

# **COURSES MODULE**

## **For**

# **SOLAR POWER PLANT DESIGN ENGINEERING**



## **Course Outline**

- ❖ Introduction to Solar Power Plant /Solar Radiation
- ❖ Series and parallel circuit
- ❖ PV Cells selection and sizing
- ❖ Inverters selection and sizing
- ❖ Module mounting system
- ❖ Plant Installation and commissioning
- ❖ Matching Array and Inverter sizing
- ❖ Balance of system and protection
- ❖ Cable Sizing and Energy Efficiency and calculation
- ❖ System losses of solar power plant
- ❖ Solar power plant site survey and assessment
- ❖ Yield performance/ maintenance and troubleshooting
- ❖ Megawatt solar power plant system
- ❖ Smart Grid/net metering
- ❖ Costing and Tendering of solar power plant

# Solar PowerPlant Design &Detail Engineering

## Introduction to Solar Power plant

### Solar Radiation

Irradiance  
Irradiation & peak Sun Hours  
Solar Radiation data  
Sun Path Diagram  
Solar altitude  
Geometric Effects  
Tilting Solar Modules  
Magnetic North & True North

### Series & Parallel circuit

Series circuit  
Parallel circuit  
Combining series & Parallel circuit  
Understanding cell connection  
Arrays

### PV Cells Selection and Sizing

Introduction  
Power characteristics of solar cell  
Fill factor & equivalent solar cell circuit  
STC & NOCT Condition  
Factors which affect the performance of solar cells  
Module Reliability  
Manufacture of Silicon Solar Cells  
Commercial Modules v Electrical Protection

### Inverters Selection and Sizing

Purpose of inverters  
Grid connected inverters vs stand-alone inverters  
Types of inverters-PV to inverter interface  
Inverter protection system  
Power quality  
Monitoring  
Inverter efficiency  
Isolated Inverters  
Inverter Products For Use In India

### Module Mounting Systems

Introduction  
Roof mounted system  
Calculating the Wind Loading of the Solar Array  
PV array row spacing  
Ground mounted system

### Plant Installation And Commissioning

IEC Standards  
Equipment Selection-Warranties  
Installation Preparation  
Equipment Installation  
Monitoring Equipment  
Commissioning  
System Documentation  
System Installation & Pre-Commissioning Checklist  
Commissioning Test Sheets

## Balance of system

Introduction & Cabling  
Array string protection & disconnect switches  
Lightning protection  
Array junction box  
PV Main disconnection devices  
Metering  
System Monitoring: Local and/or Web Based Display

### Matching Array & Inverter Sizing

Matching the pv array to the voltage specifications of an inverter  
Matching the pv array to the inverter's current rating  
Matching the PV array to the inverter's Power rating  
Summary of calculation for matching array & inverter  
Example

### System protection

Determining the protection equipment & switching  
PV Array maximum voltage  
Circuit protection: Over current  
System earthing (DC & AC)  
Connecting the system to the grid  
Disconnection Devices

### Cable sizing

Determining the size of the DC & AC Cables  
Voltage drop calculation

### System Losses of Solar Power Plant

Determining the Size of the DC and AC Cables  
Losses in a Grid-Connected PV System

### Energy Efficiency and Calculation

Introduction  
Energy Efficiency Measures  
Overview of Passive Solar Design Principles

### Solar power Plant Site Survey & Assessment

Introduction  
Undertaking a Site Assessment  
Choosing a PV Module  
Choosing an Inverter  
Choosing a Mounting System Type  
Determining the Maximum Number of Modules That Can Fit on a Roof

### Yield Performance(Energy Guarantee)

What Determines the Energy of a System  
Calculating the Energy Yield for a PV Grid-Connected System  
Specific Yield  
Performance Ratio  
CUF Calculation

**Megawatt Solar Plant System**

Introduction  
Preliminary Planning  
Designing a Large PV Grid Connect System  
What Array/Inverter Configuration Should Be Selected?  
Monitoring

**Costing and Tendering Of Solar Power Plant**

Introduction  
Simple Payback  
Life Cycle Costing  
Determining Costs Associated with the Whole PV System  
Valuing a PV System

**Maintenance And Troubleshooting**

System Maintenance  
Troubleshooting

**Smart Grid/Net Metering**

Smart Grid  
Smart Meters  
PVsyst, meteonorm, Google sketchup

**Software's**

Google sketch up  
PV Syst

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