programmes, in the actual economic and social Portuguese context, should be put in place, particularly targeted at unemployed workers, in order to promote their inclusion in the energy efficiency and renewable energy sources building sector, namely, for building stock energy rehabilitation.

Considering the economical restrictions for investment and incentives and the strong deceleration of new constructions, the period 2014-2020 should be analyzed in the framework of crisis constraints.

It is noteworthy to distinguish the vocational and educational training provided in the framework of the National Qualification System and the training provided by private and independent entities. Firstly, the analysis is focused on the former.

Training in the framework of the National Qualification System

Facing the challenges of the first crisis period, with an expectable trend on the continuous decreasing of building sector employment and preparing the building workforce for the second recovery period is important to:

- a) **Reinforce the flexibility of the training** offer to enable the upgrading of adult professionals skills, independently from age and employment state. To that end, for each qualification or groups of qualifications, other optional short duration training units (UFCD) should be available aiming at the acquisition and improvement of new skills, specialization or requalification. These optional training units can be used in initial VET programmes or through continuing vocational training. Consider also other organizational forms of training, such as e-learning without, however, to have an important practical component.
- b) **Programmes of requalification to emerging skills**, namely to energy systems which use renewable energy sources, by creating two main areas according to the background - electricity or hydraulic - allowing the requalification of the former to photovoltaic or wind installers and the latter to solar collector and bioenergy installers.
- c) **Upgrade training, transversally to all building sector**, by including cross-cutting UFCD regarding energy efficiency and renewable energy sources. This upgrade should focus not only on new materials, new techniques and construction methods, new alternative solutions, but also on general knowledge and awareness for energy efficiency, reinforcement of practical training and buildings rehabilitation. The cross-cutting training units could be used in initial VET programmes (apprenticeship courses and vocational courses), adult courses (EFA) and continuing vocational training (certified modular training).
- d) **Revise and update training standards** of specific qualifications to include skills other than the currently considered (e.g. bricklayer, trim carpenter).

- e) **Create new UFCD** for specific areas, both for youngsters (in apprenticeship or vocational courses) and adults (EFA or certified modular training), in order to complement the current qualification offer. The lack of training offer is verified for some of the priority areas (e.g. windows installer, insulation workers).
- f) **Design/define partial certification of specific skills**, even when complete qualification is not totally acquired. The partial certification can be designed within a double certification pathway and can be accessible at the end of this pathway or develop autonomously through a certified modular training.
- g) **Revise qualifications offer at level 4**, considering the rising of compulsory education to the secondary education level, that affects mainly young people, in order to include competences in traditional areas such as bricklayer, carpenter or plumber, traditionally associated with level 2, taken into account the learning outcomes required by qualifications at level 4 and the need of these qualifications at the labor market.

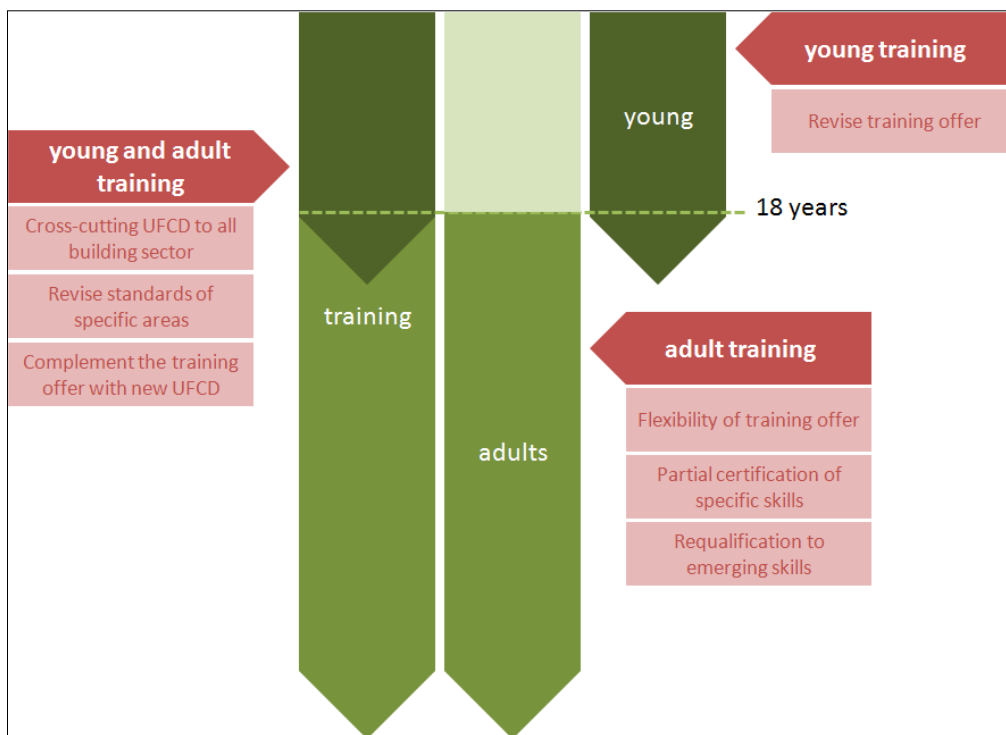


Figure 1 – Overview of the operational strategy in training provided in the framework of the National Qualification System.

Other issues

Parallel to the improvement of workers skills, other issues should be further discussed in the training roadmap, to find strategies for:

- valuing companies by the use of qualified professionals;
- harmonizing with other member states (MS) the establishment of common basic competences. This is the work being performed in the framework of WG5 - Training and Information of the Concerted Action on Renewable Energy Sources (www.ca-res.eu) – to what concerns Renewable Energy Sources