

### TECHNICAL SPECIFICATIONS for 5KW Solar Power Plant(Annexure A)

The general scope of contract includes design, manufacture, testing, inspection, packing and forwarding, transportation up to project site, loading & unloading, storage in safe custody, erection, carrying out preliminary tests at site, commissioning, performance testing and operation for at least one month & handing over to the purchaser all the equipments installed for 5KWp capacity SPV Power Plant in Amarpur PHC in Tinsukia Districts under NHM, Assam.

The illustrative schedule of requirements is in accordance to the specifications contained in this document

#### 1.1 SYSTEM DETAILS:

Sl. No.	Brief Description	Units
1	SPV modules for a total capacity of 5 KWp as per specifications	1 Set
2	SPV module mounting structure suitable for accommodating 5 KWp capacity SPV modules including foundation as per specifications on ground/roof of building.	1 Set
3	PCUs as per specifications	1 No. / Set
4	Array Junction Boxes	1 Set
5	Main Junction Boxes	1 Set
6	Data Logging system with remote monitoring as per specification	1 Set
7	DC Distribution units as per Specifications	1 Set
8	AC Distribution units as per Specifications	1 Set
9	Cables requirement as per design	Mtrs. As required at site for full plant commissioning
10	Fire extinguisher in accordance with BIS codes for electrical short circuit fires along with sand buckets	1 set
11	Lightning arrester complete set as per Specification	1 set
12	Earthing complete set as per Specification	1 Set

13	Battery Bank as per specifications	1 Set
14	Spares, tools and tackles for operation and maintenance	As per list
15	Fuses, Transfer Switches, Printed Circuit Boards required for Power Plant	1 Set
16	Providing training to engineers and site staff for Operation, Maintenance and Trouble Shooting skills	1 Item
17	Operation of the SPV Power Plant for a period of 1 month from date of commissioning of the plant.	1 Item
18	Engineering, electrical drawings and installations and O&M manuals	1 Set

## 1.2 SOLAR PHOTOVOLTAIC MODULES

- 1.2.1 The total solar PV array capacity should not be less than 5 KWp and should comprise of polycrystalline of minimum 200 Wp and above wattage. Module capacity less than minimum 200 watts should not be supplied. The module type must be qualified as per IEC 61215/IS 14286 latest edition for Crystalline Silicon PV Module. SPV module conversion efficiency should be equal to or greater than 13 – 14 % under STC. Modules must qualify to IEC 61730 Part I and II for safety qualification testing. Certificate for module qualification from IEC or equivalent to be submitted as part of the bid offer. Undertaking from manufacturer / supplier that the modules being supplied are as per above.
- 1.2.2 The PV module shall perform satisfactorily in humidity up to 100% with temperature between – 40 °C to + 85 °C. Since the modules would be used in a high voltage circuit, the high voltage insulation test shall be carried out on each module and a test certificate to that effect provided.
- 1.2.3 The predicted electrical degradation at the end of the period of 15 years shall be less than ten (10) per cent of the full rated original output.
- 1.2.4 Other general requirement for the PV modules and subsystems shall be as follows:
- Raw materials and technology employed in the module production processes shall have to be certified and a certificate giving details of major materials i.e. cells, glass, back sheet, their makes and data sheets to be submitted for the modules being supplied by the bidder.
  - The rated output power of any supplied module shall have tolerance of +/- 3% as per MNRE standard specs.
  - 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 more than 3 (three) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.
  - Except where specified, the front module surface shall consist of impact resistant, low-iron and high-transmission toughened glass.
  - The module frame, if any, shall be made of a corrosion-resistant material which shall be electrolytically compatible with the structural material used for mounting the modules.

- f. 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 IP65 rated

### **1.3 ARRAY STRUCTURE**

- 1.3.1 Wherever required, suitable number of PV panel structures shall be provided. Structures shall be of flat-plate design either I or L sections.
- 1.3.2 Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Galvanizing should meet ASTM A-123 hot dipped galvanizing or equivalent which provides at least spraying thickness of 70 microns on steel as per IS5905, if steel frame is used. Aluminium frame structures with adequate strength and in accordance with relevant BIS/ international standards can also be used.
- 1.3.3 Structures shall be supplied complete with all members to be compatible for allowing easy installation at the rooftop site.
- 1.3.4 The structures shall be designed to allow easy replacement of any module & can be either designed to transfer point loads on the roof top or UDL as per site conditions.
- 1.3.5 Each structure shall have a provision to adjust its angle of inclination to the horizontal as per the site conditions.
- 1.3.6 Each panel frame structure is so fabricated as to be fixed on the ground or roof. The structure should be capable of withstanding a wind load of 200 km/hr after grouting & installation. The front end of the solar array must be one meter above the ground. Grouting material for SPV structure shall be as per M15 (1:2:4) concrete specification.
- 1.3.7 The structures shall be designed for simple mechanical and electrical installation. There shall be no requirement of welding or complex machinery at the installation site. If prior civil work or support platform is absolutely essential to install the structures, the supplier shall clearly and unambiguously communicate such requirements along with their specifications in the bid. Detailed engineering drawings and instructions for such prior civil work shall be carried out prior to the supply of Goods.
- 1.3.8 The supplier shall specify installation details of the PV modules and the support structures with appropriate diagrams and drawings. Such details shall include, but not limited to, the following:
  - a. Determination of true south at the site;
  - b. Array tilt angle to the horizontal, with permitted tolerance;
  - c. Details with drawings for fixing the modules;
  - d. Details with drawings of fixing the junction/terminal boxes;
  - e. Interconnection details inside the junction/terminal boxes;
  - f. Structure installation details and drawings;
  - g. Electrical grounding (earthing);

- h. Inter-panel/Inter-row distances with allowed tolerances; and
- i. Safety precautions to be taken.

The array structure shall support SPV modules at a given orientation and absorb and transfer the mechanical loads to the rooftop columns properly. All nuts and bolts shall be of very good quality stainless steel.

#### 1.4 POWER CONDITIONING UNIT (PCU)

The PCUs required shall be of 5 KVA Hybrid with provision for battery back-up, should convert DC power produced by SPV modules in to AC power and adjust the voltage & frequency levels to suit the local grid conditions. The 5 KVA Hybrid PCU with battery back- up shall feed power to the lighting / dedicated loads.

Common Technical Specification:

Control Type	: Voltage source, microprocessor assisted, output regulation
Output voltage	: 1 phase, 230 V ac (+12.5 %, - 20 % V ac)
Frequency	: 50 Hz (+3 Hz, -3 Hz)
Continuous rating	: 5 KVA Hybrid inverter
Nominal Power	: 5 KVA
Total Harmonic Distortion	: less than 3%
Operating temperature Range	: 0 to 55 deg C
Housing cabinet	: PCU to be housed in suitable switch cabinet, Within IP 20 degree of ingress protection
PCU efficiency	: 94 % and above at full load,
Power Control	: MPPT

#### Other important Features/Protections required in the PCU:

- ☐ Mains (Grid) over-under voltage and frequency protection
- ☐ Fool proof protection against Islanding.
- ☐ Included authentic tracking of the solar arrays maximum power operation voltage (MPPT).
- ☐ Array ground fault detection.
- ☐ LCD and piezoelectric keypad operator interface Menu driven
- ☐ Automatic fault conditions reset for all parameters like voltage, frequency and/or black out.
- ☐ MOV type surge arresters on AC and DC terminals for over voltage protection from lightning-induced surges.
- ☐ PCU should be rated to operate at 0 -55 deg. Centigrade unless provision for air conditioning is included in PCU
- ☐ All parameters should be accessible through an industrial standard communication link.

□□ Over load capacity (for 10 sec) should be 150% of continuous rating.

- 1.4.1 The PCU shall be self commuted and shall utilize a circuit topology and components suitable for meeting the specifications listed above at high conversion efficiency and with high reliability.

The Hybrid PCU shall be self commuted and shall utilize DSP technology to meet the specifications listed above at high conversion efficiency and with high reliability. The PCU shall be Hybrid one and shall give the preference to feed the Loads from Solar Energy being produced and shall draw the additional power from mains to meet the load requirements in the case load is more than solar energy being produced.

Conversely it should feed the solar power to the Grid if the load is less than the solar energy generated. It shall also draw the Power from Mains for charging of Battery Bank in case of Low Battery conditions. The PCU shall also have the ability for automatic starting, transfer and no-break transfer to an optional generator for extended grid failure periods.

- 1.4.2 Since the PCU is to be used in solar photo voltaic energy system, it should have high operational efficiency. The DC to AC conversion efficiency shall at least be 94 percent for output ranging from 20 percent of full load to full load. The idling current at no load must not exceed 2 percent of the full-load current.
- 1.4.3 In PCU there shall be a direct current isolation provided at the output by means of a suitable isolating transformer.
- 1.4.4 The PCU output shall be 230 VAC, 50 Hz, 1 phase,
- 1.4.5 The PCU shall be able to withstand an unbalanced output load to the extent of 30 %
- 1.4.6 The PCU shall include appropriate self protective and self diagnostic features to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU's safe operating range due to internal or external causes. The self-protective features shall not allow signals from the PCU front panel to cause the PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices and not by the existing site utility grid service circuit breaker.
- 1.4.7 The PCU generated harmonics measures at the point of connection to the utility services when operating at the rated power shall not exceed a total harmonic current distortion of 4 percent, a single frequency current distortion of 4 percent and single frequency voltage distortion of 1 percent when the first through the fiftieth integer harmonics of 50 Hz are considered.
- 1.4.8 The PCU Power factor at the point of utility service connection shall be 0.95 lagging or leading when operating at above 25 percent of the rated output, but may be less than 0.95 lagging below 25 percent of the rated output.
- 1.4.9 The high voltage and power circuits of the PCU shall be separated from the low-voltage and control circuits. The internal copper wiring of the PCU shall have flame resistant insulation. Use of PVC is not acceptable. All conductors shall be made of standard copper.
- 1.4.10 The PCU shall withstand a high voltage test of 2000 V rms, between either the input or the output terminals and the cabinet (chassis).
- 1.4.11 Full protection against accidental open circuit and reverse polarity at the input shall be provided.
- 1.4.12 The PCU shall not produce Electromagnetic interference (EMI) which may cause malfunctioning of electronic and electrical instruments including communication equipment, which is located within the facility in which the PCU is housed.

- 1.4.13 The PCU shall have an appropriate display on the front panel to display the instantaneous AC power output and the DC voltage, current and power input. Each of these measurement displays shall have an accuracy of 1 percent of full scale or better. The display shall be visible from outside the PCU enclosure. Operational status of the PCU, alarms, trouble indicators and AC and DC disconnect switch positions shall also be communicated by appropriate messages or indicator lights on the front of the PCU enclosure.

**1.4.15 Electrical safety, earthing and protection**

- a. Internal Faults: In built protection for internal faults including excess temperature, commutation failure, overload and cooling fan failure (if fitted) is obligatory.
- b. Over Voltage Protection: Over Voltage Protection against atmospheric lightning discharge to the PV array is required. Protection is to be provided against voltage fluctuations and internal faults in the power conditioner, operational errors and switching transients.
- d. Earth fault supervision: An integrated earth fault device shall have to be provided to detect eventual earth fault on DC side and shall send message to the supervisory system.
- e. Cabling practice: Cable connections must be made using PVC Cu cables, as per BIS standards. All cable connections must be made using suitable terminations for effective contact. The PVC Cu cables must be run in GL trays with covers for protection.
- f. Fast acting semiconductor type current limiting fuses at the main busbar to protect from the grid short circuit contribution.

- 1.4.16 The PCU shall include an easily accessible emergency OFF button located at an appropriate position on the unit.

- 1.4.17 The PCU shall include ground lugs for equipment and PV array grounding.

- 1.4.18 All exposed surfaces of ferrous parts shall be thoroughly cleaned, primed, and painted or otherwise suitably protected to survive a nominal 30 years design life of the unit.

- 1.4.19 The PCU enclosure shall be weatherproof and capable of surviving climatic changes and should keep the PCU intact under all conditions in the room where it will be housed. The INVERTER shall be located indoor and should be either wall / pad mounted. Moisture condensation and entry of rodents and insects shall be prevented in the PCU enclosure.

- 1.4.20 Components and circuit boards mounted inside the enclosures shall be clearly identified with appropriate permanent designations, which shall also serve to identify the items on the supplied drawings.

- 1.4.21 All doors, covers, panels and cable exits shall be gasketed or otherwise designed to limit the entry of dust and moisture. All doors shall be equipped with locks. All openings shall be provided with grills or screens with openings no larger than 0.95 cm. (about 3x8 inch).

- 1.4.22 In the design and fabrication of the PCU the site temperature (5° to 55°C), incident sunlight and the effect of ambient temperature on component life shall be considered carefully. Similar consideration shall be given to the heat sinking and thermal for blocking diodes and similar components.

**1.4.23 Factory Testing:**

- a. The PCU shall be tested to demonstrate operation of its control system and the ability to be automatically synchronized and connected in parallel with a utility service, prior to its shipment.
- b. Operation of all controls, protective and instrumentation circuits shall be demonstrated by direct test if feasible or by simulation operation conditions for all parameters that can not be directly tested.

- c. Special attention shall be given to demonstration of utility service interface protection circuits and functions, including calibration and functional trip tests of faults and isolation protection equipment.
- d. Operation of start up, disconnect and shutdown controls shall also be tested and demonstrate. Stable operation of the PCU and response to control signals shall also be tested and demonstrated.
- e. Factory testing shall not only be limited to measurement of phase currents, efficiencies, harmonic content and power factor, but shall also include all other necessary tests/simulation required and requested by the Purchasers Engineers. Tests may be performed at 25, 50, 75 and 100 percent of the rated nominal power.
- f. A factory Test Report (FTR) shall be supplied with the unit after all tests. The FTR shall include detailed description of all parameters tested qualified and warranted.'
- g. Factory testing of the PCU/ PCU,s should be carried out and witnessed by the Purchaser's Engineers at the manufacturers premises.

#### **1.4.25 Maximum Power Point Tracker (MPPT)**

Maximum power point tracker shall be integrated in the PCU to maximize energy drawn from the array. The MPPT should be micro processor based to minimize power losses. The details of working mechanism of MPPT shall be mentioned. The MPPT must have provision (.manual setting) for constant voltage operation.

#### **1.5 & 1.6 ARRAY JUNCTION BOX, MAIN JUNCTION BOXES:**

The junction boxes are to be provided in the PV yard for termination of connecting cables. The J. Boxes shall be made of FRP/Powder Coated Aluminium with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The J.Bs shall be such that input & output termination can be made through suitable cable glands. Made of FRP or cast aluminium/ copper

Copper bus bars/terminal blocks housed in the junction box with suitable termination threads

Conforming to IP65 standards and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Single compression cable glands. Provision of earthing

Suitable capacity MOVs provided within the box to protect against lightning

#### **1.7 PLANT CONTROL, DATA LOGGER & PLANT MONITORING UNIT**

Basically, this unit should perform the following.

- ☐ Measurement and/or recording of energy parameters.
- ☐ Simple data logger or energy meter to record the energy data on a pre determined interval basis.
- ☐ Measurement & continuous acquisition of ambient air temperature, wind speed, solar radiation, PV module temperature, PCU output voltage and current, output frequency
- ☐ Operating state monitoring and failure indication.
- ☐ Representation of monitored data in graphics mode or in tabulation mode.
- ☐ Controlling & monitoring the entire power system through remote terminal.

☐ Necessary hardwares & softwares shall have to be supplied by the contractor. Both the softwares and hardwares required for interfacing the plant with office including CPUs, modems UPS are to be supplied and installed by the contractor.

☐ Remote control/ Instrumentation: The microprocessor control unit should have the provision for installation of RS – 232/485 communication link.

## **1.8 DC DISTRIBUTION BOARD**

DC Distribution panel to receive the DC output from the array field with analog measurement meter for voltage, current and power from different MJBs so as to check any failure in the array field.

DC DPBs shall have sheet from enclosure of dust & vermin proof. The bus bars are to made of copper of desired size. Suitable capacity MCBs be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

## **1.9 AC DISTRIBUTION PANEL BOARD**

1.9.1 AC Distribution Panel Board (DPB) shall control the AC power from PCU, and should have necessary surge arrestors. Requirement/specifications of DCDB and ACDB may be changed as per site conditions. An ACDB to be provided at the cable terminating point emanating from 5 KVA PCU for interconnection control of dedicated electrical loads.

1.9.2 All switches at the, circuit breakers, connectors should confirm to IEC 60947, part I, II and III.

## **1.10 CABLES & WIRES**

1.10.1 Cabling in the yard and control room: Cabling in the yard shall be carried out as per IE Rules. All other cabling above ground should be suitably mounted on cable trays with proper covers.

1.10.2 Wires: Only FRLS copper wires of appropriate size and of reputed make shall have to be used.

1.10.3 Cables Ends: All connections are to be made through suitable cable/lug/terminals; crimped properly & with use of Cable Glands.

1.10.4 Cable Marking: All cable/wires are to be marked in proper manner by good quality ferule or by other means so that the cable can be easily identified. Any change in cabling schedule/sizes if desired by the bidder/supplier be got approved after citing appropriate reasons, All cable schedules/layout drawings have to be got approved from the purchaser prior to installation. All cable tests and measurement methods should confirm to IEC 60189.

## **1.11 FIRE EXTINGUISHERS:**

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

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

☐ Sand buckets in the control room

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

## **1.12 LIGHTNING PROTECTION:**



There shall be the required number of suitable lightning arrestors installed in the array field. Lightning protection shall be provided by the use of metal oxide resistors and suitable earthing such that induced transients find an alternate route to earth. Protection shall meet the safety rules as per Indian Electricity Act.

### **1.13 EARTHING PROTECTION**

Each array structure of the PV yard should be grounded properly. In addition the lightning arrester/masts should also be provided inside the array field. Provision should be kept be provided inside the array field. Provision should be kept for shorting and grounding of the PV array at the time of maintenance work. All metal casing/shielding of the plant should be thoroughly grounded in accordance with Indian electricity Act./IE Rules. Earth resistance should be tested in presence of the representative of NRHM after earthing by calibrated earth tester. PCU ACDB & DCDB should be earthed properly.

### **1.14 BATTERY BANK:**

The battery bank is to be designed to provide the backup power for feeding the dedicated loads in the event of failure of grid supply.

Storage Capacity: 96V, 400 Ah @ C/10

Type: Tubular Gel batteries from reputed manufacturers.

The battery cells shall have high ampere hour efficiency so as to quickly pick up the charge of the order 95%. High watt hour efficiency of at least 85%.

#### **Battery Bank-**

- ☐ ☐ The batteries shall be solar photo voltaic batteries of Tubular Gel type, low maintenance, lead Acid and made of hard rubber container.
- ☐ ☐ Storage batteries should conform IEC 61427 / IS 1651 / IS 133369 as per specifications.
- ☐ ☐ The batteries shall use 2 / 12V cells and battery capacity is to be designed at C10 rate with end cell cut off voltage of 1.85 V / cell.
- ☐ ☐ Battery terminal shall be provided with covers.
- ☐ ☐ Batteries shall be provided with micro porous vent plugs with floats.
- ☐ ☐ Charging instructions shall be provided along with the batteries.
- ☐ ☐ Suitable carrying handle shall be provided.
- ☐ ☐ A suitable battery rack with interconnections & end connector shall be provided to suitably house the batteries in the bank. The features and dimensions of the battery rack shall be provided along with the bid document.
- ☐ ☐ The batteries shall be suitable for recharging by means of solar modules via incremental / open circuit regulators.
- ☐ ☐ Bidder shall mention the design cycle life of batteries at 80%, 40% and 20% depth of discharge at 27 deg. C.
- ☐ ☐ The batteries shall be designed for operating in ambient temperature of site in the state of Assam.

- ☐ ☐ The self discharge of batteries shall be less than 3 % per month at 20 deg. C and less than 6% per month at 30 deg. C
- ☐ ☐ The charge efficiency shall be more than 90% up to 70% state of charge.
- ☐ ☐ The topping up frequency shall be 12 – 18 months.

· The batteries shall consist of individual cells, which can be carried separately with ease while transporting.

· Offered batteries shall comply to the following:

10 % of DOD: 7200 cycles

50 % of DOD: 3000 cycles

80 % of DOD: 1200 cycles

The Battery Bank shall be designed to provide 2 days ("2 No Sun" days) autonomy.

Bidder to provide battery sizing details along with their offer. The distance between two batteries may be kept 6 inches & vice versa.

#### **1.15 TOOLS & TACKLES AND SPARES:**

After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the contractor for maintenance purpose. List of tools and tackles to be supplied by the contractor for approval of specifications and make from NRHM, Assam.

A list of requisite spares in case of PCU comprising of a set of control logic cards, IGBT driver cards etc. Junction Boxes. Fuses, MCCBs etc along with spare set of PV modules and batteries be indicated, which shall be supplied along with the equipment. A minimum set of spares shall be maintained in the plant itself for the entire period of warranty and Operation & Maintenance which upon its use shall be replenished.

#### **1.16 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 signages shall be provided one each at battery –cum- control room, solar array area and main entry from administrative block. Text of the signages may be finalized in consultation with NRHM, Assam.

#### **1.17 DRAWINGS & MANUALS**

Two copies 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 and distribution for street lighting system along with protection equipment. Approved ISI and reputed makes for equipment be used. For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to NRHM, Assam before progressing with the installation work.

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## **ANNEXURE – II**

### **SCOPE OF WORK:**

The broad scope of work would include design, supply, installation, commissioning of the 5 KW Solar PV Power Plant and providing manpower for operation for at least one month. This would inter-alia include

- 2.1 A clear understanding of the features of the Rural Hospitals under NHM in Assam and the topography of project site.
- 2.2 Supply of the complete systems, including all necessary components, subcomponents, spares, consumables, tools & tackles etc. as per technical specifications given elsewhere in this document.
- 2.3 Erection and commissioning of the supplied systems at the specified site.
- 2.4 Providing the control room near the building along with necessary partition with glass and aluminum frame structure works.
- 2.5 Providing pedestals if required for mounting of the PCU'S and control panels
- 2.6 Water pump with shed along with full C class piping for water supply for panels cleaning and washing along with water discharge piping.
- 2.7 All structural drawings to be got approved from NHM.
- 2.8 Any other work urgently required as per site conditions.
- 2.9 The selected contractor shall provide detailed Operation & Maintenance Manual in English language for all the systems.
- 2.10 Fabrication, supply and the installation of suitable support for the PV panels and other components whichever is required with the accessories.
- 2.11 Civil work (grouting) for PV structure.
- 2.12 SPV Power Plant shall be installed as per the specifications provided in the technical offer.
- 2.13 Provide sealed & tested energy meter at consumption side & generation side of SPV Power Plant.
- 2.14 Provide electrochemical marking (embossing) on each solar module frame which will show name of manufacturer, year of installation and capacity of solar module.
- 2.15 Supply and installation of control equipments required for the system.
- 2.16 Training to the users for operation and maintenance of the system.
- 2.17 Any additional works not covered above, but necessary for the functioning of the system and required as per specification incorporated. The items of minor nature, which are not mentioned, shall be incorporated by the Tenderer.
- 2.18 Regarding cabling work (external & internal) & construction of control room, the Tenderer is required to quote (including drawing & design) taking into account actual site conditions.
- 2.19 Regarding actual work to be carried out at the site Tenderer needs to execute the work in coordination with NHM Assam.
- 2.20 The Tenderer shall quote for Comprehensive Maintenance Contract for 3 years from the date of expiry of 2 years guarantee period.

- 2.21 The Tenderer shall provide the necessary training to identified representative of NHM for proper daily operation and maintenance of installed systems after being taken over by NHM.
- 2.22 The CMC period shall be 3 years from date of expiry of 1 years liability period. The successful Tenderer shall visit the installation quarterly and carry out regular servicing of installed systems and submit quarterly performance reports of installed systems to the NHM's Coordinator for the Project. The Tenderer shall also submit annual performance reports of installed system duly certified by the NHM's Coordinator for the Project, to the Mission Director, NHM Assam.
- 2.23 The grid supply connection would be provided with auto change over for topping up of the battery in case of low solar flux period.
- 2.24 All cabling and load connections should be carried by the Tenderer with proper synergy with the existing electrical systems of the project site.