

# Survey on Competences in the Renewable Energy Sector Cyprus 2011





# **Survey on Competences in the Renewable Energy Sector Cyprus 2011**



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## FOREWORD

This report was initiated by Cedefop, the European Centre for the Development of Vocational Training, and has been prepared by the Human Resource Development Authority of Cyprus, HRDA, which is the nominated National Coordinator of the European network ReferNet in Cyprus.

Cedefop established ReferNet as the European network of reference and expertise in vocational education and training. ReferNet comprises 29 members, known as ReferNet national partners, from each EU Member State, Iceland and Norway. ReferNet national partners are key organisations involved in vocational education and training in the country they represent. The aim of this network is to meet the growing demand for information on policies and developments in the area of vocational education and training in the European Union.

This report provides information on progress made in European countries on how key competences and other generic skills are included and assessed in VET programmes in the Renewable Energy Sector. This will contribute to addressing information gaps as identified in the Joint Progress Report of the Council and the Commission on the implementation of the Education & Training 2010 work programme.

The Surveys on Competences follow a common structure, which has been provided in the form of guidelines by Cedefop. The findings will feed into the ongoing work of Cedefop in this field, inform the work of specific Thematic Working Groups set up by DG EAC of the European Commission and form the basis for drafting a comparative working paper to be published in 2012 by Cedefop.

This specific report addresses the Renewable Energy Sector and provides information on developments in the occupations of Solar Photovoltaic Installer and Energy Auditor in initial vocational education and training in Cyprus. The HRDA, as the National Coordinator of ReferNet in Cyprus, wishes to acknowledge the invaluable contribution of the other members of the Cyprus consortium in the preparation of this report.



## TABLE OF CONTENTS

FOREWORD	iii
1. NATIONAL POLICY FRAMEWORK FOR THE INTRODUCTION OF KEY COMPETENCES AND GENERIC SKILLS IN INITIAL VET PROVISION	1
2. MAIN SOCIO-ECONOMIC CHARACTERISTICS OF THE RENEWABLE ENERGY SECTOR	2
3. VET PATHWAYS PREPARING FOR WORK IN THE RENEWABLE ENERGY SECTOR	4
4. MAIN POLICY TRENDS, INITIATIVES AND REFORMS OF INITIAL VET PROVISION RELEVANT TO THE RENEWABLE ENERGY SECTOR	7
5. MOTIVATION BEHIND THE REFORMS OF INITIAL VET PROVISION	9
6. CURRICULUM DEVELOPMENT PROCESS: ACTORS INVOLVED AND MAIN METHODS USED	10
7. DEFINITION OF KEY COMPETENCES AND GENERIC SKILLS IN THE RENEWABLE ENERGY SECTOR	11
8. ANALYSIS OF THE OCCUPATION OF SOLAR PHOTOVOLTAIC INSTALLER	12
8.1. VET pathways preparing for work in this occupation	12
8.2. Curricula used	13
8.3. Main characteristics of these curricula	14
8.4. Key competences and other generic skills	14
8.5. Learners' assessment	15
8.6. Extracts of curricula	15

<b>9.</b>	<b>ANALYSIS OF THE OCCUPATION OF ENERGY AUDITOR</b>	<b>18</b>
<b>9.1.</b>	<b>VET pathways for work in this occupation</b>	<b>18</b>
<b>9.2.</b>	<b>Curricula used</b>	<b>19</b>
<b>9.3.</b>	<b>Main characteristics of these curricula</b>	<b>19</b>
<b>9.4.</b>	<b>Key competences and other generic skills</b>	<b>20</b>
<b>9.5.</b>	<b>Learners' assessment</b>	<b>20</b>
<b>9.6.</b>	<b>Extracts of curricula</b>	<b>21</b>
<b>10.</b>	<b>BIBLIOGRAPHICAL SOURCES AND LIST OF NAMES AND / OR INSTITUTIONS CONTACTED</b>	<b>22</b>



## **1. National policy framework for the introduction of key competences and generic skills in initial VET provision**

Policy framework decisions in the field of VET in Cyprus are taken by the Council of Ministers following policy proposals by the responsible ministries or departments after a process of consultation with the social partners and VET stakeholders. The laws / acts regulating the provision of VET are passed by the House of Representatives.

The key actors involved in policy development in Initial Vocational Education and Training (IVET) are the Ministry of Education and Culture (MoEC), the Ministry of Labour and Social Insurance (MLSI) and the Human Resource Development Authority (HRDA).

The MoEC has the overall responsibility for the development and implementation of educational policy. The MLSI has the overall responsibility for labour and social policy. The HRDA is a semi-government organisation whose mission is to create the necessary prerequisites for the planned and systematic training and development of the human resources of Cyprus.

IVET in Cyprus is provided at the following levels:

- Upper Secondary Technical and Vocational Education (STVE)
- Apprenticeship System
- Post-secondary education and training
- Tertiary education (non-university)

STVE is offered through two distinct secondary school programmes at the Technical Schools: the Theoretical Direction and the Practical Direction. The programmes provided include a variety of branches in both the Theoretical and Practical Directions. A common first year of study for the branch in each direction, provides students with solid general education and generic skills associated with their branch, before choosing their specialisation in the second and third year of their studies. The Theoretical Direction is completely school-based and combines general education subjects with technological and workshop subjects. The first and second year of the Practical Direction are also completely school-based and combine general education subjects with technological and workshop subjects, while the third year of studies in the Practical Direction combines a school-based environment with a real workplace as final-year students are placed in industry for one day per week, where they follow a practical training programme.

The Apprenticeship System is operated by the MoEC, responsible for the vocational education and training of the apprentices, and the Cyprus Productivity Centre (CPC) a dedicated centre of the MLSI, responsible for the administration of the System. The Apprenticeship System is a two-year initial vocational education and training programme providing practical and theoretical training to young people who have not successfully completed their lower-secondary compulsory education and wish to be trained and employed in technical occupations.

Efforts to upgrade of the Apprenticeship System have began and the New Modern Apprenticeship is being promoted, with significant changes in the philosophy, the





structures, systems and processes, including the possibility of widening the coverage to accommodate possible needs of young people of wider age ranges. The New Modern Apprenticeship will provide an alternative education and training pathway to young persons who reject / drop out of the formal education system, so that they are able to learn how to learn, acquire and / or upgrade their skills, and become more employable and more able to progress in their career.

The HRDA finances the following initial training schemes:

- Accelerated initial training scheme, which aims to train mainly new entrants into the labour market, unemployed school-leavers and also persons who wish to change their occupations through retraining.
- Enterprise-based initial training, which aims at the design, organisation and implementation of training programmes by the enterprises.
- Schemes that are co-financed by the European Social Fund (ESF), which aim at the improvement of the employability of the unemployed and the economically inactive women through offering opportunities for participation in training activities and work experience.
- Upgrading training programmes for unemployed persons, implemented as from May 2009, in partnership with the Public Employment Service, the Cyprus Productivity Centre and the Higher Hotel Institute of Cyprus, in order to deal with the effects of the crisis, covering important horizontal as well as job specific skills, which will help people to return to productive employment.

IVET at tertiary level is provided by four Public Institutions of Tertiary Education (the Higher Hotel Institute of Cyprus, the Cyprus Forestry College, the Tourist Guides School and the Police Academy) which come under the jurisdiction of various ministries and by Private Institutions of Tertiary Education.

The programmes offered by the Public Institutions of Tertiary Education are technically-professionally oriented, and they are designed to offer students the necessary knowledge, skills and attitudes, which will enable them to work either in the public sector or in industry. Private Institutions of Tertiary Education offer a wide range of academic as well as vocational programmes of studies at various levels in the field of: Secretarial Studies, Aesthetics, Culinary, Music - Arts and Drama, Graphic Design, Hotel and Tourism Management, Computer Science, Social Sciences, Education, Business Studies and Engineering.

According to the level of VET provision and the actors involved, policy decisions are taken for introducing key competences and generic skills in the curricula, usually through a process of public dialogue and consultations with the social partners.

## **2. Main socio-economic characteristics of the Renewable Energy sector**

Cyprus has a small and isolated energy system without any gas, oil or electricity interconnections with other countries and is heavily dependent on imported oil for its energy supply (96% in 2010)<sup>1</sup>, thus making the renewable energy sector all the more

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<sup>1</sup> Planning Bureau (2011). Cyprus National Reform Programme 2011.

important in order to achieve energy security, combat climate change and increase the competitiveness of the economy.

There are, however, no readily available official statistical data concerning the renewable energy sector other than the installed capacity and production of renewable energy and their contribution to the energy balance.

The available renewable energy sources (RES) and technologies in Cyprus are solar and wind energy, biomass and small hydro<sup>2</sup>. The national targets set to achieve the Europe 2020 strategy regarding renewable energy are:

- 13% contribution from renewable energy sources to the gross final consumption of energy
- 10% contribution from renewable energy sources to the final consumption of energy in all forms of transport

In 2010, the contribution from renewable energy sources (RES) to the gross final consumption of energy was 5,3%, exceeding the indicative target for the period 2011-2012 that was set at 4,92%<sup>1</sup>, while the share of energy from renewable sources to the final consumption of energy in all forms of transport had risen to 2% which is slightly lower than the indicative target set at 2,2%.

Based on data from the Cyprus Energy Regulatory Authority<sup>3</sup>, at the end of 2010 there were 647 photovoltaic (PV) systems, 10 biomass/biogas systems and 1 wind park connected with the electricity grid with an estimated capacity of 94,8 MW. The total annual electricity production from RES connected to the electricity grid for 2010 was 61 MWh with an estimated total annual turnover of €10 million<sup>4</sup>.

Up to June 2011, the number of PV and biomass/biogas systems connected to the grid had increased to 705 and 11 respectively with the total installed capacity from RES increasing to 96,8 MW.

Table 1 presents the number of installed RES systems connected to the electricity grid. The expected operation of two new wind parks by the end of 2011 will substantially contribute to the installed capacity.

**Table 1: Number of installed RES systems connected to the electricity grid**

Year	PV systems		Biomass / Biogas		Wind parks	
	No of Units	Capacity	No of Units	Capacity	No of Units	Capacity
2008	321	1,58 MW	7	3,06 MW	-	-
2009	469	2,69 MW	8	3,55 MW	-	-
2010	647	5,56 MW	10	7,21 MW	1	82 MW
2011 <sup>5</sup>	705	6,84 MW	11	7,96 MW	1	82 MW

<sup>2</sup> Energy Service, Ministry of Commerce, Industry and Tourism. (Website [www.mcit.gov.cy/mcit/mcit.nsf/dmlenergyservice\\_en](http://www.mcit.gov.cy/mcit/mcit.nsf/dmlenergyservice_en)).

<sup>3</sup> [www.cera.org.cy](http://www.cera.org.cy)

<sup>4</sup> Calculations based on production and feed-in tariff.

<sup>5</sup> Data up to June 2011.

Furthermore, the Energy Service of the Ministry of Commerce, Industry and Tourism estimates that approximately 90% of households and 53% of hotels have installed solar water heaters, thus Cyprus is ranked amongst the countries with the highest installed solar collector per capita with almost 1 m<sup>2</sup> of solar collectors per person.

With regard to the number of enterprises operating in the sector, there are 50 small sized enterprises employing 10-49 persons registered to the Cyprus Association of Renewable Energy Enterprises<sup>6</sup> that specialise in the installation of solar and photovoltaic panels. According to the association, these enterprises employ around 500 persons and have an estimated total annual turnover of €15 million. There are also 2 enterprises producing biodiesel for local use which employ 10 persons and have an estimated total annual turnover of €6,5 million.

Furthermore, there is a single medium-sized enterprise<sup>7</sup> that manufactures photovoltaic panels and employs about 100 persons. It exports almost 98% of its production to Europe and its annual turnover for 2010 was €85 million.

### **3. VET pathways preparing for work in the Renewable Energy sector**

VET pathways in the Cyprus educational system leading people to work in the renewable energy sector include:

- IVET, provided through Upper Secondary Technical and Vocational Education (STVE), the Apprenticeship System, the initial training programmes subsidised by the Human Resource Development Authority (HRDA) and public and private institutions of tertiary education.
- Formal CVET, provided at the Evening Technical School, which operates under the supervision of the Directorate of STVE of the Ministry of Education and Culture (MoEC).
- Non-formal CVET, offered mainly by public providers such as the STVE and by public training institutions, as well as private, such as colleges, training institutions and enterprises, mainly subsidised by the HRDA.

STVE is offered through two distinct secondary school programmes at the Technical Schools: the Theoretical Direction and the Practical Direction (more information is provided in question 1). The Evening Technical School offers courses that are in line with the curricula that are implemented in mainstream IVET. The courses offered by both the Technical Schools and the Evening Technical School, related to the renewable energy sector, include mechanical engineering, electrical engineering, building and civil engineering. The number of students of Technical Schools and the Evening Technical School in selected fields of study during 2009/2010 and the number of graduates are presented in Tables 2 and 3 respectively.

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<sup>6</sup> [www.seapek.com](http://www.seapek.com)

<sup>7</sup> [www.enfotonsolar.com](http://www.enfotonsolar.com)



**Table 2: Number of students of Technical Schools and the Evening Technical School in selected fields of study 2009/2010**

Field of study	Number of students
<b>Theoretical Direction</b>	
General engineering	184
Plumbing, heating and cooling systems	7
Electrical engineering	141
Electrical installations	89
Electrical machines, automation and control	21
General Civil Engineering / Architecture	63
Civil Engineering	136
Architecture	21
<b>Total for Theoretical Direction</b>	<b>662</b>
<b>Practical Direction</b>	
General engineering	495
Plumbing, heating and cooling systems	217
Welding and metal construction	37
General electrical engineering	287
Electrical installations	366
Electrical machines, automation and control	33
Domestic appliances, refrigeration and air conditioning	83
Civil Engineering / Architecture	60
Building	75
<b>Total for Practical Direction</b>	<b>1.653</b>
<b>Total</b>	<b>2.315</b>

**Table 3: Number of graduates of Technical Schools and the Evening Technical School in selected fields of study in 2009**

Field of study	Number of graduates
<b>Theoretical Direction</b>	
General engineering	37
Plumbing, heating and cooling systems	12
Electrical engineering	23
Electrical installations	21
Electrical machines, automation and control	7
General Civil Engineering / Architecture	-
Civil Engineering	24
Architecture	16
<b>Total for Theoretical Direction</b>	<b>140</b>
<b>Practical Direction</b>	
General engineering	100
Plumbing, heating and cooling systems	66
Welding and metal construction	-
General electrical engineering	-
Electrical installations	130



Field of study	Number of graduates
Electrical machines, automation and control	19
Domestic appliances, refrigeration and air conditioning	41
Civil Engineering / Architecture	7
Building	20
<b>Total for Practical Direction</b>	<b>383</b>
<b>Total</b>	<b>523</b>

The Afternoon and Evening Classes of Technical Schools offer continuing education and training to adults working in industry, in order to be able to respond more efficiently to the contemporary demands of the labour market, as well as training aiming at the re-integration of unemployed individuals into the labour market, in areas where there is shortage of skilled workers.

The number of students in selected specialisations in the afternoon and evening classes of Technical Schools is presented in Table 4.

**Table 4: Students in selected specialisations in the Afternoon and Evening Classes of Technical Schools 2009/2010**

Specialisation	Number of students
Electrical installation	81
Auto mechanics	81
Building	132
Plumbing, heating and cooling systems	58
Electricians	48
Central heating and plumber welders	31
Refrigeration and air conditioning	37
<b>Total</b>	<b>468</b>

The Apprenticeship System offers occupations including auto mechanics, builders, welders / plumbers and electrotechnicians. The programme lasts for two years and is a combination of general education and vocational training which takes place at Technical Schools for two days per week, with practical training in industry for three days per week.

Table 5 presents the number of Apprentices in selected specialisations of the Apprenticeship System during 2009/2010.

**Table 5: Apprentices in selected specialisations of the Apprenticeship System, 2009/2010**

Specialisation	Number of apprentices
Auto mechanics	76
Builders	24
Welders / Plumbers	87
Electrotechnicians	22
<b>Total</b>	<b>209</b>



The HRDA initial training schemes that relate to the renewable energy sector are:

- Accelerated initial training scheme which includes theoretical and workshop sessions at a training institution and practical training in industry (offering programmes, amongst others, for Construction Workers, Plumbers, Auto Body Fitters, Builder Electricians and Air Conditioning and Refrigeration Mechanics).
- Enterprise-based initial training (for the training needs of the enterprises at all staff levels).
- Upgrading training programmes for unemployed persons, including amongst others, training programmes for energy management and renewable energy sources for mechanics, installation of photovoltaic systems, refrigeration and air conditioning and plumbing and heating systems technicians.

During the first 6 months of 2011, the HRDA organised 21 initial training programmes that cover green skills and competences for occupations such as solar photovoltaic installers, building electricians, cooling and air conditioning systems technicians, plumbing and heating systems technicians and energy management and renewable energy sources for mechanics. The estimated total expenditure for these programmes is €906.406 with the participation of 299 persons.

The HRDA subsidises a wide range of CVET activities which include Single-company Continuing Training Programmes in Cyprus and abroad, that meet the specialised needs of the enterprise, Multi-company Continuing Training Programmes implemented by public or private training institutions and organisations which aim at the provision of continuing training for meeting training needs of employees and Multi-company Continuing Training Programmes Abroad which aim at the improvement and enrichment of the knowledge and skills of senior personnel of the enterprises through the transferring of know-how and by obtaining practical knowledge and experience from equivalent, successful units abroad.

During the first 6 months of 2011, the HRDA has subsidised 2.288 persons participating in CVET programmes that include green skills and competences and cover important issues related to the transition to the green economy such as energy efficiency and assessments in buildings, design, management and maintenance of Heating, Ventilation and Air Conditioning (HVAC) systems, renewable energy sources, environmental management systems, automobile hybrid systems and waste management. The estimated total expenditure for these programmes is €1.411.620.

#### **4. Main policy trends, initiatives and reforms of initial VET provision relevant to the Renewable Energy sector**

The efforts for restructuring and modernising the educational system culminated in 2003 with the appointment, by the Minister of Education and Culture, of an Education Reform Committee consisting of seven academics, in order to study the Cyprus Education System and make suggestions for its improvement. The Committee submitted, in August 2004, a report indicating the main priority areas of reform with suggestions for the restructuring and the modernisation of the Cyprus Education System.

A public dialogue was initiated in 2005 and a number of working groups, where all major stakeholders were represented, have prepared suggestions on concrete measures to be implemented. The Council of Ministers approved the formation of committees that deal with various issues relevant to the Educational System.



For the development of the new curriculum, the government appointed in 2008 a committee of experts with the mandate to set out guidelines and general objectives and expected educational outcomes for the design of new curricula and syllabi for all levels from pre-primary to secondary education.

The development of a National Qualifications Framework (NQF) for promoting the recognition of academic and vocational qualifications that have been acquired in Cyprus is a priority of the government expected to be completed by June 2013. The development of a Competence-Based System of Vocational Qualifications, which will constitute an integral part of a future NQF, is being established and implemented by the Human Resource Development Authority (HRDA) in two phases (1st phase: 2006 – 2008 and 2nd phase, co-financed by the ESF: 2007-2015). It is expected that 7.000 persons will be assessed through the system against 77 standards of vocational qualifications.

The developed standards cover a broad range of occupations in the sectors of Retail and Wholesale Trade, Repairs of Motor Vehicles, Hotels and Restaurants, Construction, Manufacturing, Systems and Networks of Communication and Computers and Hairdressing as well as the occupation of Trainer of Vocational Training. The system itself provides the platform for the development of standards for occupations in all sectors, including the renewable energy sector.

For the systematic employment forecasting and the identification of skills gaps, the HRDA conducts research studies on long term employment trends and forecasting in Cyprus. The HRDA provides 10-year employment forecasts on a regular basis every 2 to 3 years. Thus, forecasts of employment, expansion and replacement demand are provided for 46 sectors of economic activity and for around 200 occupations, which cover the whole spectrum of the Cyprus labour market.

In 2010 the HRDA conducted a study on the anticipation of green skill needs. The study entitled “Identification of Green Skills Needs in the Cyprus Economy 2010-2013” outlines the green economy of Cyprus and provides employment needs forecasts for sectors of economic activity and occupations of the green economy for the period 2010-2013. In addition, the green skill needs for 34 new green occupations and 52 current green occupations are identified, and in parallel, important basic and general skills needed in the green economy are identified.

The research studies conducted by the HRDA are valuable tools for policy makers in order to develop appropriate policy responses for adapting to the forecasted situation in the labour market.

As a response to the study on the anticipation of green skill needs, the HRDA, in close cooperation with the Ministry of Labour and Social Insurance, has put forward a Special Scheme for Promoting Green Skills in the Cyprus economy, which includes a variety of targeted measures that are directed towards enterprises, employees and the unemployed. Furthermore, with the aim to effectively promote and publicise the importance of the acquisition of green knowledge and skills, the HRDA has declared the year 2011 as the Year of Green Skills.



Furthermore, the HRDA is part of a national consortium<sup>8</sup> that submitted a proposal, which has been approved by the European Commission, under the European initiative “Build Up Skills”. The initiative is part of the European programme “Intelligent Energy Europe” implemented by the Executive Agency for Competitiveness and Innovation (EACI) and focuses on continuing education and training of craftsmen in the field of energy efficiency and renewable energy in buildings, covering their qualifications after initial education and training or after they have entered working life.

The objectives of the initiative are to identify and quantify the need for a qualified workforce in energy efficiency and renewable energy by 2020, set up a national qualification road-map to achieve the 2020 sustainable energy policy objectives and initiate and develop national energy-efficiency and renewable energy training and qualification platforms/schemes that bring together all relevant stakeholders. The initiative is expected to contribute to the objectives of the two flagship initiatives of the Commission’s “Europe 2020” strategy — “Resource-efficient Europe” and “An Agenda for new skills and jobs”.

## **5. Motivation behind the reforms of initial VET provision**

The need for major reforms at upper secondary education, including technical and vocational education was the rationale behind the Education Reform. The main aims of the Education Reform include the improvement of the quality of the education system and the modernisation of the curricula and teaching methods.

The main priorities identified for the structured nationwide consultation to promote the Education Reform include the following:

- Resetting the aims of the education systems and programmes of study from pre-primary education through to upper secondary education
- Differentiation of the teaching in class, in order to give emphasis to cooperative, team, experiential and exploratory teaching methods
- Incorporation of new technologies in the education and training systems
- Creation of modern infrastructure through upgrading the building facilities and modernisation of their equipment
- Confrontation of school failure, which is a basic prerequisite for decreasing the number of students that drop out of school
- Improving and restructuring the system of the pre-service and the in-service education and training of educators
- Further reinforcement of special education in order to limit the danger of exclusion of socially vulnerable students

Within the context of the Education Reform, the Ministry of Education and Culture is promoting the unification of the curricula of upper secondary Technical and Vocational Education (Theoretical Direction only) with the curricula of upper secondary General Education, so that students will have the opportunity to select the programme of studies that interests them by attending a common Lyceum. The Practical Direction will continue to be offered at the existing Technical Schools.

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<sup>8</sup> Comprised of 8 national key organisations, stakeholders and departments.





Due to the fact that the unification of the curricula of the Theoretical Direction of Technical Education with the curricula of General Education will result in the reduction of the degree of specialisation attained by students, the establishment of Post Secondary Institutions of Vocational Education, which will offer further specialisation, is underway. By attending these Institutions, students, especially those who wish to enter the labour market immediately, will have the opportunity to complete technical and vocational education.

As far as Continuing Vocational Education and Training is concerned, Evening Technical Schools are considered as second chance schools and therefore the Directorate of Secondary Technical and Vocational Education of the Ministry of Education and Culture has proposed the establishment of an additional Evening Technical School in Limassol.

### Teacher training

Following the revision of the curricula of STVE, whose implementation was completed in 2004, measures were introduced during the period 2005-2008 aiming, among others, at the continuous improvement of the quality of education at all levels, mainly by the introduction of modern technologies in education and by ensuring that secondary education teachers become digitally literate and acquire necessary skills to implement new, ICT oriented curricula.

This measure included the organisation of short training courses on core IT skills, as well as long term training on the implementation of new, IT oriented, analytical programmes in Secondary Education (both General and Technical and Vocational Education).

In addition, the measure provided for the training of trainers, with a view to promoting in-school training by a relatively limited number of trained trainers and, finally, for the accreditation of the skills acquired by all teachers, in accordance with tested international standards.

Following the implementation of the new curricula in the Technical Schools, which will be fully developed by 2015, a measure will be promoted for designing, developing and implementing a new system of pre-service and in-service training for educators and school leaders, as specified in the National Reform Programme for EU2020.

## **6. Curriculum development process: actors involved and main methods used**

Curriculum development is a collective effort involving qualified Secondary Technical and Vocational Education (STVE) staff, experts from other training institutions, STVE Advisory Committee members, trade unions and employers' representatives. The STVE curriculum is subject to approval by the Council of Ministers before being implemented.

The Directorate of STVE, in order to adapt the content of its curricula according to the needs of the Cyprus economy and industry, and taking into account the latest scientific and technological advances, has developed close cooperation with all major stakeholders, such as Ministries and the Planning Bureau, the Social Partners (Employers' and Employees' Organisations), teachers and their associations, the University of Cyprus, the Pedagogical Institute and the HRDA.



Additionally, all major stakeholders were represented in a number of working groups formulated for the public dialogue initiated in 2005 in the context of the Education Reform promoted by the government. Teacher organisations and other stakeholders have also participated in the consultations for the formulation of a strategic plan for education, which contains major reforms in upper secondary education including technical and vocational education.

For the development of the new curriculum, the government appointed in 2008 a committee of experts with the mandate to set out guidelines and general objectives and expected educational outcomes for the design of new curricula and syllabi for all levels from pre-primary to secondary education. The committee has prepared its recommendations bearing in mind the stakeholder's contributions who participated in the dialogue. Twenty different Working Groups made up of subject specialists and practitioners in the field of education were appointed by the Ministry of Education and Culture in February 2009 to prepare the new curricula. Academics, as well as teachers, participate in this process.

## **7. Definition of key competences and generic skills in the Renewable Energy sector**

The definitions of key competences and generic skills used in the national approach are the same for all sectors of economic activity, including the renewable energy sector.

The revised system of Secondary Technical and Vocational Education (STVE) in Cyprus, since 2001, is based upon an instructional approach that places students, with their learning abilities, strengths, weaknesses, talents and interests, at the centre of the educational process, thus leading them to the acquisition of solid broad knowledge and generic skills, which will equip them with the capacity to solve problems, carry out research, learn how to learn and help them adapt to a changing environment.

To this end, the revised curricula developed by the Directorate of STVE (whose implementation was completed in 2004), have introduced a common first year of study for the branch in each direction, providing students with solid general education and generic skills associated with their branch, before choosing their specialisation in the second and third year of their studies. Moreover, the revised curricula place particular emphasis on subjects and issues such as modern technology, the environment, foreign languages and entrepreneurship, and also take account of the requirements of rapidly growing service industries.

In addition to the above, contemporary educational technology is employed, particularly the Internet, interactive multimedia materials and audiovisual aids, in order to motivate students, promote self-learning and enhance the effectiveness, quality and richness of the programmes on offer. The Directorate of STVE is adapting or even developing teaching and learning materials that use the information and communication technologies.

In an effort to provide students with the experience they need for their smooth entry into the labour market, machines and equipment used in laboratories and workshops simulate the workplace as closely as possible. As a result, students develop a command of valuable practical skills such as tool use, repair and maintenance of equipment and safety procedures.



## **8. Analysis of the occupation of Solar Photovoltaic Installer**

### **8.1. VET pathways preparing for work in this occupation**

Currently, there is no defined VET pathway leading to the acquisition of formal qualifications to work as a solar photovoltaic installer. Most solar photovoltaic installers are electricians who receive additional vocational training.

The curriculum of Technical Schools includes a limited number of hours dedicated to solar photovoltaic (PV) panels. Specifically, a Digital Education Content course entitled “Solar Photovoltaic Elements” has been prepared for the students of the Electrical Engineering Branch and was introduced in the school year 2010-2011. The course is taught with the use of personal computers and lasts for four 45-minute teaching periods.

In order for technical students to have a hands-on experience and adequate understanding of solar PV panels, the Energy Service of the Ministry of Commerce, Industry and Tourism, has provided a number of training kits for PV application to several Technical Schools and has organised information days for renewable energy and energy efficiency.

A national certification / qualification scheme for solar PV installers does not currently exist but the provisions for its establishment has been incorporated into the national legislation drafted in order to transpose the provisions of Directive 2009/28/EC into national law and is set to take effect in late 2012. This harmonised legislation will determine the certification process, the training content leading to a professional qualification certificate, the period of time that the certificate is valid and the skill requirements.

According to the Directive, the planned certification / qualification scheme should offer accredited training programmes to installers with work experience, who have undergone or are undergoing training as a plumber or electrician. They should have plumbing, electrical and roofing skills, including knowledge of soldering and gluing pipe joints, sealing fittings, ability to connect wiring and familiar with basic roof materials. The installers should have gone through a vocational training scheme providing them with adequate skills corresponding to a three years education in the skills mentioned above, including both classroom and workplace learning.

The existing solar PV installers employed by the private companies operating in the sector and registered to the Cyprus Association of Renewable Energy Enterprises are mostly electricians under the guidance and supervision of experienced electrical engineers. Their training as solar PV installers is provided by the companies, either at their premises or at their headquarters abroad.

Up to date, the Human Resource Development Authority of Cyprus (HRDA) has subsidised two single-company continuing training programmes for solar PV installers organised by an individual private company that specialises on installing photovoltaic panels. Technical training was provided during 2010 to the employees of the private company who already had past experience or knowledge of electrical installations.



In addition, the HRDA, in partnership with the Public Employment Service and the Cyprus Productivity Centre, a dedicated centre of the Ministry of Labour and Social Insurance, organised four training programmes during 2010-2011 on the installation of photovoltaic systems, in order to upgrade the skills of unemployed persons, giving them the opportunity to enrich their existing skills or be retrained and qualify for jobs which demand these skills. The training programmes were provided to unemployed persons with experience or knowledge in technical occupations with preference given to electricians.

The total number of persons that received training as a solar PV installer in training programmes subsidised by the HRDA during 2010-2011 was 53 persons, out of which 2 were women. More information on the participation in the aforementioned training programmes is presented in Table 6.

**Table 6: Number of trainees participating in training programmes for the installation of PV panels subsidised by the HRDA**

Type of training programme	Men	Women	Total
Single company continuing training programmes	8	1	9
Emergency scheme for training the unemployed	43	1	44
<b>Total</b>	<b>51</b>	<b>2</b>	<b>53</b>

## 8.2. Curricula used

The course offered to students of the Electrical Engineering branch of Technical Schools was introduced in the school year 2010-2011 and is intended to familiarise them with the solar photovoltaic (PV) technology and its application.

On the other hand, the curriculum used by the private company and Cyprus Productivity Centre (CPC) that implemented the training programmes has been formulated by each individual training provider to best suit the needs of the enterprise and the available resources and infrastructure.

The curriculum used by the private company since 2010 to train its employees has been formulated in accordance to the company's specific needs taking into account previous experience and expertise and the technical specifications of the specific PV panel employed by the company. The curriculum can be characterised as job specific as special emphasis is given to the practical aspect of the installation of the PV panels that includes an onsite installation.

Similarly, the CPC, that implemented the training programmes for upgrading the skills of the unemployed persons, has formulated its own training programme for solar PV installers in 2011 based on their available resources and level of experience of the trainees. The CPC's training programme is designed to provide the trainees with the necessary theoretical knowledge and practical skills to install and maintain autonomous and grid-connected PV panels.



### 8.3. Main characteristics of these curricula

The training programmes subsidised by the Human Resource Development Authority and implemented by both the private company and the public training institution (Cyprus Productivity Centre) were short-duration, intensive courses designed to provide the trainees with the necessary skills and knowledge to install and maintain the photovoltaic (PV) panels. They can be described as outcome-oriented as emphasis was given to the practical aspect of the training, ensuring that the trainee had the required skills and knowledge.

The single-company continuing training programmes had a total duration of 35 hours and were designed to provide both the theoretical knowledge and the practical experience to the employees with special emphasis given to the practical aspect of the installation of the photovoltaic panels. The curriculum was structured around key procedures of the installation with the theoretical part of the training being followed by the practical application of the theory and simulation of the installation.

The training programmes for upgrading the skills of unemployed persons comprised 5 training modules with a total duration of 100 hours. The first 3 modules (40 hours) were designed to provide the trainee with the essential theoretical knowledge regarding the use, function and components of solar cells, the relevant legal framework and the licensing procedures. The remaining 2 modules, that constitute 60% of the duration of the programme, were intended to familiarise trainees with the solar PV panels and provide practical experience on the installation and maintenance of autonomous and grid-connected PV systems.

### 8.4. Key competences and other generic skills

The key competences and generic skills emphasised in the course offered to students of Technical Schools are the following:

- Ability to describe the structure and operation of the solar photovoltaic (PV) element and mention its general characteristics
- Ability to describe the stages of energy transformation in a complete solar PV system
- Ability to draw and explain simple diagrams on how energy is transformed in an autonomous solar PV system and also in a grid-connected solar PV system
- Ability to describe the structure of a solar PV park and explain how its performance can be maximised
- Ability to mention the advantages and applications of solar PV systems
- Ability to estimate the surface required for the installation of small solar photovoltaic systems

The key competences emphasised in the curricula of the single-company continuing training programmes and the programmes for upgrading the skills of unemployed persons, that were subsidised by the Human Resource Development Authority of Cyprus, are:

- Knowledge of basic principles and components of the solar photovoltaic panel



- Ability to identify and determine the system's layout and configuration
- Safety at work using the required tools and equipment and implementing safety codes and standards

Although key competences are included in the curricula, occupation-specific skills are dominant in the training programmes with their share estimated at about 90% of the whole programme. This is due to the fact that the programmes place greater emphasis on learning outcomes, providing trainees with the necessary practical skills and competences to work as solar photovoltaic installers.

### **8.5. Learners' assessment**

In order to assess the students' understanding of the learning material taught at the "Solar Photovoltaic Elements" course of Technical Schools, the teachers employ various evaluation activities that can be used for both formative and summative assessment. Examples of such evaluation activities are multiple choice questions, matching exercises, open ended questions and problem solving activities.

More complex and thorough assessments methods are utilised by the private company's training instructor that include theoretical and practical exercises during the course and a constant evaluation of the trainees' performance and ability to complete the specified tasks pertaining to the installation and troubleshooting of a solar photovoltaic system.

Similar assessment methods are employed by the instructors of the public training institution which in order to evaluate their trainees' understanding of the training material they submit questions and provide them with theoretical and practical exercises that include an in-class simulation of an installation of a solar photovoltaic system.

### **8.6. Extracts of curricula**

The course offered at Technical Schools consists of the following four modules and sub-modules:

#### **Module 1: Photovoltaic elements**

- 1.1 The sun as a renewable energy source
- 1.2 Structure of the photovoltaic element
- 1.3 Operation of the photovoltaic element
- 1.4 Assessment

#### **Module 2: Photovoltaic parks**

- 2.1 General characteristics of Photovoltaic parks
- 2.2 Basic operations of complete photovoltaic systems

2.3 Basic diagrams of the operation of photovoltaic systems

2.4 Assessment

### **Module 3: Photovoltaic frames on buildings**

3.1 Advantages and disadvantages of photovoltaic systems

3.2 Applications of photovoltaic systems

3.3 Photovoltaic systems on buildings

3.4 Assessment

### **Module 4: General Assessment**

An extract of the curriculum used by the private company to train its employees as solar photovoltaic (PV) installers is provided below:

- Photovoltaic system- basic principles and components
- Dimensioning of a grid connected solar power system
- Workshop module mounting
- Workshop electrical requirements
- Workshop inverter installation
- Safety instruction
- Mounting systems – Introduction to mounting installation systems (Theory)
- Mounting systems – Introduction to mounting installation systems (Practical)
- Ways of measurement of the installation of the systems from the edge of the roof (Theoretical)
- Application of the theoretical knowledge. Installing the mounting systems (Practical)
- Drilling of holes and correct placement of special attachments for the mountings installation
- Installation of the modules (Theory)
- Special ways of installing the modules (Theory)
- Ways of inspecting the correct placement of the modules of the system (Theory)



- The installation of the modules in practice. Identification of the special ways of installing them as well as succeeding the correct placement of the system
- Cable and inverter installation (Theory)
- Special care in selecting the installation position of the inverters in order to avoid high temperatures (Theory – Practical)
- Installing the inverters in the predetermined positions
- Electrical cable connection of PV modules (in-series connection) and connecting them to the inverter
- Further connections to the final EAC (Electricity Authority of Cyprus) special counter equipment
- Commissioning stage – The whole system to be connected and go online (in action) and determine its functionality and outputs

A brief description of the curriculum of the training programmes for upgrading the skills of the unemployed persons on the installation of solar PV panels is the following:

- Legal framework for spatial and environmental policy
- Licensing procedures
- The environmental contribution of solar PV panels
- Licensing procedures
- Exploitation of solar radiation
- The photovoltaic effect
- Electrical attributes of solar cells
- Basic principles of solar PV systems
- Basic functions, parts and components of autonomous solar PV systems
- Basic functions, parts and components of grid-connected solar PV systems
- Practical training on the installation of autonomous solar PV systems
- Practical training on the installation of grid-connected solar PV systems





## 9. Analysis of the occupation of Energy Auditor

### 9.1. VET pathways preparing for work in this occupation

Currently, the occupation of energy auditor is nonexistent in Cyprus due to the fact that the energy services sector is still in its early stages of development. However, draft regulations have been prepared by the competent authority (Energy Service) defining the legal framework concerning the implementation of an energy audit scheme, which is expected to start operating in Cyprus by 2012. The draft regulations will define the qualifications, competences and certificates from specialised training programmes and exams that the energy auditors must possess as well as the conditions and terms applying to the issue, renewal, modification and withdrawal of the energy auditors licence.

As no more information is available on energy auditors, the analysis that follows (Questions 8-13) will focus on qualified experts performing building energy assessments, a similar occupation that is also regulated by law. The relevant law requiring the issue of an Energy Performance Certificate entered into force on January 1<sup>st</sup> 2010 for residential buildings, while for non residential buildings on September 1<sup>st</sup> 2010. It requires that all new buildings or existing buildings to be sold or rented to be inspected by a qualified expert in order to assess their energy efficiency and calculate their energy performance. The qualified expert then issues the Energy Performance Certificate of the building and provides recommendations for the improvement of the building's energy efficiency. All qualified experts are registered by the competent authority, the Energy Service, to a publicly available registry for a specific category or categories of buildings.

Qualified experts are required to have a degree in either Architecture, Civil Engineering, Mechanical Engineering or Electrical Engineering. Additionally, they are required to have at least 3 years experience in their field in order to assess the energy efficiency of residential buildings and at least 6 years experience for non-residential buildings. Another prerequisite is to succeed in the relevant exam for each category (for residential and non-residential buildings) held by the Energy Service. It is noted that potential qualified experts for non-residential buildings are also required to succeed in the exam for residential buildings. The exam syllabus is described in the ministerial order 260/2009 and it includes the relevant legal framework, the methodology for the assessment of the energy performance of buildings and the use of the relevant software.

Currently<sup>9</sup>, there are 243 qualified experts performing building energy assessments registered to the relevant database of the Energy Service, out of which 33 are women.

A multitude of training programmes for the skills' upgrading of Architects and Engineers are subsidised by the Human Resource Development Authority (HRDA) of Cyprus and their content covers amongst others the use of renewable energy sources, energy efficiency, design and thermal insulation of buildings, design and management of Heating, Ventilation and Air Conditioning (HVAC) systems and energy assessments in buildings.

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<sup>9</sup> Last update of register on 28/09/2011.



The HRDA, in partnership with the Public Employment Services, the Cyprus Productivity Centre and the Cyprus Institute of Energy, also organises training programmes for unemployed mechanics with the aim to upgrade their existing skills on issues such as energy management and renewable energy sources.

## 9.2. Curricula used

In order to assist potential qualified experts to succeed in the exam, the Energy Service offers since 2010 non compulsory training classes prior to the exams. The duration of the course offered for residential buildings is 4 days and it covers the legal framework, basic heat transfer, calculation methodology, recommendations and software practice. The duration of the course offered for non-residential buildings is 2 days and it covers case studies of large buildings with emphasis on complex technical systems and recommendations. Although attendance to the courses is not compulsory, the participation rates remain very high, reaching 80% for residential buildings and almost 100% for non-residential buildings.

Furthermore, the Energy Service has published a series of publications dealing with the thermal insulation of buildings and the calculation of their energy performance in order to assist architects, engineers and potential qualified experts. In 2007, it published the first edition of the “Guide of Thermal Insulation of Buildings” which guides architects and engineers on the methodology to calculate U-values and inform them on different insulation techniques. The 2<sup>nd</sup> edition, which was published in 2010, includes more detailed calculation methods of U-values and calculations related to thermal mass.

Even more relevant with the occupation of qualified experts were the following two guides published by the Energy Service. The first, which was published in 2009, is the “Methodology for Calculating the Energy Performance of Buildings” and it is a detailed manual of the methodology used to assess the energy performance of buildings in Cyprus describing all the procedures, assumptions and calculations required in order to issue the Energy Performance Certificate.

The second guide, which was published in 2010, is the “Guide for Certifying Existing Dwellings”. The publication lists all processes that qualified experts must follow, as well as checklists and tables that they can fill in during their assessment of the residence. It also contains default values of thermal properties of constructions in case they cannot be practically assessed.

## 9.3. Main characteristics of these curricula

The non compulsory training classes offered by the Energy Service are short duration training courses ranging from 2 to 4 days that focus on job specific skills and competences preparing potential qualified experts for the exams.

The curricula used can be considered as outcome oriented as it consists mainly of practical examples of calculating the energy efficiency of buildings and using the required software as well as reviewing case studies and analysing results.

The course offered for residential buildings has a total duration of 16 hours over a 4-day period and is designed to provide the trainees with the essential theoretical



knowledge and practical skills accomplished through the completion of practical examples and exercises.

The course offered for non-residential buildings has a total duration of 8 hours over a 2-day period and covers case studies of large buildings with emphasis on complex technical systems, mainly heating, ventilation and air conditioning systems, and providing technical recommendations to the building owner.

In order to assist candidates to prepare for the exam, the Energy Service has published since 2007 a series of technical guides dealing with the thermal insulation of buildings and the calculation of their energy performance that include all the procedures, assumptions and calculations required in order for qualified experts to assess the energy performance of buildings and issue the required certificate using the appropriate software programme.

#### **9.4. Key competences and other generic skills**

The candidates are university graduates, therefore key competences such as critical thinking, problem solving, digital competence and initiative are not emphasised in the course. However, the course provides specialised, occupation specific skills such as the ability to analyse and understand data and information regarding the design and structure of a building, its purpose and use, its electrical and mechanical installations as well as the lighting and control systems used in order to calculate the energy needs of each individual area (zone) of the building in accordance with the intended use of each zone.

The course also teaches candidates how to enter information and data into the specialised software programme provided by the Energy Service in order to perform calculations on the energy performance of the building and provide recommendations to the building owner to assist him / her in reducing the building's energy use.

#### **9.5. Learners' assessment**

Following the completion of the non-compulsory training courses offered by the Energy Service, candidates for both categories have to pass the relevant exams that are held the following day.

The comprehensive written exam for qualified experts of residential buildings focuses on job specific skills and competences and includes a test on the national legislation and methodology concerning energy assessments, an analysis of the design and structure of a test building and the calculation of its energy needs.

Likewise, the corresponding exam for non-residential buildings focuses on job specific skills and competences. It is a computer based exam that tests the candidates' capability to use the relevant software programme provided by the Energy Service in order to enter the required data, calculate the energy performance of a test building, provide technical recommendations and issue the required energy performance certificate.

## 9.6. Extracts of this curricula

An extract of the curriculum used at the training classes for qualified experts is the following:

- Legal framework for the energy efficiency of buildings
- U-values Calculation method
- Methodology for the calculation of a building's energy efficiency
- Reference building – Building's geometry
- Segregation of building into zones - Theory
- Segregation of building into zones – Practical exercise
- Electrical and mechanical installations
- Introduction course on the specialised computer software
- Case studies using the specialised computer software
- Analysis of software's output results
- Methods to improve the building's energy efficiency – Recommendations report
- Practical use of software

## 10. Bibliographical sources and list of names and/or institutions contacted

### List of institutions and contact persons

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Contact persons: Stella Xadjigiannakou, Katerina Piripitsi, Christodoulos Ellinopoulos
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Contact person: K. Zinoviou
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Contact persons: Iosif Spyrides, Stephania Tsangaridou
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Contact person: Kyriakos Angelides
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