

TRAINING, SKILL AND CERTIFICATION IN PV INSTALLATIONS

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ABSTRACT: In Italy the installed PV power has increased from 120 MW at the beginning of 2008 to 800 MW at the end of 2009. As a consequence in the last two years the net value of PV business in Italy has increased of an order of magnitude reaching an annual amount of 1300 M€ In this context it is interesting to evaluate the corresponding training activities for designers and installers especially in Italy, where there is a high amount of imported components and most people have to be trained in designing and installing.

The Directive 2009/28/EC of the 23rd April 2009 introduces a novelty for installers of PV plants. Before December 31st 2012, the Member states have to provide the installers a certification or a qualification system, based on a mutual recognition.

ENEA and Mesos have performed interviews with the installers and installing companies to find out whether they are in favour of a certification and to what extent the education influenced their work.

Keywords: Education and Training, Dissemination, Photovoltaic Plant Installer, PV Market

1. INTRODUCTION

One of the main concern about the diffusion of renewable energy sources (RES) is the availability of good plant installers and maintenance services. The RES associations fear the fact that „bad installers“ will jeopardize the opportunity to increase the RES request. The PV installers, for instance, have to demonstrate that the plants they installed produce the promised energy.

This concern is greatly emphasized in the Directive 2009/28/EC of the 23rd April 2009 on the promotion of the use of energy from renewable sources approved by the European Parliament and Council .

In Italy, the different institutions are working together to define how to fulfill the guidelines expressed in the Directive.

ENEA, the Italian Agency for new technologies, Energy and Sustainable Economic Development with Mesos company (ENEA spin off), and CEPAS, the national professional certification body, have set up a blended learning system of certification on voluntary bases. After having followed a formation programme and an examination of competence by the institutional bodies, the installers and designers, will be inserted in a register as a “certified installer”.

This experience will be presented in the European project QualiCert which is going to provide “homogenization among different European countries, as well as a mutual recognition system to grant their freedom to work, as installer in any of the 27 European countries.

The e-learning courses can be used for dissemination in other countries as they have been translated in French by the African Association of Engineers.

2. MARKET SITUATION IN ITALY

2.1 PV Plants

The second phase of the “Conto Energia” promoting Programme will be concluded by the end of this year. The installed PV power that has reached today is about 1500 MW (Fig. 1) with an increase of 150 % as respect to the previous year. At the end of such phase the milestone of 2 GW is expected to be overcome. In fact the growth rate recorded during the last months is about 90 MW per month while for the next months is foreseen

an increase of such rate owing to the consistent reduction of the incentive tariffs introduced with the third phase of the Programme. In this contest, :

- almost 100 000 plants have been installed all over the country;
- the average system price decreased with a rate of 10%/year, reaching a value of 3,0 €/W for large free standing applications while in the case of small rooftop, the prices have recorded a wide spread ranging from 3,5 €/W to 4,5 €/W;
- the module prices have reached during the last months the lowest values of 1,5 €/W for large volume orders;
- bureaucratic problems related to the incentive mechanism have been mostly overcome while the ones concerning plant construction and grid connection seem to be enough smoothed.

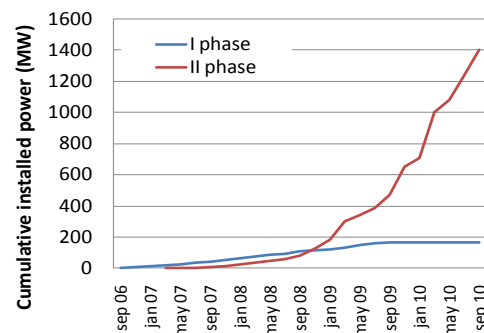


Figure 1: Installed power in the framework of the first and second phase of the Programme

However, the growth of the national PV production has not been adequate to the installed capacity. By the end of 2009, the production of photovoltaic modules, both single and multi crystalline technologies, amounted in fact to only 163 MW with a very modest increase with respect to 2008 [1].

During the year 2009 have been identified full time labour places in the following activities:

- Public research and development: 150
- Manufacturing and distributor of products (module, inverter and systems): 3 000
- Installation companies: 5 000

d) Utilities and government: 100

In this situation, characterized by a faster and faster “transfer” of production toward cheaper man power countries, it is important, at least, that the design and installation of plants is properly done and according to technical norms and rules.

Taking into account the expected growth of the Italian PV market, (see Table I), a continuous increase in the demand of skilled persons is needed.

Year	New installed (MWp)	Installers to be trained	Installers employed
2007	70		600
2008	338	675	3000
2009	723	950	5000
2010e	1000	1215	7000

Table I: Estimation of required installers

There is not only a demand for engineers (electronic, electric, civil, industrial, mechanical, energy and environmental) to occupy many different jobs, but also by law certified experts can become designers of photovoltaic plants, or, further down the line, installers or maintenance mechanics or inspectors.

In a period in which the labour market is rough, the field of renewable energy offers great opportunities, and seen the fact that well trained personnel is hard to come by, it is not strange that the amount of specialized courses in this field is growing fast.

2.2 Legal framework

The Italian law provides specific rules for professionals. Based on the Ministerial Decree (22 January 2008 N°37) for installers, companies are allowed to install small plants among which plants as defined in art. 14 of the EU directive 2009/28, if at least one of the employee has one out of the five following professional requirements ranging from University technical degree to 6 years of experience as owner of an installing company

In order to start a new activity, the company has to comply with the requirements foreseen by the legislation and will be then recorded at the Chamber of Commerce register. The Chamber of Commerce verifies, on a random basis, if the company comply with the foreseen requirements and operates properly.

For the designers of photovoltaic systems other rules apply. In order to practice the profession of "designer of photovoltaic systems" the person has to be either an engineer, an architect or a technician. They must be obligatory registered in a Professional Rank, to have the right to authorize projects, execute evaluations, consults, certification. First registration requires a degree, an admission test, and has an annual cost of around 100 Euros, but no type of update training or work experience is required.

3. TRAINING IN PV SECTOR

3.1 Overview

The Italian renewable energy sector gives clearly positive signals in contrast to the crisis of the labour market. The “green” industry promises vast new employment opportunities.

The educational panorama offers a multitude of informative seminars, symposia and workshops lasting

half a day or a day, often organized by associations, local authorities, schools or banks aimed at raising awareness amongst citizens of PV opportunities.

The courses offered, range from University master courses, to higher technical education financed by regional funds, to courses offered by companies working in the sector and to courses organized by educational institutions.

The big gap to fill in a field as dynamic and vital as photovoltaics is primarily the training of qualified technicians, who still need specialized and aimed training courses, dedicated to those who want to convert or upgrade their skills.

Training courses for designers or installers of photovoltaic plants are offered by large companies in the sector, who, because of their troubles in finding trained personnel on the labour market, often organize internal trainings for new recruits, or paid courses for non-staff.

3.2 Training structures

Nowadays public or private institutions operating in the sector also offer courses for aspiring designers or installers. Training in the Photovoltaic field is provided by different stakeholders such as training centres and manufacturers but few courses include a final examination.

Most of the courses for installers are provided by the companies in the sector and generally have a duration of 8-24 hours, are held in two to three days, have no more than 2 speakers and includes almost always a visit to the company’s plant. This type of course does not include entrance criteria, and the trainees do not have to pass a final examination and almost all receive a certificate of attendance at the end of the training.

The training courses organized by training institutions associated with universities or research centres have an average duration of 25 to 100 hours. This type of courses are primarily aimed at professionals of the field in order to update and/or deepen their knowledge on the design of photovoltaic systems or technical regulations. The courses are run by researchers or academic speakers and are primarily aimed at professionals who already work in the field and who require updates and /or deepening of their knowledge on the design of photovoltaic systems or on technical regulations. Such as the courses offered by ISES Italia, Italian Association of International Solar Energy Society, and the various professional Associations (engineers, architects, surveyors, etc.).

Vocational education in the field of PV has been developed for young science graduates. These master courses have an average duration of two years and require a significant financial commitment and issue a university degree or consist of courses financed by public funds aimed at young unemployed.

Those who have little time to follow long masters degrees and limited possibilities to travel can choose one of the E-learning courses, such as the course for Designers of Photovoltaics available on ENEA’s platform (<http://192.107.92.31/fadivgen2/>).

3.3 State of the art [5]

There is no official certification and accreditation scheme for PV installers in Italy.

However, training in the field of PV systems is organized by different actors.

The variety of training structures may therefore cause some confusion and overlapping in competences.

There are two certified courses in Italy:

- ENEA, organizes certified training accredited by CEPAS for Personal and Training Body. In this contest, ENEA has launched a spin-off, Mesos, for the certification of different professional skills in the field of PV both for designers and installers (the free e-learning courses are considered as a prerequisite for the on-site courses). The lecturers are researchers working in ENEA's photovoltaic research center, qualified by CEPAS. The course is primarily attended by engineers and professionals who wish to acquire technical and practical competences and specialize or qualify .
- CREA (Energy saving and environmental quality research centre) recognized by ESACert (European System for Accreditation and Certification Bodies energy and environmental, based on CEN standards) also provides certified training on Photovoltaic field and heat pumps.

3.4 Training and certification: results of an inquiry

ENEA with Mesos and CEPAS, have set up a blended learning system of certification on voluntary bases, under the ISO/IEC 17024 standard (ex EN 45013) "General requirements for bodies operating certification of personnel and training", composed by three parts:

- an on line free e-learning course to provide knowledge on photovoltaic plants,
- a certified face to face course to provide the ability to design a PV plant
- and finally an examination of the activities performed in the specific field in order to ensure the necessary competences. People that pass the final examination will be inserted in a register as a "certified installer".

Mesos and ENEA have performed an inquiry with the designer, installers and installing companies to find out whether they are in favour of a certification and to what extend the education influenced their work.

Up to now Mesos and ENEA have organized eight editions of the designers course and three for installers of PV plants, they have trained 207 people, of which 152 designers and 55 installers. With some exception (9%) all of which were men (91%) with an average age of 37 years. Seen the fact that the trainings have all taken place in Rome, most participants come from the Lazio region, but due to the high quality standards the ENEA/Mesos course attracts trainees from all over Italy.

Analyzing the results of representative sample of 31 people who have responded to our questionnaire, the most eye catching fact is that 65% of the trainees have changed their working situation due to the course.

Most of the respondents (58%) have enlarged their activities adding Photovoltaic, other former trainees (13%) consequently the course have found a new job or started an own company, another 22% has not changed sector or activities yet (Fig.2).

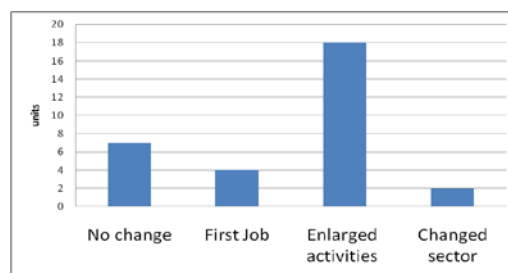


Figure 2: Changed PV Job Situation

In fact after the course 14 ex trainees out of 31 have left their sector to start or enlarge activities as a designer in the PV sector, and 11 as an installer of PV plans. But we have to note here that some them perform both activities (designer and installer) at the same time, and that another 12 respondents work in the PV sector as resellers or consultants.

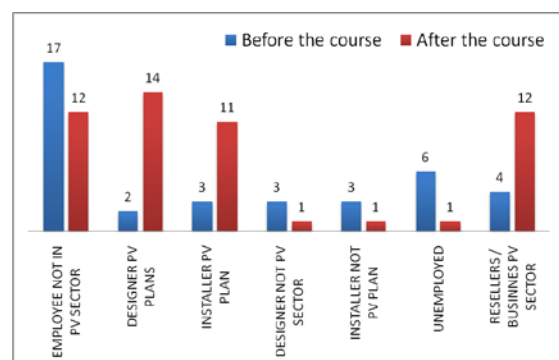


Figure 3: Job Situation, before and after the course

Figure 4 shows that 40% of the interviewed participants state that for their new activities the participation of the course was very important, and the 23% that it was quite important.

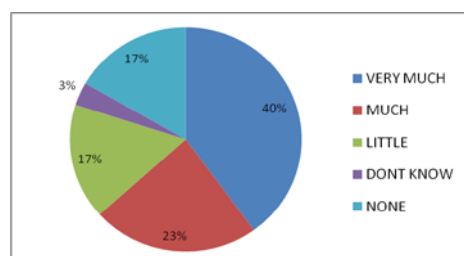


Figure 4: Significance of the participation at the course related to the new job

The following table II shows the total power installed/designed by the ex trainees in the last 3 year, and the total number of plants.

Year	2008	2009	2010
Total Power (kW)	251	664	6335
Number of plants	18	50	78

Table II: Total power of plants installed/designed by the ex trainees during the last 3 years

Comparing the results of our interview to the development of the national installed PV power, (see fig. 1), it is evident that the increase in the last three years follow the national trend. Particularly, the last year, the ex trainees of the ENEA/Mesos course have strikingly increased the total power installed/designed with an order of magnitude. According to us, there are two reasons: one, the market was very prosperous, second, the trainees' grown experience in PV sector after the course. Most of the plants installed are small or medium sized.

Because the PV technology is constantly in progress, most of the ex participants (75%) believe they need additional professional training, in particularly on new technical norms, regulation for grid interconnection as well as new emery technologies.

The interview also contained some questions on the knowledge and appreciation of the Directive 2009/28/CE.

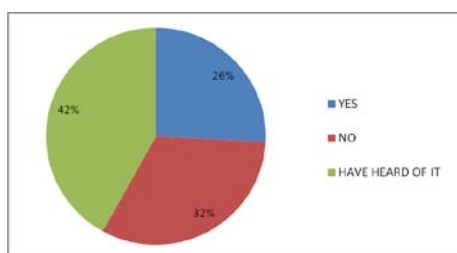


Figure 5: Knowledge of the contents of the Directive 2009/28/CE

Little more than a quarter (26%) of the respondents actually does know the Directive 2009/28/CE, in particular the obligation of qualification for installers, 42% of the participants have heard of it, while 32% doesn't know the Directive.

All the respondents are in favour of setting up at a certification scheme for installers of PV plants. Considering that, to in order to pass the qualification scheme adopted by ENEA/Mesos/Cepas, a post exam experience of two years is needed [7], it is clear that not all participants can go on with the qualification.

At the moment there are three designers, and three installers in the CEPAS register for qualify professionals in PV sector in Italy.

Figure 6 shows the most important reasons why ex-trainees aren't qualified yet.

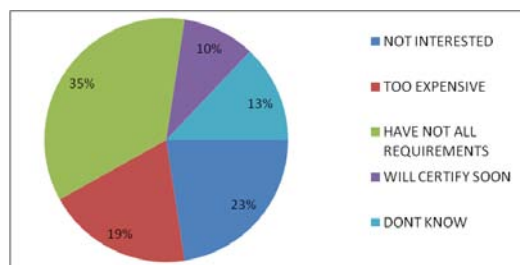


Figure 6: Reasons for not being qualified yet

Besides 23% of the interviewees that are not interested in the certification, the rest of the participants, even if they are interested, haven't yet completed the path to qualification yet: 19% thinks it's too expensive, while 35% has not all the requirements yet, but 10% are intentional to go up for qualification soon.

4. THE ITALIAN CERTIFICATION AND QUALIFICATION SCHEME

4.1 Certification scheme in PV sector

Before the 31st of December 2012 the State Members must define the certification schemes or equivalent qualification schemes for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps as reported in Art 14 – *par. 3* Those schemes may take into account existing schemes and structures as appropriate and be mutually recognized by other Member States.

In particular in the Annex IV - *certification of installers* – reports the criteria of the certification schemes or equivalent qualification schemes which shall be transparent and clearly defined by the Member State or the administrative body they appoint. All installers shall be certified by an accredited training programme or training provider. Their accreditation shall be carried out by Member States or appointed administrative bodies. The accrediting body shall ensure that the training programme offered by the training provider has continuity and regional or national coverage. It also for see short refresh courses on specific issues, including new technologies, to enable life-long learning in installations.

4.2 National Renewable Energy Action Plan

In accordance to article 4 of the Renewable Energy Sources Directive 2009/28/EC [2] the Commission adopted the Decision 2009/548/EC [3] establishing a template for National Renewable Energy Action Plans (NREAPs).

The Italian NREAP [4] was submitted by the Ministry of the Economic Development to the Commission on 29th July 2010, in accordance to the template established. The Plan was drawn up after extensive public consultation that involved both institutional authorities and environmental groups and associations. it was also shared with local authorities and the regions that will be involved in following phases of implementation, in establishing the regional breakdown of the national target (so-called burden sharing) and defining a system of regular monitoring of achievements.

It provides an overview of national policies on clean energy, describing objectives such as security of supply, the Socio-economic and environmental benefits, and the main strategic lines of action attempting to achieve, by 2020, 17% green energy in the final consumption not only for electric use but also thermal and transport usage.

With reference to the 'extra energy efficiency scenario' (SEES), in 2020 the final consumption of renewable energy will reach to an amount of about 22.6 Mtoe out of a total of 133.0 Mtoe.

According to Article 14 – *information and training* of the RES Directive in the NREAP Italy has reported all policies and measures ensuring that information on support measures is made available to all relevant actors by the supplier of the equipment or system or by the national competent authorities. Information campaigns are not mandatory but planned to begin in 2010 and last 2020.

4.3 The European Qualification Framework (EQF) and the European Project "QUALICERT"

In the European Qualification Framework [6], published in April 2008, it is underlined how important it is to establish the knowledge, the skills and the competences which are needed in order to be considered "good professionals". Schools and universities often educate students with the necessary knowledge and the right skills, if training in the laboratories is foreseen, but they cannot provide evidence of the acquisition of competences. It is therefore necessary to set up schemes for organizations who can certify that a person has also the necessary competences to perform a specific task. This is particularly in the case of new professions like the "installers of renewable energies plants". Therefore a network of all the main renewable energies organizations has set up a European project, "QualiCert", which will define the competences that the installers should have.[7] Then, each member state will organize courses to be validated by third parties certificated national bodies.

The EQF will be used to fulfil the requirements of article 14 of the European Directive for the promotion of renewable energies sources.

5. CONCLUSION

Article 4 of the Law 115/2008 has assigned to ENEA the task of the National Energy Efficiency Agency. ENEA supports regional and local authorities in energy planning, and ensures together with GSE (the Italian Operator for Electric Services www.gse.it) the monitoring of electric power from renewable energies.

Considering his long experience in R&D and training on PV, the Ministry of Economic Development in the NREAP [4] takes into account ENEA as the most appropriate agency to develop, in cooperation with regions and regional training agencies, different instruments to increase information and training in RES.[2]

These instruments are e-learning courses and face to face courses aimed to installers, designers, end-users, trainers/teachers according to European standards ISO and certified by CEPAS (www.cepas.it) the National Certification Body for Personnel and Training courses.

The experience achieved by ENEA through the participation in the Community program Qualicert. will be enhanced.

6. REFERENCE

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