SYLLABUS OF THE ONLINE COURSE ABOUT SOLAR THERMAL POWER PLANTS. CCP TECHNOLOGY

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I. DETAILED PROGRAM OF THE ONLINE COURSE

1. GENERAL PURPOSE:

The purpose of this online course is to present the basic principles of the various technologies that currently exist to convert solar radiation into thermal energy at temperatures above 150 ° C, delving into the technology that is more developed from a commercial point of view: the parabolic trough solar collectors, from which we will analyze its operation, components, energy balance and commercial applications.

2. SPECIFIC OBJECTIVES:

Specific Objective: Concentrating Solar Thermal Systems.

The objective is to provide students with basic knowledge about solar thermal concentration systems, and the various technologies currently available to convert solar radiation into useful heat in the temperature range 125 ° C <T <1500 ° C.

AGENDA
• Overview of a plant • Solar Radiation and its concentration • CSP Solar Power Tower • CSP Stirling • CSP Solar Parabolic Trough

<u>Specific Objective</u>: Components of a Parabolic Trough.

We aim to familiarize students with the components, operating principles, basic concepts, parameters and fundamental equations of the parabolic trough collectors.

AGENDA
• Components of a Parabolic Trough Collector • Losses in a CCP • The beginnings of the Solar Thermal Power Plants • Projects in Spain with Parabolic Trough Collectors and HTF • New schemes for Solar Thermal Power Plants using Parabolic Trough Collectors

We aim to explain to the students which commercial storage systems with Parabolic Trough can be used, and which are their main applications. Also we will explain the most important technological developments that are taking place today in relation to this type of Solar Collectors.

AGENDA
• Thermal Energy Storage • Thermal Storage like sensible heat • Thermal Storage like latent heat • Projects of Storage Systems in plants with Collectors Trough • Thermal Storage using oil • Thermal Storage using concrete • Thermal Storage using molten salt • Previous calculations for a 10-hour Thermal Storage • R & D in Solar Thermal Power Plants

<u>Specific Objective</u>: Performance under designing conditions from the Power Block of a Solar Thermal Power Plant.

The objective is to inform the students about the main equipments that form part of the Power Block of a Solar Thermal Power Plant.

AGENDA
• Design point for the solar field • The power block at nominal conditions • bypass valves • The condenser • The turbine • Turbine extractions • Preheaters • The degasser • Feed pumps to the steam generator • Condensate pumps • Steam Generator

<u>Specific Objective</u>: Performance under designing conditions from the BOP of a Solar Thermal Power Plant.

The objective is to inform the students about the main equipments that form part of the BOP of a Solar Thermal Power Plant.

AGENDA
• Characterization of the BOP • Water Treatment Plant • Main Cooling System • Equipment Cooling System • Treatment of discharges • Study of the solar field solar power plant at design conditions.

<u>Specific Objective</u>: Maintenance of a Solar Thermal Power Plant.

We aim to explain to the students the different strategies in managing the maintenance of a solar thermal plant.

AGENDA
• Different strategies in managing the maintenance of a Solar Thermal Power Plant • Periods in the life of a Maintenance Contract • Legal Maintenance

- Maintenance of a Solar Thermal Power Plant

II. METHODOLOGY

Prior to the start of the day, students will be provided with the text of the various topics in the form of Technical Manual. The availability of full text will help attendees go over that seen during the technical conference.

III. GENERAL REFERENCES

1. Benz, N. et al., 2008."Advances in Receiver Technology for Parabolic Troughs". In: Proceedings of 14th International SolarPACES Symposium on Solar Thermal Concentrating Technologies, Las Vegas, EEUU.

2. Duffie, J.A. y Beckman, W.A., 1991, "Solar Engineering of Thermal Processes". Ed. John Wiley & Sons, (2ª Edición), New York, EEUU. ISBN: 0-471-22371-9.

3. García Casals, X., 2001, "La energía solar térmica de alta temperatura como alternativa a las centrales térmicas convencionales y nucleares

4. Harats, Y., and Kearney, D., 1989, "Advances in Parabolic Trough Technology in the SEGS Plants", ASME Int. Solar Energy Conference., San Diego, CA.

5. Herrmann, U. y Nava, P., 2008, "Performance of the SKAL-ET collector of the Andasol power plants". In Proceedings of 14th International SolarPACES Symposium on Solar Thermal Concentrating Technologies, Las Vegas, EEUU.

6. Kelly, B. y Kearney, D., 2006, "Thermal Storage Commercial Plant Design Study for a 2-Tank Indirect Molten Slat System", Report No. NREL/SR-550-40166, NREL, Colorado