dun & bradstreet

GROWING RELATIONSHIPS THROUGH DATA

Detailed Project Report

Midwest Limited

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Executive Summary

Executive Summary

Name of the Company	Midwest Limited ('ML' or 'Company')
Date of Incorporation	11th December, 1981
CIN	U14102TG1981PLC003317
Constitution	Limited Company
Registered Office	8-2-684/3/25 & 26, Road No.12, Banjara Hills, Hyderabad – 500032, Telangana, India.
Industry	Natural Stone, Quartz Processing and Heavy Mineral Sand
Nature of activity	Natural Stone, Quartz Processing and Heavy Mineral Sand
Directors of the Company	1. Mr. Ramachandra Kollareddy 2. Mrs. Kukreti Soumya 3. Ms. Uma Priyadarshini Kollareddy 4. Mr. Rana Som 5. Mr. Pavan Kumar Duvva 6. Ms. Smita Amol Lahoti
Brief details on the Project	The Company specializes in mining and processing natural stone, including Granite and Marble. ML intends to set up a total of 0.66 MW capacity ground mounted solar power generation plants at its 2 operational mines located in Telangana state. Out of total 0.66 MW solar plants, the Company is setting up 0.52 MW Solar plant at Chimiryala village in Kodad mandal, Suryapet district and 0.14 MW Solar plant at Arpanapally village, Warangal district in Telangana State. Currently the mining activity is carried out with electricity power at these locations, which the Company intends to gradually replace with solar power with the objective of cost savings in power consumption and to reduce carbon emission. The cost of the proposed Project is INR 32.56 Million (Mn). The Company plans to raise 100% of the fund for the Project through Initial Public Offering (IPO).

Estimated COD	April 2025
Estimated project cost	INR 32.56 Mn
Means of Finance – Proceeds from IPO	INR 32.56 Mn
Current Status of the Project	• The land has been identified at respective mines for the installation solar plants. • The Company has obtained EPC quotes from Solaryte India Pvt Ltd and another, KL enterprises.

Project

Midwest Ltd (ML) specializes in mining and processing natural stone, including Granite and Marble.

ML intends to set up a total of 0.66 MW capacity ground mounted solar power generation plants at its 2 operational mines located in Telangana state.

Out of total 0.66 MW solar plants, the Company is setting up 0.52 MW Solar plant at Chimiryala village in Kodad mandal, Suryapet district and 0.14 MW Solar plant at Arpanapally village, Warangal district in Telangana State.

Currently the mining activity is carried out with electricity power at these locations, which the Company intends to gradually replace with solar power with the objective of cost savings in power consumption and to reduce carbon emission.

Project Cost

The total cost of the project is estimated at INR 32.56 Mn based on estimates made by the Company for various elements of the project. Suitable contingency provisions have also been made for the costs. The summary of the cost of the project is as given in table below:

Particulars	INR Million	%
Solar Power Plant (including I&C and civil cost)	30.72	*94.34%*
Hard Cost	**30.72**	
Contingency Cost	1.54	*4.72%*
Pre-operative Expenses	0.31	*0.94%*
Soft Cost	**1.84***	
Total Project Cost	**32.56**	***100.00%***

** Considering the rounding-off correction, the above figure is the correct value.*

Soft Cost Consideration:

Contingency Cost: *Provision for contingency has been considered at 5.00% of the Plant & Machinery cost, Miscellaneous Fixed Assets and Building & Civil works cost amounting to INR 1.54 Mn.*

Pre-operative Expenses: *Preliminary and pre-operative cost for project has been considered at 1% of the total hard cost amounting to INR 0.31 Mn.*

Means of Finance

The proposed means of finance for the project has been provided in the exhibit below –

Particulars	INR Million	%
Means of Finance – Proceeds from IPO	32.56	*100.00%*
Total Means of Finance	**32.56**	***100.00%***

The Company proposes to fund the entire project through proceeds from IPO.

Proposed Capacity of the Solar Plants

Site Locations	Proposed Solar Plant Capacity	
	MW	KWp
Kodad	0.52	520.00
Arpanapally	0.14	144.00
Total	**0.66**	**664.00**

Conclusion

For a detailed note on conclusion, please refer to page no. 53

Main Report

Scope of Work

Midwest Limited, herein after referred to as '**ML**' or the 'Company', has appointed Dun and Bradstreet Information Services India Private Limited ('D&B India') for the detailed project report for its project to set up total 0.66 MW capacity solar power generation plants at its 2 operational mines located at Warangal and Kodad regions in Telangana state.

The study would prepare detailed project report encompass assessing viability of the project and evaluation of the constraints and future potential.

The scope of work was finalized as under:

- D&B India will physically visit the proposed location.
- D&B India will validate the cost of the proposed project, given the specifications on civil works and along with Plant & Machinery.

Date of Inspection

With a view to have first-hand information of the site, the above referred site was visited on 13th June 2024. The site visit status has been provided in the technical section in this report.

Team of Consultants

The team of consultants who have worked on the project has been mentioned below:

Mr. Vishal Bhingare:

Mr. Vishal Bhingare is an Operation Analyst - holds master's degree in management studies (Finance) and bachelor's degree in commerce. He has more than 7 years of work experience in Credit Analysis and Project Appraisal Services which covers assessments like Detailed Project Report (DPR), Techno-Economic Viability (TEV) of Greenfield/ Brownfield projects and Lenders Independent Engineer Report (LIE).

Mr. Parasmal Purohit:

Mr. Parasmal Purohit is a Project Lead – holds a bachelor's degree in Automobile Engineering and has done his Post Graduation Program in Operations Management. He has more than 11 years of work experience and as part of Project Appraisal Services, have lead execution of more than 150 projects involving Detailed Project Report (DPR), Techno-Economic Viability (TEV) of Greenfield/ Brownfield projects, debt restructuring projects. Further, as part of Market Research Services, he has executed projects involving identification of market potential/ sizing, and demand-supply analysis.

Mr. Mr. Anchala Pampapathy

Mr. Anchala Pampapathy – Bachelor of Engineering (Electrical and Communication Engg) from Indian Institute of Science, Bangalore in 1972; Master of Business Administration from Osmania University, Hyderabad in 1980. With 35 plus years of experience, Subject Matter Expert (SME) of D&B India for assessment of solar projects. Worked (October 2011 to April 2014) as Director-Business development in Quanta Power solutions

India Private limited ,Bangalore, a company engaged in the business of Consultancy, design, engineering, installation and commissioning of solar PV power plants; July 2009 till September 2011- in E to E Energy systems Private Limited, Hyderabad, an end to end energy solutions company as Managing Director; June 2006 till June 09 –in Titan energy systems ltd, a company in the export and domestic business of Solar phot voltaic modules and power systems, as Chief Operating Officer (COO) and then as Sr Vice President (Mktg) and New business unit. July 2002 to May 2006 – in XL Telecom Ltd a co. in the business of manufacturing and marketing SMPS Power Plants, Solar Power Products, Cable Jointing Kits and CDMA mobile handsets and Fixed Wireless Terminals, initially as Vice President (Power Electronics) and then as Vice President (Marketing). July 1990 to 2002- in Select Electronics Pvt Ltd co in the business of manufacturing and marketing Battery Chargers, SMPS Products, Thyristor based Telecom Power Plants, Satellite receiver Products, Defense grade Power supplies - as Managing Director. Jan 1987 to June 1990 – in SAB Nife Power Systems India Ltd a company in the business of Power Electronics and Ni-Cd batteries as General Manager (Materials & Manufacturing). Jan 1973 to Jan 1987 – in Electronics Corporation of India Ltd a Public Sector Company under department of atomic Energy, Govt. of India -as Trainee Officer, Sr. Tech - Officer and Technical Manager.

Methodology

The detailed project report study assigned to D&B India was carried out in the following sequence:

1. Verification of the documents provided by the client, identification of missing information and sending the revised list of documents required from the client.
2. Visit to the proposed location and existing facilities of the Company at the Warangal and Kodad regions in Telangana state.
3. To carry out sensitivity analysis & SWOT analysis and to identify risk & its mitigation pertaining to the project
4. Assessment of the project cost reasonableness of the proposed project.
5. The technical assessment comprising of the review of proposed project locations, plant and machinery and other related aspects.

Company Background

Introduction

M/s Midwest Ltd. ("ML" or "The Company") was incorporated on 11th December 1981, with the Company name Midwest Granite Pvt Ltd and as a Limited Company registered with Corporate Identification No. (CIN) U14102TG1981PLC003317 at RoC – Hyderabad having its registered office at 8-2-684/3/25 & 26, Road No.12, Banjara Hills, Hyderabad – 500032, Telangana, India.

ML is a 40-year-old mining enterprise with major focus on natural stone, viz., Granite and Marble.

Midwest Ltd. was established in year 1981, with the main objective of developing knowledge and expertise in the field of natural stone namely Granite, Marble, Quartzite, Quartz and Heavy Mineral Sand.

The Company has a core team of Geologists, Geophysicists, Mine Planners, Mining and Process Engineers supported by a team of experts in Logistic Management, Marketing, Sales, Supply chain, Finance and other functions. Midwest has established footprint in Asia, Africa, Europe and the Americas.

The Company now proposes to set up total 0.66 MW capacity solar power generation plants at its 2 operational mines located at Warangal and Kodad regions in Telangana state to reduce its current power cost and to reduce carbon emission.

The Company details are given in the following exhibit:

Company Details	
Name	Midwest Limited
Date of Incorporation	11th December, 1981
Constitution	*Limited Company*
CIN	U14102TG1981PLC003317
Industry	Natural Stone, Quartz Processing and Heavy Mineral Sand
Nature of activity	Natural Stone, Quartz Processing and Heavy Mineral Sand
Office	8-2-684/3/25 & 26, Road No.12, Banjara Hills, Hyderabad – 500032, Telangana, India.
Location of the Proposed Unit	• Kodad – 0.52 MW plant at - Chimiryala village in Kodad mandal, Suryapet district in Telangana state. • Arpanapally – 0.14 MW plant at Arpanapally village, Warangal district in Telangana State.

List of Directors

Following is the list of directors of the Company:

Sr. No.	Full Name	Present Residential Address	Designation	Din
1	Mr. Kollareddy Ramachandra	Villa 54, NSL Orion Villas Gachibowli, Near Raidurgam Police Station, Hyderabad 500032, Telangana.	Managing Director & CEO	60086
2	Mrs. Kollareddy Uma Priyadarshini	Villa 54, NSL Orion Villas Gachibowli, Near Raidurgam Police Station, Hyderabad 500032, Telangana.	Whole-Time Director	2736184
3	Mrs. Kukreti Soumya	Villa 1038, Mallikharjuna Krinss SY. NO. 282P, 283P, Puppalguda Village, Hyderabad-500089, Telangana.	Whole-Time Director	1760289
4	Mr. Rana Som	14 Sarat Chatterjee Avenue,Tollygunge, Kolkata - 700029	Non-Executive Independent Director	352904
5	Mr. Pavan Kumar Duvva	Survey No.12 (P), Plot No.2 Khanamet, Serilingampally Shaikpet, Hyderabad, Telangana 500081	Non-Executive Independent Director	1282226
6	Mr. Smita Lahoti	A15 ,3 Floor Dr Herekar Park, Bhankarkar Road, Pune Maharashtra 411004	Non-Executive Independent Director	8764528

Source: ML

Technical Assessment

Plant Overview

The project uses Mono crystalline modules facing true south tilted at a fixed angle of 13 degree from the horizontal plane. As a PV plant of this scale would require a large number of modules, ML is keeping its options open for the market and tentatively looking to procure the same from Vikram solar. All the modules will be of 550 Wp each.

Solar PV modules are designed for optimum performance under standard test conditions (STC). For the given site climatic conditions, PV modules are likely to underperform due to various losses, for example loss due to negative temperature coefficient, soiling, inter row shading, IAM and low irradiance.

The PV Modules are electrically connected with cables sized to minimize DC ohmic losses. The DC electrical output from the PV modules is fed through solar PV grade cables to the String inverters. The inverters convert the DC electrical output to AC.

The AC Power is connected to the LT Panel in the premises through Net meter.

Project site details

Shown below are the site locations and photographs.

1. **Arpanapally – 0.14 MW**
   Project site details are as under.

   -Land Area: 2 Acre

   -Co-ordinates: 17°44'06."N 79°57'14"E

   -Land comes under: Village Teegalaveni

   -Substation: 33/11 KVA, distance 1 KM

   -Nearest Village: Teegalaveni - 500 mts

   -Nearest Bus stand: Teegalaveni - 500 mts

   -Nearest Highway: NH 365 Gudur - 9 km

   -Nearest railway station: Kesamudram - 16 km

   -Railway junction: Warangal - 60KM

   -Nearest airport: Hyderabad 226 km

Following are the site visit pictures and site visit observations as on 13th Jun 2024.

The proposed site is largely flat with no obstructions and thus suitable for PV technology. The terrain is relatively flat, with some small bushes.

No physical structures or other obstructions are present on the site. There is no possibility of soil erosion seen at site. The site is free from impediments that could hinder the construction and operation of the plant. Based on the site visit D&B has noted that the area is suitable for construction of the PV plant.

2. Kodad-0.52 MW
Project site details are as under

-Land Area: 15 Acre

-Coordinates: 16°58'06.3"N 80°02'48.0"E

-Land comes under: Village Chimiryala- 4 km

-Mandalam: Kodad -11 km

-Nearest Village: Nallabandagudem - 1.4 km

-Nearest Bus stand: Nallabandagudem - 1.4 km

-Main Bus stand: Kodad -11 km

-Nearest Highway: NH 65, Nallabandagudem - 1.4 km

-Nearest railway station: Khammam - 45 km

-Nearest airports: Gannavaram - 112 km, Hyderabad -200 km

Following are the site visit pictures and site visit observations as on 13th Jun 2024.

The land for this project needs to be levelled for setting up the Solar PV Power plant. It would mean that the land clearance and levelling calls for extra effort and more expenditure which is already considered in the project cost.

No physical structures or other obstructions are present on the site. There is no possibility of soil erosion seen at site. The site is free from impediments that could hinder the construction and operation of the plant. ***D&B India is of the opinion that the land is suitable for the installation of Solar Power plant.***

Location Analysis

Site selection of a Solar PV Power project is primarily governed by.

- Availability of adequate land
- Availability of abundant solar radiation
- Topology of Land
- Land Cover and Use
- Proximity to the grid for power evacuation
- Availability of other infrastructure such as good connectivity

Based on the above criteria, both the project sites are suitable for location of Solar PV Power plants.

Brief of the Project site and its locations and the connectivity are listed below.

Site Name	Kodad	Arpanapally
Plant AC Capacity	**520 KW**	**144 KW**
Plant DC Capacity	520 KWp	144 KWp
Land Area	3 acres	1 acre
Land coordinates	16.58 N,80.02 E	17.44 N,79.57 E
Land in Village	Chimiryala-	Teegalaveni
Mandal	Kodad	
Land District	Suryapet	Warangal
Nearest Village	Nallbandagudem	Teegalaveni
Nearest main road	Nallabandagudem	Gudur- 9 kms
Nearest Railway station	Khammam-45 kms	Kesamudram-16 kms
Nearest Bus Stand	Nallabandagudem	Teegalaveni-0.5 km
Nearest Airport	Hyderabad-200 kms	Hyderabad-226 kms

D&B India observes extent of the land available is enough for the size of the solar plants planned in the locations. Connectivity is good and the logistics are also convenient.

Project Overview

This section describes the proposed main components of the PV plant that have been selected for plant design configuration in preparing this report. The main components are solar PV modules, inverters, mounting structure, junction boxes, and monitoring and data acquisition system.

Bill of material of the solar Plants is as tabulated below.

Sr No	Item	Specification/details		Vender	Make	Qty		Remark	
		Kodad - 0.52 MW	Arpanpally - 0.14 MW			Kodad - 0.52 MW	Arpanpally - 0.14 MW	Kodad - 0.52 MW	Arpanpally - 0.14 MW
1	Solar PV Module	Mono, 545 Wp	Mono, 550 Wp	Solaryte India Pvt Ltd. (SIPL)	Vikram solar	946	262	The quotation is received from Solaryte India Pvt Ltd on 10th Sep 2024 with the Price quoted is valid for 6 Months from the date of Quote supplied (till 10th March).	The quotation is received from Solaryte India Pvt Ltd on 10th Sep 2024 with the Price quoted is valid for 6 Months from the date of Quote supplied (till 10th March).
2	PV Inverter	120 KW, String inverter	140 KW, String inverter		Goodwe	4	1		
3	MMS	Pre galvanised			SRPL	520 KW	144 KW		
4	MC4 Connector	Male & Femle Pair			Elmex/ Reputed	No	No		
5	DC Cable	4& 6 sq solar cable			Polycab	Set	Set		
6	AC cable	300 Sq armoured cable			Polycab	Set	Set		
7	RMU	WiFi/GPRS			Goodwe	1	1		
8	Earthing	AC/DC, 2 mtr Chemical			Standard	8	4		
9	Lightning arrestors	79mtr radius lighting Arrester, SS Supporting mast 2 no, 70 Sq.mm Copper Cable, earthing system, earth chamber and Installation.			Reputed	1	1		

Selection of the manufacturers/Suppliers of major components is based on the reputation and the reliability of the products. The list of suppliers is reasonable.

Proposed Solar Plant Cost

Initial Project cost estimates based on the Quotations from the P&M Supplier (Solaryte India Pvt Ltd) is given below.

Projects	Kodad-520 KWp	Arpanapally-144 KWp
Cost item	**INR**	**INR**
Design and Supply of Solar equipment	18,586,420.00	5,403,262.50
GST @12%	2,230,370.40	648,391.50
I&C and Civil foundation cost	2,444,000.00	820,800.00
GST@18%	439,920.00	147,744.00
Solar plant Hard Cost (Hard Cost)	**23,700,710.40**	**7,020,198.00**
Total Solar Plant Hard Cost of the 2 projects (In INR)		**30,720,908.40**
Total Solar Plant Hard Cost of the 2 projects (In Million)		**30.72**
Per MW Cost (In Million)		**46.27**

The Cost of the Projects comes out to be INR 46.27 Million per MW (excluding project soft cost) for setting up 0.66 MW (0.52 MW + 0.14 MW) solar plant, which seems to be slightly on higher side compared to the present market rate of Rs. 40 Million to Rs. 45 Million per MW.

As justification given by the Company, the project cost is slightly on higher side due to the cost of logistics, civil works and the small volume of the Project

Alternate Quotation:

The Company has also explored different EPC contractors and has obtained EPC quotes from alternate party, KL enterprises.

The quotations are tabulated below

Projects	Kodad-520 KWp	Arpanapally-144 KWp
Cost item	**INR**	**INR**
Design and Supply of Solar equipment	22,095,000.00	9,559,000.00
GST @12%	2,651,400.00	1,147,080.00
I&C and Civil foundation cost	3,560,000.00	870,000.00
GST @18%	640,800.00	156,600.00
Solar plant Hard Cost (Hard Cost)	**28,947,200.00**	**11,732,680.00**
Total Solar Plant Hard Cost of the 2 projects (In INR)		**40,679,880.00**
Total Solar Plant Hard Cost of the 2 projects (In Million)		**40.68**
Per MW Cost (In Million)		**61.26**

Quotations from KL enterprises also are similar to the quotes of Solaryte India Pvt Ltd (SIPL).

Quote of SIPL for the 520 KWp plant is Rs.2,58,88,257.60 and the quote for the 144 KWp plant is Rs.1,08,89,992.00.

Quote from SIPL are slightly less than those of KL enterprises.

Scope of Work

The proposed Project would be executed on a turnkey basis including pre-project study, system design, engineering, procurement, installation and commissioning.

The scope of work is as below.

SCOPE OF SUPPLY				
Design, Procurement, Supply, Installation and T&C				
S. No	**Description**	**Scope of Works**		**Remarks**
		Installer	**customer**	
A. Supply & Installation				
1	SPV Modules (Mono Crystalline)	✓		
2	Mounting Structures	✓		
3	Inverters (On-grid)	✓		
4	DC Cables, Accessories	✓		
5	Identifying the AREA for Installation		✓	
6	Identifying ventilated room for systems		✓	
7	Water and Electricity required to carry out Installation		✓	
8	Route/ Lift access for movement of goods at Site		✓	
9	Water washing arrangement, pipelines, and sprinkles during maintenance		✓	
10	Security of Installed system		✓	
11	Other equipment / service expressly not mentioned in our offer.		✓	
12	Other statutory/ legal and other applicable requirements and approvals not mentioned in our offer.		✓	
13	Lesioning Works		✓	
14	Civil Works if required	✓		
15	Permission for storage and providing security		✓	
16	Permission for Load Shut down during power evacuation		✓	
B. Testing & Commissioning				
1	SPV Modules (Mono-Crystalline)	✓		
2	Inverters Grid tie	✓		
3	Cable continuity checking, gladding & termination	✓		
4	Electrical Loop checking until main LT Panel	✓		
5	Performance test & handover of Solar PV System	✓		

Project/Equipment details

PV Module

Technically, PV modules can be broadly divided into two main categories: crystalline silicon and thin film.

1. Crystalline silicon (c-Si) modules use cells of either mono-crystalline or multi crystalline silicon. The cells are manufactured by cutting wafers from a solid ingot block of material. Key Features of Crystalline technology is:

- Crystalline technologies are commercially proven and have a track record of over 25 years in operation.
- Market Share of 95%
- Conversion Eff. from 18 to 24%

2. Thin film modules are made with a thin film deposition of semi-conductor onto a substrate. Although relatively new compared to crystalline technologies, some Thin Film technologies are being increasingly used in large scale installations. Thin film modules include semi-conductors made from amorphous silicon (a-Si), Cadmium Telluride (CdTe) and Copper Indium Gallium di-Selenide (CIGS). Key features of thin film technology are:

- Market Track record of 15 years with market Share of 5
- Conversion Eff. 6 – 12%
- Lesser temp. Co-efficient making it suitable for high temp. regions.

Project site does not have very high average temperature on the other hand land availability is very critical therefore use of Crystalline technology is recommended. 25 years proven track record also reduces the life cycle risk.

Plant design and analysis has been performed considering Mono crystalline modules.

Mono Crystalline silicon technology has a proven track record and given the fact that the Vikram solar modules provide a 25-year performance warranty, these modules can be considered for a project of this size.

Dat sheet of the Vikram Solar module is given below.

solaryte

SOLARYTE INDIA PVT LTD
(An ISO 14001, 9001, 50001 Certified Company)
Plot #B, 437, Sector 8, CDA, Cuttack - 753014, India.
Web: www.solaryte.com, Email: info@solaryte.com.

ANNEXURE – VII

SOLAR PANEL DATA SHEET

somera
HIGH EFFICIENCY MONOFACIAL PV MODULES
535-560W

MAXIMUM EFFICIENCY %	POSITIVE POWER TOLERANCE -WP	CELLS	MODULE TECHNOLOGY
21.72	0~+4.99	M10 144	HALF CUT & MICRO GAP DESIGN

- **CYLINDRICAL TABBING WIRE** increases cell absorption by enhancing scattering effects
- Implementation of bypass diodes in split JB series-parallel connections enable the module to perform in **PARTIAL SHADOW CONDITIONS** with respect to full-cell module
- **HIGHER NUMBER OF BUSBARS** make the PV modules less prone to loss in efficiency and increases tolerance to micro cracks
- **FIELD RELIABILITY** is improved due to multiple contact points on the cell which lowers the cell stress during module fabrication
- **LCOE IS CUT BACK** by using M10 size solar cell with adding more power output than lower size cell module
- **LOWER INTERNAL RESISTANCE** boosts module power helping to achieve minimal power loss with respect to previous variant modules

Monocrystalline Solar PV Modules, Monofacial, MBB, M10 Half-Cell, SOMERA VSHH-72-AAA-05

FRAME	SUPERSTRATE	SUBSTRATE
SILVER	GLASS	BACKSHEET WHITE

DCR CONTENT MODULE AVAILABLE

APPLICATIONS
- On-grid large scale utility systems
- On-grid rooftop industrial and commercial systems
- Rooftop residential systems

vikramsolar
CREATING CLIMATE FOR CHANGE

vikramsolar
CREATING CLIMATE FOR CHANGE

TECHNICAL DATA
SOMERA 535-560W

THIS DATASHEET IS APPLICABLE FOR: SOMERA VSMH.72.AAA.05 (AAA=535-560)

Electrical Data[1,2] All data refers to STC (AM 1.5, 1000 W/m², 25°C)

Peak Power P_{max} (Wp)	535	540	545	550	555	560
Maximum Voltage V_{mpp} (V)	41.6	41.7	41.8	41.9	42	42.1
Maximum Current I_{mpp} (A)	12.87	12.96	13.05	13.14	13.23	13.32
Open Circuit Voltage V_{oc} (V)	49.4	49.5	49.6	49.7	49.8	49.9
Short Circuit Current I_{sc} (A)	13.56	13.64	13.73	13.82	13.95	14.05
Module Efficiency (%)	20.75	20.94	21.13	21.33	21.52	21.72

1) STC: 1000 W/m² irradiance, 25°C cell temperature, AM1.5g spectrum according to EN 60904-3. | 2) Power measurement uncertainty is within +/- 2%.

Electrical Parameters at NOCT[3]

Power (W)	399.20	402.80	406.70	410.60	414.20	418.10
V@P_{max} (V)	38.40	38.40	38.70	38.80	39.10	39.20
I@P_{max} (A)	10.39	10.48	10.51	10.58	10.59	10.66
V_{oc} (V)	46.00	46.00	46.20	46.20	46.70	46.80
I_{sc} (A)	10.96	11.06	11.09	11.17	11.17	11.24

3) NOCT irradiance 800 W/m², ambient temperature 20°C, wind speed 1 m/sec.

Temperature Coefficients (Tc) permissible operating conditions

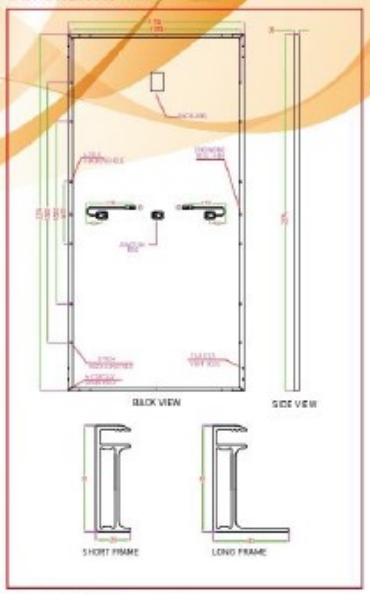
Tc of Open Circuit Voltage	-0.27%/°C
Tc of Short Circuit Current	0.050%/°C
Tc of Power	-0.35%/°C
Maximum System Voltage	1500V
NOCT	45°C ± 2°C
Temperature Range	-40°C to + 85°C

Mechanical Data

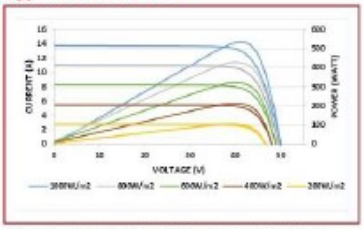
Length × Width × Height	2274 × 1134 × 35mm (89.53 × 44.65 × 1.38 inches)
Weight	28.2 Kg (62.17 lbs)
Junction Box	IP68, Split Junction Box with individual bypass diodes
Cable & Connectors*	1200 mm (+ve terminal) and 1200 mm (-ve terminal) length cables,MC4 Compatible/MC4 Connectors
Application Class	Class A (Safety class II)
Superstrate##	3.2 mm (0.125 inches) high transmission low iron tempered glass, AR coated
Cells	72 Mono PERC (144 half-cells) P-Type solar cells
Back Sheet	Composite film
Frame	Anodized aluminium frame with twin wall profile
Mechanical Load Test	5400 Pa (Snow load), 2400 Pa (Wind Load)
Maximum Series Fuse Rating	25A

Dimension's uncertainty is within ±2mm.

Dimensions in mm



Typical I-V Curves[4]



4) Average relative efficiency reduction of 5% at 200 W/m² according to EN 60904-1.

Performance Warranty

Warranty and Certifications

Product Warranty**	12 years
Performance Warranty**	Linear Power Warranty for 27 years with 2% for 1st year degradation and 0.55% from year 2 to year 27
Approvals and Certificates^	IEC 61215 : 2016, IEC 61730 : 2016, IEC 61701, IEC 62716, IEC 60068-2-68, IEC 62804, CE, CEC (California), UL 61215, UL 61730, CAN-CSA

^ All (*) certifications under progress. | ** Refer to Vikram Solar's warranty document for terms and conditions. | * 400mm(15.75 inches), 1800mm(39.37 inches),1200mm (47.24 inches) cable lengths are also available | ## Anti-glare Glass is also available

Packaging Information

Quantity /Pallet	31
Pallets/Container (40'HC)	20
Quantity/Container (40'HC)	620

CAUTION: READ SAFETY AND INSTALLATION MANUAL BEFORE USING THE PRODUCT.

sales@vikramsolar.com www.vikramsolar.com

VSL/ENG/SC/269-R02_1400_1000

Somera-535W-560W-IE_R02_1400_1000

Proposed Vikaram Solar module is a high efficiency mono crystalline module of 21.43% efficiency. It has positive

tolerance of 0 to +4.99 Wp. The degradation is 2% in the first year and 0.55% per annum thereafter. **Modules are suitable for the project.**

Module string/array

The PV plant is designed to connect Modules in series to form strings and strings are connected in parallel. Each inverter will take load of multiple strings. This arrangement ensures the current and voltage levels match the specification of the inverters.

Modules are connected in series of 19/20 modules per string.

Inverter

The Inverters from this project will be sourced from a renowned manufacturer of Solar Inverters which have been used in multiple projects in India in the recent past as well. The inverters come with following features:

- Modular approach guarantees increased conversion efficiency.
- Advance Grid Management
- Longer expected lifetime.
- Good Track Record in Market
- Extended warranty upto 10 years

A brief of the technical specifications of the inverters proposed is given below.

INVERTER DATA SHEET

HT Series

GOODWE

Technical Data	GW73KLV-HT	GW75K-HT	GW80K-HT	GW100K-HT	GW110K-HT	GW120K-HT	GW136K-HTH
Input							
Max. Input Voltage (V)	800	1100	1100	1100	1100	1100	1100
MPPT Operating Voltage Range (V)	180 – 650	180 – 1000	180 – 1000	180 – 1000	180 – 1000	180 – 1000	180 – 1000
Start-up Voltage (V)				200			
Nominal Input Voltage (V)	370	600	600	600	600	600	750
Max. Input Current per MPPT (A)				30			
Max. Short Circuit Current per MPPT (A)				45			
Number of MPP Trackers	12	10	10	10	12	12	12
Number of Strings per MPPT				2			
Output							
Nominal Output Power (kW)	73	75	80	100[*1]	110	120	136
Nominal Output Apparent Power (kVA)	73	75	80	100[*1]	110	120	136
Max. AC Active Power (kW)	69@208V; 73@220V; 75@240V	75	88	110[*1]	121[*1]	132[*1]	150[*1]
Max. AC Apparent Power (kVA)	75	75	88	110[*1]	121[*1]	132[*1]	150[*1]
Nominal Output Voltage (V)	220V, 3L / N / PE or 3L / PE	380V / 400V, 3L / N / PE or 3L / PE[*2]		400V, 3L / N / PE or 3L / PE[*2]			500V, 3L / PE
Nominal AC Grid Frequency (Hz)				50 / 60			
AC Grid Frequency Range (Hz)				45 ~ 55 / 55 ~ 65			
Max. Output Current (A)	192.0	125.3	134.0	167.0	175.5	191.3	173.2
Power Factor				~1 (Adjustable from 0.8 leading to 0.8 lagging)			
Max. Total Harmonic Distortion				<3%			
Efficiency							
Max. Efficiency	98.4%	98.6%	98.6%	98.6%	98.6%	98.6%	99.0%
European Efficiency	98.1%	98.3%	98.3%	98.3%	98.3%	98.3%	98.5%
Protection							
PV String Current Monitoring				Integrated			
PV Insulation Resistance Detection				Integrated			
Residual Current Monitoring				Integrated			
PV Reverse Polarity Protection				Integrated			
Anti-islanding Protection				Integrated			
AC Overcurrent Protection				Integrated			
AC Short Circuit Protection				Integrated			
AC Overvoltage Protection				Integrated			
DC Switch				Integrated			
DC Surge Protection				Type II (Type I optional)			
AC Surge Protection				Type II (Type I optional)			
AFCI				Optional			
Remote Shutdown				Optional			
PID Recovery				Optional			
General Data							
Operating Temperature Range (°C)				-30 ~ +60			
Relative Humidity				0 ~ 100%			
Max. Operating Altitude (m)				5000 (>4000 derating)			
Cooling Method				Smart Fan Cooling			
User Interface				LED, LCD (Optional), WLAN + APP			
Communication				RS485, WiFi or 4G (Optional)			RS485, WiFi or 4G or PLC (Optional)
Communication Protocols				Modbus-RTU (SunSpec Compliant)			
Weight (kg)	98.5	93.5	93.5	93.5	98.5	98.5	98.5
Dimension (W × H × D mm)				1008 × 678 × 343			
Topology				Non-isolated			
Self-consumption at Night (W)				<2			
Ingress Protection Rating				IP66			
DC Connector				MC4 (4 ~ 6mm²)			
AC Connector				OT / DT terminal (Max. 300mm²)			

*1: For Australia is 99.99kW / kVA (GW100K-HT).
*1: For Chile Max. AC Active Power (kW) & Max. AC Apparent Power (kVA): GW100K-HT is 100K; GW110K-HT is 110K; GW120K-HT is 120K; GW136K-HTH is 136K.
*2: For Brazil, Nominal Output Voltage (V): 380, 3L / N / PE or 3L / PE.

The string inverter of 120 KW capacity has 12 MPPTs and efficiency is 98.6% and is IEC approved. Goodwe has sizable population in India and reasonably good footprint. The inverters have earned a name. Service is also good.

Module Mounting Structures & Foundation

Fixed module mounting system of 13-degree inclination to horizontal has been chosen. The mounting structures material to be selected shall comply with the appropriate industrial standards and shall be capable of withstanding on-site loading and climatic conditions. Material to be used shall be hot-dipped galvanized mild steel.

Strength of mounting structure shall be designed to withstand upper limit of the wind speed range.

The modules shall be arranged in landscape orientation in two/three rows to minimize the effect of shading of 19/20 modules are assembled per mounting structure. Figures below illustrate the typical mounting structure layout and orientation and pitch respectively:

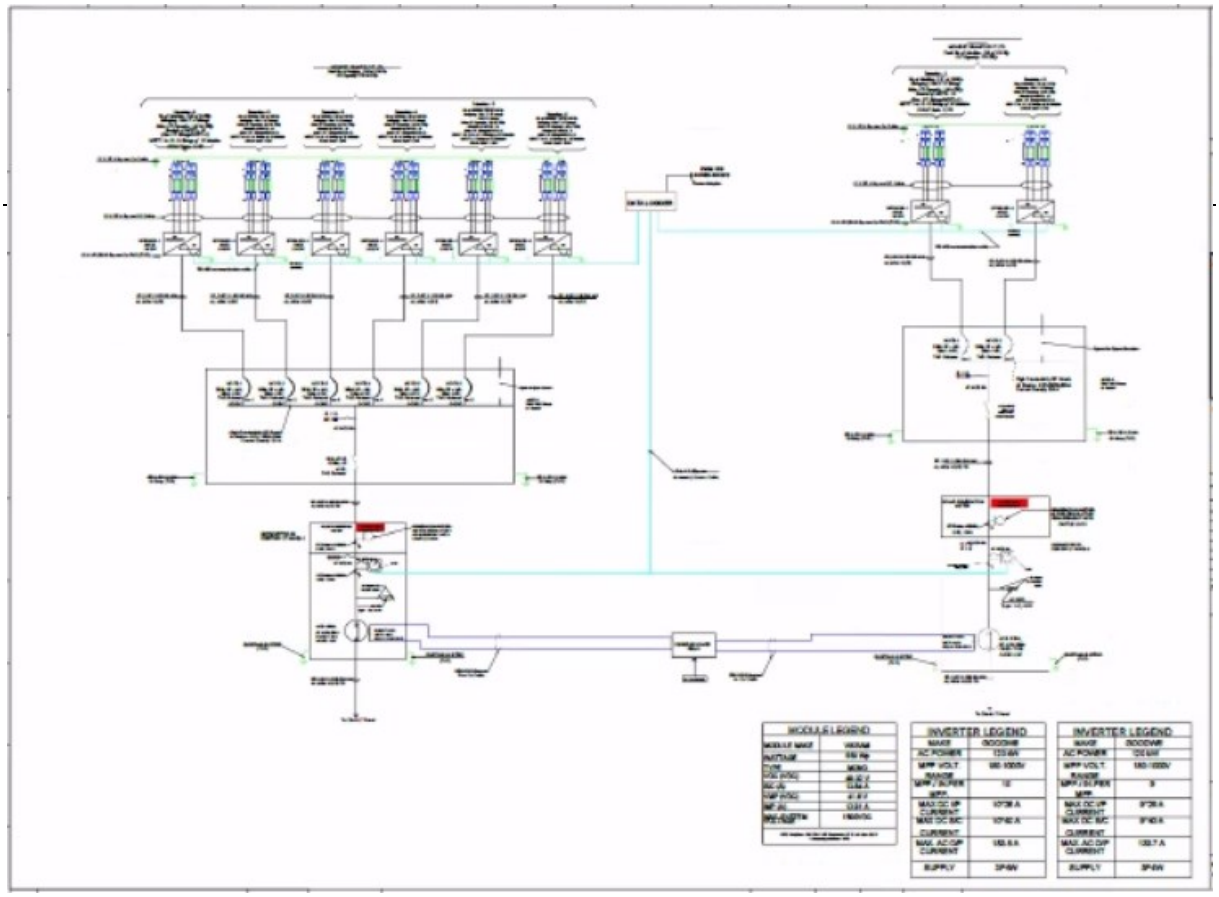
The structures will be made up of hot –dip galvanized steel and designed to withstand forces during normal conditions (viz. wind loads & dead load of switchyard components) and abnormal conditions (viz. short circuit, earthquake, etc).

Structural foundations

Civil foundation to mounting structure shall be designed to hold the mounting structure upright considering the material load added with maximum possible wind thrust. Depth and dimension of foundation base shall be decided considering that structure must not breach the net bearing capacity of soil as identified in soil test report.

Electrical Scheme

Below given is a typical SLD of the 1000 KWp Plant with 8 nos of 120 KW inverters.



The 550 WP modules are connected is series of 19/20 modules per string. 13/14 such strings are connected to one string inverter of 120 KW rating. DC input to the inverter is thus 140 to 143 KWp. 3 Phase output of the inverters at 415 V is terminated in a LT panel through appropriate MCCBs and the combined output is connected to the Project site LT system through ACB. Net metering will be installed that will record the import and export of the Power to the Grid.

The planned electrical scheme of the plant is adequate for the size of the plant. String inverters and the connection at LT level of 415 V with net metering is good scheme.

Monitoring & Data acquisition

The power plant will incorporate a communication system to monitor the output of each string and inverter so that system faults can be detected and rectified before they have an appreciable effect on production. In addition to web-based internet portal solution, the monitoring system will have local display showing instantaneous and cumulative energy produced, tons of CO2 saved, etc.

It is proposed to use platform designed for monitoring and logging site data. Monitoring system includes the following on-site components:

- Software based real time monitoring interface.
- Plant Management software customized to plant requirement.
- Electric Meters with communication ports to interact with software.
- Weather Station (which includes module and ambient temperature sensor, pyranometer for irradiance measurements and anemometers for wind speed measurement).
- Cellular (or Satellite) modem for transfer of real time data

Monitoring system is also equipped with remote access facility which can be used to access and monitor data from any location using internet. Client Connect is a secure web portal that can be used to access information about energy production and usage, weather, environmental offsets, costs savings, and more.

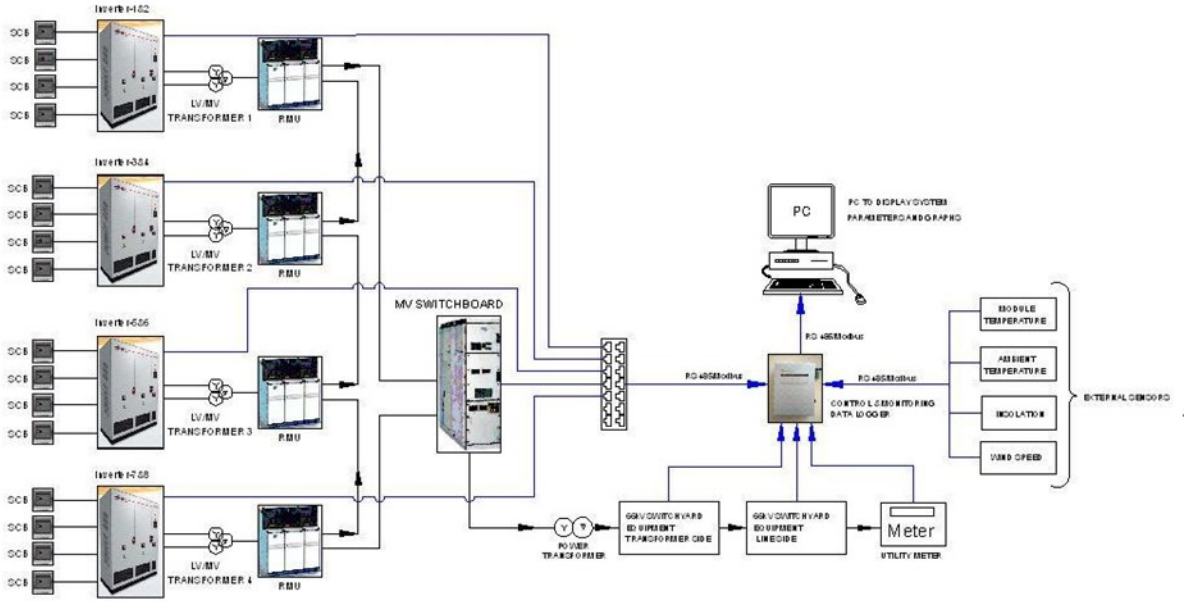
All major parameters are available on the digital bus and logging facility for energy auditing through the internal microprocessor and can be read on the digital front panel at any time the current values, historical values for up to a month and the average values (However endless historical data can be preserved).

The following parameters can be accessible through the operating interface display.

- AC Output current
- AC Voltage
- Output Power
- DC Input Voltage
- DC Input Current
- Time Active
- Time disabled
- Time Idle
- Temperatures

- Inverter Status

Typical schematic of the monitoring system architecture is indicated below:



Power evacuation

The Direct Current (DC) from modules is converted into Alternating Current (AC) by inverters. The inverter outputs are fed into a LT panel whose output in turn is connected (using 1.1 KV XLPE cable) to the common 415 V AC busbar through ACB.

LT panel and the Metering

Under normal climatic and extreme conditions (viz., earthquake), the LV and Metering panels meet the following requirements:

a) The physical alignment of 415V switchgear panels along with incoming and outgoing feeder connections, supporting insulators & structures of bus bars are not going to get disturbed and there will not be any internal flashover and/or electrical fault.

b) All relays, transducers, indicating instruments and devices in switchgear panels will maintain normal functions.

c) Current carrying parts, supporting structure, earth connection etc. will not get dislocated and /or will not break or distort.

d) Co-ordination with other systems.

All equipment will have necessary protections in switchgear along with necessary arrangement for receiving, isolating, distributing and fusing of 400 Vac supplies for various control, lighting, space heating and spring charging circuits.

Cables

All the DC and AC cables are designed for outdoor application with a continuous ambient temperature of 50°C. They are sized for a power loss below 1.5% and a voltage drop less than 2%.

DC Cabling: All the modules shall be equipped with attached junction boxes with 4mm^2 connecting leads. Modules will be interconnected using MC4 connectors to form a string of 19/20 modules using these leads.

AC Cabling: The three phase AC output from each of the inverters will be connected to the LT panel through 3.5 cores, 300mm^2 XLPE aluminium core cables.

Circuit breakers

- The circuit breaker will be totally re-strike free under all the duty conditions and will be capable of breaking magnetizing current of transformer and capacitive current of unloaded overhead lines without causing over voltages of abnormal magnitudes.
- Closing coil will be suitable for operation at all values of voltages between 85 % and 110 % of the rated voltage. Shunt trip will operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70 % and 110 % of rated voltage.

Earthing

A safety earthing system consisting of a buried GI flat conductor earthing grid will be provided for the switchyard. The earthing system will be formed to limit the grid resistance to below 1 ohm. In the switchyard area, the touch potential and step potential will be limited to the safe values. The earthing design will be as per IEEE: 80 recommendations and IS: 3043.

The buried earthing grid will be connected to earthing electrodes buried underground. Neutral point of generator transformer, non-current carrying parts of equipment, lighting arrestors, fence etc, will be earthed rigidly. The following factors will be considered for earthing system design:

- Magnitude of fault current.
- Duration of fault.
- Soil resistivity.
- Resistivity of surface material.
- Shock duration.
- Material of earth conductor and
- Earth mat grid geometry.

Lightning arrestors

The plant and various equipment and components need to be protected from the Lightning and so ESE type LAs with 79-meter radius are planned to be installed in the solar PV array area.

Other Plant Components

PV power plant shall also consist of:

- Security and Surveillance System
- Fencing and Boundary
- Water Drainage Network
- Cleaning Water Distribution System
- Fire & Safety Devices
- Earthing of all electrical components

Energy Yield studies

Energy yield have been predicted for the Project using the basic design and indicative layout as described in the previous section. Below are the steps used for yield prediction.

1. Sourced average monthly horizontal irradiation, wind speed and temperature data from a renowned source i.e., ISRO. These data have been assessed and judiciously selected for use in the energy yield simulation software.
2. Calculated the global incident radiation on the collector plane, taking shading into account.
3. Calculated the losses, using details of the inverter specifications, PV module specifications, PV module characteristics, on-site conditions and plot layout.
4. Applied downtime losses, ohmic losses, module degradation and transformer losses to obtain an energy yield that reflects a twenty-five-year plant life.

Steps 2 and 3 are facilitated using industry standard photovoltaic simulation software which simulates the energy yield using hourly time steps. The software takes as input detailed specifications of:

- The solar PV modules.
- The inverter.
- Electrical configuration including number of modules in series and parallel.

Radiation in the Plane of modules

The annual global irradiation incident on the collector plane of the modules has been maximized by optimizing the tilt angle to 13°. ISRO data is used to calculate the incident global irradiation on tilted collector plane from irradiation in the horizontal plane.

Below given is the data considered for the 144 KWp plant in Arpanapally and the 520 KWp plant in Kodad area.

GEOGRAPHICAL DATA

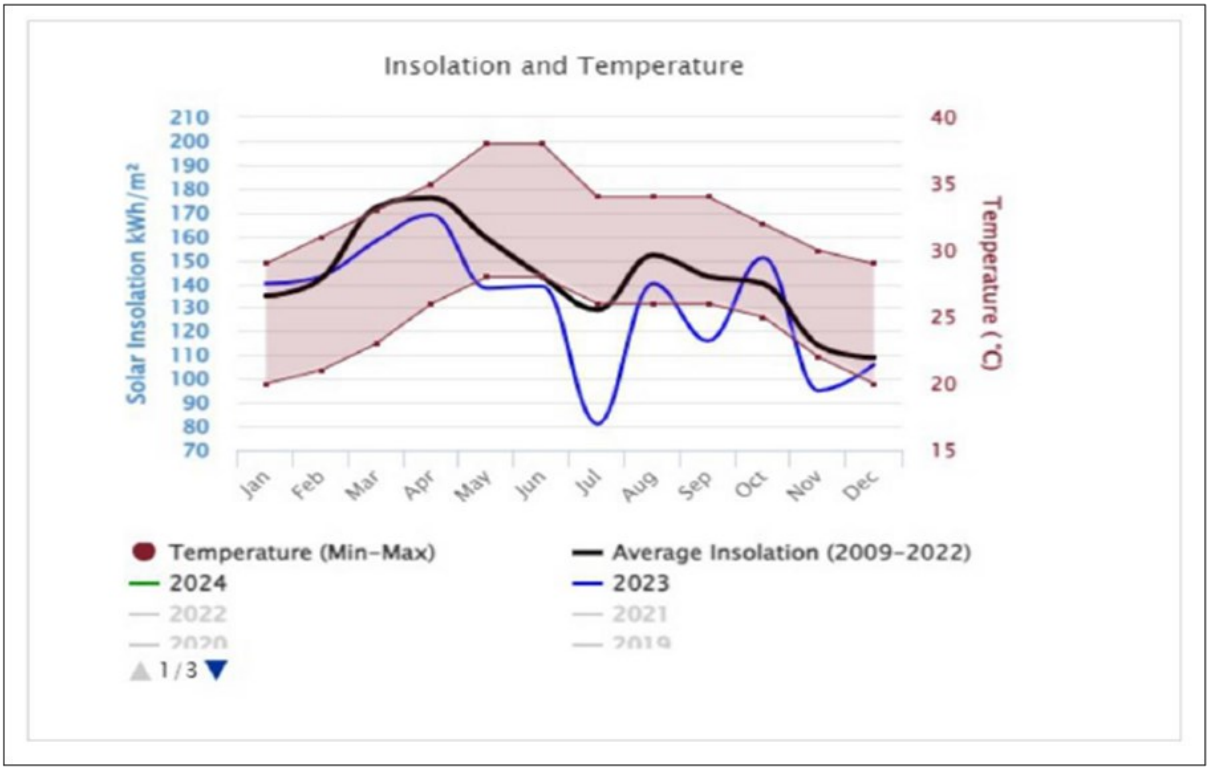
ISRO Solar Calculator

Longitude /Latitude:	**Location :**
79.99 / 15.50	Ongole Chandrapalem Road, Mangamuru, Santhanuthala Padu, Prakasam District, Andhra Pradesh. Pin-523225 (India)
DayLength (Min / Max) :	**Avg Temp. (Min / Max) :**
11.08 / 12.92 hours	24 °C / 33 °C
Tilt Angle for Solar PV :	**Annual Global Insolation :**
13°	1714 (kWh/m2/year)
Power Production of PV :	
359.9 kWh/m2/year considering 21 % efficency and energy loss. 10 m2 of PV will generate 3599.4 units per year	

Below is the data of monthly temperatures and the monthly insolation for the period 2009 to 2022.

Long Term Monthly Temperature (°C)													
Months	Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	24	20	21	23	26	28	28	26	26	26	25	22	20
Max	33	29	31	33	35	38	38	34	34	34	32	30	29
Long Term Monthly Solar Insolation (2009-2022)(kWh/m2)													
Months	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	1395	115	132	149	163	133	112	81	124	102	110	77	97
Max	2060	143	152	183	186	183	196	193	208	193	168	134	121
Avg	1714	135	142	172	176	159	143	129	152	143	140	114	109
Std	15	7	6	10	8	13	20	32	24	24	17	17	6
Monthly Solar Insolation (2009 -2024)(kWh/m2)													
Years	Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2024	130	130											
2023	1576	140	143	158	169	138	139	81	140	116	151	95	106
2022	1560	129	145	180	167	133	127	102	130	125	110	106	106
2021	1516	134	132	180	164	139	122	99	124	102	124	77	119
2020	1673	131	142	170	163	169	132	139	133	142	134	103	115
2019	1616	115	138	149	168	166	154	103	140	131	115	134	103
2018	1749	141	134	170	181	163	155	124	154	157	143	124	103
2017	1760	134	146	176	182	166	137	141	139	150	145	123	121
2016	1738	135	148	175	184	151	132	138	160	129	144	133	109
2015	1696	132	145	172	166	163	112	164	145	138	148	96	115
2014	1694	136	139	157	183	160	162	115	148	136	142	119	97
2013	1624	138	137	175	180	164	133	93	142	130	112	107	113
2012	1884	141	152	182	175	170	145	128	208	189	159	133	102
2011	1923	142	136	183	185	183	196	185	172	157	144	133	107
2010	1948	143	145	182	186	164	142	193	202	193	168	123	107
2009	1754	137	147	173	182	163	160	123	149	148	154	106	112

Below is the graph of the monthly temperatures in the year 2023 and the monthly insolation figures in the year 2024.



Capacity Utilisation factor

The Capacity Utilization Factor (CUF) also known as Plant Load Factor (PLF) of a PV power plant (usually expressed as a percentage) is the ratio of the actual output over the period of a year and its output if it had operated at nominal power the entire year, as described in the formula below.

$$CUF = \frac{Energy\ generated\ per\ annum}{8760\ (hours\ /\ annum) \times Installed\ Capacity\ (kWp)}$$

The CUF of the plant is computed to be around 13.18% for these plants in Telangana.

Performance Ratio

The quality of a PV power plant may be described by its Performance Ratio (PR). The PR, usually expressed as a percentage, can be used to compare PV systems independent of size and solar resource. The PR may be expressed as:

$$PR = \frac{AC\ Yield}{Installed\ Capacity \times Plane\ of\ Array\ Irradiation} \times 100\%$$

PR for the PV plants is computed to be around 73.77% for plants in Telangana region and with domestic module.

Degradation

Table below summarizes the total energy yield of PV plant and its first year (initial) degradation of 2% and an annual degradation of 0.55%.

Yield Uncertainty

The uncertainty in an energy yield prediction is difficult to quantify as it is a function of many independent factors. The discussion below represents a simplification of the estimated uncertainty which is believed to be the best approach given the uncertainty in the resource data.

1. A typical relative accuracy of measurements at meteorological stations by a well maintained pyranometer is 3-5%. This represents the upper limit in accuracy of resource data obtained through meteorological stations.

2. Mean global daily irradiation on a horizontal plane varies on an annual basis. This means that the plant owner does not know what energy yield to expect in any given year but can have a good idea of the expected yield in the long term. The likely variation can be quantified based on analysis of variation in long-term irradiation data in the vicinity of site. This exercise gives the standard deviation of variation in irradiation. Where measured historical irradiation data for the site is not available, analysis of nearby meteorological stations and satellite derived data must be used.

Uncertainty in radiation measurement, simulation modeling and annual resource variation can be combined and applied on energy yield to check the impact on uncertainty. Same has been taken care by applying sensitivity on Energy Yield in financial analysis.

Construction of the Project and O&M

Start-up requirements

Site Preparation

The site preparation shall include all the work as required for installation of a utility scale solar PV plant as per international practices. This shall essentially include:

- Clearing of weeds, chopping down of small bushes and trees.
- Levelling of land with excavation and back filling of soil.
- Movement of soil for levelling within the site or by bringing soil from outside.
- Grading the soil with south slope, this may be clear subsequent to topographical survey.
- Construction of culverts on cross flow, if required.

As a part of site preparation, all roads shall be designed and constructed to allow smooth on-site transportation and delivery of all project components to installation location and heavy equipment to their respective work locations.

Internal Roads and Pathways

All roads shall be designed and constructed to allow smooth on-site transportation and delivery of all project

components to installation location and heavy equipment to their respective work locations. At all cable crossings, Hume pipes of appropriate sizes shall be embedded within the road.

Main approach and internal roads shall be designed for a life of 25 years. Roads shall be constructed at minimum 300mm above ground with required cutting of soil, grading to the given slopes, backfilling and due compaction. All the Main approach and internal roads shall be WBM type as per relevant standards. Minimum width of main approach road and internal roads shall be 4.5m and 3m respectively.

Construction Power & Water Supply

A temporary connection of ~10 kW shall be taken initially to cater the requirements of the construction power, and then will be ramped up as required during the project construction cycle. As a back arrangement sufficient capacity DG set must be kept at site.

Supply of construction power shall commence 15 days prior to first excavation work on the site. As recommended in the above section the construction substation can be converted as a source for auxiliary supply. As already explained in previous sections there are four wells within the project site. Water can be pumped out from wells using pump or a water bore well can be constructed at site for meeting water requirement during construction. 3000-4000 Liter/day water is required during civil construction phase. Same bore well can serve post commissioning cleaning water requirement. The location of the water body to be planned will be done in a strategic manner by the EPC Contractor to ensure maximum efficiency of the water at the site and also for cooling reasons.

External Lighting & Security System

Main approach road and internal roads shall be lit with external lighting system strategizing site security and maintenance requirements; utmost care should be taken for avoiding any shading effect due to the poles. The light fittings shall be highly efficient having longer life. LED based system may be used.

Bollards of height upto 3 feet shall be installed along the main approach road towards modular plot. Additionally, flood lights may be mounted at strategic locations along the boundary of the PV plant.

Sufficient security staff must be appointed at site separately for day and nighttime. Material Storage and Material handling section at site must have dedicated security staff. Preferably the material handling section shall be a temporary covered space.

Fire Fighting & Health Safety System

The solar PV plant shall be equipped with suitable fire protection and fighting systems for entire construction area, all control rooms and sections as per the NFPA fire safety standards and local fire authority requirements. Portable type fire extinguishers shall be provided as means of dealing effectively and immediately with fire caused from oils, solvents, gases, paints, varnishes, electrical wiring and all flammable liquids and gases. Following type of portable fire extinguishers shall be provided in PV array area, modular plot control rooms and main control rooms.

- DCP type fire extinguisher 10kg capacity.
- CO2 operated hand portable extinguisher 9kg Capacity.

- Foam type hand portable extinguisher 9kg capacity.

Additionally, two 75 litres, CO2 operated, trolley mounted fire extinguishers having a minimum jet range of 8m shall be provided. These shall be placed in the main control room.

Operation and Maintenance

O&M staff required for power project is as below:

- Engineers – 01
- Technicians -02
- Security Staff –2
- Daily Wages Labour for module cleaning - as per requirement

The energy yield of the plant will be monitored using the remote data acquisition system connected to each inverter as described in earlier section. Significant reduction in energy yield will trigger specific maintenance requirements, such as inverter servicing or module replacement. In addition to this, on-going maintenance of the plant may be required. Typical activities are as described below:

Modules: Visual inspection and replacement of damaged modules will be required at regular intervals. Cleaning of the module glass surface during long dry periods may be considered. Cleaning may be conducted using a tucker pole (a long hollow pole with a hose fitting on one end and a soft bristle brush on the other) or automatic water sprinkling system.

Water: A water storage tank of $4m^3$ litres capacity shall be provided to cater for module cleaning and sanitation. The water tanks shall be capable of providing water for a minimum period of 2 days. Alternatively, air blowers or vacuum cleaners may also be used in water scarcity. Vacuum cleaners are expected to be more effective as blowing of sand would result in resettlement on other modules.

General Maintenance: Vegetation will need to be cut back if it starts to cause a fire risk or introduce shading.

Module Support Structure: Frequent visual inspection for general integrity of the structure, corrosion, damage and fatigue. All frame connections should be checked for deflections or tears at the module and cross beams to assess the need for replacement.

Wiring And Junction Boxes: Visual inspection for corrosion, damage such as chafing, and damage by rodents and birds, and for overheating of cables and connections. This requires the skills of an electrical technician.

Inverters: Inverter maintenance requires the skills of an electrical technician. It involves visual inspection of the fans, tightening leads and cleaning using a vacuum cleaner or brush.

Safety Devices: Checking connections, functionality of isolators and circuit breakers, and for signs of overheating.

Security System: Visual inspection for damage and breaches in the security fence.

Spares: Sufficient quantity of spare components must be maintained at site as provided by EPC contractor under O&M manual.

Project Implementation

The project implementation from the date of issuing letter of intent to the EPC Contractor is expected to be done in a time span of 3 - 4 months, during which detailed engineering, procurement, erection and commissioning of civil & structural, mechanical and electrical equipment will be executed.

Project developer will appoint owner's engineer to manage the project implementation process and to avoid any delays and cost overrun. This team will become responsible for:

- Implementation
- Soil investigation
- Co-ordination and arranging for all requisite statutory compliances / consents for project implementation.
- Project planning & programming in consultation with the Technical consultant
- Co-ordination with the Turnkey project executor for smooth implementation as per the contractual agreement
- Ensuring the terminal points and provide site support services w.r.t. land availability, storage space availability, utilities, construction power, civil front construction.
- Inspection of equipment
- Monitoring work progress & generation of reports
- Periodic project reviews and interactions
- Control over the project cost
- Ensure the grid connectivity to the project site from the nearest sub-station, as it will have a major impact on timely project commissioning on completion of construction,
- Check for proper implementation of the project as per specifications & drawings.
- To ensure all statutory compliances required for commissioning of the project.
- Assist the Turnkey project Executor in Plant commissioning & stabilization activities.
- Performance tests & Trial runs
- On successful of above, takeover plant operation

Detailed Project Implementation schedule is given herein under

S. No.	Particulars	Expected date of commencement	Expected date of completion
1.	Acquisition of land	Completed	-
2.	Conversion of land into industrial use, if applicable	Not applicable	-
3.	Building construction and related civil works	Jan-25	Jan-25
4.	Installation of plant and machineries	Jan-25	Mar-25
5.	Trial Run	Mar-25	Mar-25
6	Date of Operationalization	Apr-25	Apr-25

S. No.	Particulars	Expected date of commencement	Expected date of completion
7	Details of any delays that have been experienced so far in execution	Nil	

Targeted COD of the Projects is considered on 1st April 2025, which seems to be is reasonable.

Statutory Approvals

Below are the list of approvals needed from the Govt/semi govt/autonomous bodies for execution of the projects by ML.

S. No.	Approval	Authority	Doc Reference No.	Status
Arpanapally				
1	Technical feasibility of installation of the solar PV generator	Northern Power Distribution Company of Telangana Limited	Lr. No. DE/OP/GUDUR/TGNPDCL/SNM-900010282 Dt: 24/07/2024	Received Valid for 4 months (till 21/11/2024)
2	Electrical Scheme	Chief Electrical Inspector of Telangana Government ("**CEIG**")	NA	Application to be filed at relevant stage, before project completion
3	CEIG Approval	CEIG	NA	Application to be filed at relevant stage, before project completion
Kodad				
1	Technical feasibility of installation of the solar PV generator	Southern Power Distribution Company of Telangana Limited	SRT No: -/Dt:25/07/2024	Received Valid for 4 months (till 22/11/2024)
2	Electrical Scheme	CEIG	NA	Application to be filed at relevant stage, before project completion
3	CEIG Approval	CEIG	NA	Application to be filed at relevant stage, before project completion

NOTE: The Company has shared the Certificate of Ownership of Tree/Forest Produce (No. A / 1657 /2024 Dtd. 25/09/2024) issued by Tahsildar, Kodad Mandal stating that the Company is entitled to the timber and other forest produce existing on the land.

The Company is requested to have all relevant approvals and clearances in place as applicable for the corresponding stage of construction under the company name "Midwest Limited". This will ensure that work will not be delayed on account of approvals.

Technical Conclusion

- The Proposed Solar PV Power projects are technically feasible.
- Project locations are reasonably good for the solar insolation.
- All the Power generated from these solar plants will be for own use (Captive use)
- The Solar generation will save on the use of power from Grid and on the monthly bills.
- Mono crystalline technology in the PV modules is a good option as the modules are with good efficiency.
- Use of String inverters will avoid the Cost of buildings and also will help in minimizing the power loss due to failure of inverters if any.
- Estimated Project cost is budgetary and there is scope for economizing. Costing is based on quotes by contractors and there is ample scope for negotiations.
- It is recommended to go for higher DC:AC ratio to maximise the generation like 1.2:1 or even 1.25:1 if the land area permits deployment of higher number of modules.
- The Cost of the Projects comes out to be INR 46.27 Million per MW (excluding project soft cost) for setting up 0.66 MW (0.52 MW + 0.14 MW) solar plant, which seems to be slightly on higher side compared to the present market rate of Rs. 40 Million to Rs. 45 Million per MW.
- The Company is in process of acquiring the balance approvals and clearances for the Project and the same will be obtained as when it is necessary.

Project Cost

Project Cost Summary

The total cost of the project is estimated at INR 32.56 Mn based on estimates made by the Company for various elements of the project. Suitable contingency provisions have also been made for the costs. The summary of the cost of the project is as given in table below:

Particulars	INR Million	%
Solar Power Plant (including I&C and civil cost)	30.72	*94.34%*
Hard Cost	**30.72**	
Contingency Cost	1.54	*4.72%*
Pre-operative Expenses	0.31	*0.94%*
Soft Cost	**1.84***	
Total Project Cost	**32.56**	***100.00%***

** Considering the rounding-off correction, the above figure is the correct value.*

Each of the sub-head of the project cost is discussed in the subsequent sections of the chapter.

Land Cost

The Company has sufficient land for setting up the proposed Project. Therefore no additional land cost is envisaged under this Project.

Solar Power Plant (including I&C and civil cost)

The Plant and Machinery cost for the project has been estimated at INR 30.72 Million, basis quotations received from Solaryte India Pvt Ltd.

Kodad - 0.52 MW				
Product Description	**QTY**	**Unit Price**	**GST (%)**	**Total**
Design, Supply of 0.52 MW Grid tie Ground Mounted Solar PV power Plant	1.00	18,586,420.00	12%	**20,816,790.40**
Installation & Commissioning of 0.52 MW Grid tie Solar PV System Including piling and Civil foundation (1.2 to 1.5mtr depth) for structure	1.00	2,444,000.00	18%	**2,883,920.00**
Total Amount (INR)				**23,700,710.40**
Total Amount (INR in Mn)				**23.70**

Arpanapally - 0.14 MW				
Product Description	**QTY**	**Unit Price**	**GST (%)**	**Total**
Design, Supply of 0.14 MW Grid tie Ground Mounted Solar PV power Plant.	1.00	5,403,262.50	12%	**6,051,654.00**
Installation & Commissioning of 0.14 MW Grid tie Solar PV System Including piling and Civil foundation (1.2 to 1.5mtr depth) for structure	1.00	820,800.00	18%	**968,544.00**
Total Amount (INR)				**7,020,198.00**
Total Amount (INR in Mn)				**7.02**

Contingency

Provision for contingency has been considered at 5.00% of the Plant & Machinery cost, Miscellaneous Fixed Assets and Building & Civil works cost amounting to INR 1.54 Mn. The project cost has been arrived based on estimates provided by the Company; D&B believes that the final negotiated prices would be different from the prices indicated in the estimates; therefore, contingency is considered at 5.00% of various parameters would be adequate to factor in any escalation of prices.

Preliminary and Pre-Operative cost

Preliminary and pre-operative cost for project has been considered at 1% of the total hard cost amounting to INR 0.31 Mn.

Comment upon Project cost Reasonability

The Cost of the Projects comes out to be INR 46.27 Million per MW (excluding project soft cost) for setting up 0.66 MW (0.52 MW + 0.14 MW) solar plant, which seems to be slightly on higher side compared to the present market rate of Rs. 40 Million to Rs. 45 Million per MW.

As justification given by the Company, the project cost is slightly on higher side due to the cost of logistics, civil works and the small volume of the Project.

Means of Finance

The proposed means of finance for the project has been provided in the exhibit below –

Particulars	INR Million	%
Means of Finance – Proceeds from IPO	32.56	*100.00%*
Total Means of Finance	**32.56**	***100.00%***

The Company proposes to fund the entire project through IPO proceeds.

Risk Analysis and Mitigation

The key risks, allocation and mitigation specific to the project are shown in the following table:

Key Risks	Risk Carrier	Proposed Mitigation of Risk
Experience and Capability	ML	Midwest Ltd. demonstrates experience in both the natural stone and mining sectors. It is a well-established player in mining segment. Its expertise in the areas of raw material selection, procurement, mining, mineral processing, plant management and sales & distribution. The Company has obtained EPC quotes from Solaryte India Pvt Ltd and another, KL enterprises. Since the Company is new to solar power generation sector, D&B India advises the Company to ensure recruiting & retaining competent technical staff for smooth set up & operations of the proposed Project. D&B-India also recommend the Company to hire personnel with Project management background during the initial construction period.
Funding Risk	ML	The Company has proposed to fully fund the project through IPO. The Company to ensure timely execution of IPO and raising sufficient fund from the IPO for smooth implementation the Project.
Time Over-run Risk	ML	The Project schedule spans over a period of 8 months post financial closure in July 2024 which is reasonable and achievable, provided funds are mobilized on time and there is close monitoring of the time schedule. D&B India recommends the Company to closely monitor and supervise the critical activities for timely completion of the Project.
Cost Over-run Risk	ML	The land needed for the solar Power plants is in the possession of the Company. The Company has obtained EPC quotes from Solaryte India Pvt Ltd and another, KL enterprises.

Key Risks	Risk Carrier	Proposed Mitigation of Risk
		The Company has considered all the contingencies for the Project as the plan is to complete the project by end of March 2025 under EPC contract with the total cost as proposed in the project cost section. A provision of 5% contingency has considered in case of any escalation in the Project cost. However, in case there is a cost overrun, shortfall may be met out of internal accruals or availing additional borrowings.
Statutory Approvals	ML	The Company has already obtained approval for certificate of ownership of tree/forest produce, and technical feasibility for the project installations. Further, the Company is in process of acquiring the other approvals and clearances for the Project. However, the Management of ML has assured D&B India that all the necessary approvals and clearances will be in place before commissioning of the Project such as Electrical scheme approval and CEIG Approval etc. Since the Company has changed its name from Midwest Pvt Ltd to Midwest Ltd, D&B advises the Company to obtain all the necessary approvals with the name of Midwest Limited. Further, a detailed list of approvals required for the Project is provided in the Technical Assessment section of this report.
Technology Risk	ML	Mono crystalline Technology is proposed to be used in the Project. These modules produce high-energy output across a wide range of climatic conditions due to their superior light absorbing capabilities. The temperature loss is also low for the proposed technology and so the degradation is less with more power generation. The Mono crystalline silicon cells are a proven and established new age technology.
Pricing Risk	ML	The Company will be utilising the solar power for Captive use. Solar Power will be relatively cheaper than the Discom tariff.
Force Majeure	ML / Insurer	The Company to take adequate insurance cover for insurable Force Majeure risks.

SWOT Analysis

Strength	Weakness
• The Promoter of the Company are well experienced in mining and mineral processing enterprise with major focus on natural stone. • As the proposed Project will be for captive use, and hence there exists demand visibility. • With this Project, the Company would be able to reduce its carbon footprint.	• The generation of solar power thought the proposed Solar plant will keep on decreasing year on year due to power degradation factor. • Though Solar Photo Voltaic technology using Mono crystalline modules is the most efficient solar technology, but it is also a costly affair.
Opportunity	**Threat**
• Solar Photo Voltaic technology using Mono crystalline PV Modules produce high-energy output across a wide range of climatic conditions due to their superior light absorbing capabilities and backside power gain. • Within India's renewable energy sector, solar power stands out as the predominant segment. As of April 30th, 2024, solar power generation capacity constituted approximately 57% of the total renewable generation capacity in the country. • The Govt. has committed to reduce carbon emissions by 30% to 35% and increase renewables to 40% of the energy mix by 2030. The Government Policy of KUSUM-C supports generation of power at distributed level thus minimizing the cost.	• Generic threat of global economic slowdown. • Solar power projects are capital intensive, with generating returns on a lower scale as compared to other industries. • Any adverse changes in Government incentives & policies may affect the financials of the Project.

Conclusion

Midwest Ltd (ML) specializes in mining and processing natural stone, including Granite and Marble.

ML intends to set up a total of 0.66 MW capacity ground mounted solar power generation plants at its 2 operational mines located in Telangana state.

Out of total 0.66 MW solar plants, the Company is setting up 0.52 MW Solar plant at Chimiryala village in Kodad mandal, Suryapet district and 0.14 MW Solar plant at Arpanapally village, Warangal district in Telangana State.

Currently the mining activity is carried out with electricity power at these locations, which the Company intends to gradually replace with solar power with the objective of cost savings in power consumption and to reduce carbon emission.

D&B India has prepared detailed project report of the project based on the data provided by the Company and other market information based on secondary research.

While assessing the viability of the project, D&B India considered the following major factors:

- Project specific attributes, both positive and negative.
- Appropriateness of selling prices and operating costs from market point of view.
- Reasonableness of the Project Cost.
- Economic viability of the Project.

Technical Assessment Summary

Project Details

Midwest Ltd (ML) specializes in mining and processing natural stone, including Granite and Marble.

ML intends to set up a total of 0.66 MW capacity ground mounted solar power generation plants at its 2 operational mines located in Telangana state.

Out of total 0.66 MW solar plants, the Company is setting up 0.52 MW Solar plant at Chimiryala village in Kodad mandal, Suryapet district and 0.14 MW Solar plant at Arpanapally village, Warangal district in Telangana State.

Currently the mining activity is carried out with electricity power at these locations, which the Company intends to gradually replace with solar power with the objective of cost savings in power consumption and to reduce carbon emission.

- **Project Sites**

Brief of the Project site and its locations and the connectivity are listed below.

Site Name	Kodad	Arpanapally
Plant AC Capacity	**520 KW**	**144 KW**
Plant DC Capacity	520 KWp	144 KWp
Land Area	3 acres	1 acre
Land coordinates	16.58 N,80.02 E	17.44 N,79.57 E
Land in Village	Chimiryala-	Teegalaveni
Mandal	Kodad	
Land District	Suryapet	Warangal
Nearest Village	Nallbandagudem	Teegalaveni
Nearest main road	Nallabandagudem	Gudur- 9 kms
Nearest Railway station	Khammam-45 kms	Kesamudram-16 kms
Nearest Bus Stand	Nallabandagudem	Teegalaveni-0.5 km
Nearest Airport	Hyderabad-200 kms	Hyderabad-226 kms

D&B India observes extent of the land available is enough for the size of the solar plants planned in the locations. Connectivity is good and the logistics are also convenient.

- **Project Cost**

The total hard cost of the project is estimated at INR 30.72 Million based on estimates made by the Company for various elements of the project. Suitable contingency provisions have also been made for the costs. The summary of the cost of the project is as given in table below:

Particulars	INR Million
Solar Power Plant (including I&C and civil cost)	30.72
Total Project Hard Cost	**30.72**

Initial Project cost estimates based on the Quotations from the P&M Supplier is given below.

Projects	Kodad-520 KWp	Arpanapally-144 KWp
Cost item	**INR**	**INR**
Design and Supply of Solar equipment	18,586,420.00	5,403,262.50
GST @12%	2,230,370.40	648,391.50

Projects	Kodad-520 KWp	Arpanapally-144 KWp
Cost item	**INR**	**INR**
I&C and Civil foundation cost	2,444,000.00	820,800.00
GST@18%	439,920.00	147,744.00
Solar plant Hard Cost (Hard Cost)	**23,700,710.40**	**7,020,198.00**
Total Solar Plant Hard Cost of the 2 projects (In INR)		**30,720,908.40**
Total Solar Plant Hard Cost of the 2 projects (In Million)		**30.72**
Per MW Cost (In Million)		**46.27**

The Cost of the Projects comes out to be INR 46.27 Million per MW (excluding project soft cost) for setting up 0.66 MW (0.52 MW + 0.14 MW) solar plant, which seems to be slightly on higher side compared to the present market rate of Rs. 40 Million to Rs. 45 Million per MW.

As justification given by the Company, the project cost is slightly on higher side due to the cost of logistics, civil works and the small volume of the Project.

Technical Assessment Summary

- The Proposed Solar PV Power projects are technically and economically feasible.
- Project locations are reasonably good for the solar insolation.
- All the Power generated from these solar plants will be for own use (Captive use)
- The Solar generation will save on the use of power from Grid and on the monthly bills.
- Mono crystalline technology in the PV modules is a good option as the modules are with good efficiency.
- Use of String inverters will avoid the Cost of buildings and also will help in minimizing the power loss due to failure of inverters if any.
- Estimated Project cost is budgetary and there is scope for economizing. Costing is based on quotes by contractors and there is ample scope for negotiations.
- It is recommended to go for higher DC:AC ratio to maximise the generation like 1.2:1 or even 1.25:1 if the land area permits deployment of higher number of modules.
- The Company has already obtained approval for certificate of ownership of tree/forest produce, and technical feasibility for the project installations. Further, the Company is in process of acquiring the other approvals and clearances for the Project. However, the Management of ML has assured D&B India that all the necessary approvals and clearances will be in place before commissioning of the Project such as Electrical scheme approval and CEIG Approval etc.

Critical Success Factors

- **The Company should adhere to the project implementation schedule.**

  A regular follow up of the construction activities is necessary for overall achievement of the deadline as per the implementation schedule. The Company should also ensure that the order of plant & machinery is placed and requisite approvals and clearances for the project are obtained in a timely manner so as to avoid delay in initiation of complete commercial operations.

- **The Company should plan for availability of funds, to deploy standard operating practices & good management practices.**

  The Company have to plan for sufficient funds for the Project, to deploy the standard operating practices for the project, which are followed in the industry and ensure of the employment, training & retaining of qualified & experienced people to run the project.

- **Approvals**

  The Company needs to obtain the balance approval for smooth progress of the Project. The delay will influence the progress of the project timeline and cost. The Company should ensure timely approval to follow the implementation schedule.

Limiting Conditions

The cost estimates for the proposed project are given on the basis of estimates, and we have also relied upon the quotations being procured for the purposes of the funding, which is attached as an annexure to the report. The revenue and costs considered are based on the findings from primary survey and secondary research, as detailed in the methodology section. There may be changes in the revenue and cost estimates depending on the market conditions. The revenue and costs are comparable to the industry benchmarks.

It has been assumed that available plant and machinery are complete and balanced along with utilities and auxiliaries.

Basis:

D&B-India's assumptions are based on the information obtained from owners, prevailing rules and regulations of statutory authorities, prevailing site conditions on the date of inspection.

Documentation:

D&B-India does not normally read leases or documents of title. D&B-India assumes, unless informed to the contrary, that each Structure has good and marketable title, that all documentation is satisfactorily drawn and that there are no encumbrances, restrictions, easements or other outgoing of an onerous nature which would have a material effect on the value of interest under consideration, nor material litigation pending. Where D&B-India has been provided with documentation, D&B-India recommends that reliance should not be placed on its interpretation without verification by legal advisors.

Town Planning and Other Statutory Regulations:

D&B-India recommends that verification be obtained from legal advisors or relevant experts to the effect that:

i. The position is correctly stated in the report.

ii. The property is not adversely affected by any other decision made, or conditions prescribed by public authorities.

iii. There are no outstanding statutory notices.

iv. D&B-India's reports are prepared on the basis that the company (Midwest Limited) to comply with all relevant statutory regulations, including enactment relating to fire regulations, safety and environmental considerations and stipulation of respective statutory provisions.

Physical Surveys:

D&B-India has not carried out Physical Survey and levelling exercise of the Structures and advice Owners to carry out actual Physical Survey of the site along with levels if desired. This report is based on documents forwarded to D&B-India by Owners, Government Records made available to D&B-India and on D&B-India's cursory inspection of site.

Structural Surveys:

D&B-India has not carried out a structural survey, nor has D&B-India tested the services of the Owners and D&B-India therefore does not give any assurance that any Structure or the immoveable assets are free from defects. In D&B-India's general observations, the Structures are erected normally and appear to have been maintained properly. However, no guarantee or opinion can be inferred about the conditions of Structure and Machinery about safe working of the same.

Deleterious Materials:

D&B-India does not normally carry out investigations on site to ascertain whether any Structure was constructed or altered using deleterious materials or techniques (including, by way of example high alumina cement concrete, wood wool as permanent shuttering, calcium chloride or asbestos). Unless D&B-India was otherwise informed, our report is on the basis that no such materials or techniques have been used.

Site Conditions:

D&B-India has not carried out investigations on site in order to determine the suitability of ground conditions and services for the purposes for which they are, or are intended to be put, to use, nor does D&B-India undertake archaeological, ecological or environmental surveys. Unless D&B-India is otherwise informed, D&B-India's report is on the basis that these aspects are satisfactory and that, where development is contemplated, no extraordinary expenses or delays will be incurred during the construction period due to these or any other matters related to site.

Environmental Contamination:

D&B-India has not carried out physical site surveys or environmental assessments, or investigated historical records, to establish whether any land or premises are, or have been, contaminated. Therefore, unless advised to the contrary, D&B-India's report is carried out on the basis that properties are not affected by environmental contamination.

TERMS RELATING TO USE OF THIS REPORT

This Detailed Project Report (hereinafter referred to as this "**Report**") has been prepared by ***Dun & Bradstreet Information Services India Private Limited*** (hereinafter referred to as **"D&B-India"**) in respect of setting-up a 0.66 MW solar plant at 2 operational mines located in Telangana state (hereinafter referred to as the "**Transaction**") of M/s. Midwest Limited (hereinafter referred to as the "**Company**") for the proposed initial public offering of equity shares of the Company (hereinafter referred to as the "**Funding Entity**") (such proposed offer "**the offer**") subject to what is stated hereinafter and the same forms an integral part of this Report.

The use of this Report or dissemination of contents hereof in part or full, is meant only for the purposes of the Transaction or matters relating thereto as deemed necessary by the Funding Entity, and not by any other party or for any other purpose.

D&B-India follows ethical practices in the discharge of its professional services and amongst others, as part of such ethical practices, it follows the general rules relating to honesty, competence and confidentiality, and attempts to provide the most current, complete, and accurate information as possible within the limitations of available finance, time constraint and other practical difficulties relating thereto and arising as a consequence thereof.

This Report has been prepared keeping in view the scope of work and the methodology as stated in this Report. Sources which form the basis of this Report could be broadly classified into two categories**:** (i) the facts gathered by D&B-India by way of a visit to the site of the project relating to the Transaction, or the Government offices, to the extent possible, having regard to practical constraints, and (ii) documents and information as furnished by the Company or the Funding Entity.

This Report includes assessment and projections made by D&B-India which are based on the aforesaid sources and the methodology as adopted by D&B-India. A variation in such assessment and projections is possible due to changes in the obtaining facts and circumstances as they existed at the point of time this Report was finalised by D&B-India and the approach or methodology adopted in respect thereof. Differences between projected and actual results are possible as events and circumstances, as anticipated or contemplated, may or may not occur and such differences may be material in nature. Under the circumstances, no assurance can be provided or implied that these projections will actually materialize or for its accuracy thereof.

Therefore, such assessment and projections made, and views based thereon included in this Report should not be treated as the sole decisive factor for any decision to be taken by the Funding Entity relating to the Transaction, and the Funding Entity has to draw its own conclusions on making independent enquiries and verifications and D&B-India cannot be held liable for any financial loss incurred by anyone based on this Report.

No representation is made by D&B-India that the information contained in this Report is exhaustive or includes all such material information which may have a bearing on the future performance of the Company.

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The Report should be read as a whole so as to avoid any divergence with respect to the inferences on account of a partial reading of this Report where such inferences may be based on the entirety of this Report.

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www.dnb.com

Dun & Bradstreet Information Services India Pvt Ltd

07th Floor, Godrej BKC, Bandra (East), Mumbai – 400051, Maharashtra, India.

Tel : +91 22 2857 4190/ 92 / 94, 6676 5555 Fax :+91 22 2857 2060