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Conference Proceedings

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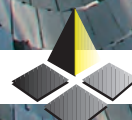
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Table of Contents

CONFERENCE SESSIONS	9
INVITED KEYNOTE LECTURES.....	9
RES 1: RENEWABLE ENERGY SOURCES - GENERAL	10
Increased res penetration within the autonomous electrical systems of non interconnected islands	11
Lightning Protection of Large - Extended Photovoltaic Installations	13
Renewable Energy Potentials as Alternative Sources of Energy Supply in the Mediterranean Islands.....	26
The greenhouse gases emissions of energy use from livestock breeding in Cyprus.....	37
State Estimator Accuracy Improvement Using Synchronized Measurements	38
Reduction of air pollutant emissions using natural gas in Cyprus' power generation.....	39
Overview of the Permitting procedures for RES in Cyprus	40
Modelling and Evaluation of "System Protection Schemes" in the Light of Increasing Distributed Generation for the E.A.C Network	52
A comprehensive methodology for outdoor and indoor degradation studies on photovoltaic modules.....	60
RES 2: SOLAR GENERATION - CONCENTRATED SOLAR POWER – VARIOUS RES TOPICS	61
Concentrating Solar Power – Technologies, Projects and Future Markets	62
Integration of Renewable Energy Systems in Mediterranean Countries	63
Heliostat Error Analysis	64
Sustainability analysis of a solar thermal power project in Mediterranean application in the island of Crete.....	73
Techno-economic evaluation for a concentrated photovoltaic park in Cyprus	86
Report on the conclusions of the techno-economic feasibility study for the co-generation of electricity and desalinated water by concentrated solar power (The CSP-DSW project)	96
Recent commercial and demonstration solar tower power plants around the world.....	106
Smart Meter Project for higher penetration of RES.....	115
Biofuels production and testing in internal combustion engines.....	116
Combine Heat and Power (CHP) Unit Utilizing Biogas as a Renewable Green Energy Source ...	129
An OTEC concept driven by the sea – air temperature difference.....	138
The Encaged Turbine concept in Oscillating Water Column Plants	151

RES 3: WIND GENERATION – WIND POWER INTEGRATION IN SMALL ISOLATED ISLAND SYSTEMS	164
An Energy Storage System Used in Isolated Power Systems for Increasing the Wind Power Penetration.....	165
Some experimental measurements of the Diffuser flow in a Ducted Wind Turbine assisted by an ejector	173
Wind farms and photovoltaic parks in Crete.....	184
Identifying Barriers preventing the Widespread of Wind Power in Europe – The GP-WIND Project	185
RES 4: SOLAR GENERATION – SMALL PHOTOVOLTAIC SYSTEMS.....	195
The use of solar thermal in Greece – systems, applications and market development.....	196
Modeling and measurements of a polycrystalline BIPV roof after ten years of installation	206
Novel Hybrid Photovoltaic-Thermal Solar Cells	217
Organic Photovoltaic Technologies.....	226
The effect of the use of Solar Home Systems on the income-generating capabilities of rural households of developing countries: Evidence from South Africa	234
Vocational Training and Certification of PV Installers - The European initiative PVTRIN	254
EE 1: SOLAR HEATING AND COOLING	264
High Combi – Pilot Projects of High Performance Solar Heating and Cooling Systems in European Buildings	265
Performance Monitoring of a Solar Based Air-conditioning System within IEA-SHC Task-38...275	
Performance Study of Solar Greenhouse Heating Using a Dynamic Model	285
Thermal Behaviour of a Solar Hot Water Storage Tank made of Mild Steel and Coated Internally with PE Using Rotational Moulding	299
Solar energy availability for drying of biological materials.....	307
The use of solar thermal in Greece – systems, applications and market development.....	317
An overview of CSP cooling systems.....	318
EE 2: MATERIALS, ANALYSIS AND DESIGN FOR ENERGY EFFICIENCY	328
Electrical Energy Consumption Analysis in Tertiary Buildings	329
Management On the Use of Building Typologies to Assess the Energy Performance of the Hellenic Residential Building Stock.....	339
Zero Energy House Design for Cyprus.....	350
Combining Vernacular Techniques with Emerging Technologies.....	350
Web-based Energy Management and Automation Systems for Buildings.....	351

Vocational Training and Certification of PV Installers

The European initiative PVTRIN

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KEYWORDS - Photovoltaic, Installer, Certification.

ABSTRACT

The EU photovoltaic (PV) market has been booming over the last decade. Within Europe, the number of photovoltaic (PV) installations is increasing dramatically due to the introduction of financial incentives for the generation of ‘green’ electricity. According to the industry’s forecasting scenarios, the EU PV market will continue to show a fast deployment. The National Renewable Energy Action Plans of the Member States, within the scope of Directive 2009/28/EC, imprint this trend.

The high photovoltaic market growth rates, further favoured by the EU supporting policies and the favourable national regulatory frameworks, may cause some concern to the PV industry due to the lack of adequately skilled workforce for PV installation and maintenance. As markets are growing faster than the qualified PV installers force can satisfy, this may result in technical failures at installed systems affecting negatively their efficiency and performance; eventually having a negative impact on the credibility of the PV technology and on the PV industry’s further development.

To meet the market challenges, the appropriate education and training systems, as well as certification schemes, need to be developed in order to supply a skilled workforce, competent to efficiently install and to ensure a good functioning of PV systems. It is expected that the interested parties (manufacturers, developers, investors) will eventually seek skills certification and quality assurance in all phases of a PV installation (design, installation and maintenance).

This paper presents the main objectives and outcomes of the PVTRIN project, an Intelligent Energy Europe action, which addresses the market needs by developing a training and certification scheme for technicians who are active in the installation and maintenance of small scale PV systems. The PVTRIN aims to set the base for the adoption of a mutually acknowledged certification scheme -that will be consistent to internationally acknowledged quality standards- within EU MS. The under development training and certification scheme incorporates the criteria set by the 2009/28/EC RES Directive regarding requirements for certified training courses and training providers; providing thus a supporting instrument for EU Member States to meet their obligations for acknowledged certifications for RES installers till 31/12/2012. Furthermore, the under development scheme integrates the national legislation, the market’s needs and the PV industry’s requirements.

Creating a qualified PV installers workforce, the increased confidence of potential PV owners will lead to market growth. In the long term, the project outcomes will contribute to the reduction of

greenhouse gas emissions; therefore will support the Member States efforts to achieve the mandatory target of a 20% share of energy from renewable sources in overall Community energy consumption by 2020.

1. INTRODUCTION

The world photovoltaic (PV) market has shown a continuous growth for the last ten years (fig.1). On a global basis, new PV installations of approximately 15,000 MW have been added during 2010, taking the entire PV capacity to almost 40,000 MW. In Europe, which represents approximately the 75% of the PV world markets, the cumulative installed capacity of PV amounted to more than 28,000 MW, at the end of 2010. Germany has been the global PV market leader, adding over 6,500 MW of new installations to the already existing 9,800 MW of PV systems. For the first time, the yearly installations in Italy surpassed 1,000 MW. In France, around 500 MW have been installed, Greece reached 150 MW, while the Belgian market scored more than 200 MW. In 2010, photovoltaic power (PV) was the leading renewable energy technology, in terms of new capacity growth, by almost 13,000 MW in Europe. [1]

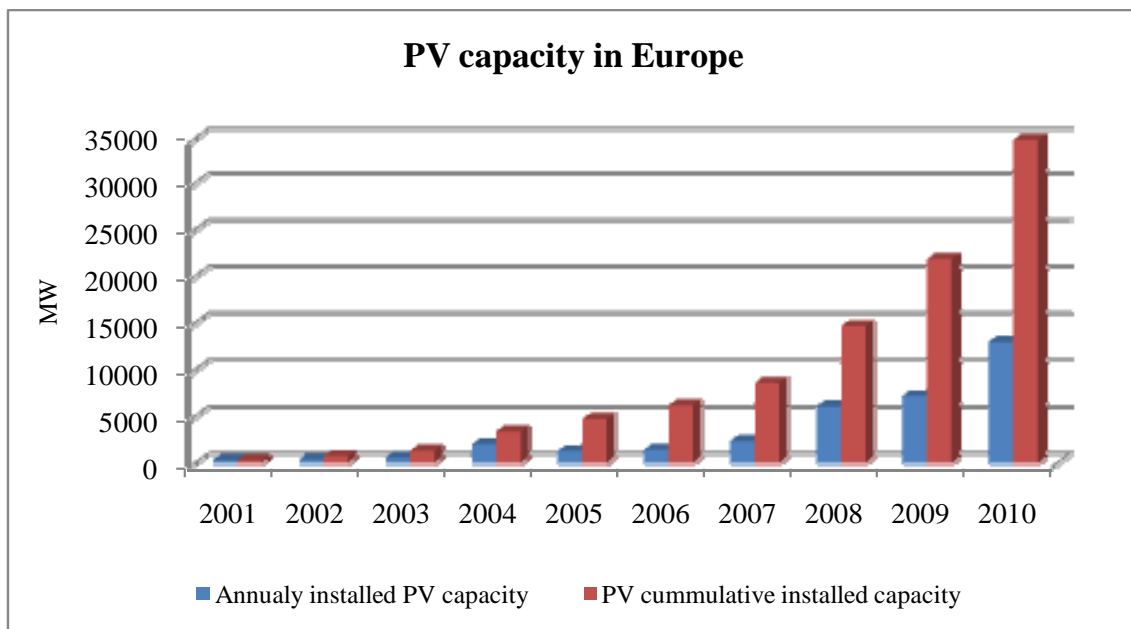


Figure 1: PV capacity over Europe the last decade [2], [3]

Although the European growth will be affected by the global financial crisis, most EU markets will continue to grow fast. According to the industry's forecasting scenarios, the total installed capacity may reach the 140GW (accelerated scenario) till 2020, or even the 280GW (paradigm shift scenario). The forecasts for 2030 are correspondingly 366GW (accelerated scenario), or even the 631GW (paradigm shift scenario), fig.2.

According the PV industry estimations, 30 FTE jobs are created for each MW of solar power modules produced and installed. Close to 220,000 people were employed, along the entire value chain world-wide, by the solar PV industry at the beginning of 2010. PV will provide an increasing number of jobs during the next decades [2]. In EU27, PV jobs may expand to 727,000 in 2020 and 1.4 million in 2030; major growth to PV installation related jobs (Table 1) [4].

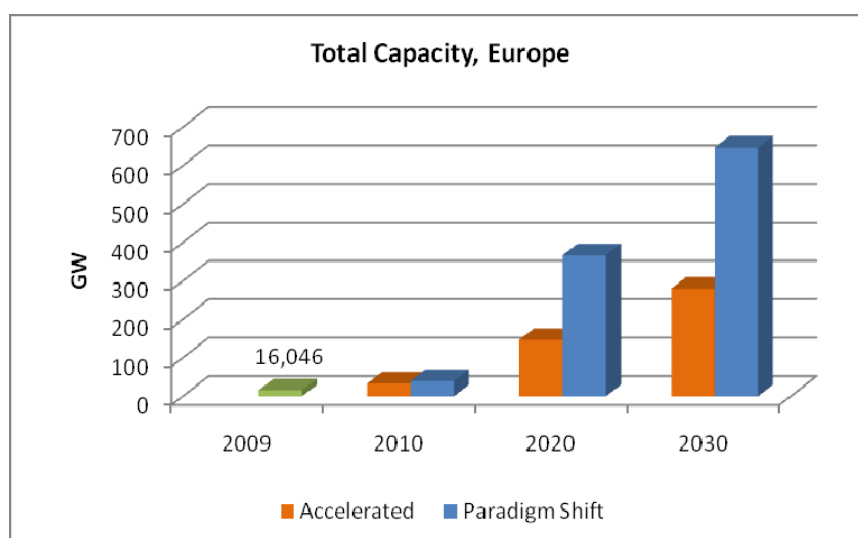


Figure2: Forecasting scenarios for total installed capacity in Europe, till 2030 [2]

Table 1 PV employment - PV jobs forecasting scenarios

	2007	2010	2020	2030
Installation and Wholesale	71.298	147.500	578.500	880.351
Production/Research/Supply	8.642	23.533	148.066	529.324
Total PV jobs (EE-27)	79.940	171.033	726.956	1.409.676

The large up-take of the PV installations will require significant number of highly-qualified installers to ensure a good functioning of systems. As markets are growing faster than the qualified PV installers force, the above figures illustrate that the fast growing PV penetration may prove to a threat for the PV industry due to the lack of adequately skilled workforce for PV installation and maintenance. It is obvious that there is a transnational market need for establishing common qualification frameworks, appropriate training methodology and tools and finally a transparent and clearly defined accreditation route which will validate the competence of the installers [5].

The PVTRIN project will assist the market to overcome the barrier of the lack of competent PV installers by developing an appropriate training course and certification scheme for PV installers; which will provide the key components for developing a European acknowledged certification scheme. It will be addressed to technicians/electricians/engineers and will be focused on the installation and maintenance of PV/BIPV systems in buildings.

2. THE PVTRIN EUROPEAN INITIATIVE

The PVTRIN's scope is the development of a training and certification scheme for the technicians who are active in the installation and maintenance of small scale PV systems, incorporating the criteria set by the 2009/28/EC RES Directive. It aims to set the base for the adoption of a mutually acknowledged certification scheme, which will be consistent to internationally acknowledged quality standards. The PVTRIN Certification will, initially, be implemented in six (6) countries: Greece, Bulgaria, Croatia, Cyprus, Romania and Spain.

2.1 Methodology and action plan

The PVTRIN's action plan [6], [7] foresees the:

- Comparative analysis of the industry and market needs on PV installation and maintenance, as well as the national legislative and normative framework in 6 countries

- Definition of the professional framework for PV installers and development of an appropriate training methodology
- Development of appropriate training material for installers and trainers; also practical training tools and an e-learning platform for a flexible and adaptable training procedure
- Development of a transparent and clearly defined certification scheme, focused on small – scale applications, in order to accredit the training course for installers and to provide mutually acknowledged quality standards within EU countries
- Implementation of pilot training courses, resulting to a pool of skilled and certified PV installers in 6 of the participating countries
- Evaluation of the main developed methodologies, materials and tools, in order to ensure that the project's outcomes will match the pre-decided quality standards
- Establishment of a mechanism to facilitate replication and exploitation of projects deliverables throughout Europe.

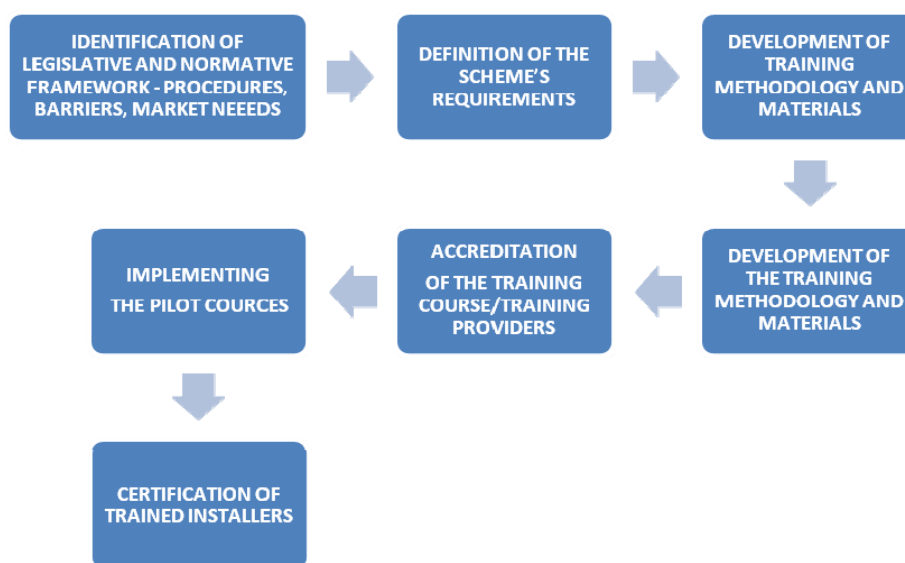


Figure 3: PVTRIN's development steps

At first, the national legislative and normative framework regarding professional training, qualifications and certification, will be identified and compared. Also potential synergies and barriers will be evaluated. Relevant initiatives and existing certification schemes for PV/RES installers -in Europe and internationally- were reviewed in order to exploit existing knowledge and expertise.

In order to incorporate the genuine market needs and to assure the broadest possible support, the key stakeholder groups (i.e. PV/RES industry associations, professional unions and installers associations, vocational training organizations, accreditation bodies, chambers of commerce, consumers/investors associations, national authorities) are involved in order to transfer the market's experience and to provide consultation.

Through the above methodology, the under development scheme integrates the national legislation, the market's needs and the PV industry's requirements. Furthermore, the training and certification scheme incorporates the criteria set by the 2009/28/EC RES Directive regarding requirements for certified training courses and training providers, providing thus a supporting instrument for EU Member States to meet their obligations for acknowledged certifications for RES installers till 31/12/201 [8].

The developed documentation will provide guidance for the certification procedure, design and installation requirements, competence/training of staff, technical facilities, auditing mechanisms.

2.2 Development of the project

The PVTRIN Certification is initially implemented in a balanced group of regions with different market maturity, including countries with a high PV penetration and significant experience in BIPV installation (Spain), others with a recently market awakening and large potential (Greece, Cyprus, Bulgaria), others with poor market performance (Romania, Croatia). The experience of countries with successful examples and extended know-how on developing vocational accreditations standards has been taken into account.

The lack of a competent installers' workforce, to cover the market needs, is more evident in the South- Eastern Europe, where there are few/or none relevant training and no available accreditation schemes (Table 2, Table 3) [9].

Table 2 Professional training and certifications schemes for PV Installers in the PVTRIN participating countries (September 2010)

Country	Training courses/efforts	Certification schemes
Greece	Distance learning program, non acknowledged Some courses not specifically addressed to PV installers, providing general knowledge not focused to technical issues, no practical training Seminars by technical universities (targeted to students and postgraduates) Technical guides/ support material from manufacturers	None
Cyprus	Training programmes provided by companies or by professional associations. Training courses have to be approved by Human Resources Development Authority (HRDA). Training efforts by PV enterprises Seminars/workshops by academic institutions, not for installers but government officials, academics etc.	None
Romania	Training provided by distributing companies on the equipment they deliver	None
Bulgaria	Training for RES installers, approved by the Ministry of Education, Youth and Sciences, is provided in Vocational schools. Available courses by PV companies	None
Croatia	Lack of PV courses in Croatia Some training efforts by RES industry Some education programs that partially cover the RES area	None
Spain	A number of training courses in solar energy, addressing to installers; both types: e-learning and physical attendance. Most important from: · CENSOLAR for solar energy installers · University of Jaen, web seminar –including BIPV issues too.	None yet acknowledged as a professional standard. There is an initiative led by AENOR in collaboration with FENIE under development

Across Europe the availability of certification schemes for PV installers varies greatly between Member States. Many do not have certification schemes, although training courses leading to qualifications for PV installers are often available. Where training courses are available these generally have different eligibility requirements and qualifications. Where certification is available (Table 3) sometimes a number of different schemes operate, usually in different regions.

Table 3 Certification schemes in the EU PV developed markets

Austria	Certification scheme managed by the Austrian Institute of Technology. The training course consists of 6 days of theory, 1 day of practical training and 1 day for the exam. Certification is valid for 3 years but may be renewed subject to additional training requirements.
Belgium	Belgium has a number of different PV installer quality schemes either operating or in preparation. PVQUAL is operated throughout southern Belgium by the RBF. The scheme is not accredited and in its current form would not be compatible with the PVTRIN scheme. QUEST operates a quality label for photovoltaic installers. No certification body is involved and there is no accreditation for the scheme.
France	A number of different PV installer certification schemes operate within France. QUALIBAT, includes verification of the evidence provided and an assessment of an installation to confirm competencies. Certification is valid for four years subject to an annual audit. QualiPV, by the Qualit'EnR organisation, is a voluntary certification process. The label is delivered to the company which commits for a 3-year-period and should be renewed every year SPV by Qualifelec, a private association which delivers qualifications to electrician companies.
Germany	Currently there are no certification schemes for PV installers in Germany.
Italy	The Italian National Agency for New Technologies (ENEA) has developed training courses for RES including both the design and installation of PV systems. The courses are delivered by independent training organisations that have been approved by CEPAS
Netherlands	Certification scheme for PV installation companies, by the KBI Foundation, where independent certification bodies are licensed by KBI to assess and certificate PV installation companies' course.
United Kingdom	A number of certified training courses already exist. A certification scheme for PV installers has been developed by the UK government's Department of Energy and Climate Change (DECC) as part of the microgeneration certification scheme – now known as MCS. The scheme is administered by a licensee (currently Gemserv Ltd.). MCS does not operate its own training courses, but certificated training courses are available, for example from LOGIC and City and Guilds, aimed at providing PV installers with the skills necessary to meet the training requirements of MCS installer certification

In order to record the attitudes, perceptions and considerations of the PV industry actors regarding the training and certification of PV installers, a wide fieldwork research was conducted in the participated countries, with 196 responders; including distributors, authorized dealers, wholesalers, engineers, technicians and building constructors, professional associations and generally actors engaged with the PV installation. 8 of 10 accept that the professional skills certification -according to internationally acknowledged quality standards- will improve the competitiveness and will contribute to the industry's development. The cross-national analysis of the data highlights the different markets' needs, the industry's considerations and the investors' opinion and perceptions [7]. Indicative findings of the survey are listed below:

- 12% evaluate the quality of existing PV installations not satisfactory, where 41% consider it just tolerable.
- 60% of them accept that operational problems due to technical failures during the installations occur, 20% of them consider this fact pretty frequent. It is important to mention that in Spain, where a large number of installation exists, this percentage reaches the 32%; in Romania this is 43% and in Greece 16% - highlighting the importance of training and assessing the skills of the installers.
- As regard their opinion for installers' skills, the responders' opinion is that as concerns sizing, electrical/mechanical design their qualifications are rather satisfactory, where when it comes for safety rules, integration in buildings and proper maintenance they rate them as rather inadequate (fig 4).
- Responders highlight the importance of appropriate training of PV installers in their country. 75% acknowledge that the adoption of a common EU certification scheme for PV installers is important for the healthy PV market development.

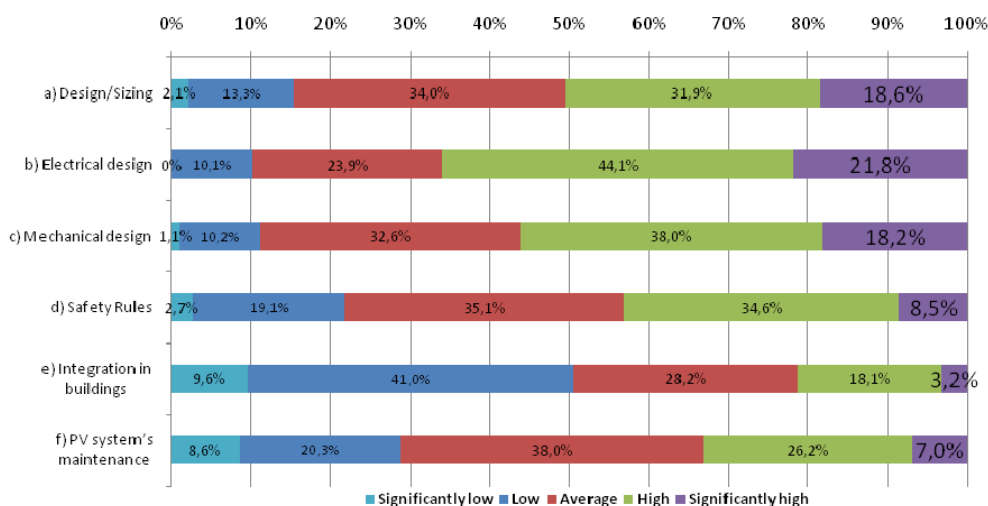


Figure 4: Rating of installers' skills according to the survey responders

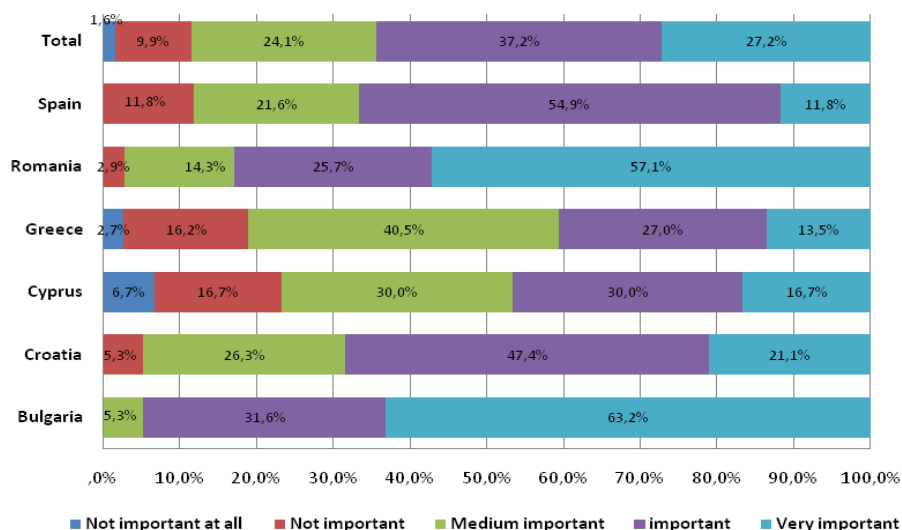


Figure 5: Importance of appropriate training to the PV market growth

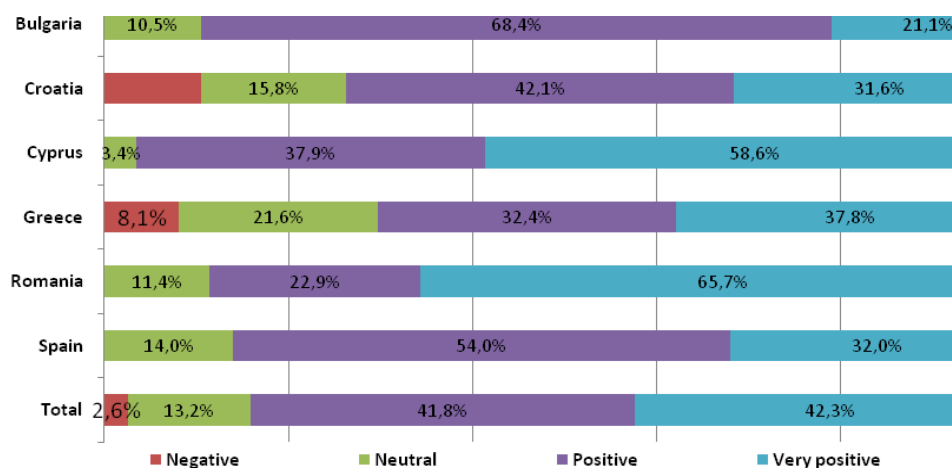


Figure 6: Attitude for the establishment of quality standards leading to installers' certification

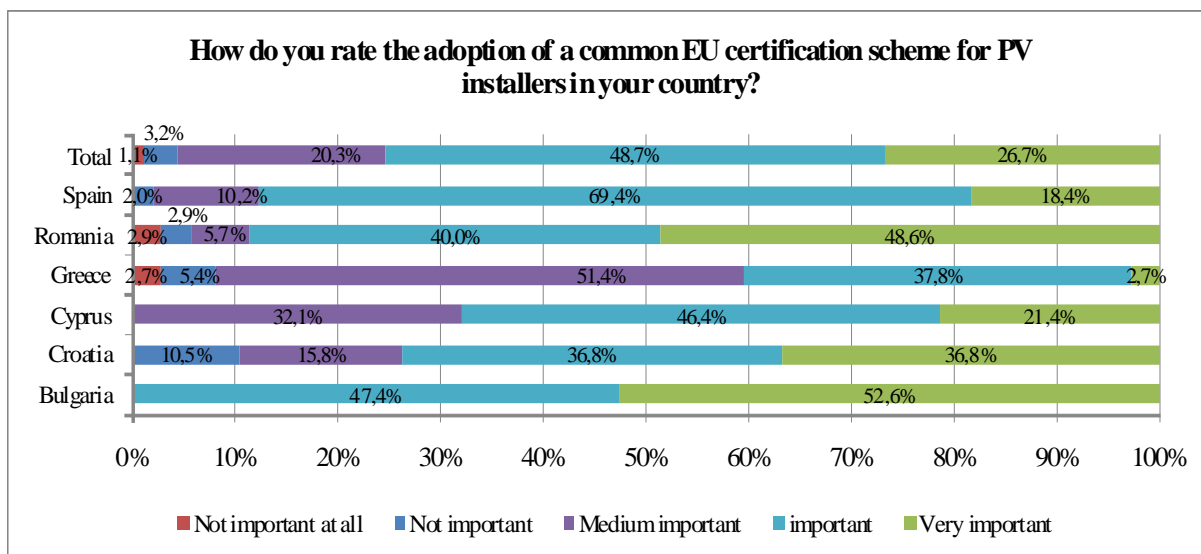


Figure 7: PV market actors' opinion on the importance of adopting an EU certification scheme

A second survey have measured the satisfaction level of PV investors (128 responders) as concerns the quality of the installation process; a significant incidents of technical failures were reported. Indicative findings are listed below:

- The basic motive to invest was to make profit, following to saving money from reduced electricity consumption.
- 91% declare satisfied or very satisfied from their PV installation. However, 42% mentioned technical failures
- Inverters (40%) and fuses (20%) are the parts that the malfunctions occur more often. According to their perception the most probable reasons for these malfunctions are the “PV system components failure”. However it is important to mention that 25% believe that these failures are due to failures in electrical installation, technicians inexperience or improper design
- 30% consider the technical skills of the existing PV installers, in relation to their needs, as non satisfactory
- 74,4% admit that they would be more confident if its system was installed by a certified installer and 52,4% are willing to pay more to have its system installed by certified staff

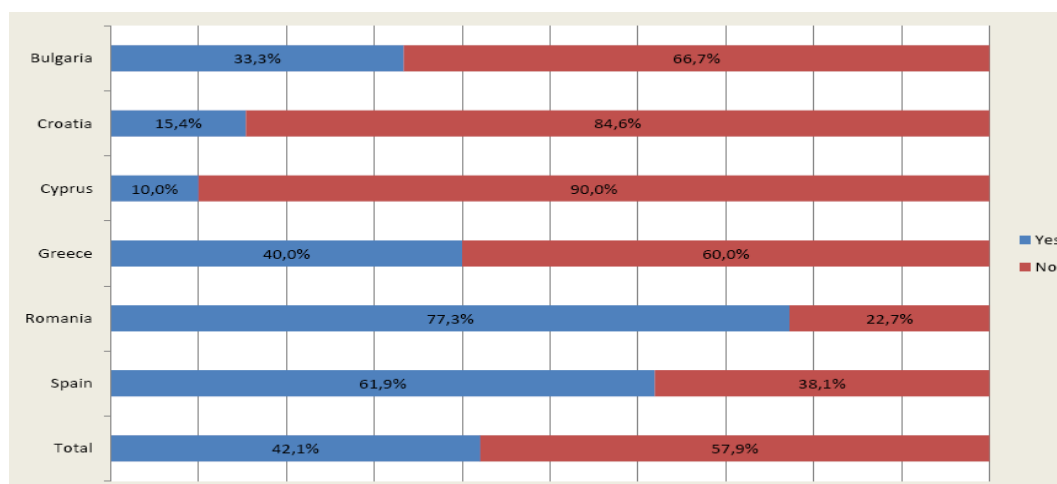


Figure 8: Are there any technical malfunctions occurred during your system's operation?

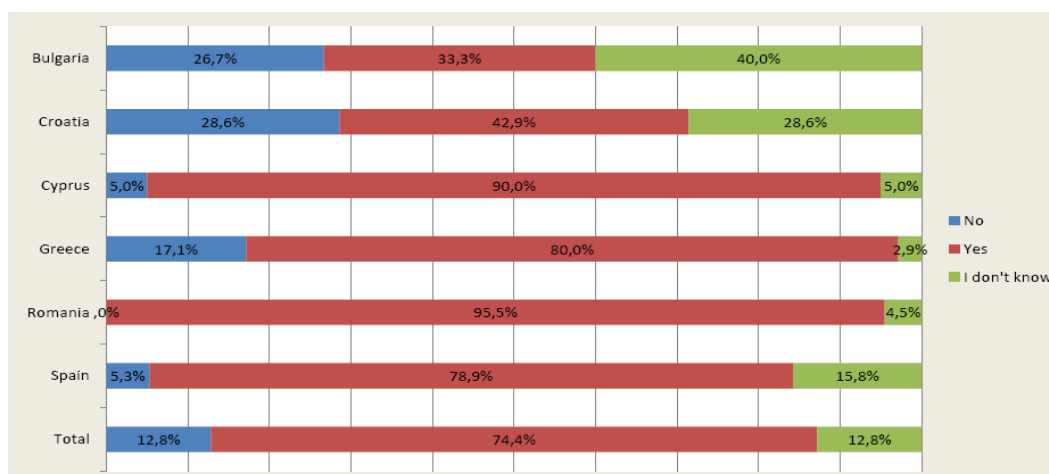


Figure 9: Would you be more confident if your system was installed by a certified installer?

The interaction with the stakeholder groups revealed significant issues which to be taken into account for the scheme's development. They admit that establishment of certification schemes may improve the market function and contribute to more efficient installations. However, they emphasized that decisions regarding the certification requirements and criteria should take into consideration not to add more bureaucratic barriers to the market development or costs to the investors. They confess that many technicians do not have the appropriate competences to install PV, much more are not aware of basic safety and sizing principles; which means high risk of accidents and technical failures. Experts highlight the importance of early practical training in PV. Project-oriented education, external trainings in the industry, and/or lab courses where practical experience can be obtained, are strongly encouraged. The key stakeholders confirmed their intention to actively contribute according to their experience, expertise and area of influence.

3. CONCLUSIONS

The high growth rates of PV installations, further favoured by the EU and national supporting policies, will require a significant number of highly skilled installers to install, repair and maintain them. Furthermore, the interested parties (manufacturers, developers, investors) seek skills certification and quality assurance in all phases of a PV installation (design, installation and maintenance). The shortage of qualified workforce may result to a threat for the PV industry.

Certification schemes can provide reassurance to customers that a contractor has the organisation, competence and equipment to complete PV installations safely and effectively.

The PVTRIN initiative, which is co-financed by the Intelligent Energy-Europe programme, addresses the market needs by developing an appropriate training and certification scheme for technicians who are active in the installation and maintenance of small scale PV systems, which will provide the key components for developing a European acknowledged certification scheme.

The implementation of the certification scheme provides benefits for the installers, the PV industry and the society:

- Creating a qualified installers workforce, the PVTRIN certification supports the EU PV Industry to address the need for skilled technicians. The increased confidence of PV investors will lead to market growth.
- The certified installers gain professional competitive advantage, improving their technical skills and knowledge; the certification provides the “passport” to the EU job market.
- Developers and engineers will profit by the existence of skilled installers. Involving them in their PV projects means efficient installations, less technical failures and satisfied customers.
- PV investors win confidence that the appropriate level of quality and performance is met and maintained for their PV system.

- National authorities will find a supporting instrument to meet their obligations for acknowledged certifications for RES installers till 31/12/2011.
- The entire society is to benefit; the higher PV penetration to the energy mix will reduce the greenhouse gas emissions improving citizens' quality of life.

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