BUILD UP SKILLS

FORESEE

Training FOR REnewableS and Energy Efficiency in building sector

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LNEG-Portugal

10th BUILD UP Skills EU Exchange Meeting
30 May 2017
### Portugal “ROADMAP” 2020

<table>
<thead>
<tr>
<th>ACTION LINE</th>
<th>MEASURES</th>
<th>TARGET</th>
<th>ESTIMATED COST (k€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewables for electricity</td>
<td>PV and wind installers</td>
<td>500-700</td>
<td>400-700</td>
</tr>
<tr>
<td>Renewables for heating and cooling</td>
<td>Solar thermal installers</td>
<td>8000-13000</td>
<td>6400-13000</td>
</tr>
<tr>
<td></td>
<td>Installers of biomass boilers and stoves</td>
<td>3000-5000</td>
<td>2400-5000</td>
</tr>
<tr>
<td></td>
<td>Heat pump installers</td>
<td>1000-2000</td>
<td>800-2000</td>
</tr>
<tr>
<td></td>
<td>Shallow geothermal installers</td>
<td>50-100</td>
<td>30-100</td>
</tr>
<tr>
<td>Energy systems (other than RES)</td>
<td>HVAC installers</td>
<td>10700-11500</td>
<td>8560-11500</td>
</tr>
<tr>
<td></td>
<td>Lighting</td>
<td>1400-2100</td>
<td>1120-2100</td>
</tr>
<tr>
<td></td>
<td>Boilers installers</td>
<td>3000-5000</td>
<td>2400-5000</td>
</tr>
<tr>
<td>Building envelope</td>
<td>Windows installers</td>
<td>1000-2000</td>
<td>800-2000</td>
</tr>
<tr>
<td></td>
<td>Bricklayer and insulation workers</td>
<td>1450-3000</td>
<td>1160-3000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>31200-46400</strong></td>
<td><strong>25-46 M€</strong></td>
</tr>
</tbody>
</table>
FORESEE Project
The training methods, materials, infrastructure developed
Training on:

**HEATING AND COOLING**
- HVAC installation and maintenance
- Solar thermal systems
- Biomass boilers

**BUILDING ENVELOPE**
- Thermal insulation installer
- Window installer

**RENEWABLE AND EFFICIENT USE OF ELECTRICITY**
- Photovoltaic systems
- Wind systems
- Lighting system

Courses 25 hs and 50 hs (Theoretical and Practical)
Training material

- **The Program** (focus on practical)
- **Manual** (theoretical and practical)
- **Power Point**
- **Samples**
- **Models**
- **The Workshop** (test site, wall, windows)
- **The Facilities for training**
- **The Equipment** (Boilers, Solar Thermal, PV, Wind, HVAC)
# BUILDING ENVELOPE INSULATION (25 hrs)

<table>
<thead>
<tr>
<th>Day 1 – (8,5 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal insulation relevance</td>
</tr>
<tr>
<td>Regulatory requirements for the thermal performance of buildings in Portugal</td>
</tr>
<tr>
<td>Materials and types of thermal insulation (part 1)</td>
</tr>
<tr>
<td>Practical part of the training: Presentation of samples of each thermal insulation available in the market</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 2 – (8 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials and types of thermal insulation (part 2)</td>
</tr>
<tr>
<td>Quality requirements required for the execution of the thermal insulation</td>
</tr>
<tr>
<td>Practical part of the training: double walls with thermal insulation in the box air; ventilated facades; ETICS; improved thermal performance coatings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 3 – (8,5 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriateness of the-thermal insulation to different applications</td>
</tr>
<tr>
<td>Influence of thermal insulation in mitigating anomalies and fulfillment of other requirements</td>
</tr>
<tr>
<td>The thermal insulation in energy rehabilitation of buildings</td>
</tr>
<tr>
<td>Practical part of the training: thermal insulation systems of walls from the inside; Flat roof; pitched roofs; Floors.</td>
</tr>
</tbody>
</table>
Practical training in a lab with a test facility (Workshop).
## Solar thermal systems

### Day 1 – (7 hours)
- Reception of participants
- Organization of work, methodology and practical training details
- Specifications of practical training equipment
- Working Group 1: Installation of the support structure and collectors
- Working Group 2: Installation of the hot water storage tank
- Working group 3: Installation of piping of the primary circuit network

### Day 2 – (7 hours)
- Working Group 2: Installation of the support structure and collectors
- Working Group 3: Installation of the hot water storage tank
- Working group 1: Installation of piping of the primary circuit network

### Day 3 – (7 hours)
- Washing, filling and pressurization system
- installation startup: execution of functional tests
- Legislation and regulations
- System components.
- Working Group 3: Installation of the support structure and collectors
- Working Group 1: Installation of the hot water storage tank
- Working group 2: Installation of piping of the primary circuit network

### Day 4 – (4 hours)
- Solar thermal systems
- Assessment of installed system
- Training Evaluation
Solar Thermal and PV

The Workshop and the Practice
The Workshop and the Practice
Training FOR RENEWABLES AND ENERGY EFFICIENCY in building sector - Training schemes set-up

The Wind Systems

The Workshop and the Practice
The most remarkable project outcomes / results and achievements
Training FOR REnewableS and Energy Efficiency in building sector - Training schemes set-up

Achievements

1. Developing a **new training scheme** for the continuous professional development with:

- **Set-up theoretical/practical contents**; **Curriculum** for the training courses
- Preparation of Training **Support Materials** and Guidelines;
- **Training of trainers** to select and prepare training resources;
- **Pilot courses** to validate technical and pedagogical training and enable to identify and correct any weaknesses.
2. Set up **facilities for training** and proper equipment to train and qualify trainees, giving special focus to the practical component.

3. Incorporate the **EE and RES concepts** in the training and design new training contents related to new competences.

4. Mobilization of **the key actors**, training providers, professional associations and interested stakeholders.

5. Construction and integration of UFCDs (**Training Units of Short Duration**) in the areas of energy efficiency that will be part of the National Catalogue of Qualifications.
The project produced 8 manuals (Boilers, HVAC, Lighting, PV systems, Solar Thermal, Thermal Insulation, Wind, Windows), which are now available for future training (As also the power point presentations in 8 separate manuals).
Training Actions

A total of 32 training actions were carried out, the planning and execution of the training actions were always developed in close collaboration with the National Stakeholders and Training Centres.

**Training of trainers** served a dual purpose: establishing a pool of suitably qualified future trainers and to adequate the training courses for craftsmen’s and installers, testing the support material and schedule distribution.

**179 participants**

**Pilot courses** of a total of **262 participants** received intensive training. The planning and execution of the training actions were always developed, in close collaboration with the National Stakeholders and Training Centre’s.
Training Evaluation

WP3

Overall Evaluation Lisbon

- PV Systems: 5
- Wind Systems: 4
- Solar Collector Systems: 3
- Biomass Boilers: 2
- HVAC: 1
- Lighting: 1
- Thermal Insulation Installer: 1
- Windows Installer: 1

Overall Evaluation Porto

- PV Systems: 5
- Wind Systems: 4
- Solar Collector Systems: 3
- Biomass Boilers: 2
- HVAC: 1
- Lighting: 1
- Thermal Insulation Installer: 1
- Windows Installer: 1

(5=very positive, 1=very negative)
Overall Evaluation Lisbon and Porto

(5=very positive, 1=very negative)
Success stories

Collaborative Construction Skills
A very participative process performed within the National Qualification Platform, stakeholders in different professional/expertise fields (i.e. energy efficiency and RES use, construction sector, education and vocational training,)

Training Actions
All the training actions, proved the interest of a large number of candidates to participate as also, companies and training centers.

National Catalogue of Qualifications
Validation profiles and contents to these training modules in the National Catalogue of Qualifications (NCQ). Another success story, is represented by the definition and implementation of modular qualification scheme for professionals regarding the Vocational Education and Training (VET) system
Challenges

Lessons learned

**Tutor ship**
It was revealed to be a difficult task to bring back professionals/workers “back to school blue collars were closely followed by one or more elements of the consortium team to contribute to their motivation and integration.

**Practical vs Theoretical**
It can be pointed out that installers training is a major issue and, was also demonstrated that, for a well succeed training and participation, a strong practical component is essential, in terms of teaching load, selection of the laboratory facilities and equipment preparation.

**Time Length**
However, as barrier it must be referred that, taking working days to update their knowledge during three and half consecutive days, is not suitable for the employee professionals.

**Institutional Partners-Legal System**
The project intends since the beginning to create “Short Duration Training Units” (UFCD) and include them in the National Catalogue of Qualifications (NCQ). This strategy was carried out, and the first Unit to be included in the Catalogue is the one related with Thermal Solar Systems and Biomass Boilers, which was proposed.
Marketing and outreach strategy
Training FOR RenewableS and Energy Efficiency in building sector - Training schemes set-up

Meetings with professional and industrial associations;

Meetings with Administration;

Meetings with Experts;

Seminars in different periods of the project;

Final Seminar in the Trainings Centers;
Communication and dissemination

### Training FOR RENewableS and Energy Efficiency in building sector - Training schemes set-up

<table>
<thead>
<tr>
<th>Common Performance indicator</th>
<th>Planned target</th>
<th>Actual achievement</th>
<th>Comment on performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of training courses</td>
<td>24</td>
<td>24</td>
<td>All the 24 courses were carried out</td>
</tr>
<tr>
<td></td>
<td>12 Train trainer, 12 Pilot courses</td>
<td>12 Train trainer, 12 Pilot courses</td>
<td></td>
</tr>
<tr>
<td>Number of people</td>
<td>420</td>
<td>441</td>
<td>In the training trainers we achieved 179 people, and in the Pilot courses 262 trainees.</td>
</tr>
<tr>
<td></td>
<td>15x12 (TT)= 180 20x12(TC)= 240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of hours taught in the frame of the courses</td>
<td>738 hr</td>
<td>900 hrs</td>
<td>Accomplished</td>
</tr>
<tr>
<td></td>
<td>12(TT) x 24hr= 288 6 (TC)x50 hr= 300 6 (TC)x25 hr = 150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated specific cost to qualify each trainee (€)</td>
<td>400 (€) Approx./trainee</td>
<td>350€ (5000€ per 3day course, with 15 students and 2 teachers)</td>
<td>The values could be between the 350 and 400 or 500€ depending of distinct factor related with the facilities in the different sites</td>
</tr>
<tr>
<td>Cumulative Investment (Euro)</td>
<td>359.180,00</td>
<td>325.120,86</td>
<td>Correspond to the total budget of the Project</td>
</tr>
<tr>
<td>Renewable Energy (toe/year)</td>
<td>2.3 kToe/year*</td>
<td>2.3 kToe/year</td>
<td>We assume that the application of the plan is on track with the goals.</td>
</tr>
<tr>
<td>*values included in National Renewable Energy Plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary energy savings (toe/year)</td>
<td>320 kToe/year*</td>
<td>340**</td>
<td>The same</td>
</tr>
<tr>
<td>Reduction GHG emissions (t CO2e/year)</td>
<td>1400 kTon CO2e/year*</td>
<td>1400 kTon CO2e/year*</td>
<td>The same</td>
</tr>
</tbody>
</table>
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Co-funded by the Intelligent Energy Europe Programme of the European Union