

Training in Renewable Energy

INFORSE-Europe proposal for implementation of the Renewable Energy Directive

Draft 28/12 2009

Requirements of the Renewable Energy Directive

The EU countries have agreed the new renewable energy directive (dir. 2009/28/EC) in December 2008, and it was finally adopted 23. April 2009. Now all EU countries shall make a national action plan for implementation of the directive and their national renewable energy targets until June 30, 2010 (art. 4 of the directive). This includes measures for information and training in renewable energy, required by article 14 of the directive.

Training of workers and professionals in renewable energy is crucial for the successful up-scaling of renewable energy to meet the national target in renewable energy. This is in particular an issue in countries with little use of the forms of renewable energy that are important to meet the national target for renewable energy. In addition, the directive specifically require in art. 14 that:

- The countries shall ensure the availability of schemes to qualify installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps by 31. December 2012. This shall be either with certification schemes or with equivalent schemes to qualify installers. The schemes shall be based on a set of criteria specified in Annex IV of the directive and the countries shall recognise certification from other countries as far as they follow these criteria.
- The countries shall publicise information on the certification/qualification schemes (what installers have learned in the training) and may make available a list of certified/qualified installers.
- The countries shall ensure that guidance is available for planners, architects and other relevant actors, so they are able to plan for and design the optimal combination of renewable energy, energy efficiency, district heating and cooling for new and renovated industrial and residential buildings and areas.
- The countries shall develop suitable information, awareness-raising, guidance and/or training programmes for citizens about the benefits and practicalities of acquiring and using renewable energy installations.

(see full text of art. 14 on page 5)

Training and Certification of Installers

Experience have shown that renewable energy installations (such as biomass boilers and stoves, solar energy installations, geothermal installations, and heat pumps) have special requirements that installers certified in for instance water installations or electricity cannot always cope with, even if they have the formal certifications to do the installation work. This can for instance be linked with use of solar fluids, the need to limit heat losses from solar tanks with long storage periods, work with (solar) water installations in attics and on roofs, and reducing heating system temperatures to optimise heat pump operation. The annex IV to the directive gives guidelines for the training required for each type of renewable energy (copy of Annex IV below)

For each type of renewable energy, we find that the training must include at least one week of theoretical course is needed, as well practical training, preferably on-the-job training. The theoretical training should include the special technical issues of the particular type of renewable

energy, introduction to the most used components and solutions used as well as design of recommended sizes and an overview of the benefits and drawbacks for the user. It should also cover information on maintenance, including recommendations for regular professional service (more details are given in Annex IV to the directive, see below).

While the training shall include European standards and use of systems in different climates to make certification transferable among EU countries (as required by the directive), most focus should be on issues that are directly useful for the installers working in the specific country.

For the practical training we propose that it is done together with experienced installers and that it includes installation of at least 5 systems for different purposes and with different technical solutions (for solar heating for instance systems with and without supply for space heating, thermosiphon systems as well as pumped systems).

After the practical training can be a final training day together with the required examination.

The training must be supplemented with regular refreshing seminars, for instance every third year.

The length and costs of the theoretical training must not become a barrier to the rapid deployment of the renewable energy technologies.

Training to acquire basic skills and/or to allow work that is normally covered by installers with other certifications (such as plumbers doing simpler electric connections, see below) must be additional to the training modules the specific renewable energy qualification.

Equipment manufacturers and suppliers can be involved in the training (as suggested in the Annex IV to the directive), but the training must include an overview of equipment and technical solutions used in the national market, as well as a supplier-independent overview of benefits and drawbacks of relevant equipment and technical solutions.

Training can Overcome Barrier of Certification Requirements

The installation of local renewable energy (biomass boilers and stoves, solar energy, geothermal and heat pumps) is in many countries limited to installers with certain certifications, such as:

- Certification to install combustion equipment and chimney constructions: for biomass boilers and stoves,
- Certification to install drinking water installations: for some biomass boilers, solar heating, some geothermal and heat pump systems
- Certification to install electric equipment: for many biomass boilers, for many solar heating systems, for PV that is grid-connected or that supplies 230 V/400 V power, for geothermal and heat pump systems
- Certification to lay pipes underground (for ground source heat pumps and geothermal)
- Certification to work with F-gases (for heat pumps)

While these certification requirements have proven important for the safe and environmentally benign use of the different types of equipment, they often lead to the requirement of more installers with different certification to install one renewable energy system, even a small system for a single family houses. The typical example is a solar hot water system that requires a plumber with certification to do drinking water installation as well as a certified electrician. This can be a barrier to the rapid deployment of small-scale renewable energy as it increases costs and complicates the installation procedure.

Therefore we recommend that the implementation of the renewable energy directive addresses this

problem by allowing one certified installer to do a full renewable energy installation of one type of renewable energy (boiler; solar heating; heat pump system; etc.). For instance could a plumber with prior qualifications in water installations after training in solar installations and simple electric installations then carry out the connection of the solar installation to electricity as far as the work is not significantly changing the electric installation of the house.

Examples of Training in Renewable Energy Installation

There is already more than 20 years of experiences with training in renewable energy installations in some European countries. Thus, countries should use experience from existing training in the country as well as in other countries, when implementing the renewable energy directive. Some examples out of many existing trainings in small-scale renewable energy installations are:

Denmark: Training to achieve certified installation in solar heating, biomass heating installations, and heat pumps is available for water installers (plumbers) from http://www.evus.dk/vk_site/start.asp. Danish Technical schools are providing training for installers of solar heating, biomass installations, and heat pumps, information is available with search at www.ug.dk.

France: The French magazine "Systemes Solaire" has published an overview in September 2009 of renewable energy courses and trainings in France, of which parts are relevant as installer training. See http://www.energies-renouvelables.org/dossier_formation.pdf

Germany: The German "Solarserver" website has an overview of solar education and training institutions, see <http://www.solarserver.de/lernen/fortbildung.html>

UK: Centre for Alternative Technologies (CAT) is organising courses in renewable energy including courses for installers, see: <http://www2.cat.org.uk/shortcourses/index.php?cPath=1>

Listing of qualified Installers

The directive proposes, but does not mandate, that countries publicise a list of certified or qualified installers. Experience have shown than such a list is a good tool for consumers and their advisers. Therefore we strongly recommend that the countries make a list public for all installers in renewable energy that do not specifically ask not to be listed (some installers are only working with certain costumers and do not want to be included in such a list).

As an example, lists of Danish certified installers in solar heating, PV, heat pumps, and biomass boilers are available from the page <http://www.kso-ordning.dk/>

Guidance and Training for Planners, Architects, and other Professionals

A large-scale success with local renewable energy solutions must include planners, architects, heating engineers, and other professionals.

For guidance we recommend well maintained, free websites in national languages for public planners as well as for private architects, heating engineers and construction technicians. The websites must give clear guidance on planning procedures, permissions needed and other legal requirements, guidance on design, evaluation of costs and user economy, good practice examples, as well as links to further information.

While professionals are able to use internet based information directly in many cases, both shorter and longer training courses must be available as well. The training shall focus on how to integrate renewable energy in the ongoing planning and construction activities of the professionals. The

courses must be specific for each job-type, such as public planners, administrations that issue building permits, architects, engineers and technicians. For each of these we recommend a short course of 1-2 days to make it easier for the professionals to deal with renewables in their daily work, as well as various longer courses to enable professionals to plan, design and optimise more complex renewable energy systems.

It is important that all administrations that issue building permits, have one or more professionals with at least basic training in use of local renewable energy.

Renewable Energy Directive (2009/28/EC), Article 14

Information and training

1. Member States shall ensure that information on support measures is made available to all relevant actors, such as consumers, builders, installers, architects, and suppliers of heating, cooling and electricity equipment and systems and of vehicles compatible with the use of energy from renewable sources.
2. Member States shall ensure that information on the net benefits, cost and energy efficiency of equipment and systems for the use of heating, cooling and electricity from renewable energy sources is made available either by the supplier of the equipment or system or by the national competent authorities.
3. Member States shall ensure that certification schemes or equivalent qualification schemes become or are available by 31 December 2012 for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps. Those schemes may take into account existing schemes and structures as appropriate, and shall be based on the criteria laid down in Annex IV. Each Member State shall recognise certification awarded by other Member States in accordance with those criteria.
4. Member States shall make available to the public information on certification schemes or equivalent qualification schemes as referred to in paragraph 3. Member States may also make available the list of installers who are qualified or certified in accordance with the provisions referred to in paragraph 3.
5. Member States shall ensure that guidance is made available to all relevant actors, notably for planners and architects so that they are able properly to consider the optimal combination of renewable energy sources, of high-efficiency technologies and of district heating and cooling when planning, designing, building and renovating industrial or residential areas.
6. Member States, with the participation of local and regional authorities, shall develop suitable information, awareness-raising, guidance or training programmes in order to inform citizens of the benefits and practicalities of developing and using energy from renewable sources.

Annex IV

Certification of installers

The certification schemes or equivalent qualification schemes referred to in Article 14(3) shall be based on the following criteria:

1. The certification or qualification process shall be transparent and clearly defined by the Member State or the administrative body they appoint.
2. Biomass, heat pump, shallow geothermal and solar photovoltaic and solar thermal installers shall be certified by an accredited training programme or training provider.
3. The accreditation of the training programme or provider shall be effected by Member States or administrative bodies they appoint. The accrediting body shall ensure that the training programme offered by the training provider has continuity and regional or national coverage. The training provider shall have adequate technical facilities to provide practical training, including some laboratory equipment or corresponding facilities to provide practical training. The training provider shall also offer in addition to the basic training, shorter refresher courses on topical issues, including on new technologies, to enable life-long learning in installations. The training provider may be the

manufacturer of the equipment or system, institutes or associations.

4. The training leading to installer certification or qualification shall include both theoretical and practical parts. At the end of the training, the installer must have the skills required to install the relevant equipment and systems to meet the performance and reliability needs of the customer, incorporate quality craftsmanship, and comply with all applicable codes and standards, including energy and eco-labelling.

5. The training course shall end with an examination leading to a certificate or qualification. The examination shall include a practical assessment of successfully installing biomass boilers or stoves, heat pumps, shallow geothermal installations, solar photovoltaic or solar thermal installations.

6. The certification schemes or equivalent qualification schemes referred to in Article 14(3) shall take due account of the following guidelines:

(a) Accredited training programmes should be offered to installers with work experience, who have undergone, or are undergoing, the following types of training:

(i) in the case of biomass boiler and stove installers: training as a plumber, pipe fitter, heating engineer or technician of sanitary and heating or cooling equipment as a prerequisite;

(ii) in the case of heat pump installers: training as a plumber or refrigeration engineer and have basic electrical and plumbing skills (cutting pipe, soldering pipe joints, gluing pipe joints, lagging, sealing fittings, testing for leaks and installation of heating or cooling systems) as a prerequisite;

(iii) in the case of a solar photovoltaic or solar thermal installer: training as a plumber or electrician and have plumbing, electrical and roofing skills, including knowledge of soldering pipe joints, gluing pipe joints, sealing fittings, testing for plumbing leaks, ability to connect wiring, familiar with basic roof materials, flashing and sealing methods as a prerequisite; or

(iv) a vocational training scheme to provide an installer with adequate skills corresponding to a three years education in the skills referred to in point (a), (b) or (c) including both classroom and workplace learning.

(b) The theoretical part of the biomass stove and boiler installer training should give an overview of the market situation of biomass and cover ecological aspects, biomass fuels, logistics, fire protection, related subsidies, combustion techniques, firing systems, optimal hydraulic solutions, cost and profitability comparison as well as the design, installation, and maintenance of biomass boilers and stoves. The training should also provide good knowledge of any European standards for technology and biomass fuels, such as pellets, and biomass related national and Community law.

(c) The theoretical part of the heat pump installer training should give an overview of the market situation for heat pumps and cover geothermal resources and ground source temperatures of different regions, soil and rock identification for thermal conductivity, regulations on using geothermal resources, feasibility of using heat pumps in buildings and determining the most suitable heat pump system, and knowledge about their technical requirements, safety, air filtering, connection with the heat source and system layout. The training should also provide good knowledge of any European standards for heat pumps, and of relevant national and Community law. The installer should demonstrate the following key competences:

(i) a basic understanding of the physical and operation principles of a heat pump, including characteristics of the heat pump circle: context between low temperatures of the heat sink, high temperatures of the heat source, and the efficiency of the system, determination of the coefficient of performance (COP) and seasonal performance factor (SPF);

(ii) an understanding of the components and their function within a heat pump circle, including the compressor, expansion valve, evaporator, condenser, fixtures and fittings, lubricating oil, refrigerant, superheating and sub-cooling and cooling possibilities with heat pumps; and

(iii) the ability to choose and size the components in typical installation situations, including determining the typical values of the heat load of different buildings and for hot water production based on energy consumption, determining the capacity of the heat pump on the heat load for hot water production, on the storage mass of the building and on interruptible current supply; determine buffer tank component and its volume and integration of a second heating system.

(d) The theoretical part of the solar photovoltaic and solar thermal installer training should give an overview of the market situation of solar products and cost and profitability comparisons, and cover ecological aspects, components, characteristics and dimensioning of solar systems, selection of accurate systems and dimensioning of components, determination of the heat demand, fire protection, related subsidies, as well as the design, installation, and maintenance of solar photovoltaic and solar thermal installations. The training should also provide good knowledge of any European standards for technology, and certification such as Solar Keymark, and related national and Community law. The installer should demonstrate the following key competences:

(i) the ability to work safely using the required tools and equipment and implementing safety codes and standards and identify plumbing, electrical and other hazards associated with solar installations;

(ii) the ability to identify systems and their components specific to active and passive systems, including the mechanical design, and determine the components' location and system layout and configuration;

(iii) the ability to determine the required installation area, orientation and tilt for the solar photovoltaic and solar water heater, taking account of shading, solar access, structural integrity, the appropriateness of the installation for the building or the climate and identify different installation methods suitable for roof types and the balance of system equipment required for the installation; and

(iv) for solar photovoltaic systems in particular, the ability to adapt the electrical design, including determining design currents, selecting appropriate conductor types and ratings for each electrical circuit, determining appropriate size, ratings and locations for all associated equipment and subsystems and selecting an appropriate interconnection point.

(e) The installer certification should be time restricted, so that a refresher seminar or event would be necessary for continued certification.