

# BUILD UP SKILLS

## FORESEE

Training **FOR R**enewable**S** and **E**nergy **E**fficiency  
in building sector

Hélder Gonçalves  
LNEG-Portugal

**10th BUILD UP Skills  
EU Exchange Meeting**  
30 May 2017

BUILD UP Skills FORESEE



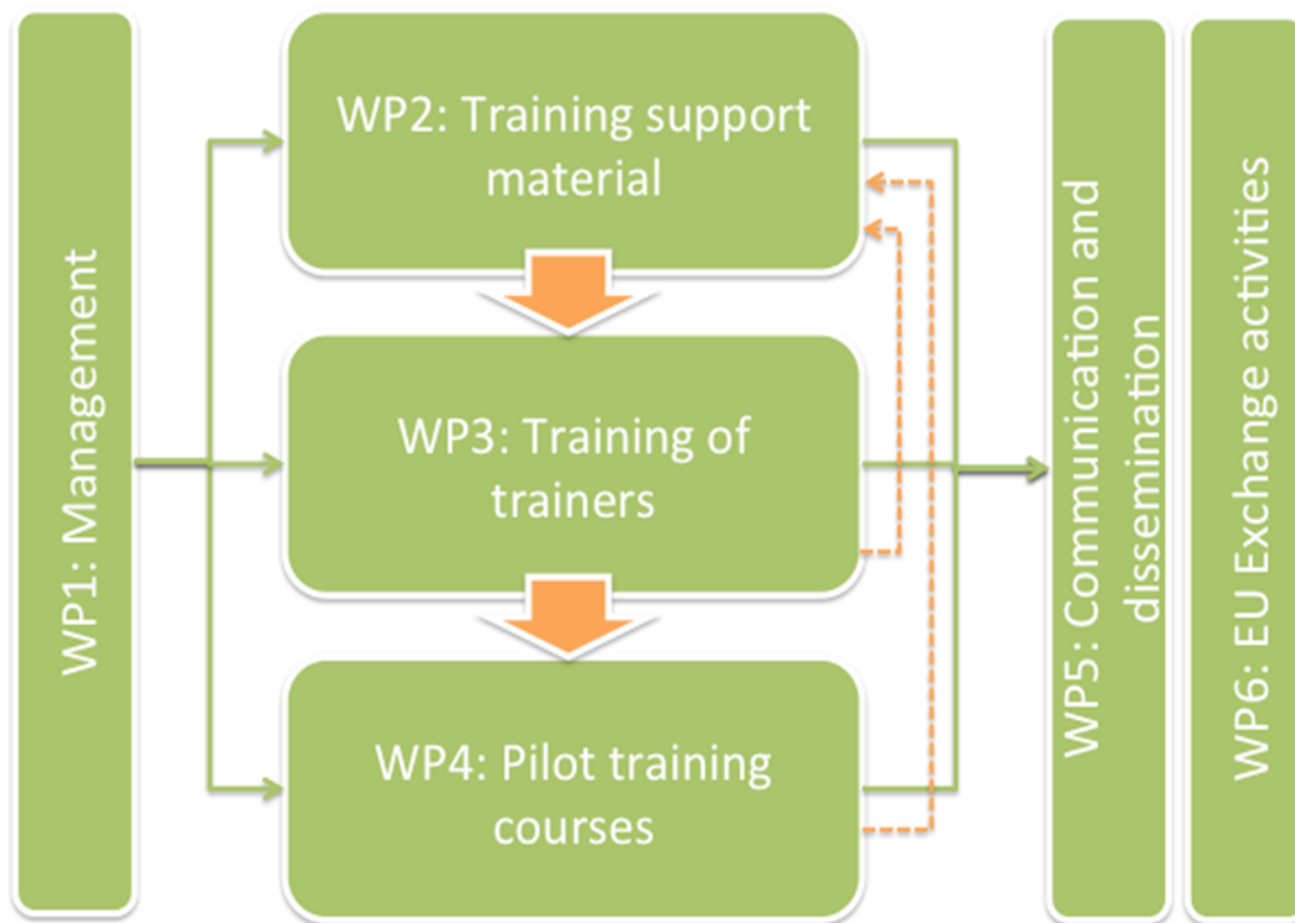
IEE/13/BWI 702/SI2.680177  
BUILD UP Skills FORESEE  
September 2014 to February 2017



## Portugal “ROADMAP” 2020

ACTION LINE		MEASURES	TARGET	ESTIMATED COST (k€)
Renewables for electricity	●	PV and wind installers	500-700	400-700
Renewables for heating and cooling	●	Solar thermal installers	8000-13000	6400-13000
	●	Installers of biomass boilers and stoves	3000-5000	2400-5000
		Heat pump installers	1000-2000	800-2000
		Shallow geothermal installers	50-100	30-100
Energy systems (other than RES)	●	HVAC installers	10700-11500	8560-11500
	●	Lighting	1400-2100	1120-2100
	●	Boilers installers	3000-5000	2400-5000
		Energy management & buildings operation	1100-2000	880-2000
Building envelope	●	Windows installers	1000-2000	800-2000
	●	Bricklayer and insulation workers	1450-3000	1160-3000
TOTAL			31200-46400	25-46 M€

## FORESEE Project





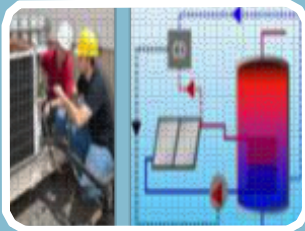
## Training FOR REnewableS and Energy Efficiency in building sector - Training schemes set-up

**The training methods, materials,  
infrastructure developed**



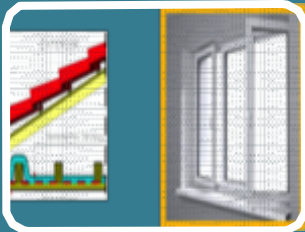


## Training on;



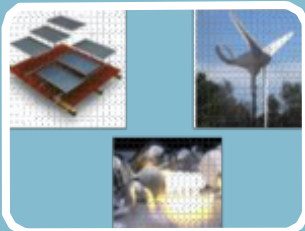
### HEATING AND COOLING

- 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 sytems
- Lighting system

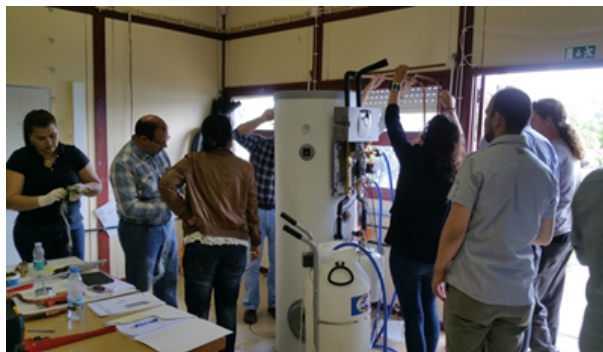
Courses 25 hs and 50 hs (Theoretical and Practical)



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

## 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)

### Day 1 – (8,5 hours)

Thermal insulation relevance

Regulatory requirements for the thermal performance of buildings in Portugal

Materials and types of thermal insulation (part 1)

Practical part of the training: Presentation of samples of each thermal insulation available in the market

### Day 2 – (8 hours)

Materials and types of thermal insulation (part 2)

Quality requirements required for the execution of the thermal insulation

Practical part of the training: double walls with thermal insulation in the box air; ventilated facades; ETICS; improved thermal performance coatings.

### Day 3 – (8,5 hours)

Appropriateness of the-thermal insulation to different applications

Influence of thermal insulation in mitigating anomalies and fulfillment of other requirements

The thermal insulation in energy rehabilitation of buildings

Practical part of the training: thermal insulation systems of walls from the inside; Flat roof; pitched roofs; Floors.



# Training FOr REnewableS and Energy Efficiency in building sector - Training schemes set-up

## Building Envelope Insulation



Practical training in a lab with a test  
facilitie (Workshop).



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

## 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





# Training FOr REnewableS and Energy Efficiency in building sector - Training schemes set-up

## Solar Thermal and PV



## The Workshop and the Practice

# Training FOr REnewableS and Energy Efficiency in building sector - Training schemes set-up



**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





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

**The most remarkable project outcomes /  
results and achievements**



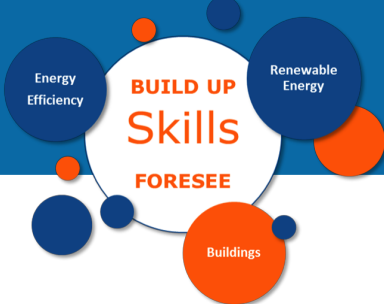
## Achievements

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.



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

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



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

## 8 Manuals



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

## 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

WP3: Training of  
trainers



WP4: Pilot training  
courses

**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

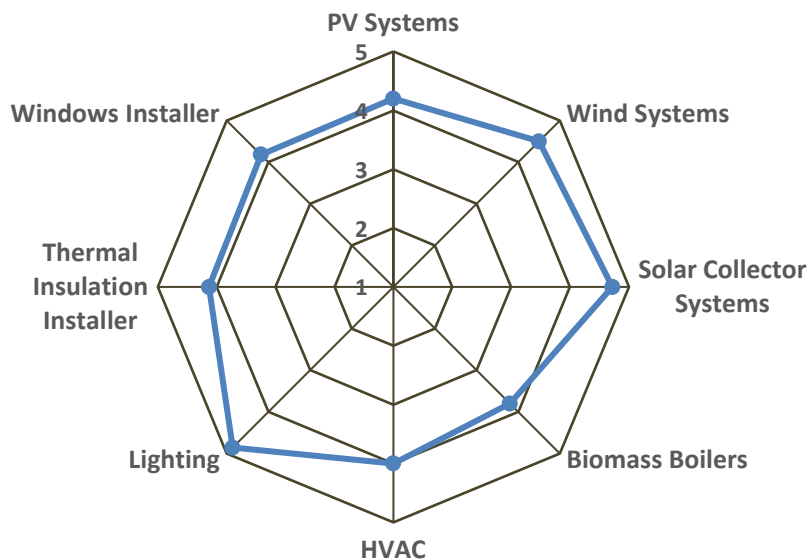


# Training FOR REnewableS and Energy Efficiency in building sector - Training schemes set-up

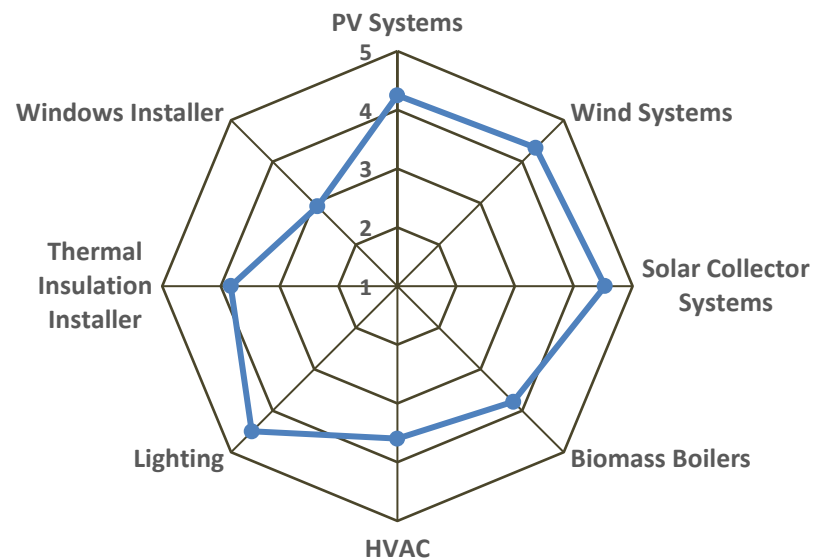
## Training Evaluation

WP3

### Overall Evaluation Lisbon



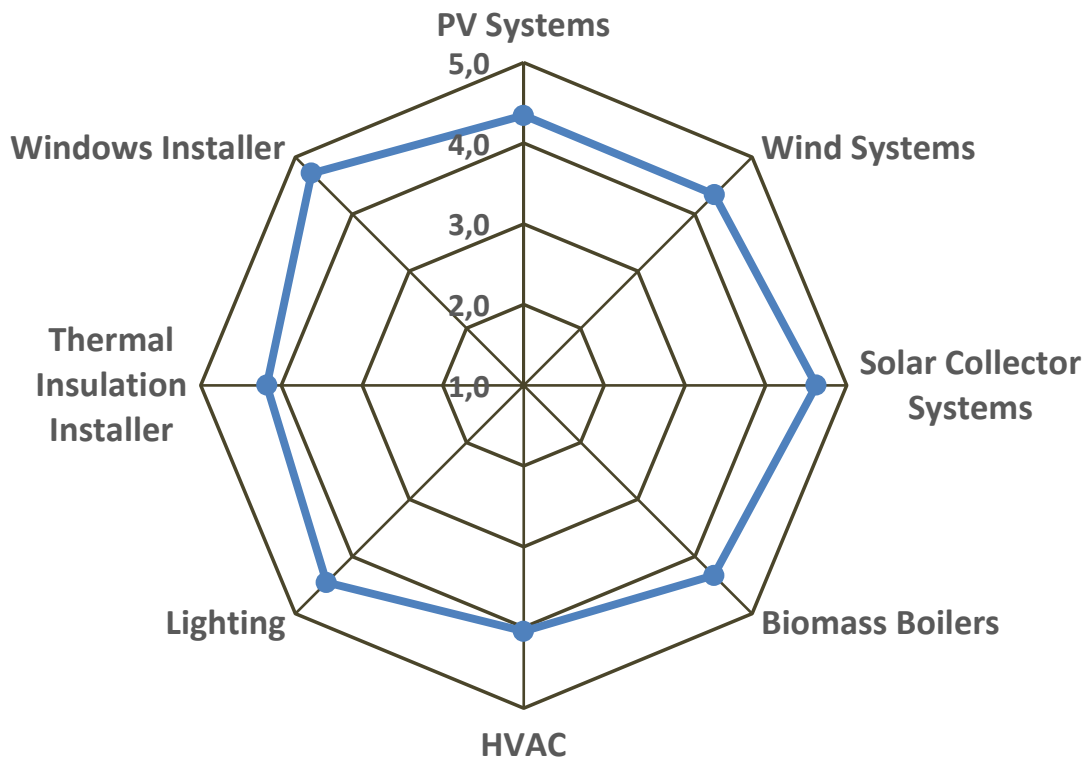
### Overall Evaluation Porto



(5=very positive, 1=very negative)

## WP4

### Overall Evaluation Lisbon and Porto



(5=very positive, 1=very negative)



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

## 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





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

## 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



## Training FOr REnewableS and Energy Efficiency in building sector - Training schemes set-up

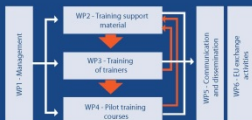
# Marketing and outreach strategy



The BUILD UP Skills FORESEE Project, financed by the Intelligent Energy Europe Programme aims to put into practice the priorities identified in the Roadmap 2014-2020 (Build Up Skills – Portugal), to overcome barriers and skills gaps or needs in various professions to achieve national goals for 2020, and provide a highly skilled workforce.

The project set-up training materials in the following areas:

- Building envelope: Installers of Windows and Installers of Thermal Insulation;
- Heating and cooling: HVAC installation and maintenance, solar thermal systems and biomass boilers;
- Renewable energy systems and efficient use of electricity: Lighting systems, Photovoltaic and Wind Systems.



Training actions for trainers and pilot courses were realized during the Project to test the supporting material developed and therefore create training opportunities, organized into short training units (UFCD) which could be included in the National Catalogue Qualifications of (NCO).

## Installers of Windows

Windows as a constructive element and principles of thermal, ventilation and sound devices

Materials and solutions - choosing devices and solutions in the window

Technical characteristics and system of Energy Labeling elements, CE mark and Mark of Energy Labeling of Windows - SEEP

Design and documentation - frames requirements; Concepts and specific manufacturing windows;

Planning and work preparation: equipment, tools and materials, window installation compliance and quality control-check, safety environment.

**Construction**



Energy in buildings;  
Legislation and technical standards;  
Photovoltaic (PV) conversion;  
PV systems components, applications, planning;  
Practical Training PV Systems installation and  
commissioning, operation and maintenance;  
Examples of PV systems in buildings and technical  
development trends.



Organization of work, methodology and practical training details
Specifications of practical training equipment
Installation of support structure and collectors, hot water storage tank, piping of the primary circuit network
Washing, filling and pressurization system
Installation strategy; execution of functional tests
Solar thermal systems and assessment of installed system
Legislation and regulations



Lighting Systems
Artificial lighting and lighting parameters
Artificial light sources
Equipment lighting installations
Lamps, control and regulation systems
Laws and regulations
Practical exercises



## Installers of thermal insulation

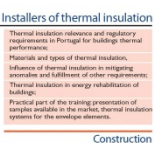
Thermal insulation relevance and regulatory requirements in Portugal for buildings thermal performance;

Materials and types of thermal insulation;

Influence of thermal insulation in mitigating anomalies and fulfillment of other requirements;

Thermal insulation in energy rehabilitation of buildings;

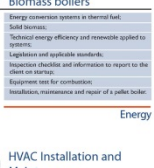
Practical part of the training presentation of samples available in the market, thermal insulation systems for the envelope elements.



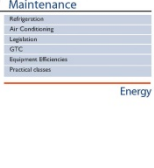
- Wind kinetic energy conversion into electricity
- Components of a wind system
- Applications of Wind Turbine Systems
- Legislation and Technical Standards, wind systems
- Installation planning of a wind system
- Assembly and installation of a wind turbine
- Maintenance of a wind system
- Examples of wind installations.



Biomass boilers
Energy conversion systems in thermal fuel:
Solid biomass.
Technical energy efficiency and renewable applied to systems.
Legislation and applicable standards:
Inspection checklist and information to report to the client on startup.
Equipment test for combustion.
Installation, maintenance and repair of a pellet boiler.



Maintenance
Refrigeration
Air Conditioning
Legislation
GTC
Equipment Efficiencies
Practical classes



# CONVITE

## SEMINÁRIO

### APRESENTAÇÃO DE RESULTADOS DO PROJETO

## 23 FEV. 2017

MAIA | Auditório do CICCOPN | Rua de Espinhosa



**BUILD UP Skills**

**FORSEE**

**PROGRAMA**

- 14:30h | **Sessão de Abertura**
- 14:45h | Apresentação do Projeto: Helder Gonçalves e Jorge Ricardo Marques
- 15:00h | Apresentação dos Módulos Formativos (10 minutos)
- 1. Bateria Tópicos - ADRENE/ANEG
- 2. Cálculos de Biomassa - API/EP
- 3. Bateria Potenciável - LNEED
- 4. Meio Edifício - LNEED
- 16:00h | **Pausa**
- 16:15h |
  - 5. ACAC - API/AC
  - 6. Instalações de Janelas - ANF/ANEG
  - 7. Instalações de Iluminação - API/AC
  - 8. Luminotécnica - Toxares/Light
- 17:30h | Apresentação das UFCDs (sessões temáticas de curta duração) - ANDEP
- 17:50h | **Sessão de Encerramento**

## INSCRIÇÃO

Unidade Coordenadora:



Entidade Parceira:




GRATUITO PARA OS 20077  
MIA 2016-2017  
Inscrição até 14 de Fevereiro 2017

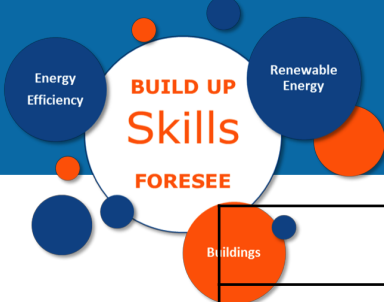


# Training FOR REnewableS and Energy Efficiency in building sector - Training schemes set-up

## Communication and dissemination



<http://www.lneg.pt/iedt/unidades/20/paginas/187>



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

Within the duration of the action			
Common Performance indicator	Planned target	Actual achievement	Comment on performance
Number of training courses	<b>24</b> 12 Train trainer 12 Pilot courses	<b>24</b> 12 Train trainer, 12 Pilot courses	All the 24 courses were carried out
Number of people	<b>420</b> 15x12 (TT)= 180 20x12(TC)= 240	<b>441</b>	In the training trainers we achieved 179 people, and in the Pilot courses 262 trainees.
Number of hours taught in the frame of the courses	<b>738 hr</b> 12(TT) x 24hr= 288 6 (TC)x50 hr= 300 6 (TC)x25hr = 150	<b>900 hrs</b> 12x25hr+ 12x50hrs	Accomplished
Estimated specific cost to qualify each trainee (€)	<b>400 (€)</b> Approx./trainee	<b>350€</b> (5000€ per 3day course, with 15 students and 2 teachers)	The values could be between the 350 and 400 or 500€ depending of distinct factor related with the facilities in the different sites
Cumulative Investment (Euro)	<b>359.180,00</b>	<b>325.120,86</b>	Correspond to the total budget of the Project
Renewable Energy (toe/year)	2.3 kToe/year* *values included in National Renewable Energy Plan	2.3 kToe/year	We assume that the application of the plan is on track with the goals.
Primary energy savings (toe/year)	320 kToe/year*	340**	The same
Reduction GHG emissions (t CO2e/year)	1400 kTon CO2e/year*	1400 kTon CO2e/year*	The same



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

**Contact: [helder.goncalves@Ineg.pt](mailto:helder.goncalves@Ineg.pt)**



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