

# **REC INSTITUTE OF POWER MANAGEMENT & TRAINING, HYDERABAD, (INDIA)**

## **CONTENTS OF THE COURSE FOR WEB BASED TRAINING PROGRAMME**

### **CONCEPTS TO COMMISSIONING OF SOLAR POWER PLANTS**

**Duration: 3 Weeks**

- 1) Global overview of solar power generation**  
Concepts and policies, solar power generation in India and Jawaharlal Nehru National Solar Mission (JNNSM), Policies and motivation, Case studies of global leaders in renewable power generation
- 2) Solar Thermal Power Generation technologies**  
Heat transfer from Sun, Concepts of Solar power generation, radiation analysis and measurement, Basic Concepts, Stirling and Breyton cycles, Solar thermal power generation, Solar steam engine and turbines, parabolic trough power plants, Issues and challenges in solar thermal power systems , Tower concept of Solar power Generation (High temp. System) Solar Collectors, Types, Parameters, classification of collectors, materials, and its relative efficiency
- 3) Solar Photo Voltaic Power Generation**  
Solar Photo voltaic, Principles & Technologies, Development of Photovoltaic Technology Solar Cell Modules, Types of cells, Cell construction, selection, testing and applications and latest trends in the design of Solar Power Plants
- 4) Design concepts of Photovoltaic Systems**  
PV modules and arrays - PV Systems types– Stand alone and grid connected – Load estimation – Sizing of the PV array, battery, inverter, etc. – Maximizing efficiency of sub-systems – Balance systems – Single axis and two axis tracking at optimum inclination of the PV array, Power conditioning and control – Maximum Power Point Trackers, Charge controllers/regulators, DC/DC Converters, DC/AC inverters Selection criteria, Safety issues
- 5) Typical applications of PV Hybrid systems**  
Solar PV-Wind, PV-Diesel, PV-Bio mass – System  
Sizing and designing examples: Domestic loads, Water pumping, Lighting (using CFLs, White LEDs) - hybrid systems, village power packs – Installation practices
- 6) Indirect methods of Solar Energy conversion and Concepts of DDG**  
Wind energy and Biomass System, Interconnection of multiple renewable sources, Opportunities in Rural Electrification and De-centralized Distributed Generation

**7) Economics, analysis and Project Planning**

Life Cycle Cost analysis – Environment impacts of PV – Green buildings – Potential for GHG emission reduction of installed PV systems - stand alone, Grid connected, etc.  
Preparation of detailed project reports, Stipulations under Solar Cost Benefit Analysis, and Tariff fixation in cases of Decentralized Distributed Generation  
Project planning, DPR Preparation, Project execution and Monitoring Practices

**8) Trouble shooting and Operation and Maintenance practices**

Best Practices in Operation and Maintenance of Solar Power generation Plant, Testing of equipment and material, calculation of performance, etc.

**9) General Management:**

Change Management, Time Management & Business Communication, Work Life Balance

**10) Case Studies of Tariff, DPR and Ultra Mega Solar Power Projects in India**

**11) Virtual field visits:**

Visits to solar power plants and Cell, panel manufacturing units, Solar Plants

**12) Project and case studies:**

Based on the topic a case studies and projects will be offered to participants to give more practical exposure.

**Day wise training programme is as below:**

**REC INSTITUTE OF POWER MANAGEMENT AND TRAINING::  
HYDERABAD**  
International Training Programme on  
“CONCEPTS TO COMMISSIONING OF SOLAR POWER PLANTS”  
E-ITEC (Web Based Training Programme)  
09<sup>th</sup> September 2021- 24<sup>th</sup> September 2021 (3 weeks)  
Programme Schedule

<b>WEEK - 1</b>			
Date/Day	Session	Topic	Name of the Resource Faculty
06-09-2021 Monday	1	Registration, Joining formalities & Introduction of participants, Inauguration of the Programme	
	2	About ITEC Training Programme, Welcome by Coordinators Glimpse of 50 years ITEC Celebrations-Short Video Play Indian Culture and Heritage – Overview (Video Play)	
	3	Curtain Raiser & Familiarization Session – About India & Hyderabad – Indian Culture, Heritage, Policy etc. About REC and RECIPMT	
	4	Global Power Scenario of new and renewable technologies, Power Generation statistics of different Renewable technologies in India and other developed countries. Role of solar power generation in meeting global energy needs, Role model countries in implementing renewable energies	
07-09-2021 Tuesday	1&2	Renewable generation basics on Biomass, Ocean, small Hydro & Geothermal	
	3&4	Technology Review, Semiconductor Physics, Trends, Type of Cells, Comparison of different solar PV technologies such as thin film and crystalline and recent trends, module, string & array combination, series and parallel connections Standard Test Conditions, NOCT Conditions IV Curve Analysis, Detailed technical specifications of Solar Panel and Inverters	
08-09-2021 Wednesday	1&2	Selection of Panel, Standards, advances, quality parameters, intricacies, quality issues, Mitigation methods, Warranty Operation and maintenance	
	3&4	Basic required prior to design solar power plant, Shadow, Analysis, Simulation (step by step) procedure to SPV plant using sketch up	
09-09-2021 Thursday	1&2	Off Grid Inverters, Types, Selection criterion, MPPT issues, salient features, Balance of system in Off Grid Inverter solar PV System such as Structure basics, Earthing & Lightning Arrestor, DCDB & ACDB	
	3&4	Basic design of Off Grid Solar PV System, Virtual visit of 1 Kwp Solar PV off Grid System	
10-09-2021 Friday	1 & 2	Actual design of Grid Tied Solar PV System, Virtual visit of 2 x 20 Kwp Solar PV Grid Tied System at RECIPMT Campus	
	3&4	Grid Tied Inverter types, grid code in India, Grid Tied Inverter schemes, net meter, gross meter details Batteries Types, Characteristics, Design Calculations for Solar PV	

**Session Timings: (10:00 AM to 17:30 PM) according to Indian Standard Timings (IST)**

Session 1: 10:00 – 11:15 Hrs  
Session 2: 11:30 - 13:00 Hrs

Tea Break: 11:15 – 11:30 Hrs  
Lunch Break: 13:00 – 14:00 Hrs

Session 3: 14:00 – 15:30 Hrs  
 Session 4: 15:45 – 17:30 Hrs

Tea Break: 15:30 – 15:45 Hrs

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**Programme Schedule**

<b>WEEK – 2</b>			
Date/Day	Session	Topic	Name of the Resource Faculty
13-09-2021 Monday	1 & 2	DPR Preparation, Site Selection and soil investigation Project Initiation and Prerequisites (Mandatory Approvals) Statutory requirements and standards for solar PV systems	
	3 & 4	Climate change, global warming, the importance of renewable energy systems, CDM, RPO Mechanism	
14-09-2021 Tuesday	1 & 2	Solar Water Pumping design	
	3 & 4	Detailed off Grid SPV Design Calculations	
15-09-2021 Wednesday	1 & 2	Standards for Solar PV systems, testing of panels and inverters etc.	
	3 & 4	Preparing Layout of solar plants for Client, <b>Design Parameters</b> to be <b>consideration for</b> different SPV installation, Over view of Site survey input before design of SPV plant	
16-09-2021 Thursday	1 & 2	Hybrid Solar Systems and Micro Grids	
	3 & 4	<b>Generation analysis &amp;</b> Energy Management, Construction & use 3D models for near shading analysis, Detailing of each losses with example simulation.	
17-09-2021 Friday	1 & 2	Use of Meteorological data in PVSYS for designing solar projects, Far shading analysis using horizon analysis by solar GIS data, Project design stimulation of various SPV	
	3 & 4	Rooftop solar PV policy and Regulations and Business Models, Market Trend and Business Potential, Contract Structure and Agreement	

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<b>WEEK - 3</b>			
<b>Date/Day</b>	<b>Session</b>	<b>Topic</b>	<b>Name of the Faculty</b>
20-09-2021 Monday	1&2	BOS & Grid Integration	
	3 &4	Power evacuation System Design for Solar Ultra Mega Power Plants, Design Criteria, Selection of Materials Such as Bus Bars CTs PTs, Transformers, Substation, Operation and maintenance	
21-09-2021 Tuesday	1&2	Performance measurement Reliability Testing, Qualification tests, IEC Standards, Safety considerations,	
	3&4	Instruments required, Diagnostics and analysis, Life Cycle Cost analysis, Technical warranty is more important than commercial warranty	
22-09-2021 Wednesday	1&2	Best practices in operation and maintenance of solar power plants	
	3&4	Concept of Smart Grid and role of solar PV systems	
23-09-2021 Thursday	1&2	Project Presentations by participants	
	3&4	Project Presentations by participants	
24-09-2021 Friday	1&2	Examination	
	3&4	Valedictory session	

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