SCOPE OF TECHNICAL REQUIREMENT (SOTR) FOR 200kWp ROOF TOP SOLAR POWER PLANT ON TURNKEY BASIS AT GRSE MAIN

1 The following work is required to be carried out at GRSE Ltd.(Main Unit).Bidders are requested to quote for the same on the basis of details as described in the SOTR.

Item No.	Description	Unit
1.	GRSE invites bids for following activities related to 200 kWp Grid Interactive Roof Top Solar Photo Voltaic System. a) Design, drawing, engineering and Supply of all necessary equipment & materials as per scope of work. b) Erection including structural & civil work, installation testing and commissioning of said 200 kWp grid interactive roof top solar photovoltaic system (GIRTSPVS). c) Supply and Installation of centralised "Online Monitoring System" for monitoring of solar generation of 1700KWp (200KWp + 1500KWp) RTS Plant. d) Operation & Maintenance for 5 years for 200kWp grid interactive roof top solar power plant and Centralised RMS system in an Online Portal for 5 Years.	As per SOTR Requirement

2 PLACEMENT OF ORDERS FOR AWARD OF CONTRACT/ BREAKUP OF PURCHASE ORDERS

"GRSE / Owner may place two separate Orders (POs) for implementation of the project in the following manner"

A. First: Purchase Order for Design, Supply & Erection of 200kWP Grid Interactive Roof Top Solar photovoltaic system at Main unit of GRSE.

B. Second: Order for Operation & Maintenance for 5 years for 200kWp grid interactive roof top solar power plant and Centralised RMS system in an Online Portal for 5 Years.

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SECTION-I

TECHNICAL SPECIFICATIONS FOR DESIGN, SUPPLY, ERECTION, TESTING & COMMISSIONING OF 200KWp ROOFTOP SOLAR PLANT

DEFINITION

A Grid interactive Rooftop Solar Photo Voltaic (GIRTSPV) power plant consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid interactive Rooftop Solar Photo Voltaic (GIRTSPV) system should be designed with necessary features to supplement the grid power during day time. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

1. SCOPE OF WORK:

A. The scope of Work includes Installation site survey in details.

B. Preparation of Initial and Final detailed project report (DPR).

C. Detailed Design, Drawing and Engineering and documentation of Plant.

D. Supply of equipment, and materials including Packing and forwarding, unloading at GRSE site.

E. Involving Independent Certification Agency for Approval of Design, Documents, BOQ, Witness the FAT (Factory Acceptance Report) before dispatch of materials & SAT (Site Acceptance Test) at site during Erection, Testing & Commissioning of the Project.

F. Civil and structural works, erection, testing and commissioning, Training of executive/technician for 200 kWp Grid Interactive Roof top Solar PV Power Plant with associated equipments and materials on turnkey basis at GRSE Limited.

G. Water supply line with all the arrangements for module cleaning.

H. Setup of “Online Monitoring System” for monitoring of solar generation from 200KWp RTS and inclusion of Existing 1500KWp plant generation in an Online Portal for 5 Years.

I. Complete construction and installation of the solar project in all respect

2. SCOPE OF SUPPLY: The equipment and materials for 200kWp Grid Interactive Rooftop Solar PV Power Plant with associated system (Typical) shall include but not be limited to the Supply, Erection, Testing & Commissioning of the following;

A. Solar PV modules consisting of required number of MONO PERC PV Modules. Minimum capacity of PV module should be 450Wp.

B. Mounting structures, mounting frames, foundation bolts and nuts for holding structures and module inter connection with purlin of structure.

C. Grid interactive Power Conditioning Unit/Inverter.

D. Remote Monitoring System along with Router, Dongle and SIM with internet facility (for 5 years) for online monitoring of generation data from 200KWp Plus existing 1500KWp plant. Details of Existing plant with Inverter details are attached in Annexure-1.

E. Array Junction boxes, distribution boxes and fuse boxes. MCBs, Surge Arrestors. Inverters having inbuilt property of AJB, then DCDB need not require to supply.

F. ACDB/LT Power Interfacing Panel or Inverter Interfacing Panel (IIP) combiner shall be Outdoor type with Canopy, consisting Incoming [5 MCCB (4 in use & 1 as standby)] & Outgoing [2 MCCB (1in use & one as Standby)], SPD protection, Digital Multifunction Meter, export meter, indicators and protection relays. [Net Metering with our DISCOM i.e. CESC will be done by GRSE].

G. LT Power and Control Cables including end terminations and other required accessories for both AC & DC power. All the cable laying shall be through proper cable tray with clamping and cable tagging at appropriate interval.

H. Earthing system for PV Array, PCU power system, Lightning protection system (Early streamer emission- ESE/ Ionizing lighting rod system with lighting counter meter to be installed for protection against lighting), Earthing mat in front of all the Electrical Panels. Earth Pit its cover and Name Plate marking.

I. Civil & Structural work-related item for ACDB foundation, cable laying trough cable trench. Making Suitable cable trench as per site requirement.

J. Necessary pipeline and accessories for Module cleaning.

K. IR/UV protected PVC AC & DC Cables, pipes, Pumps, Pump starter(Protective Switch), Tanks and accessories.

L. Five Fire extinguisher along with Five sand bucket. Earth Mat in front of all the PCU/Inverter and IP Panel. Danger plates, name boards/Signage etc.

M. Maintenance Tools (like spanner set, Allen key set, Screw driver set, Digital Multi meter) for maintenance requirement to be provided.

N. Any other equipment / material required to complete the 200 kWp Solar Power Plant on turnkey Basis

3. CODES AND STANDARDS

A. All Equipment and accessories shall comply to requirement of standards published by Bureau of Indian Standards (BIS). In case no BIS codes exist the equipments shall meet the requirement of international standard including IEEE for design and installation of grid connected PV system. The list of standards adopted shall be indicated in the bid.

B. The SPV Module must be provided with acceptable Test & Certified documents.

C. The quality of supplied equipment shall meet the guidelines of MNRE and other related codes for all the equipment. Vendor has to submit a list of all the latest applicable codes applicable for each equipment's along with the Technical Bid.

4. SOLAR PHOTOVOLTAIC MODULES:

A. The PV modules used should be made in India.

B. The PV modules used must qualify to the latest edition of IEC PV module qualification test or equivalent BIS standards Crystalline Silicon Solar Cell Modules IEC 61215/IS14286. In addition, the modules must conform to IEC 61730 Part-2- requirements for construction & Part 2 – requirements for testing, for safety qualification or equivalent IS.

a. For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701

b. The total solar PV array capacity should not be less than allocated capacity (kWp) and should comprise of solar MONO PERC modules of minimum 450 Wp and above wattage. Module capacity less than 450Wp watts should not be accepted.

c. Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.

d. PV modules must be tested and approved by IEC authorized test centers.

e. The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.

f. The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid. GRSE shall allow only minor changes at the time of execution.

g. Other general requirement for the PV modules and subsystems shall be the Following:

I. The rated output power of supplied module shall have tolerance +/- 3%.

II. The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall not vary by more than 2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.

III. The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP-65 rated.

IV. I-V Curves at STC should be provided by bidder.

C. Modules deployed must use a RF identification tag. The following information must be mentioned in the RFID used on each modules (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions).

a. Name of the manufacturer of the PV module

b. Name of the manufacturer of Solar Cells.

c. Month & year of the manufacture (separate for solar cells and modules)

d. Country of origin (separately for solar cells and module)

e. I-V curve for the module Wattage, Im, Vm and FF for the module

f. Unique Serial No and Model No of the module

g. Date and year of obtaining IEC PV module qualification certificate.

h. Name of the test lab issuing IEC certificate.

i. Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001

D. Warranties:

a. Material Warranty:

I. Material Warranty is defined as: The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than five (05) years from the date of sale to the original customer ("Customer")

II. Defects and/or failures due to manufacturing

III. Defects and/or failures due to quality of materials

IV. Non conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the Owners sole option

b. Performance Warranty:

I. The predicted electrical degradation of power generated not exceeding 20% of the minimum rated power over the 25 year period and not more than 10% after ten years period of the full rated original output.

5. ARRAY STRUCTURE

A. Hot dip galvanized MS mounting structures shall be used for mounting the modules/ panels/arrays. Each structure should have angle of inclination as per the site conditions to take maximum insolation. However to accommodate more capacity the angle inclination may be reduced until the plant meets the specified performance ratio requirements.

B. The Mounting structure shall be so designed to withstand the speed for the wind zone of the location where a PV system is proposed to be installed (**like Kolkata- wind speed of 180 kM/ hour).** It may be ensured that the design has been certified by a recognized Lab/ Institution in this regard and submit wind loading calculation sheet to [NAME OF THE ORGANISATION]. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed.

C. The mounting structure steel shall be as per latest IS 2062: 1992 and design & construction shall be as per IS-800 and also galvanization of the mounting structure shall be in compliance of latest IS 4759.

D. Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts.. Necessary protection towards rusting need to be provided either by coating or anodization.

E. The fasteners used should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels

F. Regarding civil & supporting structures the Contractor shall take care of the load baring capacity of the roof and need arrange suitable structural base based on the type/ quality of roof without any sort of damage to the existing roof structure.

G. All precautions shall be adopted by the contractor to ensure that the civil/supporting structure shall not cause any sort of water leakage in the roof during life of solar panels.

H. The total load of the structure (when installed with PV modules) on the terrace should be less than 15 kg/m2.

6. CIVIL WORKS

The following civil works shall be carried out by the firm.

A. The contractor shall take utmost care during construction so that the existing civil & supporting structure shall not cause any sort of water leakage in the Sheet roof during life of solar panels.

B. Laying of equipment's/structures and connecting to the GI Sheet & Purlin as per the layout drawing approved by GRSE.

C. Cutting of cable trenches etc. wherever necessary. Laying of cable through cable trench.

7. AC DISTRIBUTION PANEL BOARD – ACDB Combiner Panel :

A. AC Distribution Panel Board (ACDB) /Combiner Panel shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at GRSE LT Bus bar while in grid tied mode.

B. A 400A SFU unit is required to be fixed by vender to GRSE LT Panel for getting input from ACDB/ Combiner Panel.

C. ACDB shall be floor mounted type and shall have all the measuring instruments such as voltmeter, ammeter, and frequency meter, Export Energy Meter {for measuring the deliverable units {kWh} for sale, selector switches etc. Incoming and outgoing indicator.

D. All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.

E. The changeover switches, cabling work should be undertaken by the bidder as part of the project.

F. Panel's shall be Outdoor type have protection of IP65 with canopy, metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz. All the power cables shall be taken through top/ Bottom of the panel as per site requirement. Necessary Flooring Work is required to strengthen the base.

G. The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.

H. All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions

Variation in supply voltage	+/- 10 %
Variation in supply frequency	+/- 3 Hz

I. The ACDB shall fitted with suitable rating & size copper /Aluminium bus, MCCB, HRC fuses/circuit breaker/isolator, indicators for all incomer and outgoing terminals, LED voltmeter & Ammeter with suitable selector switches to monitor & measure the power to be evacuated.

J. Nut & bolts including metallic shall have to be adequately protected against atmosphere and weather prevailing in the area.

K. The overall dimension, weight, sheet thickness, painting etc. should be indicated by the Contractor. Minimum dimension of ACDB panel shall be W:1400mm X H:1600mm X D:500mm.

L. Modifications/ addition if any, in existing L T panel of GRSE Ltd. shall be done at site and covered in scope of Bidder. Also required size cable and other equipment between existing panel to solar AC distribution panel is covered in scope of Bidder.

8. PCU/ARRAY SIZE RATIO:

A. The combined wattage of all inverters should not be less than rated capacity of power plant under STC.

B. Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.

9. PCU/ Inverter:

As SPV array produce direct current electricity, it is necessary to convert this direct current into alternating current and adjust the voltage levels to match the grid voltage. Conversion shall be achieved using an electronic Inverter and the associated control and protection devices. All these components of the system are termed the "Power Conditioning Unit (PCU)". In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array & the Inverter, to the power conditioning unit/inverter should also be DG set interactive. If necessary.

A. Inverter output should be compatible with the grid frequency. Typical technical features of the inverter shall be as follows:

i. Switching devices : IGBT/MOSFET

ii. Control : Microprocessor /DSP

iii. Nominal AC output voltage and frequency : 415V, 3 Phase, 50 Hz (In case single phase inverters are offered, suitable arrangement for balancing the phases must be made.)

iv. Output frequency : 50 Hz

v. Grid Frequency Synchronization range : + 3 Hz or more

vi. Ambient temperature considered : -20^{o} C to 50^{o} C

vii. Humidity : 95 % Non-condensing

viii. Protection of Enclosure : IP-65(Minimum) outdoor Type.

ix. Grid Frequency Tolerance range : + 3 or more

x. Grid Voltage tolerance : - 20% & + 15 %

xi. No-load losses : Less than 1% of rated power

xii. Inverter efficiency(minimum) : >96% (In case of 10kW or above)

xiii. Inverter efficiency (minimum) : > 93% (In case of less than 10 kW)

xiv. THD : < 3%

xv. PF : > 0.9

B. PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown.

C. The output of power factor of PCU inverter is suitable for all voltage ranges or sink of reactive power, inverter should have internal protection arrangement against any sustainable fault in feeder line and against the lightning on feeder.

D. Built-in meter and data logger to monitor plant performance through external computer shall be provided. RMS/GPRE/WIFI/BLUETOOTH Enabled or Externally connected.

E. The power conditioning units / inverters should comply with applicable IEC/ equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683 and IEC 60068- 2(1,2,14,30) /Equivalent BIS Std.

F. The charge controller (if any) / MPPT units environmental testing should qualify IEC 60068-2(1, 2, 14, 30)/Equivalent BIS std. The junction boxes/ enclosures should be IP 65(for outdoor)/ IP 54 (indoor) and as per IEC 529 specifications.

G. The PCU/ inverters should be tested from the MNRE approved test centres / NABL /BIS /IEC accredited testing- calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses.

10. CABLING & WIRING:

A. All instruments and Panel wiring shall be of heat resisting and self-extinguishing type in compliance with IS. Plastic or porcelain cleats of the limited compression type shall be used for holding wiring runs. All wires shall be suitable for bending to meet the terminal studs at right angles. Metal cases of all apparatus mounted on panels shall be separately earthed by means of copper wire or strips.

B. The following colour scheme of the wiring shall be used as per IS: 375.

i. AC three phase circuits:
ii. No.1 Phase: Red.
iii. No.2 Phase: Yellow.
iv. No.3 Phase : Blue
v. Neutral Conductor : Black
vi. Connection to Earth : Green
vii. D.C. circuits : Grey

C. LT 1.1kV Grade, Al. Conductor PVC Armoured Cables in AC side shall be used for all LT Power Cables between Power & Respective feeders etc. These cables shall be laid on structural supports and using Galvanized Cable trays of adequate strength or through pacca cable trench as required. The cable shall be terminated using Al. Lugs of adequate cross section area.

D. 1.1kV Grade, Cu. Conductor, PVC Armoured Cables shall be used for all control cables required for the Solar Power Plant. These cables shall be laid on structural supports and using Galvanized Cable trays of adequate strength. The cable shall be terminated using Cu. Lugs of adequate cross section area.

a) Cu. Conductor, PVC armoured with miller insulation between each pair and tinned copper screening. All cables shall be PVC insulated with appropriate grade conforming to IS.

b) Only copper conductor cables of reputed make shall be used in DC side of plants between interconnection of MODULES, JUNCTION BOX, PCU, LT Interfacing panel/ DC panel and other associated equipments.

c) The wiring for module inverters connection shall be with hard PVC conduit of renowned make. All Tees, Bends etc., shall also be renowned make.

E. Cables of appropriate size to be used in the system with following characteristics:

a) Will meet IS 694/1554 standards
b) Temp. Range –10 degree centigrade to +80 degree centigrade.
c) Voltage rating 660/1100V
d) Excellent resistance to Heat, Fire, oil, cold, water, abrasion, UV radiation.
e) Flexible Cabling on DC side of the system shall be as short as possible to minimize the voltage drop in the wiring. Components and hardware shall be vandal and theft resistant. All parts shall be corrosion resistant. The system description, general/technical requirements etc. are given for general guidance only.

11. INTEGRATION OF PV POWER WITH GRID:

The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization. In case of grid failure, or low or high voltage, solar PV system shall be out of synchronization and shall be disconnected from the grid.

12. DATA ACQUISITION SYSTEM / Online Solar Generation Monitoring System

A. The Remote monitoring system will consist of a Data Logger and environmental sensors (like Module Temp sensor, Pyranometer, combiner, SIM cards etc) . The data logger will connect to the Inverters over MODBUS through RS 485 and collect the generation details of the Inverter and store locally. The data logger will also connect to the following two sensors – irradiation sensor (for measuring solar insolation), module temperature sensor collect the data from them and store locally. The data after being stored locally will be transferred to the remote portal in the internet cloud which will keep a backup of the data. GRSE user can logon to the remote portal and access the generation data using a predefined username and password. It should be possible to control the output power of the Inverter through the Inbuilt Webserver of the data logger. Necessary SIM card for net connectivity will be provided by Bidder for 5 Years..

B. Similar type of setup to be done for all other 1500kWp rooftop solar plants installed at different units of GRSE. The generated data to be accessible from an online portal where the real time generation data and other information's can monitored/obtained. The logging facility with USER ID & Password to be shared with GRSE. Any renewable for service licence charge of portal for 5 years will be in scope of Bidders.

C. All the SIM used for RMS must be 4G SIM CARD (Post Paid), Data Logger 4G, IP65 outdoor type enclosure (Lockable) for Data Logger, RS 485 cables, Power cable etc.

D. The data shall be recorded in a common work sheet chronologically date wise. The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.

E. All instantaneous data shall be shown on the computer screen. A training to GRSE representatives to be provided on Online Monitoring System.

13. PROTECTIONS

The system should be provided with all necessary protections like earthing, Lightning, and grid isolation as follows:

A. LIGHTNING PROTECTION

The SPV power plants shall be provided with lightning &overvoltage protection. The main aim in 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 The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IEC 62305standard. The protection against induced high-voltages shall be provided by the use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth.

B. SURGE PROTECTION

Internal surge protection shall consist of three MOV type surge-arrestors connected from +ve and –ve terminals to earth (via Y arrangement).

C. EARTHING PROTECTION

I. Each array structure of the PV yard should be grounded/ earthed properly as per IS:3043-1987. In addition the lighting arrester/masts should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representative of Department/[NAME OF THE ORGANISATION] as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly.

II. Earth resistance shall not be more than 5 ohms. It shall be ensured that all the earthing points are bonded together to make them at the same potential.

III. All the Earth pit to be properly covered and separate name plate indicating the earthpit number, its value, inspection date and next due date near to the pit.

D. GRID ISOLATION:

I. In the event of a power failure on the electric grid, it is required that any independent power-producing inverters attached to the grid turn off in a short period of time. This prevents the DC-to-AC inverters from continuing to feed power into small sections of the grid, known as “islands.” Powered islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.

II. A manual disconnect 4pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance.

14. CABLES

Cables of appropriate size to be used in the system shall have the following characteristics:

I. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards

II. Temp. Range: $-10^{o}C$ to $+80^{o}C$.

III. Voltage rating 660/1000V

IV. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation, Flexible

V. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use.

VI. Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified.

VII. The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25years. Cable selection data to be submitted.

VIII. The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant provided by the bidder. Any change in cabling sizes if desired by the bidder/approved after citing appropriate reasons. All cable schedules/layout drawings approved prior to installation.

IX. Multi Strand, Annealed high conductivity copper conductor PVC type 'A' pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground laying. All cable trays including covers to be provided. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below: BoS item / component Standard description Standard Number Cables General Test and Measuring Methods, PVC/XLPE insulated cables for working Voltage up to and including 1100 V,UV resistant for outdoor installation IS /IEC 69947.

X. The size of each type of DC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 1%.

XI. The size of each type of AC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 2 %.

15. QUALITY ASSURENCE

A. Contractor should submit and get finalized detailed comprehensive Standard Field Quality Plan (SFQP) within 30 days from date of issue of the order for bought out items and items manufactured by them. The Standard Field Quality Plan shall relate to the specific and objective erection practices right from storage of equipment till final inspection and testing to be followed for bought out items and items manufactured by Contractor. Accordingly, the Manufacturing Quality Plan shall be submitted broadly under following sub-heads:-

B. Raw material/Bought Out items and Components.

C. In process inspection and test/checks to establish successful completion/accomplishment of the process.

D. Final tests/checks in accordance with relevant national/ international standards/specification.

E. The quantum of check for each and every inspection/test items shall be based on an established sampling method and the quantum of check indicated in the SFQP should be designed adequate quality protection.

F. In case reference documents/acceptance norms are indicated as per plant standards then the same shall be duly substantiated/properly explained by well established and proven engineering practices. All submissions will be in English language only.

G. Bidder will to allow GRSE Ltd. to carry out Quality/Audit/Quality surveillance on bidders and our sub-vendor's work with reference to contractual obligations to ensure that the quality management practices/norms as detailed out in the Quality Manual are adhered to. To facilitate this activity, you shall keep GRSE Ltd. informed all progress of work in this contract on monthly basis.

H. Contractor will associate/fully witness in each inspection being carried out at their/their sub vendor's works by our authorized inspection engineer(s).

I. A detailed 'QAP' for Manufacturing and Inspection shall be submitted by the Bidder for approval of GRSE Ltd.

J. The shop test shall be carried out to prove the performance parameters of the offered model. The testing shall be done in the presence of the representatives of the GRSE.

K. Necessary arrangement including all infrastructural facilities for GRSE representative towards inspection of stage manufacturing and testing at works of SPV module and PCU to be made by the agency. The notice of such inspection shall be given well in advance in case of countries outside India and 15 days in India.

L. Manufacturer has to submit procedure for Test carried out at their Factory.

16. TESTS / INSPECTION

A. Modules, MMS, Inverters & AC distribution board shall be physically inspected and tested through Independent Certification Agency (ICA) viz; IRS, SGS, LLOYD, DNV, RITES, TUV Nord., QUEST (Quality evaluation & systems team Pvt. Ltd) during manufacture. Other items (BOS) to be certified/reviewed based on the Test report by ICA. During Erection, Testing & Commissioning stage ICA shall witness the process / Installation and certify the work. Copies of all the test certificates for above inspections in triplicate shall be supplied before dispatch of the equipments.

B. In case of imported components, the same should be inspected at the stock yard / warehouse of contractor. However, GRSE may have a liberty to depute their representatives for plant inspection & prototype inspection at overseas works.

C. The bidder shall also furnish a schedule of inspection / testing so that GRSE may associate their representative to witness the tests. The Contractor shall also furnish copies of all test/inspection reports for records and reference of Owner.

D. Inspection shall be carried out on 10% quantity of the ordered equipments viz. The major items requiring inspection/testing are modules, Invertors AC distribution board, DC distribution Board; For LT MCB manufacturers test certificate shall be submitted. All other items like cables, conductors, relays and associated equipment/components shall confirm to relevant international/national standards.

E. The scope of work broadly includes review of manufacturing / fabrication procedures, QA/QC plans, and review of documents including Quality Assurance Plan during manufacturing / fabrication activities.

F. All the standard tests in accordance with the Standards adopted shall be carried out at the manufacturer's works on all the major equipment and accessories so as to ensure efficient operation and satisfactory performance of all the component/parts.

17. ERECTION, TESTING & COMMISSIONING

A. The installation shall be carried out by an electrical contractor holding a valid license as required by the State Government Authorities.

B. The contractor shall provide necessary drawings and documents required by statutory authorities and obtain the approval before taking up erection. It shall be the sole responsibility of the contractor in obtaining safety certificate / approval from local statutory authorities, if required.

C. Any modification in the equipment or installation that may be demanded by the inspecting authorities shall be carried out by the contractor at no additional cost to GRSE Ltd.

D. In accordance with the specific installation instruction as per the manufacturers drawings or as directed by GRSE Ltd, the successful Bidder shall unload, assemble, erect, install test, commission and hand over all electrical equipments included in this contract.

E. Erection materials including all consumables, tools, testing instruments or any other equipment required for successful commissioning shall be arranged by the successful Bidder in a timely manner.

F. Clearing the site after completion of erection as well as regular clearance of unwanted materials from site.

G. All equipment and instruments, indoor and outdoor, shall be marked with Numbers and provided with suitable danger boards as per Indian electricity Rules/code etc. before commissioning.

H. The contractor shall touch up the surface with paint of same shade for equipments, which are scratched and / or damaged during transportation and erection before commissioning.

I. The contractor shall employ skilled and semi-skilled labourers for erection, testing and commissioning as required. All the electricians, cable jointers, wiremen, welders and others employed shall have valid certificates / license recognized by competent authorities.

J. The contractor shall set up his own facilities at site at allocated place to undertake fabrication/assembly jobs etc.

K. The Contractor shall carry out major civil engineering works as called for in scope of work pertaining to electrical equipment's like foundation for modules structures control rooms for Operation staff etc. as per the latest relevant drawings. In doing so if any minor civil works such as foundation bolts, cutting holes in walls, chipping of floor and ceiling etc. making good the same after installation of the equipment arise the same will also be carried out without any extra charges.

L. During erection, Electrical connection will be given by GRSE on chargeable basis as per CESC charge. Electric Meter to be arrange by contractor.

18. PREPARATION OF THE EQUIPMENT FOR COMMISSIONING;

A. After completion of the installation at site for the preparation of plant commissioning, the contractor shall check all the equipment and installation in accordance with the agreed standards, latest relevant code of practices of Indian Standards and specific instructions furnished by the particular equipment suppliers as well as purchaser.

B. Checking required to be made on all equipment and installations at site shall comprise, but not limited to, the following:

a) Physical inspection of Modules for removal of any foreign bodies, external defects, such as damaged, loose connection in Junction Boxes & PCU etc. loose foundation bolts etc.
b) Check for the free movement of mechanism for the circuit – breaker, rotating parts of the rotating machines and devices.
c) Check for tightness of all cable joints and busbar termination ends as well as earth connections in the main earthing network.
d) Check for clearance of live bus bars and connectors from the metal enclosure.
e) Check for proper alignment of all the modules etc.
f) Continuity checks in case of power and control cables.

g) Checking of all mechanical and electrical interlocks including tripping of breakers using manual operation of relay.
h) Checking of alarm and annunciation circuits by manual actuation of relevant relays.
i) Check and calibrate devices requiring field adjustment/calibration like adjustment of relay setting etc.
j) Check for proper connection to earth network of all non-current carrying parts of the equipment and installation.

C. The relevant tests shall be carried out in accordance with relevant IS of latest issue. The tests which are to be carried out on the equipment shall include, but not be limited to, the following:

a) Check for completeness of installation.

i. Each pole to earth insulation resistance test.
ii. Insulation resistance test shall be conducted for cables rated up to 1.1kV grade.
iii. All 1.1 kV cables shall be subjected to high voltage test after joining and terminating but before commissioning as per relevant standards.
iv. In each test, the metallic sheath / screen / armour should be connected to earth.
v. Continuity of all the cores, correctness of all connections as per wiring diagram, correctness of polarity and phasing of power cables and proper earth connection of cable glands, cable boxes, armour and metallic sheath, shall be checked.
vi. Earthing Tests to ensure continuity of all earth connections.
vii. Tests to obtain earth resistance of the complete network by using earth tester. The test values obtained shall be within the limits (less than 3 ohms).

19. DANGER BOARDS AND SIGNAGES:

Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date. Three signage shall be provided one each near to the control room, solar array area. Text of the signage may be finalized in consultation with [NAME OF THE ORGANISATION]/ owner.

20. FIRE EXTINGUISHERS:

The firefighting system for the proposed power plant for fire protection shall be consisting of:

A. Portable fire extinguishers in the control room for fire caused by electrical short circuits

B. Sand buckets in the control room

C. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided in the control room housing PCUs as well as on the Roof or site where the PV arrays have been installed.

21. DRAWINGS & MANUALS:

A. Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

B. For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to GRSE before progressing the installation work.

22. PLANNING AND DESIGNING:

A. The bidder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labor. The bidder should submit the array layout drawings along with Shadow Analysis Report to GRSE /Owner for approval.

B. GRSE reserves the right to modify the landscaping design, Layout and specification of sub-systems and components at any stage as per local site conditions/requirements.

C. The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidder submit three sets of final drawing for formal approval to proceed with construction work.

23. DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT

The Contractor shall furnish the following drawings Award/Intent and obtain approval

A. General arrangement and dimensioned layout for the system.

B. Schematic drawing showing the requirement of SPV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.

C. Structural drawing along with foundation details for the structure.

D. Itemized bill of material for complete SV plant covering all the components and associated accessories.

E. Layout of solar Power Array & Shadow analysis of the roof

24. SAFETY MEASURES:

The bidder shall take entire responsibility for Fire & safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc. GRSE Safety guidelines to be followed by the contractors' at site.

25. EXCESS / WASTE / REJECTED MATERIALS:

Removal of excess/waste/rejected materials etc. generated during execution of work shall be arranged by the Contractor after completion of work each with valid entry returnable challans. All the erection and excess materials (if any) to be entered in GRSE with valid returnable challans.

26. PROGRESS REPORT & PROJECT REVIEW MEETING

A. The EPC contractor shall **submit fortnightly progress report (soft and hard copies)** along with catch up plans against slippages if any to Owner / In charge of YM dept.

B. Owner shall hold project review meetings with EPC Contractor at pre-defined periodicity.

27. NET MINIMUM GUARANTEED GENERATION (NMGG) AND LIQUIDATED DAMAGES/COMPENSATION

A. The bidder shall be required to quote the Net Minimum Guaranteed Generation (NMGG) for 25 years period. The Bidder shall give NMGG per annum after considering proposed configuration and all local conditions, solar insolation, wind speed and direction, air temperature & relative humidity, barometric pressure, rainfall, sunshine duration, grid availability and grid related all other factors and losses due to near shading, incidence angle modifier, irradiance level, temperature loss, array loss, Module quality loss, Module array mismatch loss, and various inverter losses etc. To assess/verify feasibility of quoted NMGG, bidders are required to provide computation documents along with considered factors base on which NMGG has been computed**.**

B. Bidders are expected to make their own study of solar profile and other related parameters of the area & make sound commercial judgment about power output i.e. Net Minimum guaranteed generation. It shall be the responsibility of the bidder to access the corresponding solar insolation values and related factors of solar plant along with expected grid availability. The bidder should access all related factors about the selected site for the project and then quote the NMGG for the proposed project.

C. The agency shall be responsible for achieving NMGG. For any shortfall in the net minimum guaranteed generation corresponding to the offer, the compensation shall be recovered from the agency on yearly basis. The contractor has to maintain the Solar Plant equipment/s including its repair, replacement etc. so as to give the agreed NMGG per year. **It is also advisable to install minimum 2.5% additional solar PV Modules for maintaining any shortfall in the agreed NMGG.**

D. There will be no relaxation in NMGG beyond 5%. However, the bidder will be allowed to relocate the solar modules and install at different places at their own cost ensuring guaranteed net minimum generation. The entire cost including dismantling and re-erection, etc, will be borne by the bidder. To ensure NMGG, the bidder will be allowed to erect additional number of solar modules without extra cost to GRSE Ltd. In case of GRID failure or maintenance of LT panels from GRSE side, same shall be considered as hindrance and further cumulative relaxation shall be provided in NMGG.

E. In case of shortfall in quoted NMGG in a block period of two years, compensation will be recovered from the date of commissioning and after completing the particular block year. But the NMGG shall be worked out for every year. The compensation shall be paid by the contractor or shall be recovered from any payment due to contactor's B.G. The performance of 200 kWp Solar Power Project will be evaluated on two years block basis. The benefit of excess generation in any year of block shall be considered to compensate the shortfall in generation in other year of the block. In case there is shortfall in the block of two year the compensation as penalty shall be calculated on year to year basis and shall be charged based on average tariff (Rs. / kWh) per annum as decided by the Electricity Regulatory Commission from time to time.

28. SITE LOCATION AND PLANT DETAILS

A. LOCATION

Building Name Unit wise	Available Area (approx.)	MONO PERC PV Module Capacity	Inverter Rating	Cable Length (approx.)
Engineering Complex (GI Roof Shed) Block 1 and 2 at GRSE Main Unit	2000 Sq. mtr.	200kWp	50KW X 4 Nos of Invertor to get 200KW output	**1.** Inverter to ACDB 250 Mtr. **2.** ACDB to GRSE LT Panel 120 Mtr.

Note: Bidders are requested to visit the site for actual Measurement for further clarification.

B. Plant Details SPV module

i.	Output	200 kW_p
ii.	PV cell type	MONO PERC
iii.	Power Rating of module	Minimum 450 Wp and above

C. Mounting Arrangement

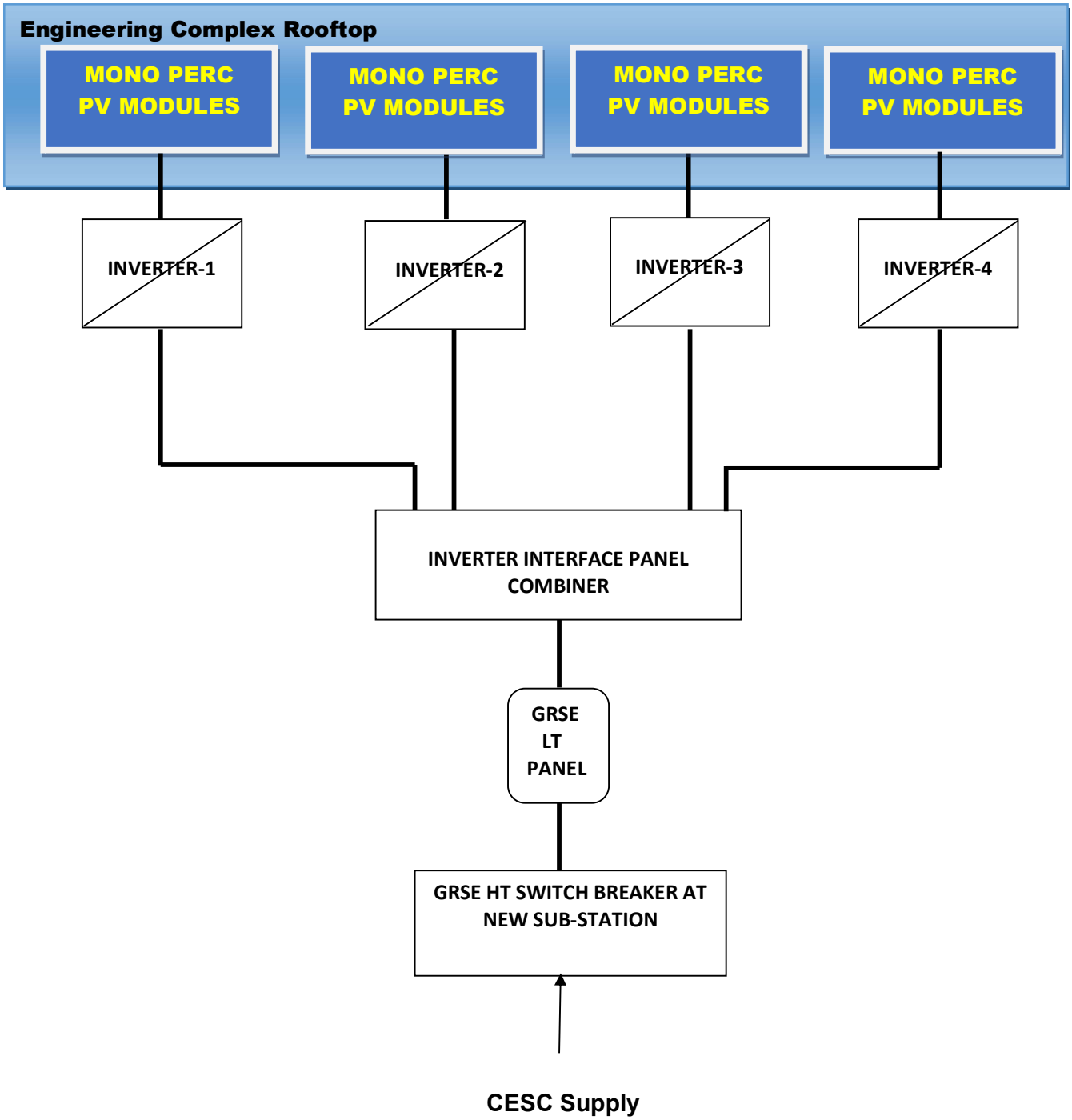
i.	Mounting	Fixed Type
Ii	Surface azimuth angle of PV Module	0 degree True south
iii	Tilt angle(slope) of PV Module	At altitude or as per site requirement

D. Inverter/ Power Conditioning Unit (PCU)

i.	Number of units	4
ii.	Rated Capacity	Minimum 50 KVA Grid tied
iii.	DC link voltage range	0 to 600 V
iv.	Output Voltage	3 phase, 415 V AC (+ 5 %)
v.	Frequency	50 Hz
vi.	Minimum Efficiency	96 % and above at full load,
vii.	Inverter no load losses	1% (Max)

E. Grid Connection Details : 415 V, 3Ph ,50 Hz

Proposed Single Line Diagram



SECTION-II

SPECIAL CONDITION OF CONTRACT FOR DESIGN SUPPLY AND ERECTION

1. Delivery Schedule:-

A. Job will be started from the data of issue of LOA/P.O from GRSE.

B. Completion Period for Design, Supply, Installation and Commissioning of 200kWp Solar Power Plant will be 04 Months from the date of LOA/P.O.

2. WORK DONE CERTIFICATE / COMPLETION CERTIFICATE

A. The contactor shall submit Completion Report of the project to GRSE. The Completion Report shall consist of the following documents:

a) Copy of the Job completion certificate of Solar Power plant duly signed/certified by Third Party Inspection Agency.

b) Four sets of as built drawings showing therein modification and corrections, if any. A soft copy of as built drawings shall also be submitted.

c) Copy of complete layout of the solar system.

d) Copies of test Certificates for type / routine tests performed on major equipment.

e) O&M Manuals – 3 sets

f) Copies of Statutory clearances / permissions if any.

B. Certifying Authority for Hindrance register will be YM Dept.

C. Owner shall issue Completion Certificate after verifying the completion documents and satisfying itself that the work has been completed in accordance with details set out in the construction and erection drawings and the contract documents. No Completion Certificate shall be given nor shall the work be deemed to have been executed until the export of generated Solar power commenced to LT BUS, statutory requirements are completed and all surplus materials and rubbish is cleaned off the site completely.

3. INFORMATION TO BIDDER / PRE BID MEETING

A. A prospective bidder requiring any clarification of the bidding documents may notify the tendering authority in writing or by cable (hereinafter "cable" include e mail, letter and facsimile) at GRSE's address indicated in the invitation to Bid. GRSE will respond to any request for clarification which he received earlier than 15 days prior to the deadline for submission of bids. Copies of the GRSE's response will be forwarded to all purchasers of the bidding documents, including a description of the enquiry but without identifying its source.

B. A pre-bid discussion meeting will be carried out to clarify issues and to answer queries on any issue raised by the bidder.

a) Bidder shall submit queries in writing or by e-mail to reach GRSE not later than one week before the meeting. The date of such meeting will be fixed by GRSE.

b) Minutes of the meeting, including the text of the questions raised without identifying the source of enquiry and the responses given, will be transmitted without delay to all purchasers of the bid/tender documents. Any modification of the tender/bidding documents which may become necessary as a result of the pre-bid meeting shall be made by GRSE exclusively through the issue of an Addendum and not through the minutes of the pre-bid meeting.

c) Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

d) All addenda are to be considered an integral part of the tender document which will be web hosted and can be viewed in www.eprocure.gov.in & www.grse.nic.in/etender.

e) Rate quoted must cover all items of incidents, transport, conveyance, taxes, octroi etc. for the completion of work. All rates shall be quoted on the tender schedule both in figures as well as in words. In case of any discrepancy found between the rate/amounts quoted in figures and words, the rate/amounts quoted in words will be considered for acceptance. Tenderer shall initial all correction and sign with date on each page of the tender. In case of any discrepancy the rate/total value written in words shall be accepted. If there is any conflict between the Tender Notice in English and those in any other language or languages, the English version shall prevail and be followed.

f) The quotation shall be valid for acceptance for a period of 180 days from the date of submission. Tenderers are advised to inspect and examine the local & site conditions and its surroundings means of access to site as well as nature of work before submitting the tender. No extra charges/claims subsequent of any misunderstanding or otherwise shall be allowed

4. TECHNICAL BID EVALULATION METHODOLOGY / ELIGIBILITY CRITERIA

A. MNRE approved Channel Partners/Module manufacturers and other firms having adequate similar experience will be eligible to compete in this tender. To substantiate this, necessary documents, certificates shall have to be attached with the proposal. (Section-V "Bid response sheet no.2 to be filled up accordingly").

B. The tenderer should furnish the details of minimum three (03) years' experience of successful installation of grid connected PV projects.

C. The bidder should have installed at least Two Grid connected Solar PV Power Plant having capacity of not less than 100 kWp which should have been commissioned during last three years including operation & maintenance in India. (Please attach copies of PO's and satisfactory report from previous installations in support of the same as per Bid Response sheet - 8).

D. The bidder should have a service setup in an around Kolkata.

E. The firm must have adequate capacity to design, manufacture, test, supply, erect, and commission the power plant within the given time schedule.

F. Bidder to confirm Net minimum guarantee generation (NMGG) per annum as per schedule(Bid response sheet no-3) and minimum guaranteed generation should be **2,73,600 kWh per annum**. Any bid quoted lower than the requisite generation criteria will not be considered for acceptance.

G. Guarantee of all the supplied product for 5 Years from the date of Handing over the Plant to GRSE.

All above criteria should be strictly followed. Tenderer should quote only if he is eligible.

5. GUARANTEE / WARRANTEE

A. Any material, equipment and/or accessories which prove defective or which fail to meet the design guarantee or Performance Guarantee during the defects liability period (which is 60 months from the date of commissioning of solar plant) the Contractor shall replace / rectify at his own cost such material, equipment and/or accessories, workmanship including spare parts for a period of five years from date of commissioning.

B. The Contractor shall guarantee the Solar power plant and installation work for a period of 60 (sixty) months from the date of commissioning of solar plant. Any damage or defect that may arise or lie undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by them or in the workmanship, shall be rectified or replaced by the Contractor at their own expenses as deemed necessary by the Engineer-in-Charge or in default, the Engineer-in-Charge may cause the same to be made good by other workman and deduct expenses (for which the certificate of Engineer-in-charge shall be final) from any sums that may be then or at any time thereafter, become due to the Contractor or from his SPBG.

6. INSURANCE:

The contractor shall arrange insurance to cover all risks in respect of their personnel, materials and equipment belonging to the contractor or its subcontractor during the tenure of the contract.

7. PROTECTION OF PROPERTY AND EXISTING FACILITIES:

A. Contractor shall perform each work in such a manner as will prevent damage to the Company's property and conform to and are consistent with, operational practices of shipbuilding industries. Any permanent damage /loss to the Company's assets due to actions undertaken by the Contractor in order to provide the services envisaged under this Contract shall have to be remedied by the Contractor, entirely at their own cost. This cost shall include and not be limited to actual replacement of such damaged assets or payment of actual replacement cost in relation thereto as may be incurred by the Company.

B. Contractor shall take sufficient care in moving their plants, equipments and materials from one place to another so that they do not cause any damage to any person or to the property of GRSE LTD.

8. STATUTORY APPROVALS FOR SOLAR PLANT

Any statutory approvals/permissions of drawings from the concerned local statutory authorities (viz. Inspector of Factories, Govt of WB) for installation of roof top solar plant and also for necessary electrical grid connections as necessary under applicable law / rules, shall be obtained by the Contractor. Statutory charges will be borne by the Client. However, other related charges/fees for preparation & approval of drawings shall be borne by the Contractor.

9. While deputation of workers at GRSE premises to carry out the work, Statutory compliance i.e. ESI & PF to be complied and Minimum wage to be paid to Contractor's workmen which is issued by Chief Labour Commissioner, Govt. of India, Ministry of Labour & Employment. Necessary gate passes will be obtained from GRSE HR dept. as per prevailing rules (CLMS policy) of GRSE.

SECTION-III
TECHNICAL SPECIFICATIONS FOR OPERATION & MAINTENANCE OF SOLAR POWER PLANT

SCOPE OF WORK FOR OPERATION & MAINTENANCE & 1700KWP RMS System

1. The implementing agency shall be responsible for all the required activities for the successful running, optimum energy generation & preservation of the Solar Photovoltaic Power Plant covering:

A. Successful running of Solar Power Plant for optimum energy generation.

B. Monitoring, controlling, troubleshooting, maintaining of records, registers. (Format for the maintenance schedule to be shared with GRSE ES dept.)

C. Supply of all consumables throughout the operation period as per recommendations of the equipment manufacturers and fixing / application, replacement of damaged modules, invertors/PCU,s , Replacement of Modules & Invertors/PCU"s, for a period of 5(five) years (as per Guarantee Clause)

D. Conducting periodical checking, testing, over hauling and preventive action.

E. Submission of Generation data from all the 1700KWp RTS plant, Intimation of any fault in the equipment of the plant as reported/recorded in the Remote Monitoring System / Online Monitoring system.

F. Cleaning of Solar PV Modules in an interval of minimum 15 days, if required weekly to match the NMGG. Cleaning of SPV module through water to be avoided during 11 AM to 4 PM (peak sunshine hours) to avoid any loss in generation of solar power and for prevention of SPV modules.

G. Work Done Certificate from GRSE ES Dept. after cleaning of Modules at every 15 days interval.

H. Submission of periodical reports to GRSE Ltd on the energy generation & operating conditions of the solar plant.

I. Maintaining the SIM card with internet facility for online data monitoring of solar data for 5 Years. Recharging of SIM on time, to avoid any disturbance in the Online Monitoring of generation data. SIM will be returned to the Firm after completion of 5 Years contract after getting clearance from ES Dept.

2. Continuous monitoring the performance of the Solar Power Plant and regular preservation of the whole system including Modules, PCU"s, junction boxes, underground cables, outdoor/indoor Distribution Board and all associated equipment etc. necessary for extracting and maintaining the maximum energy output from the Solar Power Plant.

3. Operation of the Solar Photovoltaic Power Plant shall be carried out for a period of 5 (five) years from the date of commissioning of the project. The period of Operation will be deemed to commence from the date of commissioning of solar Photovoltaic Power Plant.

4. The contractor shall carry out the periodical plant upkeep as given in the manufacturer's service manual and perform at least minimum requirement. Periodic checks of the Modules, PCU"s shall be carried out as a part of routine activity.

5. In order to meet the safeguarding requirements stock of consumables are to be maintained as well as various spare as recommended by the manufacturer at least for 2 years to be kept for usage.

6. Particular care shall be taken for outdoor equipment to prevent corrosion. Cleaning of the junction boxes, cable joints, insulators etc shall also be carried out at every month interval.

7. Resistance of the earthing system as well as individual earthing is to be measured and recorded every month. If the earth resistance is more than 2-ohm, suitable action is to be taken to bring down the same.

8. According to the recommendations stock of special tools and tackles shall be maintained for Modules, PCU"s and other major electrical equipment.

9. The Schedules will be drawn such that some of the jobs other than breakdown, which may require comparatively long stoppage of the Power Plant, shall be carried out preferably during the non-sun period.

10. The Contractor shall deploy adequate manpower at Solar Photovoltaic Power Plant site to carryout work instructions and preventive schedules as specified.

11. The Contractor will attend to any breakdown jobs immediately for repair/replacement /adjustments and complete at the earliest working round the clock. During breakdowns (not attributable to normal wear and tear) at Operation period, the Contractor shall immediately report the accidents, if any, to the Engineer In Charge at site of GRSE Ltd showing the circumstances under which it happened and the extent of damage and or injury caused.

12. The contractor shall at their own expense provide all amenities to their workmen as per applicable laws and rules.

13. The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to their or Co-contractor or GRSE Ltd Workmen.

14. If negligence of the contractor's operator results in failure of equipment such equipment should be repaired replaced by contractor at free of cost.

15. If any jobs covered in Operation Scope are not carried out by the contractor during the Operation period pro-rata deduction will be made based on the quantum of work from the Operation contract bills.

16. In order to ensure longevity & safety of the core equipment and optimum performance of the system the contractor should use only genuine spares of high quality standards.

17. A monthly generation report comprising daily energy generation, breakdowns hours, plant availability etc shall be sent through e-mail to Owner not later than 5th day of the following month.

SECTION-IV
SPECIAL CONDITION OF CONTRACT FOR OPERATION & MAINTENANCE OF SOLAR POWER PLANT

SPECIAL CONDITIONS OF CONTRACT

1. The Agency shall be responsible for Operation & Maintenance of the 200 kWp Solar Power Plant for a period of five (5) years and maintaining centralised Online monitoring of 1700KWP Solar generation data from the date of commissioning of solar project. The O&M will be monitored by Engineering Services (ES) Dept. of GRSE.

2. The bidder shall be responsible for performance during operation & maintenance contract to meet net minimum guaranteed generation as offered by the bidder. For any shortfall in the minimum guaranteed generation the LD/compensation shall be recovered from the contractor as per NMGG clause.

3. The bidder shall be responsible for supply of all spare parts as required from time to time, to carry out schedule and preventive protection, major overhauling of the plant, replacement of defective modules, inverters, PCU"s etc. and will maintain log sheets for operation detail, provisioning of infrastructure for continuous operations and qualified engineer for supervision of Operation work.

4. As the entire system is guaranteed for a period of 5 years from the date of commissioning of the system, any sort of upkeep including replacement of all spare parts as required during said tenure for successful operation of the plant shall be carried out by agency at no extra cost to GRSE.

5. After expiry of guarantee period Comprehensive Annual Maintenance Contract will be entered with successful bidder subject to satisfactory performance of the agency during the guarantee period at mutually agreed rate, terms & conditions.

6. The successful agency shall provision adequately qualified and experienced personnel for operating and maintaining the solar power plant. The agency shall ensure that such personnel should take all the care for operation and maintenance of the plant from date of commissioning.

7. The contractor shall arrange insurance to cover all risks in respect of their personnel, materials and equipment belonging to the contractor or its subcontractor during the tenure of the contract.

8. The Contractor shall comply with the provision of all relevant acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Mines Act 1952, Employees State Insurance Act 1948, Contract Labor (Regulations & Abolishment) Act 1970 or any other law relating whereto and rules made there under from time to time. While deputation of workers at GRSE premises to carry out the work, Statutory compliance i.e. ESI & PF to be complied

9. Separate Bank Guarantee shall be submitted by the bidder for the amount equivalent to the contract value for the entire period of Operation and Maintenance contract.

10. OPERATION CHARGES / RATE:

The rate shall be firm, fixed and binding & no escalation will be paid. The payment will be made after all statutory deductions as applicable to such type of contracts. The rate quoted shall be deemed to be inclusive of all salaries & other cost, expenses of employees, cost of consumables & taxes, duties & levies thereof, tools & tackles, insurance etc. and liabilities of every description and all risk of every kind to be taken in operation, maintenance and handing over the plant to the owner by the agency. Owner shall not be responsible for any such liability on the Operator in respect of this contract and exclusion of any applicable taxes at prescribed rates due to ignorance or otherwise shall not form a reason for claiming anything extra at a later date.

11. PAYMENT

The payment of Operation & Maintenance charges shall be made on quarterly basis after deduction of taxes and adjustment of dues payable to owner. The agency will raise the bill promptly following the end of each quarter of Operation period and submit it to the Maintenance department (ES) for processing of bill with job done certification.

The Operation & Maintenance charges shall be quoted with applicable taxes & duties showing separately. Any increase in statutory taxes, levies / fees or newly imposed taxes would be charged extra (with submission of documentary proof). Similarly, due credit would be given to Owner in case of withdrawal or reduction in applicable taxes / fees / duties.

12. PAYMENT PERIOD

The Contractor shall raise the bills in triplicate on quarterly basis at the end of each quarter. The complete bill will be forwarded on satisfactory completion of entire work within 30 days of submission of clear and complete bill in Finance Department duly certified by HR Department on compliance of statutory obligations by the contractor like PF, ESI, minimum wages etc through ECS mode after deduction of cost of materials, if any, issued by GRSE on recovery basis as per certificate of Engineer In-charge against Security Deposit cum BG.

13. HANDING OVER THE PLANT AFTER EXPIRY OF TERM

After the expiry of term & extension of term as the case may be, agency shall hand over the plant to the owner in excellent condition. The operator shall demonstrate performance test of all the major & critical equipment to ensure Generation from the Solar Photovoltaic Power Plant. While handing over the plant agency shall hand over all technical documents, literature, instruction manuals, lists of spare part & tools & tackles. Operator will also hand over all the relevant record/documents.
On completion of Operation term the agency will apply to the Engineer in-charge for the issue of Handing Over Certificate and the same will be issued within 1 months of the Handing Over in all respects, after verifying from the documents & tests and satisfying that the Operation has been completed in accordance with details set out in the control documents & Prudent Utility Practices.
All the aforesaid safeguards / rights provided for GRSE Ltd shall not prejudice its other rights / remedies elsewhere provided herein and / or under law.

14. DEFECTS/ NON ACHIEVEMENT PLANT DEPENDABLE CAPACITY AFTER HANDING OVER

In order that the agency could obtain a Handing Over certificate, they shall rectify any defect / non achievement of plant dependable capacity in accordance to the norms of manufacturer arising from the defective Operation & maintenance practices or non compliance of Prudent Utility Practices or that may have been noticed or developed during/ after the plant has been taken over, the period allowed for carrying out such works will be normally one month. If any defect could not be remedied or plant dependable achievement capacity in accordance to the norms of manufacturer could not be achieved within a reasonable time the Owner may proceed to do the work at agencies risk and expense and deduct from the final bill such amount as may be decided by the Owner.

All the aforesaid safeguards /rights provided for the Owner shall not prejudice its other rights/remedies elsewhere provided herein and/or under law.

15. FINAL PAYMENT

Whenever, in the opinion of the Engineer-in-charge, the Operator has completely performed the contract on their part, the Engineer in-charge will so certify in writing to the agency.

Final payment to the agency shall be made after accounting for all the previous payments/advances/adjustments of dues, provided always that agency furnishes a "NO Further Claim - No Dues Certificate". The release of final payments does not relieve the agency from their any other obligations as provided for in the contract.

Owner shall deduct statutory taxes at source as per prevailing rates from bills of the agency.

SECTION - V

BID RESPONSE SHEETS

Bid Response Sheet No.	Description	
1.	**GENERAL PARTICULARS OF THE BIDDER**	
2.	**BID REJECTION CRITERIA FORM**	
3.	**NET MINIMUM GUARANTEED GENERATION (NMGG) FOR 25 YEARS PERIOD**	
4.	**DRAFT ACTIVITY CHART**	
5.	**SOURCE OF COMPONENTS (Annexure-1 LIST OF PREFERRED MAKES)**	
6.	**LIST OF COMPONENTS HAVING LIFE LESS THAN 25 YEARS**	
7.	**DRAWINGS TO BE ENCLOSED BY THE BIDDER**	
8.	**DETAILS OF PAST EXPERIENCE IN SOLAR POWER**	

Tender no. :

Bid Response Sheet No 1

1. GENERAL PARTICULARS OF THE BIDDER

1.	Name of the Company	
2.	Registered Office Address	
3.	Telephone, Telex, Fax No	
4.	E-mail	
5.	Web site	
6.	Authorized Contact Person(s) with name, designation Address and Mobile Phone No., E-mail address/ Fax No. to whom all references shall be made	
7.	Year of Incorporation	
8.	Bidding company PAN Number	
9.	Bidding company TAN Number	
10	Have the bidder/Company ever been debarred By any Govt. Dept. / Undertaking for undertaking any work.	
11	Reference of any document information attached by the Bidder other than specified in the RFS.	
12	Whether the Bidder wishes to form a Project Company for execution of work	Yes/No/May be
13	Bidding company is listed in India	Yes/No
14	Details of the Ownership structure (Details of persons owning 10% or more of the Total Paid up equity of the Bidding Company in the Format as below	
15	Bid Security Bank guarantee No	
16	Validity of Bid Security	
17	Banker E-mail ID, FAX No of the banker	

Signature of Bidder

Tender No. :
Bid Response Sheet No.2

2. BID REJECTION CRITERIA FORM

Sl. No.	Item	Reference of supporting Document
	TECHNICAL :-	
1.	The offered Solar PV plant shall be rated for a 200 kWp	Yes
2.	MNRE approved Channel Partners/Module manufacturers and other firms having adequate similar experience will be eligible to compete in this tender. To substantiate this, necessary documents, certificates shall have to be attached with the proposal.	Supporting Document to be Submitted.
3.	The tenderer should furnish the details of minimum three (03) years' experience of successful installation of grid connected PV projects.	Supporting Document to be Submitted.
4.	The bidder should have installed at least Two Grid connected Solar PV Power Plant having capacity of not less than 100 kWp which should have been commissioned during last three years including operation & maintenance in India. (Please attach copies of PO's and satisfactory report from previous installations in support of the same as per Bid Response sheet - 8).	Supporting Document to be Submitted.
5.	The bidder should have a service setup in and around Kolkata.	Supporting Document to be Submitted.
6	The firm must have adequate capacity to design, manufacture, test, supply, erect, and commission the power plant within the given time schedule.	Yes
7	Bidder to confirm Net minimum guarantee generation (NMGG) per annum as per schedule(Bid response sheet no-3) and minimum guaranteed generation should be **2,73,600 kWh per annum**. Any bid quoted lower than the requisite generation criteria will not be considered for acceptance.	Yes
8	Guarantee of all the supplied product for 5 Years from the date of Handing over the Plant to GRSE.	YES

Documentary evidence in support of above are enclosed.

Signature of the Bidder

3. NET MINIMUM GUARANTEED GENERATION (NMGG) FOR 25 YEARS PERIOD

A. The Bidder shall give NMGG per annum after considering offered design configuration and all local conditions, solar insolation, wind speed and direction, air temperature & relative humidity, barometric pressure, rainfall, sunshine duration, grid availability and grid related all other factors and losses due to near shading, incidence angle modifier, irradiance level, temperature loss array loss, Module quality loss, Module array mismatch loss, and various inverter losses etc. To assess/verify feasibility of quoted NMGG, bidders are required to provide computation documents along with considered factors based on which NMGG has been computed. **It is also advisable to install minimum 2.5% additional solar PV Modules for maintaining any shortfall in the agreed NMGG.**

B. Bidder shall furnish detailed calculations for estimated NET MINIMUM GUARANTEED GENERATION (NMGG) FOR 25 YEARS PERIOD of the solar power plant based on Solar radiation and climatic parameters and factors considered for calculating NMGG

Sl. No.	**Year**	Year wise NET MINIMUM GUARANTEED GENERATION (NMGG) in kWh
1.	1st	
2.	2nd	
3.	3rd	
4.	4th	
5.	5th	
6.	6th	
7.	7th	
8.	8th	
9.	9th	
10.	10th	
11.	11th	
12.	12th	
13	13th	
14.	14th	
15.	15th	
16.	16th	
17.	17th	
18.	18th	
19.	19th	
20.	20th	
21.	21th	
22.	22th	
23.	23th	
24.	24th	
25.	25th	
	TOTAL	

C Calculations copy to be enclosed.

Signature of Bidder
Tender No:

Bid Response Sheet No.4

4. DRAFT ACTIVITY CHART

Bidder shall furnish Bar Chart for the following activities and his plan for implementation of the project to meet the completion date. This information shall be in addition to detailed project schedule and other information he is required to furnish as part of their offer. The activities indicated herein are minimum activities for which bidder shall furnish the required information. Project Completion period is 4 Months.

Sl. No.	Activity	Start Time	Completion Time
1.	Installation Site Survey		
2.	Design of structures, foundation, ,overall plant design and drawings , submission to GRSE and arranging approval from GRSE		
3.	Supply of PV Modules, Module Mounting Structures, Inverters and other related Equipment's & Materials.		
4.	AC Distribution Board , DC distribution Board , Power and control Cables and Balance items of Solar Plant		
5.	Erection and Installation		
6.	Commissioning and Generation of Power.		
7.	Completion of plant in all respect		

Signature of the Bidder

Tender No:

Bid Response Sheet No.5

5. SOURCE OF COMPONENTS

Sl. No	Item Description	Make	Qty.

Bid Response Sheet No.5 (ANNEXURE- 1)

LIST OF PREFERRED MAKES

SLNO.	ITEM DESCRIPTION	APPROVED VENDOR LIST
1.	MODULES	MNRE Approved MONO PERC Models Manufacturers.
2.	PCU/ INVERTER	ABB, KACO, DELTA, SCHNEIDER ELECTRIC INDIA PVT. LTD, THEA
3.	CABLES (POWER & CONTROL)	HAVELL'S , POLYCAB, LAPP, LEONI, UNIFLEX CABLES LTD., UNIVERSAL CABLES LTD.
4.	JUNCTION BOX	REPUTED MAKE (ISI Mark)
5.	FUSES	ABB LTD, L&T, SEIMENS C&S ELECTRIC LIMITED
6.	PUSH BUTTON & INDICATORS	SCHNEIDER ELECTRIC INDIA PVT. LTD C&S ELECTRIC LIMITED
7.	TIMER	SCHNEIDER ELECTRIC INDIA PVT. LTD BCH ELECTRIC LTD. SIEMENS LTD
8.	AUX. RELAY	ALLEN BRADLEY SCHNEIDER ELECTRIC INDIA PVT. LTD
9.	PANEL METERS	CONZERVE ENERGY METER SECURE METERS PVT LTD
10.	PROTECTION RELAYS	ALSTOM LTD. ABB LTD C&S ELECTRIC LIMITED AREVA T&D INDIA LTD SCHNEIDER ELECTRIC INDIA PVT. LTD
11.	ENERGY EXPORT METER	SECURE METERS PVT LTD LARSON & TUBRO
12.	CABLE TRAY	REPUTED MAKE (ISI Mark)
13.	CHEMICAL EARTHING KIT	REPUTED MAKE ((ISI Mark)
14.	SURGE PROTECTION DEVICES	REPUTED MAKE ((ISI Mark)
15.	PVC GLANDS (UV PROTECTED)	HUMMEL CO. LTD HENSEL ELECTRIC PVT LTD
16.	METAL GLANDS(DOUBLE COMPRESSED)	COMMETGROUP COMEX GROUP
17.	CABLE LUGS	DOWELL ELEKTRO WERKS PVT LTD COMEX GROUP
18.	SWITCH BOARDS	1. BCH ELECTRIC LTD 2. CONTROLS & SWITCHGEAR LTD 3. LARSEN & TOUBRO LTD 4. SCHNEIDER ELECTRIC INDIA PVT. LTD- 5. SIEMENS LTD
19.	UPVC Pipes	Supreme, Finolex, Astral

Tender No

Bid Response Sheet No. 6

6. LIST OF COMPONENTS HAVING LIFE LESS THAN 25 YEARS

Sl No.	Description of Item	Make	Expected Life

Signature of the Bidder

Bid Response Sheet No. 7

7. DRAWINGS TO BE ENCLOSED BY THE BIDDER

The Bidder should enclose the following drawings with the bid:

i Single line schematic diagram of electrical system for grid interfacing and grid interconnection from Solar plant along.

ii General arrangement drawings and circuit diagrams of Module , PCU, and overall solar plant arrangement.

iii. General arrangement drawings for Civil and Structural plan for installation of Solar PV Modules arrangement.

iv. Drawings of similar type of project already commissioned by bidder.

Signature of the Bidder

8. PROFORMA FOR FURNISHING DETAILS OF PAST EXPERIENCE IN SOLAR POWER PLANTS DURING LAST FIVE YEARS (TURNKEY PROJECT)

a) Total Aggregate capacity of all solar power plant executed on turnkey basis in India in the last five years.

Work Experience Details of the Firm						
Sl. No.	**Project Name & Capacity**	**Name of the Employer**	**P.O. No. & Date**	**Contract Period/ Stipulated period of completion**	**Actual date of completion**	**Contact Details of Firm**

b) O&M works of Solar Power projects undertaken in India for total capacity

c) O&M contract for last three years in hand indicating capacity thereof.

Signature of Bidder

SECTION – VI

Annexure's

Annexure's	Description	
1.	Details of Installed Solar Plants & Inverters	
2.	Layout of Main unit indicating installed Solar Plant.	
3.	Layout of FOJ unit indicating installed Solar Plant.	
4.	Layout of RBD unit indicating installed Solar Plant.	

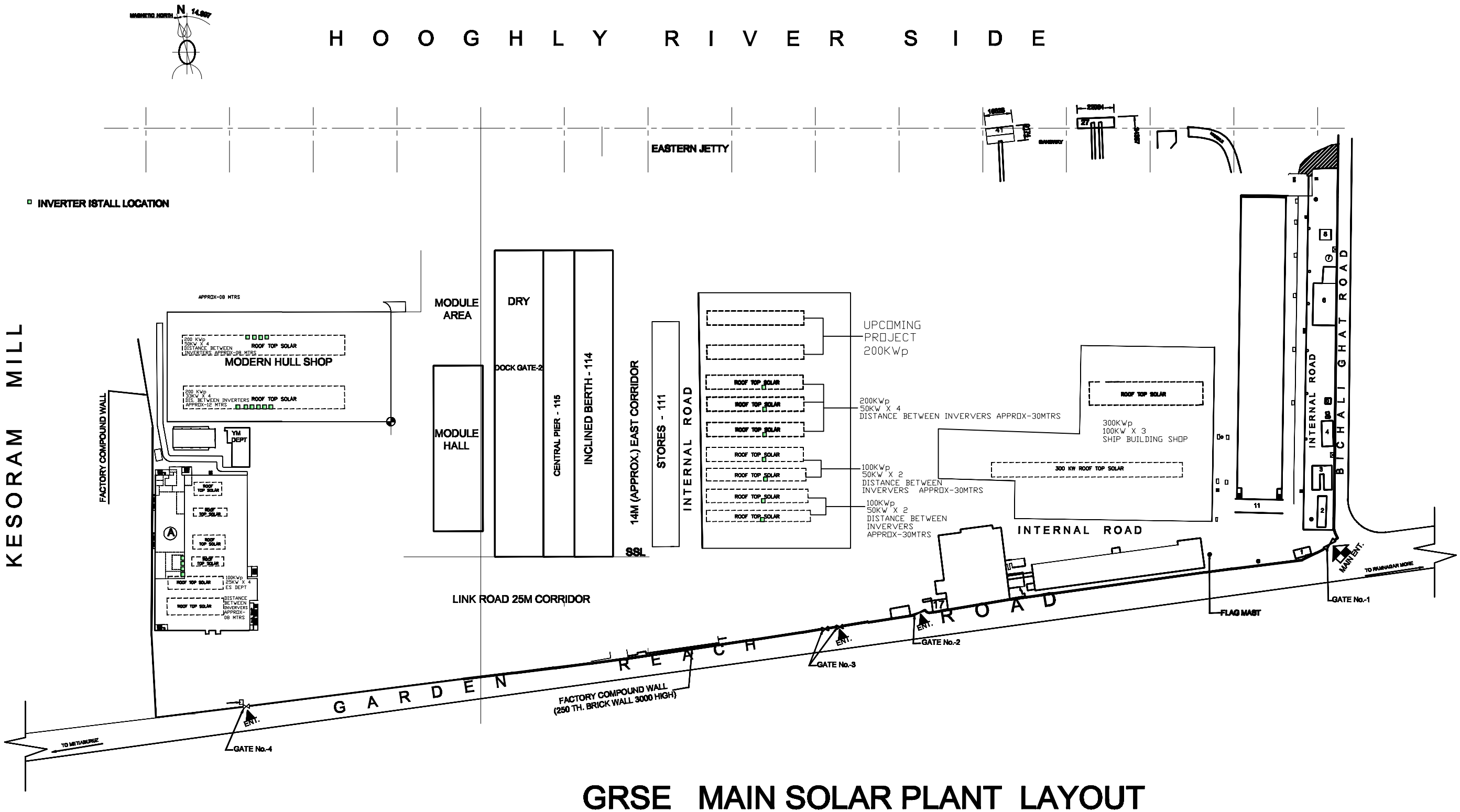
Annexure-1 : Details of Installed Solar Plants & Inverters

Sl. No.	Plant Capacity	Roof Location/ Unit	No. of Inv.	Inverters Details (Make, Capacity)					
				Inverter-1	Inverter-2	Inverter-3	Inverter-4	Inverter-5	Inverter-6
1.	100 KWp	ES Building Main	4	Make:- Schneider Capacity:- 25 KW	Make:- Schneider Capacity:- 25 KW	Make:- Schneider Capacity:- 25 KW	Make:- Thea Capacity:- 25 KW	NA	NA
2.	200 kWp	MHS Bay-I Main	6	Make:- ABB Capacity:- 33 KW	Make:- ABB Capacity:- 33 KW	Make:- ABB Capacity:- 33 KW	Make:- ABB Capacity:- 33 KW	Make:- ABB Capacity:- 33 KW	Make:- ABB Capacity:- 33 KW
3.	200 kWp	MHS Bay-II Main	4	Make:- Kaco Capacity:- 50 KW	Make:- Kaco Capacity:- 50 KW	Make:- Kaco Capacity:- 50 KW	Make:- Kaco Capacity:- 50 KW	NA	NA
4.	100 kWp	Engineering Complex (Block 8&9) Main	2	Make:- ABB Capacity:- 50 KW	Make:- ABB Capacity:- 50 KW	NA	NA	NA	NA
5.	100 kWp	Engineering Complex (Block 6&7) Main	2	Make:- ABB Capacity:- 50 KW	Make:- ABB Capacity:- 50 KW	NA	NA	NA	NA
6.	150 kWp	GM & WOT Building **FOJ**	3	Make:- DELTA Capacity:- 50 KW	Make:- DELTA Capacity:- 50 KW	Make:- DELTA Capacity:- 50 KW	NA	NA	NA
7.	150 kWp	GM, Medical & Canteen Building **RBD**	3	Make:- DELTA Capacity:- 50 KW	Make:- DELTA Capacity:- 50 KW	Make:- DELTA Capacity:- 50 KW	NA	NA	NA
8.	300 kWp	Ship Building Shop Main	3	Make:- ABB Capacity:- 100 KW	Make:- ABB Capacity:- 100 KW	Make:- ABB Capacity:- 100 KW	NA	NA	NA
9.	200 kWp	Engineering Complex (Block 3,4&5) Main	4	Make:- THEA Capacity:- 50 KW	Make:- THEA Capacity:- 50 KW	Make:- THEA Capacity:- 50 KW	Make:- THEA Capacity:- 50 KW	NA	NA
	Total	**1500KWp**							

a) Total installed Solar power plant is 1500KWp.
b) Plant Sl. No. 1 to 5 don't have RMS, complete items are required for setup RMS/OMS.
c) Plant Sl. No. 6, 7, 8 & 9 are LIVE on Trackso, only SIM is required for them for 5 Years.
d) Plant 4 & 5 can be clubbed and make a single plant as inverters are within 60Mtr.
e) RBD & FOJ plants are live and 6 SIM's has been used for RMS system, as all inverters are far away from each other's.
f) Considering above, total 12 SIM's are required. **Only POST-PAID SIM TO BE USED.**

ANNEXURE-2 : LAYOUT OF MAIN UNIT INDICATING INSTALLED SOLAR PLANT

H O O G H L Y R I V E R S I D E



GRSE MAIN SOLAR PLANT LAYOUT

ANNEXURE-3 : LAYOUT OF FOJ UNIT INDICATING INSTALLED SOLAR PLANT

INVERTER

EVEREST ASBESTOS ROAD

H.P. PETROL PUMP

F.O.J BUS STOPAGE

B A L A J I T R I M B E R

K A R L M A R X

MAIN GATE

MAIN ENT.

F.O.J BUS STOPAGE

RAIL GATE

GATE-1

GATE

PASS.

VER.

(CONC. INTERNAL ROAD) TOP OPEN

(CONC. INTERNAL ROAD) TOP OPEN

INTERNAL ROAD

INTERNAL ROAD

INTERNAL ROAD

INTERNAL ROAD

50KW SOLAR POWER PLANT

50KW SOLAR POWER PLANT

50KW SOLAR POWER PLANT

2100 HIGH WIRE FENCING

TOOLS STORE

CRANE STOP BUFFER

CRANE STOP BUFFER

E.L.L. (ELECTRICAL LUFFING LAP)

(CONC. INTERNAL ROAD) TOP OPEN

(CONC. INTERNAL ROAD) TOP OPEN

H Y S I D E

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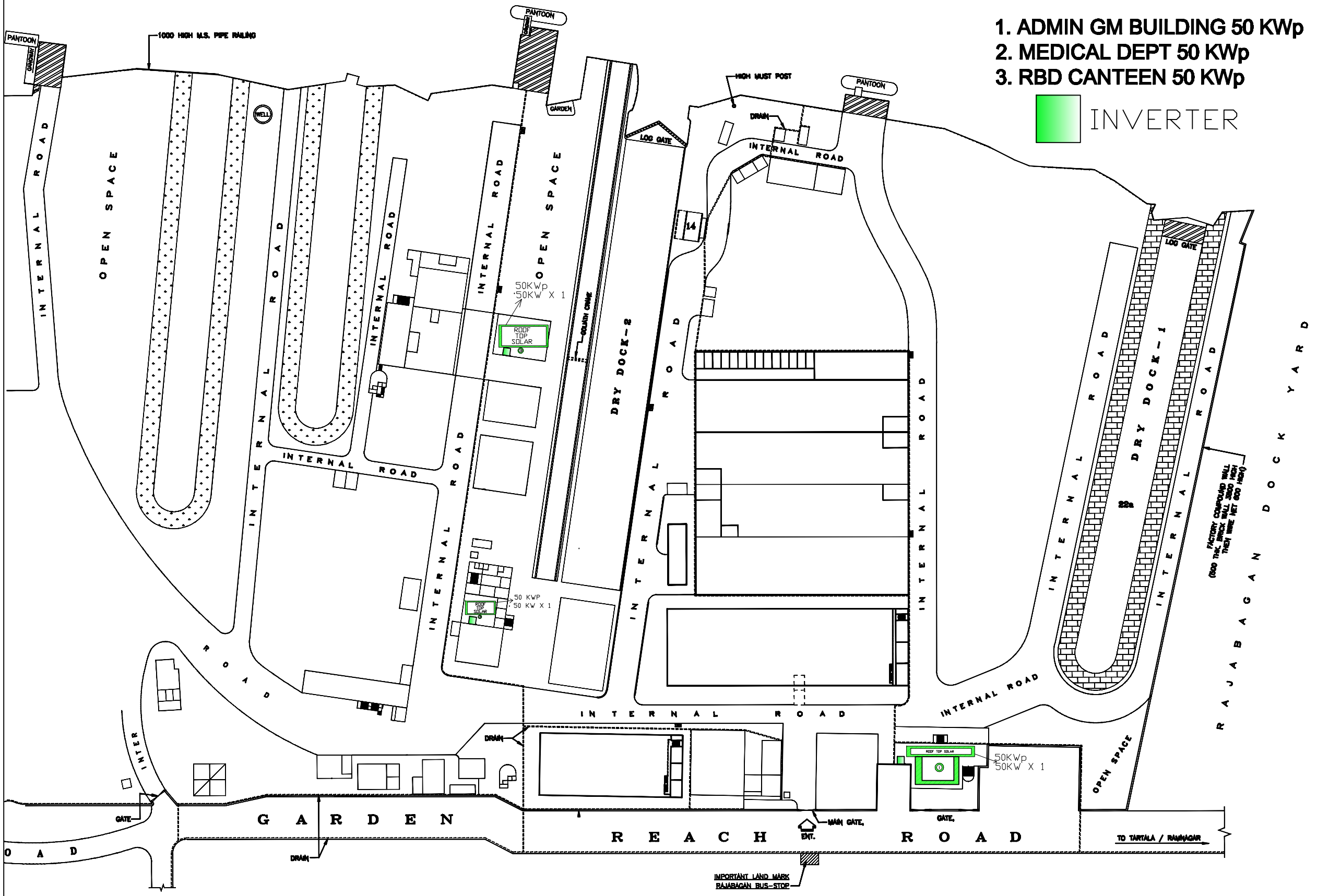
ANNEXURE-4 : LAYOUT OF RBD UNIT INDICATING INSTALLED SOLAR PLANT



SITE PLAN **RBD UNIT**

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