SOLAR FIELD OPERATOR

Parabolic Trough Concentrated
Solar Power Plants (PT CSP)

SSA SOLARCV GENERAL OBJECTIVES ARE:

- To increase the response of continuing Vocational Education and Training (VET) systems to Concentrated Solar Power (CSP) labour market demand for new skills.
- To strength the exchange of knowledge and practice between VET institutions and the CSP labour market by integrating work-based learning (WBL).
- To increase mobility of EU CSP learners, by increasing the recognition of learning outcomes and by providing flexibility of learning pathways to achieve qualifications.
- To strength the Union's capacity by the "anticipation and matching of labour market and skills needs" as established in priority 2 of the Agenda for new skills and jobs: "A European contribution towards full employment" .

SPECIFIC OBJECTIVES

WP 2 specific objectives:
- To gather and interpret evidence of skills needs on the labour market in the CSP sector, drawing on reports of the EU Skills Panorama, involving representatives from European Sector Skills Councils, and underlining the future CSP occupational profile on base to the classification of European Skills, Competences, Qualifications and Occupations (ESCO).

WP 3 specific objectives:
- To provide a methodology for the validation of current non-formal and informal training in CSP sector.
- To "integrate innovative approaches to teaching and learning through more strategic and integrated use of ICTs (Information and Communication Technologies) as CSP solar field e-simulator.

WP 4 specific objectives:
- To test and verify the EU CV structure and its integration in an ICT teaching system.
- To test and validate the methodology for non-formal training validation, as well as its implementation in an ICT system.

WP 5 specific objectives:
   Specific objectives of the 2 pilots are to check:.
- the e-simulator Tool and its proper integration of teaching and learning in the CSP sector through ICT methods.
- the methodology for validation of non-formal learning and its implementation in ICT support systems.
- To scale the recognition of the EU CSP CV by promoting the adoption of formal training structure (National proposals of European Qualification) in each of the countries with CSP VET needs.
- To assure the recognition of workers skills by creating an EU Certification of CSP Plant Operator, through the establishment of a private certification and recognition structure at EU level.

Project activities assure developing the project products, which assure the project results and thus the objectives.

Three main project results can be underlined as objective-achievers:

- The definition of European Standard (EU CV) for the training of CSP solar-field operators
- The creation of a ICT e-learning platform and e-simulator for providing formal training
- The delivery of a methodology for validation non-formal learning

The CSP Competence Profile, EU CSP CV and learning units, have considered European Credit transfer system for Vocational Training and Education (ECVET, http://www.ecvet-projects.eu/) and European Quality Assurance in Vocational Education and Training (EQAVET, http://www.eqavet.eu/gns/home.aspx) European references, so the resulting products ensure a better understanding and comparability of qualifications and learning achievements across countries (such as learning outcomes approach do), increasing workers mobility capacity.

SOLAR FIELD OPERATOR PARABOLIC TROUGH CONCENTRATED SOLAR POWER PLANTS (PT CSP)

- COURSE CONTENT -

UNIT 1: RADIATION

- *Solar Geometry*
- *Potential Generation Evaluation*

UNIT 2: TECHNOLOGIES

- *Different Technologies*
- *Parabolic Trough CSP Plants*
- *PT CSP Plants with Thermal Storage*
- *Linear Fresnel Concentrators*
- *Parabolic Disc with Stirling Engine*
- *Central Receiver Plants with Direct Steam Generation*
- *Central Tower Plants with Inorganic Molten Salts*
- *Hybridization with fossil fuel boilers*
- *Hybridization with biomass boilers*
- *Hybridization with Combined Cycles, Integrated Solar Combined Cycle (ISCC plants)*

UNIT 3: SOLAR FIELD IN PT

- Concentrator Module
- Solar Collector Assembly (SCA)
- Solar Field in a PT CSP Plant
- Loops in a PT CSP Plant

UNIT 4: HTF

- Heat Thermal Fluids in industry

UNIT 5: SOLAR OIL SYSTEM

- *The Organic Synthetic Fluid (HTF)*
- *Overall Vision of the HTF System*
- *Solar Field and HTF System*
- *The Pumping System*
- *Expansion Tanks*
- *HTF Purification System*
- *Natural Gas Auxiliary Boiler*
- *HTF System Instrumentation and Control*

UNIT 6: THERMAL STORAGE

- *Thermal Storage System*

UNIT 7: STEAM GENERATOR

- *Steam Generation Train (SGT)*

UNIT 8: POWER BLOCK

- *Elements of Power Block*

UNIT 9: PLANT OPERATION

- *The Function of Operation and Organization char of a PT CSP*
- *Starting Modes*
- *Operation Modes*

UNIT 10: SAFETY

- *Risks Assesment*
- *Special Risks: Working in the Solar Field*
- *Special Risks: Explosive Atmospheres*
- *Special Risks: Confined Spaces*
- *Special Risks: Electrical Risks*
- *Special Risks: Chemical Products*

UNIT 11: PRACTICES - SIMULATOR

- *E-Simulator*
- *Practices*

Each unit will have:

- Description of learning objectives of the unit
- One prezi presentation for each element of the unit
- One or more videos for each element of the unit
- One online test
- One theoretical exercise
- One practical exercise
- Optionally, some units will have a supporting text in PDF format

The platform will have a blog (coordinated by RENOVETEC), FAQs and a fórum.

1.1 Solar Geometry

- CONTENT: Solar Geometry
- CONTENT: Solar Geometry
- VIDEO: Concentrating solar power CSP: different technologies
- VIDEO: Solar Geometry
- Theoretical exercise UNIT 1.1
- Practise Exercise UNIT 1.1
- Test Element 1.1. Solar Geometry
- Glossary

E-learning and online training platform is available 24 hours, 7 days a week.

The student receives an email in which there will be all the steps to enter in the course in which has been registered.

Mail details the URI, user, and password.

The URL to access is http://solarcv.org

The student needs to enter their data into the platform, once inside it is necessary to select the unit.

All Courses

| UNIT 1: Radiation | UNIT 2: Technologies | UNIT 3: Solar field in PT |
| UNIT 4: HTF | UNIT 5: Thermal Oil System | UNIT 6: Thermal Storage |

The duration of the course is 300 hours.

The on-line platform especifies the number of attemps and requirements for each test, theoretical and practical exercise.

The student has to pass at least the 80% of correct answers, in order to pass the course.

Each training unit may be studied independently, will have as reference material a presentation in PREZI format, a series of videos that explain the PREZI full and some special for some concrete units, will have at least one test, one theoretical exercise and a practical exercise, and additionally may be included others additional documents in different formats.

The last unit requires the handling of the solar thermal power plant simulator, in which six practices could be performed correctly.

The correct answer of all the tests, the exercises and the practical exercises with simulator, performing the course with a company approved in the platform, in form decided by the consortium, will mean grant an overcoming course certificate. The material will be in the online platform to free available, part of the material may be downloaded freely, after a registration process, and part of it will be online material that may be viewed or used in the platform.

The connection to the platform will require a minimum connection speed of approximately 10 Mb of upload and 10 Mb down, and the equipment that is connected to the platform it is possible that could need some technical requeriments in terms of the operating system, memory, etc. It will always be non-restrictive requirements, which will be referred to the difficulty of connection with equipments or systems considered as obsolete nowadays.

E simulator and practices

Regarding to the Simulator, aimed at the realization of the operation of the solar field practices, it's a tool that can be downloaded from the platform, where the student will have a video presentation and helps in the installation, also available in the platform of the course.
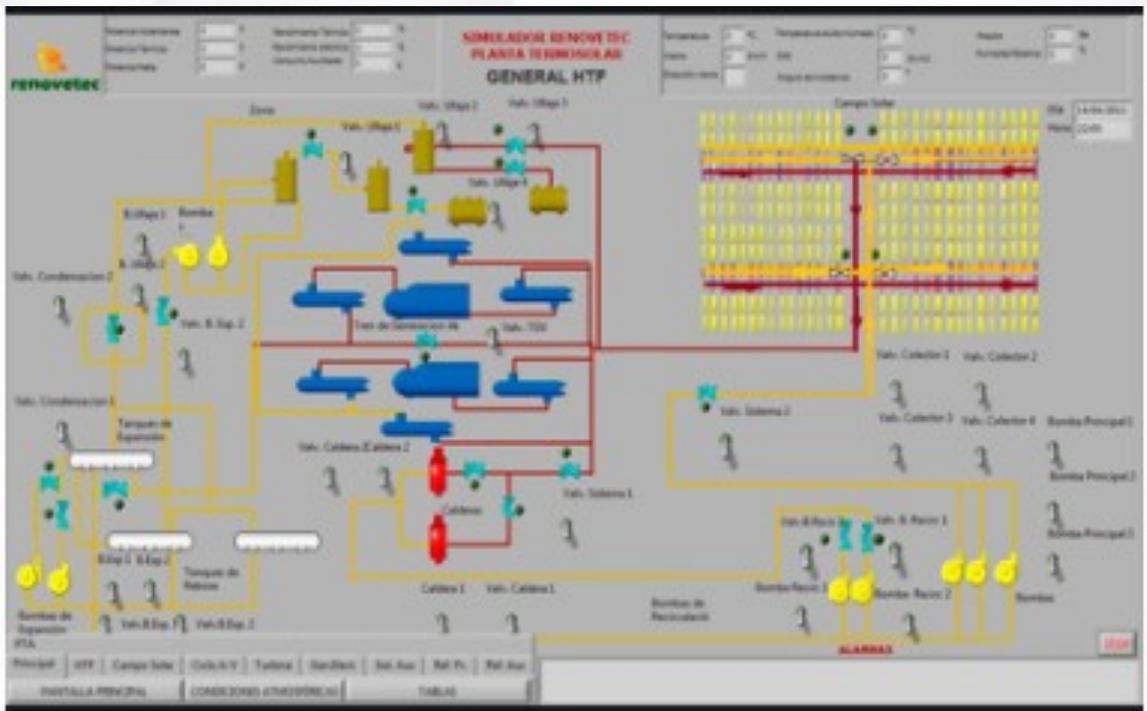
The simulator presents 6 practices, which are necessarily to be overcome by the student. Each practical exercise with the Simulator will feature an explanatory video of the same and consist of a practice to be carried out by the student using the Simulator. To overcome every practice there should be at leats 3 successful attempts.
The exercise only will be overcome with the correctly resolution without exceeding the time limit, indicated by the tool in each case, every time that the Simulator has a time control of execution. The program also controls attempts and successful attempts. The student must also send a screenshot demonstrating that it has succeeded, with the student identification in the screen.

Minimun requirements:

- JAVA, version 7-67 par 64-bit. The program can be downloaded in the following direccion: http://www.java.com/es/download/chrome.jsp?locale=es-is advisable
- Is recommended ADOBE READER V10
- The processor must be an Intel i3 or higher, or an equivalent of this with regard to benefits.
- The minimum RAM must be 4 GB. It is recommended 6 GB
- The operating system of the computer must be Windows 7 or higher. SIMULATOR does not work on operating system ANDROID or iOS, and nor does it correctly in lower versions of the WINDOWS operating system (95, XP, Millennium, Vista). Specifically works correctly with WINDOWS 8.
- The minimum initial available memory on hard disk: 10 GB, although it needed a number of upper memory if the number of data is very high.

Requirements for the students

To register a student in the course it is necessary to know all these data:

- Full name
- Passport number or Identity number
- Profile
- Age
- Gender: Male or Female
- Contact (email)
- Nationality
- Residence place
- Company
- English level and accreditation
- University degrees or vocational training qualifications

Each student will receive an email with all the details and passwords before the beginning of the course.

Course tutor

Santiago García Garrido García Garrido, graduate in Chemical Sciences and Technical Manager at RENOVETEC. Has more than 15 years of experience in companies such as Gas Natural, MASA, OPEMASA. He delivers courses related with OM, technology of Combustion Engines, CSP, PV and electricity generation plants in general.

For more information about the tutor
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