Table of Contents

1. Executive Summary

The 2.05MW$_{AC}$ /2.7MW$_{DC}$ rooftop Solar Power Plant at ATLI Battery, Sohna, Haryana is planned to be developed by Sunbeam Real Ventures Private Limited with a target of commissioning by June, 2025. The PPA was executed based on an initial assessment of 2.7MW$_{DC}$. A brief overview of the project simulation summary is also projected below:

PVsyst V7.4.8
VE3, Simulation date:
12/03/25 15:56
with V7.4.8

Project: ATLI - Sohna
Variant: ATLI_Final PVsyst report_SolarGIS
Solo Power (India)

Project summary

Geographical Site		**Situation**		**Project settings**	
ATLI		Latitude	28.83 °N	Albedo	0.20
India		Longitude	76.92 °E		
		Altitude	218 m		
		Time zone	UTC+5.5		

Weather data
ATLI
SolarGIS Monthly aver. , period not spec. - Synthetic

System summary

Grid-Connected System		**Unlimited sheds**		
PV Field Orientation		**Near Shadings**	**User's needs**	
Sheds		Mutual shadings of sheds	Unlimited load (grid)	
Tilt	10 °	Electrical effect		
Azimuth	0 °			

System information

PV Array		**Inverters**	
Nb. of modules	4680 units	Nb. of units	17 units
Pnom total	2761 kWp	Pnom total	2050 kWac
		Pnom ratio	1.347

Results summary

Produced Energy	4313344 kWh/year	Specific production	1562 kWh/kWp/year	Perf. Ratio PR	84.83 %

- **Solar Plant Developer and Ownership (Shareholders):**
  i. Sunil Gadhoke
  ii. Viraj Gadhoke
- **Location and Approach Roads**

  ATLI Battery is located at Sohna in the state of Haryana. The geo-location of upcoming solar plant of 2MW$_{AC}$ /2.7MW$_{DC}$ at Sohna is 28.19305°N, 77.06764°E. The site proposed for the solar plant is approximately at a distance of
  - 72 km from New Delhi, via NH 48
  - 32 km from Gurgaon, Haryana

- **Area of Rooftop Available**

  The area of rooftop available for developing the solar plant is approximately 17,915 m^2. There are 2 roofs where installation is planned. The height of the building where solar plant installation is planned is approximately 29m. The satellite image of this facility is shown hereafter where solar PV plant installation is planned.

Total Solar Power Capacity to be Developed (MW$_{AC}$)

2MW$_{AC}$

- **Solar Power Evacuation Plan (Refer ANNEXURE 2)**

  Solar Power transmission and evacuation of each roof is done at the 2000A feeder of the client Distribution Panel at 415V within each building. The transmission of solar power generated will be through 7Rx3.5Cx240sqmm Al/Cu cable.

2. Scope of Report

- **Introduce the concept of the solar plant**

  A Rooftop Solar Plant is a small to medium-scale photovoltaic system (PV system) designed under C&I segment, basically for captive power consumption. They operate in grid parallel mode with the ability to export surplus power to the local electricity distribution network. It provides security of power supply and resilience through self-generation with great cost benefits, particularly when the current and the future escalated grid tariff are accounted. It also assists in reducing carbon footprints and contributes to improved environmental impacts.

- **A brief description of the solar plant being planned**
  2.05MW$_{AC}$ solar plant is planned at the rooftop of ATLI facility in Sohna of Haryana, India. The power generated will be consumed by the facility. The PV technology installed here is mono-crystalline N-type TOPCON modules and 17 Sungrow inverters; (16)125kW and (1)50kW are used to convert the DC power generated from the PV modules to the grid.
- **Purpose of the DPR**
  Detailed project report is a complete document for investment decision-making, approval, planning. Detailed project report is based document for planning the solar plant and implementing the solar plant. In this DPR all details, starting from Renewable energy scenario in India, Solar irradiation available at site, Type of Roof and planning of Rooftop Solar Plant installed are included.

3. Solar Sector Overview

- **PV Technologies**
  Photovoltaics (PV) is the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect, a phenomenon studied in physics, photochemistry, and electrochemistry. A typical photovoltaic system employs solar panels, each comprising a number of solar cells, which generate electrical power. PV installations may be ground-mounted, rooftop mounted or wall mounted. The mount may be fixed, or use a solar tracker to follow the sun across the sky. Solar PV has specific advantages as an energy source: once installed, its operation generates no pollution and no greenhouse gas emissions, it shows simple scalability in respect of power needs and silicon has large availability in the Earth's crust. Photovoltaic systems have long been used in specialized applications, and standalone and grid-connected PV systems have been in use since the 1990s. They were first mass-produced in 2000, when German environmentalists and the Eurosolar organization got government funding for a ten thousand roof program. Advances in technology and increased manufacturing scale have in any case reduced the cost, increased the reliability, and increased the efficiency of photovoltaic installations Net metering and financial incentives, such as preferential feed-in tariffs for solar-generated electricity, have supported solar PV installations in many countries. More than 100 countries now use solar PV. The term "photovoltaic" comes from the Greek word (phōs) meaning "light", and from "volt", the unit of electro-motive force, the volt, which in turn comes from the last name of the Italian physicist Alessandro Volta, inventor of the battery (electrochemical cell). The term "photo-voltaic" has been in use in English since 1849. Photovoltaics are best known as a method for generating electric power by using solar cells to convert energy from the sun into a flow of electrons by the photovoltaic effect. Solar cells produce direct current electricity from sunlight which can be used to power equipment or to recharge a battery. The first practical application of photovoltaics was to power orbiting satellites and other spacecraft, but today the majority of photovoltaic modules are used for grid connected power generation. In this case, an inverter is required to convert the DC to AC. Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material. Copper solar cables connect modules (module cable), arrays (array cable), and sub-fields. Because of the growing demand for renewable energy sources, the manufacturing of solar cells and photovoltaic arrays has advanced considerably in recent years.

Solar photovoltaic power generation has long been seen as a clean energy technology which draws upon the planet's most plentiful and widely distributed renewable energy source – the sun. Cells require protection from the environment and is usually packaged tightly in solar panels. Photovoltaic power capacity is measured as maximum power output under standardized test conditions (STC) in "W_P" (watts peak). The actual power output at a particular point in time may be less than or greater than this standardized, or "rated", value, depending on geographical location, time of day, weather conditions, and other factors. Solar photovoltaic array capacity factors are typically under 25%, which is lower than many other industrial sources of electricity.

- **Overview of Available Technology**

  Solar energy can be converted into electricity using the following two broad technology options:

  Photovoltaics (PV) is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of several cells containing a photovoltaic material. Materials presently used for photovoltaic include mono-crystalline silicon, multi-crystalline silicon, amorphous silicon, cadmium telluride, and copper indium selenide/sulphide. PV uses both direct and diffuse radiation for generation of electricity. Concentrated solar power (CSP) is the system that uses lenses or mirrors to concentrate a large area of sunlight, or solar thermal energy, onto a small area. Electrical power is produced when the concentrated light is converted to heat which drives a heat engine (usually a steam turbine) connected to an electrical power generator. CSP uses only direct radiation for generating electricity. As the Solar Plants has been allocated a 20MW Solar PV, this DPR will confine itself to the description of solar photovoltaic (PV) options.

- **Solar PV Technology**

  Photovoltaic conversion is the direct conversion of sunlight into electricity with no intervening heat engine. A PV cell consists of two or more thin layers of semiconducting material, most commonly silicon. When the silicon is exposed to light, electrical charges are generated; and this can be conducted away by metal contacts as direct current. The electrical output from a single cell is small; so multiple cells are connected and encapsulated (usually glass covered) to form a module (also called a panel). PV generation technology is commercially proven and large multi-megawatt generation plants have been operating since the 1990s. Costs associated with the technology are high, but the technology is well known and reliable. The major categories of solar photovoltaic technologies available are:

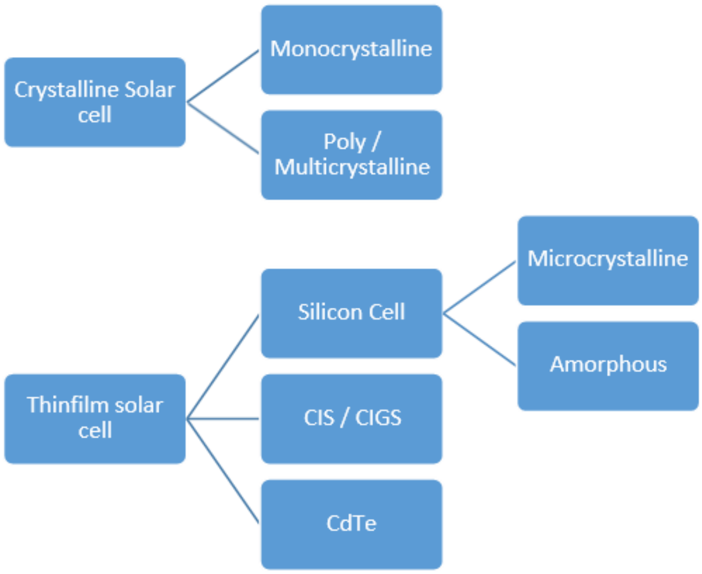
  Mono-crystalline silicon cells: In these cells, the silicon has a single continuous crystal lattice structure with almost no defects or impurities. Their main advantage is high efficiency; though a complicated manufacturing process is required to produce mono-crystalline silicon, which results in higher costs than those of other technologies.

  Multi-crystalline silicon cells: These cells are produced using numerous grains of mono-crystalline silicon. The manufacturing process involves casting of silicon into ingots, which are subsequently cut into very thin wafers and assembled into complete cells. These are cheaper to produce because of a simpler manufacturing process.

  Thin film: Extremely thin layers of photosensitive materials are deposited on a low-cost backing like glass, stainless steel or plastic. The selected materials are all strong light absorbers and only need to be about 1-micron thick, so materials costs are significantly reduced. The most common materials are amorphous silicon (a-Si), or the polycrystalline materials such as cadmium telluride (CdTe) and copper indium (gallium) (CIS or CIGS). Thin film cells trade-off lower efficiencies against a significantly lower cost of materials.

Concentrating PV: Concentrating the sunlight by optical devices like lenses or mirrors reduces the area of expensive cells or modules, and increases their efficiency. The most important benefit of this technology is the possibility to reach system efficiencies beyond 30%, which cannot be achieved by single junction 1-sun[1] photovoltaic technology.

1. 1-sun means testing conditions using irradiance of 1000 W/m^2



4. Solar Plant Details

- **Roof Size**
  The area of shadow free roof available for developing the solar power plant is approximately 17,915 m^2.
- **Total power capacity (in AC) to be located within the solar plant**
  2.05MW$_{AC}$
- **External Transmission infrastructure requirements, capacity already available, augmentation required up to target destinations: (Refer ANNEXURE-2)**
  Solar Power transmission and evacuation of each roof is done at the 2000A feeder of the client Distribution Panel at 415V within each building. The transmission of solar power generated will be through 7Rx3.5Cx240sqmm Al/Cu cable.
- **Solar Radiation Resource Assessment station:** The following data sensors shall be provided in the plant (in the module area) to monitor the following parameters:
  - Global Horizontal Irradiance – Pyranometer
  - Collector plane Irradiance – Pyranometer
  - Ambient temperature
  - Module temperature

- **Drainage System:**
  Water based cleaning is done on the subject rooftop solar plant through a network of PVC plumbing pipes from the water tapping point to the PV module area.
- **Telecommunication infrastructures:** Communication System is planned to be installed to fetch the plant and its equipment performance data through Datalogger to monitor the plant remotely.

4.1 Solar Irradiation and Weather Data

- **Average monthly GHI from the nearest met station or other reliable sources**
  The average monthly GHI of Sohna was taken from SolarGIS meteorological database and the following monthly values of irradiance, ambient temperature and wind speed. It experiences an annual average rainfall of 636mm. The figure below shows the monthly solar irradiation and weather data at Manesar along with the monthly generation table P50 figures as simulated in PVSyst. The simulation table also specifies the estimated PR on monthly basis.

ATLI_Final PVsyst report_SolarGIS(20-03-2025)
Weather data and incident energy

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	WindVel m/s	GlobInc kWh/m²	DifSInc kWh/m²	Alb_Inc kWh/m²	DifS_GI ratio
January	92.0	52.8	13.10	2.3	103.6	38.69	0.139	0.000
February	122.4	56.9	16.50	2.7	136.5	35.35	0.185	0.000
March	175.8	75.4	22.20	2.1	188.7	42.00	0.267	0.000
April	193.3	88.6	28.70	2.4	199.6	47.37	0.292	0.000
May	194.5	105.3	32.50	2.6	194.5	58.78	0.295	0.000
June	163.6	100.3	33.00	2.6	162.0	60.36	0.247	0.000
July	142.9	96.5	30.10	2.3	141.8	64.56	0.217	0.000
August	152.3	92.8	28.90	2.8	154.1	58.20	0.231	0.000
September	154.6	77.9	28.10	2.3	161.8	47.82	0.234	0.000
October	147.9	73.9	25.30	2.3	161.5	45.11	0.224	0.000
November	111.1	59.6	20.20	1.8	125.6	39.64	0.169	0.000
December	97.0	52.4	15.09	2.0	111.9	36.06	0.147	0.000
Year	1747.4	932.4	24.51	2.3	1841.6	573.95	2.647	0.000

- **Wind**
  Wind speed influences air temperature. In other words, at higher wind speeds, the air temperature could decrease and so does the solar cell operating temperature. That means that wind can help a solar PV system perform more efficiently to harvest the positive influence of wind on solar cell operation temperature, one will install systems at heights elevated above the surface of the roof. This allows wind to flow between the surface of the solar panels and the roof, reducing the operating temperature of the solar cells. This helps us ensure maximum module and solar PV system efficiency for your system.

  Wind speed, including wind gusts, can have physical impacts on solar PV systems. For example, if a solar PV system was not installed with the correct mounting equipment (e.g. rails, attachments, fasteners, etc.) and there are high wind gusts, then the system could be damaged. If the damage is significant, the electrical operation of the system could be affected. In a worst-case scenario, the solar panels could be dislodged from the mounting equipment or the roof due to high winds. The system would lose electrical contact and be inoperable.

- **Temperature**
  Local air temperature means the temperature of the air directly around the panels of the system. That can change how the solar PV system's voltage will function. Since solar cells – the physical material within a solar panel that converts sunlight into electricity – are under glass, they are well insulated. Thus, they have higher temperatures than the environment immediately around the panel. Temperature and voltage have an inverse relationship meaning the higher the temperature, the lower the operating voltage. Lower operating voltages cause lower module (and overall) system efficiency.
- **Rain and Humidity**
  Humidity can slow efficiency in two ways. Tiny water droplets, or water vapour, can collect on solar panels (like beads of sweat) and reflect or refract sunlight away from solar cells. This reduces the amount of sunlight hitting them and producing electricity. Consistent hot, humid weather can degrade the solar panels themselves over their lifetime. This is true for both crystalline silicon cells and thin film modules. Rain can also affect in many ways like If rainy period in year is more than generation is also reduced after rain water droplets cause same effect as above.

4.2 Annual Energy Yield Assessment

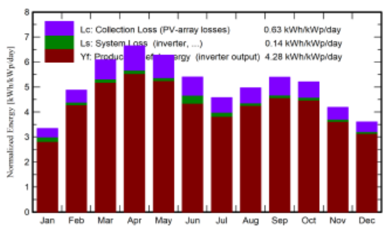
- **Simulation using reputed PV software**
  With the Meteonorm data, PVSyst simulation at 10° tilt and azimuth of 0°S was performed to assess the annual energy yield. A degradation of 1% was considered for a duration of one year from the time of installation. The simulation was performed on the basis of 2.7MW$_{DC}$ and 2.05MW$_{AC}$. The simulation result obtained is as shown in the Table given below. Annual Specific yield is 1444kWh/kWp/yr.

Main results

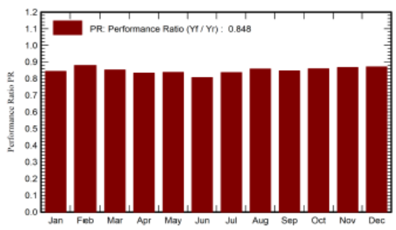
System Production

Produced Energy (P50) 4313344 kWh/year Specific production (P50) 1562 kWh/kWp/year Perf. Ratio PR 84.83 %
Produced Energy (P75) 4142271 kWh/year Specific production (P75) 1500 kWh/kWp/year
Produced Energy (P90) 3987957 kWh/year Specific production (P90) 1444 kWh/kWp/year

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	92.0	52.8	13.10	103.6	97.0	257275	241685	0.845
February	122.4	56.9	16.50	136.5	128.9	339904	331832	0.880
March	175.8	75.4	22.20	188.7	178.7	455405	444488	0.853
April	193.3	88.6	28.70	199.6	189.3	470586	459268	0.833
May	194.5	105.3	32.50	194.5	184.0	460622	450062	0.838
June	163.6	100.3	33.00	162.0	152.9	387192	360816	0.807
July	142.9	96.5	30.10	141.8	133.4	341584	327864	0.837
August	152.3	92.8	28.90	154.1	145.4	373709	365110	0.858
September	154.6	77.9	28.10	161.8	152.9	387939	378871	0.848
October	147.9	73.9	25.30	161.5	152.8	392641	383498	0.860
November	111.1	59.6	20.20	125.6	118.0	307689	300693	0.867
December	97.0	52.4	15.09	111.9	104.8	275484	269156	0.871
Year	1747.4	932.4	24.51	1841.6	1738.0	4450030	4313344	0.848

Legends

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

- **Orientation and tilt angle of solar PV modules:** 10° tilt and azimuth of 0°S
- **Capacity Utilization Factor (CUF): 16%**
- **Annual Degradation:** 1% for the 1st year and 0.4% thereafter

4.3 Electrical Infrastructure

- **Electrical Interface Point**

  A grid-tied solar power system produces solar electricity that is fed directly into the utility grid, hence the term grid-tied, as the system is tied, literally, to the grid. Grid-connected or utility-interactive PV systems are designed to operate in parallel with and interconnected with the electric utility grid. The primary component in grid-connected PV systems is the inverter, or power conditioning unit (PCU).

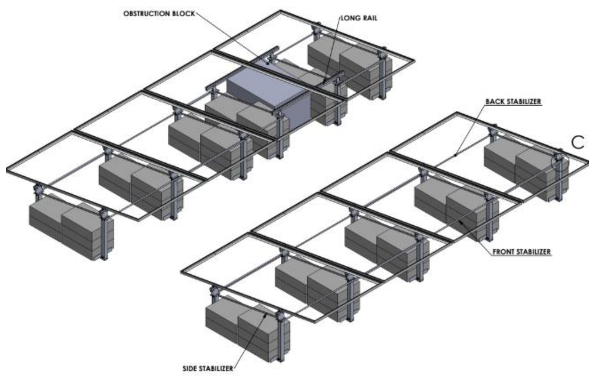
  The PCU converts the DC power produced by the PV array into AC power consistent with the voltage and power quality requirements of the utility grid, and automatically stops supplying power to the grid when the utility grid is not energized. A bi-directional interface is made between the PV system AC output circuits and the electric utility network, typically at an on-site distribution panel or service entrance. This allows the AC power produced by the PV system to either supply on-site electrical loads, or to back feed the grid when the PV system output is greater than the on-site load demand.

  At night and during other periods when the electrical loads are greater than the PV system output, the balance of power required by the loads is received from the electric utility.

4.4 Module Mounting Infrastructure

Customized ballast structure is planned for mounting of modules for this Rooftop Solar Project. This is to mitigate several obstructions present at the module mounting area and also avoid any damage to the waterproofing done in advance at the roof. A typical ballast structure that is proposed for this project is shown in the figure below:

ISOMETRIC VIEW WITH STABILIZERS



ISOMETRIC VIEW

5. Operation & Maintenance

The operation and maintenance of the plant will be taken care by the Asset Management Team of the project developer. Water based module cleaning and preventive maintenance as per the suggested OEM is scheduled and performed to maintain the generation guarantee and plant performance mentioned in the PPA. An annual cleaning cycles of 32-36 is undertaken with 12 monthly, 4 quarterly & 1 annual schedules of preventive maintenance. In case of any breakdowns in between these cycles, it will be attended on immediate basis.

6. Conclusion

A generation guarantee of 36,72,905kWh/yr has been mutually agreed according to the PPA.

List of Annexures

- Annexure 1: General Lay Out Plan of Solar Power Plant
- Annexure 2: Power Evacuation System Diagram
- Annexure 3: PVSyst Report
- Annexure 4: Bill of Materials

LEGEND

Fire Pipe Line	
Modules	
Client Foundation	

DEVELOPER/CLIENT: ATLI_SOHNA

POWER PURCHASER: ATLI_SOHNA

PROJECT: 2761.2 kWp ROOFTOP SOLAR PROJECT

LOCATION: 28.192584°N, 77.066593°E

SHEET TITLE: MODULE LAYOUT

DRAWING NO: MODULE LAYOUT_1.1

STAMP: ORIGINAL : "420X297"

A4 A3 A2 A1 A0

THIS INFORMATION IS CONFIDENTIAL AND IS NO PART IS TO BE DISCLOSED TO OTHERS WITHOUT WRITTEN PERMISSION FROM CONCERN PERSON

(All dimensions are in mm)

DATE	:	07-10-2024
PREPARED BY	:	ASIF KHAN
CHECKED BY	:	ANKIT
APPROVED BY	:	S. SHAHNAZ
APPROVED BY	:	
APPROVED BY	:	

NO.	REVISION	DATE

- A - ISSUED FOR INFORMATION ☑
- B - ISSUED FOR APPROVAL ☐
- C - ISSUED FOR CONSTRUCTION ☐
- D - AS BUILT ☐

SCALE

SHEET NO 1

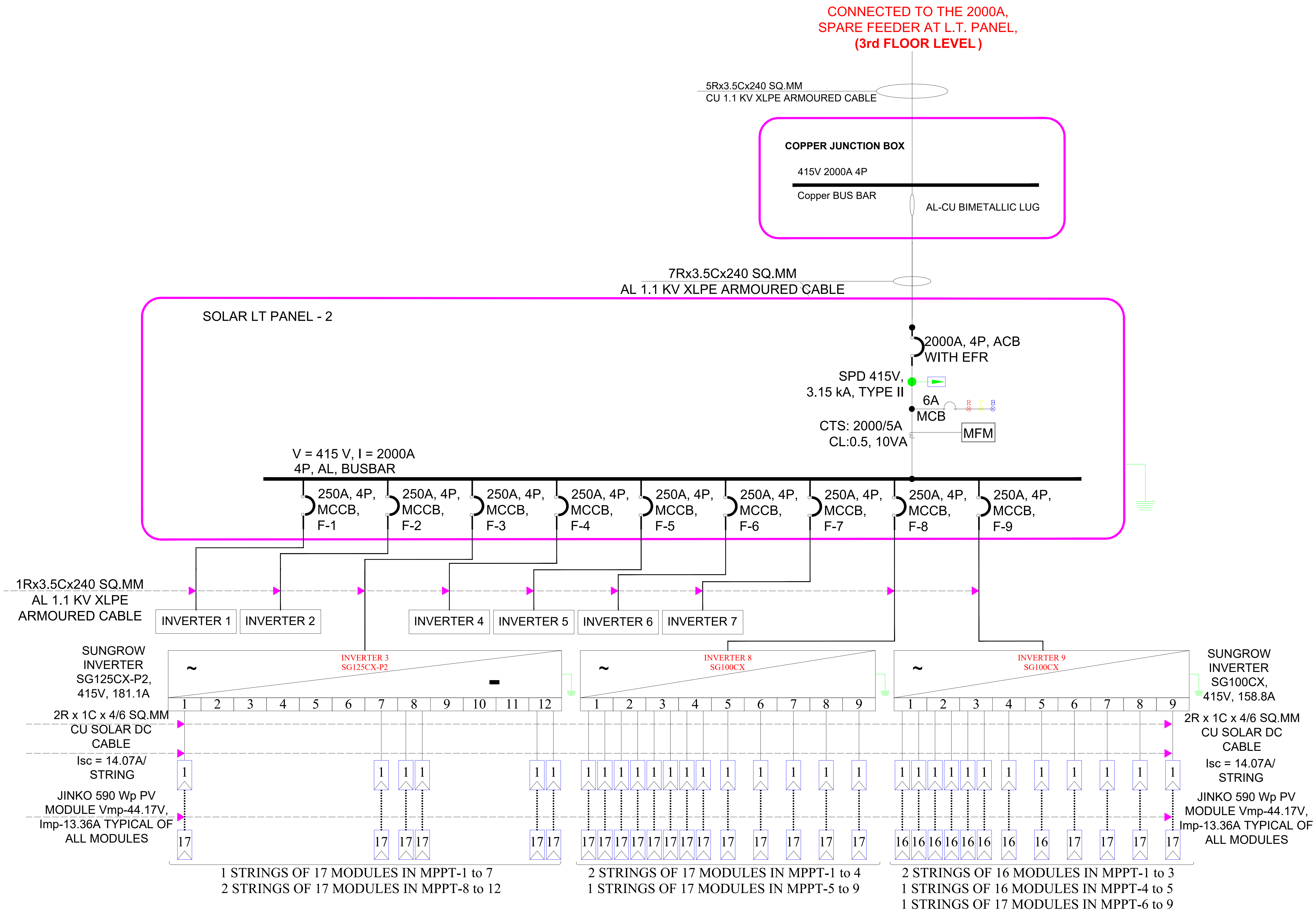
N E S W

VIBGYOR ENERGY

ATLI, SOHNA

2761.2kWp SOLAR POWER PLANT INFO

NAME OF ROOF	MODULE TILT	NO. OF MODULES	DC CAPACITY (kWp)
F4	10	2584	1524.56
FI-A	10	2096	1236.64
TOTAL		4680	2761.20
MODULE USED- JINKO 590Wp			



CONNECTED TO THE 2000A,
SPARE FEEDER AT L.T. PANEL,
(3rd FLOOR LEVEL)
5Rx3.5Cx240 SQ.MM
CU 1.1 KV XLPE ARMOURED CABLE
COPPER JUNCTION BOX
415V 2000A 4P
Copper BUS BAR
AL-CU BIMETALLIC LUG
7Rx3.5Cx240 SQ.MM
AL 1.1 KV XLPE ARMOURED CABLE
SOLAR LT PANEL - 2
2000A, 4P, ACB
WITH EFR
SPD 415V,
3.15 kA, TYPE II
6A
MCB
CTS: 2000/5A
CL:0.5, 10VA
MFM
V = 415 V, I = 2000A
4P, AL, BUSBAR
250A, 4P, MCCB, F-1
250A, 4P, MCCB, F-2
250A, 4P, MCCB, F-3
250A, 4P, MCCB, F-4
250A, 4P, MCCB, F-5
250A, 4P, MCCB, F-6
250A, 4P, MCCB, F-7
250A, 4P, MCCB, F-8
250A, 4P, MCCB, F-9
1Rx3.5Cx240 SQ.MM
AL 1.1 KV XLPE
ARMOURED CABLE
INVERTER 1
INVERTER 2
INVERTER 4
INVERTER 5
INVERTER 6
INVERTER 7
SUNGROW
INVERTER
SG125CX-P2,
415V, 181.1A
INVERTER 3
SG125CX-P2
INVERTER 8
SG100CX
INVERTER 9
SG100CX
SUNGROW
INVERTER
SG100CX,
415V, 158.8A
2R x 1C x 4/6 SQ.MM
CU SOLAR DC
CABLE
Isc = 14.07A/
STRING
JINKO 590 Wp PV
MODULE Vmp-44.17V,
Imp-13.36A TYPICAL OF
ALL MODULES
1 STRINGS OF 17 MODULES IN MPPT-1 to 7
2 STRINGS OF 17 MODULES IN MPPT-8 to 12
2 STRINGS OF 17 MODULES IN MPPT-1 to 4
1 STRINGS OF 17 MODULES IN MPPT-5 to 9
2 STRINGS OF 16 MODULES IN MPPT-1 to 3
1 STRINGS OF 16 MODULES IN MPPT-4 to 5
1 STRINGS OF 17 MODULES IN MPPT-6 to 9

Version 7.4.8

PVsyst - Simulation report

Grid-Connected System

Project: ATLI - Sohna

Variant: 21-02-2025 35% overload

Unlimited sheds

System power: 2761 kWp

ATLI - India

Author

Solo Power (India)

Project summary

Geographical Site		Situation		Project settings	
ATLI		Latitude	28.83 °N	Albedo	0.20
India		Longitude	76.92 °E		
		Altitude	218 m		
		Time zone	UTC+5.5		

Weather data
ATLI
SolarGIS Monthly aver. , period not spec. - Synthetic

System summary

Grid-Connected System — **Unlimited sheds**

PV Field Orientation		Near Shadings	User's needs
Sheds		Mutual shadings of sheds	Unlimited load (grid)
Tilt	10 °	Electrical effect	
Azimuth	0 °		

System information

PV Array		Inverters	
Nb. of modules	4680 units	Nb. of units	17 units
Pnom total	2761 kWp	Pnom total	2050 kWac
		Pnom ratio	1.347

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General parameters

Grid-Connected System

Unlimited sheds

PV Field Orientation

Orientation

Sheds	
Tilt	10 °
Azimuth	0 °

Sheds configuration

Nb. of sheds	2 units
Unlimited sheds	

Sizes

Sheds spacing	3.02 m
Collector width	2.28 m
Ground Cov. Ratio (GCR)	75.4 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Shading limit angle

Limit profile angle	27.8 °

Shadings electrical effect

Cell size	15.6 cm
Strings in width	1 unit

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon

Free Horizon

Near Shadings

Mutual shadings of sheds
Electrical effect

User's needs

Unlimited load (grid)

Bifacial system

Model	2D Calculation unlimited sheds

Bifacial model geometry

Sheds spacing	3.02 m
Sheds width	2.32 m
Limit profile angle	28.6 °
GCR	76.8 %
Height above ground	0.60 m

Bifacial model definitions

Ground albedo	0.30
Bifaciality factor	80 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

PV Array Characteristics

Array #1 - F4

PV module

Manufacturer	Jinkosolar
Model	JKM-590N-72HL4-BDV
(Original PVsyst database)	
Unit Nom. Power	590 Wp
Number of PV modules	2023 units
Nominal (STC)	1194 kWp
Modules	119 string x 17 In series

At operating cond. (50°C)

Pmpp	1107 kWp
U mpp	674 V
I mpp	1643 A

Inverter

Manufacturer	Sungrow
Model	SG125CX-P2
(Original PVsyst database)	
Unit Nom. Power	125 kWac
Number of inverters	7 units
Total power	875 kWac
Operating voltage	180-1000 V
Pnom ratio (DC:AC)	1.36
Power sharing within this inverter	

PV module

Manufacturer	Jinkosolar
Model	JKM-590N-72HL4-BDV
(Original PVsyst database)	
Unit Nom. Power	590 Wp
Number of PV modules	634 units
Nominal (STC)	374 kWp

Inverter

Manufacturer	Sungrow
Model	SG110CX
(Custom parameters definition)	
Unit Nom. Power	100 kWac
Number of inverters	3 units
Total power	300 kWac

PV Array Characteristics

Array #2 - F4

Number of PV modules	153 units	Number of inverters	6 * MPPT 12% 0.7 unit
Nominal (STC)	90.3 kWp	Total power	70.5 kWac
Modules	9 string x 17 In series		
At operating cond. (50°C)		Operating voltage	200-1000 V
Pmpp	83.7 kWp	Max. power (=>45°C)	110 kWac
U mpp	674 V	Pnom ratio (DC:AC)	1.28
I mpp	124 A		

Array #3 - F4

Number of PV modules	64 units	Number of inverters	3 * MPPT 10% 0.3 unit
Nominal (STC)	37.8 kWp	Total power	29.5 kWac
Modules	4 string x 16 In series		
At operating cond. (50°C)		Operating voltage	200-1000 V
Pmpp	35.0 kWp	Max. power (=>45°C)	110 kWac
U mpp	634 V	Pnom ratio (DC:AC)	1.28
I mpp	55 A		

Array #5 - F1A

Number of PV modules	221 units	Number of inverters	1 unit
Nominal (STC)	130 kWp	Total power	100 kWac
Modules	13 string x 17 In series		
At operating cond. (50°C)		Operating voltage	200-1000 V
Pmpp	121 kWp	Max. power (=>45°C)	110 kWac
U mpp	674 V	Pnom ratio (DC:AC)	1.30
I mpp	179 A	Power sharing within this inverter	

Array #6 - F1A

Number of PV modules	68 units	Number of inverters	3 * MPPT 12% 0.3 unit
Nominal (STC)	40.1 kWp	Total power	34.7 kWac
Modules	4 string x 17 In series		
At operating cond. (50°C)		Operating voltage	200-1000 V
Pmpp	37.2 kWp	Max. power (=>45°C)	110 kWac
U mpp	674 V	Pnom ratio (DC:AC)	1.16
I mpp	55 A		

Array #7 - F1A

Number of PV modules	128 units	Number of inverters	6 * MPPT 11% 0.7 unit
Nominal (STC)	75.5 kWp	Total power	65.3 kWac
Modules	8 string x 16 In series		
At operating cond. (50°C)		Operating voltage	200-1000 V
Pmpp	70.0 kWp	Max. power (=>45°C)	110 kWac
U mpp	634 V	Pnom ratio (DC:AC)	1.16
I mpp	110 A		

PV Array Characteristics

Array #4 - F1A

PV module		Inverter	
Manufacturer	Jinkosolar	Manufacturer	Sungrow
Model	JKM-590N-72HL4-BDV	Model	SG125CX-P2
(Original PVsyst database)		(Custom parameters definition)	
Unit Nom. Power	590 Wp	Unit Nom. Power	125 kWac
Number of PV modules	2023 units	Number of inverters	7 units
Nominal (STC)	1194 kWp	Total power	875 kWac
Modules	119 string x 17 In series	Operating voltage	180-1000 V
At operating cond. (50°C)		Pnom ratio (DC:AC)	1.36
Pmpp	1107 kWp	Power sharing within this inverter	
U mpp	674 V		
I mpp	1643 A		

Total PV power		Total inverter power	
Nominal (STC)	2761 kWp	Total power	2050 kWac
Total	4680 modules	Number of inverters	17 units
Module area	12090 m²	Pnom ratio	1.35
		Power sharing defined	

Array losses

Array Soiling Losses
Loss Fraction 3.0 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation
Loss Fraction 1.0 %

Module Quality Loss
Loss Fraction 0.0 %

Module mismatch losses
Loss Fraction 2.0 % at MPP

IAM loss factor
Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

DC wiring losses

Global wiring resistance 3.2 mΩ
Loss Fraction 1.7 % at STC

Array #1 - F4		**Array #2 - F4**	
Global array res.	8.9 mΩ	Global array res.	88 mΩ
Loss Fraction	2.0 % at STC	Loss Fraction	1.5 % at STC
Array #3 - F4		**Array #4 - F1A**	
Global array res.	187 mΩ	Global array res.	6.7 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC
Array #5 - F1A		**Array #6 - F1A**	
Global array res.	61 mΩ	Global array res.	199 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC
Array #7 - F1A			
Global array res.	94 mΩ		
Loss Fraction	1.5 % at STC		

System losses

Unavailability of the system

Time fraction	0.8 %
	3.0 days,
	3 periods

AC wiring losses

Inv. output line up to injection point

Inverter voltage	400 Vac tri
Loss Fraction	0.86 % at STC

Inverter: SG125CX-P2

Wire section (14 Inv.)	Copper 14 x 3 x 120 mm²
Average wires length	61 m

Inverter: SG110CX

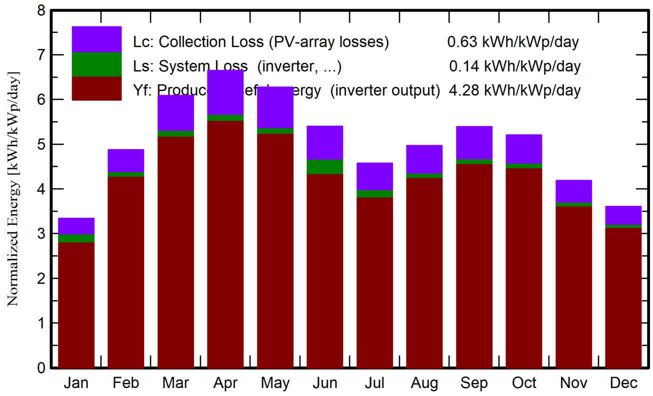
Wire section (3 Inv.)	Copper 3 x 3 x 70 mm²
Average wires length	0 m

Main results

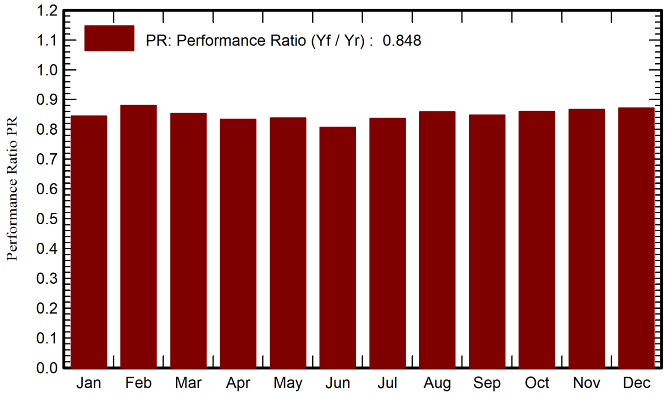
System Production

Produced Energy (P50)	4313344 kWh/year	Specific production (P50)	1562 kWh/kWp/year	Perf. Ratio PR	84.83 %
Produced Energy (P75)	4142271 kWh/year	Specific production (P75)	1500 kWh/kWp/year		
Produced Energy (P90)	3987957 kWh/year	Specific production (P90)	1444 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



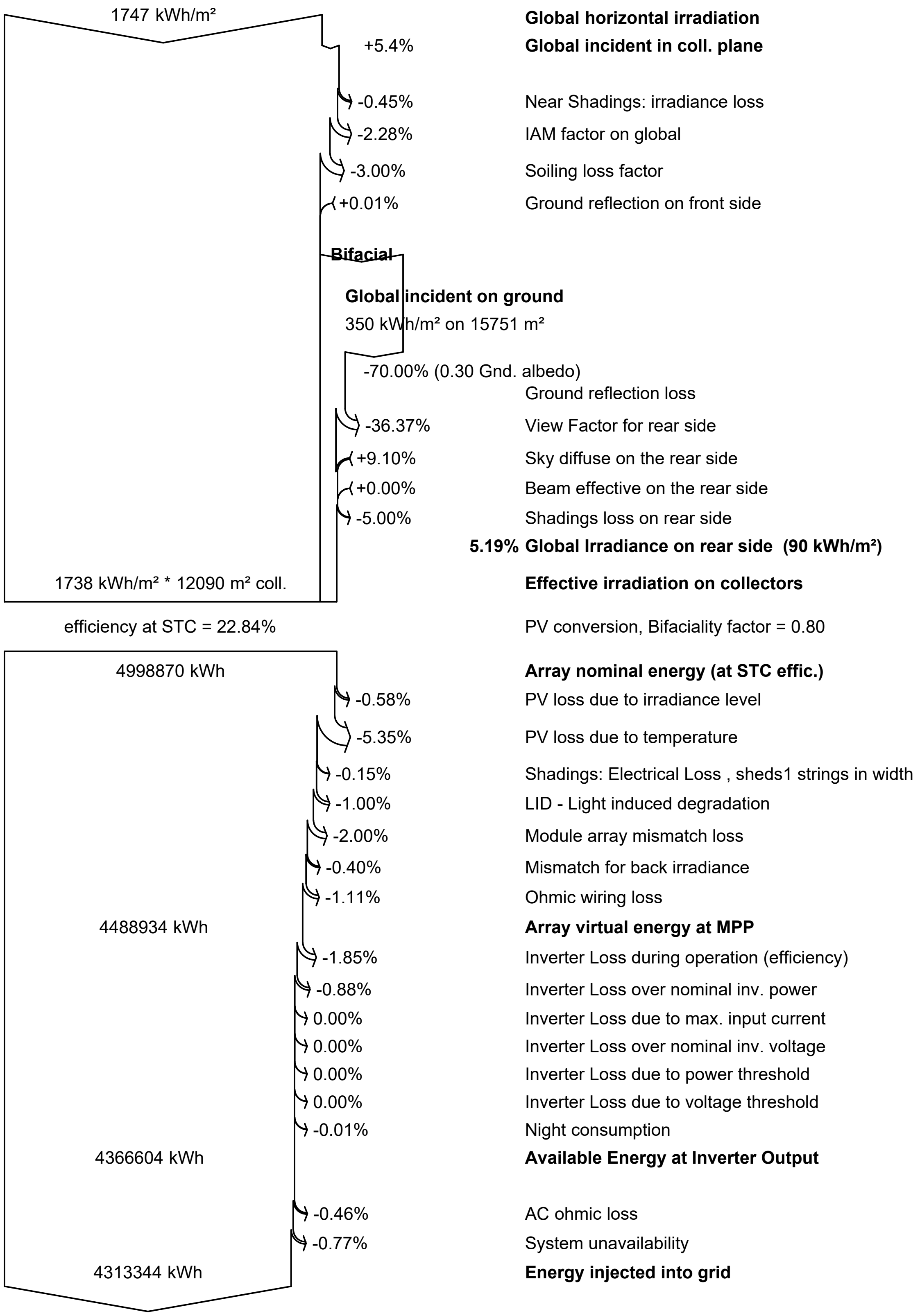
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	92.0	52.8	13.10	103.6	97.0	257275	241685	0.845
February	122.4	56.9	16.50	136.5	128.9	339904	331832	0.880
March	175.8	75.4	22.20	188.7	178.7	455405	444488	0.853
April	193.3	88.6	28.70	199.6	189.3	470586	459268	0.833
May	194.5	105.3	32.50	194.5	184.0	460622	450062	0.838
June	163.6	100.3	33.00	162.0	152.9	387192	360816	0.807
July	142.9	96.5	30.10	141.8	133.4	341584	327864	0.837
August	152.3	92.8	28.90	154.1	145.4	373709	365110	0.858
September	154.6	77.9	28.10	161.8	152.9	387939	378871	0.848
October	147.9	73.9	25.30	161.5	152.8	392641	383498	0.860
November	111.1	59.6	20.20	125.6	118.0	307689	300693	0.867
December	97.0	52.4	15.09	111.9	104.8	275484	269156	0.871
Year	1747.4	932.4	24.51	1841.6	1738.0	4450030	4313344	0.848

Legends

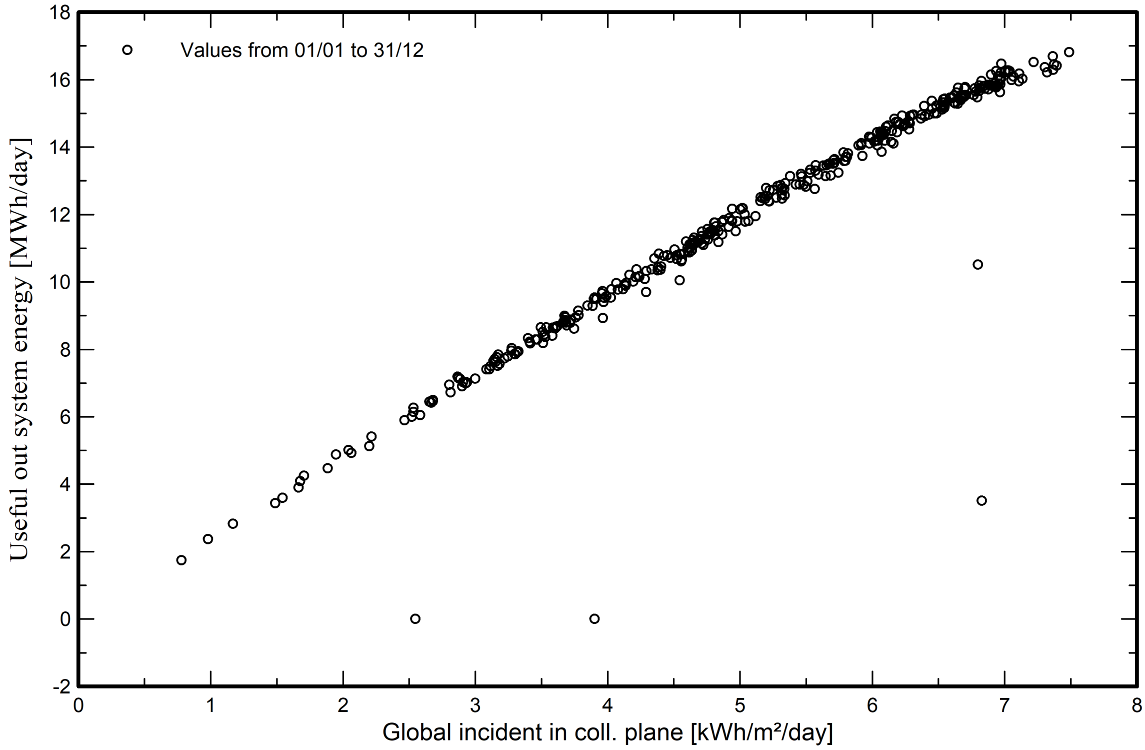
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

Loss diagram

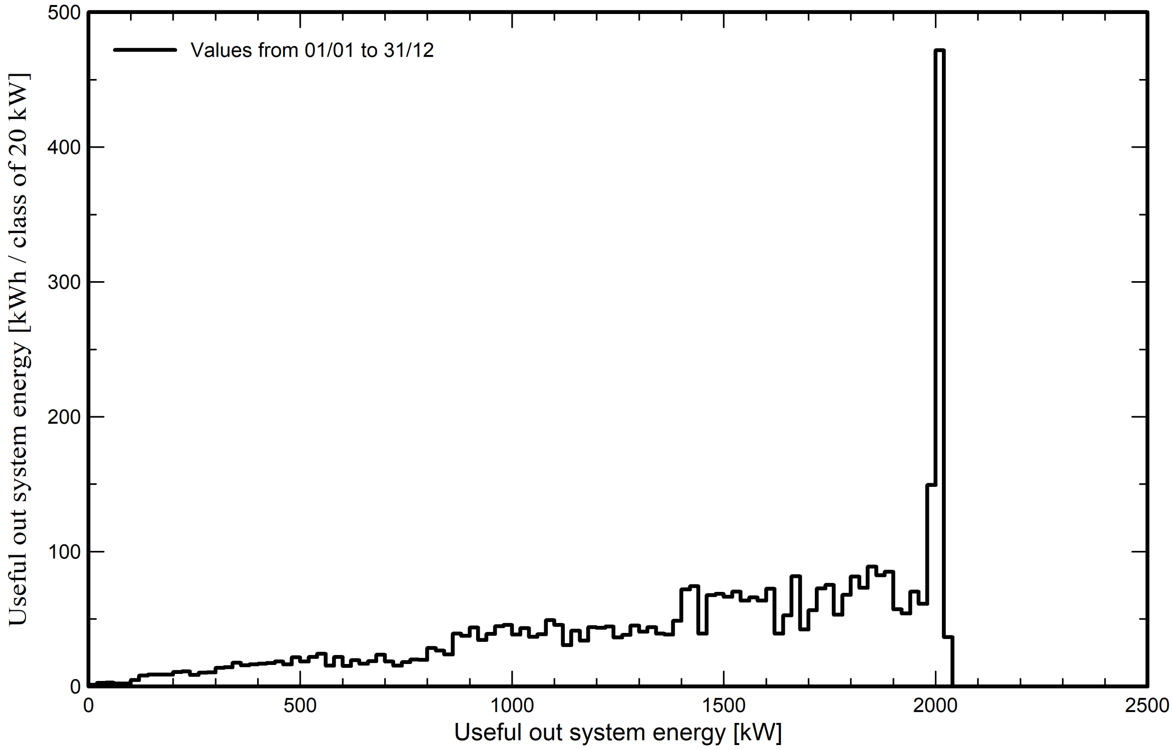


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



P50 - P90 evaluation

Weather data

Source	SolarGIS Monthly aver. , period not spec.
Kind	Monthly averages
Synthetic - Multi-year average	
Year-to-year variability(Variance)	5.6 %

Specified Deviation

Climate change	0.0 %

Global variability (weather data + system)

Variability (Quadratic sum)	5.9 %

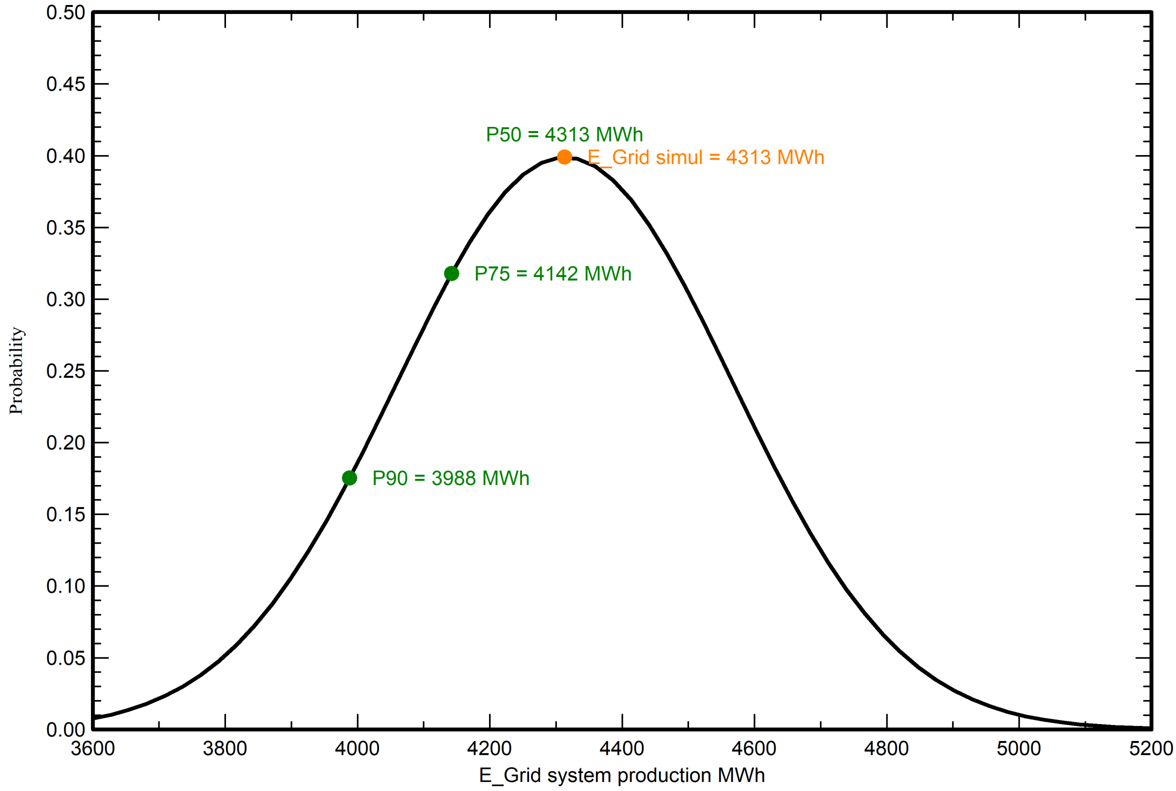
Simulation and parameters uncertainties

PV module modelling/parameters	1.0 %
Inverter efficiency uncertainty	0.5 %
Soiling and mismatch uncertainties	1.0 %
Degradation uncertainty	1.0 %

Annual production probability

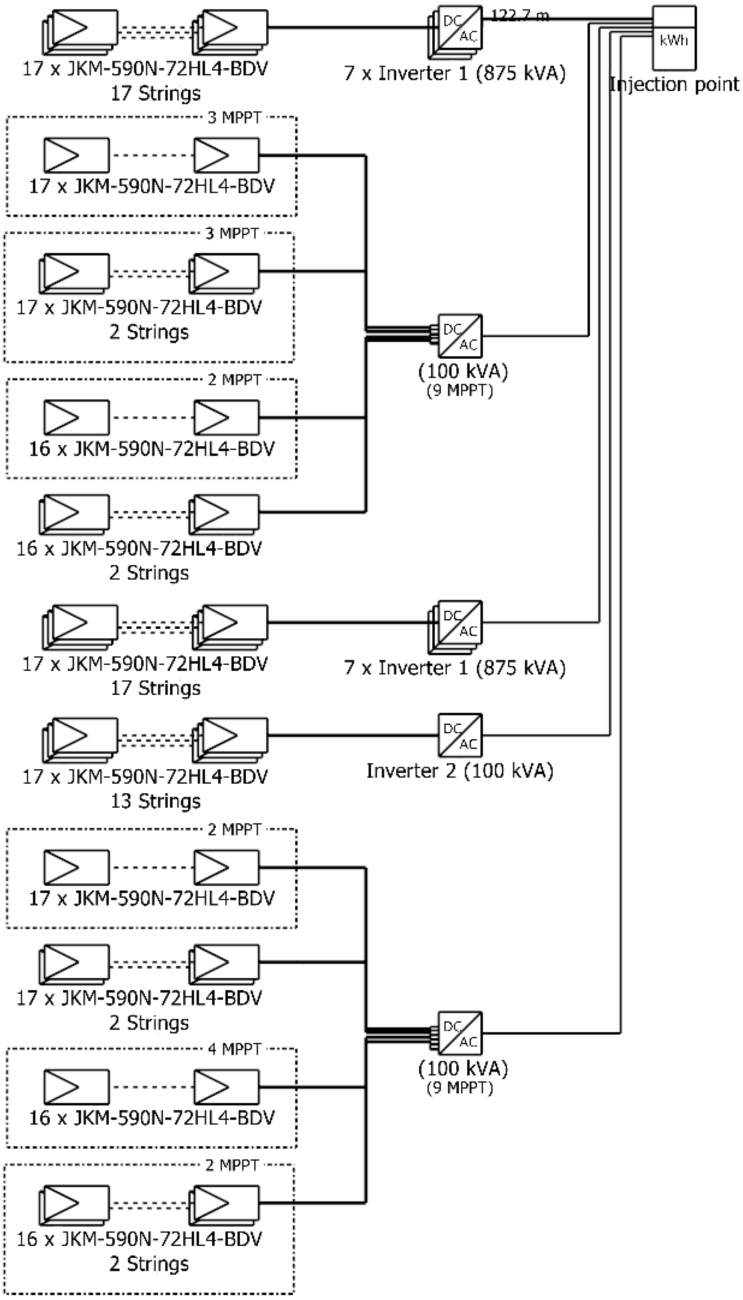
Variability	254 MWh
P50	4313 MWh
P75	4142 MWh
P90	3988 MWh

Probability distribution



Single-line diagram

PVsyst V7.4.8
VE3, Simulation date:
12/03/25 15:56
with V7.4.8



PV module	JKM-590N-72HL4-BDV
Inverter 1	SG125CX-P2
Inverter 2	SG110CX
String 1	17 x JKM-590N-72HL4-BDV
String 2	16 x JKM-590N-72HL4-BDV

	ATLI - Sohna	Solo Power (India)
	VE3 : ATLI_Final PVsyst report_SolarGIS	12/03/25

BILL OF MATERIAL

Site Name : ATLI, Sohna

2761.2 kWp Solar Photovoltaic Power Plant

Developer: - Sunbeam Real Venture Pvt. Ltd	25-04-2025
	Prepared By : Asif Khan
Power Purchaser : ATLI, Sohna	Checked By : S. Shahnaz

Sr. No.	Components on Supply	Technical Specification	MAKE	UOM	Quantity
1	Solar PV Module	590 Wp Monocrystalline with 1400 mm module cable	Jinko	NOS.	4680
2	Solar Inverter with canopy	125 kW CX-P2	Sungrow	NOS.	16
		50 kW CX-P2	Sungrow	NOS.	1
3	ACDB-1 with stand & canopy	8-in(1R-3.5C-240 Sq.mm AL with 4P,250A MCCB) , 1-out (7R-3.5C-240 Sq.mm AL)) with 2000A 4P MCCB with EFR , 4P AL BUSBAR, IP6X at 415V	Standard	NOS.	1
	ACDB-2 with stand & canopy	9-in(8-in(1R-3.5C-240 Sq.mm AL with 4P,250A MCCB)& 1-in(1R-3.5C-50 Sq.mm AL with 4P,125A MCCB)), 1-out (7R-3.5C-240 Sq.mm AL)) with 2000A 4P MCCB with EFR , 4P AL BUSBAR, IP6X at 415V	Standard	NOS.	1
4	Copper Junction Box with copper bus bar	7R-in(3.5C-240 Sq.mm AL) , 5R-out (3.5C-240 Sq.mm Cu)	Standard	NOS.	2
5	MFM	CT Ratio 2000/5A, 0.5 Class	Secure	Set	2
6	AC Cable	Al-3.5C-XLPE(1.1 kV), 50 Sq.mm. , Multistrand, Armoured	Seichem/Polycab	Meter	7
		Al-3.5C-XLPE(1.1 kV), 240 Sq.mm. , Multistrand, Armoured	Seichem/Polycab	Meter	1500
		Cu-3.5C-XLPE(1.1 kV), 240 Sq.mm. , Multistrand, Armoured	Seichem/Polycab	Meter	80
7	DC Cable	DC Solar cable 6 Sq.mm (Single core,XLPO-UV stabilized) as per TUV 2Pfg 1169/08 2007, CE	Seichem/Polycab	Meter	103250
8	Earthing Cable	4 Sq. mm 1C Cu	Seichem/Polycab	Meter	1720
		10 Sq. mm 1C Cu	Seichem/Polycab	Meter	5
		50 Sq. mm 1C Cu	Seichem/Polycab	Meter	80
		1C 50 Sq.mm Cu Down Conductor	Seichem/Polycab	Meter	500
9	Earthing Strip	25 x 3 mm GI FLAT	Standard	Meter	2300
		50 x 6 mm GI FLAT	Standard	Meter	660
10	Earthing Electrode	17.2 mm dia and 3 meter long CU Coated(250 Microns) Steel Rod Earthing Electrode with 22.5 kg Earthing Backfill Compound Chemical, with Pre Cast Chamber pit cover	JMV/VNT/Standard	Set	10
11	Lightning Arresters	Level III with 107 m radius With 5m Mast Height with 17.2 mm dia and 3 meter long CU Bonded Earthing Electrode, 1 set with 2 Electrode	Onay Plus	Set	2
12	Module mounting Structure	FIX TILT 10 DEG STRUCTURE BALLAST TYPE	Standard	kWp	2737.8
13	AC Cable Tray Ladder Type	80x60 mm Cable Tray	Standard	Meter	25
		320x60 mm Cable Tray	Standard	Meter	45
		520x60 mm Cable Tray	Standard	Meter	200
14	DC Cable Conduit	HDPE Conduit 1" Dia.	Standard	Meter	2830
15	DC Cable Tray (Perforated Type with cover)	40x40 mm Cable Tray	Standard	Meter	360
		100x40 mm Cable Tray	Standard	Meter	145
		200x40 mm Cable Tray	Standard	Meter	240
		250x40 mm Cable Tray	Standard	Meter	235
		400x40 mm Cable Tray	Standard	Meter	330
16	MC4 Connector		Standard	Set	1220
17	Inline Fuse	25A	Standard	Nos.	580
18	Radiation Sensor	Pyranometer, Ambient Temperature & Module	Standard	NOS.	1
19	Monitoring (PVDG not required)	Datalogger	Standard	NOS.	2
		RS 485 cable	Standard	Meter	270
		HDPE Conduit 1" Dia., Schedule 40.	Standard	Meter	270
20	Module Cleaning System	1 " UPVC Pipe	Standard	Meter	610
		0.75 " UPVC Pipe	Standard	Meter	510
		0.75 Tap Valve	Standard	Nos.	35
		1 to 0.75 inch reducer T	Standard	Nos.	35
		Flexible Rubber Pipe	Standard	Meter	60
		2 HP Motor	Standard	Nos.	2
21	Fire Protection	(4) 5kg sand bucket + (2) ABC type fire extinguishers		Set	4
22	Others	In Line Connectors (Pin & Ring type lugs), Insulators, Ferrules & Cable Tags, Silicon Sealant, Safety Tags, Electrical Tapes, PVC Clips, Anticorrosive Paste, Cable ties, Stainless Steel Screws, Nuts, Lugs, Bolts, Flexible Conduit etc.		As Requirement	

This Bill Of Material can be changed as per Site Condition