

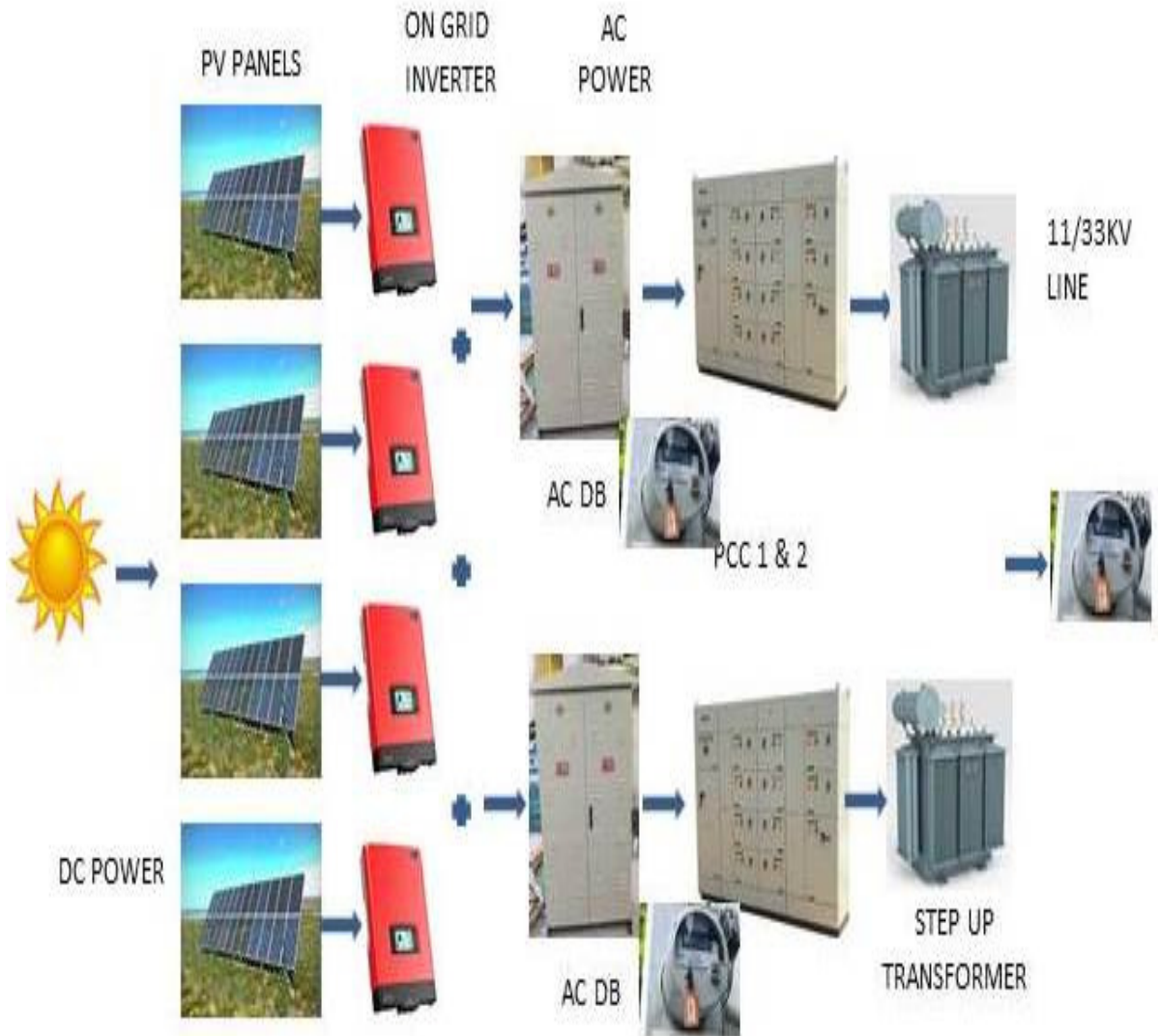
**REQUEST FOR PROPORSAL OF DESIGN, SUPPLY,
INSTALLATION AND COMMISIONING OF 500KWp GRID
CONNECTED SOLAR ROOF TOP AT VARIOUS
LOCATIONS AT KIMSDU KARAD.**

**SPECIFICATION FOR 500KWp GRIDCONNECTED SOLAR ROOF TOP AT
VARIOUS LOCATIONS WITHIN THE CAMPUS.**

A] SCOPE:

The scope includes the design, fabrication, supply and installation (vendor) of Grid Connected (Tied) Solar power pack with necessary DC and AC cabling from PV cells to the DC DB before the Grid tied Inverter and finally terminating to suitable provided feeder in the Main Utility Panel **PCC 1 and 2** properly distributed so that the total capacity of the Solar roof top connected to the Individual Transformer doesn't exceed the safe limit of the Transformer loading, for various roof top locations within the campus mentioned below. The scope includes the supply of high efficiency Solar PV Cell mounted on suitable designed structure (considering the wind load) with anti-corrosion treatment, DC wiring interconnecting all modules using suitable outdoor type junction boxes and wiring it through the Grid tied Inverter with inbuilt high performance MPPT and as per the specifications of Utility company for Grid connectivity and wiring it to the tapping point with all necessary energy meters AC and DC. A Basic system overview is shown in Fig.1-1.

The scope includes availing the necessary subsidy and benefits for government building. The vendor has to be approved MNRE channel partner with a minimum of 2MWp similar installation in his name and sound financial background. The system shall be installed on Renewable Energy Company mode i.e. Built, Operate and Transfer through EPA.



Summary of Area of Solar Insolation and the ON Grid Solar Capacity				
Sr.	Description	Area from the drawing	Area in Sqft	Solar ON Grid Power Pack
1	Hostel - H1	4.67	7234.81	72
2	Hostel - H2	4.67	7234.81	72
3	Hostel - H3	4.67	7234.81	72
4	Hostel - H4	5.1	7900.97	79
5	Hostel - NRI	1.03	1595.69	16
6	LADIES HOSTEL	2.4	3718.10	37
7	IHR-1	0.58	904.78	9
	IHR-2	2.05	3219.99	32
8	Dental College	2.8	4337.79	43
9	Auditorium - MS roof	1.78	2757.59	28
10	Library	2.49	3857.53	39
11	Pharmacy	7.02	10875.45	109
12	Staff Quarter-1	0.9	1394.29	14
13	Staff Quarter-2	0.9	1403.97	14
14	Ward - 1-9 - I	1.35	2091.43	21
15	Ward - 1-9 - II	1.35	2091.43	21
16	New Ward	1.27	1967.50	20
17	Ward - OT Area	3.41	5282.80	53
18	Blood Bank	1.99	3082.93	31
19	Adminstrative	4.31	6677.09	67
20	Annex	7.75	12006.37	120
21	School Of Nursing - MS roof	1.13	1750.61	18
22	Ladies Hostel - Survey-145	6.26	9698.05	97
23	Medical College	1.18	1828.07	18
	Total		110147	1101

The above capacity is shown for reference; we are expecting a minimum of 500KWp of Solar Roof Top.

The vendor shall ensure proper safety provisions at par with the latest standards in the industry. In event of any undue incidence related to his work on the site the vendor shall be solely responsible for the same.

Various State and Central Government acts related to labor, child labor, safety of operations, proper hygienic arrangements for the labor shall be in the scope of the vendor.

The site shall be kept clean and hygienic and the waste shall be disposed OFF in environmental friendly nature.

Before submitting the offer, site visit is recommended to assess the overall situation for a proper quote. Revisions in the quote after finalization shall not be entertained. The capacities of the ON Grid Solar Power pack have been finalized based on the trends of energy consumption of the last one year. Depending upon the recent developments the capacity may vary at the time of finalization of the order.

The point of metering shall be at one location and the same shall be accessible to the Energy Management System of existing installation. The existing metering used for EMS is LEGRAND performance of the plant for the next season. Prediction of panel cleaning, drop in performance of PV module etc, should be possible and the same type shall be proposed for metering. Company at their own cost shall conduct Harmonic Audit and submit a detailed report to KIMSDU after installation. The report shall be evaluated by our experts and any concerns shall be addressed for further rectifications. SCADA shall be implemented and integrated with evaluation software to ensure that the overall system is being operated at the optimum efficiency. The evaluation software shall monitor the performance on day to day basis and the recorded data shall be used to analyze the.

B] DESIGN PARAMETERS

Solar PV power systems shall be optimally designed considering the following parameters

A) The existing building at various locations are proposed with Solar Roof top with different capacities.

B) The insulations available per day are 5.5Hours as per the as per the data available from – <http://www.solar-facts.com/power-calculations/potential-power.php>

C) The major components that shall be proposed shall be from the approved list of Ministry of New and Renewable Energy and as per the approved makes specified in Sr.No.8

D) Electrical Panels shall be as per the latest IS specifications.

E) All other equipment except PV cell (Refer item no.5 of PV modular) shall carry defect liability period of 3years.

F) Preventive maintenance of the complete plant like maintaining the records of generated & consumed energies, output power, cleaning of PV cells, checking of earthing of the structure, etc. shall be included in scope of supplier & is applicable for a period of the Three-year of installation or as decided **at the time of negotiations**. The purpose of this is to assure that the overall system is working to its optimum level.

G) The PV Panels shall be mounted on suitable size MS Frame structure. The MS angle frame structure shall be hot dip galvanized and fixed on site with suitable size zinc plated nut & bolts secured in cement heavy duty blocks to ensure safety against wind load patterns. A safety report from a Structural Engineer is compulsory regarding the complete installation.

H) The complete PV panel mounting structure shall have proper concrete foundation. The civil related work is included in the scope of solar power pack supplier. The PV panel mounting structure shall be mounted on the Terrace and hence wind pressures have to be taken into consideration during the design of the foundation. The foundation arranging shall be got approved from the structural Engineer on site. A report shall be submitted.

I) Guarantee of Unit Generation – On an average over a year the Unit shall generate 4.5KWh/day/KW.

J)Optimum Level – This means that the On grid is generating the energy to as intended without interruptions to the facility and around 50% of the capacity connected to the DG set.

C] MAJOR COMPONENTS OF SOLAR PV – POWER PLANT

1. Solar PV Modules

2. Module mounting structures for solar PV Modules
3. Grid Tied Inverter System
4. DC& AC Distribution Boards
5. Cables
6. Installation accessories, Safeties and Earthing.
7. Junction boxes

1. SOLAR PV MODULE

Crystalline high power cells shall have to be used in the Solar Photovoltaic module conforming to IEC 61215. Each Solar module shall consist of redundantly interconnected 200W/250W photovoltaic cells and peak power rating should not be less than 200W/250W/360Wp. For eg.: The existing 10KW Grid tied PV system, the 25nos. of PV panels rated at 200W each, shall be connected in series to get a voltage of 300VDC and 5KWp. Two such arrays shall be connected in parallel to get 10KWp. Care has to be taken so that the maximum output of the Array doesn't exceed the MPPT Window. The interconnection shall be done in suitable size Junction boxes housing connectors suitable for the wires.

Care has to be taken that the maximum voltage doesn't exceed in any case 550VDC and the maximum short circuit array doesn't exceed the limit mentioned in the Grid interactive Inverter. For maximum Power transfer the voltage doesn't decrease or increase to 195 and 550VDC respectively.

To connect the solar module interconnection cable shall be provided, Photo/electrical conversion efficiency of SPV module shall be mentioned.

Module shall be made of high transmissivity glass front surface giving high Encapsulation gain and rubber edge sealant for module protection and mechanical support. All materials used shall have proven history of reliable and stable operation in external, applications, It shall perform satisfactorily in relative humidity up to 100% with temperatures between -10°C and 190°C and with stand just up to 200 km /hr from backside of the panel.

Solar module shall be mono/multi crystalline type lamination technology using established polymer (EVA) and tedlar laminate.

Sample modules, representative of the production processes employed in the manufacture of the offered module shall be in accordance with the requirements of MNES and shall be certified by MNES or its authorized test center.

The bidder shall submit appropriate certificates.

Maximum Power	200Wp/250Wp/360Wp
Open Circuit Voltage	21V
Short Circuit Current	Please specify
Max Power Voltage	17V
Max Power Current	Please specify
Max System Voltage	600V
NOCT	45degree centigrade +/- 2
Operating Temperature Range	-10 to 190 degree centigrade
Junction Box	Ip65
Application Class	Safety Class II
Front Glass	Tempered
Cells	Poly Crystalline
Frame	Anodized
Guarantee	90% Output for 10years, 80% Output for 25years
Product Warranty	5years
Certification	IEC 6125 / IEC 61730

THE GENERAL REQUIREMENTS OF MODULE PV

1. The rated output power of any supplied module shall not vary more than 5% from the average power Rating of all modules.
2. The module frame is made of corrosion resistant material, which is electrolytic ally compatible with this Structural material used for mounting the module.
3. Protective devices against surges at the PV module shall be provided, if required low voltage drop bypass and /or blocking diode(s) any also be provided, if required.
4. Module junction box (weather resistant) is designed for long life out door operation in harsh Environment.
5. A minimum warranty of 25 years is required with degradation of power generated not exceeding 10% for 10years and 20% at the end of 25 years period.
6. The Solar modules shall have suitable encapsulations and sealing arrangements to protect the silicon cells from the environment. The arrangement and the material of encapsulation shall be compatible with the thermal expansion properties of the

silicon cells and the module framing arrangement /material. The encapsulation arrangement shall ensure complete moisture proofing for the entire life of the solar Modules.

7. Each module shall have low iron tempered glass front for strength and superior light transmission. It shall also have tough multi layered polymer back sheet for environment protection against moisture and provide high voltage electrical insulation.

8. The fill factor of modules shall not be less than 0.70.

9. The solar array capacity shall not be less than the KWp at STC of the individual locations.

10. The solar array capacity shall operate at 300/500VDC suitable to operate in grid tied mode with MSEDCL.

Data sheet shall be furnished duly filled as follows:

- 1) Mounting arrangement for solar module
- 2) Solar module frame material
- 3) Module type
- 4) Module dimensions
- 5) No of solar cells per module
- 6) Solar cell manufacturer type
- 7) Cable gland at module junction Box
- 8) Weather resistant HDPE junction box (IP 55)
- 9) Make of solar module
- 10) Country
- 11) Max temperature rise of solar cells under severe working condition over max. Ambient temperature
- 12) Nominal voltage
- 13) Operating voltage of solar module (nom.)
- 14) Peak power voltage (Vmp) at 50° C
- 15) Peak power current (Imp) at 50° C
- 16) Open circuit voltage (Voc) at 50° C
- 17) Short circuit current (Isc) at 50° C
- 18) Weight of each module

2. MODULE MOUNTING STRUCTURE:

1. Module shall be mounted on a non corrosive support structures suitable for main building at with facility to adjust tilt to maximize annual energy output.
2. Support structure design and foundation or fixation mounting arrangement should withstand minimum horizontal wind speed of 200 km/hr.
3. Support structure shall be manufactured with steel angles & channels, hot dipped galvanized to IS 1477 part- 1 with thickness of 70 microns as per IS:5905 .
4. Structure shall be designed for mounting of offered solar modules with angle adjustment facility from 5° to 45° with an interval of 5° All fasteners shall be of stainless steel – SS 304.
5. The foundation for module mounting structure shall be 1:2:4: PPC construction .The detailed calculation along with drawings of module structures and foundation details to be submitted along with the offer.
6. There shall be minimum necessary clearance between ground level and bottom edge of SPV modules.
7. ORIENTATION AND TILT OF PV MODULE :Modules alignment and tilt angle shall have to calculate to provide the maximum annual energy output.

3. GRID TIED INVERTER SYSTEM

The SPV cells produce direct current electricity and this shall be tapped through High Voltage PV string arrays-single or polycrystalline with a voltage of max 550VDC using a MPPT (Maximum Power Point Tracker) to harvest the maximum Solar Energy through the PV Cells. It is necessary to convert this to alternating current and adjust the voltage, frequency and phase angles to levels suitable to synchronize with the Grid with the least harmonics injection. Conversion is to be achieved using electronic Inverter and the associated control and protection devices . All these components of the system are termed the "Grid tied Inverter " Unit an interface between solar PV array & the Inverter, to Maximize solar PV array energy input into the system. Vendor shall provide the Output power VS Ambient Temperature Graphs. Proper Islanding protection complying to AS4777.3 clause 4-B with Type Active rate of change of Voltage and should be considered for safety of person working on grid

and during system disturbance. The utility disconnect settings shall be password protected and may be essential in case of weak grid. The Inverters shall comply to all the technical requirements of the Utility company.

INVERTER

STANDARD FEATURES	
IP54 with External Heat sink and forced cooling arrangement in built	
LCD Display for Data Access with back lit	
Two LED Indication for Status and Ground Fault	
Max Input Voltage	1000V
Max DC Power	Should be limited to 15KWp or shall be specified by the VENDOR
Rated Power	15000W
Max Apparent AC Power	15000VA
AC O/P	3/N/PE/415VAC tied to MSEDCL grid
Max O/P Current	21A
Rated Power Factor	Unity
Topology/Cooling	Transformer less / Opti Cool
Warranty	5years
RS 485	Required and shall be connected to the Main Data Access System to record the daily Energy Generation. Protocol – Profibus or modbus. Readings shall be available online through CLOUD. No extra charges for the cloud be paid.
Peak Efficiency Of Inverter	98%
THD	<3%
Display Accuracy	
Instantaneous Power	+/- (30W+1%reading)
Voltage	+/- (1% of rating+1%reading)
Current	+/- (1% of rating+1%reading)
System life time Energy	+/-5%
Data Access	LCD display of Daily Energy Consumption, Cumulative Energy Consumption, Max KW, Power Factor on per day / month / year using RJ45 socket (preferred) on the Inverter to communicate the above mentioned to the client server. The power disruptions trends shall be recorded.
Protection Scheme	
Protection	Earth Fault, Over Voltage, Short Circuit, Islanding
Protection	Integrable Type Of Over Voltage Protection
Operating Temperature	-25 to +65 degree centigrade
Humidity	<95% non condensing
Abbreviations:	
LED	Light Emitting Diode

LCD	Liquid Crystal Display
Vmp	Voltage at Maximum Power

4. DC & AC DSITRIBUTION BOARDS

The PV arrays shall be grouped in series and parallel combination to achieve voltage levels suitable for the DC input of the Grid tied Inverter. The maximum level shall be not more than 550VDC.

For eg.: The 10KW Grid tied PV system, the 25nos. of PV panels rated at 200W each, shall be connected in series to get a voltage of 300VDC and 5KWp. Two such arrays shall be connected in parallel to get 10KWp. This shall be wired to the DC DB through suitable size DC MCB in the DC Distribution Board. The output of the DC DB shall be terminated to the Grid Tied Inverter.

The Inverter Output shall be routed through AC Distribution Board through a suitable size 4P MCCB/MCB and finally terminated to the Main Panel of the client. Suitable provisions shall be made in the Main panel to terminate to the Main Bus. Care shall be taken for proper earthing of the Distribution Boards.

Suitable 0.5class accuracy energy meters shall be provided for both DC and AC side, to calculate the Energy Generated and Supplied. Preferable communication ready to record the readings to ensure the performance at optimum level. The trends shall be recorded for submission to the client.

5. CABLES (ARRAY & OTHER INTERCONNECTIONS)

All the cables shall be supplied confirming to IS 1554/694 part 1 of 1988 and shall be of 1.1 KV grade as per requirement. Only copper cables shall be used. Main Cable running from the Inverter DB output to the Feeder shall be Aluminum of suitable capacity and the voltage drop allowed is less than 2%.

The copper cables are proposed for interconnecting of the PV cells up to the Distribution Board. All these cables shall run through hot dipped galvanized GI perforated trays. These tray shall be supported using independent supports. Care shall be taken not to disturb the water proofing in case its roof top mounted for which proper co-ordination with the Civil Engineering authorities need to be done.

Aluminum cable shall run from the AC DB to the Main feeder proposed in the Main Panel. All the cables i.e. Copper (Flexible) and Aluminum (Armored) shall be terminated using suitable glands and lugs. The installation has to comply all the latest IE rules and regulations. The cables shall be suitable for Outdoor installation i.e. the maximum temperatures anticipated at various locations.

6. INSTALLATION ACCESSORIES AND SAFETIES:

A. LIGHTING AND OVER VOLTAGE PROTECTION

The SPV Power Plant shall have to be provided with lightning & over voltage protection. The main aim of this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc. Metal oxide variastors (MOV's) shall be provided inside the array junction boxes. In addition suitable MOV's to be provided in the inverter Output Circuit for Light circuit protection.

B. EARTHING

Each array structure of the PV yard shall be grounded properly. All metal casing / shielding of the plant shall be thoroughly grounded in accordance with Indian electricity/ IE Rules and as per IS:3043. Vendor shall conform requirement of DC grounding based on the Inverter requirement. The compound used shall be hygroscopic in nature with submission of the test certificates for the same. Lightning Arrester protection ESE type with lightning counter shall be installed. The ESE LM shall be connected to 3nos. of earth pit connected in d\lta using a suitable copper strip of minimum 25x3mm flat.

C. SAFETY

Danger boards depicting the Voltage levels shall be installed wherever necessary. Rubber Matt for the Inverter and Main Panels shall be installed as per IE rules and regulations. Fire Extinguishers of adequate capacity and suitable for the Electrical Installation shall be installed.

D. COMPLIANCES

Test certificates of the following shall be submitted –

1. MS Angle structure
2. MCB and DB
3. PV Cells
4. Inverter
5. Earthing and Compound
6. Energy Meters – AC and DC
7. Electrical Inspectorate – Approval for Installation and Commissioning
8. MSEDCL formalities shall be in the scope of the Vendor.
9. MNRE channel partner certificate – updated to 2015 – 2016.

7. JUNCTION BOXES.

The junction boxes shall be made of FRP with dust, water and vermin proof (IP 65). The terminals shall be of copper bus bar arrangement of appropriate size, shall have fuses in such a way where it shall be possible to isolate single array from the system by removing the fuse, without disturbing the system operation . All cables passing into junction boxes shall be terminated correctly using proper size glands and if multi strand cables or wires are used Lugs – Copper shall be mandatory.

8. APPROVED MAKES.

ON GRID INVERTER	-	SMA, SCHENIDER / EQUIVALENT
SOLAR PV PANELS	-	WAAREE/ VIKRAM/EMMVEC/ EQUIVALENT
MCB and DB	-	LEGRAND.
WIRES	-	FINOLEX, LAP,RPG.
JUNCTION BOXES	-	HENSEL
FIRE EXTINGUISHERS	-	FIREX OR EQUIVALENT
EARTH RODS	-	PIPE IN PIPE – FAST ELECTRODE
CABLES	-	RR-Solar grade

9. PAYMENT TERMS

10. PROJECT COMPLETION SCHEDULE

- a. Delivery of Material shall be done within One month of issue of the PO.

- b. Site shall be commissioned within One month after receipt of material on Site.
- c. Delay in commissioning of the project shall be liable for penalty that shall be decided during finalization.

11. JURIDICTION

- a. Matters related to this offer shall be subject to Karad jurisdiction.

12. PRICE SCHEDULE

The price quoted for the Unit rate shall be inclusive of taxes and f.o.r (packing and forwarding, unloading on site) at site with insurance up to erection and commissioning of the Solar Power Pack. Client shall not be liable for any damages to the PV, Inverter etc. during the operation of the Power pack. No other extra charges shall be paid to the vendor till the end of the contract. The terms and conditions of the payment and mode shall be clearly mentioned in the quote. The quote for the infrastructure development like trenches and cables up to the point of PCC shall be separately quoted. The energy figures being pumped at the PCC shall be considered for the billing.

13. SUBMISSION OF THE PROPORSAL

- a. The proposal shall be submitted in the hard copy to the client on address mentioned below With technical details browser s –
The Registrar,
KIMSDU,
Karad
- b. The proposal shall be submitted before **_16 March 2016 before 5.00pm**
- c. Major clarifications shall be done on E-mail before submitting the offer. Clarifications of query of any one vendor shall be shared with others to ensure quoting on uniform platform.
- d. Contact Person – Shri Yogesh Kulkarni, In Charge - Electrical Engineer
M - 9049000575
- e. A pre-bid meeting shall be arranged at Karad if required by the vendor.

- f. Client shall update the date of finalization after the comparative is put forth by the Consultant.

14. ADDRESSES OF INSTALLATIONS

- 1. KIMSDU KARAD

15. SITE VISIT BY CLIENT'S ENGINEER AND OFFICIAL PERSON

- a. Site visit shall be arranged by the Vendor to the installation of similar capacity. Necessary arrangement of travel and stay shall be in the scope of the vendor who has been shortlisted.
- b. Technical data shall be made accessible like units being generated and the recording of the same to confirm the claimed figures.

16. TRAINING

- a. Vendor shall arrange a training program and transfer the knowhow of the installation.

17. BASIC STRUCTURE FOR REQUEST FOR PROPOSAL

- a. **Make of the following Components to be specified**
 - i. **PV Cell with efficiency figures**
 - ii. **Inverter**
 - iii. **Cables**
 - iv. **Junction Boxes**
 - v. **SCADA and Evaluation software**
- b. **Assuming round the clock GRID, guarantee of energy generation and pumping it to the system for 25years**
- c. **Probable reduction in Energy Expenses for the period quoted**
- d. **Excess Power that is exported to the Grid shall be credited to our account through Net Metering policy – YES / NO**
- e. **Electrical Inspectorate and MSEDCL formalities scope in Vendor – YES / NO**
- f. **Grid / DG synchronization should be possible – YES / NO**
- g. **Harmonic Evaluation after installation and its corrective suggestions latter if any – YES / NO**

h. Help in Completing the formalities to avail Rebate, say like Property Tax or if any other due to installation of Green Power generation – YES / NO

18. ATTACH LIST OF COMPLETED AND INPROGRESS PROJECTS OF COMPARABLE NATURE .

19. All rights reversed by KIMSDU KARAD.

20. Bill of Material:

Item Details	Unit	QTY
PV Modules	Nos.	
Module Mounting Structures	Set	
Main Junction Boxes with monitoring capabilities	Lot	
Solar module array to Junction box Interconnection cable (Cu)	RM	
Junction box to Inverter Interconnection Cable	RM	
Connection accessories – lugs, ferrules, glands etc.	Lot	
DC cables & AC (LT) Cable of appropriate sizes	RM	
Power Conditioning Units/ Inverters	Nos.	
Meteorological station with sensors and data logger	Lot	
String level monitoring system (SCADA) and ancillaries	Set	
Circuit breakers,	Set	
AC & DC distribution panels/ boards	Lot	
Control and Relay Panel	Lot	
Lightning Arresters of suitable ratings	Nos.	
Earth mat for switch yard, DC field array and equipment	Lot	
Control and power cables	Lot	
Surge Protection devices and Fuses	Set	
Earth cables, flats and earthing pits	Lot	
Equipment and Control cum office Building	Lot	
Rubber Mats for specific kV ratings	Lot	
Foam type Fire extinguisher	Lot	
CO ₂ Extinguisher	Lot	
Sand Buckets	Lot	
Power efficient peripheral lighting arrangement for the plant safety	Nos.	
Fire – fighting automation and signboards in buildings	Lot	
Metering Equipment	Set	
Protection Equipment	Set	
Solar Observatory with remote monitoring assistance	Set	

Module cleaning system	Lot	
CCTV cameras	Lot	
Danger sign plates, anti-climbing, bird protection etc.	Lot	