An overview & Performance Analysis of 5 MWp Solar PV Plant at Khimsar, Rajasthan

Reliance Industries Limited
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Utility Scale PV Plant - Ground Mounted

5MWp ground mounted Grid connected SPV power plant in Khimsar, Rajasthan

- Largest SPV Plant in India with multiple technologies installed at a single location
- Evaluation of all existing and emerging technologies.
- World class Installation practices resulting in
  - Low O&M Cost
  - Highest performance factor
  - High Efficiency

RIL Solar has commissioned India’s largest ground mounted system with state-of-the-art technology
## 5MWp Plant : Salient Features

### 1. Location
- **State**: Rajasthan, India
- **Locality**: Nagaur district
- **Latitude**: 23.9 N
- **Longitude**: 73.4 E

### 2. Area of SPV Plant
- **Area**: 35 acre
- **Location**: Khimsar

### 3. SPV Power Plant
- **Capacity**: 5 MWp
- **No. of Modules**: 24841
- **No. of Modules in series**: 18/20 modules per string
5MWp Plant : Salient Features

4. Technical details of a SPV Module
   (a) PV Module type
       Crystalline silicon
   (b) Physical Dimensions
       i. Length of frame 1500 mm
       ii. Width of frame 990 mm
       iii. Thickness 36 mm

5. Mounting Arrangement
   i. Mounting Fixed (Ground mounted)
   ii. Tilt angle (Slope) of PV module 26 deg
### 5MWp Plant: Salient Features

**6. Inverter/Power Conditioning Unit (PCU)**

- **i. Number of units**: 432
- **ii. Rated Capacity**: 11 KVA
- **iii. Input Voltage Range**: 333 - 500V DC
- **iv. Output Voltage**: 230 V single phase
- **v. Frequency**: 50 Hz
- **vi. Efficiency**: 98%

**7. Grid Connection Details**

- **i. Electrical interconnection**: 33 kV, 4 pole sub station

**8. Annual Energy Generation**

- **i. Annual Generation (estimated)**: 7.5 million units (per year)

**9. Construction Time**

- **6 months**
5MWp Plant location details
# 5MWp Plant – Implementation Phases

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5MWp Plant – Construction phase
5MWp Plant - Array Layout
5MWp Plant - Power generation stages

- Solar modules are connected in series/parallel to form solar array
- Three 1-ph Inverters configured for 3 ph grid interface
- One Sub Power Junction Box (SPJB) for three Inverters
- Main Power Junction Box (MPJB) for Three SPJB’s
- One LT Panel for 16 MPJB’s (415V) for each 2 MVA transformer
- HT Panel for three transformers 2MVA each
- HT panel connection to 4 pole 33 KV feeder line with digital metering
5MWp Plant - Power flow

Diagram:
- PV Generator
- String Inverter
- LT Panel
- Metering Unit for Checking
- Utility transform 33KV/415V
- HT Panel
- Metering Unit
- Utility Grid
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India’s first 5MW plant wherein multiple PV technologies are showcased for the purpose of performance evaluation of each technology
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5MWp Plant - Installed Components

All components were chosen after detailed specifications’ study.
5MWp Plant - Installed Components

Module Mounting Structure
Galvanized steel structures designed to withstand 200 kmph wind load

33KV Feeder to Grid
Equipped with measuring units & protections

Each feeder has vacuum circuit breaker in it

HT Panel 33KV

Gang Operating Switch to operate at no load condition

Transformer 415V/33KV, 2MVA

Critical components of plant are from well known leading equipment suppliers
5MWp Plant - Installed Components

- Sealed Energy meters installed by AVVN to measure export of Energy
- Standby Energy meters interfaced with SCADA
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5MWp Plant - Challenges

Mar - April 2010 :
- > 47 Deg C temp.
- No work (11am to 5 pm)

May 2010 :
- Dust storm and Twister
  (1st & 2nd week)
- High Temp. - no work
  (11am to 5 pm)

June - July 2010 :
- Heavy Cyclone and Flooding
  (1st week)
- High Temp. - no work
  (11am to 5 pm)
33 kV Transmission line:

- Newly constructed 5km Transmission line from the 220 kV sub-station
- Commissioned just two days before
- Managed testing within available time
To get the optimum energy generation from the plant, O&M plays an important role with following key roles:

- Solar PV Modules cleaning
- Rigidity of electrical connections
- Tightness of Mechanical assemblies
- Verification of designed protections
- Ensure proper earthing & grounding

A dedicated O&M team is committed to achieve maximum uptime of SPV plant
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5MWp Plant – Performance at a glance

Average Capacity Utilization Factor (CUF) of 19.5% achieved
Thank you

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