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



Reliance
Industries Limited

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- A. 5MWp SPV Plant at Khimsar, Rajasthan
- B. 5MWp SPV Plant – Installed Technologies
- C. 5MWp SPV Plant – Installed components
- D. 5MWp SPV Plant – Challenges
- E. 5MWp SPV Plant - Performance

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

- | | | |
|------|-----------|------------------|
| i. | State | Rajasthan, India |
| ii. | Locality | Nagaur district |
| iii. | Latitude | 23.9 N |
| iv. | Longitude | 73.4 E |

2. Area of SPV Plant

- | | | |
|-----|----------|---------|
| i. | Area | 35 acre |
| ii. | Location | Khimsar |

3. SPV Power Plant

- | | | |
|------|--------------------------|--------------------------|
| i. | Capacity | 5 MWp |
| ii. | No. of Modules | 24841 |
| iii. | 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
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8. Annual Energy Generation

i. Annual Generation (estimated)	7.5 million units (per year)
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9. Construction Time

6 months

5MWp Plant location details



5MWp Plant – Implementation Phases

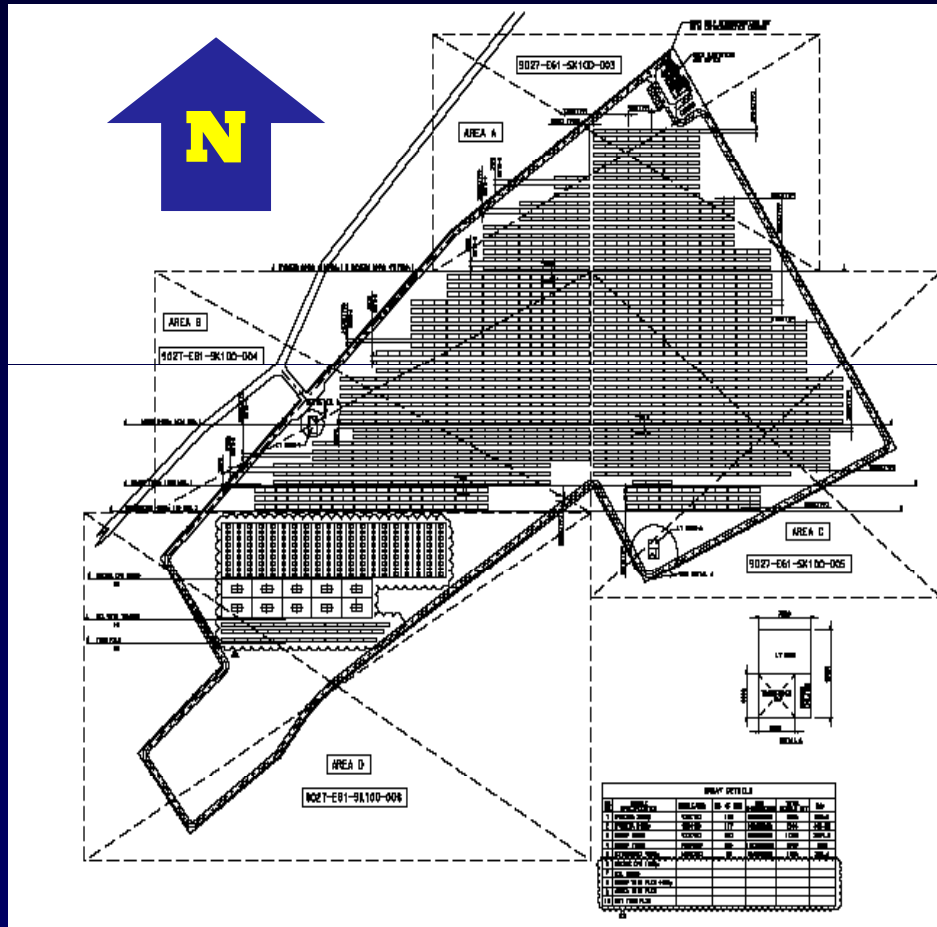


Phases no.	Project Phases	Phase Description
1	Design phase	Designing of 5MWp System
2	Development phase	Development of System Components
3	Pre-installation phase	Inspection of input materials
4	Installation phase	Inspection/Audit of construction material and activities
5	Commissioning phase	Verify all installations against requirements
6	Post commissioning phase	Inspection of commissioned plant and machineries
7	Operational phase	Inspection / Audit and Monitoring of records and data for analysis

5MWp Plant – Construction phase



5MWp Plant - Array Layout

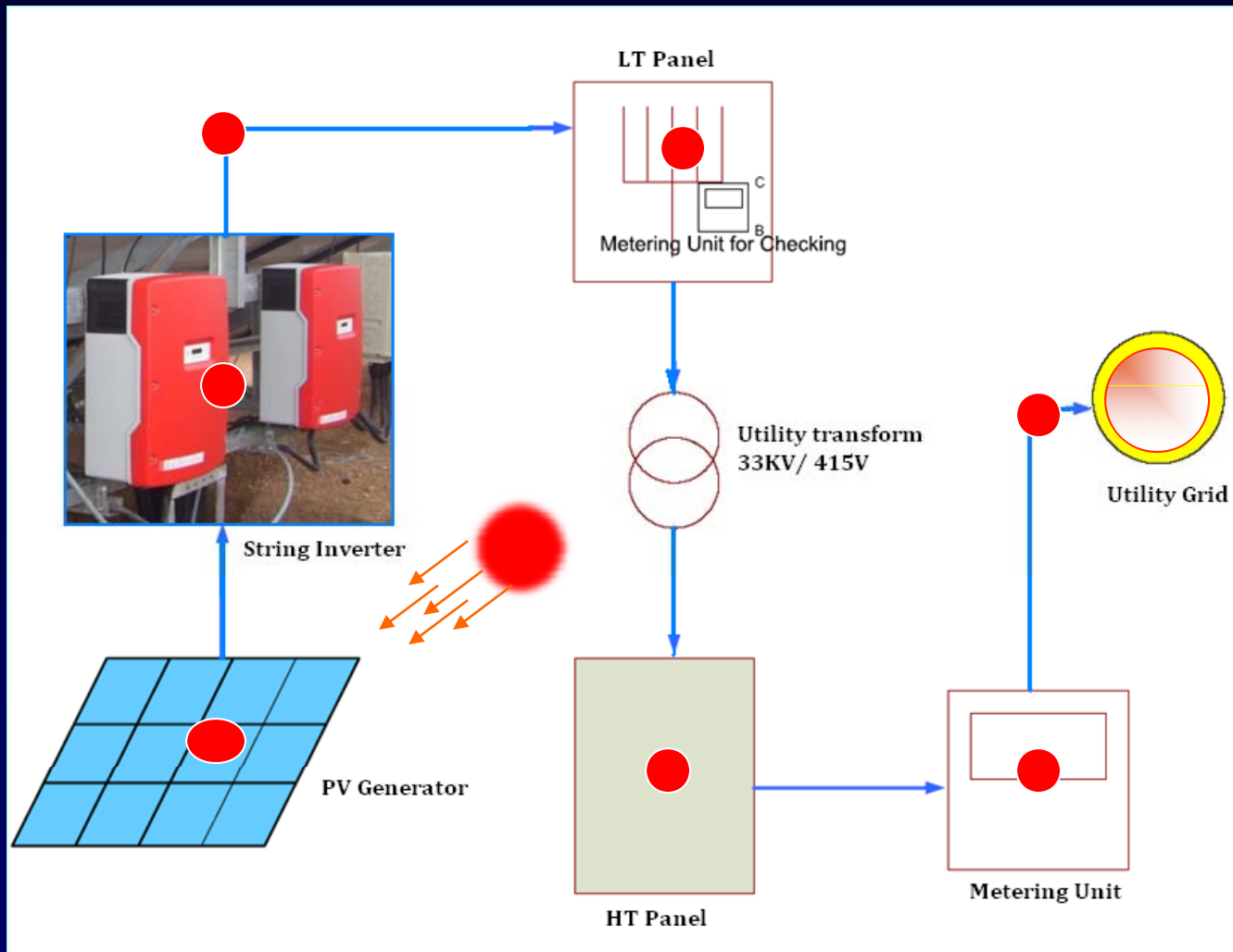


5MWp Plant - Power generation stages



- ❖ 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



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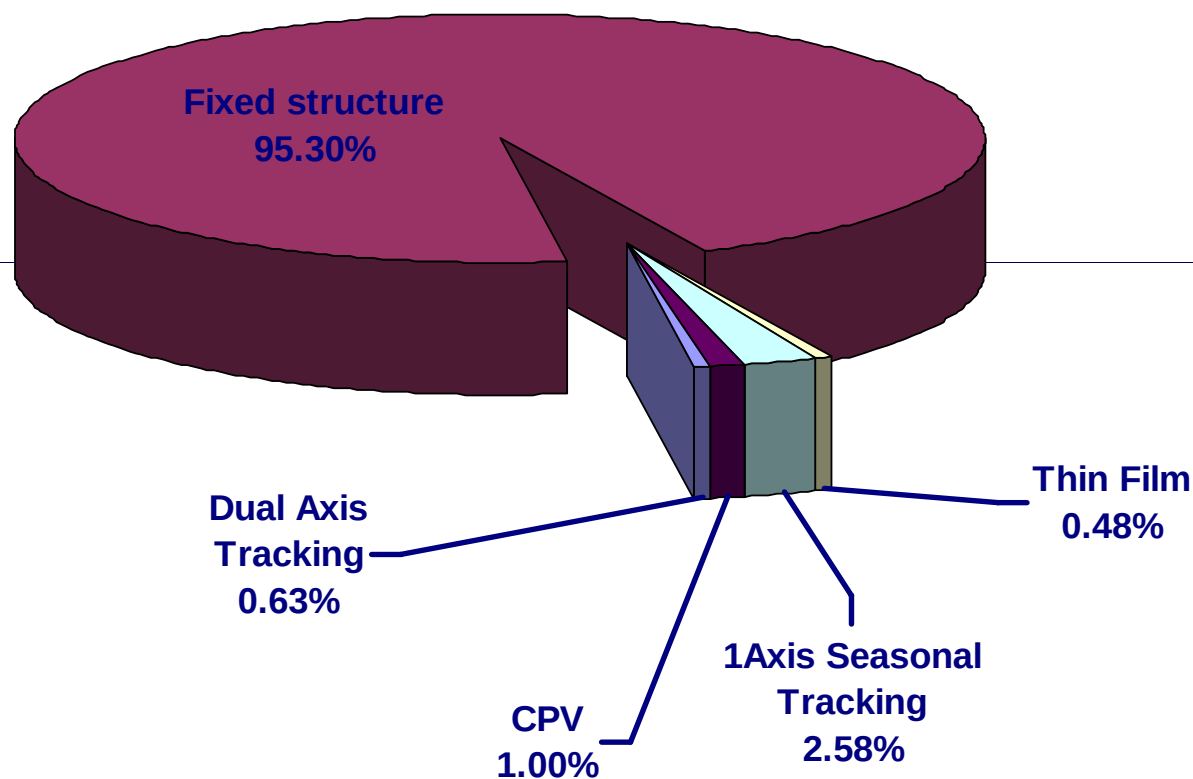


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5MWp Plant – Installed Technologies



Technology Distribution of Installed Capacity



India's first 5MW plant wherein multiple PV technologies are showcased for the purpose of performance evaluation of each technology

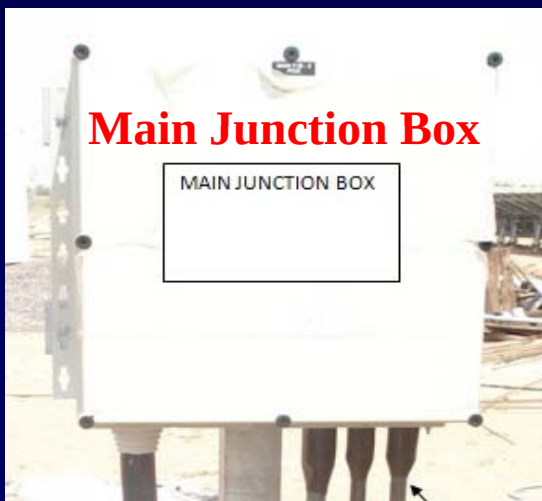


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5MWp Plant - Installed Components



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)



5MWp Plant - Challenges



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



5MWp Plant - Operation & Maintenance



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



Capacity Utilisation Factor (in %)



Average Capacity Utilization Factor (CUF) of 19.5% achieved



Thank you

*Reliance Industries Ltd - Solar Group
Reliance Corporate Park
Building 5C, First floor
Thane-Belapur Road, Ghansoli
Navi Mumbai-400701*

*www.relsolar.com
sales.reliancesolar@ril.com*

Kolkata: +91-9987031863 **New Delhi:** +91-9810447014 **Bangalore:** +91-9611555766 **Ahmedabad:** +91-9662502613
Bhubaneswar: +919987031863 **Chennai:** +91-95662 26667 **Guwahati:** 03612305665, **Hyderabad:** +91 9989585554,
Jodhpur: 919928034965 **Lucknow:** +91-522-4045922, **Raipur:** +91-9630031311