PVTRIN
INSTALLER CERTIFICATION

TRAINING OF PHOTOVOLTAIC INSTALLERS

Development and implementation of a common certification scheme for PV installers

Review of current PV installer certification schemes in Europe
(WP5 –D5.1)

INTELLIGENT ENERGY EUROPE

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PVTRIN: The PVTRIN project scope is the development of a training and certification scheme for technicians, according common accepted criteria and standards, focused on the installation and maintenance of small scale PV.

The expected results are: Accredited training courses and an operational certification scheme for PV installers in 6 participating countries; Practical training material/tools for installers and their trainers; Web portal with access to technical information on PV installation/integration; 8 pilot training courses implemented, a pool of skilled/certified PV installers; A roadmap for the adoption of the certification scheme across Europe.

Long term, PVTRIN will contribute to the PV/BIPV market growth in the participating countries, provide a supporting instrument for EU MS to meet their obligations for acknowledged certifications for RES installers till 31/12/2012 and enforce the MS efforts to achieve the mandatory target of a 20% share of energy from RES in overall Community energy consumption by 2020. The PVTRIN is co-financed by the Intelligent Energy - Europe (IEE) programme.

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European Photovoltaic Industry Association (EPIA)	EU
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1 Summary

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 certification is available sometimes a number of different schemes operate, usually in different regions. Where training courses are available these generally have different eligibility requirements and qualifications.

This report reviews the different schemes available throughout Europe and concludes that in all Member States there is the potential for introducing the PVTRIN scheme. Often this would involve modifying the training requirements for existing schemes to include successful completion of a PVTRIN training course and examination.

2 Introduction

Within Europe demand for the installation of photovoltaic (PV) systems is increasing dramatically due to the introduction of financial incentives for the generation of 'green' electricity and an increasing awareness of sustainability and climate change issues.

For many people the installation of a PV system represents a significant financial commitment yet they will have little or no knowledge of the technology they are investing in. Customers must therefore place significant trust in their PV installer. Certification schemes can provide reassurance to customers that an installer has the organisation, competence and equipment to complete PV installations safely and effectively.

An objective of PVTRIN is the development of a clearly defined and understandable certification scheme for PV installers.

The first stage in developing the certification scheme was a review of current PV installer certification schemes in Europe. In this respect we note and acknowledge an earlier review of certification schemes in Europe that was conducted by the 'Qualicert' project and published in Qualicert Deliverable D2.1 'List of existing schemes by country and summary of the research work'. The PV installer initiatives identified in this report have been reviewed, updated where appropriate, and included in this report. In addition PVTRIN partners have contributed information at a national level from their own countries. Information was collected in a common format using a questionnaire which was sent to all partners. Additional information was also collected from literature and internet searches.

3 Definitions

Throughout this document the following definitions apply:

Accreditation

Confirmation of ***competence*** to carry out specific conformity assessment (e.g. certification) tasks

Certification

Procedure by which a third party gives written assurance that a product, process or service (e.g. installation of PV systems) conforms to specified requirements

Competence

Demonstrated ability to apply knowledge and/or skills

4 Review of current PV Installer certification schemes in Europe

This review has focussed on PV installer certification schemes in the following countries:

- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- France
- Germany
- Greece
- Italy
- Netherlands
- Romania
- Spain
- United Kingdom

Information for this review was obtained by PVTRIN partners for their own countries using a questionnaire developed by BRE. Also BRE has collected PV installer certification information for other EU Member States and has included relevant information, updated where appropriate, contained in the Qualicert deliverable D2.1 'List of existing schemes by country and summary of the research work.'

The information obtained for each of the countries listed above is detailed in the following sub-sections.

4.1 Austria

Austria operates a certification scheme managed by the Austrian Institute of Technology.

To obtain certification under the scheme for PV installers must attend a training course and pass an exam. This is the same process (course and examination) as that included in the PVTRIN project and so provided that the course content meets the requirements defined by PVTRIN the Austrian approach would be compatible with the scope of PVTRIN.

Subjects included in the training course are:

- Fundamentals, types of PV systems
- Working principle of solar cells
- Components, guidelines, tax aspects and subsidies
- Planning and dimensioning of grid-connected and stand-alone systems
- Dimensioning using simulation programmes
- Mounting systems and building integration of PV systems
- Installation and commissioning, function and yield monitoring
- Cost-effectiveness, marketing and sales strategies

The training course consists of 6 days of theory, 1 day of practical training and 1 day for the exam. The cost of attending the training course is €1,400 and the cost of taking the exam is €200. There is also a €260 fee for membership of the certification scheme. Certification is valid for 3 years but may be renewed subject to additional training requirements.

AIT is accredited to EN 17024 'Conformity assessment — General requirements for bodies operating certification of persons'. AIT's training is conducted in collaboration with partner training centres – principally WIFI Steiermark.

4.2 Belgium

Belgium has a number of different PV installer quality schemes either operating or in preparation.

PVQUAL

PVQUAL is operated throughout southern Belgium by the 'Renewable Business Facilitator' or RBF – see http://www.energyplatform.eu/. It is a self certification scheme which means that no certification body is involved. Consequently the scheme is not accredited and in its current form would not be compatible with the PVTRIN scheme.

To become a member of PVQUAL an installer must provide details of their company, details of the last 5 PV installations completed by the company, the total number of installations completed and the cumulative output (in kWp) of these installations. Details of the training and experience of employees is also required. Members must also commit to a quality charter consisting of 11 components examples of which include:

- Use appropriately qualified installers (e.g. for electrical and roofing work)
- Provision of appropriately tested equipment (e.g. to EN 12975 for crystalline PV systems)
- Provision of a detailed quotation for work including the products to be installed, cost, warranty and estimate of annually energy production
- Assistance with claiming financial incentives.
- Confirm that technicians and sub-contractors either have appropriate training or will receive such training within 18 months.

Membership of PVQUAL costs €500 and over 200 installers have signed up to the charter. Should the training requirements of PVQUAL include the successful completion of a PVTRIN approved course then PVQUAL could be made compatible with the scope of PVTRIN.

Quality Centre for Sustainable Energy Technologies - QUEST

QUEST operates a quality label for photovoltaic installers. No certification body is involved and there is no accreditation for the scheme. Thus currently the scheme would not be compatible with the scope of PVTRIN.

To qualify for the QUEST label installers must provide a technical dossier for assessment by the QUEST Technical Commission. This information required in the dossier includes:

- Example quotes and contracts
- Design and installation details
- Products installed, technical specifications and manuals
- Warranty details
- Estimate of annual energy yield

In addition to reviewing the documentation sample audits of installations are also performed.

The application fee for QUEST is €1950 for companies with up to 5 employees and €3000 for larger companies. Certification is valid for two years. Very few companies have joined the scheme, a general search using the QUEST website retrieved only 5 installers.

Development of Quality References in Distributed Renewable Energy Concepts in Belgium - Q-DIRECT

Q-DIRECT was a project commissioned by Belgian Science Policy with the objective of defining guidelines for policymakers to encompass the growth of the renewable energy industry in Belgium. The objective of the first phase of the project was designed to identify the technical basis of an integrated quality scheme through a review of the state of the art of photovoltaic systems. Phase one of the project concluded with the recommendation for PV installers that:

- Initiatives such as PVQUAL and QUEST should be supported to improve quality and form the basis of a Belgian quality scheme and related quality controls.
- Training of PV engineers and installers should be prioritised. Certified training programmes based on international good practice manuals should developed.

See http://www.belspo.be/belspo/ssd/science/Reports/QDirectPhase1_finalrep_en.pdf

Since Q-direct is concerned with guidelines and recommendations rather than the training of PV installers themselves the approach is not compatible with the scope of PVTRIN although the guidelines and recommendations made may facilitate the development of a PVTRIN compatible training and certification programme.

4.3 Bulgaria

Currently there is no certification scheme for PV installers in Bulgaria. There are however certificated training courses for renewable energy installers, including PV, which are managed by the Ministry of Education and Sciences. These courses could form the basis of a PVTRIN compatible training and examination programme for PV installers.

There is also product certification managed by the Bulgarian Institute of Standardisation.

4.4 Croatia

There are no certification schemes for PV installers in Croatia. The Vocational Education Agency developed an approved training course under the CARDS 2003 programme and also provided a laboratory/training room complete with PV equipment. The course consisted of 136 hours of training (approximately 1 month) including both theoretical and practical exercises and concluded with an

examination. The course was developed for individual installers who were required to provide evidence of relevant secondary education to qualify for the course. The course was held once in 2007 for 30 unemployed delegates but has not been repeated. There was no fee. The course and examination could, if updated, be compatible with the scope of PVTRIN.

4.5 Cyprus

There are no certification schemes for PV installers in Cyprus. Any scheme that is developed would be the responsibility of the Cyprus Organization for Standardization (CYS). CYS has the appropriate expertise and the qualified personnel, but has not yet received a request to develop such a scheme.

CYS works with the international organisation RABQSA in the certification of professional skills and training programmes. See http://www.rabqsa.com/

4.6 France

A number of different PV installer certification schemes operate within France. These are:

- QUALIBAT
- QualiPV
- Qualifelec

QUALIBAT

QUALTIBAT is a not-for-profit organisation established in 1949 to provide qualifications and certifications in the construction sector. The scope of QUALIBAT now includes the installation of roof mounted, free standing and integrated photovoltaic panels with an output of less than 10kWp. Currently these certifications are not included in QUALIBAT's accreditation schedule (from COFRAC).

To meet the requirements of the photovoltaic certification schemes companies must provide details of previous installations and provide evidence that they:

- Are a legal entity, are financially secure and have appropriate insurance
- Have appropriately trained and experienced technicians – at least one technician must have 5 years or more relevant experience – for the design, installation and maintenance of photovoltaic systems
- Have appropriate operating procedures, including safety procedures, and possess the correct installation equipment
- Are able to provide customers with reliable estimates of energy performance and information about financial incentives

Assessments are conducted by independent auditors appointed by QUALIBAT. This 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. Since no specific training course is included the QUALIBAT scheme is not compatible with the scope of PVTRIN. However the certification process would be compatible if successful completion of a PVTRIN training course was included as the training requirement.

QualiPV

QualiPV is a certification scheme operated by the Qualit'EnR organisation. Qualit'EnR was created in 2006 by five professional entities (CAPEB, Enerplan, UCF-FFB, UNCP-FFB and SER).

Photovoltaic installer companies seeking QualiPV certification must sign up to a 10 point charter which includes:

- Ensuring that the company is a legitimate legal entity and has appropriately trained employees.
- They install equipment that complies with relevant regulations and standards, and best meets the customer's needs.
- Advise customers and help them choose the solutions that best meet their needs.
- Following a property survey, provide the customer with a complete, descriptive estimate in writing for the proposed installation.
- Inform customers regarding administrative requirements, such as submitting notifications prior to the installation or qualifying for available state aid.
- Complete the installation in compliance with the customer's order and best practice.
- Calibrate and start the installed system. Give the customer the technical installation and user's manuals for the equipment.
- Give the customer a complete, detailed invoice for the service provided as well as any statement the customer needs to claim applicable aid or tax incentives.
- In the event of incidents involving the operation of the installed equipment, respond rapidly and perform the required verifications and repairs.
- Facilitate any verification or audit that Qualit'EnR may wish to perform of installed systems.

As with QUALIBAT the requirements of QualiPV is very similar to the proposed scope of PVTRIN and so if the training requirement was to include successful completion of a PVTRIN course the QualiPV scheme could be compatible with the scope of PVTRIN

Qualifelec

Qualifelec is a private association which delivers qualifications to electrician companies. A new qualification, termed 'Solar Photovoltaic' or 'SPV', has been developed for photovoltaic installations, which is linked to their electrical qualification.

Applications are assessed by a committee consisting of representatives of professional organizations and consumers.

Photovoltaic installers seeking to achieve the Qualifelec qualification must provide evidence of:

- Membership of the Qualifelec 'Electrotechnique' scheme
- The legal and financial status of the company
- Details of the training and experience of technicians
- Details of the installation equipment used by the company
- Details of recent photovoltaic installations completed by the company.

The Committee assesses the application of the company based on the documentation sent and may also carry a technical audit of a sample of the installations completed by the company. For successful companies certification is awarded which is valid for 4 years and which is reviewed every 2 years.

Again, if the training requirements of Qualifelec were to include successful completion of a PVTRIN course then the Qualifelec scheme could be compatible with the scope of PVTRIN.

A probationary certification is available for companies that are not members of the Electrotechnique scheme or which are unable to provide evidence of PV installations that they have completed. This is termed 'Provisional Solar Photovoltiaic' or 'PSPV' and is valid for 2 years. After this time the certification may be upgraded to the full version following a review of the full set of evidence requirements.

4.7 Germany

Currently there are no certification schemes for PV installers in Germany. This is because Germany operates a legally binding and regulated system that requires high quality training and education of its workforce. This includes theory based training courses held at specialist training organisations combined with employer provided training in the practical aspects of PV installation. The training courses, if compatible with PVTRIN requirements, could form the basis of a PVTRIN scheme in Germany

4.8 Greece

There is no official certification scheme for PV installers in Greece and so systems are often installed by electricians or engineers with a variety of formal training ranging from no formal training at all to competent technicians with many years experience. This is not compatible with the scope of PVTRIN and so the introduction of PVTRIN approved training courses leading to PV installer certification would provide a valuable resource for PV installers and their clients.

4.9 Italy

The Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) has developed training courses for renewable energy systems including both the design and installation of photovoltaic systems. The courses include distance learning and classroom based training and are delivered by independent training organisations that have been approved by CEPAS – a not-for-profit Italian personnel and training courses certification body accredited to ISO/IEC 17024 by Accredia, the Italian National Accreditation Body.

To attend a class-based training course a PV installer must first achieve a certain level of training and experience. To assist potential delegates in achieving the minimum level of training ENEA have developed e-learning courses, some of which are delivered through the DESIRE-net project (Development and Sustainability with International Renewable Energies network) see http://www.desire-net.enea.it/index.htm. Candidates undertaking the e-learning courses must pass an intermediate examination to confirm their level of knowledge before attending the classroom based part of the training course.

The classroom based part of the photovoltaic installer course involves 3 days of training followed by written and practical examinations. The fee for this course is €1000. Delegates successfully completing the course are awarded a certificate. This approach would be compatible with the scope of PVTRIN if the training courses included in the scheme were PVTRIN approved.

4.10 Netherlands

A major concern amongst developers of PV systems in the Netherlands has been the lack of a certification program for installers. As a consequence the Dutch government has commissioned a project team consisting of its division for renewable energy, the building standardisation association, the association of installers, and the national association for the solar energy industry to develop a recommendation for defining a certification program for PV installers and installations in line with the requirements of the RES directive. This approach would be compatible with the scope of the PVTRIN scheme.

There is also a certification scheme for PV installation companies operated by the KBI Foundation. Under this scheme independent certification bodies are licensed by KBI to assess and certificate PV installation companies. Certification is valid for 3 years and is maintained through annual audits.

The requirements of the scheme include:

- Assessment of the legal status of the company
- Appropriate training and/or experience of employees

- Assessment of previous PV installations
- Assessment of individual installers

If the training requirements of the KBI scheme were to include successful completion of a PVTRIN approved course then this scheme could be compatible with the scope of PVTRIN

4.11 Romania

Currently there is no certification scheme for PV installers in Romania, but a law published in 2008 and republished and modified in 2010 contains an appendix that relates to certification schemes for installers of renewable energy systems, including PV.

Guidelines for a certification scheme have been developed and for applicants these include:

- Being a certificated electrician
- Participation in a training programme, equivalent to 3 years of theory and practical training in photovoltaic installations, covering the design, installation and maintenance of PV systems and including energy assessment and safety issues.
- Knowledge of European standards and certification schemes (e.g. MCS)
- Ability to work safely using appropriate tools and procedures
- Ability to specify and design PV systems, including solar resource assessment and structural considerations

The training course may be operated by a PV equipment manufacturer, training institute or association and should conclude with the certification or qualification of the installer.

Certification would be for a fixed period with recommendations that installers attend regular training courses and workshops.

This approach has similarities with that of PVTRIN and so, provided the training requirements and training provider are PVTRIN approved, could be compatible with the scope of PVTRIN.

4.12 Spain

There is an initiative in Spain led by 'Asociación Española de Normalización y Certificación' (AENOR) in collaboration with Federación Nacional de Empresarios de Instalaciones Eléctricas y Telecomunicaciones de España (FENIE) to develop certification for low voltage installations by specialists in renewable energy services and PV installers in particular. The certification scheme will include assessment of;

- Quotation and contract procedures
- Quality management system
- Installation and maintenance procedures
- Training and experience of technicians

An internationally recognised diploma in the field of PV installation is also available from the Centro de Estudios de la Energía Solar (*CENSOLAR)*. Other universities and technical schools also offer seminars and training courses on renewable energy systems. This initiative could be compatible with the scope of PVTRIN if the training requirements were to include successful completion of a PVTRIN course.

4.13 United Kingdom

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.) and a number of certification bodies are sub-licensed to operate the various installer and product certification schemes within MCS. See www.microgenerationcertification.org

The certification bodies offering MCS certification must be accredited to EN 45011 by the United Kingdom Accreditation Service (UKAS) for the appropriate MCS standard or scheme document. The relevant standard for PV installers is MIS 3002 'Requirements for Contractors Undertaking the Supply, Design, Set to Work, Commissioning and Handover of Solar Photovoltaic Microgeneration Systems'. The key requirements of this standard for contractors include:

- Capacity and capability to undertake the design, supply, installation, set to work and commissioning of PV systems, using sub-contractors if necessary.
- Operation of a satisfactory quality management system
- Be a member of, and comply with, a consumer code of practice approved by the Office of Fair Trading
- Provide a estimate of annual energy performance for PV systems
- Design and install PV systems in accordance with 'Photovoltaics in Buildings – Guide to the Installation of PV Systems. 2nd Edition 2006
- Provide comprehensive documentation to their client
- Notify the MCS licensee of each installation completed

Applicants undergo an office based assessment of their quality management system and an assessment of an installation to establish their competence to install systems to the requirements of MIS 3002. Once awarded certification is maintained through regular surveillance audits – usually conducted annually.

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.

The MCS scheme already meets the requirements of 2009/28/EC and so it would not be necessary to introduce a PVTRIN scheme. However since MCS is voluntary it is possible that a PVTRIN scheme may be established, although if this is not sufficiently robust it is unlikely to be considered as equivalent to MCS.

5 Conclusion

This review has found that in many Member States there is no certification scheme in operation that enables PV installers to demonstrate their competence and quality of work to potential clients. This represents a barrier to the uptake PV within Europe since the complexity of PV systems and their high cost means customers are reluctant to make the required financial commitment without the reassurance that a certificated installer would bring.

Despite this lack of certification schemes this review, and the findings of PVTRIN deliverable D2.1: 'List of relevant training/certification initiatives and identified areas of cooperation' has confirmed that there many training courses and training centres that could be used to develop and deliver training courses for PV installers based on PVTRIN criteria and standards. Some synergies have also emerged with existing schemes. For example there is a general requirement that the installer has relevant training and experience and that this is demonstrated through both written and practical examination. If these requirements were to be modified to include successful completion of a PVTRIN training course and examination this would enable PVTRIN to be implemented in these countries.

In terms of specific skills there is a general requirement that installers are able to design PV systems effectively, including being able to estimate the energy performance of their proposed systems, working with electricity and working at height (e.g. on roofs). They should also be aware of current regulations and standards and be capable of working in a safe manner. Appropriate tools should be used and customers should be provided with adequate documentation regarding their systems (use and maintenance instructions). In addition there is often a requirement that the installer be aware of the economics of PV installations including the tax implications and financial incentives. In many cases the legal status of the installer must also be established.

These findings, and those of other workpackages, will now be used to define the requirements for a PV installer certification scheme including the content of the training course leading to certification. Key areas for the requirements will include:

- Applicable regulations and directives
- Installation and maintenance requirements
- Site specific issues
- System performance
- Technical competencies
- Quality management
- Customer care

Other areas will also be included where appropriate. The specific requirements will be listed in deliverable D5.2 which will be updated throughout the project.

Useful Links

Renewable Energy Directive
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF
PVTRIN www.pvtrin.eu
Qualicert www.qualicert-project.eu

Austria
Austrian Institute of Technology (AIT) www.arcs.ac.net

Belgium
PVQUAL www.pvqual.be/
QUEST www.questforquality.be
Q-Direct www.belspo.be/belspo/ssd/science/projects/Q-Direct_en.pdf

Bulgaria
Ministry of Education and Sciences www.minedu.government.bg/

Croatia
CARDS 2003 http://public.mzos.hr/Default.aspx?art=6481&sec=2468

Cyprus
Cyprus Organisation for Standardisation www.cys.org.cy

France
Qualibat www.qualibat.com
QualiPV www.qualit-enr.org/document/Menu_Haut/.../QualiPV/index.htm
Qualifielec www.qualifelec.fr/

Germany
Federal Institute for Vocational Education and Training http://www.bibb.de/en/

Greece
Hellenic Association of Accredited Certification & Inspection Bodies www.hellascert.gr
National Accreditation Centre for Continuing Vocational Training (EKEPIS www.ekepis.gr
Hellenic Accreditation System www.esyd.gr
Ministy of Education, Lifelong Learning and Religious Affairs www.minedu.gov.gr
Technical Chamber of Greece www.tee.gr

Italy

Italian National Agency for New Technologies, Energy and Sustainable Economic Development www.enea.it

CEPAS www.cepas.it

Netherlands

KBI www.kbi.nl

Romania

Romanian Energy Laws – 220/2008 & 139/2010 http://carboncreditromania.wordpress.com/tag/law-220

Spain

Asociación Española de Normalización y Certificación (AENOR) www.aenor.es

Federación Nacional de Empresarios de Instalaciones Eléctricas y Telecomunicaciones de España (FENIE) www.fenie.es

Centro de Estudios de la Energia Solar (CENSOLAR) www.censolar.es

United Kingdom

Department of Energy and Climate Change www.decc.gov.uk

MCS (formerly the UK microgeneration installer and product certification scheme) www.microgenerationcertification.org