FEASIBILITY REPORT

ON

300MW SOLAR PV PROJECT

AT

BAP, JODHPUR (DT), RAJASTHAN

List of Abbreviations

AC	**:**	**Alternate Current**
°C	**:**	**Degree Celsius**
DC	**:**	**Direct Current**
km	**:**	**Kilometer**
kV	**:**	**Kilovolt**
LOA	**:**	**Letter of Award**
MW	**:**	**Megawatt**
NTPC	**:**	**National Thermal Power Corporation Limited**
PGCIL	**:**	**Power Grid Corporation of India**
PPA	**:**	**Power Purchase Agreement**
PV	**:**	**Photovoltaic**
SCD	**:**	**Scheduled Commissioning Date**

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PROJECT AT A GLANCE

S. No.	Particulars	Description
1	Project Company	M/s ABC Solar (India) Private Limited
2	Project SPV	M/s ABC Renewable Energy (RJ-01) Private Limited
3	Project Capacity	300 MW AC
4	Project Site	Badri Sid Village, Bap Tehsil
5	District Name	Jodhpur
6	State	Rajasthan
7	Country	India
8	Latitude	27°28'31.80"N
9	Longitude	72°26'17.40"E
10	Nearest railway station	Phalodi (Rajasthan)
11	Nearest International airport	Phalodi Airport 40 km
12	Nearest Highway	NH-15
13	Distance from Town	35 km from Phalodi.
14	Climate in Jodhpur District	Hot & Semiarid
15	Minimum Temperature	10°C
16	Maximum Temperature	41°C
17	Relative Humidity	24%
18	Power Evacuation	Bhadla II 765/ 400/220KV Pooling station
19	Required Land Area	Approx. 1549.42 Acres
20	Elevation	190-220m above Mean Sea Level

CHAPTER-1

EXECUTIVE SUMMARY

1.Project Overview

National thermal Power Corporation Limited (NTPC) has floated a tender for setting up of 1200 MW ISTS connected solar PV power project anywhere in India through its RfS No. RE-CS-0000-BOO-5 dated 10.08.2019. After successful completion of bid submission and reverse auction, ABC Solar (India) Private Limited previously known as TBEA Solar (India) Private Limited was declared as successful bidder and the Letter of Award (LoA) was issued on 20.11.2019 for a capacity of 300 MW. The Project can be implemented under the SPV name of ABC Renewable Energy (RJ-01) Private Limited.

Axis Energy Ventures India Pvt. Ltd. (AEVIPL) had been established in the year 2010 with the objective of becoming a major renewable energy developer in the country and has developed renewable energy projects in India having total capacity of 1024 MW with additional projects of 1080 MW in the advanced stages of development. AEVIPL holds 49% stake and ABC (Solar) India Pvt Ltd holds 51% stake in ABC Renewable Energy (RJ-01) Private Limited.

CHAPTER – 2

DETAILS OF SOLAR PROJECT

2.Details of the Solar Project

Salient Features of Solar Project

The indicative features of the Solar project are as under:

1	District	Jodhpur
2	State	Rajasthan
3	Country	India
4	Latitude	27°28'31.80"N
5	Longitude	72°26'17.40"E
6	Project Capacity	300 MW AC
7	Nearest Highway	NH-15
8	Nearest railway station	Phalodi (Rajasthan)
9	Nearest Airport	Phalodi Airport 40km
10	Distance from Town	35 km from Phalodi
11	Power Evacuation	Bhadla II 765/400/220kV PGCIL substation
12	Elevation	190-220 m above Mean Sea Level

CHAPTER – 3

SITE DETAILS

3.Site Details

Bap Village is located in Bap tehsil of Jodhpur district of Rajasthan. Bap village with an average elevation of 200 meters. It has well road and rail connectivity from Jodhpur, Jaisalmer and Bikaner. The capacity of proposed Solar power plant is 300 MW AC.

Figure represents the district map of Jodhpur indicating the proposed site.

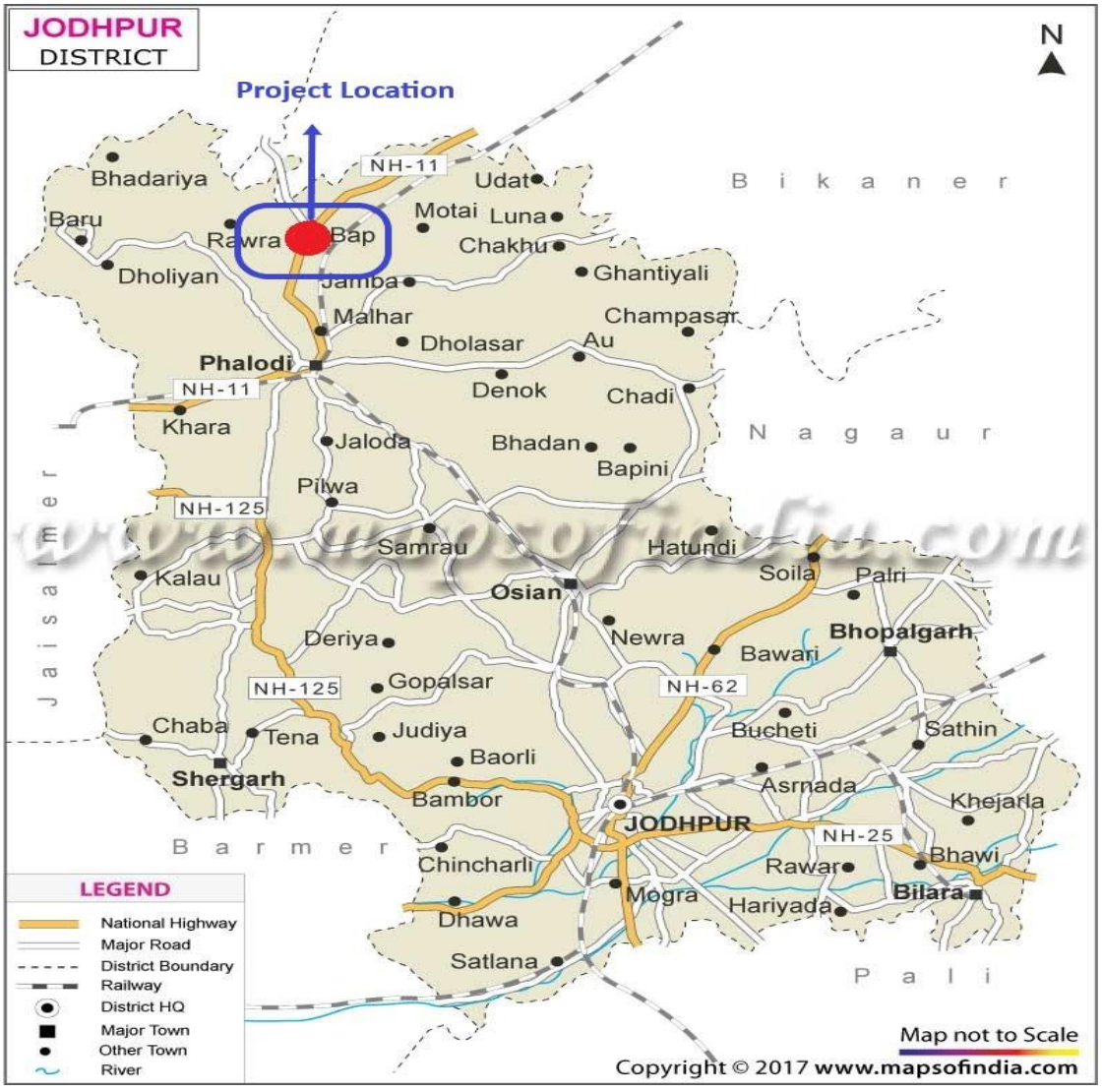


Fig: District map of Bap (Bap), Jodhpur

Jodhpur is located in the State of Rajasthan in western India.

Figure represents the satellite image of the region indicating the proposed site for setting up 300MW A C solar PV power project.

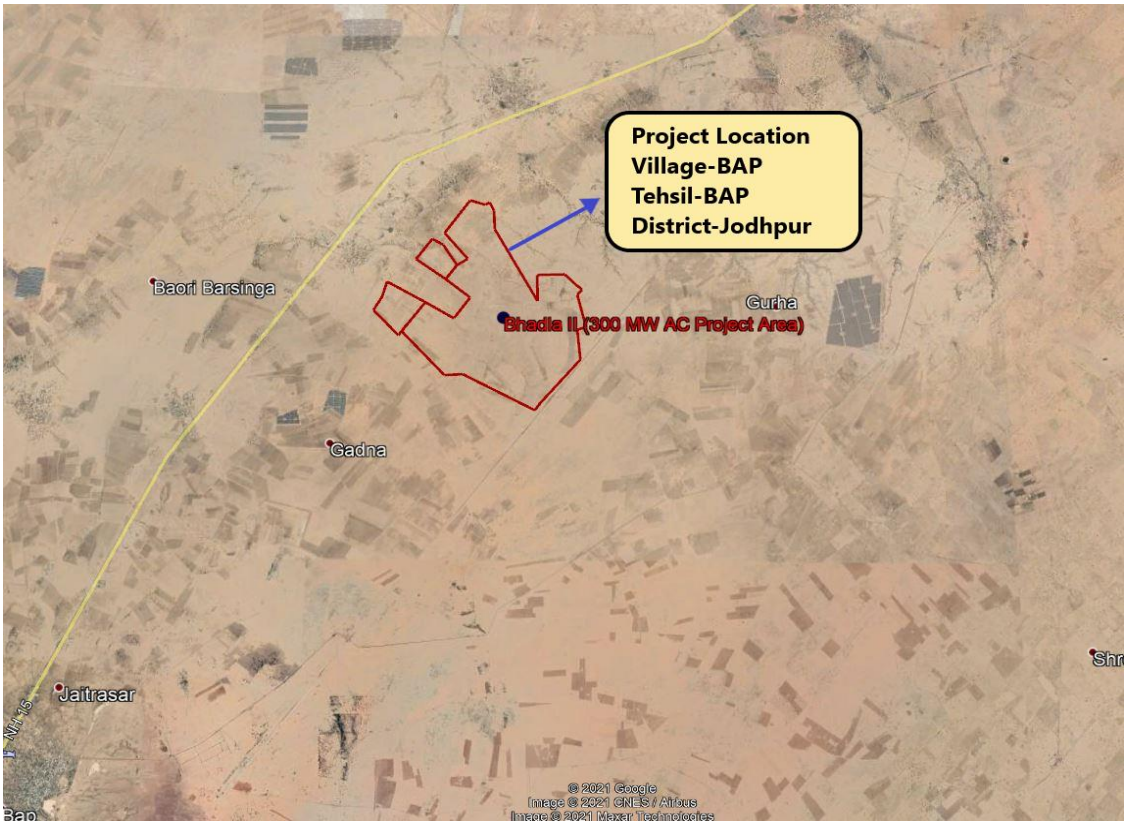


Fig: Satellite map of Bap (Bap), Jodhpur

The 300 MW AC Solar Power Project is proposed at Badi Sird Village in Bap Tehsil of Jodhpur District in the state of Rajasthan. The project will be set up for supplying power to National Thermal Power Corporation (NTPC) Limited through Inter-State Transmission System (ISTS).

Project Location Connectivity Details:

- Bap is located around 25-30 km from Phalodi Tehsil of Jodhpur district
- Bap, Phalodi towns of Jodhpur district are nearby towns and are connected with national Highway (NH-15) and also with rail way connections.
- The total land availability is around 4686.33 Bighas/1549.42 Acres.
- The nearest sub-station for power evacuation is about 9 km from the Site.
- Bhadla-II PGCIL is the nearest grid substation from the site.
- The specification of Bhadla-II PGCIL substation is 765/400/220 kV.

CHAPTER-4

LAND DETAILS

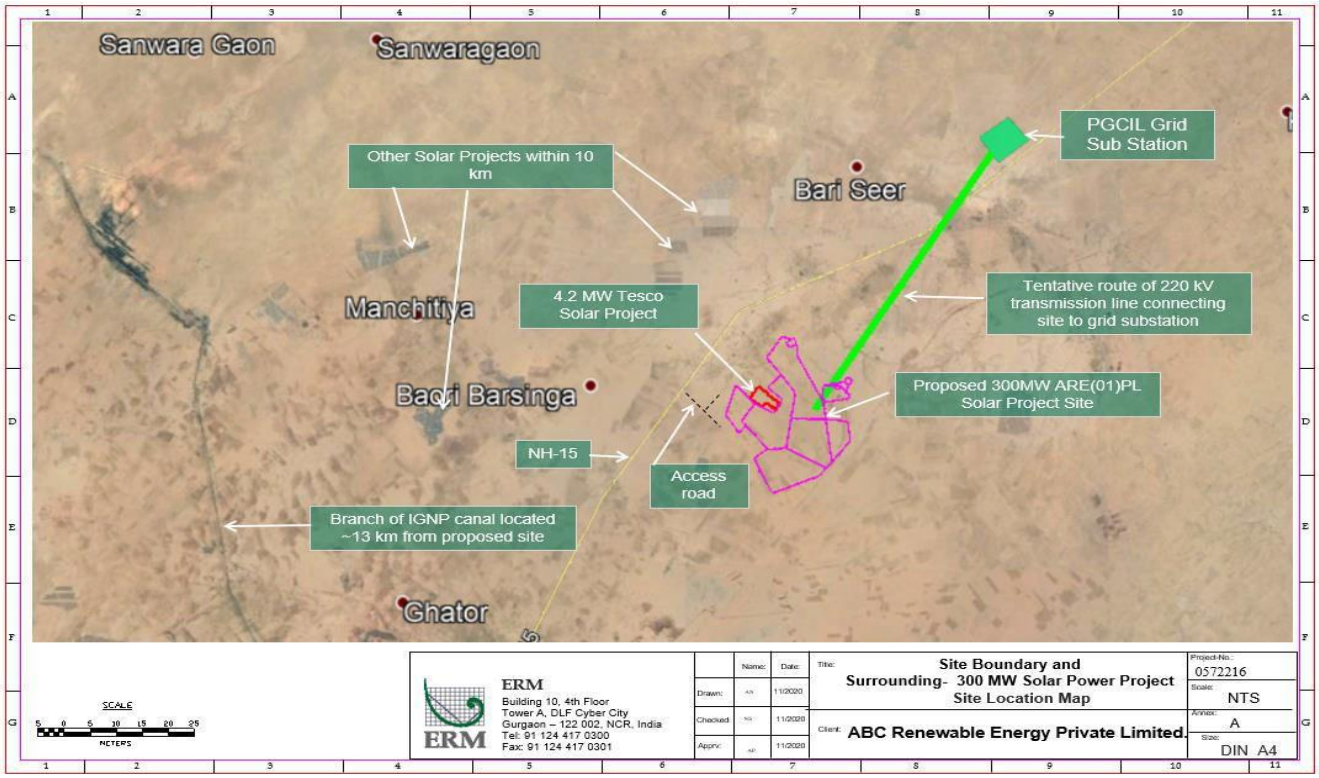
4.Land Details

Bap is a town in Jodhpur district in the Indian state of Rajasthan. Though it is geographically connected to Bikaner and Jaisalmer district of Rajasthan, it comes under Jodhpur district. It is located 150 km from Jodhpur which is a business capital and a globally recognized tourist place. The location of village-Bhadla falls in the Bap taluk of the district. Also, it is adjacent to Jodhpur-Bikaner National Highway (NH-15).

The project is located in an open area, with an elevation ranging between 195 m to 215 m above mean sea level slightly sloping from North (N) to South (S). The proposed site is irregular in shape with land parcel admeasuring 1549.42 acres. A 4.2 MW operational solar power plant developed by Tesco Energy Private Limited is located along the boundary of the proposed site towards north west direction. Furthermore, there are several other solar power projects located within 10 km of the proposed site. The proposed project area is not falling in GIB priority area.

The nearest village to the site is Baori Barsinga located approximately 500 m (aerial distance) from site towards west direction. Badi Sird village is located approximately 1.5 km (aerial distance) from site towards north direction. The approach road is well connected to National Highway (NH)-15.

The indicative location of the project is as provided in below fig.



For the proposed solar plant, we have identified around 1549.42 Acres of Land, of which 961.82 acres will be taken on lease and 587.60 acres will be purchased for the Project from private landowners.

The total lease and purchase land for the solar plant is from two (2) villages of Bap Tehsil of Jodhpur District, Rajasthan:

- Badi Sird (1330.38 acres); and
- Naya Gaon (219.04 acres).

The indicative Plant Layout of the project is as provided in below fig.

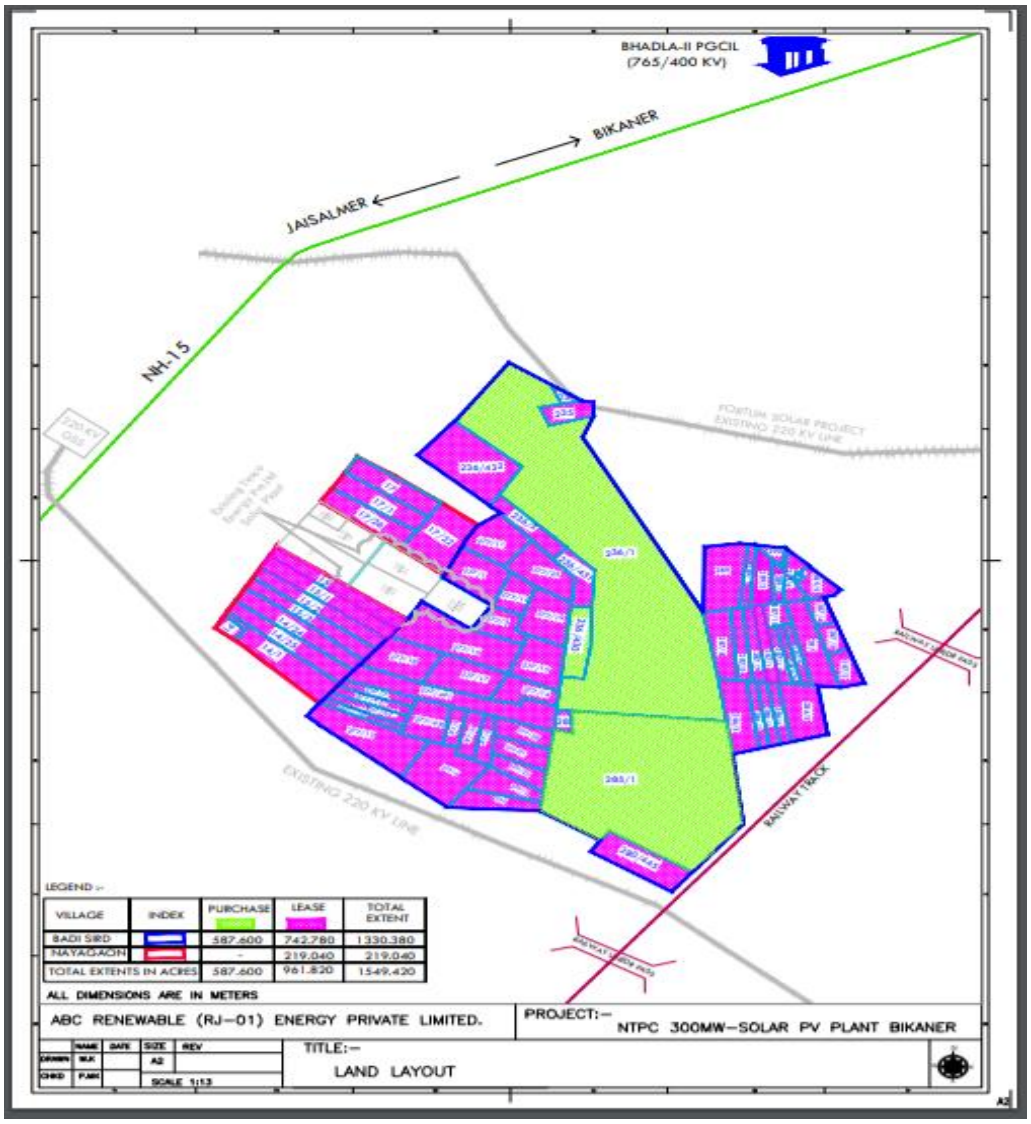


Fig: Plant Layout of Proposed 300 MW AC Solar Power Plant

The proposed 300 MW AC project land details are enlisted below:

S.No	Survey No	Khata No	Village Name	Total Extent (Acres)
1	236/1	1	Badi Sird	346.4000
2	236/430	380	Badi Sird	16.0000
3	285/1	1	Badi Sird	225.2000
Sub Total Badi Sird Purchase Extent				**587.6000**
4	235	403	Badi Sird	8.9200
5	236	298	Badi Sird	1.8600
6	236/3	313	Badi Sird	12.4000
7	236/431	269	Badi Sird	11.6000
8	236/432	12	Badi Sird	40.0000
9	277	212	Badi Sird	11.7200
10	277/1	368	Badi Sird	19.0000
11	277/2	174	Badi Sird	11.7800
12	277/3	429	Badi Sird	10.8000
13	277/4	359	Badi Sird	32.0000
14	277/6	134	Badi Sird	8.0000
15	277/7	121	Badi Sird	6.5600
16	277/9	167	Badi Sird	6.5600
17	277/10	434	Badi Sird	6.5600
18	277/11	408	Badi Sird	20.0000
19	277/12	521	Badi Sird	10.0400
20	277/13	133	Badi Sird	32.0000
21	277/14	4	Badi Sird	11.7600
22	277/15	281	Badi Sird	20.0000
23	277/16	137	Badi Sird	38.3000
24	277/17	354	Badi Sird	20.0000
25	277/18	355	Badi Sird	20.0000
26	277/19	5	Badi Sird	20.0000
27	277/20	431	Badi Sird	8.0000
28	277/21	432	Badi Sird	8.0000
29	277/22	432	Badi Sird	8.0000
30	277/23	97	Badi Sird	6.5800
31	277/24	134	Badi Sird	8.0000
32	277/25	378	Badi Sird	20.0000
33	277/435	83	Badi Sird	6.5600
34	277/436	165	Badi Sird	14.5600
35	277/441	80	Badi Sird	35.5600
36	280/445	227	Badi Sird	24.9200

37	285	298	Badi Sird	3.2400
38	286/1	427	Badi Sird	6.3000
39	286/2	10	Badi Sird	6.3200
40	286/3	188	Badi Sird	18.9400
41	286/4	220	Badi Sird	6.3000
42	286/5	139	Badi Sird	18.9400
43	287	139	Badi Sird	16.0000
44	287/1	768	Badi Sird	12.6800
45	287/2	10	Badi Sird	5.3200
46	287/3	427	Badi Sird	5.3400
47	287/4	220	Badi Sird	5.3400
48	287/5	29	Badi Sird	12.6600
49	287/6	186	Badi Sird	4.8200
50	287/7	191	Badi Sird	12.6600
51	287/8	502	Badi Sird	14.3400
52	287/9	533	Badi Sird	4.8200
53	287/10	106	Badi Sird	1.6400
54	287/11	162	Badi Sird	4.8200
55	288	142	Badi Sird	0.4400
56	289	516	Badi Sird	23.6000
57	289/1	106	Badi Sird	3.1800
58	289/2	209	Badi Sird	10.0000
59	289/3	284	Badi Sird	4.8200
60	289/4	426	Badi Sird	8.0000
61	289/5	142	Badi Sird	8.0000
62	290	516	Badi Sird	4.2200
Sub Total Badi Sird Lease Extent				**742.7800**
63	15	9	Naya Gaon	18.4000
64	15/1	17	Naya Gaon	18.4000
65	15/2	8	Naya Gaon	18.4000
66	15/3	7	Naya Gaon	18.4000
67	14	10	Naya Gaon	3.2000
68	14/1	13	Naya Gaon	24.9200
69	14/24	15	Naya Gaon	20.0000
70	14/25	16	Naya Gaon	20.0000
71	17	6	Naya Gaon	17.2600
72	17/1	5	Naya Gaon	17.2600
73	17/22	3	Naya Gaon	26.0000
74	17/26	4	Naya Gaon	16.8000
Sub Total Naya Gaon Lease Extent				**219.0400**
Total Extent				**1,549.4200**

Fig: Details of Land Status

Different photographs of the land selected for Bhadla 300 MW AC Solar Plant:

CHAPTER-5
SOLAR RESOURCE ASSESSMENT

5.Solar Resource Assessment

Rajasthan is one of India's most solar-developed states, with its total photovoltaic capacity reaching 5137.91 MW by end of Dec 2020. Jodhpur district leads the state with installed capacity of over 1,500 MW, followed by Jaisalmer and Bikaner.

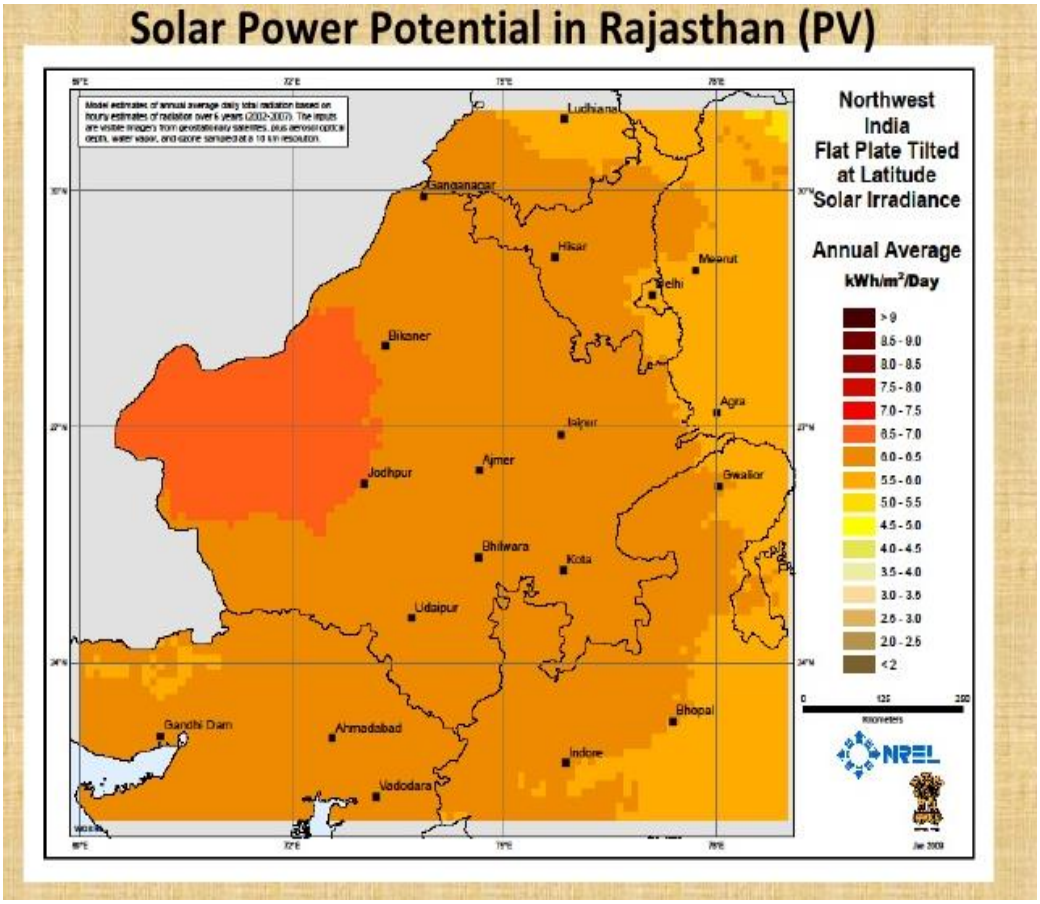


Fig: Annual Global Solar Radiation Map of India

Jodhpur

Jodhpur is the second-largest city in the Indian state of Rajasthan. It was formerly the seat of a princely state of Jodhpur State. Jodhpur was historically the capital of the Kingdom of Marwar, which is now part of Rajasthan. Jodhpur is a popular tourist destination, featuring many palaces, forts, and temples, set in the stark landscape of the Thar Desert. Jodhpur experiences a bright and sunny weather all through the year. For this, the city is also known as "Sun City". It is popularly known as the "Blue City" among people of Rajasthan and all over India. It serves as the administrative headquarters of the Jodhpur district and Jodhpur division.

The climate of Jodhpur is hot and semiarid during its nearly year-long dry season, but contains a brief rainy season from late June to September. The average rainfall is around 362 mm. Temperatures are extreme from March to October, except when the monsoonal rain produces thick clouds to lower it slightly. In April, May, and June, high temperatures routinely exceed 40°C. During the monsoon season, average temperatures decrease slightly, but the city's generally low humidity rises, which adds to the perception of the heat.

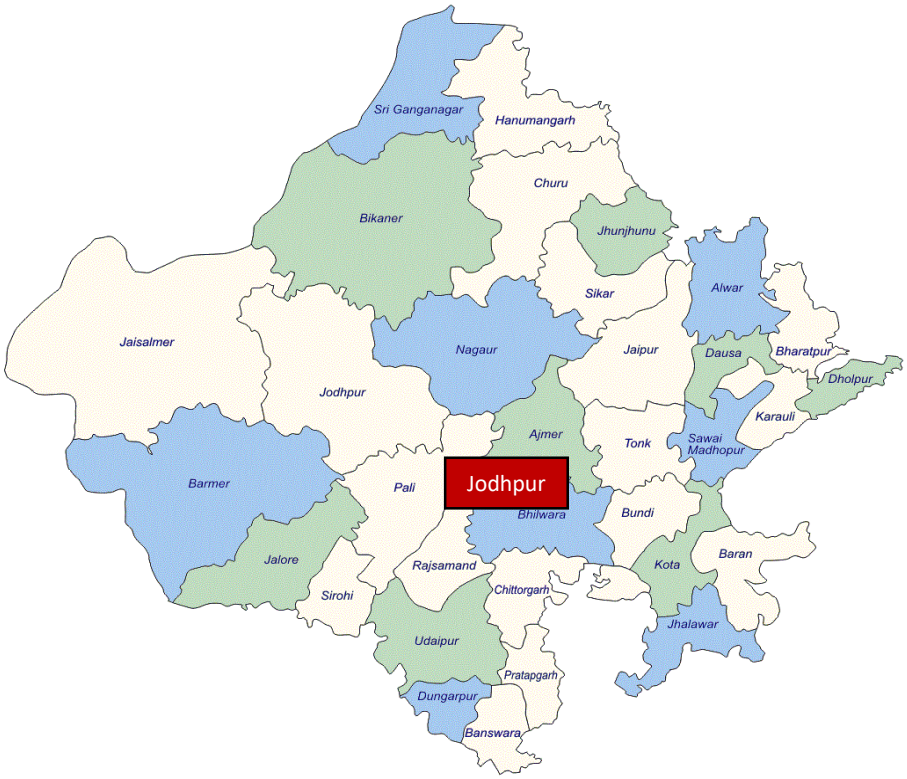


Fig: Jodhpur Jodhpur District Map of Rajasthan

Solar Assessment

Energy Yield Analysis

The proposed technology will consist of an arrangement of several components, including solar panels to absorb and directly convert sunlight into electricity, a solar inverter to change the electric current from DC to AC, as well as mounting, cabling and other electrical accessories.

All components of the PV plant are in accordance with technical specifications given in relevant IEC standards.

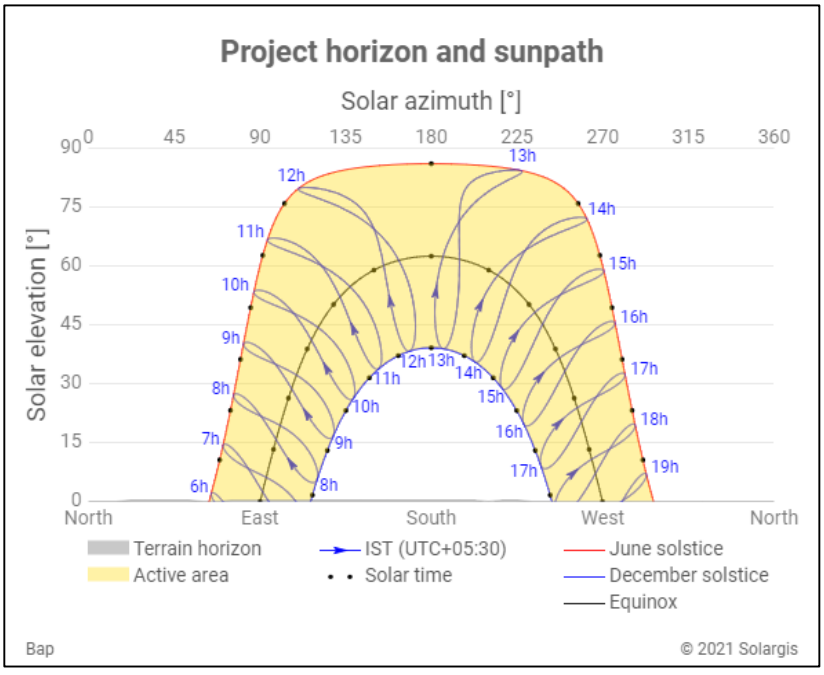
Brief about the Technology

We had computed the preliminary annual energy yields for the 300 MW Solar PV Plant using two different overloading's with the basic designs and indicative layout. We are in the process of evaluating the latest technologies for better generation.

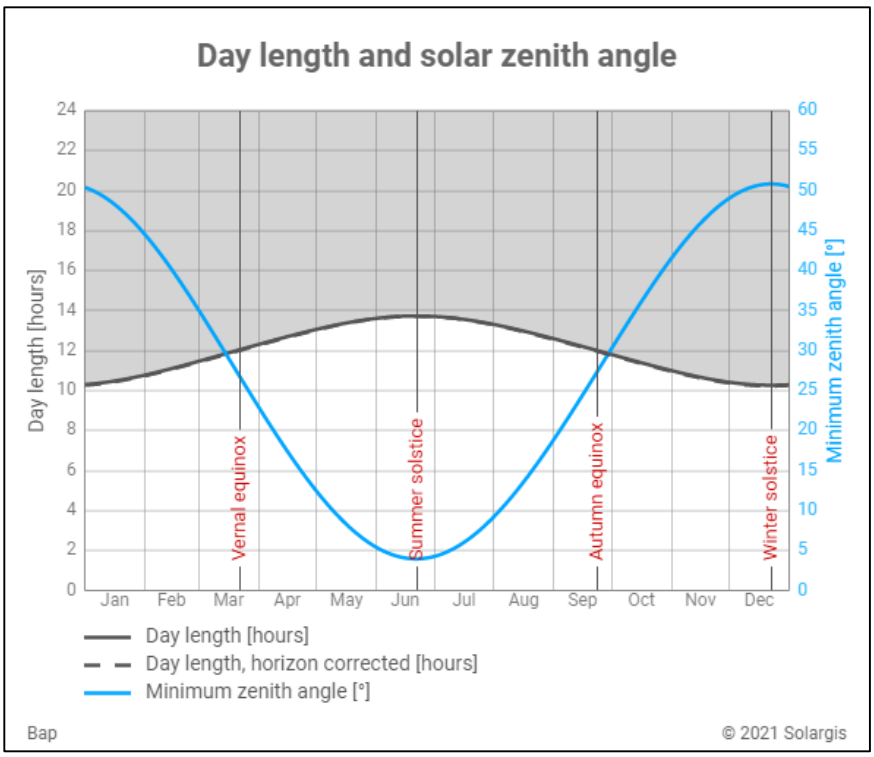
Solar Radiation of the proposed site:

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	120.3	40.1	15.42	162.5	153.7	63054	60742	0.831
February	138.8	38.1	19.85	174.9	167.3	66933	62118	0.789
March	178.1	64.8	26.45	201.6	192.2	74937	72168	0.796
April	199.9	75.6	31.21	206.9	196.8	75018	72291	0.776
May	211.9	95.4	35.51	205.0	194.0	73482	68179	0.739
June	195.1	100.9	34.68	183.7	173.1	66221	63966	0.774
July	178.0	101.6	33.10	169.9	159.6	61670	59594	0.780
August	170.6	95.5	31.72	170.0	160.1	62155	60010	0.784
September	172.0	69.3	31.21	186.3	176.9	68049	65605	0.782
October	156.5	58.2	29.35	187.1	178.2	68900	66426	0.789
November	125.4	38.9	22.89	165.3	157.5	62556	58159	0.782
December	111.0	36.5	17.55	153.2	144.7	58886	56725	0.823
Year	1957.7	814.9	27.44	2166.4	2054.1	801859	765984	0.786

Project horizon and sun path of proposed site:



Project Day Length and Zenith Angle of proposed site:



Estimated Annual Produced energy from Solar plant is 765984 MWh/Year and the CUF is 29.15%

The Proposed 300MW AC Project evaluated in PVSYST Software at two different overloading's i.e., 50% and 60% are and the reports are attached as Annexure-I.

CHAPTER-6
POWER EVACUATION

6.Power Evacuation

The power generated from the Proposed 300 MW AC Project will be evacuated as detailed under: -

Project Capacity	:	300 MW
Customer	:	NTPC
Type of Project	:	Solar
ISTS Transmission system	:	PGCIL
Proposed Connecting Sub-Station	:	Bhadla-II PGCIL (765/400/220 kV)

- Proposed to construct 33/220KV Pooling substations at suitable project location in the region of Bap, by laying 220KV SC line from proposed pooling substations to existing Bhadla II Substations at 220KV level. Further, the power can be evacuated to the Substation connecting 220KV SC line.
- The project got Stage I and Stage II connectivity approvals received from Power Grid Corporation of India Limited (PGCIL) on 10th February, 2020.
- The transmission agreement had executed with PGCIL on15th July 2020 by submitting Con.BG. PGCIL has allotted 220 kV bay at Bhadla-II PS for evacuating 300 MW Ac.

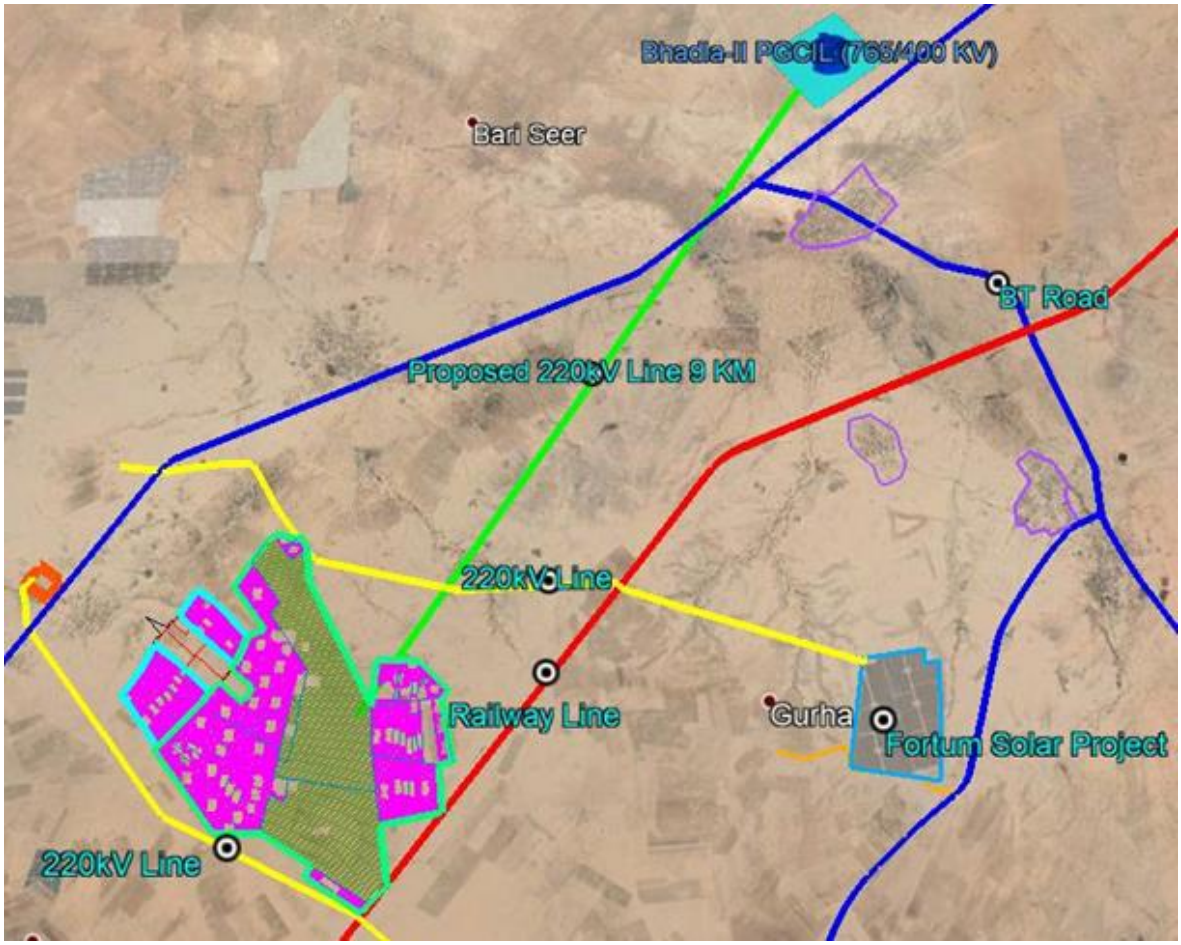


Fig: Power Evacuation Facility of Proposed Site

CHAPTER-7
PROJECT IMPLEMENTATION SCHEDULE

7. Project Implementation Schedule

The Project is Planned to be implemented at the earliest. The most essential aspect regarding the implementation of this Project will be commissioning of project within the stipulated timeline.

The Scheduled Commissioning Date (SCD) shall be the date as on 18 months from the effective date of PPA.

Accordingly, key timelines are furnished below;

RfS no	: "RE-CS-0000-BOO-5"
RfS issued date	: 10.08.2019
Last Date of bid submission	: 30.09.2019
Date of Reverse Auction	: 25.10.2019
Date of LOA	: 20.11.2019
Effective date of PPA	: 19.01.2020 for 100 MW and balance 200 MW yet to execute the PPA
Date of Financial Closure	: Within 12 Months from the Effective Date of PPA
SCD	: Date as on 18 months from the Effective date of PPA

Timelines of Financial Closure and SCD will be extended considering the blanket extension of 5 months granted by MNRE due to COVID-19. Further extension, if any, will be taken up as per the terms of PPA.

CHAPTER-8
ESTIMATIONS OF PROJECT COST

8.Estimation of Project Cost

Cost Estimates for Solar Plant are furnished as under:

The total estimated project cost is approximately Rs. 1200 cr.

Grid-Connected System: Simulation parameters

Project : **BAP Project**

Geographical Site	**Bāp**		Country	**India**
Situation	Latitude	27.40° N	Longitude	72.37° E
Time defined as	Legal Time	Time zone UT+5.5	Altitude	199 m
	Albedo	0.20		
Meteo data:	**Bāp**	Meteonorm 7.3 (2001-2010), Sat=100% - Synthetic		

Simulation variant : **300 MW 1.5**

	Simulation date	19/02/21 17h34

Simulation parameters	System type	**Unlimited sheds**		
Collector Plane Orientation	Tilt	22°	Azimuth	0°
Sheds configuration	Nb. of sheds	10	Unlimited sheds	
	Sheds spacing	6.60 m	Collector width	4.25 m
Inactive band	Top	0.02 m	Bottom	0.02 m
Shading limit angle	Limit profile angle	31.2°	Ground Cov. Ratio (GCR)	64.4%
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
			Circumsolar	separate
Horizon	Free Horizon			
Near Shadings	Mutual shadings of sheds			
User's needs :	Unlimited load (grid)			

PV Array Characteristics

PV module	Si-mono	Model	**LR5-72 HPH 540 M**	
Original PVsyst database		Manufacturer	Longi Solar	
Number of PV modules		In series	27 modules	In parallel 30864 strings
Total number of PV modules		nb. modules	833328	Unit Nom. Power 540 Wp
Array global power		Nominal (STC)	**449997 kWp**	At operating cond. 411322 kWp (50°C)
Array operating characteristics (50°C)		U mpp	1008 V	I mpp 408105 A
Total area		Module area	**2130026 m²**	Cell area 1931988 m²
Inverter		Model	**SG3125HV-32**	
Custom parameters definition		Manufacturer	Sungrow	
Characteristics		Unit Nom. Power	**3125 kWac**	Oper. Voltage 960-1300 V
		Max. power (=>30°C)	3781 kWac	
Inverter pack		Total power	**300000 kWac**	Pnom ratio 1.50
		Nb. of inverters	96 units	
Total		Total power	**300000 kWac**	Pnom ratio 1.50

PV Array loss factors

Array Soiling Losses			Loss Fraction	2.0 %
Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	0.041 mΩ	Loss Fraction	1.5 % at STC
Serie Diode Loss	Voltage drop	0.7 V	Loss Fraction	0.1 % at STC
LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	0.0 %
Module mismatch losses			Loss Fraction	2.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %

Grid-Connected System: Simulation parameters

Incidence effect (IAM): User defined profile

0°	25°	45°	60°	65°	70°	75°	80°	90°
1.000	1.000	0.995	0.962	0.936	0.903	0.851	0.754	0.000

System loss factors

AC wire loss inverter to transfo	Inverter voltage	660 Vac tri		
	Wires: 3 x 100000 mm²	115 m	Loss Fraction	2.2 % at STC
MV transfo	Grid Voltage	20 kV		
One MV transfo				
Operating losses at STC	Iron loss (24/24 Connexion)	444.13 kW	Loss Fraction	0.1 % at STC
	Copper (resistive) loss	3 x 0.01 mΩ	Loss Fraction	1.0 % at STC
Unavailability of the system	3.7 days, 3 periods		Time fraction	1.0 %

Grid-Connected System: Main results

Project : **BAP Project**

Simulation variant : **300 MW 1.5**

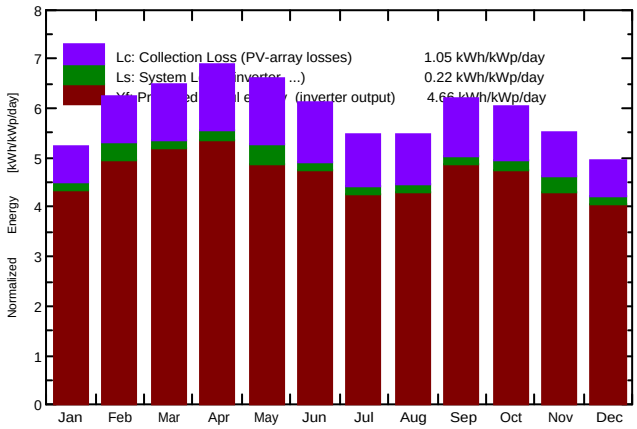
Main system parameters				
	System type	**Unlimited sheds**		
PV Field Orientation	Sheds disposition, tilt	22°	azimuth	0°
PV modules	Model	LR5-72 HPH 540 M	Pnom	540 Wp
PV Array	Nb. of modules	833328	Pnom total	**449997 kWp**
Inverter	Model	SG3125HV-32	Pnom	3125 kW ac
Inverter pack	Nb. of units	96.0	Pnom total	**300000 kW ac**
User's needs	Unlimited load (grid)			

Main simulation results

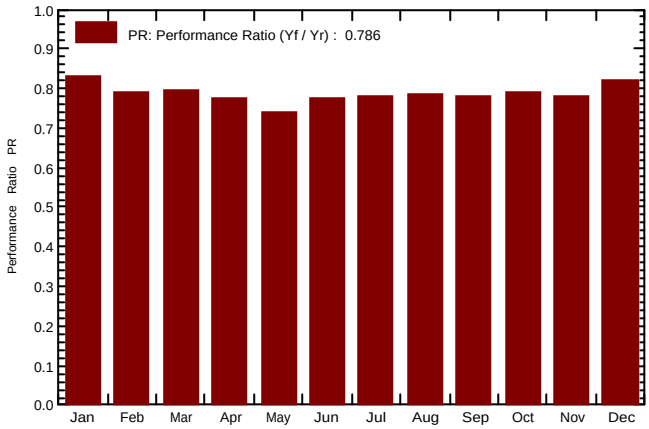
System Production — **Produced Energy** **765984 MWh/year** Specific prod. 1702 kWh/kWp/year

Performance Ratio PR 78.57 %

Normalized productions (per installed kWp): Nominal power 449997 kWp



Performance Ratio PR



300 MW 1.5

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	120.3	40.1	15.42	162.5	153.7	63054	60742	0.831
February	138.8	38.1	19.85	174.9	167.3	66933	62118	0.789
March	178.1	64.8	26.45	201.6	192.2	74937	72168	0.796
April	199.9	75.6	31.21	206.9	196.8	75018	72291	0.776
May	211.9	95.4	35.51	205.0	194.0	73482	68179	0.739
June	195.1	100.9	34.68	183.7	173.1	66221	63966	0.774
July	178.0	101.6	33.10	169.9	159.6	61670	59594	0.780
August	170.6	95.5	31.72	170.0	160.1	62155	60010	0.784
September	172.0	69.3	31.21	186.3	176.9	68049	65605	0.782
October	156.5	58.2	29.35	187.1	178.2	68900	66426	0.789
November	125.4	38.9	22.89	165.3	157.5	62556	58159	0.782
December	111.0	36.5	17.55	153.2	144.7	58886	56725	0.823
Year	1957.7	814.9	27.44	2166.4	2054.1	801859	765984	0.786

Legends:

GlobHor	Global horizontal irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T_Amb	T amb.	E_Grid	Energy injected into grid
GlobInc	Global incident in coll. plane	PR	Performance Ratio

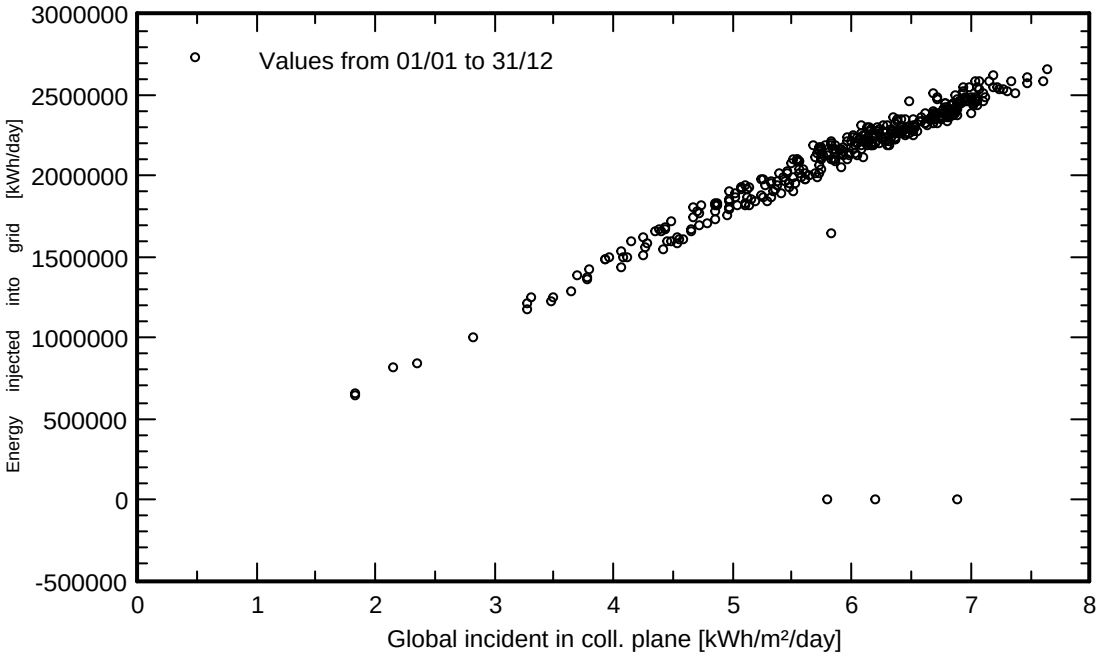
Grid-Connected System: Special graphs

Project : **BAP Project**

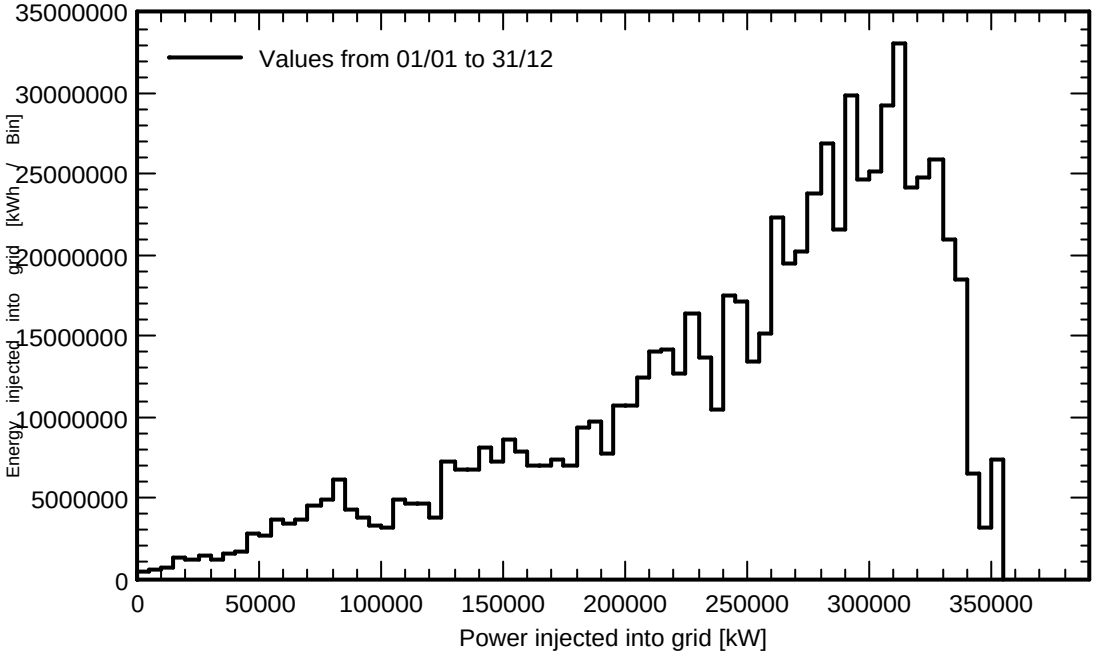
Simulation variant : **300 MW 1.5**

Main system parameters	System type	**Unlimited sheds**		
PV Field Orientation	Sheds disposition, tilt	22°	azimuth	0°
PV modules	Model	LR5-72 HPH 540 M	Pnom	540 Wp
PV Array	Nb. of modules	833328	Pnom total	**449997 kWp**
Inverter	Model	SG3125HV-32	Pnom	3125 kW ac
Inverter pack	Nb. of units	96.0	Pnom total	**300000 kW ac**
User's needs	Unlimited load (grid)			

Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

Project : **BAP Project**

Simulation variant : **300 MW 1.5**

Main system parameters	System type	**Unlimited sheds**		
PV Field Orientation	Sheds disposition, tilt	22°	azimuth	0°
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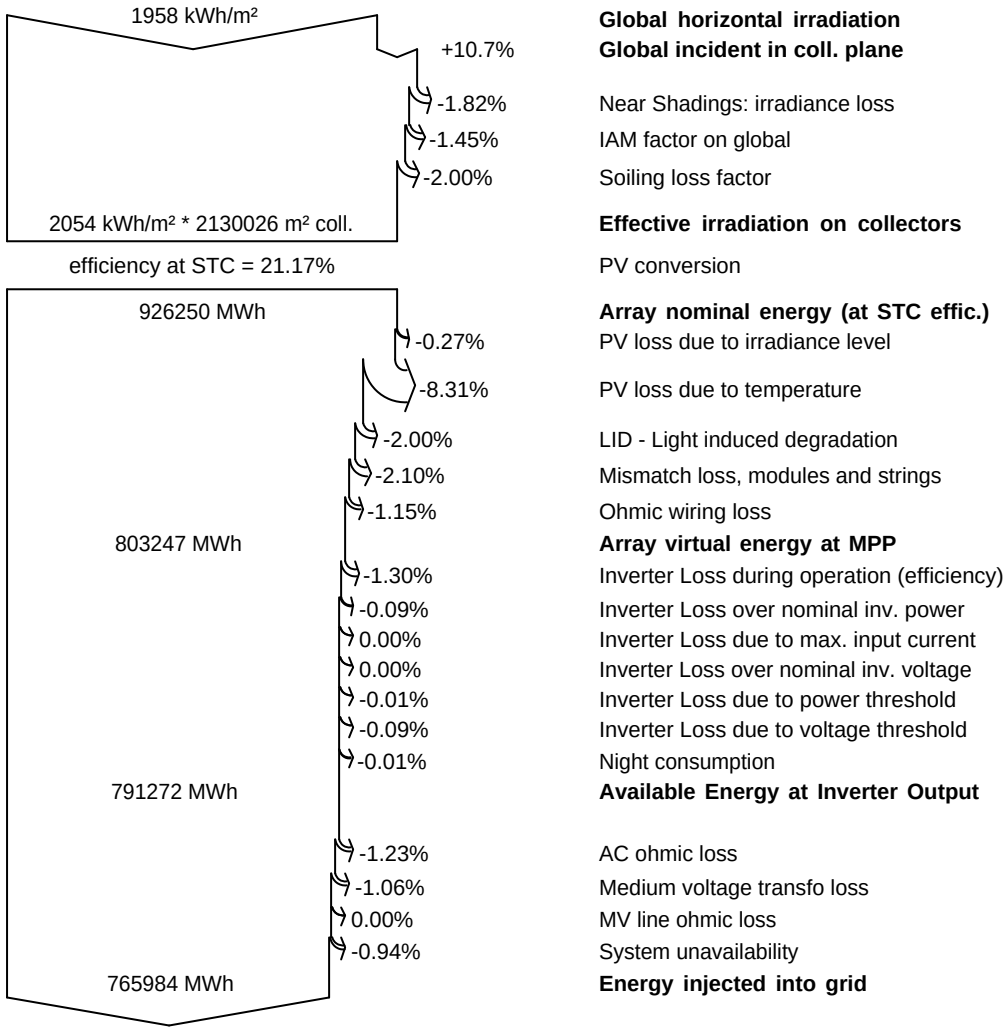
Inverter	Model	SG3125HV-32	Pnom	3125 kW ac
Inverter pack	Nb. of units	96.0	Pnom total	**300000 kW ac**
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



Grid-Connected System: P50 - P90 evaluation

Project : **BAP Project**

Simulation variant : **300 MW 1.5**

Main system parameters				
	System type	**Unlimited sheds**		
PV Field Orientation	Sheds disposition, tilt	22°	azimuth	0°
PV modules	Model	LR5-72 HPH 540 M	Pnom	540 Wp
PV Array	Nb. of modules	833328	Pnom total	**449997 kWp**
Inverter	Model	SG3125HV-32	Pnom	3125 kW ac
Inverter pack	Nb. of units	96.0	Pnom total	**300000 kW ac**
User's needs	Unlimited load (grid)			

Evaluation of the Production probability forecast

The probability distribution of the system production forecast for different years is mainly dependent on the meteo data used for the simulation, and depends on the following choices:

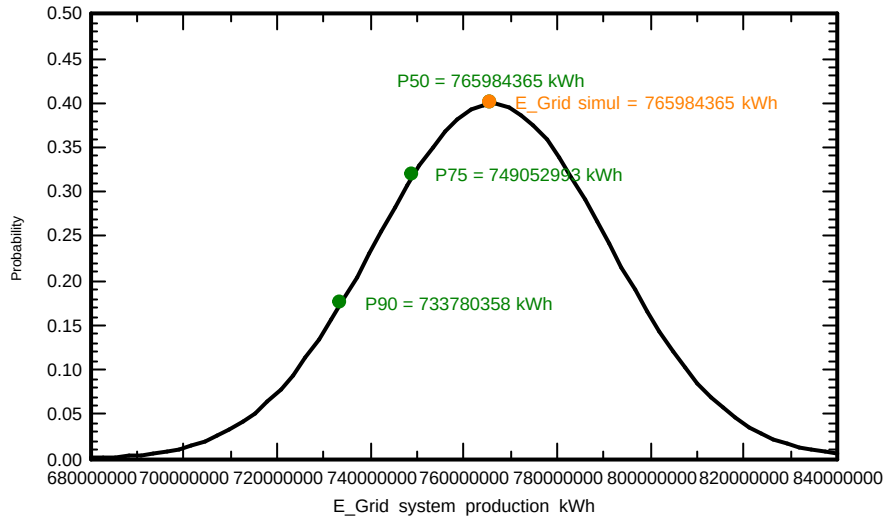
Meteo data source		Meteonorm 7.3 (2001-2010), Sat=100%
Meteo data	Kind	TMY, multi-year
Specified Deviation	Climate change	0.0 %
Year-to-year variability	Variance	2.5 %

The probability distribution variance is also depending on some system parameters uncertainties

Specified Deviation	PV module modelling/parameters	1.0 %	
	Inverter efficiency uncertainty	0.5 %	
	Soiling and mismatch uncertainties	1.0 %	
	Degradation uncertainty	1.5 %	
Global variability (meteo + system)	Variance	3.3 %	(quadratic sum)

Annual production probability	**Variability**	**25114 MWh**
	P50	**765984 MWh**
	P90	**733780 MWh**

Probability distribution



Grid-Connected System: Simulation parameters

Project : **BAP Project**

Geographical Site	**Bāp**		Country	**India**
Situation	Latitude	27.40° N	Longitude	72.37° E
Time defined as	Legal Time	Time zone UT+5.5	Altitude	199 m
	Albedo	0.20		
Meteo data:	**Bāp**	Meteonorm 7.3 (2001-2010), Sat=100% - Synthetic		

Simulation variant : **300 MW 1.6**

	Simulation date	19/02/21 17h45

Simulation parameters	System type	**Unlimited sheds**			
Collector Plane Orientation	Tilt	22°		Azimuth	0°
Sheds configuration	Nb. of sheds	10		Unlimited sheds	
	Sheds spacing	6.60 m		Collector width	4.25 m
Inactive band	Top	0.02 m		Bottom	0.02 m
Shading limit angle	Limit profile angle	31.2°	Ground Cov. Ratio (GCR)		64.4%
Models used	Transposition	Perez		Diffuse	Perez, Meteonorm
				Circumsolar	separate
Horizon	Free Horizon				
Near Shadings	Mutual shadings of sheds				
User's needs :	Unlimited load (grid)				

PV Array Characteristics

PV module	Si-mono	Model	**LR5-72 HPH 540 M**		
Original PVsyst database		Manufacturer	Longi Solar		
Number of PV modules		In series	27 modules	In parallel	32922 strings
Total number of PV modules		nb. modules	888894	Unit Nom. Power	540 Wp
Array global power		Nominal (STC)	**480003 kWp**	At operating cond.	438749 kWp (50°C)
Array operating characteristics (50°C)		U mpp	1008 V	I mpp	435317 A
Total area		Module area	**2272056 m²**	Cell area	2060812 m²
Inverter		Model	**SG3125HV-32**		
Custom parameters definition		Manufacturer	Sungrow		
Characteristics		Unit Nom. Power	**3125 kWac**	Oper. Voltage	960-1300 V
		Max. power (=>30°C)	3781 kWac		
Inverter pack		Total power	**300000 kWac**	Pnom ratio	1.60
		Nb. of inverters	96 units		
Total		Total power	**300000 kWac**	Pnom ratio	1.60

PV Array loss factors

Array Soiling Losses			Loss Fraction	2.0 %
Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	0.038 mΩ	Loss Fraction	1.5 % at STC
Serie Diode Loss	Voltage drop	0.7 V	Loss Fraction	0.1 % at STC
LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	0.0 %
Module mismatch losses			Loss Fraction	2.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %

Grid-Connected System: Simulation parameters

Incidence effect (IAM): User defined profile

0°	25°	45°	60°	65°	70°	75°	80°	90°
1.000	1.000	0.995	0.962	0.936	0.903	0.851	0.754	0.000

System loss factors

AC wire loss inverter to transfo	Inverter voltage	660 Vac tri		
	Wires: 3 x 100000 mm²	115 m	Loss Fraction	2.4 % at STC
MV transfo	Grid Voltage	20 kV		
One MV transfo				
Operating losses at STC	Iron loss (24/24 Connexion)	473.69 kW	Loss Fraction	0.1 % at STC
	Copper (resistive) loss	3 x 0.01 mΩ	Loss Fraction	1.0 % at STC
Unavailability of the system	3.7 days, 3 periods		Time fraction	1.0 %

Grid-Connected System: Main results

Project : **BAP Project**

Simulation variant : **300 MW 1.6**

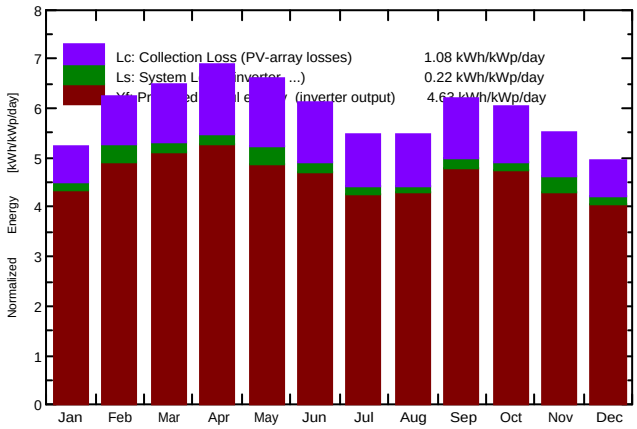
Main system parameters				
	System type	**Unlimited sheds**		
PV Field Orientation	Sheds disposition, tilt	22°	azimuth	0°
PV modules	Model	LR5-72 HPH 540 M	Pnom	540 Wp
PV Array	Nb. of modules	888894	Pnom total	**480003 kWp**
Inverter	Model	SG3125HV-32	Pnom	3125 kW ac
Inverter pack	Nb. of units	96.0	Pnom total	**300000 kW ac**
User's needs	Unlimited load (grid)			

Main simulation results

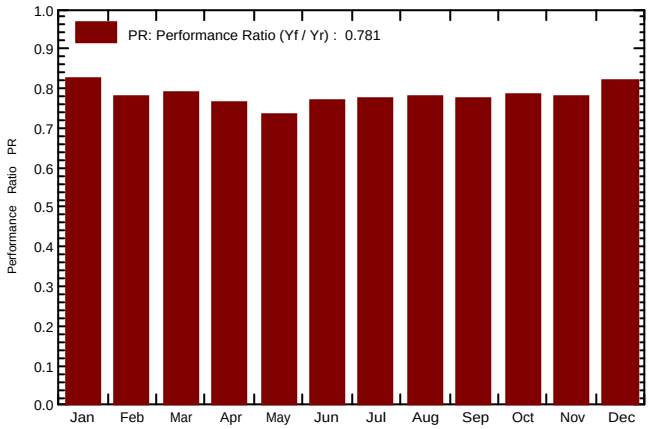
System Production — **Produced Energy** **811979 MWh/year** Specific prod. 1692 kWh/kWp/year

Performance Ratio PR 78.08 %

Normalized productions (per installed kWp): Nominal power 480003 kWp



Performance Ratio PR



300 MW 1.6

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	120.3	40.1	15.42	162.5	153.7	67134	64609	0.828
February	138.8	38.1	19.85	174.9	167.3	70902	65731	0.783
March	178.1	64.8	26.45	201.6	192.2	79304	76304	0.789
April	199.9	75.6	31.21	206.9	196.8	78945	76019	0.765
May	211.9	95.4	35.51	205.0	194.0	77952	72270	0.735
June	195.1	100.9	34.68	183.7	173.1	70453	67993	0.771
July	178.0	101.6	33.10	169.9	159.6	65668	63403	0.778
August	170.6	95.5	31.72	170.0	160.1	66109	63773	0.782
September	172.0	69.3	31.21	186.3	176.9	71855	69219	0.774
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November	125.4	38.9	22.89	165.3	157.5	66668	61916	0.780
December	111.0	36.5	17.55	153.2	144.7	62746	60384	0.821
Year	1957.7	814.9	27.44	2166.4	2054.1	850780	811979	0.781

Legends:

GlobHor	Global horizontal irradiation	GlobEff	Effective Global, corr. for IAM and shadings
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Grid-Connected System: Special graphs

Project : **BAP Project**

Simulation variant : **300 MW 1.6**

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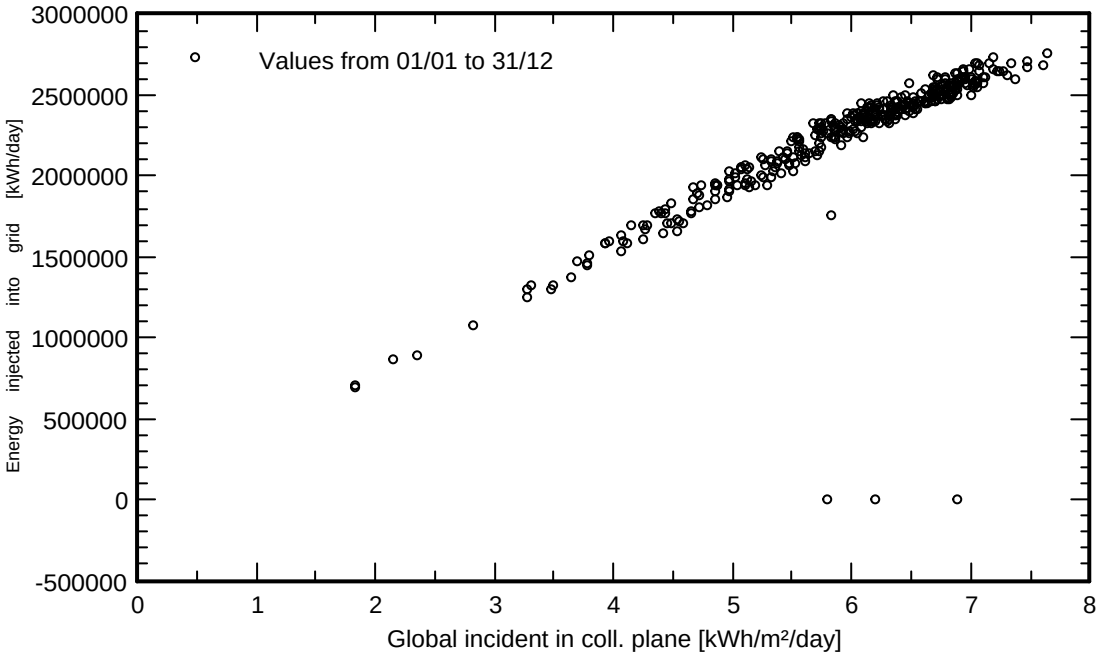
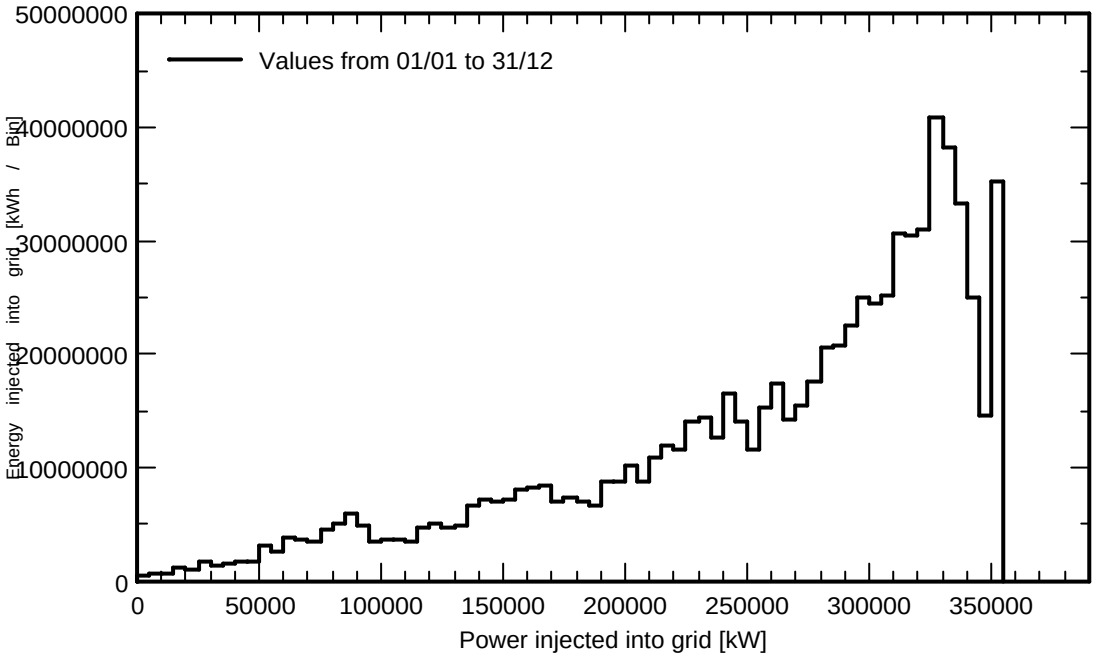
Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

Project : **BAP Project**

Simulation variant : **300 MW 1.6**

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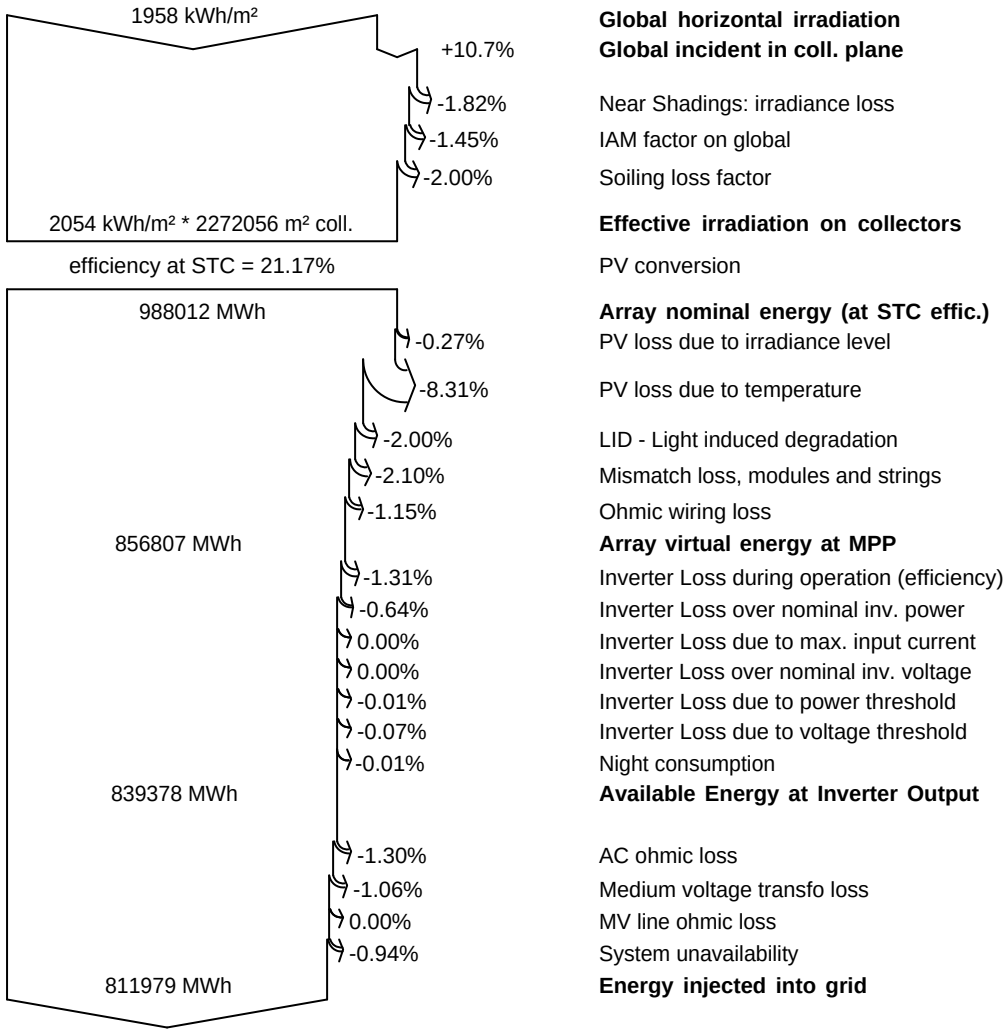
Loss diagram over the whole year



Grid-Connected System: P50 - P90 evaluation

Project : **BAP Project**

Simulation variant : **300 MW 1.6**

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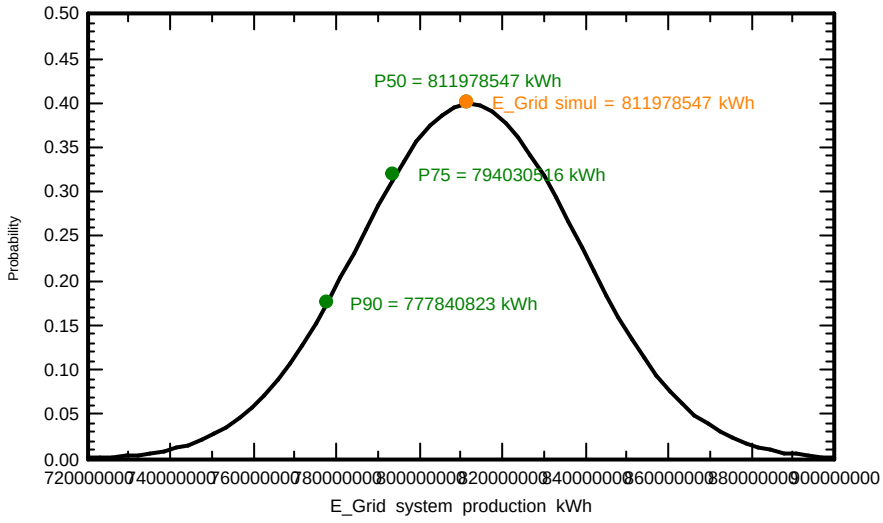
	Soiling and mismatch uncertainties	1.0 %	
	Degradation uncertainty	1.5 %	
Global variability (meteo + system)	Variance	3.3 %	(quadratic sum)

Annual production probability	**Variability**	**26622 MWh**
	P50	**811979 MWh**
	P90	**777841 MWh**

Probability distribution



For ABC SOLAR (INDIA) PRIVATE LIMITED

SANJAY PUROHIT
Authorized Signatory