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FILE NO.: VIS (2022-23) PL283-215-413 **Dated: 05/09/2022**

LENDER'S INDEPENDENT ENGINEER REPORT OF 475 kW GROUND MOUNTED SOLAR POWER PROJECT

PROPOSED TO BE SET UP AT

DEVBHUMI COLD CHAIN PRIVATE LIMITED MATIANA FACILITY AT SHIMLA, HIMACHAL PRADESH

COMPANY/PROMOTER

DEV BHUMI COLD CHAIN PRIVATE LIMITED

REPORT PREPARED FOR

STATE BANK OF INDIA, SME, UDYOG SADAN, DELHI

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PART A	REPORT SUMMARY

1.	**Name of Project:**	Setting up of 475 KW Solar Project
2.	**Project Location:**	Devbhumi Cold Chain Private Limited Matiana Facility at Shimla, Himachal Pradesh
3.	**Name of the Company:**	M/s. Devbhumi Cold Chain Private Limited
4.	**Director's**	i. Sanjay Aggarwal ii. SunilA Aggarwal iii. Shagun Verma
5.	**Prepared for Bank:**	State Bank of India
6.	**LIE Consultant Firm:**	M/s. R.K. Associates Valuers & Techno Engineering Consultants (P) Ltd.
7.	**Date of Survey:**	26th August 2022
8.	**Date of Report:**	5th September 2022
9.	**Purpose of the Report:**	To review Project cost, expenditure and examine the current status of installation and commissioning of the project.
10.	**Scope of the work provided by the Lender:**	To verify the Project cost, expenditures and examine the commissioning, installation status of Solar Power Plant set-up by M/s. IICS Pvt. Ltd. • Industry/ sector research and demand & supply trend is out of scope of the report. • Financial feasibility study of the Project is out of scope of the report.

- Providing any kind of design report or map is out-of-scope of the report.

11.	**Documents perused for Proposal:**	a. Project Report b. Copies of Invoices
12.	**Annexure with the report:**	1. Copies of Invoices

PART B	INTRODUCTION

1. **NAME OF THE PROJECT:** Installation and Commissioning of 475 kW of Ground Mounted Solar Power Project.

2. **PROJECT OVERVIEW:** The company has proposed to set up 475 kWp of Ground Mounted Solar Power plant Project at existing vacant land of Control atmosphere cold storage for apples at DBCC's Matiana facility at Shimla in Himachal Pradesh with the envisaged cost of approx. Rs.2.30 Crore. The project is proposed to be executed by Delhi based Sugs Loyd Pvt. Ltd. who is being quoted as proposed EPC contractor of this project. This project is a captive solar power plant project.

Proposed Capacity of Plant	475 kWp
Site Address	Devbhumi Cold Chain Private Limited Matiana Facility at Shimla, Himachal Pradesh
Latitude and Longitude	31°12'37.1"N 77°24'21.1"E

We have conducted the visit of the project site on 26th august 2022. During site visit it was informed by the company's representative that works related to this project have not commenced yet and will commence post receipt of sanction of term loan from the concerned Bank.

However, during visit it was observed that there were already some pre-existing solar panels with capacity of approx. 125 kWp at the proposed project site which were found to be functional. The company has informed that these Solar panels are totally out of scope of this project and they are planning to install new solar panels under this project with a total power generation capacity of 475 kW. Bank to take note of it.

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3. SCOPE OF THE REPORT:

To verify the Project cost, expenditures and examine the commissioning, installation status of Solar Power Plant set-up by M/s. DBCC Pvt. Ltd.

- *Industry/ sector research and demand & supply trend is out of scope of the report.*
- *Financial feasibility study of the Project is out of scope of the report.*
- *Providing any kind of design report or map is out-of-scope of the report.*

4. PURPOSE OF THE REPORT: To Provide Project Progress Monitoring Report to SBI.

5. METHADOLOGY ADOPTED:

a. Study of Project Planning documents/ reports to know about the Project.
b. Additional information, data, documents collection the company.
c. Study and analysis of the documents and information obtained from the company.
d. Research about the Project/ sector from the sources in the public domain.
e. Correlation of the provided information against Industry/ sector benchmarks/ trend.
f. Information compilation, analysis and reporting.

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PART C	PROJECT LOCATION & SITE APPROPRIATENESS

1. LOCATION:

The project is located at Devbhumi Cold Chain Private Limited Matiana Facility at Shimla, Himachal Pradesh.

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2. SITE APPROPRIATENESS:

3.1 SITE APPROPRIATENESS FOR THIS LOCATION:

The site appropriateness for a ground mounted solar power unit is basically based on the weather and solar radiation parameters since annual energy yield of a PV plant is solely dependent on the solar resource of the site.

Basically, there are three standard test conditions which are the industry standard for the conditions under which a solar panel are tested and give its efficiency rating.

i. Temperature of the cell: 25°C. The temperature of the solar cell itself, not the temperature of the surrounding.

ii. Solar Irradiance: 1000 Watts per square meter. This number refers to the amount of light energy falling on a given area at a given time.

iii. Mass of the air: 1.5
This number is somewhat misleading as it refers to the amount of light that has to pass through Earth's atmosphere before it can hit Earth's surface, and has to do mostly with the angle of the sun relative to a reference point on the earth. This number is minimized when the sun is directly above as the light has to travel a minimum distance straight down, and increases as the sun goes farther from the reference point and has to go at an angle to hit the same spot.

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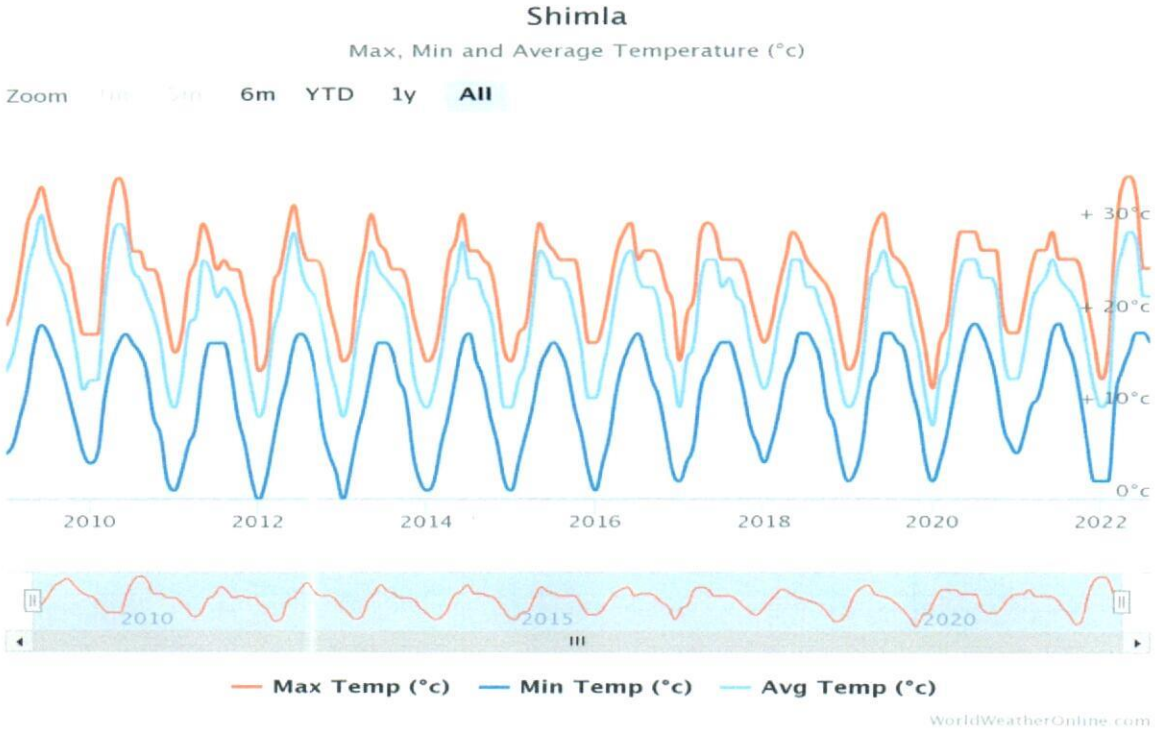
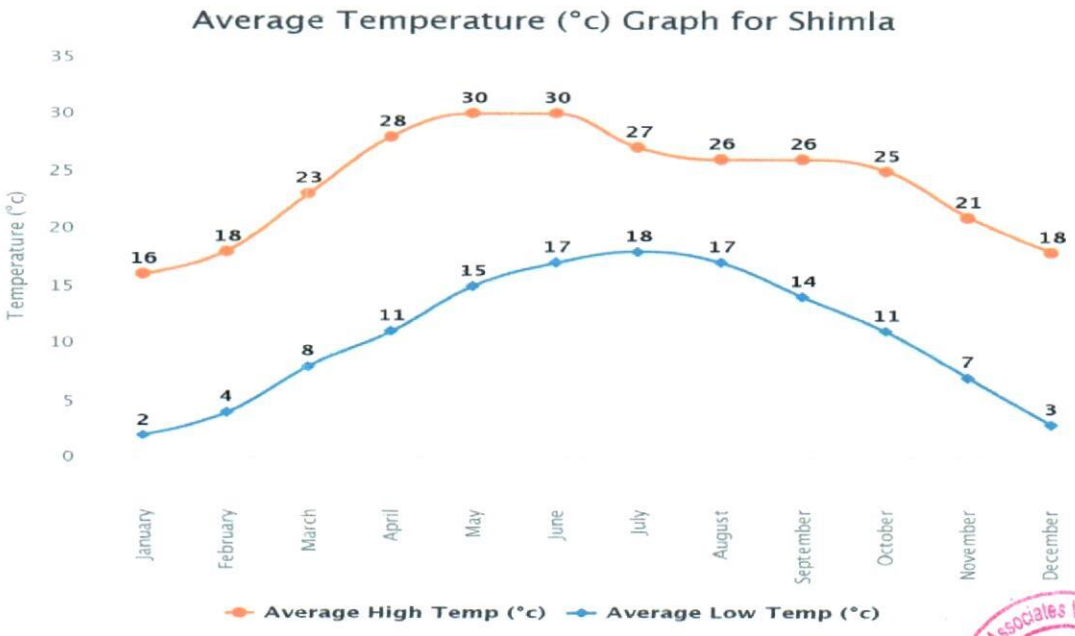
In this regard for doing the site appropriateness following site parameters are being evaluated:

a. Temperature: The average temperature is measured as per the Metrological Station statistic available at shimla. At an average temperature of 30^0 C, May-June is the hottest month of the year and at an average temperature of 2^0 C January is the coldest month.





Source: https://www.worldweatheronline.com/shimla-weather-averages/himachal-pradesh/in.aspx

Temperature tolerance of solar panels is denoted by temperature coefficient, which denotes the decrease in efficiency of the solar panel with increase in temperature. Typically, temperature coefficient of solar panels is about -0.4% to -0.6% / degree C.

All solar cells have a temperature coefficient. As a solar panel increases in temperature, the power output of the solar panel decreases. Generally, monocrystalline solar cells have a temperature coefficient of -0.5%/degC. This means a mono solar panel will lose half of one percent of its power for every degree the temperature rises. Solar panels are all rated at 25degC, however, when solar panels are installed on a roof or ground, they generally reach much higher temperatures.

EXAMPLE:

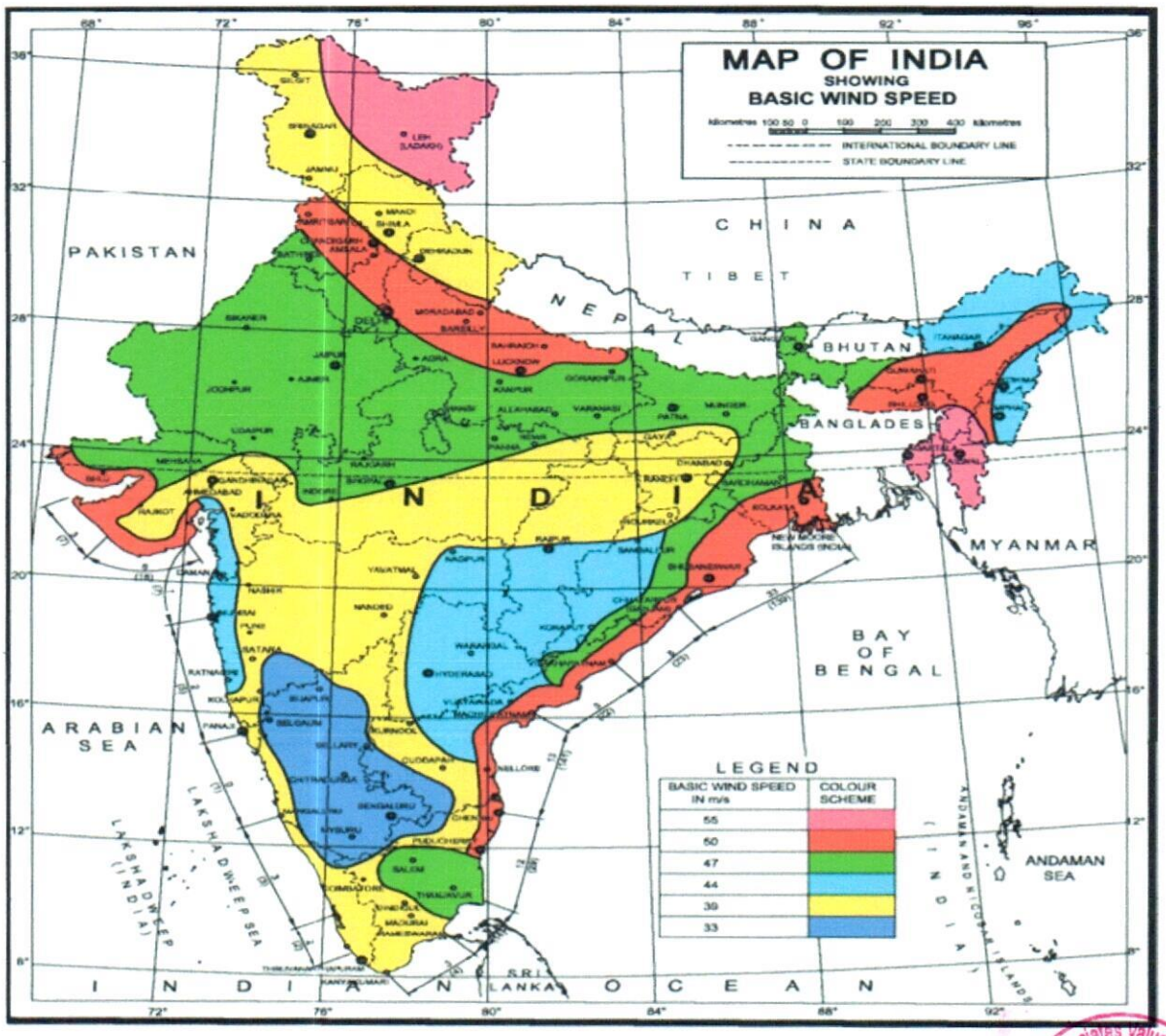
All solar cells have a temperature coefficient. As a solar panel increases in temperature, the power output of the solar panel decreases. Generally, monocrystalline solar cells have a temperature coefficient of -0.5%/degC. This means a mono solar panel will lose half of one percent of its power for every degree the temperature rises. Solar panels are all rated at 25degC, however, when solar panels are installed on a roof or ground, they generally reach much higher temperatures.

Let's say a 250W monocrystalline solar panel installed on a roof is at 65degC. The solar panel's power loss can be calculated as follows:
65degC – 25degC = 40degC
40degC x -0.5% = 20%
Therefore, panel power loss = 20% x 250W = 50W
Therefore, Panel Power = 200W+

At an average temperature of 30^0 C, May-June is the hottest month of the year and at an average temperature of 2^0 C January is the coldest month. There will surely be a reduction in power generated in summer months which can also be seen in the performance ratio infographics given in the PVsyst report and is also covered in the below sections of our report. **However, temperature coefficient is the inherent property of the solar modules and since the reduction of power generation in summer months will be covered with satisfactory power generation in winter months therefore the temperature in Shimla seems to be favorable for this project.**

b. Wind Speed: The macro-level wind speed zones of India have been formulated and published in IS: 875 (Part 3) - 1987 titled "Indian Standard Code of Practice for Design Loads (other than earthquakes) for Buildings and Structures, Part 3, Wind Loads". There are six basic wind speeds `V_b' considered for zoning, namely 55, 50, 47, 44, 39 and 33 m/s. From wind damage view point, these could be described as follows:

- 55 m/s (198 km/h) - Very High Damage Risk Zone – A
- 50 m/s (180 km/h) - Very High Damage Risk Zone – B
- 47 m/s (169.2 km/h) - High Damage Risk Zone
- 44 m/s (158.4 km/h) - Moderate Damage Risk Zone – A
- 39 m/s (140.4 km/h) - Moderate Damage Risk Zone – B
- 33 m/s (118.8 km/h) - Low Damage Risk Zone



Design Wind Speed (V_z) - The basic wind speed (V_b) for any site shall be modified to include the following effects to get design wind velocity at any height (V_z) for the chosen structure:

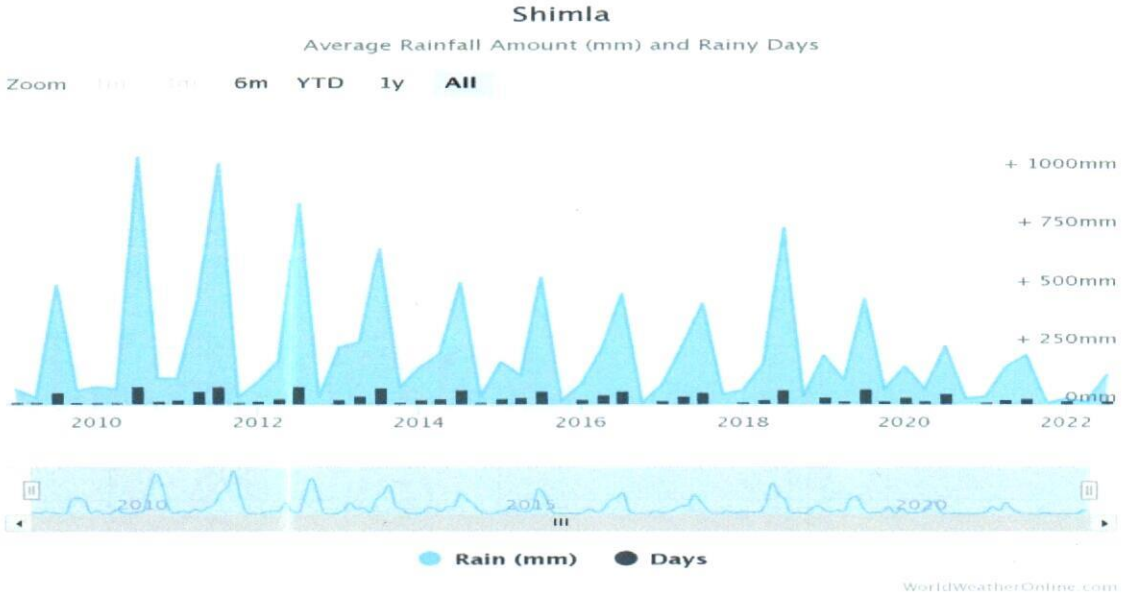
a) Risk level;
b) Terrain roughness, height and size of structure; and
c) Local topography. It can be mathematically expressed as follows:

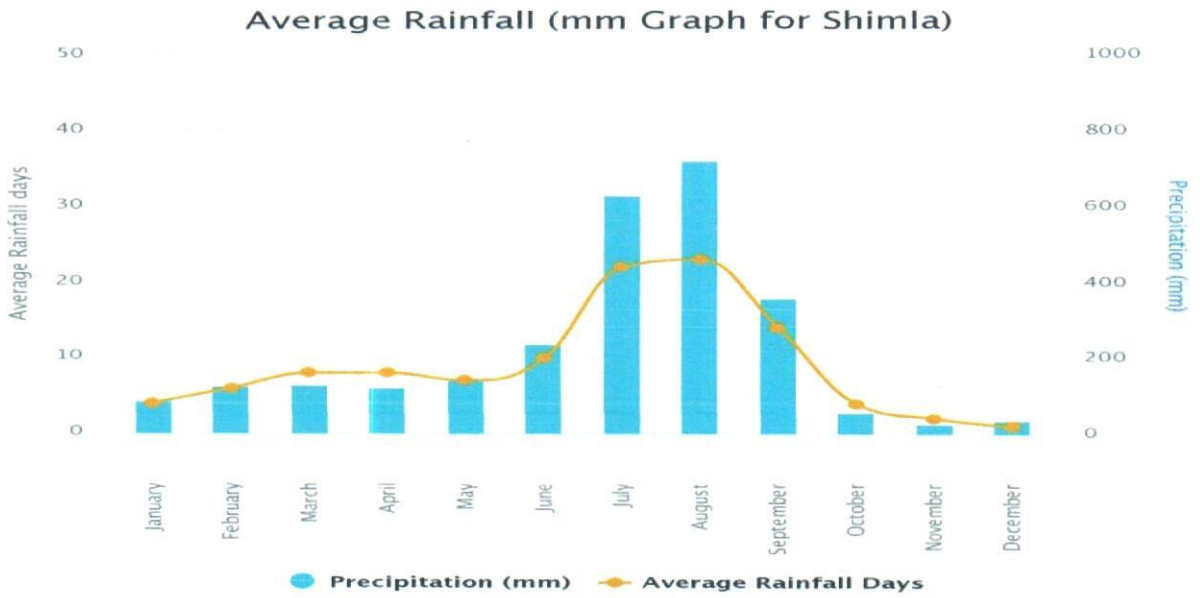
$$V_z = V_b\, k_1 k_2 k_3$$

V_z = Design wind speed at any height z in m/s;
V_b = Basic Wind Speed
k_1 = Probability factor (risk coefficient)
k_2 = Terrain, height and structure size factor
k_3 = Topography factor

The basic wind speeds are applicable to 10 m height above mean ground level in an open terrain with a return period of 50 years. Shimla lies on 39 m/s band of wind speed. **Therefore, Shimla lies in Moderate damage risk zone. However, from production point of view the wind velocity can reduce the thermal losses, moderate basic wind velocity is favorable for the PV solar projects.**

c. **Rainfall:** To show variation within the months and not just the monthly totals, we show the average rainfall for Year 2010 to Year 2022 (as on date)

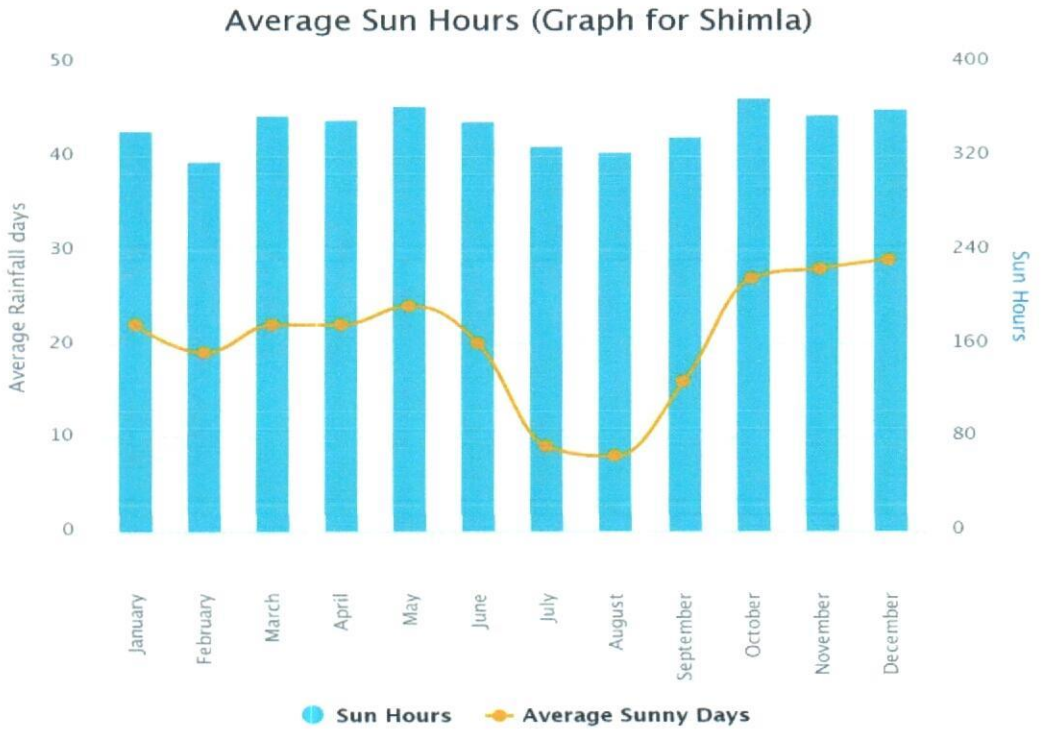




Source: https://www.worldweatheronline.com/shimla-weather-averages/himachal-pradesh/in.aspx

While the rain itself will have no impact on the panels, the rain clouds can lower the electricity production. However, the occasional rainstorm could actually be good for solar system's production, because with no extra effort it can naturally clean the panels. Since Shimla falls under moderate rain zone therefore it is ok for the solar project.

d. Average Sun Hours and Sun Days:



Source: https://www.worldweatheronline.com/shimla-weather-averages/himachal-pradesh/in.aspx

{Table: 2}

SHIMLA						
Year	**2019**		**2020**		**2021**	
Days/Year	**Sun Day**	**Sun Hour**	**Sun Day**	**Sun Hour**	**Sun Day**	**Sun Hour**
January	16	328	5	271	26	335
February	5	302	20	309	25	309
March	21	353	16	293	29	347
April	26	359	26	338	23	311
May	24	369	28	348	23	314
June	25	360	24	315	22	327
July	5	361	19	262	14	244
August	6	362	4	204	21	232
September	12	357	24	336	29	228

October	23	372	31	372	30	359
November	25	348	26	347	30	360
December	27	336	28	350	28	343
Total	**215**	**4207**	**251**	**3745**	**300**	**3709**

AVERAGE SUN DAYS	AVERAGE SUN HOURS
255	**3887**

As per last 3-year data, average sun days are 255 Days and average sun hours in a year is 3887 Hours recorded at Shimla zone.

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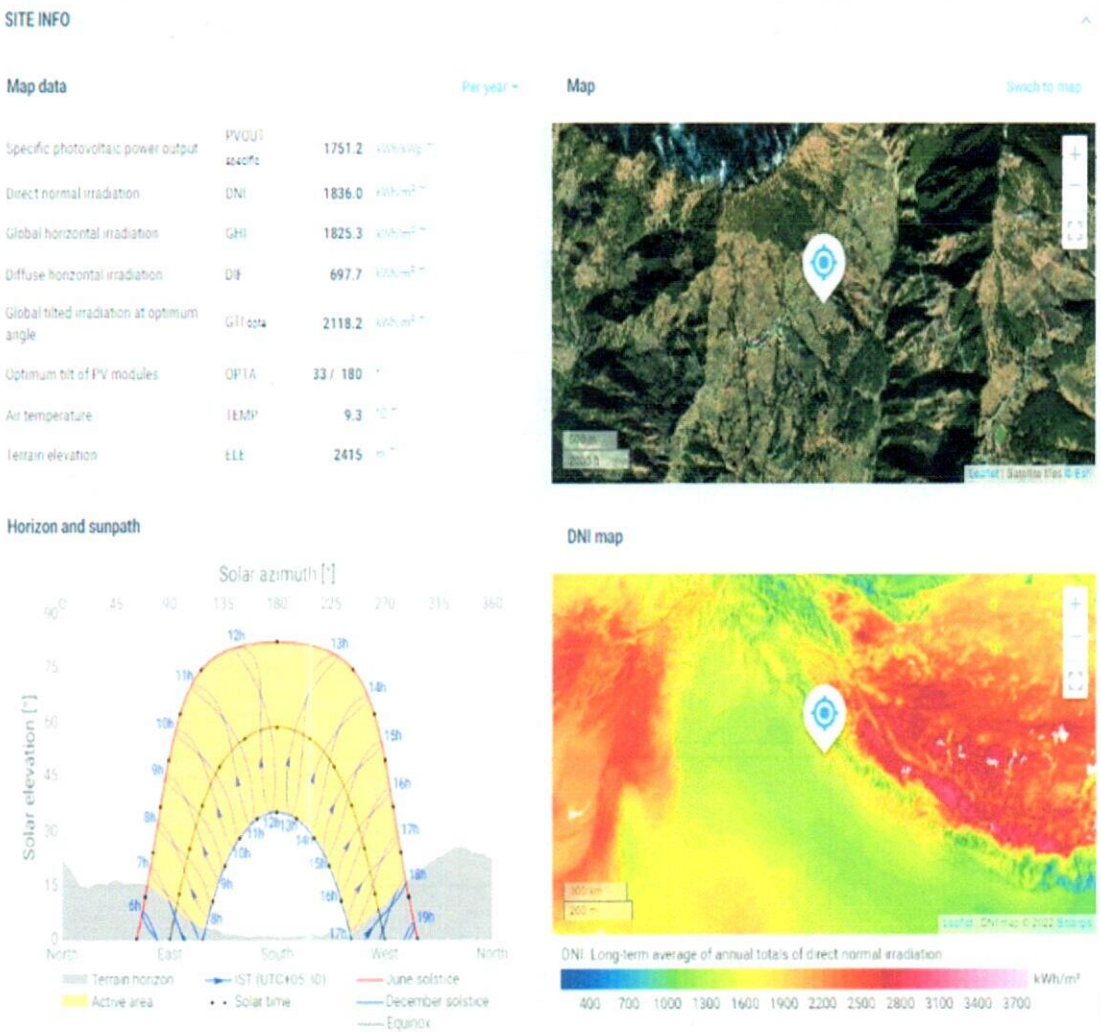
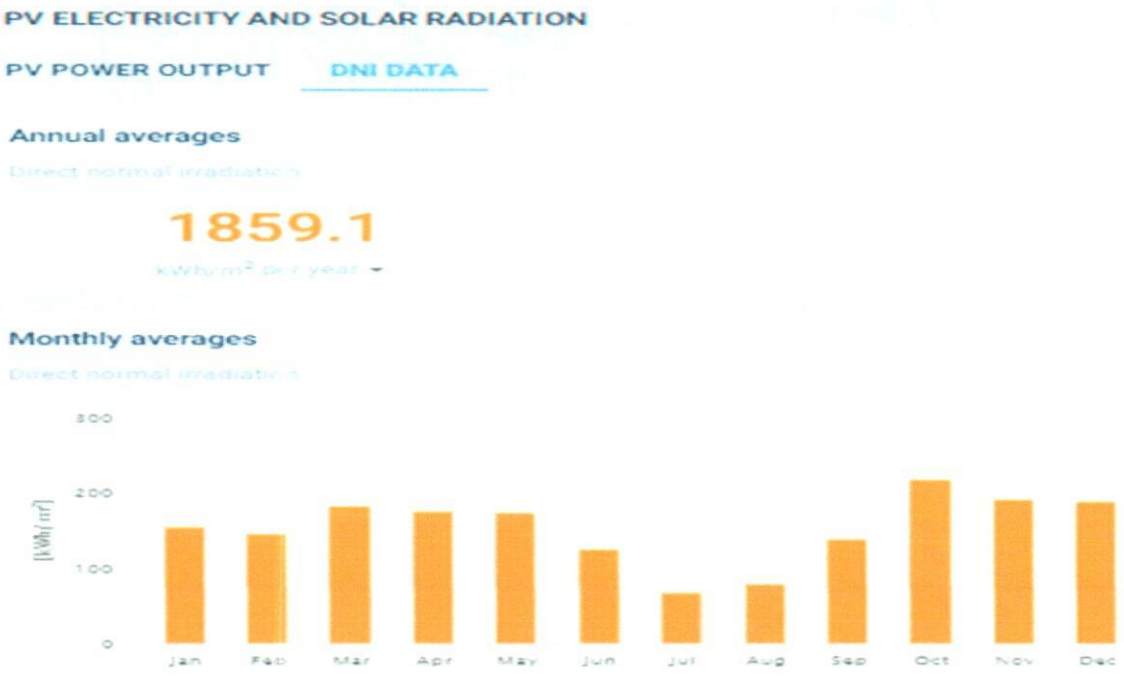
e. Irradiation map of Project Location

Solar irradiance *is the power per unit area (watt per square metre, W/m2), received from the Sun in the form of electromagnetic radiation as reported in the wavelength range of the measuring instrument.*

Global Horizontal Irradiance (GHI) *is the total amount of shortwave radiation received from above by a surface horizontal to the ground. This value is of particular interest to photovoltaic installations and includes both Direct Normal Irradiance (DNI) and Diffuse Horizontal Irradiance (DIF).*

Diffuse Horizontal Irradiance *is the amount of radiation received per unit area by a surface that does not arrive on a direct path from the sun, but has been scattered by molecules and particles in the atmosphere. Basically, it is the illumination that comes from clouds and the blue sky.*





Source:

https://globalsolaratlas.info/detail?c=31.210452,77.405548,11&s=31.210306,77.405861&m=site

f. **Shadow Analysis and Obstruction:** The site of a Ground Mounted location should be free from any nearby building or structure. We have verified through google map location and our site visit conducted on 26th august 2022 that there is no obstruction by shadow on the structure from nearby site.

g. **Water Availability**: Plant will require module cleaning during dry spells. Cleaning may require substantial quantities of water approx. 2.0 liters per module depending upon the manpower available and degree of soiling. The company has proposed to use Borewell for the same. Bank to ensure that Groundwater abstraction clearance is available with the company.

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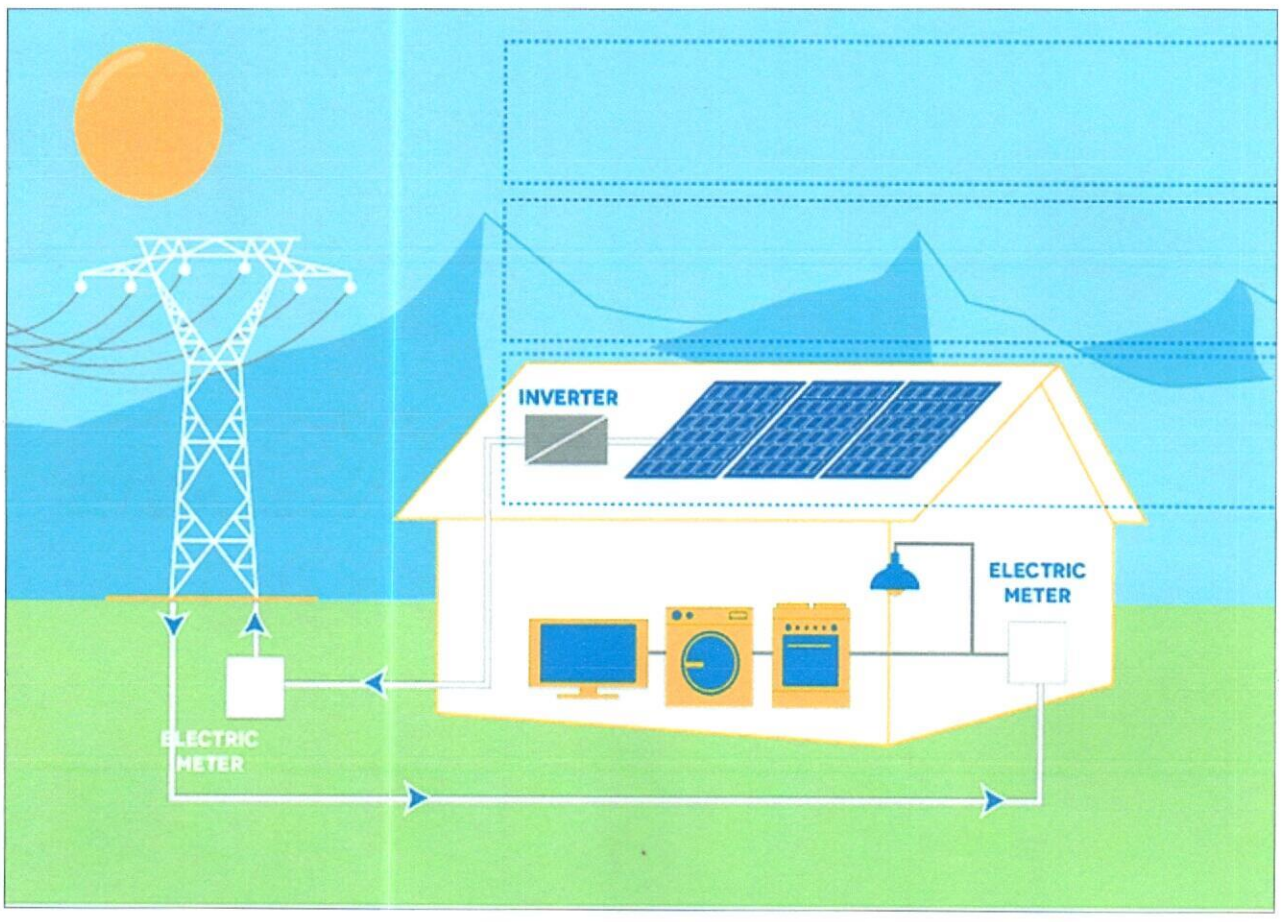
PART D	PROJECT TECHNICAL DETAILS

1. PLANT CONFIGURATION

The solar power harnessing will be done by using the below mentioned components in the project

i. Solar Panels
ii. Solar Inverters
iii. Transformer
iv. Other ancillary machinery components

2. SOLAR PV PRODUCTION PROCESS:



3. COMPONENTS AND ITS TECHNICAL SPECIFICATIONS:

a. **Plant Type:** Basically, there are three types of Solar Power Plants:

- **Off Grid Solar Power Plant:** Off grid is a battery based solar power system. In the first priority this system will run your home appliances or connect load (as per solar inverter capacity) and surplus power feed in to the solar battery bank, provided with the solar power system. This type of solar power is recommended where power cut is the major problem.

- **On Grid Solar Power Plant:** On grid solar system is grid (Government electricity supply) connected system. In the first priority this system will run your home appliances or connect load (without any limit). If the connected load will exceed the capacity of installed solar power plant it will automatically use the power from main grid and if the connected load is less, it will supply surplus power to the grid. This type of system is recommended to reduce electricity bills only.

- **Hybrid Solar Power Plant:** Hybrid is a combination of on grid solar system as well as off grid solar system. One side hybrid solar system connects with the main electricity grid and simultaneously it will also provide battery backup to you.

Devbhoomi Cold chain private limited will set-up an On-Grid PV Module Solar Power Plant. The Incoming and outgoing electricity is proposed to be monitored by net metering systems.

b. **PV Module Type and Configuration:** Solar panels can be categorized on the basis of various parameters like the number of junctions they have or the generation they belong to. On the basis of the number of junctions, there are single-junction and multi-junction solar panels that differ in terms of the number of layers in the solar panel. Then there is another way of classifying solar panels i.e., with regards to the generation they belong to, which focuses on the material and efficiency of different types of solar panels.

1ST GENERATION SOLAR PANELS

These are basic solar panels that are made up of Mono-crystalline silicon or polycrystalline silicon and are used in conventional surroundings.

- **Mono-Crystalline solar panels (Mono-SI):** These are made up of mono-crystalline silicon. They have a dark look throughout the panel and rounded edges. These panels have the highest efficiency rate due to the high purity of the silicon used. They are most expensive because of their quality of occupying less space, high power output and long durability.

  In India, Mono-Crystalline solar panels are available in a panel efficiency range of 17%, 18% and 19%.

- **Polycrystalline solar panels (Poly-SI):** Their production technology is based on melting raw silicon. Their outer structure has square cells, angles that are uncut and they are blue in colour. They are cheaper than Mono-SI because they occupy more space to generate the same amount of energy as compared to Mono-SI. Polycrystalline solar panel technology is the more prevalent technology in the world. These solar panels are made out of polycrystalline silicon which can be as much as 99.99% pure. These panels have an efficiency of between 13%-17%. Polycrystalline solar cells have lower efficiency and costs than Mono Crystalline solar cells. But that is changing over time and today few brands of polycrystalline solar panels are offering efficiency levels of 20%+. These are blue in Color

2ND GENERATION SOLAR PANELS

These panels comprise different types of thin film solar cells that are primarily used to build solar power systems with low power output.

- **Thin film solar panels (TFSC):** These are a less expensive option. They are made by placing one or more films of photovoltaic material onto a substrate. These are cheaper as less material is used in its manufacturing. They are not suitable for residential purpose because they require large spaces to generate sufficient energy. They have shorter warranties in comparison to their 1st generation counterparts. They are best suited for the areas that have ample open space for installation.

- **Amorphous silicon solar panels (A-Si):** These types of solar panels use a triple layer technology which is considered to be the best in the thin film variety. They are available at very low costs but provide efficiency of only 7%.

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3RD GENERATION SOLAR PANELS

Solar panels belonging to this generation use organic as well as inorganic materials. These include a variety of thin film panels and some of them, such as 'bio hybrid solar cells', are still in the development phase.

- **Cadmium Telluride solar panels (CdTe):** These solar panels are manufactured using Cadmium Telluride. They are efficient as their manufacturing cost is very low and require very less amount of water to be produced. The primary advantage of these panels is that they can reduce carbon footprints significantly while their only disadvantage is that they can lead to fatalities if ingested or inhaled.

- **Concentrated PV panels (CVP or HCVP):** These panels are the most efficient type of solar panels with an efficiency of 41%. They use curved mirror surfaces and lenses and cooling systems are also integrated to make them more efficient. These are multi-junction solar panels which can be best efficient when they receive sun rays at a perfect angle.

4TH GENERATION SOLAR PANELS

The fourth-generation solar cell technology is also referred to as the 4G solar cell technology. This technology makes use of the combination of inorganic and organic materials, as a means to boost the efficiency and cost-effectiveness of solar cells. The 4G solar cells are engineered at solar scale and are characterized by the flexibility of conducting polymer films (the organic materials), and the stable nanostructures (inorganic materials).

Devbhoomi Cold chain Private Limited has proposed to use either Half cut Mono Crystalline P type PERC bifacial solar cells or Waaree's WSMD series Mono PERC PV modules in both the projects. These PV panels are readily available in Indian markets at lower unit prices with proven lifelong performance. Technical data of the proposed modules is attached below in this report.

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4. SURFACE AZIMUTH ANGLE:

The azimuth angle is the compass direction from which the sunlight is coming. For the countries like India which falls in Northern Hemisphere, the best orientation is directly to South. However even if solar panels face outside true south up to maximum 45^0 (south-west, south-east), the annual production goes rather limited reduction (1-3%). The solar radiation that the panel receives is almost the same. However, if the panel are turned at an angle greater than 45^0 compared to true south, production begins to decrease significantly.

In the PySyst Report provided by the client, Azimuth angle taken is 20^0 in both the projects.

5. TILT ANGLE:

Ideally, a fixed, roof/ground-mounted solar energy system should be at an angle that is equal to the latitude of the location where it is installed. However, pitch angles between 30 and 45 degrees will work well in most situations. Overall, the angle of rooftop has less impact on solar panel performance than the direction your roof faces. Optimal electricity production occurs when solar panels face south at a tilt equal to 30°.

The optimal tilt angle of the panel changes for every month, therefore, it is required to have a tilt adjustment schedule on a seasonal basis so that adjustment frequency of angle will be minimized and the output energy of the panel is maximized. However, this is not always feasible practically to adjust the panel at every tilt angle as it also increases the cost and works in the installation process of the panel.

The monthly optimal angle varies between 10° and 40° throughout the year. For fixed tilt angle throughout the year, the angle of the latitude is preferred. This is one fixed orientation where the panel almost always intercepts the greatest amount of solar radiation during the year.

The coordinates for this project are* 31°12'37.0"N (Latitude) 77°24'21.1"E (Longitude). *However, In the PvSyst Report provided by the client, tilt angle taken is 10^0.

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PART E PHYSICAL PROGRESS AT SITE

Site inspection for the project was carried out on 26th august 2022. Following observations were made during site visit:

- During site visit approximately 200 Solar panels were found to be pre-existing and installed at site (As per Company's representatives, the company currently has an installed capacity of 125 kWp. However, the same are not a part of this project having a proposed installed capacity of 475 kW no fund is to be reimbursed for these panels). Bank to take note of it.

- Erection works in the project have not yet commenced and no fresh material pertaining to this project was found to be delivered to the site.

- The company's representative has showed us the location where the project is proposed to be erected. Site Photographs of the same are attached as annexures with this report.

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PART F PLANT INFRASTRUCTURE SECTIONS & FACILITY DETAILS

1. LAND DETAILS:

For setting up of this Ground mounted solar Power Plant, Devbhoomi Cold chain private limited has proposed to use the existing land parcel of Control atmosphere cold storage for apples at DBCC's Matiana facility at Shimla in Himachal Pradesh and no extra land is proposed to be purchased by the company for this project. Bank to take note of this.

2. BUILDING & STRUCTURAL DETAILS:

The company has proposed to install a ground mounted solar power plant at their Cold storage facility located at Matiana, Shimla. For the installation of the same the company will be installing steel pillars on which the PV module mounting frame will be placed.

3. PLANT, MACHINERY AND MISCELLANOUS FIXED ASSETS:

i. SOLAR PANELS

- Features of proposed solar panels by **Adani power** at both the locations as per Project report:
  - The selected Adani module is the Elan Shine Mono PERC Bifacial PV modules.
  - The module has a capacity of 520-545 Wp peak power and has 144 cells.
  - The Bifacial gain is expected to be around 10-25% of the total power produced.
  - The gain will be due to the bifacial factor and the ground reflection.
  - The Solar PV module provides a warranty for 98% + power output in the first year, thereafter, from year 2 to 30, the maximum decrease in power output shall be 0.55% from module's nominal power output per year, ending with around 82% in the 30th year after the defined warranty start date.
  - The product warranty shall be 12 years.
  - The performance warranty shall be for 30 years.
  - Data Sheet of proposed Adani Power solar module is as below

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adani
Solar

ELAN SHINE Series

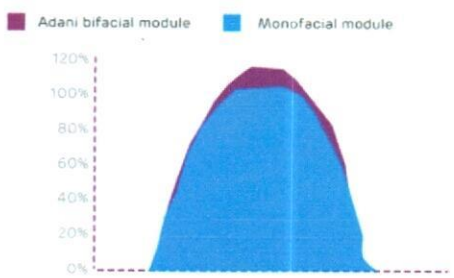
Bifacial PV Modules
MBB P-Type PERC Half-cut

ASB-M10-144-AAA (AAA=520-545) | 144 Cells |520-545 Wp

Highlights

- MBB cell technology - excellent anti-microcracking performance with more balanced interior stress: grid pattern current path, lower cost
- Up to 600 Wp at 15% bifaciality Gain**
  Up to 70 ± 5 % bifaciality Factor
- Longer Product life and performance -0.45 year over year degradation with 30 years warranty on power
- HIGH — Least Degradation for LID e, LeTID
- Modules Made with Ga doped wafer, Smart soldering, 10BB
- Excellent PID Resistance

Higher generation due to bifacial technology



Warranty based on Power

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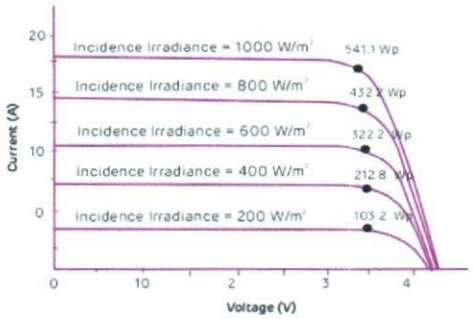
www.adanisolar.com

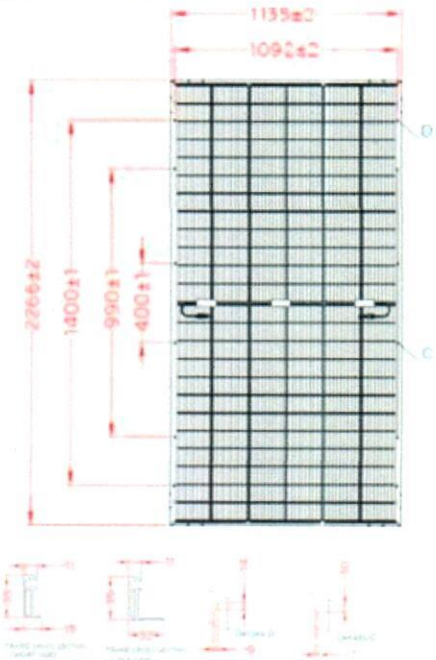
adani Solar

Technical Data

Multi irradiance curve for
ASB-M10-144-AAA
Cell temp. 25°C



Dimensions in mm



Warranty and certifications

Product warranty**
12 years of product warranty

Performance guarantee**
Power degradation <2.0 % in first year
<0.55 % / year in 2-30 years

Approvals and certificates* : IEC 61215 Ed2, IEC 61730, IEC 61701, UL 1703, MCS, JET, CEC, CEC-Aus, IEC 62716, IEC 62782, IEC 60068-2-68, IEC 61853, BIS

*All certifications are under process

Electrical data – All data measured to STC*

Electrical Specification	Only front (STC)					
Peak power, (0 ~+ 4.99 Wp) Pmax(Wp)	520	525	530	535	540	545
Maximum voltage, Vmpp (V)	41.19	41.34	41.49	41.64	41.80	41.94
Maximum current, Impp (A)	12.65	12.73	12.79	12.86	12.93	13.01
Open circuit voltage, Voc (V)	48.18	48.36	48.57	48.72	48.92	49.07
Short circuit current, Isc (A)	13.54	13.62	13.70	13.74	13.84	13.92
Module efficiency (%)	20.22	20.41	20.61	20.80	21.00	21.19

*STC: Irradiance 1000 W/m², cell temperature 25°C, Ir mass AM1.5 according to EN 60904-3. Average efficiency reduction of 4.5 % at 200 W/m² according to EN 60904-1. Except Pmpp, all other parameters have a tolerance of +/-3 %, measurement uncertainty <3 %.

Electrical Characteristics with different rear side power gain (Reference 525 Wp Front)

Electrical Specification	Pmax gain from rear side*			
Bifaciality Gain	10%	15%	20%	25%
Peak power, (0 ~+ 4.99 Wp) Pmax(Wp)	575	600	630	650
Maximum voltage, Vmpp (V)	41.35	41.35	41.36	41.36
Maximum current, Impp (A)	13.89	14.50	15.25	15.75
Open circuit voltage, Voc (V)	48.36	48.36	48.36	48.36
Short circuit current, Isc (A)	15.01	15.66	16.47	17.01
Module efficiency (%)	22.36	23.33	24.50	25.27

* Power gain from rear side depends upon the ground reflectance (Albedo) & Bifaciality factor

Temperature co-efficients (Tc) and permissible operating conditions

T. of open circuit voltage (β)	-0.29% /°C
T. of short circuit current (α)	0.045 % /°C
T. of power (γ)	-0.35 % /°C
Maximum system voltage	1500 V (IEC & UL)
NOCT	44°C ± 2°C
Temperature range	-40°C to + 85°C

Mechanical data

Length	2266 mm
Width	1135 mm
Height	35 mm
Weight	33.5 kg
Junction box	IP68; Junction box, MC4 compatible
Cable and connectors	300 mm length cable, MC4 & Amphenol compatible connectors
Application class	Class A (Safety class II)
Superstrate	2.0mm High Transmission ARC, Heat Strengthened Glass
Cells	144 Half-cut mono-crystalline P-type PERC bifacial solar cells; MBB bus bars
Encapsulation	High volume resistivity and low MVTR
Substrate	Semi Tempered Glass-2.0 mm
Frame	Anodized Frame
Mechanical load test as per IEC & UL	5400 Pa-front; 2400 Pa-back*
Maximum series fuse rating	25 A

Packaging Configuration

Container	40'HC
Pallets / Container	19
Pieces / Container	589

Note:
- The specifications included in this datasheet are subject to change without notice.
- The electrical data given here is for reference purpose only.
- Please confirm your exact requirements with the sales representative while placing your order.

** Warranty:
Please read Adani solar warranty documents thoroughly.

*Caution:
Please read safety and installation instructions before using the product.

Authorized distributor: Loop Solar | P: +91-9971136369 | E: info@loopsolar.com | W: www.loopsolar.com

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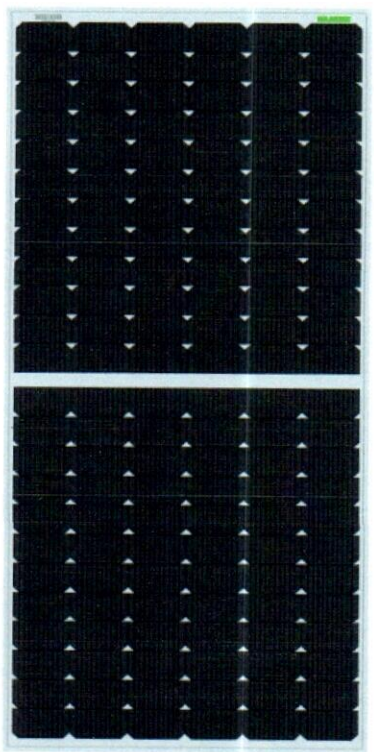
- Features of proposed solar panels by **Waaree** at both the locations as per Project report:

  - The selected Waaree module is the WSMD Arka series Mono PERC PV modules. The module has a capacity of 515–545 Wp peak power and has 144 cells.
  - The Solar PV module provides a warranty for 98% + power output in the first year, thereafter, from year 2 to 27, the maximum decrease in power output shall be 0.55% from module's nominal power output per year, ending with around 81.9% in the 27th year after the defined warranty start date.
  - The product warranty shall be 12 years.
  - The performance warranty shall be for 27 years.
  - Data Sheet of proposed waaree solar modules is as below:

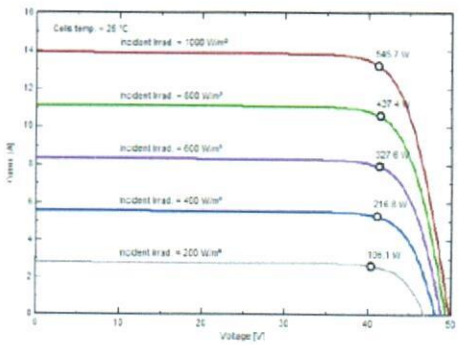
ARKA SERIES
WSMD-515 to WSMD-545

WAAREE
One with the Sun

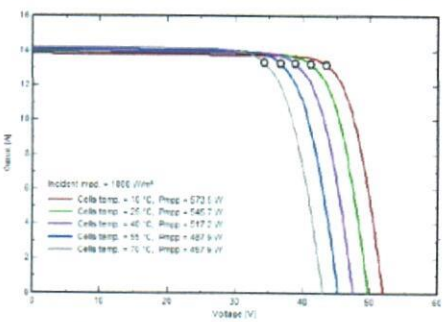
- Highest reliability & enhanced crack tolerant 10BB module
- Module utilizing Half cut cell for optimum performance
- Highly efficient Mono PERC M10 cells
- Best in class thermal coefficients
- Highest commercial gains, lower LCOE
- Split junction box improve heat dissipation
- Increase shade tolerance



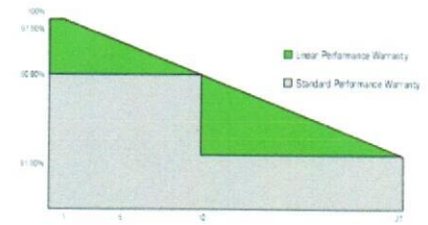
I-V VARIATION WITH IRRADIANCE



I-V VARIATION WITH TEMPERATURE



The Graphs are for reference purpose only. Please consult Waaree technical team for further clarifications



ISO 9001:2015 I ISO 14001:2015 I ISO 45001:2018
Independent assessment of factories by BLACK & VEATCH

www.waaree.com

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ARKA SERIES

WSMD-515 to WSMD-545

WAAREE
One with the Sun

ELECTRICAL CHARACTERISTICS

Models	Pmax (W)		Vmp (V)		Imp (A)		Isc (A)		Voc (V)		Module Eff. (%)
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	
WSMD-515	515	388.3	40.99	37.70	12.57	10.29	13.49	10.89	48.86	45.80	20.01
WSMD-520	520	391.9	41.14	37.90	12.65	10.34	13.55	10.94	49.01	46.00	20.20
WSMD-525	525	395.6	41.29	38.00	12.73	10.40	13.63	11.00	49.16	46.10	20.39
WSMD-530	530	399.2	41.45	38.20	12.80	10.45	13.69	11.05	49.31	46.20	20.59
WSMD-535	535	403.1	41.60	38.40	12.88	10.51	13.76	11.11	49.46	46.40	20.78
WSMD-540	540	406.7	41.75	38.50	12.95	10.56	13.83	11.16	49.61	46.50	20.98
WSMD-545	545	410.4	41.90	38.70	13.02	10.62	13.90	11.22	49.76	46.70	21.17

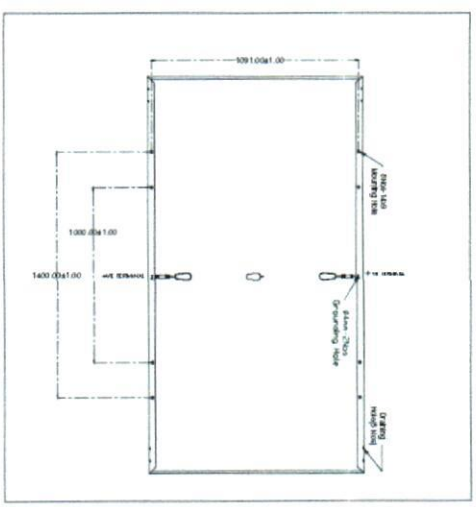
*Standard Test Conditions (STC) - 1000 W/m2 irradiance, Air Mass 1.5, and 25°C cell temperature. Nominal Operating Cell Temperature (NOCT) - 800 W/m2 irradiance, Air Mass 1.5, Ambient temperature 20°C and Wind speed 1 m/s. Average power reduction of 4.5% at 200 W/m2 as per IEC 60904-1. Measuring Uncertainty ± 3%

System Voltage	1500 V	Series Fuse Rating	25 A

MECHANICAL CHARACTERISTICS

Length x Width x Thickness (L x W x T)	2272 mm (L) x 1133 mm (W) x 35 mm (T)
Weight	27.5 kgs
Solar Cells per Module (Units) / Arrangement	144 cells / (12x6 || 12x6)
Solar Cell Type & Size	Mono PERC, 91 x 182 mm
Front Glass	3.2 mm Low Iron and Tempered glass with ARC coating
Encapsulate	PID Free & UV Resistant
Junction Box (Protection degree/ Material)	IP68 / Weatherproof PPO
Cable & Connector (Protection degree / Type)	IP68 rated / MC4 compatible
Cable cross - section & Length	4 mm² & 500mm
Frame	Anodized Aluminium Alloy

DESIGN SPECIFICATIONS



12 Years Product Warranty • 27 Years Power Output Warranty

- The electrical data given here is for reference purpose only.
- Please confirm your exact requirements with the sales representative while placing your order.
- Refer installation Manual instructions & Waaree warranty statement for terms & conditions.
- Waaree Reserves the right to change the specifications without prior notice.

THERMAL CHARACTERISTICS

Temperature coefficient of Current (Isc), α (%/°C)	0.05
Temperature coefficient of Voltage (Voc), β (%/°C)	-0.27
Temperature coefficient of Power (Pm), γ (%/°C)	-0.35
NOCT (°C)	43 ± 2
Operating temperature range (°C)	-40 to 85

Waaree Energies Ltd. is amongst the top Solar Energy Companies and has the country's largest Solar PV Module manufacturing capacity of 5 GW. In addition, it is committed to provide top notch EPC services, project development, rooftop solutions, solar water pumps and also in an Independent Power Producer. Waaree has its presence in over 325 + locations nationally and 68 countries globally.

*If you need specific product certificates, and if module installations are to deviate from our guidance specified in our installation manual, please contact your local Waaree sales and technical representatives.

www.waaree.com

WEL/E&PD/515-545/144/MP/HC/03/20.05.2021

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- Technical Details of PV modules proposed to be installed at site as per PVsyst report is as below:

    - PV Module: Si-Mono Model
    - Model: TSM-540DE18M(II)
    - Manufacturer: Adani Power
    - Number of PV modules in series: 18
    - Number of PV Modules to be installed: 880
    - Total Module Area: 2223 Sq. mtr.
    - Cell Area: 2262 Sq. mtr.
    - 1 Module capacity: 540 kWp
    - Total Capacity: 540 wP * 880 no's =475.20 kW

Note: As per PV syst report the company has used Adani power solar modules for analysis. However, the manufacturer of the module is yet to be finalized by the company.

ii. SOLAR INVERTERS

- Solis is one of the top 3 inverter manufacturers in Asia. The company has opted for 80K PV Solar Inverter - 80K-5G-DC make inverters. The main features of the inverter are as under:

    - Max. 13A per string, support 1.5 DC overloading capability
    - Efficient logic algorithm, over 99% max. Efficiency
    - String monitoring, shorter O&M time
    - Remote & local intelligent IV scan function
    - Leakage current repression technology
    - Volt-watt work mode integrated
    - DC input reverse alarm
    - Optional anti-PID function integrated
    - Reactive power compensation function
    - The model has a 5-year warranty which is extendable to 20 years on purchase of extended warranty packages.
    - Data sheet of proposed solis inverters:


solis
Solis-80K-5G, Solis-(80-110)K-HV-5G
Solis 5G Three Phase Inverters
5G Series
Features:
Max. 13A per string, support 1.5 DC overloading capability
10 individual MPPT, lower dismatch loss
Efficient logic algorithm, over 99% max. Efficiency
String monitoring, shorter O&M time
Remote & local intelligent IV scan function
Leakage current repression technology
Volt-watt work mode integrated
DC input reverse alarm
Optional anti-PID function integrated
Reactive power compensation function
Model:
Solis-80K-5G
Solis-80K-HV-5G
Solis-90K-HV-5G
Solis-100K-HV-5G
Solis-110K-HV-5G
Datasheet

- **Technical details of the inverter proposed to be installed at site as per PVsyst report is as below:**

    - Model: Solar inverter M100_210/M75
    - Manufacturer: Solis Energy
    - Number of Inverters: 5 Units
    - Operative Voltage: 590-1000 V
    - Unit Nominal Power: 475 Kw
    - Maximum Power (=>40 Degree Celsius): 525 KW ac

iii. IMPORTANT CATCH POINTS FROM PV SYST. V6.88 REPORT DATED 9TH JUNE 2022

- Produced Energy: 721.50 MWh/year
- Performance Ratio: 80.18%
- PV Field Orientation
    i. Tilt: 10 Degrees
    ii. Azimuth: 20 Degrees
- No. of Modules: 880 Nos
- Capacity of 1 module: 540 wP
- Nos. of Inverters: 5 Units
- Unit nominal of Inverters: 475 kW AC
- Produced Energy (EArray): 712.50 MWh/Year (EArray: Effective energy at the output of the array)
- Performance Ratio: 80.18 % against industrial accepted standard PR of 75%.
    i. The Performance ratio is decreasing in the summers because of increase in temperature losses due to summer heat effect in the region.
- E_Grid Energy: 560 MW per year (Electricity injected onto the grid)
- Horizontal Global Irradiation: 1603 kWh/m^2
- Loss Diagram

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PVSYST V6.88	Sugs Lloyd Pvt Ltd	09/06/22	Page 5/6

Grid-Connected System: Loss diagram

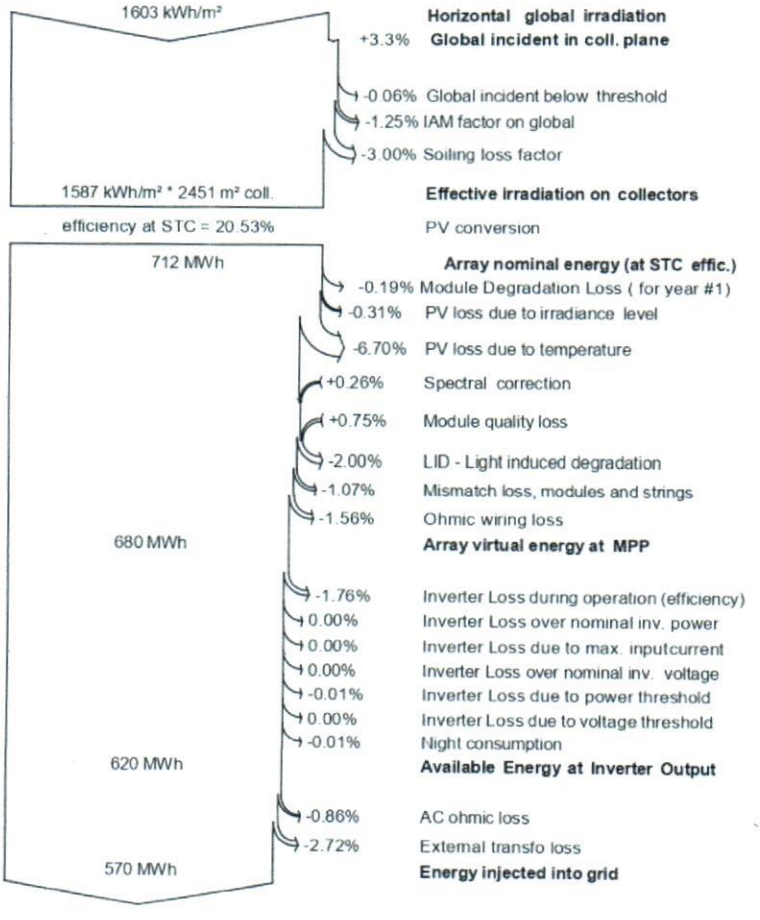
Project : Dev Bhoomi Cold Chain Pvt Ltd

Simulation variant : Adani 540 Wp (S)

Simulation for the 1st year of operation

Main system parameters	System type	**No 3D scene defined, no shadings**	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540DE18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total **475 kWp**
Inverter	Model	Solar Inverter M100_210	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total **475 kW ac**
User's needs	Unlimited load (grid)		

Loss diagram over the whole year



PVsystLicensedto Sugs Lloyd Pvt Ltd)

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PART G MAJOR SUPPLIERS/EPC CONTRACTOR

The company has proposed to appoint M/s Sugs Loyd private limited for erection, implementation and commissioning of the project. As per the PVsyst report the EPC Contractor has proposed to purchase solar panels from Adani Power/Waaree and Solis energy for Solar inverters. Details of which is as below:

Sr. No.	Company	PO No.	PO Amount (Cr.)	Scope of Work
1.	Sugs Loyd	-	-	EPC Contractor
a.	Adani Power	-	-	Supply of 880 No's of Solar Panels
b.	Solis Energy	-	-	Supply of 5 Units of Solar inverters

Note:

a. The company has informed that they have appointed EPC contractor M/s Sugs Loyd private limited erection, implementation and commission of the project. However, we have only received the PVsyst report generated by M/s Sugs loyd Pvt. Ltd. for technical information purpose and Techno commercial Proposal by M/s Sugs loyd Pvt. Ltd. For Bill of quantities of the project.

b. Final Signed contract document was sought from the company. Accordingly, the company has informed that the final contract document is yet to be signed between both the parties and as soon as the contract document is signed the same will be shared with bank. Bank to take note of this.

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PART H — PROJECT COST & MEANS OF FINANCE

1. TOTAL PROJECT COST:

As per the Project report the project cost amounts to approx. Rs. 2.30 Crore. Breakup of Rs.2.30 Crore is as below:

Sr. No.	Particulars	Amount (In Crore)
1.	Solar Panel	1.48
2.	Inverter	0.05
3.	Structure	0.27
4.	Balance of System (HT Panel, Cables etc.)	0.28
5.	Installation and commissioning	0.22
Grand Total		**2.30**
Total Incurred Project cost incurred on the project		**0.00**

Note: The basis of the above estimated cost is as per the project report provided by the company which is including GST.

Observations & Comments:

a. As per the cost of project, the solar panel modules amount to Rs.1.48 Crore including GST. Thus, per watt cost of modules amounts to Rs.29 per watt incl GST. As per industry standards the cost of modules ranges between Rs.29 per watt to Rs.38 per watt depending upon the brand, source of manufacturing and efficiency. Accordingly, the same is in line with the industry standards.

b. Furthermore, the benchmark cost for Ground mounted 1 MW solar power plant is approx. Rs.4.5 Crore. Accordingly, the cost of solar power plant with 0.475 MW capacity amounts to Rs. 2.14 Crore. However as per companies estimate the same amounts to Rs. 2.30 Crore. Thus, there is approx. 8% increase in their total project cost in regard to the industry standards.

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c. In past few months an escalation is seen in Solar power plant establishment cost. The major reasons behind this escalation are as below:

- The government announced a 40 per cent basic customs duty (BCD) on solar modules in 2021 and 25 per cent BCD on solar cells. These came into effect on April 1, 2022 and Benchmark cost is for FY21-22.

- With effect from Friday (1st Oct 2021), the Finance Ministry has announced a 12% goods and services tax (GST) rate for solar photovoltaic (PV) modules and other renewable energy equipment and Benchmark cost for FY21-22 was released on 18th August 2021.

d. Thus, the project cost amounting to approx. Rs.2.30 Crore for installation of 475 kWp of Ground Mounted solar power plant seems to be reasonable due to economic reasons mentioned above. Further analysis of the same is given in Point 4 of Part H.

e. Detailed breakup of Rs.2.30 Crore is as below:

(Amount in Rs. Crore)

Item	Amount	GST (%)	GST	Total
Solar Panel (Mono Crystalline)	₹ 1.32	12%	₹ 0.16	₹ 1.48
Inverter	₹ 0.05	12%	₹ 0.01	₹ 0.05
Structure	₹ 0.23	18%	₹ 0.04	₹ 0.27
Balance of systems (Includes HT Panel, Cables,	₹ 0.24	18%	₹ 0.04	₹ 0.28
Installation and Commissioning	₹ 0.19	18%	₹ 0.03	₹ 0.22
GRAND TOTAL	**₹ 2.02**		**₹ 0.28**	**₹ 2.30**

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2. CURRENT STATUS & TOTAL EXPENDITURE INCURRED TILL DATE:

The project is yet to take off. Therefore, no expenditure has been incurred on the project till 26th August 2022.

SR. NO.	PARTICULARS	TOTAL ALLOCATED AMOUNT	INCURRED UP TO 26TH AUGUST 2022	CURRENT STATUS OF EXPENDITURE
		(All figures in cr.)		
1.	**Solar Panels**	Total allocated amount	1.48	Project is yet to take off. Therefore, no expenditure has been incurred under this head.
		Expenses shown by the company	0.00	
		Approved by LIE up to 26th August 2022	**0.00**	
2.	**Solar Inverters**	Total allocated amount	0.05	**Project is yet to take off. Therefore, no expenditure has been incurred under this head**
		Expenses shown by the company	0.00	
		Approved by LIE up to 26th August 2022	**0.00**	
3.	**Structure including Balance of system**	Total allocated amount	0.55	Project is yet to take off. Therefore, no expenditure has been incurred under this head
		Expenses shown by the company	0.00	
		Approved by LIE up to 26th August 2022	**0.00**	
4.	**Installation and commissioning**	Total allocated amount	**0.22**	Project is yet to take off. Therefore, no expenditure has been incurred under this head
		Expenses shown by the company	**0.00**	
		Approved by LIE up to 26th August 2022	**0.00**	
5.	**Total**	Total allocated amount	**2.30**	Project is yet to take off. Therefore, no expenditure has been incurred under this head
		Expenses shown by the company	**0.00**	
		Approved by LIE up to 26th August 2022	**0.00**	

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3. SOURCES OF FINANCE & UTILIZATION OF FUNDS:

PARTICULARS	PLANNED AMOUNT	CURRENT STATE OF INVESTMENT
	(Amount in Crore)	
Term Loan	-	-
Own Sources	2.30	0.00
TOTAL	**2.30**	**0.00**

Comments:

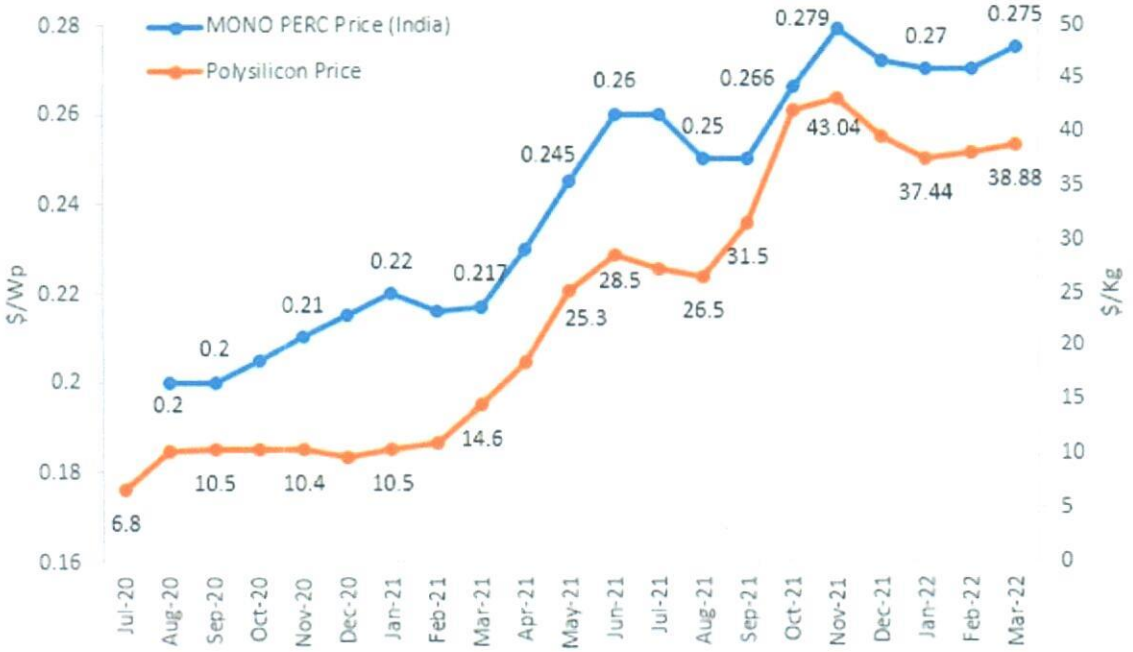
i. Term Loan amount is yet to be finalized by the bank.
ii. Project has not commenced yet. Therefore, no expenditure has been incurred on the project.

4. ANALYSIS OF INCREASE IN RISING COST OF GROUND MOUNTED SOLAR PROJECTS:

Excerpts of our Secondary research is as below:

a. GENERAL REASON FOR INCREASE IN PROJECT

One of the key selling features that have helped solar power become the world's fastest-growing energy source is cost reduction, which had recently encountered a snag due to recent increases in solar module pricing. **PV module components account for roughly 50-55% of the total project cost. Solar module prices have increased by 18% since the beginning of 2021, after plummeting by 90% over the previous decade. Thus, giving a significant rise in project cost of solar power plants.**



The value of projects awarded in the last six to nine months will be impacted by a rise in solar photovoltaic (PV) module prices. The government has imposed a 40% basic customs duty (BCD) on solar modules and a 25% BCD on solar cells beginning April 1, 2022. The price increase is mostly due to a significant increase in the price of polysilicon, a vital input for cell and module manufacturing. Metal prices have recently increased, putting increasing pressure on the overall capital cost of solar generating installations. Chinese module manufacturers have recently hiked their costs by more than a fifth and begun cancelling contracts to provide equipment.

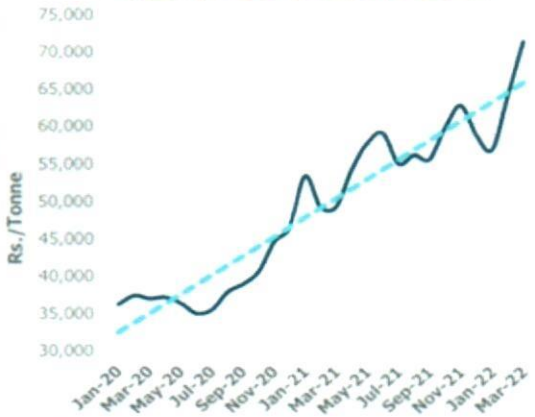
b. COST OF RAW MATERIALS:

Polysilicon is a key raw material in solar module manufacturing. Over the years, its price reduction has been a significant factor contributing to the decline in solar module prices, leading to competitive tariffs. However, polysilicon prices increased significantly from $10 per kg in August 2020 to $44 per kg in November 2021 (4.4 times increase). This multi fold increase in prices has primarily resulted in higher module prices.

Other disrupting factors in the module supply chain include price hikes for commodities such as glass, steel and aluminum, shortages of containers, and an increase in freight rates. Steel and aluminium prices have increased by around 95% and 115%, respectively, from

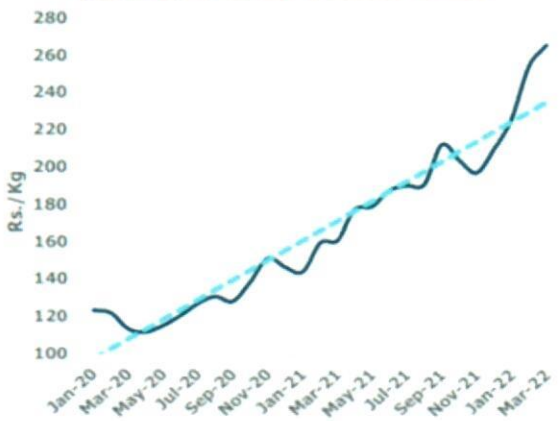
January 2020 to March 2022. Such disruptions were exacerbated due to various pandemic lockdowns.

Exhibit-3: Movement in Steel Prices



Source: Steel Insights, CareEdge Ratings

Exhibit-4: Movement in Aluminium Prices



Source: Investing.com, CareEdge Ratings

c. IMPACT OF BASIC CUSTOM DUTY (BCD) AND APPROVED LIST OF MODELS AND MACNUFACTURERS (ALMM)

From April 2022 onwards, BCD has been applied on import of solar modules (40%) and cells (25%). As BCD became applicable from April 2022, the developers, to save on costs, have preemptively stocked modules ahead of time. This is reflected by an increase in the imports to 9.7 GW in the fourth quarter of fiscal 2022. Additionally, government mandated solar developers to only use ALMM enlisted modules for government projects, government-assisted projects, those under government schemes and programs (e.g., Component A of PM-KUSUM scheme) as well as open access and rooftop net metering projects. ALMM so far, only contains domestic manufacturers. Anticipating upsurge in demand for domestically manufactured solar modules due to above factors, the leading domestic solar manufacturers have increased their prices by 3-4 cents (viz. 3-4%) between February and March 2022.

The build-up of module prices under different scenarios is tabulated below:

Exhibit-5: Module and Cell Price Build-up

Pre BCD				
Module Cost (Cents/Wp)	BCD@40%		GST@12%	Final Landed Cost (Cents/Wp)
30	NA		3.6	~34
Post BCD				
Import of modules				
Module Cost (Cents/Wp)	BCD@40% Cess of 10% on BCD		GST@12%	Final Landed Cost (Cents/Wp)
30	13.2		5.2	~48
Import of cells and domestic conversion to modules				
Cell Cost (Cents/Wp)	Conversion Cost (Cents/Wp)	BCD@25% Cess of 10% on BCD	GST@12%	Final Landed Cost (Cents/Wp)
18	14	5.0	4.4	~41

Source: CareEdge Ratings

Thus, we can see a direct increase of approximately 30% being reflected on project CAPEX due to increase in GST rate and imposition of Basic customs duty on Solar modules as well as solar cells.

ALMM factor is not applicable to this project since this is not a government project.

d. RISING DEMAND FOR SOLAR MODULES:

Solar power installations have increased at a compounded annual growth rate (CAGR) of 23% from calendar year 2016 to calendar year 2021, as a decline in solar costs have made it competitive compared to other sources of generation. Higher emphasis on procuring power through cleaner sources and global commitment to reduce carbon emissions has supported demand, too. This has resulted in demand outpacing supply over the past few quarters and, in turn, increased the cost of modules. The power crisis in China, which accounts for a major portion of global production, has also impacted the supply of modules.

These inflationary pressures are likely to put upward pressure on the capital cost of solar power projects. At present, the delivered price (on cost, insurance, and freight [CIF] basis) of imported solar modules and cells from China is around $0.30/Wp and $0.18/Wp, respectively. Additionally, modules and cells attract BCD of 40% and 25%, respectively, and cess of 10% on BCD. A GST of 12% is applicable on the solar equipment.

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e. INCREASE IN STEEL PRICES

Other disrupting factors in the PV supply chain include price hikes for commodities such as glass and metals, shortage of containers etc. Such disruptions were exacerbated further due to various Covid-19 induced lockdowns across the world which resulted in halting of manufacturing activity. However, In the year 2022 it is observed that the steel prices are coming down which will give some respite to Solar power projects in due course.

This increase is giving an upward trajectory to Project CAPEX since the project will be ground mounted but will be mounted over steel frames and colums.

f. MISCELLANEOUS

During Q3 CY2021, several countries including China faced an energy crisis. Main reasons were shortage of coal and associated supply chain disruptions in coal supply. The solar manufacturing industry, still highly concentrated in China, was affected by the rolling blackouts implemented by the government of the energy intensive industries. This crisis compounded an already difficult situation and contributed to increase in module prices in short term. With covid cases surging in China post March 2022, the Chinese government has imposed strict lockdowns across several major provinces. Thus, this hindrance to solar manufacturing in China may affect solar module prices at least in the short term.

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PART I	CONCLUSION

1. The project cost amounting to approx. Rs.2.30 Crore for installation of 475 kWp of Ground Mounted solar power plant seems to be reasonable on account of increased GST rates (5% to 12%) and imposition of 40% basic Custom duty.

2. Site inspection for the project was carried out on 27th august 2022. As per observations made during the site visit, the geographical factors responsible for efficient power generation in the project seems to be satisfactory and the site is geographically well suited for such type of solar projects. In addition to satisfactory geographical location, the company should implement the installation exercise as per the parameters mentioned in the PVsyt report to keep the project technically efficient.

3. During site visit approximately 200 Solar panels were found to be pre-existing and installed at site (As per Company's representatives, the company currently has an installed capacity of 125 kWp which is not a part of this project having a proposed installed capacity of 475 kW). On clarification the company's representative accompanying during site visit informed that these pre-existing solar panels are not the part of this project and no fund is to be reimbursed for these panels. Bank to take note of it.

4. Panel identification numbers of pre-existing and installed panels were sought from the company to differentiate between old panels and new panels at the time of progress monitoring in the project. However, the same are not provided by the company.

5. The average temperature is measured as per the Metrological Station statistic available at shimla. At an average temperature of 30^0 C, May-June is the hottest month of the year and at an average temperature of 2^0 C January is the coldest month.

6. The basic wind speeds are applicable to 10 m height above mean ground level in an open terrain with a return period of 50 years. Shimla lies on 39 m/s band of wind speed. Therefore, Shimla lies in Moderate damage risk zone.

7. As per last 3-year data, average sun days are 255 Days and average sun hours in a year is 3887 Hours recorded at Shimla zone.

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PART J	DISCLAIMER

1. No employee or member of R.K Associates has any direct/ indirect interest in the Project.

2. This report is prepared based on the copies of the documents/ information which the Bank/ Company has provided to us out of the standard checklist of documents sought from them and further based on our assumptions and limiting conditions. All such information provided to us has been relied upon in good faith and we have assumed that it is true and correct in all respect. Verification or cross checking of the documents provided to us has not been done at our end from the originals. If at any time in future, it is found or came to our knowledge that misrepresentation of facts or incomplete or distorted information has been provided to us then this report shall automatically become null & void.

3. This report is a general analysis of the project based on the scope mentioned in the report. This is not an Audit report, Design document, DPR or Techno-financial feasibility study. All the information gathered is based on the facts seen on the site during survey, verbal discussion & documentary evidence provided by the client and is believed that information given by the company is true best of their knowledge.

4. All observations mentioned in the report is only based on the visual observation and the documents/ data/ information provided by the client. No mechanical/ technical tests, measurements or any design review have been performed or carried out from our side during Project assessment.

5. Bank/FII should ONLY take this report as an Advisory document from the Financial/ Chartered Engineering firm and it's specifically advised to the creditor to cross verify the original documents for the facts mentioned in the report which can be availed from the borrowing company directly.

6. In case of any default in loans or the credit facility extended to the borrowing company, R.K Associates shall not be held responsible for whatsoever reason may be and any request for seeking any explanation from the employee/s of R.K Associates will not be entertained at any instance or situation.

7. This is just an opinion report and doesn't hold any binding on anyone. It is requested from the concerned Financial Institution which is using this report for taking financial decision on the project

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that they should consider all the different associated relevant & related factors also before taking any business decision based on the content of this report.

8. All Pages of the report including annexures are signed and stamped from our office. In case any paper in the report is without stamp & signature then this should not be considered a valid paper issued from this office.

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SURVEYED BY

ER. ABHISHEK SHARMA AND MR. SACHIN PANDEY

DATE: 26TH AUGUST 2022

PREPARED BY

ER. TEJAS BHARADWAJ

DATE: 8TH SEPTEMBER 2022

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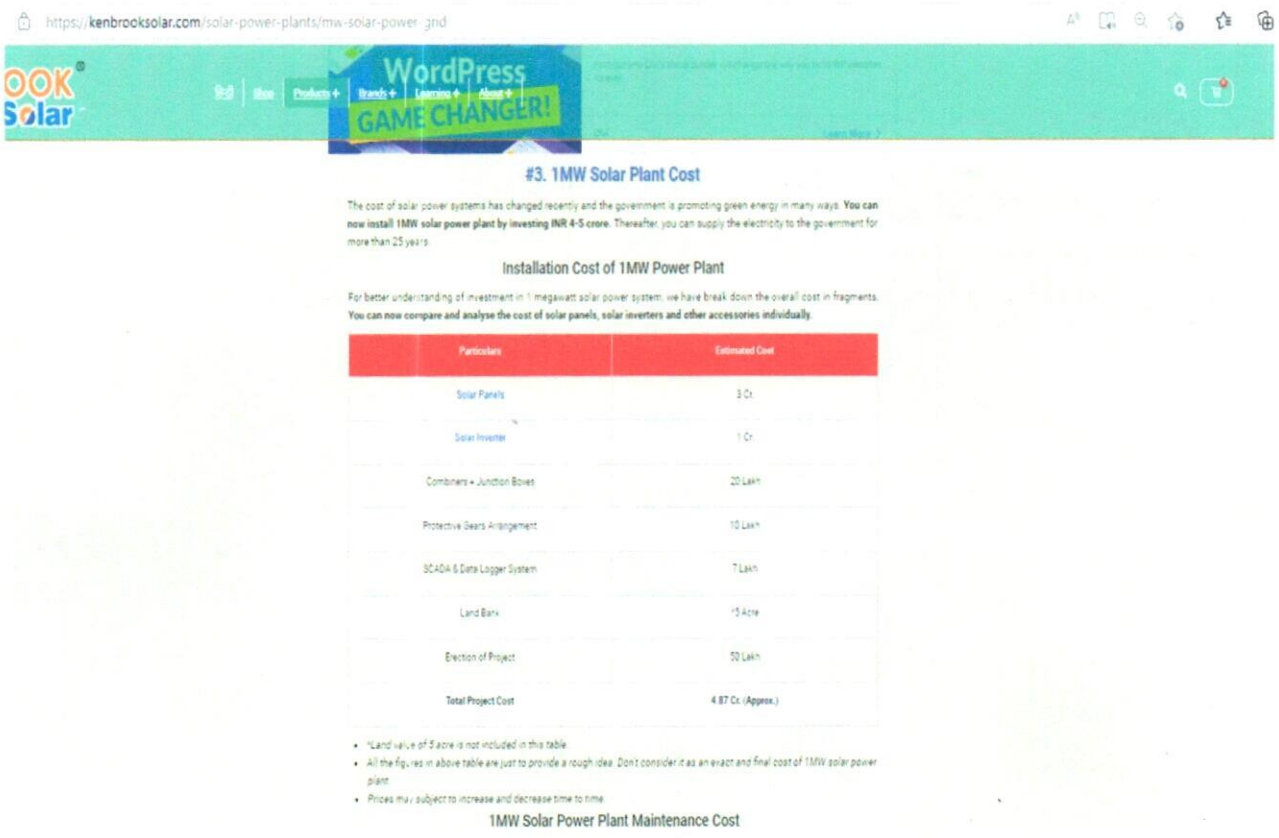
ANNEXURE 1: INDUSTRY BENCHMARK COST (2022) SNAPSHOTS



https://kenbrooksolar.com/solar-power-plants/mw-solar-power-grid

OOK Solar

WordPress GAME CHANGER!

#3. 1MW Solar Plant Cost

The cost of solar power systems has changed recently and the government is promoting green energy in many ways. **You can now install 1MW solar power plant by investing INR 4-5 crore.** Thereafter, you can supply the electricity to the government for more than 25 years.

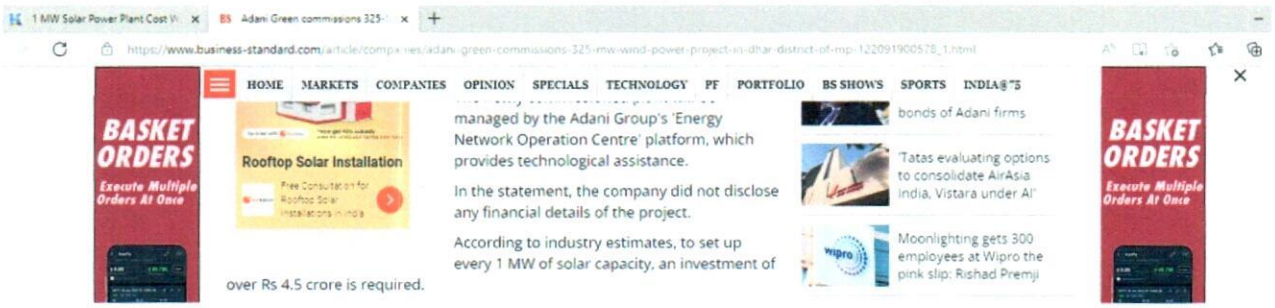
Installation Cost of 1MW Power Plant

For better understanding of investment in 1 megawatt solar power system, we have break down the overall cost in fragments. **You can now compare and analyse the cost of solar panels, solar inverters and other accessories individually.**

Particulars	Estimated Cost
Solar Panels	3 Cr.
Solar Inverter	1 Cr.
Combiners + Junction Boxes	20 Lakh
Protective Gears Arrangement	10 Lakh
SCADA & Data Logger System	7 Lakh
Land Bank	*5 Acre
Erection of Project	50 Lakh
Total Project Cost	4.87 Cr. (Approx.)

- *Land value of 5 acre is not included in this table.
- All the figures in above table are just to provide a rough idea. Don't consider it as an exact and final cost of 1MW solar power plant.
- Prices may subject to increase and decrease time to time.

1MW Solar Power Plant Maintenance Cost



1 MW Solar Power Plant Cost W... | Adani Green commissions 325-... | +

https://www.business-standard.com/article/companies/adani-green-commissions-325-mw-wind-power-project-in-dhar-district-of-mp-122091900578_1.html

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BASKET ORDERS Execute Multiple Orders At Once

Rooftop Solar Installation

Free Consultation for Rooftop Solar Installations in India

managed by the Adani Group's 'Energy Network Operation Centre' platform, which provides technological assistance.

In the statement, the company did not disclose any financial details of the project.

According to industry estimates, to set up every 1 MW of solar capacity, an investment of over Rs 4.5 crore is required.

bonds of Adani firms

'Tatas evaluating options to consolidate AirAsia India, Vistara under AI'

Moonlighting gets 300 employees at Wipro the pink slip: Rishad Premji

BASKET ORDERS Execute Multiple Orders At Once

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ANNEXURE 2: PV SYST REPORT

PVSYST V6.88	Sugs Lloyd Pvt Ltd(India)	09/06/22	Page 1/6

Grid-Connected System: Simulation parameters

Project : **Devbhoomi Cold chain Pvt Ltd**

Geographical Site	**Shimla(HP)**			Country	**India**
Situation		Latitude	31.21° N	Longitude	77.40° E
Time defined as		Legal Time	Time zone UT+5.5	Altitude	2276
		mAlbedo	0.20		
Meteo data:	**Shimla(HP)**		Meteonorm 7.2 (1981-2010), Sat=27% (Modified by user) (Modif - Synthetic		

Simulation variant : **Adani 540 Wp (S)**

Simulation date	09/06/22 12h38
Simulation for the	**1st year of operation**

Simulation parameters		System type	**No 3D scene defined, no shadings**		
Collector Plane Orientation		Tilt	10°	Azimuth	20°
Models used		Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon		Free Horizon			
Near Shadings		No Shadings			
User's needs :		Unlimited load (grid)			

PV Array Characteristics

PV module	Si-mono	Model	**TSM-540DE18M(II)**		
Original PVsyst database		Manufacturer	Adani Power		
Number of PV modules		In series	18 modules	In parallel	48 strings
Total number of PV modules		Nb. modules	880	Unit Nom. Power	540 Wp
Array global power		Nominal (STC)	**475 kWp**	At operating cond.	475 kWp (50°C)
Array operating characteristics (50°C)		U mpp	738 V	I mpp	273 A
Total area		Module area	**2223 m²**	Cell area	2262 m²
Inverter		Model	**Solar Inverter M100_210/M75**		
Original PVsyst database		Manufacturer	Solis Energy		
Characteristics		Operating Voltage	590-1000 V	Unit Nom. Power	475 kWac
				Max. power (=>40°C)	525 kWac
Inverter pack		Nb. of inverters	5 units	Total Power	475 kWac
				Pnom ratio	1.1

PV Array loss factors

Array Soiling Losses			Loss Fraction	3.0 %
Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	29 mOhm	Loss Fraction	2.5 % 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	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Module average degradation	Year no	1	Loss factor	0.4 %/year
Mismatch due to degradation	Imp RMS dispersion	0.4 %/year	Vmp RMS dispersion	0.4 %/year

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.993	0.968	0.926	0.825	0.583	0.000

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PVSYST V6.88	Sugs Lloyd Pvt Ltd	09/06/22	Page 2/6

Grid-Connected System: Simulation parameters

Spectral correction — FirstSolar model. Precipitable water estimated from relative humidity

Coefficient Set	C0	C1	C2	C3	C4	C5
Monocrystalline Si	0.85914	-0.02088	-0.0058853	0.12029	0.026814	-0.001781

System loss factors

AC wire loss inverter to transfo	Inverter voltage	475 Vac tri		
	Wires: 3x500.0 mm²	500 m	Loss Fraction	1.8 % at STC
External transformer	Iron loss (24H connexion)	984 W	Loss Fraction	0.2 % at STC
	Resistive/Inductive losses	3.25 mOhm	Loss Fraction	1.0 % at STC

PVSYST V6.88	Sugs Lloyd Pvt Ltd	09/06/22	Page 3/6

Grid-Connected System: Main results

Project Dev Bhoomi Cold Chain Pvt Ltd

Simulation variant : Adani 540 Wp (S)

Simulation for the 1st year of operation

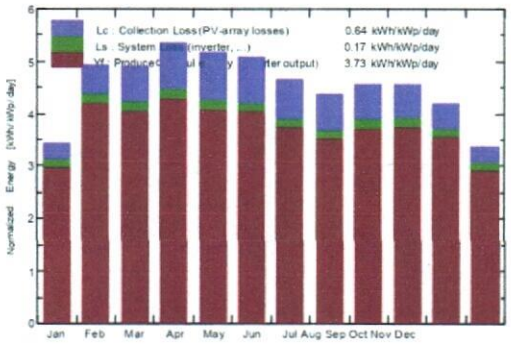
Main system parameters	System type	**No 3D scene defined, no shadings**	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540E18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total **475 kWp**
Inverter	Model	Solar Inverter M100_100	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total **475 kW ac**
User's needs	Unlimited load (grid)		

Main simulation results

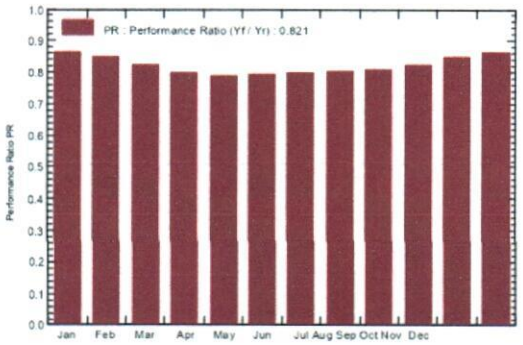
System Production **Produced Energy 712.5 MWh/year** Specific prod. 1500 kWh/kWp/year

Performance Ratio PR 80.18 %

Normalized productions (per installed kWp): Nominal power 475 kWp



Performance Ratio PR



Adani 540 Wp (S)

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
January	99.0	44.7	14.00	106.8	102.3	56.34	45.34	0.837
February	128.7	45.4	17.81	138.0	132.4	57.54	46.54	0.820
March	146.2	60.2	23.79	151.8	145.5	57.56	46.63	0.826
April	157.8	69.9	29.71	160.3	153.7	58.56	47.20	0.802
May	159.9	93.3	33.27	160.1	153.4	58.65	47.20	0.789
June	152.7	104.9	32.60	151.9	145.4	59.67	48.45	0.797
July	145.4	94.7	31.63	144.3	138.0	59.86	48.45	0.803
August	134.9	90.3	30.47	135.4	129.6	58.65	48.10	0.805
September	133.9	74.9	29.08	137.2	131.4	58.54	48.05	0.812
October	133.6	59.8	26.37	140.9	135.1	57.65	47.67	0.823
November	116.4	46.0	20.42	125.8	120.4	57.34	47.80	0.809
December	95.0	36.5	15.74	104.5	100.1	57.12	47.45	0.806
Year	1603.5	820.6	25.44	1657.1	1587.4	712.50	570	0.801

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

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PVSYST V6.88	Sugs Lloyd Pvt Ltd	06/09/22	Page 4/6

Grid-Connected System: Special graphs

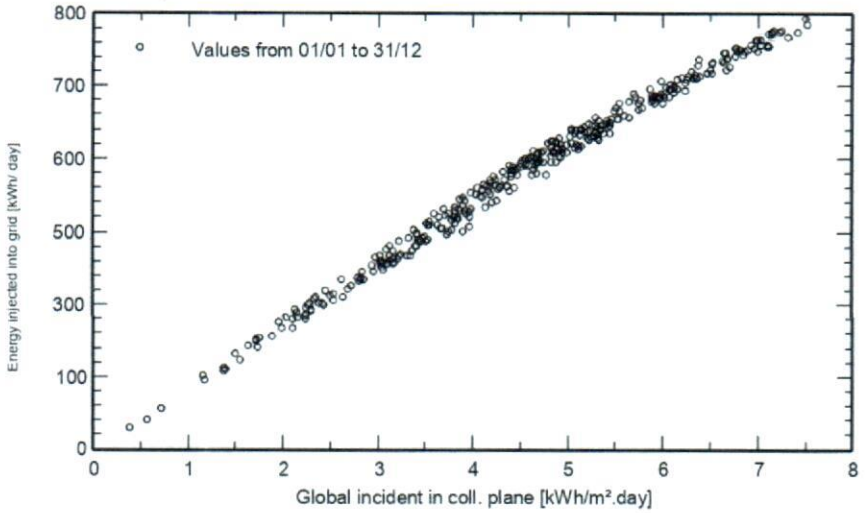
Project Dev Bhoomi Cold Chain Pvt LTd

Simulation variant : Adani 540 Wp(S)

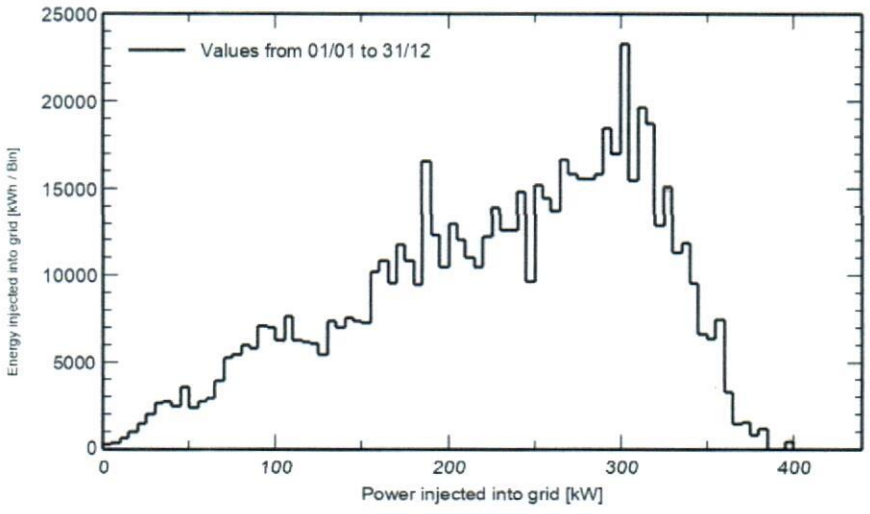
Simulation for the 1st year of operation

Main system parameters			
System type	**No 3D scene defined, no shadings**		
PV Field Orientation	tilt 10°	azimuth 20°	
PV modules	Model TSM-540DE18M(II)	Pnom 540 Wp	
PV Array	Nb. of modules 880	Pnom total **475 kWp**	
Inverter	Model Solar Inverter M100_210	Pnom 475 kW ac	
Inverter pack	Nb. of units 5.0	Pnom total **475 kW ac**	
User's needs	Unlimited load (grid)		

Daily Input/Output diagram



System Output Power Distribution



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Grid-Connected System: Loss diagram

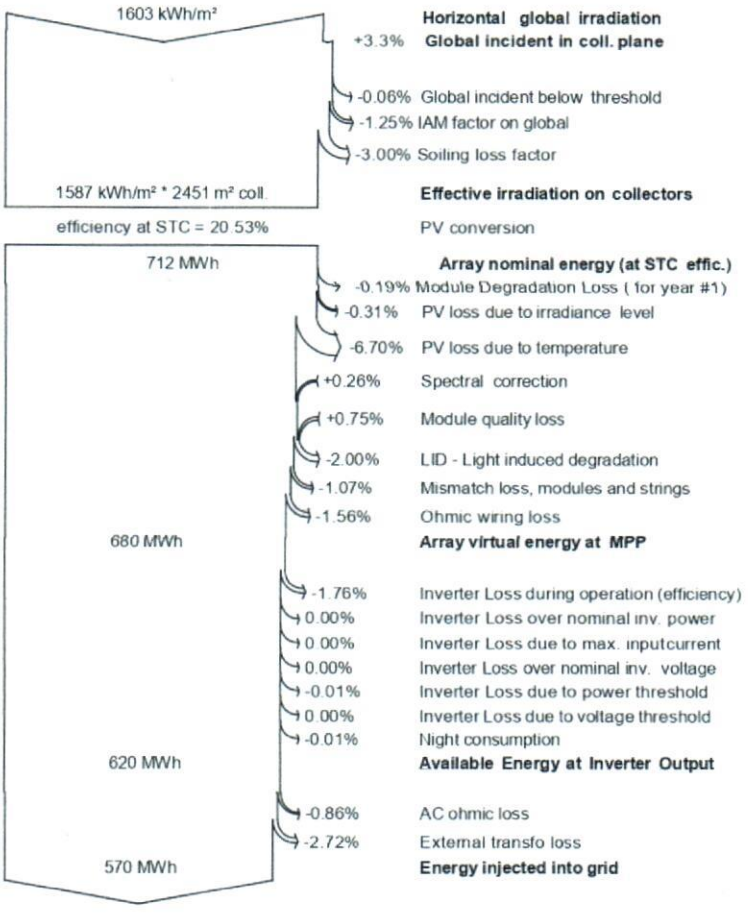
Project : Dev Bhoomi Cold Chain Pvt Ltd

Simulation variant : Adani 540 Wp (S)

Simulation for the 1st year of operation

Main system parameters	System type	**No 3D scene defined, no shadings**	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540DE18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total **475 kWp**
Inverter	Model	Solar Inverter M100_210	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total **475 kW ac**
User's needs	Unlimited load (grid)		

Loss diagram over the whole year



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Grid-Connected System: P50 - P90 evaluation

Project : Dev Bhoomi Cold Chain Pvt Ltd

Simulation variant : Adani 540 Wp(S)

Simulation for the 1st year of operation

Main system parameters	System type	**No 3D scene defined, no shadings**	
PV Field Orientation	tilt	10°	azimuth 20°
PV modules	Model	TSM-540DE18M(II)	Pnom 540 Wp
PV Array	Nb. of modules	880	Pnom total **475 kWp**
Inverter	Model	Solar Inverter M100_210	Pnom 475 kW ac
Inverter pack	Nb. of units	5.0	Pnom total **475 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:

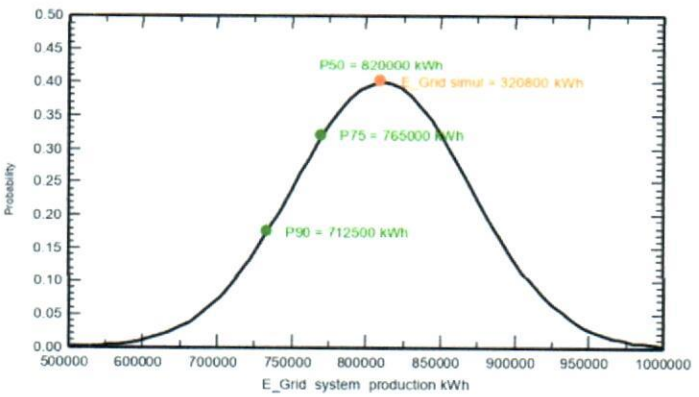
Meteo data source		Meteonorm 7.2 (1981-2010), Sat=27% (Modified by user) (Mod	
Meteo data	Kind	Not defined	Year 1995
Specified Deviation	Year deviation from aver.	3 %	
Year-to-year variability	Variance	3.0 %	

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

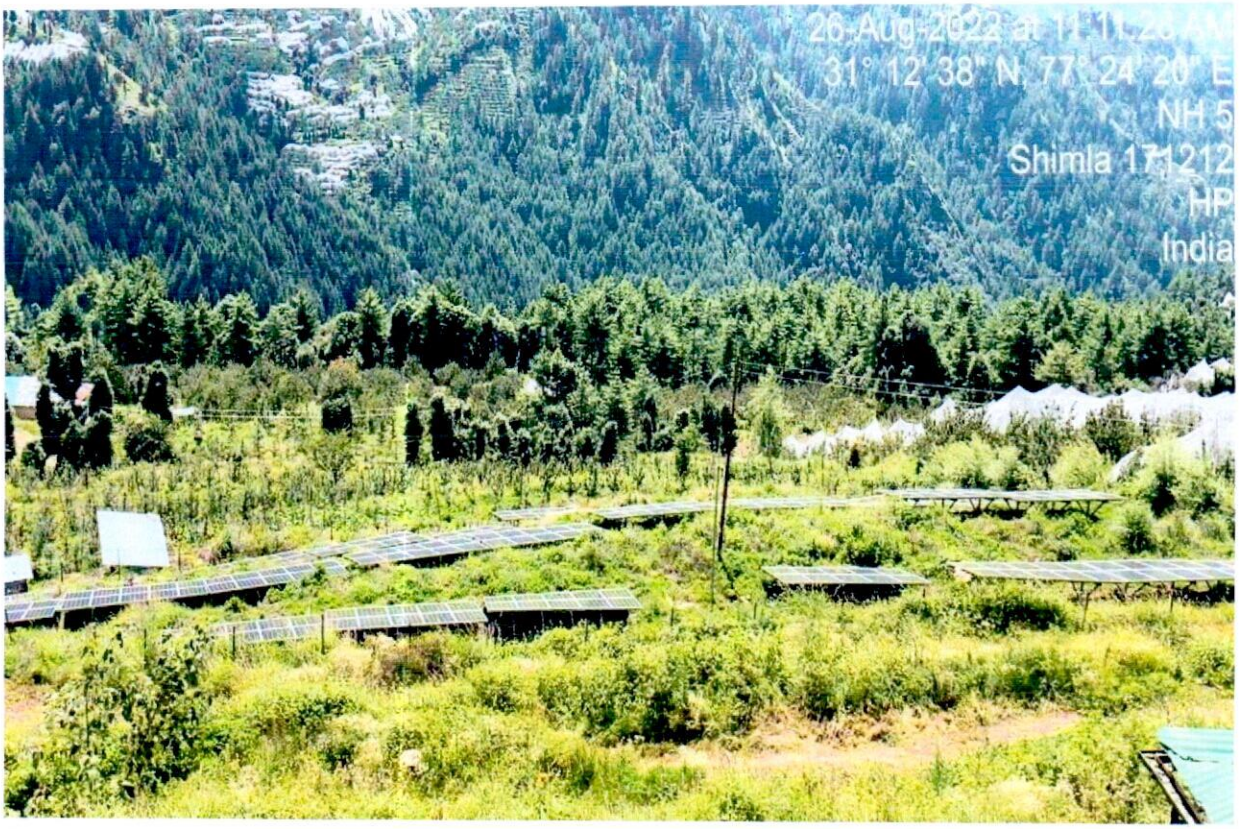
Specified Deviation	PV module modelling/parameters	1.0 %	
	Inverter efficiency uncertainty	0.5 %	
	Soiling and mismatch uncertainties	1.0 %	
	Degradation uncertainty	1.0 %	
Global variability (meteo + system)	Variance	3.5 %	(quadratic sum)

Annual production probability	**Variability**	**712 MWh**
	P50	**820 MWh**
	P90	**712.5 MWh**

Probability distribution



SITE PHOTOGRAPHS



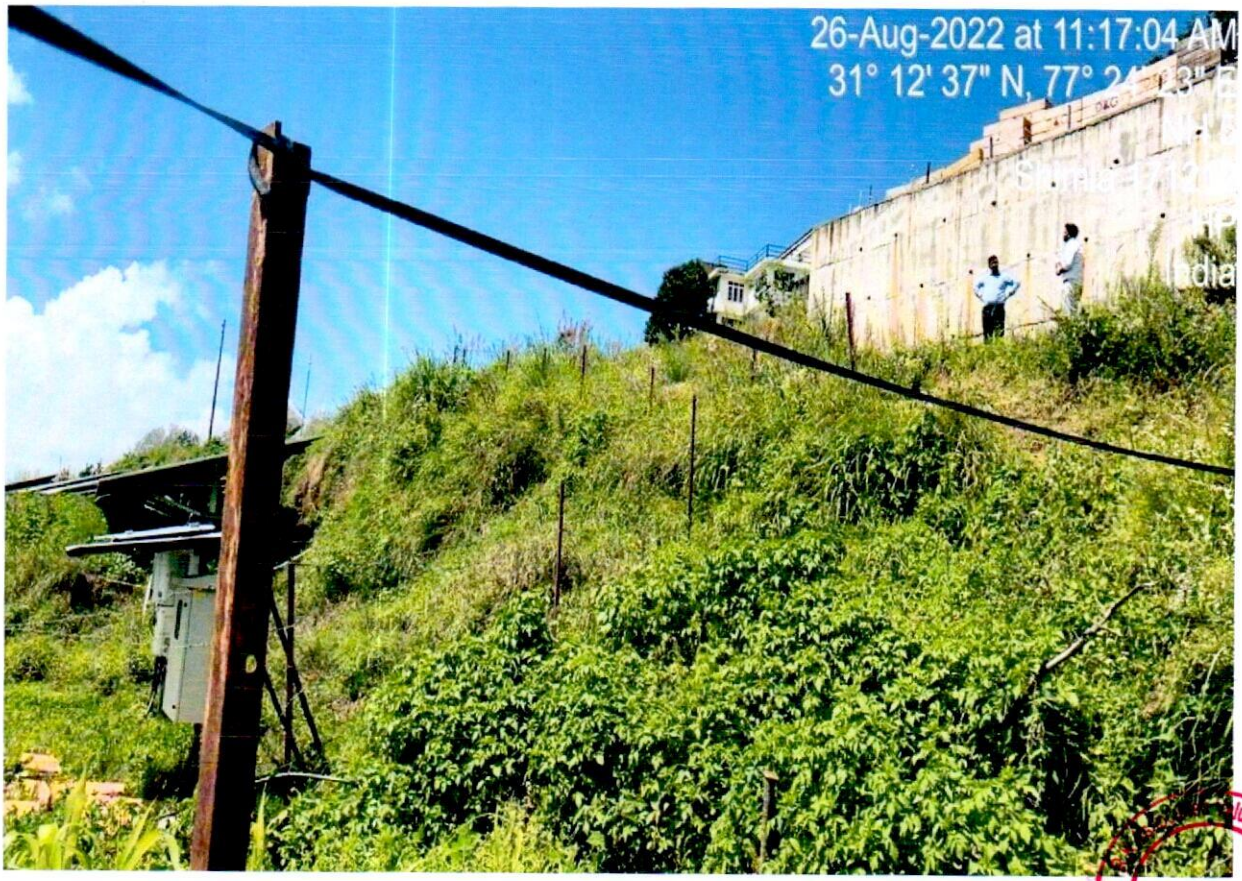

15:06 AM
NH 5
Shimla 171212
HP
India


26-Aug-2022 at 11:15:09 AM
31° 12' 37" N, 77° 24' 22" E
NH 5
Shimla 171212
HP
India


26-Aug-2022 at 11:16:11 AM
NH 5
Shimla 171212
HP
India


26-Aug-2022 at 11:16:13 AM
NH 5
HP
India


26-Aug-2022 at 11:16:47 AM
31° 12' 38" N, 77° 24' 22" E
NH 5
Shimla 171212
HP
India


26-Aug-2022 at 11:17:04 AM
31° 12' 37" N, 77°


26-Aug-2022 at 11:17:06 AM
31° 12' 37" N, 77° 24' 23" E
NH 5
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