Training: MED-SOLAR

MODULE :4

Constructing and Starting-up Of a Solar Power Plant

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Constructing and Starting-up the Power Plant:

1. Steps Prior to field Mobilization. (OFFICE)
3. Commissioning / Fine Tuning
4. Startup/ Handing over
5. Wrap Up (As built, Manuals, Training) (OFFICE)
1-Pre Mobilization
   - Design Review
   - Cost Engineering

2-Mobilization & Construction
   - Plant Component
     - PV Array & DC system
     - Grid Inv. & AC sys.
     - Off-Grid System
     - Monitoring & Ctrl
     - Coupling to Existing sys.

3-Commissioning and Testing
   - Filed Work
     - Shop Drawing
       - Verification Site Visit
       - Executorial Drawing
     - BOQ
     - Planning

4-Plant StartUp

5-Project Completion

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Project funded by the European Union
Construction:
Pre Mobilization to site

- Preliminary design Study and verification of design. (Cross match with Client’s Requirement, Legal Frame work and Licenses)

- Cost Engineering and Design Optimization

- Site Engineer Verification Visit and cross matching of Shop drawing.

- Preparation of BOQ

- Executional drawings.

- Project Planning: Management, Time table and Resources assignment.

- Mobilization-> Start of Construction
Construction:
Cost Engineering and Design Optimization

- Plant Components
  - PV array & DC system
  - On-Grid Inverters and AC System
  - OFF-Grid System
  - Monitoring and Control
  - Coupling to existing system
Construction:
Cost Engineering and Design Optimization

- PV Array & DC system:
  - PV array size and physical allocation.
  - PV module type selection and string assignment.
  - PV racking selection and optimization.
  - DC cable management, selection Optimum Routing solution

  ✓ Verification of shortest and most cost effective solution. (Safety in HV. DC grid)

  ✓ Verification of losses and Voltage Drop in DC Solution
Construction:
Cost Engineering and Design Optimization

- ON-Grid Inverters and AC grid
  - Inverters sizing / match with string size and assignment
  - Inverter Location
  - AC routing and combiner boxes
  - AC Cable routing, sizing optimization
    - Verification of shortest and most cost effective solution. (Safety in AC grid)
    - Verification of losses and Voltage Drop (<4% corresponds to 1%Energy)
Construction:
Cost Engineering and Design Optimization

- OFF-Grid system & Accumulators (If applicable)
  - Location of System
  - Size verification of Inv./Autonomy.
  - Coupling means with Solar energy (DC or AC coupling)
  - Battery location (Accessibility and Env. Condition)
  - Load Grid and distribution.
  - Safety measures and Verification of losses in Energy
Construction:
Cost Engineering and Design Optimization

- Monitoring and Control
  - Verification design and functionality
  - Various Sensors allocation
  - Deployment and communication compatibility
  - Compatibility with all system components.
  - Communication with outside world.
Construction:
Cost Engineering and Design Optimization

- Coupling to Existing System
  - Verifying of Connection means with existing installation
  - Customization of existing installation to adapt solar plant.
  - Safety and fault safe measures.
Construction:

Pre Mobilization to site

- Preliminary design Study and verification of design. (Cross match with Client’s Requirement, Legal Frame work and Licenses)
- Cost Engineering and Design Optimization
- Shop drawing
- Site Visit for verification and cross matching of prepared Shop drawing.
- Executional drawings.
- Preparation of BOQ
- Project Planning: Management, Time table and Resources assignment.
- Mobilization-> Start of Construction
Construction:
Pre Mobilization to site
Construction:

Project Planning Components

- Identify individual task Jobs, time and resource
  - Legal Frame work and Design Phase:
    - Resources: Engineering, Legal Dept., Time: xxx
  - Material Procurement
    - Resource: Procurement, Logistic, Time: xxx
  - Site Field Work:
    - Resource: Engineering, Technicians, workers, etc., time: xx
  - Startup Commissioning and testing.
  - Hand over and project completion.
Construction:
Pre Mobilization to site
Filed Work

- Civil Work and site preparation
- Mech. and Elect: PV array
- Mech. and Elect: Inv
- DC and AC cabling
- OFF-Grid System
- Monitoring and Control
Construction:
Field Work

First Day in the Field

- Civil Work and site preparation
  - Storage
  - Transportation and Accommodation
  - Safety Measures
Construction: Field Work
Construction:

Field Work

- Mechanical and Electrical Insulation of PV array
  - Prevent Closing the String Loop (Electrical Shock)
  - Grounding of Panels and Metal Structure
  - Mechanical Fixation of racks as per ground condition
    - Wind Speed resistance (Verifying fixation method Vs Wind Force)
  - Near Object Shading
Construction:
Field Work

Lowest noon angle in winter = 90 - 23.5 - lat

32° Incl.
Construction:
Field Work
Construction: Field Work
Construction:
Field Work
Construction:
Field Work
**Construction:**

**Field Work**

- Mechanical and Electrical Insulation Inverter
  - Weather Proof > IP6
  - As close as possible to array
  - Accessible for Maintenance.
- Physical Fault indication in Control Room
- Connection of DC Stringd
  - IV test of each string
- Connection of AC coupling
Construction:
Field Work
Construction:
Field Work

- Cable deploying
  - Routing over Cable try
  - Termination
  - Labeling
  - Megger
Construction:
Field Work
Construction:
Field Work
Construction:
Field Work

- Off-Grid System
  - System deployment
  - Battery bank arrangement connection
  - Battery bank testing and commissioning
Construction:
Field Work
Construction:
Field Work
Construction:
Field Work

- Monitoring and Control
  - Whether Sensors
  - CT and Switching
  - Communication Equipment
  - PLC and Micro Controller
Construction: Field Work
Commissioning and Start Up:

- DC connection to Inv.
  - Verify Voltage, current and insulation of DC of circuit
  - Verify Resistance of Earthling Circuits

- AC connection to Grid
  - Connection of partial group of Inverter
  - Monitor Production and Current injection
  - Strat of whole inverters and monitor AC current values

- Commissions off-Grid system and accumulators
  - Verify priority load, Verify charging state of Accumulators in different Scenarios.
Commissioning and Start Up:

- Commissioning of ATS and Panels
  - Test different connection scenarios
  - Test fault safe measures

- Commission and test of Monitoring and control.
  - Verify communication with all system components
  - Test Control instruction
  - Initiate logging.
  - Verify Measured values.
Commissioning and Start Up:

- Commissioning of ATS and Panels
  - Test different connection scenarios
  - Test fault safe measures
- Commission and test of Monitoring and control.
  - Verify communication with all system components
  - Test Control instruction
  - Initiate logging.
  - Verify Measured values.
Commissioning and Start Up:

- **START UP** Monitor for few days and fine tune setting.
- Keep Log file for future enhancement
- As Built Drawing & system Manuals
- Preventive maintenance.
- Brief Training For operation

- Mission completed 😊$😊.
Thank you!

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