QualiCert Manual

A common approach for certification or equivalent qualification
of installers of small-scale renewable energy systems in buildings

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QualiCert Manual

A common approach for certification or equivalent qualification of installers of small-scale renewable energy systems in buildings

QualiCert stands for "Common approach for certification or equivalent qualification of installers of small-scale renewable energy systems in buildings" and the project started in July 2009.

The large up-take of renewable energy installations in the building sector will require a significant number of highly-qualified installers capable of integrating renewables in both new and existing buildings. It will also be necessary to ensure the good functioning of these systems after installation and make sure that they are well adapted to the individual requirements of each customer and that life-cycle considerations are taken into account at all times.

QualiCert was launched in anticipation of the implementation of Article 14 of the Directive on the promotion of the use of energy from renewable sources (2009/28/EC), obliging Member States to develop and mutually recognize certification or equivalent qualification schemes for installers of small-scale renewable energy systems (e.g. biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps) by December 2012.

The project has identified a number of key-success criteria that should be taken into account when designing a certification or equivalent qualification system.

Any certification or equivalent qualification scheme needs to be embedded in the national training and quality framework of the Member State. Therefore, the development of one European scheme that could be applied to all EU Member States is inappropriate.

The approach taken by this project is in line with the requirement of Art. 14 of the European RES Directive asking Member States to provide such schemes by 31st December 2012. The project involves the national stakeholders of 5 core countries (Austria, France, Greece, Italy and Poland), the other EU Member States being involved through a wide dissemination activity.

Visit the project website to learn more:
www.qualicert-project.eu

Quali**Cert**

Project description

Coordinator

French Environment and Energy Management Agency (ADEME)

Co-coordinator

European Renewable Energy Council (EREC)

Project Partners

- Association française pour la qualité d'installation des systèmes à énergie renouvelable (Qualit'EnR)
- Austrian Institute of Technology (AIT)
- Centre for Renewable Energy Sources and Saving (CRES)
- Ente per le Nuove tecnologie, l'Energia e l'Ambiente (Italian National Agency for New Technologies, Energy and the Environment - ENEA)
- European Biomass Association (AEBIOM)
- European Builders Confederation (EBC)
- European Geothermal Energy Council (EGEC)
- European Heat Pump Association (EHPA)
- European Photovoltaic Industry Association (EPIA)
- European Solar Thermal Industry Federation (ESTIF)
- European Technical Contractors Committee for the Construction Industry (CEETB)
- Krajowa Agencja Poszanowania Energii S.A. (Polish National Energy Conservation Agency - KAPE)

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Introduction

In its recently adopted Climate and Energy Package, the European Union has set itself ambitious energy and climate targets, the well-known 20/20/20 targets to be reached by 2020. In order to reach these targets, the building sector is a key area on which to focus attention. On the one hand, it is a big energy consumer and on the other, it offers great potential for the integration of small-scale heat and/or power systems using energy from renewable sources (RES). The large up-take of RES installations in the building sector will require a significant number of highly-qualified installers capable of integrating renewables in both new and existing buildings. It will also be necessary to ensure the good functioning of these systems after installation and make sure that they are well adapted to the individual requirements of each customer and that life-cycle considerations are taken into account at all times.

QualiCert[1] was launched in anticipation of the implementation of Article 14 of the Directiveon the promotion of the use of energy from renewable sources(2009/28/EC), obliging Member States to develop and mutually recognise certification or equivalent qualification schemes for installers of small-scale renewable energy systems [2] by December 2012. The project has identified a number of key-success criteria that should be taken into account when designing a certification or equivalent qualification system. These key-success criteria are outlined in this manual.

To guarantee the broadest possible support for future certification or equivalent qualification schemes, QualiCert relies on an interdisciplinary, multi-stakeholder approach involving all of the following: builders and installers via their EU associations, existing training providers and accrediting bodies, the RES industry through its European associations, and a number of national energy agencies. [3] Beyond the proactive approach anticipating the EU obligation, QualiCert also addresses the genuine market need by making a qualified offer for a comprehensive system to certify installers in order to guarantee quality installations and satisfied customers. This will, in turn, spur further market deployment.

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1. For more information on the project and its activities, please visit www.qualicert-project.eu
2. « biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps ».
3. French Environment and Energy Management Agency (ADEME), European Renewable Energy Council (EREC), European Photovoltaic Industry Association (EPIA), European Solar Thermal Industry Federation (ESTIF), European Biomass Association (AEBIOM), European Geothermal Energy Council (EGEC), European Heat Pump Association (EHPA), Association Française pour la qualité d'installation des systems à énergie renouvelable (Qualit'EnR), Austrian Institute of Technology (AIT), European Technical Contractors Committee for the Construction Industry (CEETB), European Builders Confederation (EBC), Centre for Renewable Energy Sources (CRES), Polish National Energy Conservation Agency (KAPE), Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA).

Box 1: QualiCert
– How the key success criteria were drafted

In a first step, QualiCert collected information to assess certification schemes that already exist in the different EU Member States for installers of small-scale RES installations in buildings. Based on this analysis[4], a set of success criteria for technical, legal, institutional, financial and communication aspects were distilled by the multi-disciplinary QualiCert consortium (national energy agencies, renewable energy industry federations, installer federations, national certification/ accreditation management bodies).

The following 4 critical aspects were considered: obtaining certification or equivalent qualification; renewing certification or equivalent qualification; training and audits.

The identified success criteria were then subject to reality checks from:

- experts in the field of RES and accreditation/certification/equivalent qualification from 21 different EU countries and members of the ad hoc QualiCert "High-level Steering Group";
- other relevant stakeholders who also participated in QualiCert validation workshops – organised in Italy (14th May 2010), Poland (25th May 2010), Greece (3rd June 2010), Austria (21st June 2010), France (1st July 2010) and Brussels (30th September 2010).

Box 2:QualiCert Glossary
– What does this mean?

In order to be as precise as possible, a glossary was developed detailing the exact meaning of key terms referred to in this document. This Glossary can be found in the annex on page 59. Those most frequently used are listed below:

Accreditation:refers to a proof of competence given by a credible authority; applies to an entity or a training or education programme abiding by sufficiently stringent and uniform training standards and suitably designed to reach their goals.

Certification: refers to a proof of conformity; more specifically, a procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements.

Installer:an individual or an installation company which plans, installs, maintains and troubleshoots a small-scale RES system.

Label:a recognised quality brand, issued by an awarding body, which conforms to a set of criteria implemented by a company, following an assessment and a validation procedure.

Qualification:the formal outcome (certificate, diploma, title or label) of an assessment and validation process, obtained when a competent body determines that an installer has achieved the learning outcomes and possesses the necessary competence to do a job in a specific area of work; a qualification confers official recognition of education and training in the labour market.

For a full list, please visit the Annex.

4. The full version of the document "Assessment of existing certification, equivalent qualification and training schemes in Europe" is available on www.qualicert-project.eu

One

State of the art of the certification or equivalent qualification in Europe

1

State of the art of the certification or equivalent qualification in Europe

This section summarises the results of the analysis [5] mentioned in Box 1 (p. 7) as well as some main outcomes of the validation workshops organised during the period May – September 2010.

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The consulted stakeholders stressed the importance of implementing a certification or equivalent qualification scheme to improve the quality of RES installations. It is widely agreed that such a scheme would, on the one hand, enable the development of installation standards and best practices, while increasing the craftsmanship of professionals, and improving the general quality of RES installations. On the other, it would also increase consumer confidence in RES products and give them easy access to a network of qualified installers.

The results show that the existing schemes are very diverse and all present unique characteristics. For example, a scheme might be implemented by public authorities or private organisms, and both have proved to work. Some certifying bodies comply with an international norm (such as ISO 17024) or have been accredited by the national body. Other bodies have been created by the stakeholders themselves, involved in the RES sector, and have been implemented following a collaborative initiative between installers' unions and industry sectors. Most of the schemes implemented have started with one technology (most often solar thermal installations or heat pumps) and some have then been extended to integrate other technologies. Beyond these intrinsic characteristics, it was found that the success of a scheme very much depends on the way in which it is implemented. In particular, a purely voluntary scheme and one linked to a subsidy programme will draw very different results.

Training for RES installers may be provided by different training infrastructures depending on the country. Training institutions, manufacturers, federations, guilds may offer different types of training. The variety of training structures may therefore cause some confusion and overlapping in competences. The training structures may be accredited.

Not all certification or equivalent qualification schemes contain an audit component. However, there is a general agreement on the crucial role of audit for controlling the quality, safety and performance of the installations. Different types of audits might be realised: administrative audits based on documentation sent by the company or/and on-site audits to control the quality of installations.

5. The full version of the document "Assessment of existing certification, equivalent qualification and training schemes in Europe" is available on www.qualicert-project.eu

However, concern is expressed regarding both costs and the administrative burden of a certification /equivalent qualification process. Some stakeholders also stress the lack of training and certification/ equivalent qualification infrastructures in some countries and thus the additional need for financial resources to set them up. Support from public authorities, including financial support, is considered necessary for the implementation of a certification or equivalent qualification process. The need for determining new regulations in some of the countries may also constitute a hurdle to the process, depending also on the complexity of the legislative procedure in those countries. Additionally, some installers' unions have expressed their disagreement with a mandatory certification which would oblige already active installers to go through an additional costly process to be able to continue performing their activities.

Finally, it has been stressed that mutual recognition of certificates between different Member States constitutes an enormous challenge, considering the different criteria (e.g. the requirement for audit only in some countries) or even the duration and content of the required training.

As a general consideration, quality schemes aiming at giving assurance regarding the skills of installers can have different names: certification, qualification, label, etc. The use of those terms by European actors of the RES industry does not follow one harmonised set of definitions – in fact the meaning of those words can be quite different from one country to another. This report transcribes the terms used by the scheme managers themselves. Therefore we advise the reader not to draw conclusions as to the specifics of one scheme based on the use of one word or the other. As already stressed in Box 2 (p. 7), with the aim of avoiding any misunderstanding with the terminology used, a Glossary of key terms has been developed which is annexed to this report (see the Annex).

The major schemes are summarised in the table according to the following format:

Name of the scheme

Managed by: (public / private)

Checks:

Technologies covered:

Scheme for a Person / Company

Launch date:

Checks:

Training: The installer must participate in a specific training programme.

Exam: The installer must pass an examination (written or practical).

Technical references: The installer must provide documentation on previous installations.

Charter: The installer must sign a Quality Charter.

Proof of relating training:proof of competence that is not necessarily acquired in the framework of the certification scheme.

Documentation audit: The installer is controlled regarding registration, tax compliance, insurances, etc.

On-site audit: An installation by the installer is audited.

Technologies covered:


Solar Thermal systems


Photovoltaic systems


Biomass boilers and stoves


Shallow geothermal systems


Heat Pump systems
(including geothermal heat pumps)

1.1. European schemes

1.1.1. Running schemes

EU-CERT.HP Certification

EUCERT Certification

Managed by:
European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2006

The "EUCERT" training programme for heat pump installers w
the result of the EU-Cert.HP project, completed in 2006. It developed a common training framework and a certification scheme for heat pumps installers across Europe. The program is active and coordinated by the European Heat Pump Association (EHPA).

More information on this scheme under Chapter 3 – Heat Pumps section.

European Qualifications Framework for Lifelong Learning (EQF)

The European Qualifications Framework for Lifelong Learning (EQF) is a "common European reference framework which links countries' qualifications systems together, acting as a translation device to make qualifications more readable and understandable across different countries and systems in Europe. It has two principal aims: to promote citizens' mobility between countries and to facilitate their lifelong learning."[6]

1.1.2. Other relevant projects

GEOTRAINET project

The objective of the GEOTRAINET project is to develop a European Education programme for the certification of geothermal heating and cooling installations. The aim is to launch a massive training programme specifically for designers (a feasibility study) and drillers (digging boreholes and inserting tubes) of geothermal installations. Further to the training programmes, a certification scheme for drillers should be implemented in 2011 and will be managed by the Austrian Institute of Technology (AIT). The certification will then be issued on a voluntary basis by the national competent authorities in consultation with the relevant stakeholders, allowing it to be recognised at EU-level.

SIRET project

The SIRET project (Further Training Model "Specialists in Renewable Energy – Technology in Sanitary, Heating and Air-Conditioning Crafts) was an EU-funded project aiming at developing a European training model. The project trained 99 craftsmen who acquired basic and detailed knowledge in the following technologies: solar thermal, photovoltaics, biomass and heat pumps. The project developed basic and structural modules. Each module was completed by a written test. When passing the examination, participants received the certificate "Specialist in renewable energies and technologies in the sanitary, heating and air conditioning crafts".

6. European Commission, Education and Culture DG, EQF Brochure, European Communities, 2008; http://ec.europa.eu/education/lifelong-learning-policy/doc44_en.htm

EARTH project

The Extend Accredited Renewables Training for Heating (EARTH) project aimed at developing installer training courses for solar water heating systems (SWH), ground-source heat pumps (GSHP), and biomass energy for heating. The objectives of the project were to extend or create definitions of key competencies required to install biomass, GSHP and SWH systems and develop appropriate training courses for installers and "train-the-trainers trainings". The project was carried out in Austria, Bulgaria, Germany, Spain, Finland, Greece, Lithuania, Slovenia and the United Kingdom, with links to observer partners in Poland, Hungary and Romania. It ended in 2006.

SUNTRAIN project

The SUNTRAIN project aimed at defining the general key competencies that an installer must have to install solar thermal systems safely and effectively. Training institutes and courses providing solar thermal courses should then be accredited/certified by an independent body. The objective of the project was to develop training programme accreditation standards and certification requirements which can be implemented using existing training infrastructures. The following countries were involved in the project: Germany, Greece, Spain and the United Kingdom.

1.2. National Schemes

1.2.1. Austria: running schemes

Although Austria has various technical trainings and certification schemes already in place, the Austrian stakeholders consulted in the first phase of the project stressed the importance of defining a common framework at a national level. Furthermore, individual actors (i.e. institutes, training providers, etc.) should work together so as to get the most out of the training courses/certification schemes as set up.

Austrian Institute of Technology (AIT) training and certification schemes

AIT Certification

Managed by:
Austrian Institute of Technology (public-private)

Checks:
Training, Exam, Random On-site audits

Technologies covered:

Scheme for a Person

Launch date: 2005/2010

The certification scheme is managed by the Austrian Institute of Technology (AIT), a private non-profit body co-financed by the Austrian Ministry for Transport, Innovation and Technology (BMVIT), and by the Federation of Austrian Industries. As part of the EUCERT.HP project (see section on European projects p.11), AIT has developed specific training courses and certification schemes for installers and planners of heat pumps (since 2005); and for installers and planners of solar thermal and photovoltaic installations (implemented in 2010). AIT is accredited by the Austrian notified body and the certification process follows the ISO 17024 standard. The certificate is delivered to the installer or the planner.

Austrian Biomass Association trainings

Austrian Biomass Association trainings

Managed by:
Austrian Biomass Association (private)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2000

The Austrian Biomass Association organises different kind of trainings, such as: courses for certified “Bioheat plumbers”, courses for “Bioheat-chimney sweepers”, seminar days for master builders, seminar days for teachers, and information evenings for mayors. Supported by the Ministry of the Environment (Lebensministerium), in the framework of the “Klima:activ” initiative, the aforementioned trainings are organised in cooperation with the national and regional guilds and are mainly practice-oriented. More information on “Bioheat plumbers” and the “Bioheat-chimney sweepers” courses under Chapter 3, p. 42 – Biomass section.

1.2.2.1. Belgium: running schemes

“Soltherm Training” and Recognition

Soltherm

Managed by:
Walloon Regional Authority (public)

Checks:
Training, Exam

Technologies covered:

Scheme for a Company

Launch date: 2004

The “Soltherm training” for solar thermal installers has been run as a voluntary scheme by the Walloon region since 2002. Since 2004, the training is linked to the regional subsidy scheme. The grant is only given for solar thermal installations made by a “Soltherm installer”. The installer has to attend a mandatory training to be certified as a “Soltherm installer”. The qualification is valid for 2 years and may be renewed after a written examination. By December 2010, more than 1,200 installers had received the “Soltherm” recognition.

QUEST: Quality Centre for Sustainable Energy Technologies

QUEST label

Managed by:
QUEST Quality Centre Sustainable Energy (private)

Checks:
Tech. references, On-site audit

Technologies covered:

Scheme for a Company

Launch date: 2010

Quest is a non-profit association founded by technical expertise centres and sector federations. It was initiated by the Flemish Energy Agency in 2007 and is operational since 2010. The body is financed by fees from public authorities, sector federations and installers/suppliers and manages quality labels for installers of small-scale renewable energy systems. As of December 2010, only photovoltaic and heat pump systems were covered, with plans to extend the scheme to solar thermal and ventilation systems with heat recovery. The five first labels were granted to PV installers in October 2010.

PVQUAL

PVQUAL Charter

Managed by:
Renewable Business Facilitator (private)

Checks:
Charter

Technologies covered:

Scheme for a Company

Launch date: 2007

The Renewable Business Facilitator, a private association gathering a network of 300 manufacturers, installers and research centres, manages the PVQual label. As part of this voluntary scheme, the installer signs a Quality Charter with 11 commitments. The installer has two possibilities: 1. officially ensure the company's technical staff and subcontractors attend relevant training; 2. provide evidence of relevant experience of at least 2 years in the field of PV systems.

RBF / Heat pump platform: EUCERT Certification

EUCERT Certification

Managed by: RBF/Heat pump platform in cooperation with the European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2010

From 2010 onwards, Belgium offers trainings according to the EUCERT European programme for heat pumps installers (see section on European schemes, p.11).

1.2.2.2. Belgium: other relevant projects

Q-DIRECT

The Q-Direct project aims at developing a reference framework for a quality scheme for distributed renewable energy concept (for both products and installers of solar thermal, solar photovoltaics, biomass, heat pumps, ventilation systems with heat recovery and urban wind turbines). The objective is to develop guidelines to design and operate a quality scheme for installers of small-scale renewable energy systems. The project is financed by a public body, the Belgian Federal Science Policy Office.

1.2.3. Bulgaria

There is no existing certification or equivalent qualification scheme in Bulgaria. Nevertheless, an introduction on the use and general information for RES is organised by the National Biomass Association (BGBIOM) in the context of the Agricultural University since 1999. Some manufacturers organise training sessions of different natures for their staff members. Several stakeholders, such as the Association of Bulgarian Energy Agency (ABEA), consider that there is a lack of such schemes in the market and are interested in the outputs of QualiCert.

1.2.4. Cyprus

There is no existing certification or equivalent qualification scheme in Cyprus. However, the stakeholders involved in the renewable energy sector are currently considering implementing a quality scheme and would be interested in QualiCert outputs.

1.2.5. Czech Republic: running schemes

EHPA EUCERT scheme

EUCERT Certification

Managed by: Czech Heat Pump Association AVTC in cooperation with the European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered: 

Scheme for a Person

Launch date: 2006

The EHPA EUCERT scheme is managed by the Czech Heat Pump Association (AVTC) which also handles the certification

1.2.6. Denmark: running schemes

KSO Scheme

KSO Quality Assurance Scheme

Managed by:
Danish Technological Institute (public-private)

Checks:
Training, Exam, On-site audit

Technologies covered: 

Scheme for a Company

Launch date: 2002

The KSO scheme is managed by the Danish Technological Institute, a non-profit centre accredited by the National Accreditation Body (DANAK). The Danish Technological Institute receives public subsidies from the Danish Energy Agency for operating the KSO scheme – the scheme is co-financed by the participating installers. The KSO scheme includes solar thermal installations as well as photovoltaic and biomass systems.

1.2.7. Finland: running schemes

SULPU: EUCERT training programme

EUCERT Certification

Managed by:
Finnish Heat Pump Association (SULPU) and AMIEDU in cooperation with the European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered: 

Scheme for a Person

Launch date: 2008

Finland joined the EUCERT programme in 2007 (see details in the European schemes section). The programme is run by the Finnish heat pump association (SULPU) and the training provider AMIEDU in cooperation with the EHPA.

1.2.8. France: running schemes

Various schemes exist in France which cover all the RES technologies addressed by Art.14 of the RES Directive. The stakeholders consulted in the first phase of the QualiCert project found that, although they currently only refer to companies, schemes for individuals could also suit the French system. Moreover, they pointed out the importance of establishing more connections with the building and construction sectors so as to define a "one-stop-shop" system.

Qualit'EnR

Quali'Sol, Quali'PV, Quali'Bois & Quali'PAC

Managed by:
Qualit'EnR (private)

Checks:
Training, Exam, On-site audit

Technologies covered:

Scheme for a Company

Launch date: 2006

Qualit'EnR is a non-profit association created in 2006 by professional organisations and industrial associations. The quality label for solar thermal installations was first implemented by the French National Energy Agency, ADEME, and then transferred to Qualit'EnR in 2006.

Qualit'EnR manages quality labels for installers of small-scale RES:

- Qualisol for solar thermal installations
- QualiPV for photovoltaic installations
- Qualibois for biomass systems
- QualiPAC for heat pumps (from January 2010 and managed by the French Association for heat pumps (AFPAC) in the period 2006-2009).

Qualibat

Qualibat qualifications and certifications

Managed by:
Qualibat (private)

Checks:
Doc. audit, Tech. References, On-site audit[7]

Technologies covered:

Scheme for a Company

Launch date: 2009

Qualibat is an association under private law which issues qualifications and certifications in the construction sector. Qualibat is accredited for its activities by COFRAC, the French accreditation body. For solar thermal, biomass, geothermal heat pumps and soon photovoltaics. Qualibat manages a certification scheme aimed at assessing the technical skills of installers.

Qualifelec

Qualifelec qualifications

Managed by:
Qualifelec (private)

Checks:
Doc. audit, Tech. references

Technologies covered:

Scheme for a Company

Launch date: 2008

Qualifelec is a private association which delivers qualifications to electrician companies. In 2008, a new qualification was developed for photovoltaic installations, which can be obtained along with the electrotechnics qualification.

7. For certifications only.

BRGM/Qualiforage

Qualiforage

Managed by:
BRGM (public)

Checks:
Charter

Technologies covered:

Scheme for a Company

Launch date: 2006

Qualiforage is a quality label for drillers of geothermal systems set up by ADEME-BRGM-EDF and managed by BRGM, a public body. It is a voluntary process and the installer signs a quality Charter and commits to comply with technical standards and good practices.

1.2.9. Germany: running schemes

DVGW CERT GmbH

DVGW CERT

Managed by:
DVGW CERT GmbH (private)

Checks:
Doc. audit, Tech. references

Technologies covered:

Scheme for a Company

Launch date: 2000

The quality scheme is managed by DVGW, a private body, and follows the ISO standards 17024 and 17011. The certification covers vertical ground-source drilling and is delivered to companies. It is a voluntary process, however, the national supervisory authority often requires a certification for granting the permission for drilling and installing a ground-source system.

The German Heat Pump Association: EUCERT training programme

EUCERT Certification

Managed by:
German Heat Pump Association in cooperation with the European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2006

The German Heat Pump Association executes trainings according to the EUCERT programme (see section on European schemes). These trainings take place in four centres in Germany. The certificate is personal and is issued by the German Heat Pump Association.

1.2.10. Greece

There is no official certification or equivalent qualification scheme for RES installers in Greece.

However, there are some organisations (29 up until the date of this publication) that provide certification and inspection services in Greece, which are all members of the Hellenic Association of Accredited Certification & Inspection Bodies (HellasCert). The body responsible for the management of the accreditation system in Greece is the Hellenic Accreditation System S.A. (ESYD), while the National Accreditation Centre for Continuing Vocational Training (EKEPIS) provides accreditation to training centres.

As a result of the consultation process led during the first phase of the project, both the State and the market actors have proved to be interested in training courses that lead to certification. This would contribute to the improvement of the quality of installations and would increase both consumer confidence and the number of small-scale RES applications. Nevertheless, installers, associations and guilds demonstrate some resistance to a certification or equivalent qualification process. It is therefore essential to adequately communicate the advantages and added value of being certified. Additionally, the existence of several organisations providing several services in the field of certification, as is the case in Greece for the moment, may lead to an overlapping of competences.

1.2.11. Hungary: running schemes

Hungary has set the legislative basis for the implementation of certified trainings for RES installers. The Hungarian Ministry of National Resources and the Ministry of National Economy are among the stakeholders cooperating in this process. Eighty seven educational institutes have already been designated responsible for providing trainings and, at ultimately, delivering certified diplomas to the participating installers.

1.2.12. Ireland: running schemes

SEAI registration for FETAC and C&G qualifications

The Further Education and Training Awards Council (FETAC) and the City and Guilds (C&G) are the awarding bodies of qualifications for renewable energy installers in Ireland. FETAC delivers qualifications for installers of heat pumps, solar hot water systems, and biomass boilers. C&G delivers a qualification for photovoltaic panels. Having an appropriate FETAC or City & Guilds qualification will allow an individual to register as an installer with the Sustainable Energy Authority of Ireland (SEAI). This is then the first step to also access a grant scheme administered by the SEAI, called “Greener Homes”. This grant scheme is provided to householders who invest in renewable energy based heating systems under the following categories: solar heating, heat pumps and wood chip or pellet boilers. Installers under the scheme must be registered with SEAI. Registration with the SEAI also serves the purpose of ensuring that installations comply with Building Regulations requirements and guidance.The requirement is that installation works are carried out in a “workmanlike manner” and that the design and installation of RES systems is carried out by a person qualified to carry out such work, as required by Building Regulations Technical Guidance Document Part L 2008 for dwellings. A set of guidelines have also been established by the National Standards Authority of Ireland (NSAI), the Department of the Environment and SEAI.

1.2.13. Italy

There is no official certification or equivalent qualification scheme for RES installers in Italy. However, training in the field of RES systems is organised by different actors.

There are two certified courses in the country:

- ENEA, the Italian Energy Agency, organises certified training accredited by CEPAS, the Italian Certification Body for Personal Training. ENEA has developed e-learning courses on solar photovoltaics and solar thermal, biomass and geothermal installations. ENEA has launched a spin-off, Mesos, for the certification of different professional skills in the field of RES both for designers and installers (the free e-learning courses are considered as a prerequisite for the on-site courses).
- CREA (Energy Saving and Environmental Quality Research Centre) recognised by ESAcert (European System for Accreditation and Certification Bodies energy and environmental, based on CEN standards) also provides certified training on heat pumps.

Furthermore, the Italian Heat Pump Association is working to roll-out the EUCERT training and certification in cooperation with ENEA. During the QualiCert workshop in Italy held on 14 th May 2010, the solar thermal association, Assolterm, developed a proposal for standard requirements for the training of a solar thermal installer, as well as for the characteristics of the certification scheme.

Amongst the main barriers to the constitution of an Italian scheme, encountered by the national stakeholders consulted in the first phase of the project, were costs and the non-mandatory nature of the certification process. Ad hoc stringent policies in these areas were advocated in order to improve the communication among the actors involved. This should be accompanied by less cumbersome administrative procedures for small plants (and bigger ones) and by transparent information and awareness campaigns.

1.2.14. Lithuania

There is no official certification or equivalent qualification scheme, for the time being, for RES installers in Lithuania.

1.2.15. Luxembourg: running schemes

“Energie fir d’Zukunft” Label

“Energie fir d’Zukunft” Label

Managed by:
Chambre des Métiers (public)

Checks:
Training, Exam

Technologies covered:

Scheme for a Company

Launch date: 2001

The label “Energie fir d’Zukunft” training and label programme was created on the initiative of the Ministry of Environment and the Chamber of Skilled Trades (“Chambre des Métiers”) in 2001. The label aims to help consumers to identify the qualified installers in the field of RES and is delivered to companies working in the construction sector after they have followed the relevant training session.

1.2.16. Malta

As of December 2010, there was no certification or equivalent qualification scheme for RES installers in Malta. The University of Malta was working on designing a scheme for solar thermal and photovoltaic systems installers, as those two technologies are the most widespread in Malta.

1.2.17. The Netherlands: running schemes

Kiwa Nederland BV

Kiwa Nederland BV certification

Managed by:
Kiwa Nederland BV (private)

Checks:
Proof of relevant training, On-site audit

Technologies covered:

Scheme for a Company

Launch date: 2005

The quality scheme is managed by Kiwa Nederland BV, a private organisation certified ISO 17021 (for system certification) and 45011 (for product certification). The certification scheme was first developed for heat pumps, but now covers solar thermal, photovoltaics and biomass systems. The certification is linked to the Dutch Building Regulations but is a voluntary process.

KBI

KBI certification

Managed by:
KBI (private)

Checks:
Doc. audit, Tech. references, On-site audit

Technologies covered:

Scheme for a Company

Launch date: 2000

KBI is an non-governmental organisation (NGO) developing and maintaining certification schemes for the installation sector and accredited by the Dutch Accreditation Council. The certification schemes are voluntary and are carried out by EN 45011 accredited certification institutes. KBI signs contracts with the certifying bodies which follow clear procedures and a Council monitors the process.

Haarden- en Kachelbranche
(Dutch Association for the Fireplace and Stove Sector)

In the year 2000, the Nederlandse Haarden- en Kachelbranche (Dutch Association for the Fireplace and Stove Sector) established a special professional training course for installers of fireplaces and stoves, usually offered several times a year. This professional training course provides broad knowledge on the products that are sold, as well as the workmanship required in order to install fireplaces and stoves. Considerable attention is also paid to providing the consumer with correct and thorough advice. Since 2006, the professional training course has been given through a modular-based system.

Accreditation scheme for installers of fireplaces and stoves

Since 2007, the Netherlands has had a special accreditation scheme in place for the installers of fireplaces and stoves. This scheme is administered by the Stichting Erkenningsregeling voor Installateurs van Sfeerverwarming – EVIS (Institute for the Accreditation of Installers of Ambiance Heating). Accreditation takes place based on diplomas that are achieved and on business equipment.

1.2.18. Poland

There is no official certification and/or accreditation scheme for installers of small-scale RES in Poland, as stated in National Renewable Energy Action Plan (NREAP), edited by the Polish Ministry of Economy in December 2010. Actually, in Chapter 4.2.5 of the document, it is mentioned that no separate procedure of certification of installers of small-scale renewable systems exist in Poland that would be in line with art 14.3 of the RES Directive. Nevertheless the NREAP points out that a procedure from the Secondary Law of Minister of Economy from 28 April 2003 on “Detailed rules affirming qualifications by individuals maintaining appliances, installation and grids” can be acknowledged as an equivalent qualification scheme. This Secondary Law was a result of article 54 of the Energy Law.

Despite the fact that there is no official system or scheme, some stakeholders (i.e. producers of solar collectors, heat pump and other RES heat technologies, agencies and associations, etc.) provide training programmes for installers on RES technologies conducted by their training centres. The trainees receive a graduation certificate at the end of the training although it is not an official accreditation.

1.2.19. Portugal: running schemes

Professional Aptitude Certificate

Professional Aptitude Certificate

Managed by:
Directorate General for Energy and Geology (public)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2004

Since 2004, it has been possible for installers of solar thermal systems to obtain qualifications and the corresponding Professional Aptitude Certificate (PAC) within the scope of the National Professional Certification System (SNCP). The PAC is granted by the Directorate General for Energy and Geology (DGEG). A list of the persons with this PAC can be found on the website www.aguaquentesolar.com.

1.2.20. Romania

There is no certification or equivalent qualification scheme for installers in Romania and no authority to certify the installers. However, there are training centres that provide trainings on the proper use of RES. The trainees receive a graduation certificate at the end although it is not an official certification or equivalent qualification. Some stakeholders have expressed their interest in the implementation of a national certification scheme.

1.2.21. Slovakia: running schemes

Slovak association for cooling and air-conditioning: EUCERT training programme

EUCERT Certification

Managed by: Slovak association for cooling and air-conditioning in cooperation with the European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2006

There is no certification or equivalent qualification scheme for other RES installers implemented in Slovakia. Some manufacturers provide one-day seminars to individuals or companies which are interested in installing or designing solar thermal systems sold by the manufacturer. These are usually short training sessions (one day) composed of theoretical lectures on the design and installation of solar thermal systems.

1.2.22. Slovenia

There is no certification or equivalent qualification scheme for RES installers in Slovenia, for the time being.

1.2.23. Spain: running schemes

Professional Qualification for Installers

Professional Qualification for Installers

Managed by: Comisión Nacional de la Certificación Profesional (public)

Checks:
Training, Tech. references

Technologies covered:

Scheme for a Person

Professionals of the installation sector must be qualified through the National Qualification and Vocational Education System (SNCFP). 4 qualifications have been especially created for installers of renewable energy systems:

- "Assembly and Maintenance of Thermal Solar Installations"
- "Assembly and Maintenance of Photovoltaic Solar Installations"
- "Organisation and projects for Thermal Solar Installations"
- "Organisation and projects for Photovoltaic Solar Installations"

1.2.24. Sweden: running schemes

Solar Energy Association of Sweden

The certification scheme has been in place since 2009 and is managed by the Solar Energy Association of Sweden (SEAS), a private association. The certification scheme covers solar thermal installations and will be extended to biomass systems and photovoltaic installations at a later stage. The certification is delivered to the installer and to their company. However, if the installer leaves the company, the certification label is no longer valid. A certification scheme for pellet installers, authorised by PellSam (Federation of Pellets Stakeholders), is also in place.

Swedish Heat Pump Association: EUCERT training programme

EUCERT Certification

Managed by: Swedish Heat Pump Association (SVEP) in cooperation with the European Heat Pump Association (private)

Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2006

The European EUCERT training programme also exists in Sweden. It is executed by the Swedish Heat Pump Association and Midsweden University or by INCERT AB (third party) as well as by the major manufacturers (See section on European schemes).

1.2.25. The United Kingdom: running schemes

Microgeneration Certification Scheme

Microgeneration Certification Scheme

Managed by: Department of Energy and Climate Change (DECC) (public)

Technologies covered:

Scheme for a Company

Launch date: 2006

The Microgeneration Certification Scheme (MCS) was launched by the Department of Energy and Climate Change (DECC) in 2006. The MCS is a third-party certification and is led by a stakeholder panel, comprised of representatives from the industry including certification bodies, government departments, trade associations and other interested parties. The role of Licensee is undertaken by Gemserv, an industry-independent organisation appointed by DECC to manage and coordinate the MCS. The certification is delivered by certification bodies which are private companies accredited by the United Kingdom Accreditation Scheme (UKAS). The certification scheme created an incentive by linking the scheme to England's renewable energy grant scheme called the Low Carbon Buildings Programme (LCBP).

EUCERT training programme

EUCERT Certification

Managed by:
BSRIA with support from the UK heat pump association and BEAMA (private)

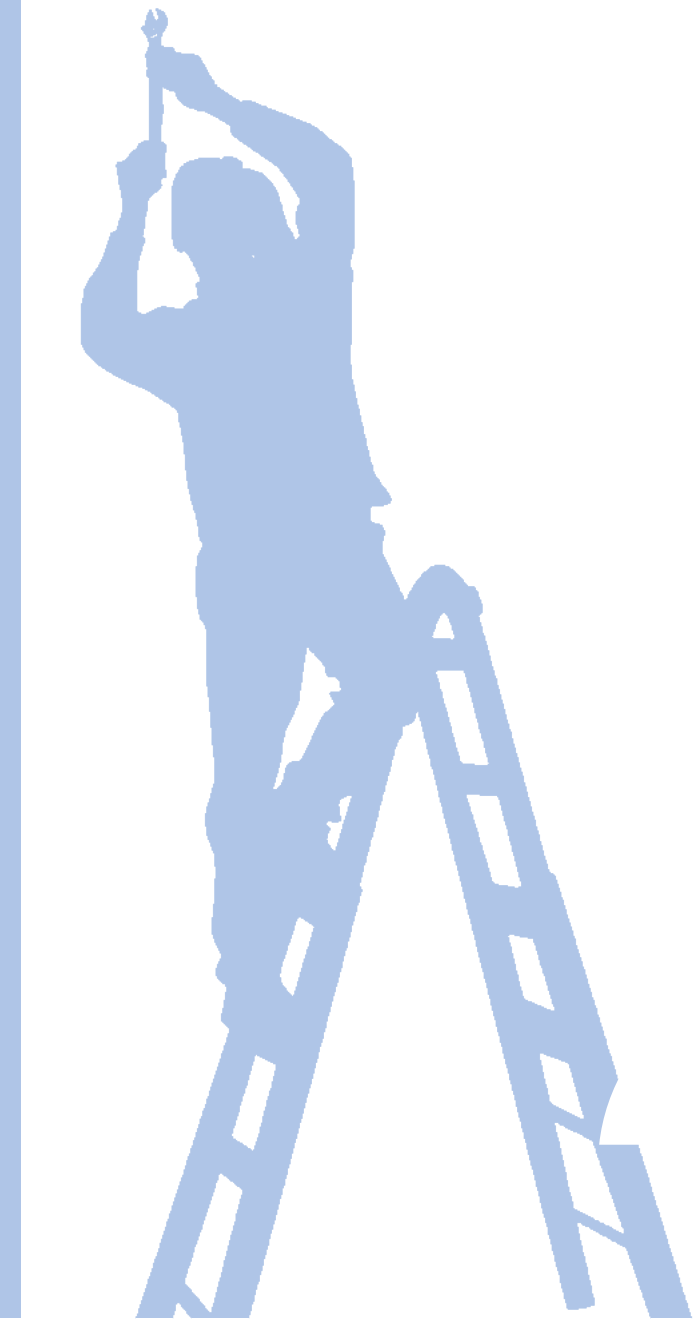
Checks:
Training, Exam

Technologies covered:

Scheme for a Person

Launch date: 2010

The European EUCERT training programme for heat pump installers also exists in the UK. Since 12/2010 it is coordinated by BSRIA with support from the UK heat pump association and BEAMA. Trainings in this context will be offered on the basis of differing construction skills.



Two

Key-success criteria

2

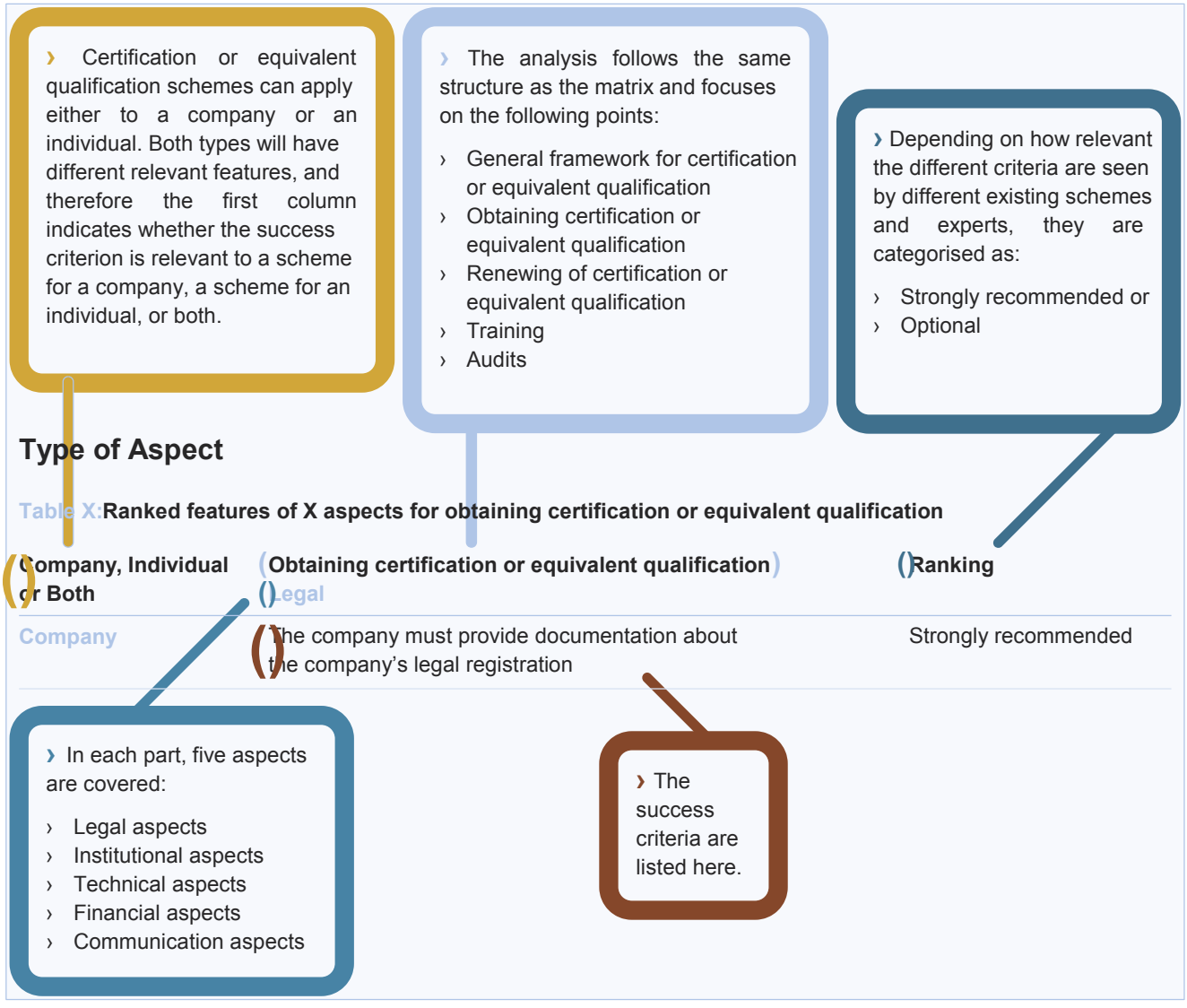
Key-success criteria

Any certification or equivalent qualification scheme needs to be embedded in the national training and quality framework of the member state. Therefore, the development of one European scheme that could be applied to all EU Member States is inappropriate. Instead, the QualiCert consortium has carried out extensive market research and stakeholder consultation to identify what constitutes the "key-success criteria" of well functioning certification or equivalent qualification schemes, that can be referred to by Member States individually. These key success-criteria were put in a matrix which is further detailed in this chapter.

2.1. Matrix of success criteria

This section presents the different features of the matrix, which define the "key success criteria", and illustrates the findings with a series of best practice examples (see diagram below for an explanation).

The key success criteria identified by the project are presented in tables based on the following template:



2.2. Analysis

2.2.1. General framework for certification or equivalent qualification

Certification or equivalent qualification of a company or of a person?

A major difference between some of the schemes implemented across Europe is whether they apply to a company or to an individual. Both schemes exist and have their legitimacy. Some examples:

- Certification or equivalent qualification of a company: Belgium, France, UK, Netherlands, Switzerland
- Certification or equivalent qualification of a person: Austria, Czech Republic, Ireland, Denmark, Germany, Portugal
- Both: Sweden

The main argument brought forward in favour of granting certification or equivalent qualification to a company is that the company is liable for the quality of the installation. In this case, the certification or equivalent qualification is given to at least one "technical referee", namely a person appointed responsible within the company's staff and who has the necessary knowledge, skills and/or competences required by the quality scheme. It is sometimes believed that a personal certificate bears the danger that employees having gained the relevant qualification will be head-hunted by the competitor.

The main argument in favour of certifying a person is that the installation is always carried out by the actual person having gained the required qualification which is not guaranteed if certification or equivalent qualification is granted to a company.

Experience shows that both schemes, although different, can meet the required quality standards.

Public / private partnership

When setting up a certification or equivalent qualification scheme, experience has shown that doing so in strong partnership between the public and private sector is clearly an advantage. The public sector (e.g. a national energy agency) brings the necessary political weight and authority to the process, while the private sector (e.g. representatives of the RES technology as well as the building sector industry) can contribute with their practical experience and ensure high acceptance of the scheme in the market right from the moment of its creation.

This public/private partnership is highly recommended for the start-up phase of a scheme (when few companies are certified) as well as for the first years of operation. It should apply both for the design of the system as well as for its financing. Public financial support may especially be needed at the beginning of the scheme. However, once the scheme is up and running, the role of the public sector can decrease over time.

One centrally managed scheme for all RES technologies

For the sake of simplicity in the implementation of a certification or equivalent qualification scheme for installers of small-scale renewable energy systems in buildings, the set-up of one centrally-managed scheme for all technologies is advisable (i.e. PV, solar thermal, biomass, geothermal, and heat pumps). On the one hand, this reduces the administrative burden on the installers and makes integral communication on the scheme easier. On the other hand, it reduces costs, thus allowing support to the whole range of technologies through a basic management structure. Finally, it also simplifies the consumer's access to qualified professionals.

Furthermore, it is also recommended to link RES schemes with other qualification schemes for construction professionals whenever possible, as is currently done in France, for example. The idea is to have a “one-stop-shop” for various RES technologies, so that professionals can more easily obtain the official document they need for the installation (i.e. certificate, diploma, title or label) and to encourage potential customers to install.

A single certification system does not mean that there would be only one type of training for all RES technologies, rather, there would still be different training programmes and examinations performed separately for the different technologies. However, the existence in a country of different certification (or equivalent qualification) schemes for individual technologies can make the creation of a centrally managed scheme difficult or impossible. In that case, existing schemes need to be taken into account.

Linking the scheme to a subsidy scheme or building code

In terms of market acceptance of a certification (or equivalent qualification) scheme, the linking of such a scheme to a subsidy scheme is advisable (e.g. local/regional/national subsidies for small-scale renewable energy installations or building codes). Even if this may be politically more complicated, experience has shown that strictly voluntary schemes take much longer to gain market acceptance than schemes coupled to a subsidy scheme or building code.

Accreditation of an awarding body

It might make sense and improve the standing and acceptance of a scheme that the body managing the quality scheme undergoes an accreditation process itself.

2.2.2. Obtaining certification or equivalent qualification

This part describes a number of features regarding the granting process of a certification (or equivalent qualification) scheme that are agreed upon by European actors as “key success criteria”.

In the long term, experts agree that Member States should aim at having all of their installers certified (or equivalently qualified), i.e. at making the scheme mandatory. Of course, reaching this objective requires that sufficient training providers are available and that the awarding body can process a large number of applications. Furthermore, the costs for implementing a scheme on such a large scale need to be carefully assessed and planned for. Therefore it is recommended for the scheme to be voluntary to begin with and then for it to become mandatory at a later stage, thus leaving time for fine tuning.

As a consequence, the involvement of the State or related authoritative bodies in the definition and management of the scheme is strongly recommended. Indeed only the State has the authority to guarantee the neutrality of the scheme, provide strong incentives by linking it to existing subsidies, and eventually enforce its timely implementation.

Schemes that apply to companies must deal with the fact that skills and competences are always held by individuals in the end. The most common solution is to identify someone within the company who has the necessary knowledge and is responsible for making sure the installations set up by the company do meet the scheme quality standards. In this case, the identity of this “technical referee” should be clearly indicated by the company.

It is widely agreed that companies applying to the certification or equivalent qualification schemes should fulfil basic administrative criteria (e.g. legal registration, insurance).

Legal aspects

Table 1: **Ranked features of legal aspects for obtaining certification or equivalent qualification**

Company, Individual or Both	Obtaining certification or equivalent qualification Legal	Ranking
Both	The Quality scheme is defined by the Member State or an accredited awarding body	Strongly recommended
Both	The installer must sign a binding agreement with the awarding body	Strongly recommended
Both	In the case the quality scheme is a certification system, the scheme is monitored by a trusted third-party	Strongly recommended
Company	The company must provide : the identity of technical referee(s) and/or documentation about the company's staff and activities and/or civil-liability insurance and/or documentation about the company's legal registration	Strongly recommended
Both	The certification or equivalent qualification is mandatory as regards building regulations	Strongly recommended
Company	The company must provide proof of compliance with tax obligations	Optional

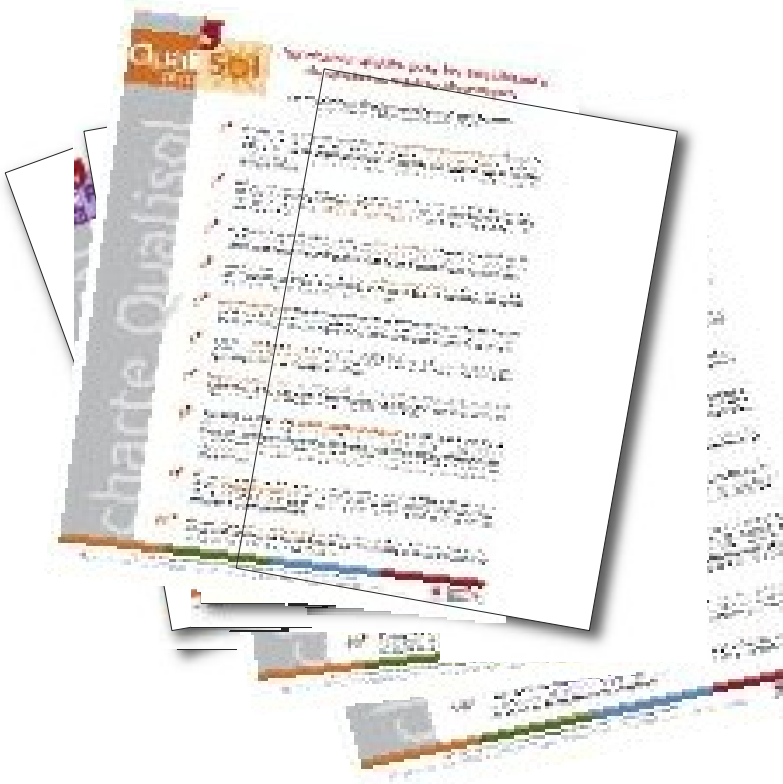
Once the certification or equivalent qualification has been obtained, the installer receives a certificate as proof of his/her acquired skills. Optionally, the signing of a quality charter can be envisaged, demonstrating the installer's commitment to high-quality installations. In addition to a general quality charter, it might be useful to develop technology-specific versions.

The section on the following page contains the general quality charter developed for Qualit'EnR, a French scheme, used as a best practice example:

The 10 points of the Quality Charter by Qualit'EnR

The company that holds a certification/equivalent qualification commits to fulfilling the following 10 points of the Quality Charter:

1. Have staff with the necessary professional skills. Be updated on both social and fiscal obligations. Possess legal warranties for the activities and the works that are performed.
2. Give advice on the material to use which meets the regulatory requirements (i.e. law, technical advice or EC label) and which is the most suitable to the customer's needs.
3. Ensure the customer will be provided with the necessary advice in the choice of the solutions that best suit their needs.
4. Following a visit, provide the customer with a full written quote describing the installation proposed.
5. Inform the customer on the steps to be undergone in order to make the necessary declarations before starting the works; receive public supporting measures; etc.
6. Install the system in accordance with the necessary requirements.
7. Set up the installation. Provide the customer with the technical descriptions for installing and using the system.
8. Provide the customer with a detailed invoice for the work performed on the system as well as with any certificate required for benefiting from the applicable support measures.
9. In case of malfunction of the system, rapidly react and proceed with the necessary intervention to solve the problem.
10. Encourage any control check Qualit'EnR wishes to perform on the systems installed.



Institutional aspects

Table 2: Ranked features of institutional aspects for obtaining certification or equivalent qualification

Company, Individual or Both	Obtaining certification or equivalent qualification Institutional	Ranking
Both	The actors involved in the set up, the management and the awarding of the scheme include representatives of:	
	Installers	Strongly recommended
	Industry	Strongly recommended
	Technical experts	Strongly recommended
	Training institutions	Strongly recommended
	A public body	Strongly recommended
	Consumers	Optional
	Trade unions	Optional

It is widely agreed that a collegial approach should be adopted to set up and manage the certification (or equivalent qualification scheme), also within the awarding process. The actors that should be involved are the following: representatives of the installers, of the industry and from a public body, actors from the training sector. In all cases, people with a high level of expertise should be involved.

Technical aspects

Table 3: Ranked features of technical aspects for obtaining certification or equivalent qualification

Company, Individual or Both	Obtaining certification or equivalent qualification Technical	Ranking
Both	The installer must undergo a third party audit of an installation	Strongly recommended
Both	The installer must provide documentation on the equipment used	Strongly recommended
Company	The company must provide proof of relevant professional training and/or relevant previous experience and/or relevant education	Strongly recommended
Individual	The individual must provide proof of relevant professional training and/or relevant previous experience and/or relevant education	Strongly recommended
Both	The installer must provide documentation on a number of recent installations realised	Optional

In order to become certified or qualified to an equivalent degree an installer (either the individual person or technical referee if representing a company) needs to provide documentation on:

› The equipment used, e.g. PV panels, solar thermal collectors, heat pumps, and biomass boilers

› Proof of relevant professional training

› Proof of relevant education

› Proof of relevant previous experience, e.g. a number of recent installations realised.

All the features stated above were rated as “strongly recommended”. If an installer can prove that he/she has already realised a certain amount of installations and can further prove that these installations meet the fixed quality requirements (e.g. through a third-party audit of a random installation), the possibility to skip the training and directly pass on to the phase of proofing his/her skills (exam) should be foreseen (see section 2.2.4. on training).

The certification or equivalent qualification of installers of small RES systems will certainly promote a stronger interaction between the installers of different systems, having diverse initial backgrounds and qualifications. In many cases, installers of small RES systems come from the plumbing or from the HVAC sector, with some cases where they specialise in solar (both solar thermal and photovoltaics) and have qualifications on machinery for roofing work. It is therefore expected that the market will have installers with very different expertise. While their special and vocational training backgrounds can vary, their certification scheme (or equivalent qualification) should follow the same procedure.

As mentioned earlier, the setting-up and management of a certification (or equivalent qualification) system in public/private partnership, is recommended – including in financial terms. Although the majority of stakeholders agree that the installer needs to bear the cost for obtaining the certification (or equivalent qualification), they also agree that the quality scheme should be supported by public funds. The RES and building sectors should also contribute financially to the scheme. This is important both for the economic viability of the scheme and for guaranteeing support and involvement from the stakeholders. This is acceptable because all stakeholders benefit from an effective and trusted scheme. The broader the financial basis of the scheme, the more comprehensively it can be designed, with positive repercussions on the market.

Furthermore, it is important that, on the one hand, the certification (or equivalent qualification) is linked to public subsidy schemes for consumers, and on the other that the awarding body is an economically independent entity which manages its own budget.

Financial aspects

Table 4: Ranked features of financial aspects for obtaining certification or equivalent qualification

Company, Individual or Both	Obtaining certification or equivalent qualification Financial	Ranking
Both	The quality scheme is supported by public funds	Strongly recommended
Both	Certification or equivalent qualification is linked to subsidy scheme for consumers	Strongly recommended
Both	The awarding body is economically independent	Strongly recommended
Both	Installers bear costs for obtaining the certification or equivalent qualification	Strongly recommended
Both	The industry brings financial support to the quality scheme	Strongly recommended

Communication aspects

Table 5: Ranked features of communication aspects for obtaining certification or equivalent qualification

Company, Individual or Both	Obtaining certification or equivalent qualification Communication	Ranking
Both	The list of certified/qualified installers is publicly available	Strongly recommended
Both	There is a public website about the Quality scheme	Strongly recommended
Both	Promotion of the certification or equivalent qualification (short advertising films or documents marketing campaign, etc.) towards consumers	Strongly recommended
Both	Promotion of the certification or equivalent qualification (short advertising films or documents marketing campaign, etc.) towards installers	Strongly recommended
Both	The Quality scheme includes provision of information to certified/qualified installers (e.g. in the format of a regular newsletter about new regulations, technical updates, etc.)	Strongly recommended
Both	Installers have online reserved access (information about the Quality scheme, communication tools, etc.)	Optional
Both	Installers have access to communications tools (stickers for vehicles, flyers, panels, etc.)	Optional

As in many cases it will not be a case of providing isolated, basic training for beginners but rather an upgrade of skills for installers already making installations, a smart campaign steered by installer professionals is highly recommended. In order to ensure quick market uptake, promotion of the scheme to installers and consumers is recommended. This should especially be the case if such a scheme is not linked to a public subsidy. This can be done with a well-targeted marketing campaign including for example an ad hoc public website, short advertising films, newsletters, documentation on the scheme, etc. Furthermore, it is highly advisable to make the list of certified/qualified installers publicly available, e.g. on the website of the entity managing the quality scheme. This allows consumers to easily identify qualified installers, and constitutes a good incentive for installers to join the scheme.

An installer should be given access to communication tools, such as vehicle stickers, flyers, panels to be displayed at construction sites, newsletters, etc., in order to attract new customers. Similarly, an “intranet” providing reserved access to further details on the quality scheme and downloadable communication tools (etc.) should also be readily available for certified/qualified installers.

A strong involvement of the RES industry (both manufacturers and distributors) in the design and dissemination of information tools is considered essential.

2.2.3. Renewing certification or equivalent qualification

Once the criteria for obtaining certification (or equivalent qualification) are determined, further considerations arise when it comes to renewing them. Indeed, all actors agree that a certification (or equivalent qualification) should be granted only for a limited period of time, and be renewed regularly. In this respect, the duration of validity is an important element.

Should a renewing interval be fixed, it is crucial to not make it too short so as not to create an unnecessary burden for the installer. However, the interval should also not be too long as RES technologies evolve quickly and it is therefore important to update installers' competences regularly on the latest technological developments.

A renewal interval of 2 years seems advisable, though some schemes could practice shorter or longer intervals. Existing schemes foresee between one and three years (e.g. 1 year for Qualit'EnR (France), 3 years for EUCERT (EU) and AIT (Austria) and make specific recommendations to ensure ongoing learning activity.

The renewing of the certification (or equivalent qualification) shall be granted by the same body awarding certification (or equivalent qualification) in the first instance.

Legal aspects

Table 6: Ranked features of legal aspects for renewing certification or equivalent qualification

Company, Individual or Both	Renewing certification or equivalent qualification Legal	Ranking
Both	The certification or equivalent qualification is awarded for a certain duration (e.g. one year) or until a deadline (e.g. 1st January of the year following certification or equivalent qualification)	Strongly recommended
Both	The installer must provide:	
	› up-to-date documentation if needed	Strongly recommended
	› the same documentation as for obtaining the certification or equivalent qualification	Strongly recommended

Institutional aspects

Table 7: Ranked features of institutional aspects for renewing certification or equivalent qualification

Company, Individual or Both	Renewing certification or equivalent qualification Institutional	Ranking
Both	Renewing is granted by the same body awarding certification or equivalent qualification	Strongly recommended

Technical aspects

Table 8: Ranked features of technical aspects for renewing certification or equivalent qualification

Company, Individual or Both	Renewing certification or equivalent qualification Technical	Ranking
Both	In the case the quality scheme is a certification system, the installer must pass a third-party audit inspection of an installation	Strongly recommended
Both	The installer must provide documentation on installations realised	Strongly recommended
Individual	The individual must go through further professional training	Strongly recommended
Company	The company technical referees must go through further professional training	Strongly recommended
Both	The installer must provide evidence of a predefined minimal number of installations realised during the period of validity of the certification or equivalent qualification	Strongly recommended
Individual	The individual must pass an examination	Strongly recommended
Company	The technical referees must pass an examination	Strongly recommended

Should the quality scheme be a certification, the installer must pass a third party audit inspection of an installation. Furthermore, when designing the renewing of certification (or equivalent qualification), a number of technical parameters need to be taken into account:

First, it is important that the installer:

- Provides simplified documentation compared to obtaining of certification / equivalent qualification.
- Provides proof of predetermined minimum number of installations realised during the period of validity of the certification / equivalent qualification.
- Undergoes further professional training through short "update" sessions.
- Passes a theoretical examination (either individual installer or technical referee(s)), aimed at testing the installer's knowledge of new legislative texts or new technologies. The exam can be skipped if there is proof of a qualification in an equivalent competence or through third party audits, for instance, showing that such a test is unnecessary (see section 2.2.4. on training).

In order to make the scheme adapted to the specificities of companies, in particular their size and level of activity in the considered technology, it may be relevant to have flexible technical requirements for renewing. This flexibility can be implemented through compliance required with one type of criterion: either proof of a number of installations realised, or further professional training or successful audit of one or more installation(s). It is likely that a small company will not carry out as many installations as a big company. Moreover this flexibility is also a good way to avoid a decrease in the market which may lead an important part of certified or qualified companies to be under the minimum number of installations required. In this case these companies must be able to maintain their certification / qualification showing they are still up-to-date with technical skills (training) or proving they perform high quality installations (audit).

The installer/manufacturer of products shall bear the cost for renewing the certification or equivalent qualification.

Once their certification or equivalent qualification is successfully renewed, the installer should have continued access to the communication services as outlined under the section on communication aspects on p.31.

Financial and communication aspects

Table 9: Ranked features of financial and communication aspects for renewing certification or equivalent qualification

Company, Individual or Both	Renewing certification or equivalent qualification	Ranking
	Financial	
Both	Installers bear costs for renewing the certification or equivalent qualification	Strongly recommended
	Communication	
Both	To partners and concerned stakeholders	Strongly recommended

2.2.4. Training

In most cases, certification (or equivalent qualification) systems require training. However, in many countries different training schemes are already in place. Therefore, when setting up a certification (or equivalent qualification) system, it is of utmost importance to take into account the already existing training structures/schemes in order to avoid 'reinventing the wheel'.

Furthermore should an installer prove that they have already realised a certain amount of installations and that these installations meet the fixed quality requirements (e.g. through a third-party audit of a random installation), they should be able to skip the training and move directly on to the examination phase.

However, in order to be relevant for a certification (or equivalent qualification) scheme, it is important that training programmes and the training providers themselves are approved by an authoritative body – or that they have received formal recognition of a Member State according to Annex IV of the RES Directive. The training can be provided by both public and private training centres. It is advisable to provide modern equipment of the training centres with the latest technologies available on the local market.

Furthermore, training providers need to sign a contract with the awarding body which provides details on the training standards as well as the practical arrangements of the training. The training standards need to be elaborated and regularly updated by a working group of experts.

Legal aspects

Table 10: Ranked features of legal aspects for training

Company, Individual or Both	Training	Ranking
	Legal	
Both	Training providers are approved by an authoritative body or have received the formal recognition of the Member State	Strongly recommended
Both	Training programmes are approved by an authoritative body or have received the formal recognition of the Member State	Strongly recommended
Both	Training providers sign a contract/convention with the awarding body	Strongly recommended

Institutional aspects

Table 11: Ranked features of institutional aspects for training

Company, Individual or Both	Training Institutional	Ranking
Both	Training is provided by :	
Both	Training institutions (providing general training or specialised training in the relevant field)	Strongly recommended
Both	Guilds	Strongly recommended
Both	Federations	Optional
Both	Manufacturers	Optional

Training should be provided by accredited training institutions providing general or specialised training in the relevant fields. The inclusion of renewable energy companies or federations in the training could be an added value. Their participation in the training is encouraged in order to ensure training on the most advanced practical level with highest market relevance possible.

Finally, it has to be stated that European countries feature very different education systems. Their characteristics and structures need to be taken into account when it comes to training on renewable energy technologies.

As stated in Annex IV of the RES Directive (2009/28/EC), training sessions must contain the following elements:

- Practical exercises
- Theoretical lessons and exercises
- Final examination (that “shall include practical assessment of successfully installing” a RES system).

Trainers should have followed a train-the-trainer session and should provide evidence of recent relevant experience.

Regular feedback from installation audits (see section 2.2.5) into training curricula is very important to continuously improve the training, promote best practice and avoid recurring mistakes.

Technical aspects

Table 12: Ranked features of technical aspects for training

Company, Individual or Both	Training Technical	Ranking
Both	Training sessions contain practical exercises, theoretical lessons and exercises, and a final examination	Strongly recommended
Both	Training standards are elaborated and updated by a working group of experts	Strongly recommended
Both	Trainers must provide evidence of recent relevant experience	Strongly recommended
Both	Trainers must follow a train-the-trainers session	Strongly recommended
Both	Trainers must provide regular feedback from installation audits into training schemes (to promote best practices and warn against difficulties and bad practices)	Strongly recommended

Financial and communication aspects

Table 13: Ranked features of financial and communication aspects for training

Company, Individual or Both	Training	Ranking
	Financial	
Both	Installers bear training costs	Strongly recommended
Both	Training centres bear costs for technical equipment	Strongly recommended
Both	Training centres pay fees to the awarding body	Optional
	Communication	
Both	Short advertising documents to promote the role of training	Strongly recommended
Both	Promotion on website	Strongly recommended
Both	Communication with concerned stakeholders to promote RES training	Strongly recommended

Installers should bear training costs, while training centres should bear costs for technical equipment.

In order to promote the training, communication elements about the training and its advantages should be foreseen.

The following are best-practise examples of training courses (see also section 1.1. on European Schemes on p.11):

- EHPA EUCERT Certification[8]
- GEOTRAINET[9]
- AIT training courses[10]
- Austrian Biomass Association trainings[11]

2.2.5. Audits

When it comes to audits, one can differentiate between administrative audits of installations and on-site audits of RES installations in operation. The results of the QualiCert survey indicate a clear preference for on-site audits. All stakeholders agree that audits are a valid means to give evidence of the quality achieved; on the other hand, audits are quite expensive and time-consuming and therefore need to be limited to a random selection of installations for each installer.

The (third-party) audit body, which needs to be certified or accredited, needs to sign a contract with the awarding body.

Audits should be based on the following criteria:

- A predefined number of installations to be audited over a certain period (e.g. one installation audited every year for each certified installer) or
- A predefined frequency of systems installed (e.g. one audit every 100 installations)

According to the feedback received, the size of the company (number of employees, turnover) is not necessarily a decisive factor when determining the number of audits. As a general rule, audits should be conducted during the period of validity of certification (or equivalent qualification) and should be initiated based on random selection from installation references. However, they can also be initiated on the basis of complaints about installations.

The clear objective of a certification (or equivalent qualification) scheme is to increase the number of highly-qualified market players. In this respect, the function of audits in this context is to improve the quality of installations; therefore they should be used as a positive incentive for correcting mistakes and improving quality. If audits reveal the poor quality of an installation, these results should be discussed with the installer in order to guide him/her towards improving performance. Only in the case of serious misconduct or repeated unsatisfactory installations should audit results lead to suspension of the certification (or equivalent qualification) of the installer.

8. www.ehpa.org/eucert
9. http://geotrainet.eu/moodle/
10. www.ait.ac.at/research-services/research-services-energy/training-education/?L=1
11. www.biomasseverband.at/biomasse

Legal aspects

Table 14: **Ranked features of legal aspects for audit**

Company, Individual or Both	Audit Legal	Ranking
Both	On-site audits of installations in operation are conducted	Strongly recommended
Both	Audits results may lead to suspension of the certification or equivalent qualification of the installer	Strongly recommended
Both	The audit body signs a contract/convention with the awarding body	Strongly recommended
Both	Audits of the installer are based on a predefined number of installations to be audited over a certain period (e.g. one installation audited every year) or on a predefined frequency of systems installed (e.g. one audit every 100 installations)	Strongly recommended
Both	The audit body is selected following a tender process	Optional
Both	Audits of the installer are based on the size of the company (based on the number of employees, turnover, etc.)	Optional
Both	Administrative audits of installations are conducted	Optional

Institutional and Technical aspects

Table 15: **Ranked features of institutional and technical aspects for audit**

Company, Individual or Both	Audit Institutional	Ranking
Both	The audit body is certified or accredited	Strongly recommended
Both	Audits are conducted by a third-party	Strongly recommended
	Technical	
Both	Audit standards are elaborated and updated by a working group of experts	Strongly recommended
Both	Audits are conducted during the period of validity of certification or equivalent qualification	Strongly recommended
Both	Audits are initiated following complaints about installations	Strongly recommended
Both	Audits are initiated based on random selection from installation references	Strongly recommended

An additional important feature to be implemented is the possibility to audit installations following complaints from the consumer.

Audit standards need to be elaborated and regularly updated by a working group of experts. Audit standards for different technological applications need to be clearly communicated to the installers to allow for self-auditing. The image to the right provides an example of a self-auditing tool developed by Qualit'EnR for solar thermal, biomass, heat pumps and PV installations:

Financial and communication aspects

Table 16: Ranked features of financial and communication aspects for audit

Company, Individual or Both	Audit	Ranking
	Financial	
Both	Installers bear audit costs	Strongly recommended
Both	The awarding body bears audit costs	Strongly recommended
	Communication	
Both	Promotion on website	Strongly recommended
Both	Audit results of an installation are communicated to concerned stakeholders/partners	Strongly recommended
Both	Dissemination of short advertising documents to promote the role of audit	Strongly recommended
Both	Anonymous global results of audits are publicly available (e.g. number of non compliant installations)	Strongly recommended
Both	Audit results of an installation are communicated to the installer's client	Optional

Depending on the set-up of the certification (or equivalent qualification scheme), cost for audits should be borne by either the installer or the awarding body.

As far as communication about audit results is concerned, they should only be communicated in anonymous and aggregated format by the body managing the certification or equivalent qualification scheme with a clear objective not to blame and shame but to demonstrate the usefulness of audits for inducing quality improvements. Therefore, communication about aggregated audit results can only be done after a certain period of running time of a scheme.

Three

Sectoral specificities & best practices

3

Sectoral specificities & best practices

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3.1. Biomass

3.1.1. Technology & buildings

The bioenergy sector is, like all other renewable energy technologies, complex in that it includes many different pathways to a variety of different uses and products. It is made up of two main components: the resource, so the fuel, and the conversion technology to produce either heat or electricity. Both can vary greatly, making bioenergy a highly versatile natural resource. Biomass fuels for heating (and cooling) can take the form of traditional wood logs, wood chips and, more recently, pellets. Each of these forms is adapted to different needs, sizes and the possible automatisation of the technology. The conversion technology can be divided into two main categories: stoves and boilers.

User behaviour is particularly important for bioenergy. While wood chips and pellets allow for automatic appliances, this is not the case for wood logs, which still represent the majority of biomass used by households. The way people manage their biomass resources and use their stoves has a significant and often underestimated impact on the efficiency of the appliance and emissions into the air. The moisture content of the logs and the load factor of the stove, for example, are key factors to take into account in terms of efficiency.

Heating with wood is possible in many dwellings, from traditional appliances to cutting edge technologies. Three modern ways of using wood are given below:

1. **Wood gas boilers:** pieces of wood 25-50 cm long are placed inside the boiler on the fire bed. By means of a draught, the gas from the wood is displaced through an opening into the burning chamber, which is either beneath or beside the filling space. In the burning chamber secondary air is added and the gases burn at high temperatures. The hot flue gas releases its heat to the heating system by passing the heat exchanger elements. Thereafter the gas flows off through the chimney.
2. **Wood chip firing:** the storage room for wood chips is placed next to the boiler room. A screw transports the chips to the boiler. This system must not allow “back-burn”. The burning process starts by the decomposition of the solid wood; the originating gases burn at high temperatures and provide the supply of pre-heated secondary air. Continuous feeding with wood chips and a well-regulated air inlet allows a high efficiency factor and a good adaptation of the burning process to the actual need for heat. State of the art wood chip firing systems have automatic ignition, ash discharge, and cleaning of heat exchangers.

3. **Pellets firing:** pellets (compressed natural wood) are a high-grade fuel for automatically feeded wood firing systems, even with low power (3 kW). The principle of this system is similar to that of the wood chip firing process explained above. Wood pellets can be stored easily in each dry cellar room. The automatic feeding of the boiler is performed either by a suction device or a screw. The needed storage room for pellets is just a fourth of the volume, which would be needed by common wood chips. Due to this each one-family house provides enough space for the annual need of fuel. The main element of a biomass boiler system is the hot water tank. An option for all boilers is a buffer system that takes up excess heat and releases heat if needed.

The selling and installing of biomass boilers is mostly done by plumbers. The plumber is responsible for connecting the boiler to the heating system and carrying out regular maintenance checks. Plumbers are important opinion leaders in topics concerning heating systems. Beside the plumbers, chimney sweepers provide a source of information for private persons. If biomass firing-systems are to become widespread, there is a pressing need for well-educated plumbers.

3.1.2. Minimum training requirements

It is up to the installers (mainly plumbers for the time being) to inform their clients about the features of their chosen biomass heating system. The aim of the training courses for installers is to update and expand the know-how in the field of biomass firing. This leads to a win-win situation with benefits for the plumbers, the customers and the environment. Plumbers that successfully passed the training courses benefit in terms of their professional qualifications and by increasing the reputation and market share of their company, through a significant advance in know-how compared with competitors.

Complex firing systems need the right installations to work as they are meant to, which means that without special training for the installers, there is high risk of error. Furthermore, a displeased customer leads to damage to the image of the sector and to the company.

The organisation of the training courses for professionals in the bioenergy sector should be done in co-operation with the plumber representatives, producers of biomass boilers and independent testing laboratories. Essential is the selection of good lecturers. The course should cover both theory and practice.

Topics of the theoretical part should include:

- Environment and market
- Alternative fuels from biomass and biomass logistic
- Building law, fire protection, aid, “energy pass”
- Chimney and exhaust gas routing
- Burning technique and firing systems
- Hydraulic solutions
- New business areas, e.g. energy-contracting and micro local heat
- Cost comparison

Topics of the practical part should include:

- Installation and implementing
- Maintenance and service
- Repair of failures (trouble-shooting)

Proof of practical experience:

A number of biomass firing systems must be installed by the certificated installer/plumber.

At the end of the training programme, which includes practice and the proof of experience, a certificate affirms the acquired knowledge. It is advisable to limit the validity of certificate in time, so that a refreshing course, a practical proof or a participation on the whole training course is needed.

The second, very important group of professionals are the chimney sweepers, who cooperate at each installation of a firing system. The training courses should easily be adaptable to their needs.

3.1.3. Best practice example: Austria

The "Biowärme-Installateur" seminars in Austria are organised by the Austrian Biomass Association in co-operation with the plumbers' guild. The first courses started in 2000. They are repeated each year in January, February and March. To increase the attractiveness of the courses the trade mark description "Biowärme Installateur" (plumbers) and "Biowärme Rauchfangkehrer" (chimney sweepers) was created. After successfully passing the training programme, the participants are allowed to use this trade mark for advertising purposes.

How the plumber courses work:

1. **Goals and reasons:** the development of the Austrian energy market by modern biomass firing systems; the plumber, an important opinion maker, should be convinced that biomass technology yields profits and environmental benefits.
2. **Planning and prearrangement:** the involvement of the plumber guild, bio-energy experts, regional governments, chamber of agriculture and producers of biomass boilers is essential to provide sound contents and records, recognised lecturers, good timing and location for the courses.
3. **Advertisement and invitation:** invitations should be sent in cooperation with regional guilds, advertisements by plumber journals, regional energy consulting offices, klima:aktiv projects and the internet; the certificate is issued by the Minister for the Environment at the end of the course.
4. **Contents, control and refreshing training:** conform to the programme and major interests; evaluating the participant's feedback, observing the practical training of the boiler producers, checking practical experience; the basic courses are followed by advanced courses, which have to be attended every 3 years.
5. **Attendance and costs:** between 2000 and 2010, 52 basic seminars with 1,330 participants and 65 advanced courses with 1,350 participants were held. The total cost of holding these courses was covered by attendance charges and through financial support.

Beside the plumber courses, the Austrian Biomass Association organises also courses for chimney sweepers, builders and architects.

Source: Austrian Biomass Association (Österreichischer Biomasse-Verband)

3.1.4. Recommendations

The general recommendations for good training programmes for renewables apply also for bioenergy.

However bioenergy is quite a special sector and appropriate aspects should be taken into account. Sectoral organisations should be involved, such as guilds of plumbers. The plumber is the main adviser to households when the conversion of the main heating (and cooling) system is considered. Well educated professionals are key to the success of bioenergy in a region/country. Cleaning chimneys, mandatory in some Member States, is also specific to bioenergy. Chimney sweepers visit installations regularly and should provide advice to the consumers how to make the best use of their installations, maximising efficiency and minimising emissions. Architects are a third category of key professionals because biomass is 2 to 10 times more voluminous than fossil fuels for the same energy content and therefore storage should not be underestimated in terms of place and location in the house. Various techniques should also be considered to maximise heating with stoves.

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3.2. Geothermal energy

3.2.1. Technology & buildings

Per definition, geothermal energy is the energy stored in the form of heat beneath the Earth's surface. Geothermal energy is today used for electricity, for district heating, as well as for heating (and cooling) of individual buildings, including offices, shops, small residential houses, etc. Shallow geothermal systems harness the heat from the ground from the surface down to a depth of ca. 400-500m, in areas without specific geothermal anomalies. Hence the low temperature in the ground is brought to a higher level through a thermodynamic device (the heat pump).

Shallow geothermal installers and heat pump installers are differentiated by the scope of their work (see figure 1 in chapter 3.3). A heat pump system consists of the installation of a heat source, the unit itself and the heat distribution system. The shallow geothermal installer prepares the heat source for the ground source heat pump (GSHP) whereas the heat pump (HP) installer connects this source to the heat pump and the building. The shallow geothermal part is done by drillers and pipe-layers, a sub-sector of the construction industry, while the installation of the heat pump itself is done by personnel with skills in refrigeration and heating/cooling technologies. Their education requirements will be dealt with in the next section on heat pumps. Shallow geothermal installers are divided into two groups:

1. **GSHP designers:** engineers, geologists, technicians, etc. who design the ground connection of a heat pump system. They may work e.g. in consulting companies, freelance, as part of drilling companies, or for heat pump manufacturers. Main task is the sizing of the ground system with regard to both the geological/ hydrogeological site conditions and the building heating and cooling needs.

2. **Drillers:** drillers and installers (piping), typically from the sector of water well drilling, geotechnical drilling, etc.; the maximum depth considered should be less than 400m. The interface of the work on the building side could be a manifold, the connection to the heat pump on the ground side, or similar. The work shall comprise all drilling, installation, grouting, completion, pipe-laying, welding, etc. from the ground side to the interface mentioned before.

3.2.2. Minimum training requirements

The theoretical part of the shallow geothermal installer training shall cover all of the following: geothermal resources and ground source temperatures of different regions, soil and rock identification for thermal conductivity, regulations on using geothermal resources, basics in determining the most suitable geothermal heat pump system and system layout, drilling technologies, installation of borehole heat exchangers, well construction, pressure testing, logistics, building laws, and safety.

The training shall also provide good knowledge of all European standards for shallow geothermal, and of relevant national and European legislation. The installer shall demonstrate the following key competences:

a. basic geological and hydrogeological knowledge and understanding geological and geothermal parameters of the underground and knowing their determination, nomenclature and identification of soil and rock types, preparing borehole reports including lithology, groundwater, etc.;

b. familiarity with different drilling and digging technologies, choice of the optimum drilling method, ensuring protection of the environment (in particular groundwater) while drilling;

c. skills for welding of plastic pipes and other connection methods and ability to install borehole heat exchangers, to grout, backfill or otherwise complete the ground source system, and to perform pressure tests; ability to construct groundwater wells, to install the relevant pipes, pumps and control systems;

d. ability to perform the relevant documentation including identification and drawing up of drilling locations.

3.2.3. Best practice examples

Ground Source Heat Pumps (GSHP) systems consist of three main components: the ground side, the heat pump itself, and the building side. A good design must take care of the whole system, matching the components in such a way that the most effective operation and the highest comfort can be achieved.

Today, a certification for the HP installers exists which covers the HP and the heat distribution system. Planning and installing the geothermal system (the ground part), is only covered by a few schemes in Europe:

› One scheme for registering drillers exists in **France**, “Foreurs qualité-PAC”: 80 companies are registered but only 20 are really active in GSHP. In France, there are around 2,000 drillers in total.

› In **Sweden**, the drilling association organises some training courses, and the Geological Survey gives certifications to drillers, but the two systems are not linked. They estimate to have 200 GSHP drillers on a total of ca. 500 drillers in Sweden.

› In **Germany**, a general certification for drilling companies exists, mainly towards environmental issues (“DVGW W 120”). A section for geothermal drilling exists within that scheme; the relevant rules are just under revision. Another “certificate” has been established by GtV-BV (the German geothermal association) in cooperation with the German Heat Pump Association (BWP), figawa (“Firmen im Gas-und Wasserfach”) and DVGW (“Gütesiegel Erdwärmesonden-Bohrfirmen”). However, this “Gütesiegel” (quality symbol/label) does not include a training and testing component yet, it just checks the self-declaration of the companies. DGGT (German Association for Geotechnics) has prepared a curriculum for shallow geothermal driller courses, which are offered by some educational institutions.

› Other countries are working on a certification scheme: **UK, Ireland,** and **Spain**.

It should be noted that certification scheme typically concerns the companies. Education of individual workers can be a prerequisite for this certification.

3.2.4. Recommendations

The geothermal heating and cooling is increasingly based on the use of GSHPs. It is a source of energy with growing popularity and an excellent feedback from the leading countries. This type of renewable energy answers to different types of energy needs: heating, cooling and hot water production. Shallow geothermal energy with GSHP, can be present virtually everywhere in Europe (and the world) and is permanently available for heating and cooling. It saves from 40 to 80% of the energy bill, and is largely independent from the conventional energy price.

Indeed GSHPs contribute greatly to energy savings and emission reduction. In Europe, a sustainable market has only been established in some countries such as Sweden, Switzerland, Germany and Austria. Research in Europe shows that one of the barriers to a sustainable and growing shallow geothermal market is the lack of appropriate skilled personnel, of quality of design and not always satisfactory works. Furthermore to keep quality up, a certification programme for the GSHP workforce is required.

There are two big needs:

› train the GSHP designers to give them the knowledge to link ground potential and energy needs and so to assure the sizing, and

› train the drillers to have the necessary knowledge of the installation of borehole heat exchangers, to be sure they interpret the design, and drill the boreholes according to the good practice.

The training of GSHP designers and installers is necessary to give them a complete competency in GSHP encompassing:

› Environmental respect: taking into consideration potential contamination of the soil and groundwater, ground stability, hydro geological knowledge, ensuring protection of the environment (in particular groundwater) while drilling;

› Ground thermal conditions: shallow geothermal resources and ground source temperatures of different regions, soil and rock identification for thermal conductivity, regulations on using geothermal resources, determining the most suitable geothermal heat pump system;

› Technical conditions: familiarity with different drilling and digging technologies, choice of the optimum drilling method, ensuring protection of the environment (in particular groundwater) while drilling, well construction, pressure testing, logistics, building laws, and safety.

Certified planners, manufacturers and installers (including drillers) are necessary to ensure high efficiency and longevity of a GSHP system. Also for the certification of drilling companies, joint basic rules should be developed in order to facilitate cross-border service.

The certification of drillers, installers, and, more generally, of all specialists that contribute to the design, installation and maintenance of GSHP systems is a very important issue in order to guarantee the proper operation of the system.

Concerning the certification of specialists for GSHP applications, e.g. drillers, installers etc., common requirements for this procedure have to be established in the framework of a common European norm. Moreover, HPs and materials (grouting, pipes, and connections) used for these systems have to be certified in order to ensure the quality and long-life operation of the GSHP system.

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3.3. Heat pumps

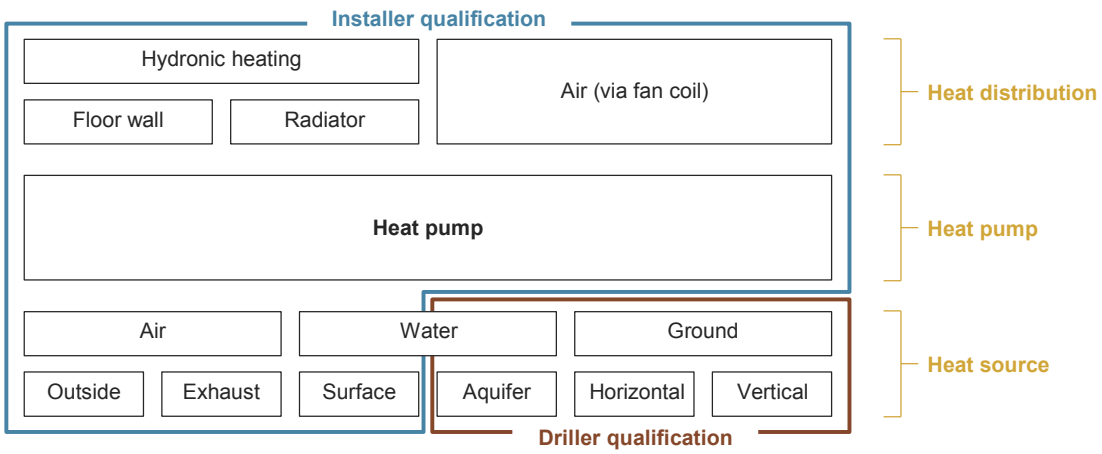
3.3.1. Technology & buildings

A heat pump transfers renewable heat from the air, ground and water for use in a building or a process. It can also recover waste heat from industrial processes and exhaust air.

A HP system consists of three major parts: a heat source, the HP unit and a distribution system to heat or cool the building. The energy is transported from the low temperature heat source via one or more heat exchangers (and a transfer fluid transport) to a higher temperture heat sink. Auxiliary energy – usually electricity or gas – is needed to run the compressor and the pumps. The direction of the heat pump cycle can be reversed so the same machine can be used for heating and cooling giving it an additional economic advantage in cases where both services are needed. In heating mode, ambient energy is the heat source and the buildings heat distribution system is the heat sink. In cooling mode, the cylce is reversed: the building is cooled down using the outside as heat sink. In cases where green electricity or thermal energy from renewable sources is used, the heat pump system provides 100% emission free heating, hot water and cooling.

The efficiency of the HP system depends on several factors, such as the operating temperatures, the quality of the HP product, an appropriate building envelope as well as thorough and proper design and installation of the system components. In particular, the HP system must both match the building's demand for heating, cooling and hot water and the need for a good balance of heat source and heat sink. Over- or undersizing must be avoided. As a general rule it

Figure 1:Components of a heat pump system and required installer expertise



Source: EHPA

can be stated that the lower temperature difference between source and sink temperature, the higher the system efficiency. Fulfilling these requirements is demanding for the installer: he/she needs a good technical understanding, a wide range of competencies for building and systems design as well as for installation procedures, and, for geothermal HPs, an understanding of geological issues (see figure 1 on the heat pump system and required installer expertise).

3.3.2. EUCERT: when best practices meet minimum training requirements

The European Certified Heat Pump Installer programme (EUCERT) is the response of manufacturers and industry stakeholders to setting minimum requirements for heat pump installers that are necessary for high quality, efficient and reliable installations. It focuses on implementing a training program for heat pump installers, establishing a certification programme for this target group and disseminating the trademark “certified heat pump installer”. A key element of the programme is the provision of identical training material (in the local language) for all EUCERT training courses throughout Europe to enable the development of a comparable qualification and mutual acceptance of certificates by different participating countries.

The core training manual addresses relevant aspects of an efficient heat pump installation from a technical and a sales perspective. The technical part covers: technical operating principles of a HP, factors influencing efficiency, planning and installation of the heat source, heat distribution systems and hydronic systems, environmental impact, energy efficiency in buildings, conducting a site assessment, installing HP and auxiliary components, operation modes and control, performing a system check, failure detection and maintenance of a HP system, electrical basics, frequent mistakes and practical experiences. The economic part covers marketing and sales, cost calculation, customer education and warranty, compliance with legal standards.

Each training course consists of 36 hours manufacturer independent education including 8 hours of hands-on, practica training. It is completed by an examination. EUCERT training does not replace manufacturer-specific product training but supports it by providing a broad foundation for future learning.

Participants who successfully pass the examination and provide proof of active experience as an installer can then opt for a certification which – if successful – grants the title “European Certified Heat Pump Installer”. The certificate is valid for three years and can be renewed. The renewal procedure requires proof of active work as a HP installer as well as participation in additional education activities. The certification process is already operating in Austria, Germany and Sweden.

The requirements of EUCERT are 100% compliant with the installer certification foreseen by Annex IV of the RES-Directive (2009/ 28/EC). The project material was developed in the EU supported EU-CERT.HP project. Its implementation is today executed by the EHPA quality label committee. This committee is one of the Technical Committees of European Heat Pump Association (EHPA). Its members are the national coordinators of the training programmes. Key tasks of the committee are the maintenance of the programmes content, namely the education manual, the certification requirements and the laboratory manual. The committee is the forum for the national coordinators to exchange programme related issues, to discuss future modifications and development aspects as well as to inform interested parties on setting up a training and certification scheme in their respective country and to solve issues of mutual acceptance of qualification.

The national coordinators (one body per participating country) set up and overview training activities at national level. National coordinators can either be the national HP association or a cooperating institution, which they assign. They can offer training activities themselves or assign a third party – typically one or several training institutes – with this task. Each training institute must comply with the quality requirements of the EUCERT programme. EUCERT training

Map 1:EUCERT in Europe

Source: Data courtesy CIA World Book

courses are currently taking place in Sweden, Austria, Slovakia, UK, Czech republic, Finland, France, Germany and Belgium (see map). In total, nearly 1,500 installers participated in the education courses in 2009 and approximately 2,000 trainees in 2010. Other EU countries are in the process of joining the scheme and there has also been interest from outside the EU. The EUCERT programme is a proof of the possibility to establish joint training and certification criteria with wide support from industry stakeholders.

3.3.3. Recommendations

Experience from the EUCERT programme, as an example of best practice, show that the success of the programme strongly relies on support from the industry (manufacturers/HP associations offering a brand-independent education scheme) and governments (acknowledgement of an increasing share of RES systems in heating and cooling and appropriately adjusting the curricula of education and training). Agreement on one education system supported by relevant industry actors seems to be of particular importance. A rapid uptake of education and training programmes, as well as of certification options in the workforce seems to strongly rely on the abovementioned elements. As a lack of sufficiently educated installers can severely limit market development, it is in the interest of Member States as well as of industry to establish training and certification options at the same time encouraging (new) installers to enrol in them.

The best solution would be to make proof of training or even certification mandatory, due to cost and time constraints for the training of all installers. A pragmatic approach is needed to allow a fair number of installers to be trained without posing too big a burden on the installer trade. A transparent, long-term subsidy scheme with interim requirements that can be met by today's large majority of installers and increasing requirements over time could be an option.

In order to accommodate for the different needs of:

a. trainees/students following initial (vocational) training classes, and

b. installers or other experts with an interest in continuous training and education

The required knowledge should be integrated into the basic training and education infrastructure of experts in the field.

This should also be offered as part of continuous training. This applies both to government run and privately managed systems (see table 17 below).

In order to save resources, Member States should aim at agreeing on one qualification system leading to a commonly accepted certificate. This is by no means a trivial task, in particular when looking at mutual acceptance across Europe. Its implementation needs to start immediately.

As for publicly available information on installer training and certification schemes and making a list of qualified or certified installers available, Member States should cooperate towards the collection of comparable data on certified personnel and companies. Such data would be very valuable for the coordination of thr implementation of the RES Directive, as well as for statistical evaluation and consumer confidence.

With regard to EUCERT, necessary next steps are:

1. To establish understanding in the administration of Member States on the compliance of EUCERT with the requirements of Annex IV of the RES Directive and seek official acknowledgement of the programme as an option to fulfil the Directive's requirements.
2. Find partners in the remaining European Member States to execute the programme.
3. Encourage more installers to participate in the training courses and in certification.
4. Completion of the EHPA database of EUCERT certified installers.

Table 17: Requirements for trainings and certifications

	Requirements for training	Requirements for certification
First time education: › **vocational training** › **higher education**	Integration of relevant knowledge into basic education and training of installers, planers, designers, architects and engineers	Optional (third party) certificate, ideally within the same scheme as used for all certification in the heating/cooling field
Advanced (vocational) training	Manufacturer independent, mutually accepted training courses	Optional (third party) certificate, ideally within the same scheme as used for all certification in the heating/cooling field

Source: EHPA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3.4. Photovoltaics

3.4.1. Technology & buildings

PV Technologies

The most common PV (photovoltaics) technology is based on crystalline silicon (monocrystalline or multicrystalline). This technology makes up the lion's share of the modules placed on the market (about 80% in 2009). The alternative is thin film PV technology which includes silicon-based amorphous (a-Si) and micromorph (a-Si/µc-Si) technologies and a variety of non-silicon based technologies such as Cadmium-Tellurium (CdTe), Copper-Indium (Gallium)-Selenide (CI(G)S). Other technologies include concentrator PV and organic cells. Most PV products are rigid modules sandwiched on a glass substrate with an aluminium frame. Apart from these, also flexible and unframed modules exist as well as specialised PV roof tiles and other specific customised PV products for building integration. Each type of technology has its own advantages depending on the type of application and its location.


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PV Market segments and Type of Applications

As shown in table 18 below, four end-user segments can be distinguished. These can be categorised into 3 different types of applications. Article 14(3) of the RES Directive, which provides the background for the Qualicert project, targets small-scale applications. Nevertheless, the PV industry is committed to ensuring safe and quality PV systems through the training of installers regardless of the size of the system and its application/market segment. In the case of PV in buildings (either a rooftop PV system where the building envelope is penetrated or a fully integrated PV system where the PV components are the primary weatherproof layer and provide structural support), adequate and sufficient training is especially critical.

Table 18: Typical type and size of applications per market segment.
BAPV: Building Applied Photovoltaics / BIPV: Building Integrated Photovoltaics

Market segment Type of applications	Residential < 10 kWp	Commercial 10kWp - 100kWp	Industrial 100kWp - 1MWp	Utility-Scale >1MWp
Ground mounted			●	●
Roof-top (BAPV)	●	●	●	
Integrated into Façade / Roof (BIPV)	●	●		

Most PV installations are simply applied onto the existing roof (Building Applied PV-BAPV). However, the use of Building Integrated PV (BIPV) is rapidly spreading. BIPV, as mentioned above, refers to the concept in which the photovoltaic systems do not only function as generators of electricity, but also take on the role of primary weatherproofing building elements. As such, a BIPV system can provide shading, heat insulation, water resistance, etc. BIPV requires that the PV products are fully integrated in the building structure rather than applied onto the existing structure. For this purpose, innovative modules (such as flexible laminates, roof tiles, semi-transparent modules, glass or glass laminates) have been developed as alternatives for the standard rigid modules. The concept of BIPV increases the applicability of photovoltaics. Because of the particular nature of BIPV, the installation of such products should be dealt with greater care. Innovative solutions for easier integration have already been developed. For the moment, BIPV only makes up a relatively small market share (except in France and Italy due to the legal promotion of BIPV and in the UK thanks to Building Planning requirements), mainly because BIPV products still have a higher cost due to lower production volumes. However, its popularity is rapidly growing thanks to its multi-functionality, its appealing aesthetics and its ability to be a building product in its own right which transforms an inert roof surface into an unobtrusive active energy generator.

3.4.2. Minimum training requirements

PV requires qualified installers

The need for qualified installers for PV systems results from the significant differences that PV systems have when compared to standard electrical and roofing practices in the building industry. On the electrical side, there is a need to work with direct current (DC) series connections rather than alternate current (AC) parallel connections. On the roofing side, roofers should be capable of making the connections between modules during the installation on the roof. They also need to be able to deal with special mounting procedures (especially in the case of BIPV).

Furthermore, the long lifetime of PV products (a proven lifetime of 30 years for mature module technologies) requires installers to follow correct mechanical installation procedures to ensure that the PV arrays remain safely on the roof and do not damage the supporting roof structure due to overloading under strong winds and heavy snow load.

The output of PV modules is DC power. In order to be able to connect the system to the grid, an inverter is needed to transform the DC power into AC power. PV modules are connected in series to form strings and then connected in parallel. The voltage of one module is typically between 25V and 100V and does not exceed 120V. Hence, when handled correctly, it does not present any danger to the installer. However, after having interconnected the PV modules in series, the voltage grows significantly up to a maximum allowed system voltage of 1,000V.

The combination of all the specificities listed above implies that installers must clearly understand the procedures and carry them out; hence the need for competent and knowledgeable installers.

Training of installers

Ideally, a team responsible for the installation of a PV system should consist of an electrician and a roofer. The electrician should manage the electrical DC connections as well as the connection to the grid, whereas the roofer should have sufficient experience to manage the installation of the panels on the roof and make the interconnections between the modules on the DC side.

Table 19: Best Practices throughout the EU

Name of the project	Timeframe	Goals	Area of application
PV TRIN	Start: 05/2010 End: 04/2013	Training material Pool of certified installers EU Certification mark	Specific for PV
SolTec	Start: 11/2009 End: 10/2011	Competence profile EU pilot training course	Specific for PV
INSTALL+RES	Start: 05/2010 End: 04/2013	Large-scale training courses Training of the trainers	All RES in buildings

PV systems are only another type of electricity generator. Therefore the education and on-the-job-training of electrical contractors should be the first step in order to be capable of installing PV systems. Of course, because technology specifications and other requirements are rapidly changing (especially in the field of BIPV), it is important to regularly upgrade these skills. It would be desirable that electricians, roofers and other construction workers combine their knowledge in a new kind of job description which could be called “solar installer”.

Important topics to include in the education of such “solar installers” are related to the following considerations:

- safety (especially with respect to dealing with high voltage, DC power and working at height)
- performance (selection of components, angle of inclination, orientation, shading, ventilation and damage caused by building defects)
- installation and good functioning
- maintenance procedures (especially for larger systems)
- the installation of BIPV systems

3.4.3. Recommendations

Certification or equivalent qualification of the installers and the installation companies[12]

The certification of installers is a way to promote the quality and safety of PV installations, though it does not ensure that every system is properly installed. Regarding the quality of PV systems, it is up to the installer to choose to which extent the performance of the system is guaranteed. Typically, the same guarantee is offered for the PV components as for the module and inverter manufacturers. An additional monitoring service can be offered, as well as a performance guarantee at system level. However, this depends on the company’s preferred level of responsibility and not on a certification system. On the contrary, in order to ensure the safety of the installations, insurance policies might be coupled to the requirement for certification. As a recommendation towards insurers, no damage related to the installation or presence of a PV installation should be covered when it was not installed by a certified installer. Finally, it is important to clearly communicate to end-customers the advantages of hiring an installation company that works with well-trained and certified installers.

Companies working with certified installers should be able to obtain a label issued by an independent third-party public body of technical experts. This label would be awarded if these companies are able to prove that these installers are capable of dealing with the planning, installation and maintenance of a system. They should demonstrate that they have built the necessary knowledge about the country-specific planning and administrative requirements and that they are working with skilled electrical contractors and roofers. Such a label can also be an effective marketing tool. Regular audits by an independent and accredited third-party body can provide assurance on the quality of the installations over time. However, when this is not the case, these audits should be able to lead to the suspension of the use of the label when deemed necessary.

No EU-wide scheme is needed yet

For the moment, there is no need for creating one harmonised training and certification/equivalent scheme in Europe. Many of the training requirements mentioned in Annex IV of the RES Directive are country-specific. The technical part of the training requirements, concerning characteristics and dimensioning of solar PV systems and components, ecological aspects, fire protection (etc.), certainly has common elements.

Moreover, because installers of PV systems act locally (within their country or even within their region), there is no need to implement harmonisation. Installation companies that are active in different countries should continue using local labour. Hence, PV will trigger employment in all EU Member States where a PV market is present.

3.4.4. Conclusion

The main points mentioned before are reiterated here:

- No mandatory certification but recommendations for insurance companies.
- More awareness raising to consumers on the possibilities and advantages of working with certified installers.
- Use and exchange of best practices amongst EU Member States.
- Use of local employees even if the scope is becoming more and more international.
- Working towards a new kind of job description of “solar installers”.

12. These installation companies can be SMEs and even one-man companies.

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3.5. Solar thermal

Solar thermal is one of the main sources of Renewable Heating and Cooling for domestic use. It is already a mature technology today, though still developing and improving its performance and reducing costs. The performance of a good solar thermal system depends widely on the quality of the installation. Therefore, to meet the increased demand, it is important to ensure that there are across Europe, a sufficient number of well-qualified installers.

3.5.1. Technology & buildings

Solar thermal systems may vary, according mainly to the type of system, the collector mounting and the type of application. Other characteristics may also be relevant for the installation, such as the type of collector for which there may be some specific instructions from the manufacturer.

Type of system

The most common systems are forced circulation and thermo-siphon. The thermo-siphon systems make use of natural flow, i.e. do not require pumps or control stations. These systems have the storage tank integrated on top of the collector and are widely used in Southern Europe. The forced circulation systems are more complex and require pumps for the water to circulate through the system, between collectors on the roof and the storage tank located inside the house. These systems can also cover space heating (Solar Combi systems) and are more common in Central and Northern Europe.

Type of application

Most of a households' energy consumption is linked to two basic needs: hot water and space heating. Low temperatures in the range of 40–60°C are therefore required which can be easily obtained from the sun with rooftop installations. There are other applications for large residential, tertiary and industrial buildings and even for industrial process heat.

Domestic hot water(DHW) heating is the most common application for solar thermal systems. The relatively constant demand for hot water all year round matches the solar energy supply, though a conventional backup system might be required.

Space heatinghas become more common in recent years and today accounts for half of the newly installed solar thermal systems in countries such as Germany and Austria. The demand for space heating is higher in winter when solar energy is less available. Therefore, ordinary solar thermal systems only meet part of the space heating demand, with the remainder covered by a back-up system.

Solar-assisted coolingis becoming a more common application, also at domestic level, representing a good alternative to meeting the growing demand for cooling, including in central European countries. Solar chillers use thermal energy to produce cold and/or dehumidified air. A typical solar cooling system also provides space heating and hot water (Solar Combi +).

Other specifications

There are different types of solar thermal collectors: glazed collectors (flat plate, evacuated tube) and unglazed collectors (used mostly for swimming-pools). The latter are easily installed and are not technically demanding. Glazed collectors present small variations in terms of performance and mounting, so specific requirements can be described in the product manual provided by manufacturers.

3.5.2. Minimum training requirements

There is a set of key tasks which installers of solar water heating systems must be able to undertake to be classified as competent installers. It is important to take into account that the required qualifications should reflect the fact that there are different aspects to domestic solar water heating installation and various system configurations. It must be noted that there are variations throughout Europe regarding the type of system installed, reflecting climate and cultural differences. Therefore courses in each country may need to be adapted in order to meet the specific needs of a given country. The scope of the training and the knowledge to be acquired should be clearly defined. Although, for instance, higher qualifications should be required for a system designer, an installer, who is usually only contracted for small solar thermal systems (mainly domestic), should be familiar with many aspects of the design as he/she may have to adapt it to fit a particular application or customer's need. It is crucial that courses cover these key competencies and include practical training with solar thermal installations.

Priority tasks

The tasks to be considered can be divided into three categories. The most important are necessarily those involving safety matters, followed by tasks related to the system performance and finally tasks related to good working practice. While these tasks are usually based on conventional designs, equipment and practice used in the industry today, they should not limit or restrict innovative equipment, design or installation practice in any way. As with any developing technology, it is fully expected that the skills required from the practitioner develop and change as new materials, techniques, codes and standards evolve.

Minimum qualifications

The minimum qualifications required for a course in the installation of domestic solar water heating systems depend on the specific qualifications targeted. In particular it is important to have some plumbing qualification, although some training with electrical installations and roofing techniques would be relevant. Therefore installers (or students) are expected to have plumbing and basic electrical skills before starting a course. For plumbing these skills include cutting pipes, soldering pipe joints, gluing pipe joints, lagging, sealing fittings, testing for leaks and installing vented and unvented heating systems. With regard to electrical aspects, the installer should be familiar with basic electrical concepts and terms. They should have the ability to understand wiring diagrams and be able to do electrical wiring and create weatherproof connections. The roofing component applies in particular to the roof mounting of solar collectors, for which basic knowledge on roofing would be relevant.

Primary objectives for qualification

After completion of a training course, the installer must have the skills required to install a solar water heating system that meets the performance and reliability needs of the customer, incorporates quality craftsmanship, and complies with all applicable codes and standards. All this should be possible with the help of basic instructions, a manufacturer installation manual, specifications of major components, schematics and drawings. The installer must be able to demonstrate key competences under a qualification scheme combining theoretical knowledge and practical skills.

3.5.3. The French QualiSol

Qualisol is a voluntary certification scheme for installers of solar thermal systems running in France and managed by Qualit'EnR, a French association consisting of craft unions and renewable energy industry associations. Qualisol includes 10 commitments (from advice to after sale, and installation rules). It is a voluntary three year commitment with annual renewal. To use the "Qualisol" label, a company must prove its solar thermal technical knowledge by previous experience or by successfully completing a recognised training course. This process is complemented by a quality audit of one installation made by the installer (within three years of engagement). Currently Qualit'EnR performs already over 5,000 audits annually. The audit is presented as a pedagogical tool for the installer and as means to provide confidence to the final customer as to the quality of the service. On the basis of the audit result, the installer retains or not the right to use the quality label.

3.5.4. Recommendations

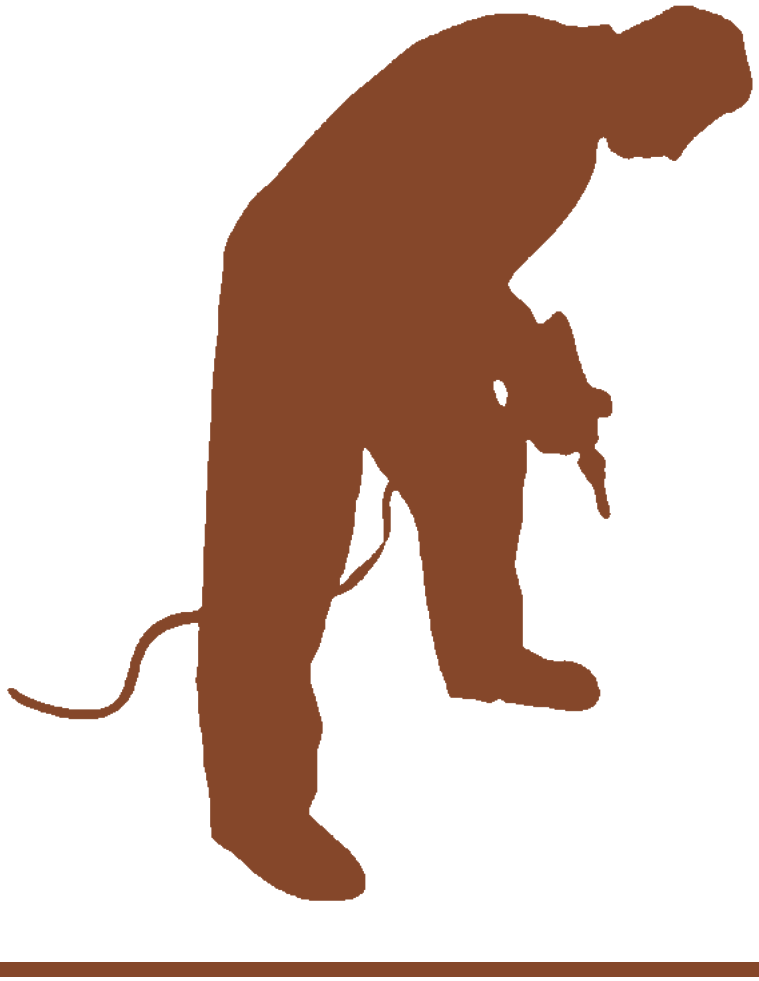
Consumer confidence in the quality of solar thermal systems is a decisive factor for increasing the use of solar thermal energy in Europe. Confidence is achieved by a high level of quality, not only of the hardware but also of the installation work. Therefore the quality of the installation represents a key element in the performance and durability of a solar thermal system. In some European countries, there have been in the past frequent quality problems that have damaged the image of the solar thermal technology for years. Therefore, ensuring good quality standards of hardware and installation is of the utmost importance for the development of the sector.

Heating and cooling are almost exclusively decentralised and even where district heating networks exist, they only supply local demand. Therefore, the sector encourages the creation of local jobs – about half of the existing jobs and added value within the solar thermal supply chain occur at local level, i.e. distribution, installation and maintenance tasks. Therefore, a broad certification and qualification of installers is crucial for the development of solar thermal markets, ensuring both adequate quality and quantity as well as a good geographical coverage.

To ensure that solar thermal systems are installed correctly, the installer must be able to master certain specific tasks. The time necessary to acquire the required skills may vary, depending on the general level of training of the installer and on the complexity of the solar thermal system to be installed. It is essential to bear in mind that these skills should reflect the fact that there are different aspects to domestic solar water heating installation and various system configurations. Furthermore, there are various country specific needs that have to be taken into consideration in connection with the type of system installed. Moreover, training should assist the development of the sector, being constantly updated and promoting the introduction of new methods and technologies.

Training of installers focused on solar thermal is not only important to ensure a good quality installation but also as this has a strong influence a customer's decision. Indeed, often installers play a decisive role in marketing solar thermal systems. Well-trained installers are more motivated to recommend solar thermal systems to customers.

Finally, it must be stressed that the sector's training needs are not solely limited to qualified installers but that education and training should be provided across the whole sector, i.e. for system designers or researchers.



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Four

Conclusions

4

Conclusions

The European Union is currently characterised by a heterogeneous set of certification schemes (or equivalent qualification) schemes for small-scale RES systems, which vary significantly in terms of structure, compulsoriness, actors involved and cost. Moreover, most of these schemes are relatively new and still in the process of being adjusted to evolving market needs. In this context, the implementation of Article 14 of the RES Directive at a national level is of utmost importance in order to guarantee the set-up of a "common denominator" amongst EU Member States which would allow mutual recognition. As it is impossible to have one certification (or equivalent qualification) system for all 27 EU Member States, QualiCert's objective is to come up with a list of key success criteria for the successful design and implementation of a scheme. This conclusion is intended to serve as inspiration for Member States when designing their certification (or equivalent qualification) system, while at the same time allowing them to adapt their system to the existing national situation and ensuring a high quality of RES installations, with the ultimate goal of fostering market penetration of renewable energy.

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To conclude, QualiCert identified the following crucial points:

› **Private/public partnership:** installers, manufacturers and actors of the training sector should be involved in the set up and management of the scheme. Indeed the acceptance of the scheme by each stakeholders is absolutely necessary for effective market implementation. Furthermore, the fact that all actors have something to gain from the scheme should lead to effective technical and possibly financial cooperation. Public authorities have a prominent role to play to gather the different actors, provide initial financial and political support, link with the existing training structures, push to harmonise if not unify the several existing schemes, and ideally aim at linking the scheme with existing subsidies or building codes. Public authorities play a relevant role in all the steps that lead to a successful set-up and implementation of a scheme.

› **One centrally managed scheme for all technologies:** should this be coherent with any other existing national schemes, the set-up of one centrally managed scheme for all RES technologies concerned[13] is recommended. This scheme should also be linked to any other qualification schemes for construction professionals. Several reasons concur in reaching this conclusion.The administrative burden borne by installers would be reduced, with the same being valid for costs, thus requiring a basic and unique management structure for all the technologies. What's more, communication on the scheme would be made easier and this would simplify consumer access to a network of qualified professionals.

13. Biomass, geothermal energy, solar thermal energy, PV and heat pumps.

- **The role of audits:** It is widely agreed that audits (particularly on-site ones) are an essential part of the scheme which can effectively increase the scheme's credibility and guarantee the quality of installations. Financial barriers due to the costs of audits can be overcome by adjusting the number of audits conducted (e.g. random selection).
- **Communication tools:** the importance of communication, both towards customers and installers, should not be underestimated. The major role of a certification (or equivalent qualification) scheme is to provide reliable information to the market, and it should thus include sufficient means to do so, especially during the first years of the scheme.
- **Ensuring the mutual recognition of a scheme:** due to the diversity of existing schemes as well as national differences, a main topic of discussion is on how to ensure that a certification (or equivalent qualification) scheme issued in one Member State is also recognised in a different EU country. The QualiCert work shows that a large number of central features of a certification (or equivalent qualification) scheme obtain general consensus. This should serve as a basis for each Member State in building national schemes with a common approach and ambition. Moreover, a "European Transparency Platform" such as the one existing on the National Renewable Energy Action Plans, should be built for certification (or equivalent qualification) schemes for small-scale RES installations which would encourage an exchange of information, and thus, facilitate the implementation of mutual recognition features. The European Commission has started an initiative to improve the qualification of the building workforce, called the "Build Up Skills" initiative, which will help the mutual recognition of schemes (see p.58).

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Annex

Glossary

The aim of this glossary is to provide general guidance on the key-terms related to certification/equivalent qualification and accreditation as part of the QualiCert project. The following definitions are excerpted mainly from the Glossary on the terminology of European education and training policy published by the Cedefop (European Centre for the Development of Vocational Training), from the European Directive on the promotion of the use of energy from renewable sources, from the European Directive on the Recognition of Professional Qualifications and from definitions provided by CEN (European Committee for Standardisation). These definitions have been adapted to comply with the scope of the project.

Accreditation of an awarding body Procedure by which an authoritative body gives formal recognition that an awarding body is competent to issue qualifications (certificate, diploma, title or label).

Accreditation of an education or training programme A process of quality assurance executed by an authoritative body through which accredited status is granted to a programme of education or training, which meets predetermined stringent and uniform standards.

Accreditation of an education or training provider A process of quality assurance executed by an authoritative body through which accredited status is granted to an education or training provider, which meets predetermined stringent and uniform standards.

Assessment of learning outcomes The process of appraising knowledge, skills and/or competences of an individual against predefined criteria (learning expectations, measurement of learning outcomes). Assessment is usually followed by validation of learning outcomes and/or certification.

Audit Examination and verification of an installer's knowledge, skills, and/or competences to install, maintain and troubleshoot a small-scale RES system. Different types of audits exist, such as administrative audits based on documents and administrative proofs submitted by the installer or on-site audits performed during the works or after installation.

Awarding body A body issuing an official document (certificates, diplomas, titles or labels) formally recognising the knowledge, skills and/or competences of an installer, following an assessment and a validation procedure.

Certificate An official document, issued by an awarding body, which recognises the achievements, knowledge, know-how, skills and/or competences of an installer following an assessment and validation against a predefined standard. Related terms:label, diploma, title

Certification of learning outcomes The process of issuing a certificate, diploma or title formally attesting that a set of learning outcomes (knowledge, skills and/or competences) acquired by an individual have been assessed and validated by a competent body against a predefined standard.

Certification Procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements.

Curriculum The inventory of activities implemented to design, organise and plan an education or training action, including the definition of learning objectives, content, methods (including assessment) and material, as well as arrangements for training teachers and trainers.

Education or training programme An inventory of activities, content and/or methods implemented to achieve education or training objectives (acquiring knowledge, skills and/or competences), organised in a logical sequence over a specified period of time.

Education or training provider Any organisation or individual providing education or training services.

Examination Testing of an individual knowledge, skills and/or competences. A proof of successful examination is usually issued.

Installer An individual (or an installation company) who plans, installs, maintains and troubleshoots a small-scale RES system.

Label A recognisable quality brand, issued by an awarding body, which recognises a set of criteria implemented by a company, following an assessment and a validation procedure.

Learning outcomes The set of knowledge, skills and/or competences an individual has acquired and/or is able to demonstrate after completion of a learning process.

Qualification The formal outcome (certificate, diploma, title or label) of an assessment and validation process which is obtained when a competent body determines that an installer has achieved the learning outcomes to given standards and/or possesses the necessary competence to do a job in a specific area of work. A qualification confers official recognition of the value of learning outcomes in the labour market and in education and training.

The above-cited definition is “formal qualification”, to which we refer to in the context of a Quality scheme designed for “certification or equivalent qualification of an installer”.

The term qualification can also be defined as:

› Professional qualification: professional experience achieved either through a training course not forming part of a certificate or diploma, or through full-time pursuit of the profession for three consecutive years or for an equivalent duration on a part time basis during the previous 10 years.

› Skills requirements: the knowledge, aptitudes and skills required to perform the specific tasks attached to a particular work position (ILO).

Quality scheme A scheme describing the necessary steps to ensure the overall quality of small-scale RES installations, the qualification process being a part of it.

Qualification process A process encompassing the different stages of vocational training and qualification of an installer, leading to the attestation that an installer has demonstrated the necessary knowledge, skills and competences required to plan, install, maintain and troubleshoot a small-scale RES system.

Technical referee In the case of certification or equivalent qualification of a company, the company has to appoint at least one technical referee among its staff. The technical referee is an individual with adequate knowledge, skills and/or competences required according to the quality scheme.

Validation Confirmation, through the provision of objective evidence that the requirements for a specific intended use or application have been fulfilled (ISO 9000:2005 3.8.5).

New IEE initiative 2011 - 2013

BUILD UP Skills

The EU Sustainable Building Workforce Initiative

Background and scope of the initiative

The large contribution expected from the building sector to the 2020 objectives is a major challenge to the construction sector and to industry as a whole, which needs to be ready to deliver renovations offering a high energy performance as well as new nearly zero-energy buildings. This calls for a major effort to increase the number of qualified workers on the market along with measures that facilitate decision-making for building owners. As education and learning new skills are 'upstream' measures, it is time to act now, so that a better qualified workforce can deliver by 2020.

IEE therefore aims to unite forces to increase the number of qualified workers in Europe's building workforce, through the new initiatve **BUILD UP Skills**. This initiative will contribute to the objectives of two flagship initiatives of the Commission's: 'Europe 2020 - A Resource-efficient Europe' and 'An Agenda for new skills and jobs'. It will also enhance interactions with the existing structures and funding instruments such as the European Social Fund and the Lifelong Learning Programme and will be based on the European Qualification Framework (EQF) and its outcome-oriented approach.

BUILD UP Skillsfocuses on continuing the education & training of **craftsmen and other on-site construction workers and systems installers**in the field of energy efficiency and renewable energy in buildings, covering these qualifications of craftsmen, construction workers, etc. **after initial education and training or after they have entered working life.**

Objectives of BUILD UP Skills

- Initiate national discussion processes that bring together all relevant stakeholders on training and qualifications of the building workforce on energy efficiency and renewable energy;
- Identify and quantify the needs and priorities for establishing a workforce qualified in energy efficiency and renewable energy in each Member State by 2020 (and beyond);
- Set up and agree national qualification roadmaps to achieve the sustainable energy policy objectives for 2020;
- Support concrete qualification schemes on the basis of roadmaps to 2020 with identified needs and priorities.

Elements of BUILD UP Skills

Pillar I: National qualification platforms and roadmaps to 2020 (open in Call 2011)should trigger processes to gather all relevant stakeholders in a country and should result in a roadmap.

Pillar I	→	**Pillar II**
National platforms and roadmaps **open in Call 2011**		Initiation / Upgrading of qualification and training schemes **closed in Call 2011**

Targeted European Exchange Activities

Common branding of all projects within the Initiative

Pillar II: Qualification and training schemes (not open in Call 2011) will invite proposals for introducing new or upgrading existing qualification schemes. These should be based on an established roadmap as developed under pillar I.

Activities under pillars I and II will be complemented by **targeted Europe-wide networking** and**support activities**organised by the EACI.

Pillar I: National qualification platforms and roadmaps to 2020 (open in Call 2011)

Expected are **single country applications**. The team submitting a proposal for a national roadmap should include leading expertise in moderation, communication, life-long learning and energy, all related to the topic of building workforce. E.g. this could be the country's institutional training providers, the relevant accreditation bodies, leading energy efficiency and renewable energy expertise, key industry representatives, national policy makers, etc. In general it is expected to fund **one proposal per country**; similar interests within a country should be channeled into one application.

The deadlineis 15 June 2011, 17:00 (Brussels time), via online application only. The **indicativebudget**for the Call 2011 is 8 million euros, with **EU funding**up to 90% of the total eligible costs.

Further info:http://ec.europa.eu/energy/intelligent/ call_for_proposals/index_en.htm

Best practices world-wide

The following section has been excerpted from the technical report "Research on the international system of certification/qualification for installers of small-scale renewable energy systems", by CEPAS – an Italian Personnel and Training Courses certification body. [14] **Further details on the schemes described below can be found on the aforementioned report, available at www.qualicert-project.eu**

Australia and New Zealand

The accreditation body named JAS-ANZ works in Australia and New Zealand and is responsible for providing accreditation to Conformity Assessment Bodies (CABs) in the fields of certification and inspection. JAS-ANZ accredits 70 CABs who in turn certify some 50,000 organisations. JAS-ANZ is a signatory to a number of bilateral, regional and international agreements. These agreements provide international recognition and acceptance of JAS-ANZ accredited certificates and inspection reports.

Accredited CABs provide certification and inspection services to organisations. These common schemes certified by CABs are quality management systems (QMS) based on the ISO 9001 standard, and environmental management systems (EMS) based on the ISO 14001 standard.

The most relevant role in terms of accreditation for energy installations seems to be played by the Clean Energy Council (CEC). The CEC is a membership based industry association representing the clean energy and energy efficiency sectors. It includes more than 300 member companies involved in the development or deployment of energy technologies. The Council operates through 9 directorates comprising representatives from member companies to advise the council on policy and industry development issues in specific areas of the clean energy industry. These directorates include:

1. Wind
2. Solar PV
3. Energy Efficiency
4. Solar Hot Water
5. Grid (Network)
6. Bioenergy
7. Clean tech (emerging technologies)
8. International
9. Hydro

The Clean Energy Council currently accredits workers in the RES Industry for Design and/or Installation of stand-alone power systems (SPS) and grid-connected (GC) power systems.

CEC Accreditation is awarded to individuals on the basis of verifiable qualifications.

Canada

According to the analysis conducted, in Canada, voluntary industry certification and qualification schemes exist for installers of small-scale solar thermal and geothermal energy systems. No third party certification exams for installers seem to be in place.

The Canadian solar Industries association (CanSIA) plays an important role in the certification of installers in the solar sector . In the field of solar domestic hot water systems for residential applications, CanSIA has developed a programme for experienced applicants and a training programme for new members of the solar industry.

The qualification and certification system for installers in the geothermal sector is implemented by the Canadian GeoExchange Coalition (CGC). GeoExchange is the industry's term used to describe an alternative to traditional oil- gas or coal-fired heating, ventilation and air conditioning (HVAC) systems. Geoexchange systems have also been referred to as earth energy systems, or geothermal heat pump systems. The Global Quality GeoExchange Programme is a Canadian-made industry based programme developed and designed with the goal of ensuring quality "geoexchange installations" in Canada.

14. www.cepas.it/

Japan

In the last years, the Japanese Government has stressed the importance of energy efficiency and the use of RES technologies, especially given the dramatic effect of the twin oil shocks on Japan when oil prices skyrocketed in the 1970s. Due to measures taken at that time, Japan became one of the most efficient energy users among industrial powers. Moreover, surging prices in recent years have led to a sense of urgency among Japanese policymakers and industry to promote new sources of EE and RES.

The Japanese Industrial Standards (JIS) specifies the standards used for industrial activities in Japan. The standardisation process is coordinated by the Japanese Industrial Standards Committee (JISC) and published by the Japanese Standards Association (JSA).

In the energy sector, the only mandatory qualifications needed are those related to gas appliances installers and nuclear power plants workers. This is because, in the case of natural catastrophic events, these technologies could have dramatic effects on the environment and on people.

As regards renewable energy, and more in particular PV, installations exhibit excellent workmanship and are done by certified electricians. Unlike in the U.S., there are no independent certified installers (e.g., no NABCEP equivalent). The industry is responsible for training its own installers. In return, the companies can receive the Green Power Certification System, which provides power generation services mainly to corporate customers using natural energy sources. The Green Power Certification System is promoted by the Japan Natural Energy, a company which trades natural energy generated from solar, wind, geothermal and so on, with more than 150 companies adhering to it (e.g. Sony, Toshiba, Matsushita (Panasonic)).

In the Japanese culture, it is a matter of cultural honour for both installers and manufacturers to have satisfied customers. Therefore, there are no requirements for using listed equipments and it is strictly voluntary to have listed modules and inverters. However, most manufacturers will seek a voluntary listing from the Japan Electrical Safety & Environment Technology Laboratories (JET) so as to be more competitive. Basically, Japanese installers are left on their own to do the right job.

An accreditation body also exists, called the Japan Accreditation Board for Conformity Assessment (JAB). The JAB is responsible for the assessment and accreditation of management systems registration bodies, auditor certification bodies and auditor training bodies.

South Africa

In South Africa, the qualification and certification of any individual – included in the field of small-scale RES installations - is based on the National Qualification Framework (NQF) by the South African Qualifications Authority (SAQA). NQF is a comprehensive system approved by the Minister for the classification, registration, publication and articulation of quality-assured national qualifications. It sets principles and guidelines by which records of learner achievements are registered to enable national recognition of acquired skills and knowledge, thereby ensuring an integrated system that encourages life-long learning. The NQF system is based on formative credits which can be defined as a collective volume of learning required for a qualification in terms of the minimum number of credits required at specific exit levels of the NQF.

Uganda

The Denmark based Nordic Folkecenter for Renewable Energy works also in Uganda. It is a non-profit, independent organisation providing research, technology development, training and information for the manufacture, industrial innovation and implementation of renewable energy technologies and energy savings. Nordic Folkecenter conducts various types of trainings in Uganda and some of their courses in Denmark are addressed to foreign immigrants, including Ugandans. One of their courses is entitled "Training Workshop on Solar Water Heating systems".

United States of America

Being sensitive to issues such as sustainable “green” development and clean energy production, in the United States of America all the states have adopted regulations and specific licenses for installers of small-scale renewable energy installations. A federation being characterised by states with different regulations and licensing, it is not easy to develop and mutually recognise accreditation/certification or equivalent qualification schemes for installers of small-scale renewable energy installations across the whole national territory. Through the U.S. Department of Energy’s Solar America Cities programme, 25 major U.S. cities and over 180 organisations (including municipal, county, and state agencies, solar companies, universities, utilities, and non-profit organizations) are working to accelerate the adoption of mutually recognised codes, standards, certified qualifications and certifications in the field of the small-scale RES technologies.[15]

Typically, American states require SWH (Solar Water Heater) installers to hold a plumber’s license and PV installers to hold an electrical license. More than a dozen states require contractors to obtain a separate, specialised solar contractor’s license. In the Geothermal sector, a certification and qualification system for installers exists, and it has been developed by the International Ground Source Heat Pump Association (IGSHPA).[16] The wind sector is characterised by a certification scheme for small wind turbines, held by the Small Wind Certification Council (SWCC),[17] an independent certification body.

All in all, certification and qualification systems observed are voluntary industry certifications. No third party certification exams for installers seem exist. Furthermore, the U.S. certification and qualification programmes do not guarantee their certified installers work or performance.

The Institute for Sustainable Power (ISP) developed the ISP accreditation and certification programme for training providers in the fields of renewable energy, energy efficiency and distributed generation. Accreditation for training programmes and for programmes built on life-long learning have been implemented, while certifications are offered to trainers and instructors.

15. www.solaramericacities.energy.gov
16. www.igshpa.okstate.edu/training/ttt.htm
17. www.smallwindcertification.org/

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