Curriculum for the Seminar

"Solar Energy– Technology and Applications"

for Small and Medium-Sized Enterprises

Baltic Sea Region Programme 2007–2013

Part-financed by the European Union (European Regional Development Fund and European Neighbourhood and Partnership Instrument)

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This training course was developed by the QUICK Project Partner: Hamburg Chamber of Skilled Crafts and Small Businesses in Hamburg, ZEWU - Centre for Energy, Water and Environmental Technology, and tested in practice on 23 and 24 March 2011 in Tallinn/Estonia with 67 participants (Lecturers: Bernhard Weyres-Borchert, German Society of Solar Energy, Hamburg, Germany; Tatiana Abarzua, German Society of Solar Energy, Hamburg, Germany; Michael Wegecsanyi, Managing Director, Energy Smart OÜ, Estonia).

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1. Summary of the Most Important Characteristics

1.1 Objective

The objective of this seminar is to give the employees and decision makers in small and medium-sized enterprises (SMEs) an overview of the possibilities of energy saving measures in their enterprises through the adoption of energy-saving measures and /or the use of renewable energies. The seminar provides information and facts about various possibilities, costs and benefits, as well as good examples to enable the participants to assess the implementation of possible measures in the sector-specific enterprises.

1.2 Target Groups

Electricians, gas and water system installers, roofers, heating installers (masters, apprentices, experts and managerial staff)

1.3 Duration and Timing

The seminar is designed as a full-time course and includes 2 days, the third day is optional. The first day includes the presentation and discussion of the basics of solar energy use, as well as technical and financial aspects of solar thermal systems. It begins at 9:00 a.m. and ends at 6 p.m. (8 teaching units). Applications of large systems are shown, goods examples are presented and basic knowledge of solar power generation is provided during the second day. The conclusion of the course is the topic of customer service and solar marketing (7 teaching units). On the third day (depending on the interest of the participants) an excursion to a completed solar project site takes place, which provides not only technical information but also the experience of the system operators in the implementation and operation of the plant.

1.4 Qualification of Instructors

The seminar should possibly be conducted by instructors who posses both extensive knowledge in the field of solar energy utilisation (market, technology, planning, installation, costs, efficiency of solar thermal and solar power systems), as well as country-specific knowledge, in particular the financial framework conditions for the implementation of measures. It is advisable to hire at least three instructors for the seminar. The instructors should not only be professionally competent but also have experience in the area of education, presentations and discussions. The advantage is of course the guidance of group work and the involvement of participants in the discussions and role plays.

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1.5 Required Technical Equipment

- System components as illustrative models (e.g. absorbers, flat plate collectors, vacuum tube collectors, monocrystalline and polycrystalline solar modules, inverters, charge controllers)

In addition:
- Flip chart
- Blackboard
- PC with a beamer
- Internet access for the instructor's laptop
- Screen.

1.6 Methodological and Didactic Remarks

Depending on the knowledge of the participants, the basic relationships are touched upon as far as necessary, but they can be deepened if there is such a need at any time. In order to give the block "Customer Service" a certain classification, the following areas should be discussed with the participants:

- Customer groups and customer requirements
- Typical questions and answers
- Course of a consultation calls

2. Seminar Concept

2.1 General Concept

2.1.1 Overview Over Key Topics and Contents (based on the content of the master set of slides for the instructor)

In the key topics 4 and 8 the market areas and the support are appropriately presented by instructors from the respective countries.

Key Topic 1: Why Should We Use Solar Energy? 1 TU

Topic 1.1: Increasing Energy Consumption in View of Shrinking Inventories (Peak Oil)
Topic 1.2: Rising Energy Prices
Topic 1.3: Global Warming and Climate Change

Key Topic 2: Applications of Solar Energy, Construction and Functioning of Solar Thermal Systems - 2 TU

Topic 2.1: Solar Energy Use and Supply
Topic 2.3: Structure and Function of Solar Thermal Systems
Topic 2.4: Components of Solar Thermal Systems

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Topic 2.5: Regulation and Control
Topic 2.6: Solar Hot Water Preparation and Heating Support

Key Topic 3: Planning and Dimensioning, Installation, Commissioning and Maintenance - 2 TU

Topic 3.1: Planning and Design, Checklists and Rules of Thumb
Topic 3.2: Solar Fraction and Solar and Utilisation Rates
Topic 3.3: Installation of Collectors, Tanks and the Solar Circuit
Topic 3.4: Defects, Causes and Solutions
Topic 3.5: Maintenance and Service

Key Topic 4: Costs and Benefits, Profitability, Market and Support – 2 TU

Topic 4.1: Investment Costs and Energy Savings
Topic 4.2: Profitability Calculations, Amortisation Time
Topic 4.3: Solar Thermal Market and Support Programs in Estonia

Key Topic 5: Large Solar Thermal Systems – 1 TU

Topic 5.1: Areas of Application of Large Plants
Topic 5.2: Systems and Planning of Large Systems
Topic 5.3: Installation, Costs and Profitability of Large Systems

Key Topic 6: Structure and Functioning of Solar Power Systems – 1 TU

Topic 6.1: Grid-Connected Systems and Isle Systems
Topic 6.2: Components of Solar Power Systems, Modules, Inverters

Key Topic 7: Planning and Dimensioning, Installation, Commissioning and Maintenance – 2 TU

Topic 7.1: System Design, Dimensioning of Components
Topic 7.2: Installation, Advantages and Disadvantages of Different Mounting Types
Topic 7.3: Operational Monitoring and Maintenance of Solar Power Systems

Key Topic 8: Costs and Benefits, Profitability, Market and Support – 2 TU

Topic 8.1: Investment and Installation Costs
Topic 8.2: Power Consumption or Power Supply
Topic 8.3: Feed-in Tariff and Profitability
Topic 8.4: Solar Power Market and Promotion in Estonia

Key Topic 9: Customer Service – 2 TU

Topic 9.1: Customer Types and Customer Requirements
Topic 9.2: Typical Questions and Answers
Topic 9.3: Course of Customer Calls

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Key Topic 10: Excursion – 4 TU

Topic 10.1: Regional Solar Project (visiting the facility, presentation of the technology, operational experience of the operator)

2.2 Learning Objectives and Methodological and Didactic Comments on the Key Topics of the Concept

The main learning objective is to explore the possibilities of solar energy use, to be able to assess the application in one's own facility and get the knowledge about financing and support possibilities.

Specific learning objectives of the seminar include the following topics:

- Assessment of the global energy situation
- Overview of the possibilities and the efficiency of solar technologies
- Knowledge of the components, as well as their structure and function
- Dimensioning of a solar system (solar thermal and solar power)
- Cost and benefit analysis taking support into consideration

The learning objectives for each key topic are described below:

2.2.1 Key Topic 1: Why Should We Use Solar Energy?

The participants ...
... recognise the importance of solar energy in the light of rising energy prices and decreasing availability of resources in terms of fossil energy.
... get an idea of the real consequences of progressive global warming

2.2.2 Key Topic 2: Applications of Solar Energy - Structure and Functioning of Solar Thermal Systems

The participants ...
... learn to assess the solar energy supply and its quality
... learn about various uses of solar energy
... know the structure and function of solar thermal systems
... obtain information about the components and their role and function

2.2.3 Key Topic 3: Planning and Dimensioning, Installation, Commissioning and Maintenance

The participants ...
... know the essential parameters of customised planning
… learn the tool for the system design (simulation software)
... learn about the process of system installation
... learn about commissioning and maintenance protocols

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2.2.4 Key Topic 4: Costs and Benefits, Profitability, Market and Support

The participants ...
... are informed about the costs of solar systems and can estimate the expected energy savings
... learn methods of profitability calculation and get an overview of the market situation and, if necessary, the existing support programmes

2.2.5 Key Topic 5: Large Solar Thermal Installations

The participants ...
... know appropriate applications for large solar thermal systems
... learn the basic differences between small and large plants
... learn about the planning process of large solar plants
... know the cost situation on the large plant area

2.2.6 Key Topic 6: Structure and Functioning of Solar Power Systems

The participants ...
... get to know the structure and components of solar power systems
... know the efficiency of solar cells and inverters
... are able to estimate the yield of a solar power plant

2.2.7 Key Topic 7: Costs and Benefits, Profitability, Market and Support

The participants ...
... get to know the cost structure of solar power systems (components, installation)
... are able to calculate the cost of a solar power plant
... know what energy savings are possible in the case of photovoltaics
... get an overview of the PV market situation and possibly the existing funding

2.2.8 Key Topic 8: Planning and Design, Installation, Commissioning and maintenance

The participants ...
... learn to design a solar power system (rules of thumb, simulation software)
... know the individual installation steps (taking shading into consideration)
... know the maintenance costs of solar power systems

2.2.9 Key Topic 9: Customer Service

The participants ...
... get to know different types of customers die
... Are able to provide appropriate answers to typical questions
... Know the stages of a consultation talk

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2.2.10 Key Topic 10: Excursion

The participants ...
... get to know a completed solar project
... are informed about difficulties in the implementation or financing, if necessary
... know what energy savings can be achieved,what operational experience have the operators gained, and what recommendations they can give for similar projects

3. Certificate

The participants receive a certificate upon completion of the seminar, in which the training contents (key topics) are listed and signed by the training centre (Chamber of Crafts) and the Hanseatic Parliament. The certificate contains possibly the INTERREG Disclaimer.

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