proper record of maintenance operations. Battery should be placed on the porcelain base kept on the wooden rack.

- The battery shall be connected to D.C. distribution board by single core cables laid above ground. Suitable terminal arrangement with glands shall be provided for this purpose.
- Battery room shall be painted with acid proof paint. Exhaust fans should be provided in the battery room. Contractor shall submit the details of the same to the owner.
- Battery room shall be corrosion proof type lamp and fixtures.
- The ripple content in the D.C. current shall be less than 1%.
- The float charger unit shall be capable of supplying continuous D.C. load and trickle charge the battery.
- Necessary alarm and indication shall be provided with the DC System and also in the annunciation window of the Battery Charger.
- Necessary terminals with lugs for earthing the charger panels with two distinct separate earthing for each panel shall be provided. In addition, separate terminals for earthing of equipment shall be provided. The charger panels shall have space heaters.
- Compression type cable glands of suitable rating for PVC unarmoured cable, suitably mounted in the panel for cable entry from the bottom for A.C. & D.C. supplies shall be provided.
- Type of cell, cell terminal, containers and installation of battery, chargers, inverter, DC Distribution Board, cables etc. should conform to the latest edition of relevant Indian Standard.
- During installation of battery, charging & discharging and charging is to be done proper installation procedure.

5.9.10.4 TECHNICAL REQUIREMENTS

Minimum technical requirements for the DC Battery, Battery charger and DC Distribution Board are as following.

- The battery shall be made of lead-acid cells with tubular type plates conforming to latest issue of IS 1651. The battery cells shall be high discharge performance (HDP) type.
- The capacity of 220 V D.C. batteries based on 10 hours discharge rate shall be selected to fulfill the plant's requirement. The contractor shall propose the same to the owner and decision of the owner will be final and bound to the contractor.

- The battery shall normally remain under floating condition with the charger supplying the normal continuous load. However, the battery shall be capable of supplying the load without fall of terminal voltage per cell below 1.85V (92.5% of rated voltage).
- The number of cells of the 220 volt battery bank at Main Control Room and required voltage at Local Control Room shall be chosen to suit the following conditions.
  - Nominal floating voltage per cell shall be between 2.15 and 2.21 V.
  - The voltage of each cell under floating conditions shall be of optimum value for its performance and maintenance in a healthy condition.
  - The voltage of the battery after meeting the D.C. load cycle shall not be less than 90% of the rated voltage. The manufacturer shall ensure safe operation of the battery after the aforementioned end voltage.
  - The voltage across the load shall not exceed 110% of rated value under charging conditions of the battery. To achieve this condition under quick charging, a blocking diode may be incorporated by the supplier in the charging equipment.
- The bidder shall clearly justify the choice of number of cells in the tender on the above lines and furnish any clarifications required by the owner.
- All cell terminals shall have adequate current carrying capacity and shall be of lead-alloy or lead-alloy reinforced with copper core inserts. Cell terminal posts shall be equipped with acid resisting connector bolts and nuts.
- The electrolyte shall be of battery grade sulphuric acid. The battery shall be transported dry.
- The charging equipment shall preferably employ solid state full wave rectifier in a 3 phase full wave bridge circuit with suitable filter circuit of AC ripples, suitable for operation in conjunction with static voltage regulator. A.C. and D.C. Circuit breakers with thermal overload and instantaneous short circuit releases shall be provided on input and output sides of chargers respectively.
- Capacity of the float charger and the boost charger in the float cum boost charger shall be sufficient to meet the system requirement. Contractor shall submit the details to the owner.
- The charger shall be capable of providing the floating voltage between 2.15 V to 2.21 V per cell with the variation of not more than +1% irrespective of input supply voltage fluctuations within +/-10%, frequency fluctuation within +/-5 % throughout its ampere rating with ambient air temperature range of -3^{0}C to 40^{0}C.

- The DC Distribution Board (DCDB) shall be free standing, self-supporting and floor mounting type. It shall be totally enclosed and compartmentalized. DCDB shall be made as per relevant Indian Standard.
- One equivalent capacity of Incomer provision shall be there to connect with existing DC system with a castle key interlock
- The Emergency Lighting Board supplying the emergency lighting requirement of the power house at A.C shall have an arrangement so that automatic changeover to emergency lighting in case of A.C. failure, is achieved through an inverter of suitable capacity. Normally, the inverter shall run on AC. supply. In the event of failure of AC, the inverter shall automatically switch-over to DC supply and feed the selected emergency loads (lighting loads) at 230 V AC. On restoration of AC supply, the inverters load will automatically return to AC.
- The DC system shall have necessary control & protection arrangement which include but not limited to the following.
  - Auto/Manual selector switch
  - Digital D.C. voltmeter, ammeter
  - A.C. failure alarm
  - Ground fault relay and its annunciation
  - Double pole D.C. contactor of suitable capacity for annunciation
  - Triple pole A.C. contactor of suitable capacity for ON/OFF operation
  - MCCB and DC contactor of suitable capacity in output circuit of each charger to suit the operation requirements.
  - Indicating lamps, as required
  - Triple pole, A.C. circuit breaker of sufficient capacity to meet system requirements & capacity with overload and short circuit release for incoming A.C. supply to charger panel
  - MCB/MCCBs for A.C. supply to individual chargers
  - A.C. under voltage relay
  - A.C. voltmeter, ammeter etc.
- Nearest local control room from the main control room should be connected with 220 V DC from Battery Bank DCDB.
- 220 V AC/DC converter is to be provided in each isolated switchgear for operation of circuit breaker/isolator as and where required. Power required in ACDB/DCDB for illumination, control system etc. for each control room should be collected from 415 V (3phase+N) transmission line with necessary cables and protection.

5.9.10.5 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the DC system:

- Detailed specification of all the items.
- Necessary Drawings
- Test Certificates etc.

Prior to the delivery of the product, the contractor shall submit but not limited to the following documents:

- Guarantees
- Instructions for installation and operation, manual
- Detailed schematic, connection and control wiring diagrams etc.

The contractor can deliver the product to the site only after receiving such approval against their prayer in writing from WBPDCL.

5.9.11 RELAYS (For HT and LT Switchgear)

I. General- A

a) All relays & timers in the protection circuit shall be flush mounted with connection from inside. They shall have transparent, dust tight covers, removable from the front. They shall have built-in testing facilities. Except small auxiliary relays and timers all relays shall be draw out type.

b) Relays shall be rated for operation on 1A / 5A secondary current and 110V secondary voltage to be decided by the bidder. Number and rating of relay contacts shall suit the job requirements.

c) The Bidder shall furnish, install & co-ordinate all relays to suit the requirements of protection, interlock. Application check shall be made on all protection relay. The result of such check shall be furnished for approval.

d) It shall be the responsibility of the Bidder to fully co-ordinate the overload and short circuit tripping of the circuit breakers with the upstream and downstream circuit breakers to provide satisfactory discrimination.

e) All setting devices shall be accessible after removing the front cover. No relay shall be mounted on the rear side of Switchgear panel.

f) All relay coils and their auxiliary contacts (including un-enabled relays in Composite Numerical Relays, if any), including spare contacts will be wired up to the terminal blocks of respective panels for wiring to remote panel / PLC and for future use.

g) Parameterization and loading and downloading of data shall be possible from local HMI as well as from remote panel / PLC.

h) All numerical relays shall have front communication port for parameterization, loading and downloading of data through Laptop.

i) All numerical relays and multi-functional meters shall be hooked up and connected with HMI through Fiber Optic cable.

II. General- B

a) All protective relays shall be of numerical microprocessor based multifunctional type having communication facility.

b) All relays shall conform to the requirements of IS: 3231 / IEC: 60255 standards. The Numerical relays shall have communication, Metering and monitoring facility.

c) Bidder shall ensure availability of spare parts and maintenance support for the equipment for at least 15 years from the date of supply.

d) Separate Master trip Lockout Relay shall be provided for all VCB, SF6, ACB operated HT and LT system.

e) Any foreign relay manufacturer through his Indian partner or subsidiary company in India shall provide application, testing, commissioning and other necessary support for minimum 15 years. They shall also maintain adequate inventory of each type of relay or spares to meet the requirement arising during project execution and plant operation.

III. Technical Requirement

a) **Auxiliary Power Supply**

Unless otherwise specified, relay shall be suitable to accept both AC / DC supplies with range 110V to 240V with tolerance of ± 20%. The auxiliary power supply shall preferably be site selectable requiring no additional hardware.

b) **Basic Requirement and Constructional Requirement**

i. Relays shall be suitable for flush mounting on the front with connections from the rear. The enclosure shall be dust tight having degree of protection minimum as IP: 52.

ii. Relay shall have draw out feature with plug in type PCB for easy replacement. In case of fixed type relay, the terminals shall be easily accessible for testing and commissioning.

iii. Relay shall have self-diagnostic feature with indication of relay failure on relay front. However, while diagnostic circuit runs, it must not interfere in the main protective relay circuit and allow working of main protective circuit continuously. Relay faults (self-diagnostic) shall be communicated and annunciated to HMI.

iv. Design of the relay shall be such that it must operate selectively and with proper discrimination. It must be immune to any kind of electromagnetic interference. Vendor to submit all related type test reports for the offered model along with the offer.

v. Necessary auxiliary relays, timers, trip relays, etc. required for complete scheme, interlocking, alarm, logging, etc. shall be provided. No control relay, which shall trip the circuit breaker when relay is de-energized, shall be employed in the circuits.

vi. Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity to the satisfaction of the Owner.

vii. The internal clock of the system shall be synchronized through the GPS Time Synchronizing System.

c) Display & Indication

i. All numerical relays shall have keypad / keys to allow relay settings from relay front. In addition, relay shall have front port for downloading / uploading of relay settings from the PC / Laptop. All hand-reset relays shall have reset button on the relay front. Relay to be self or hand reset shall be software selectable.

ii. All relays shall have LED / LCD display for settings, status, faults and events. LCD display shall be backlit and temperature compensated up to 65°C for contrast and legibility.

iii. As a minimum, the relay shall have LED indicating lamps for fault trip, relay healthy / unhealthy and control supply on.

iv. The relay shall have at least 6 programmable LEDs on relay front.

d) **Software Security**

Relay shall be provided with password protection against unauthorized write access. However, viewing of metering data, settings, and status and event data as read only parameters should be without password protection. All software shall be user friendly and latest up to date version.

e) **Disturbance, Event Recording & Data Storage**

Status, disturbance data and events shall be stored in non-volatile memory or memory backed up by battery. It should be possible to store minimum 50 events with date and time stamp, last 5 fault records and last disturbance record. When auxiliary power fails, it should be possible to see the latest state of display when power is restored. Also, in case of power supply failure lock out status of the relay should be stored and kept in memory to allow the working of interlock logic properly on restoration of the supply.

f) **Trip Circuit Supervision & Lock out function**

i. Relay shall have built in lockout function. Lock out feature shall be self reset or hand reset and shall be software selectable.

ii. Relay shall have built in trip circuit supervision function.

g) **Input / Output Interface, Filters and Galvanic Isolation**

h) Relay shall have at least 4 NO contacts each shall separately be programmable for either hand reset or self-reset. The contact rating shall be minimum 5A at 250V AC / DC.

i. Relay shall be made immune to capacitance effect due to long length cables.

ii. All IOs shall have galvanic isolation. Analog inputs shall be protected against switching surges, harmonics etc.

i) **Serial Communication**

i. Relay shall have RS485 or FO (Fiber Optic) port for serial communication.

ii. All relays should be able to communicate with remote panel / PLC system. Data shall be available at the remote panel / PLC on request.

iii. Protocol adapted for communication to remote panel / PLC should facilitate easy interface with worldwide used open protocol like Modbus or IEC 103 protocols.

iv. It shall be also possible for Relay Parameterization as well Downloading of Disturbance Records from PC/ Laptop provided in Unit & Engineering Workstations located in Control Room of PWS. Necessary user friendly and latest software to be provided for this purpose. Communication protocol shall be selected from relay to PC to provide all information.

v. One (1) set of Laptop, loaded with common support software and which will allow easy settings of relays in addition to uploading of event, fault, disturbance records and measurement from relay front communication port. The Switchgear supplier shall furnish CD's for the above relay parameterization as well as download of disturbance recorder for all relays of his supplied switchgear. Accessories like

table/chair/desk/power socket etc. as required for all PC/Laptop should be supplied.

5.9.12 PROTECTION SYSTEM

5.9.12.1 SCOPE

The scheme shall consist of design, engineering, quality surveillance, manufacture, tests at manufacturer's works before dispatch, transport, transit insurance, supply, delivery to site, storage at site, erection, testing, trial run and commissioning, handing over to the purchaser of protection system for

- PV Array yard
- Solar Inverter
- Three winding Step up Transformer
- Incomer feeder for 33 kV Switchyard
- Outgoing feeder for 33kV Switchyard
- Station Auxiliary Transformer

The protection system shall include protection relays, trip relays, relay contacts, trip & alarm circuits, Annunciation system, diagnostic system, other necessary equipment with all accessories, wiring and cubicles for making the protection system complete for 5 MW Floating Solar PV Power Plant in SgTPP, West Bengal.

5.9.12.2 STANDARDS

All materials and equipments shall conform to latest edition of relevant Indian/IEC Standards unless otherwise specified. Equipment conforming to any other authoritative standard ensuring equal or better quality than the standards indicated below will also be acceptable. However, in such eventuality, the salient points of difference between the standards adopted and the standards mentioned below shall be brought out by the bidder. The list of reference standards is given below:

Sl. No.	Standards	Description
1	IS: 2705	Current Transformers
2	IS: 3156	Voltage Transformer s
3	IEC: 60255 (Part 1 to 23)	Electric Relays
4	IEC: 60337	Control switches and low voltage switching devices for control and auxiliary circuits
5	IS: 1885	Electro-technical vocabulary on Electrical relays, Electric Power System Protection and Switchgear & Control

6	IS:13947	Degree of protection provided by enclosures for low voltage switchgear and control gear
7	IS: 3231	Electric relays for Power System protection
8	IS: 5834	Electric Timer relays
9	IS: 8686	Static Protective relays

5.9.12.3 TECHNICAL REQUIREMENTS

The technical requirements of the protection system shall be but not limited to the following.

- Protection shall be designed to ensure reliability, sensitivity and stability under through fault conditions of the system.
- The protection system shall be fully integrated with SCADA system.
- The protection scheme shall be coordinated with control & protection of solar modules, solar inverters and generator transformers etc. All protection, though not specified but which are recommended for this capacity of the machine as per relevant IEC / other Standards shall be provided.
- The protective relays shall be of the numerical, fully tropicalised, plug in type, arranged in protection cubicles including all ancillary devices, such as interposing transformers, tripping matrix and relays, test facilities, power supply units, etc. with all circuits complying to latest editions of IEC 60255-4 recommendation or British Standard 142 and 5992, parts 1, 2 and 3 or relevant Indian Standard. However necessary SAS integration provision shall be there.
- The relays/protection system shall be of state of the art of technology and only latest proven versions of the relay series shall be offered. If the protection system mentioned in the awarded Contract become obsolete at the time of supply, the Supplier shall offer the latest model with the approval of Employer, without any extra cost.
- Protection system shall be provided to prevent operation of protective equipment due to, magnetizing current inrush during switching-in of the transformer from the high voltage side.
- Precaution shall also be taken so that the unavoidable inductive and capacitive couplings from the power circuits do not cause disturbances.
- Protection relay shall have features but not limited to the following:
    - Man machine communication interface with alarm and trip value setting, displaying of alarm/trip set values, alarmed/tripped values, fault current and disturbance values etc.

- Self-supervision and indication of any failure.
- Continuous monitoring of external and internal auxiliary voltages
- Easiness of replacing a set in case of failure.
- Communication interfaces or ports.
- Indication of alarm and trip condition.
- Test facilities etc.

- All devices shall remain inoperative during external faults and transient phenomenon. They shall be insensitive to mechanical shocks, vibration and external magnetic fields.
- The protection relays, shall be located in conventional panels and shall be flush mounted in dust and moisture proof cases with protection class IP 54 and of the draw out type with rear connections. The protection class of the cover for all relays or protection systems, in which the modules are mounted, shall not be inferior to IP 54.
- The protection systems shall be fed by the battery banks installed in the main control room and local control rooms. Relay shall be suitable for operation on DC systems without the use of voltage dropping resistors.
- The supplier has to supply the equipments for protection of best quality. The supplier has to maintain control and quality assurance during the manufacture, installation, testing and commissioning of equipments as per approved quality assurance plan.
- Minimum protection functions to be provided for different type of circuits are listed below -

For 33kv Incomer feeder-

a) 3 Nos. IDMTL over current (51) for phase fault
b) 1-Definite time O/C relay (50 N/2) for earth fault.
c) Under voltage with time delay (27)
d) VT fuse failure

For Outgoing feeder-

a) 3 Nos. IDMTL over current (51) for phase fault feeder
b) 1-Definite time O/C relay (50 N/2) for earth fault.
c) Under voltage with time delay (27)

For Transformer-

a) 3 Nos. IDMTL over current (50/51) with high set instantaneous units for phase faults

b) 1 No. Definite time O/C (50G) for earth fault (through CBCT)
c) 1-Definite time O/C relay (50 N/2) for earth fault
d) Differential protection (for transformers rated 3MVA and above)
e) Restricted Earth fault (64) for Transformer LV side from transformer neutral including LV side Bus duct / cable.
f) Low vacuum alarm and trip.
g) Winding temperature alarm and trip.
h) Oil temperature alarm and trip.
i) Pressure relief device operated alarm.
j) Conservator oil level low alarm.
k) Buchholz protection.

- For switchyard necessary protection shall be given.

5.9.12.4 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the protection system:

- Detailed specification of all the items.
- All required drawing etc.

Prior to the delivery of the products, the contractor shall submit but not limited to the following documents:

- Guarantees
- Instructions for installation
- Instruction O&M manual Testing & commissioning manuals
- Detailed BOQ covering protection relays, CTs /PTs, DC Sources and all other devices.

The contractor can deliver the product to the site only after receiving such approval against their prayer in writing from WBPDCL.

5.9.13 EARTHING AND LIGHTNING PROTECTION SYSTEM

5.9.13.1 SCOPE

The scope of work under this specification covers the design, supply, transportation, delivery at project site, transit insurance, storage at site, erection, testing & commissioning of electrical grounding and lightning protection system along with necessary materials. All the equipment and building shall be protected from lightning through Lightning Protection System.

5.9.13.2 STANDARDS

The grounding system shall conform to the requirement of following standards.

Sl. No.	Standards	Description
1	ANSI/IEEE: 80 –2000	Guide for safety in AC Substation Grounding
2	CBIP Publication: 223	Design of Earthing Mat for High Voltage substation
3	IS: 3043	Code of Practice for Earthing Indian Electricity Rules

5.9.13.3 OBJECTIVE

The grounding system shall be designed with the following objectives:

- To provide low impedance path to fault currents, during ground faults, to ensure prompt and consistent operation of protective devices to effect isolation
- To keep the maximum voltage gradient during ground faults along the surface inside and around the switchyard, PV array yard, control rooms etc. within safe limits
- To protect the life and property from electrical shocks due to over voltage
- To stabilize circuit potentials with respect to ground and limit the overall potential rise

5.9.13.4 TECHNICAL REQUIREMENTS

Minimum technical requirement of the earthing system is mentioned below.

- The earth resistance should be less than 1 Ω.
- Suitable number of earthing pit shall be provided at the array field.
- Design and installation of the earth mat and other associated system shall confirm IS: 3043 and shall be followed by modern practice.
- The earthing for solar field and power distribution system shall be made with GI pipe of suitable size including accessories, and providing masonry enclosure with cast iron cover plate having locking arrangement, watering pipe using charcoal or coke and salt as required as per provisions of IS: 3043. The Mounting structure shall be grounded properly using GI strips and maintenance free earthing kit.
- Size of ground earth mat shall be 1000mm below FGL and 40 mm dia MS rod
- Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance.
- The earth conduction shall run through GI pipe partly buried and partly on the surface of the control room building.

- The complete earthing system shall be mechanically & electrically connected to provide independent return to earth.
- All three phase equipment shall have two distinct earth connections.
- Along the cable trays suitable size of GI Flat shall be provided inside the control room.
- For each earth pit, necessary Test Point shall have to be provided.
- The earthing system shall be connected to the following.
    - Solar modules with suitable number of earthing pit at the solar array field
    - The neutral point of each system/equipment
    - Equipment framework and other non-current carrying parts
    - Frames of panels & cubicles
    - Metallic structures of switchgear, cable racks, casing of cable boxes
    - Equipment supporting Steel structures
    - All extraneous metallic frame work not associated with equipment
    - The earth point of lightning arrestors; voltage transformers and lightning conductors through their permanent independent earth electrodes.
    - Fence
- For equipment connection to mat/riser, 50 mm x 6 mm or higher size GS flat shall be used.
- Each neutral point of transformer shall be provided with two separate treated earth pit through 80 mm dia GS perforated pipe having 3 mtr depth. Necessary charcoal, salt etc. to be provided for earth pit as per relevant standard. Each earth pit shall be connected with Main earth grid through a bolted type test point.
- Separate grounding grid to be provided for electronic earthing for PLC / DCS system with earth resistance 0.5 Ω. (Refer NIT Drawing SG-FLSP-DWG-E-003-Model).
- The conductor shall be of adequate cross-section to safely withstand the system fault current for time duration of fault clearance by the remotest/back up protective system.
- Sufficient allowance needs to be provided for corrosion of the embedded conductor on account of chemical properties of soil and also due to galvanic action with other embedded systems.

- For determination of the size of the conductor, the value of fault current may be taken as 40 kA; duration of fault current may be considered as 1 second. The extra allowance of 20% to take care of corrosion shall be added to arrive at final conductor size.
- For designing of the earth mat for 33kV switchyard, the material of ground mat conductor shall be 40 mm MS rod and that of risers emanating from ground mat shall be GS flats. Soil resistance of the site is available in the soil report.

Lightning Protection System:

Lightning protection work shall be carried out in compliance to the following standards/codes. All standards, specifications and codes of practice (COP) referred to herein shall be the latest editions including all amendments and revisions as on the date of opening of bid. In case of conflict between the specification and those standards/codes referred to herein, the former shall prevail:

- Indian Electricity rules
- National Electrical Code
- COP for the protection of building and allied structures against lightning : IS 2309
- Recommended practice for hot-dip galvanizing of iron and steel: IS 2629
- Method of testing uniformity of coating on zinc coated articles : IS 2633
- Methods for determination of mass of zinc coating on zinc coated iron and steel articles : IS 6745
- IEEE guide for instrumentation and control equipment grounding in generating stations : IEEE 1050;
- Lightning protection will also be provided for building/ structures where the overall rise factor exceeds 10^{-6} as per IS: 2309

5.9.13.5 APPROVAL

The successful bidder shall carry out the earth resistance measurement at the site and they need to submit the measurement report to WBPDCL.

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the earthing system:

- Detailed specification of all the items.
- Soil resistivity measurement data
- Necessary calculations and drawings etc.

The successful bidder required to produce schematic diagram of the earthing system and the proposed locations for earth mat as per relevant standard with the Detailed Design Report.

All drawings and calculations submitted by the contractor will be subjected to approval of the WBPDCL.

5.9.14 CONTROL, MONITORING AND DATA ACUSITION

5.9.14.1 SCOPE

The scope of work under this specification covers the design, engineering, manufacture, testing at manufacturer's works, transportation, transit insurance, delivery at project site, storage at site, erection, testing at site and commissioning of Control, monitoring & Data Acquisition system comprising of computers, VDU, key board/mouse, SCADA System, PLC's, input and output relays, meters, fields sensors, panels/cubicles for housing above equipment/devices, power supplies, transducers, converters, wiring etc to make the system complete.

5.9.14.2 SCADA SYSTEM

- The existing 5MW solar PV plant is being controlled from maxDNA based SCADA system, placed inside the existing inverter cum main floating solar control room, supplied by BHEL. Total operation, control & monitoring of the existing switchgear is done from the same SCADA system.
- Remote control/operation/monitoring of all new electrical breakers that will be supplied by the bidder under battery limit of this project, is to be done from the same existing BHEL supplied maxDNA based SCADA system.

  i. Additional spare IOs have been kept in the existing DCS for this purpose. Allocation of IOs in the DCS panels shall be done by the bidder during detail engineering. However, if any extra module is required that will be supplied by the bidder.

  ii. Bidder has to supply cables, JB and all other hardware accessories, as required, for hooking up of these signals to the existing DCS.

  iii. Laying and termination of cables in DCS panel terminal block for hooking up of these signals in the existing DCS is under Bidder's scope of work.

  iv. Bidder shall also modify the HMI pages and implement all the logics in the existing DCS accordingly.

- The automatic control panels shall be located in each control room. The control panels shall be provided with local automatic selection. On local automatic selection, control will be transferred to control panels located in local control rooms from where unit can be started by single push button control.
- SCADA system with all hardware & software for integrated operation of total Solar PV Plant is to be provided.
- SCADA system shall have data logging and display system for continuous monitoring of data.
- In addition to the real time trend, SCADA shall also have provision for offline viewing and retrieving of historical data of all parameters. All the trend and cumulative graphs shall be able to view and store. Also all the events including outages and faults shall be logged and stored with time and date stamped. SCADA should also have provision for offline viewing of daily, monthly and annual average of all the parameters.
- Bidder shall provide two nos. Engineering cum Operators' Work Station cum Historian. Bidder shall also supply a network printer.
- HMI peripherals shall be kept inside main control room beside raw water pond no. 3. Total solar PV plant shall be controlled from there.
- SCADA Communication Network shall have redundancy at all level.
- SCADA system shall be OPC compliant.
- SCADA system hardware, UPS system, HMI peripherals etc. shall be kept in A.C. humidity controlled environment.
- The SCADA shall have the feature to be integrated with the Network system as well as remotely via the web using either a standard modem or a GSM/WIFI modem. The contractor shall provide compatible software and hardware so that data can be transmitted via standard modem.
- The SCADA work station and push button control panel shall be interlocked by means of hardwired and software (Logic) to ensure smooth and safe operation of the plant.
- All pre-synchronisation checks shall be made to ensure normal and safe operation of the machine. Detailed philosophy shall be submitted by the contractor.

- System shall acquire on continuous basis the parameters of PV array, like DC current of string, DC voltage of each combiner box etc., Parameters of Solar Inverter like Power at the input of each inverter, Power at the input of each inverter, phase current, voltage, PF, MVAR, MW, Frequency etc., similar parameters of Generator Step-up and auxiliary Transformers etc.
- The Monitoring system shall perform String level monitoring for trouble free operation and maintenance of the plant. System shall indicate these on VDU Mimic alongside relevant device.
- System shall monitor and indicate on VDU status of all electrical devices including all switchgear.
- Shall provide mimics of main single line diagram, Auxiliary SLD and DC SLD in colour. The parameters as above shall be displayed by the side of respective device in proper units of measurement.
- The control & monitoring system for the generating units shall be microprocessor based digital control.
- The data logger shall have reliable battery backup and data storage capacity to record all sorts of data simultaneously round the clock.
- Inverters should be integrated with SCADA and provision of Data logging should be there. Logger should have the provision of recording the data of solar insolation, PV Module temperature and ambient temperature and associated electrical parameters at different stages to study performance of system as well as to study status of the system at a particular instant. The data logger should have required transducer to monitor and record the required system data. The data logger should be provided with an insolation sensor and a module temperature sensor, ambient temperature sensor matched with the system.
- Plant based Remote Monitoring system must be compatible with data logger. The other required accessories, hardware and compatible software shall have to be provided as an integrated part of the system to monitor the real time data through the server. The Data logger shall continuously send data to the server. Plant based Data logging system may be provided with special software (minimum 10 users). Upgradation of the software, if any, shall be done by the contractor. The server shall not be provided by WBPDCL or end-user.

- In case the data cable to be laid in the array field, SPD (surge protection device) suitable for communication network, as much number at suitable location are required must be provided with the system.
- The Plant based monitoring system should have the provision of graphical representation of the data shall include but not limited to the following:

SI. No.	Operating Parameter	Desired specification
1	Input data	PV Power PV Energy
2	Meteorological data	Insolation (inclined on the plane of module as well as horizontal) Module Temperature Ambient Temperature Wind Velocity
3	Output data	Inverter Export Power Inverter Export energy

- All data shall be recorded chronologically date wise. The data file should be MS Excel/XML/any readable form compatible and should have the facility of easy downloads.
- IT grade server may be installed including provision for back up data at least for 02 years. Copper cable,Cat6 cable and fibre optic cable and other hardware as required for interconnection and complete commissioning of SCADA system and complete commissioning of solar PV power plant shall be supplied by the bidder.
- Bidder shall supply proven latest version of hardware and software available at the time of system designing. All software (supplied for the project by the bidder) user licenses shall be valid for entire life of power plant. User should not have to pay any recurring license fee during the usage period of the system. In case of future up-gradation of software, Bidder shall remain committed to upgrade the supplied system at per with the new version within the warranty period and ensure successful integration of the system without any additional cost to owner. Beyond the warranty period and during the remaining life of the plant, any up-gradation in hardware and software shall be brought to the notice of Owner indicating whether it shall be possible to upgrade the system by partially replacing, modifying and/or patching of hardware /software.
- Also user license for all the software shall not be machine specific. That is, if any hardware / machine is upgraded or changed, the same license shall hold

good and shall not be necessary for owner to seek a new license/renew license due to upgradation/change of hardware/machine in system at site.

- Password security shall be provided in order to ensure security level to the plant operation.
- For interface between Electrical equipment and DCS, screened pair instrumentation cable is required. Bidder shall use Overall screened for Digital signal and Individual and overall screened for analog signal. All types of C&I (Instrumentation pair) cables shall have at least 10% spare pair.

5.9.14.3 CCTV SURVEILLANCE SYSTEM :

- PTZ (Pan-Tilt-Zoom)/CCTV outdoor/indoor cameras covering the whole plant (nos. of cameras requirement shall be as per design for well coverage of the plant) and total Inverter cum Control Room to be deployed with night vision and central monitoring through 42" LED monitor/TV at control room.
- Plant monitoring through CCTV system shall be done from existing main control room beside raw water reservoir no. 3. So, CCTV system shall be placed inside main control room.
- Bidder shall supply power supply cable, FO cable, CAT 6 cable, all types of cable connectors for the above cables and other hardware accessories, as required for CCTV system.
- CCTV system shall be powered from UPS ACDB. The system to be installed with the following Specification:Technical specification of CCTV surveillance system

Technical Specification	
1/3 -inch, CCD / CMOS sensor IP Box/Bullet outdoor type HD 1080p True Day/Night Switching IP Camera UL listed with VF lens 3.3 to 12 mm, two way audio and audio alarm, WDR 65db or more ,IP, Onvif profile	
Video compression	Two Simultaneous individual configurable H.264 Stream at 1080p 30fps.
	Camera Must support 2 Regions of interest and Remote E-PTZ, Motion, tamper and audio detection.
Image format	
Active Pixels	1920 x 1080 with aspect ratio 16: 9
Video Resolution (H x V)	1080p, 720p,
Sensitivity	Min. 0.3 lx, 0.0 lx (IR active)
Shutter	Automatic Electronic Shutter (AES) Fixed (1/30 [1/25] to 1/10000 or better
Lens	Varifocal 3.3 to 12 mm, DC Iris
Wide Dynamic Range	65db or more
Audio Communication	Two-way, full duplex

Technical Specification	
IR LED /Illuminator	LED high efficiency array, 850 nm
Night Vision distance	25m
Protocols	IPv4/ IPv6, UDP, TCP, HTTP, TTPS, RTP/RTCP, IGMP V2/V3, ICMP.
Ethernet	10/100 Base-T, auto-sensing, half/full duplex, RJ45
Connectivity-Onvif profile,	auto-MDIX
Operating Temperature	-10°C to +55°C with housing
Ingress and impact	Protection IP66
True Day/Night	Auto, Color Monochrome
Certifications	CE, FCC and UL
Video Management System Software (VMSS)	The Windows based video management system (VMS) specified shall be client/server based IP video security solution that provides seamless management of digital video and data across an IP network. System is designed to work with own CCTV cameras and Onvif profile compliant 3rd party products.
Display System	42" LED HD (1920 x 1080)
Data Storage Server	i. Data Base Server – Designed as per system requirement for smooth operation ii. OS - Windows Storage Server latest available, iii. Colour Monitor - 21" Flat Panel LED Monitor iv. RAM - 4GB DDR2, 667MHz SDRAM(minimum) v. Memory - 2 TB HDD(minimum) vi. Graphic Card - Integrated Intel Graphics Media Accelerator X3100 vii. Two(2) PCI-X and Two(2) PCI-Express Expansion Slots viii. 2/4 USB, 2 serial, and 2 VGA Adaptor, ix. CD/DVD ROM.; USB Keyboard and Mouse x. Dual Channel Internal Ultra320 SCSI xi. Integrated RAID-l with hot-spare xii. Dual Integrated 10/100/1000 Ethernet NIC xiii. I/O Expansion Option xiv. Should be with Antivirus and Firewall complete in all respects as per specifications as required.

5.9.14.4 TECHNICAL SPECIFICATION OF HMI PERIPHERALS :

Sl. No.	**Description**		**Minimum requirement**
Engineering cum Operator's Work Station cum Historian			
i.	Processor	:	Latest, minimum Intel Core i5 quad core

Sl. No.	Description		Minimum requirement
ii.	Configuration	:	Tower
iii.	Internal clock	:	3.2 GHz (min.)
iv.	Architecture	:	32 bit
v.	Video Card	:	PCI
vi.	RAM	:	4 GB (Minimum) DDR
vii.	Hard drive	:	1TB SATA (7200 RPM)
viii.	Cache	:	512 KB Level 2
ix.	CD/DVD Drive	:	DVD-Both Read & Write for OWS. Both DVD Read & Write for EWS
x.	Audio controller	:	16-bit
xi.	Operating system	:	windows 8.1 Professional downgraded to Windows 7 Professional 64 bit or latest at the time of detailed Engineering/procurement
xii.	Graphic accelerator	:	8MB (min.)
xiii.	Communication ports	:	(a) RJ-45 NIC- 02 Nos. (b) USB ports – 04 nos. (min.) (c) USB 3.0 - 02 nos.
xiv.	Accessories	:	USB Keyboard, USB Mouse
Monitor for Work Stations			
i.	Type	:	LED
ii.	Screen diagonal	:	24”
iii.	Display	:	Full HD
iv.	Resolution	:	1920 X 1080 or better
v.	Degree of protection	:	IP-30
vi.	External Controls	:	Brightness, contrast, Horizontal / Vertical amplification & shift
vii.	Power supply	:	240 V, 50 Hz, 1 phase
viii.	Ambient temperature	:	0-50O C
ix.	Humidity	:	95% non-condensing
x.	Version	:	To suit industrial application (latest version as per availability at the time of detailed Engineering/ procurement
Color Laser Printer			
i.	Type	:	Electro-photographic laser, tabletop
ii.	Printer Memory	:	512 MB (min.)

Sl. No.	Description		Minimum requirement
iii.	Speed	:	Monochrome 24 ppm - A4, Color 6 ppm - A4
iv.	Resolution	:	1200 x 1200 DPI in color
v.	No. of color (Basic)	:	4 (four) minimum
vi.	Duty cycle	:	Monochrome 75000 pages / month
vii.	Power supply	:	240V AC, 50 Hz, 1 phase UPS
viii.	Ambient temperature	:	0-50°C
ix.	Humidity	:	95% non-condensing.
x.	Interface	:	USB and Ethernet (RJ45)
xi.	Size of paper	:	A4
xii.	Print media	:	Plain paper, transparencies, thick stock, glossy stock, envelopes
xiii.	Special Features	:	1) Automatic Two-sided printing. 2) Built in Networking with Fast Ethernet 10/100 Base-T network port.
xiv.	Accessories	:	Connector & Cable

5.9.14.5 CONTROL DESK & FURNITURE

Bidder shall provide a control desk and complete set of furniture as required to place HMI peripherals supplied by them. Bidder shall provide ergonomically & aesthetically designed control desk, chair etc. from reputed manufacturer especially designed for computer peripherals.

The set of furniture shall include but not be limited to control desk, chair, printer table, computer tables etc.

All the above furniture shall have permanent Modular type power receptacles of ISI standard having five Plug points (15Amps rated) with individual isolation switches. Permanent I/O receptacles shall be provided."

5.9.14.6 TECHNICAL SPECIFICATION OF UNINTERRUPTED POWER SUPPLY (UPS) :

UPS system to be provided to meet the power requirement of bidder supplied SCADA system, HMI peripherals as well as CCTV system.

UPS alarms shall be monitored remotely from working stations in control room.

UPS system shall have with 2x100% configuration, normally both will run in parallel mode sharing 50% load. On failure of any UPS, its load shall automatically get transferred to the other healthy UPS.

The UPS system shall meet the following minimum specifications.

1.	**Type**	:	IGBT based high frequency PWM technology of latest proven design.
2.	**Configuration**	:	2 X 100% parallel redundant chargers and inverters, (2 X 100%) battery bank, bypass line transformers & voltage stabilizers, static switch, manual bypass switch and power distribution board.
3.	**Charger**	:	Solid state silicon controlled full wave rectifier designed for single and parallel operation with battery and shall have automatic voltage regulator, current limiter and filter circuits. Charger shall have provision for float, equalizing and boost charging.
4.	**Charger output Regulation**	:	± 1% from no load to full load with input power supply variation of 10 % to -15% in voltage and ± 5% in frequency with output ripple content less than 2%.
5.	**Battery**	:	Ni-Cd vented type, pocket plate high discharge battery of adequate capacity to meet the requirement of UPS, generally conforming to IS-10918. Sizing calculation shall be furnished
6.	**Backup time**	:	1 hour in case of input power fail.
7.	**Inverter capacity**	:	To be decided by bidder. 25% extra capacity margin to be considered.
8.	**Overload capacity**	:	a) 125% for 10 minutes b) 150% for 60 seconds
9.	**Sizing**	:	a) Environmental temperature 0 to 50 degC. b) Power factor of load - 0.8 c) Adequate I2 t capability to clear fault in the maximum rated branch circuit. d) UPS shall be capable to operate without DC battery in circuit and under all conditions of load.

			e) In case of failure of a charger / input power, other charger whose input supply is healthy shall be capable to charge the battery and as well supply input power to inverter. No discharge of battery is allowed. f) Inrush current
10.	**Inverter Output Regulation**	:	a) Voltage- 240V ± 1% b) Frequency- ± 0.5% c) Power factor of load - 0.8 d) Transient voltage regulation (on application /removal of 100%load) – better than ± 20 %. e) Recovery time from transient to normal – 50 msec.
11.	**Harmonic**	:	a) Sine wave output b) Total harmonic content- 5% (maximum) c) Content of single harmonic- 3% (maximum)
12.	**Efficiency**	:	a) 100% Full load- 85% b) 50% load-80%
13.	**Synchronization limit**	:	Between inverter & standby AC source shall be within 47 Hz to 53 Hz field adjustable. Inverter shall remain synchronized with the AC mains.
14.	**Inverter protection**	:	Overload, short circuit and 100% loss of load.
15.	**Load sharing**	:	50% by each inverter in normal parallel operation. In case of failure of either inverter, 100% load shall automatically transfer to other inverter without any degradation of the UPS power quality. Power shall be transferred to the standby AC power without a break in synchronization if within limit in case of failure of both inverters. Asynchronous transfer to standby AC source in case inverters are being out of synchronism limit with AC mains.
16.	**Static switch**	:	Transfer UPS load to standby AC power in case of failure of

			both inverters. Transfer UPS load to standby AC power in case of failure of a inverter.
17.	**Voltage stabilizer & Transformer**	:	Solid state with regulation ± 1 % with efficiency greater than 95%. Overload capacity of transformer / stabilizer shall not be less than 300% of steady state for 200 msec.
18.	**Diagnostic alarms**	:	On panel & potential free contacts for interface to PLC
19.	**Spare feeders**	:	25%
20.	**Accessories**	:	Power distribution board, Voltage & current meters, power factor meter, KVA, frequency, panel alarms, switches etc.

5.9.14.7 OPTICAL FIBER CABLE

- This specification defines the minimum general requirements for the Design, manufacture, supply, inspection, installation, testing & commissioning of optical fiber cables and accessories, such as fiber distribution (patch) panels, adapters, connectors, joint boxes, pigtails and other components, as required to complete the system. Bidder shall consider all related activities, such as cable stripping, cable entry in boxes and panels, cable fiber splicing/fusion, cable performance testing and other services, to achieve a properly documented and operational cable network. all Fibre Optic cables shall be Single Mode type.
- Fiber Optic Cables shall be installed on cable tray, duct bank, cable trench installation as necessary. For outdoor applications the cable shall be armoured with Poly Ethylene sheathing. In all cases cable shall be routed through suitable grade HDPE permanently lubricated protection pipe as per IS 4984, IS 12235 & TEC.G/CDS-08 /01of suitable size @ 53% fill factor. Permanent route marking in FRP (Fibre Reinforced Plastic) material shall be provided at intervals not exceeding 5 meters for all FO cables laid through buried/trench/ trestle during detail engineering.

- The Optical Fiber core shall be of ultra pure fused silica glass coated with UVcured acrylate suitable to withstand temperature of about 80□ C (continuous).
- Fiber optic cable shall be of loose tube design. Typically, fibers shall be housed in-groups of 6 (minimum) within gel-filled buffer tubes to protect against ingress of moisture and vibration. The tubes shall be manufactured with industry standard material like Poly-Butylenes Terathylate (PBT). They shall be colored for easy identification. Buffer tubes shall be approachable with industry standard tools and practices. The buffer tubes shall be stranded around the Central Strength Member utilizing Reverse Oscillating Lay (ROL). Blank fillers shall be used as necessary to maintain circular cable structure. The fiber optic cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end.
- The central strength member of the cable shall be Fiberglass Reinforced Plastic (FRP) or other material with equivalent mechanical strength to provide both tensile and anti buckling strength to the cable.
- In addition to central strength member, additional strengthening substance like aramid yarns shall be helically applied over the cable core to provide additional tensile strength to the cable.
- The cable shall be of dual jacket & armoured. Inner sheath consists of a medium density polyethylene (MDPE) jacket extruded over the cable core.
- Two highly visible ripcords are placed under the jacket to aid in sheath removal. A co-polymer coated steel tape is corrugated and wrapped around the inner jacket to provide additional cable compression strength and rodent protection. The armor is covered with an outer black FRLS MDPE jacket. A ripcord is also placed underneath the armor for easy outer jacket removal.
- Minimum bending radius shall be equal or more to 15 D (D= Diameter). A continuous strength member shall be provided for the entire length of the cables. Every tube and fiber shall be colour coded to provide easy identification. The outer sheath shall be marked to show fiber type and cable classification at suitable intervals.
- The entire length of each cable shall be marked with the following items:
    - Manufacturer's Name

- Month and year of manufacturing
- Coded description of the cable based on Telcordia's (Bellcore) SR-2014 Suggested Optical Cable Code (SOCC).
- Sheath Identification Number
- Sequential Length Marking in meter
- A Telephone Handset symbol to distinguish communication from power cable as per NESC section –35 G.

❖ Fiber optic cable shall provide a long life expectancy of minimum 25 years and shall meet the industrial standard of operation at temperature of 55 deg C and humidity to 100% without degradation to optical or mechanical performance.

❖ Optical fiber used in the plant shall generally conform to the following specification.

i. SPECIFICATION FOR G.652 MONOMODE FIBER

ATTRIBUTES	VALUE
1. Cladding Diameter	: 125μm ± 1.0μm
2. Cladding non-circularity	: ≤ 1.0%
3. Attenuation Coefficient at	
(a) 1290 nm to 1340 nm	: < 0.36 dB/km
(b) 1525 nm to 1575 nm	: < 0.25 dB/km
4. Chromatic Dispersion Coefficient at	
(a) 310 nm	: < 3.5 ps/nm.km
(b) 1550 nm	: < 18 ps/nm
5. Polarization Mode Dispersion (PMD)	: ≤ 0.5 ps/√km
6. Mode Field Diameter at	
(a) 1310 nm	: 9.2 ± 0.4 μm
(b) 1550 nm	: 10.50 ± 1.0 μm
7. Mode Field Concentricity Error	: ≤ 0.5 μm
8. Proof Test	: ≥ 1%
9. Fiber Curl (ROC)	: ≥ 4.0 m
10. Macro-bend Test on Fiber at 1550 nm	: ≤ 0.1 dB

ii. CABLE ASSEMBLY

❖ Optical Fiber Environmental Splice Enclosure

❖ Optical fiber environmental splice joint enclosures shall be re-enterable and rack / wall mountable. The interior splice case shall be equipped to

mechanically accommodate single-mode optical fibers connected by the fusion method. Splice case shall be equipped to organize the splice trays and the required service loops of buffered incoming optical fibers and outgoing 'pigtails' in such a way that allows each completed splice and associated optical fiber to be maintained in an unstrained configuration. Splice enclosure shall be dust and weather proof.

iii. Fiber Optic Distribution Patch Panel

- Fiber optic distribution panels shall be provided as required. The fiber optic distribution panels shall be of a standard wall mounted sheet metal enclosure type. Fiber optic distribution panels shall be equipped to secure optical fiber patch cables and pigtails to prevent damage during all operation and maintenance functions. In general splice enclosure are envisaged. However,
- If no optical fiber splice enclosures are implemented, than the fiber optic distribution panels shall be equipped with splice trays for storage and protection of fusion splice connections of single-mode fiber optic cable and pigtails. Each fiber optic distribution panel shall be fully equipped with 'SC' type bulk head connector sleeves or equivalent. Unused sleeve ports shall be equipped with reusable caps to prevent the intrusion of dust.

iv. Pigtail and Patch Cord

- All pigtails shall be factory SC-connectorized, and satisfy specified performance for optical links. All unused pigtails (including spares) shall be terminated with the connector to a bulkhead connector sleeve, protected by a reusable cap on the opposite sleeve port, to prevent the intrusion of foreign material or dust. All necessary connectorized pigtails shall be provided in the lengths required.

v. Tests

- Following minimum test as per any approved standards shall be carried out on the cables

  a. Attenuation and Dispersion Characteristics Tests
  b. Proof Tests
  c. Macro-Bend Resistance Test
  d. Mechanical Tests
  e. Low And High Temperature Cable Bend Test
  f. Impact Resistance Test

g. Compressive Strength Test
h. Tensile Strength Test
i. Cable Twist Test
j. Cable Cyclic Flexing Test
k. Environmental Characteristics Test
l. Temperature Cycling Test
m. Color Permanence Test Cable Aging Test
n. Water Penetration Test
o. Lightning Test
p. Routine Test / Sample Test
Site Test (Like Continuity & Attenuation)

5.9.14.8 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the data acquisition and monitoring system:

- Detailed scheme
- Details of panels, metering system
- Necessary drawings for the scheme etc.

Drawings and scheme submitted by the contractor will be subjected to approval of the owner.

5.9.15 CABLES & CONDUCTOR:

5.9.15.1 SCOPE

The scope of work under these specification covers the Design, Manufacture, Assembly, Shop Testing, Delivery at site, transit insurance, Storage, Erection, Testing & Commissioning of power, control and instrumentation cables (complete with cable terminals and all accessories for making the systems complete and for warranting a trouble free and safe operation).

The scope shall also include supply of all material, fabrication and erection of cable supporting structure, cable trance, cable racks & trays as well as laying of cables on cable racks.

The scope of supply shall also include necessary spares required for a period of 5 (five) years & special tools & plants required for erection & maintenance.

5.9.15.2 STANDARDS

The equipments covered under this chapter shall comply with the requirement of latest edition of following IS/BS/IEC specifications as amended up to date except where specified otherwise.

Sl. No.	Standards	Description

Sl. No.	Standards	Description
1.	IEC 60529/IEC 60502	All cables that are submerged or in contact with water should be with IP 68 rating.
2.	IS: 7098 – Part 1	Cross linked polyethylene insulated PVC sheathed cables for working voltage up to and including 1.1kV
3.	IS: 7098 – Part 2	Cross linked polyethylene insulated PVC sheathed cables for working voltage from 3.3kV up to and including 33kV
4.	IS 10418	Drums for cables
5.	IS 8130	Conductors for insulated electric cables and flexible cords
6.	IS 8308	Compression type tubular inline connectors for aluminium conductors
7.	IS 8309	Compression type tubular terminals for aluminium conductors
8.	IS 8438	Moulds of cast resin based straight joints of cable up to including 1.1kV
9.	IS 11967	Specifications for co-axial cables
10.	IS : 2062	Structural Steel (Standard Quality)
11.	IS : 513	Cold rolled low carbon steel sheets & strips
12.	IS : 277	Galvanized sheet steel
13.	IS : 808	Rolled Steel Beam, Channels and Angle section
14.	IS : 2629	Recommended practice for hot dip galvanizing of iron and steel.
15.	IS : 2633	Method of testing uniformity of coating on zinc coated articles.
16.	IS : 800	Specification for use of structural steel in general building construction.

Cables and other accessories complying with other internationally accepted standards such as IEC, IEEE, BS, etc. will also be accepted if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case the Contractor shall clearly indicate the standard/standards adopted and furnish a copy of English version of the latest revision of the standard(s) along with the Bid and the salient features of comparison shall be brought out.

5.9.15.3 GENERAL REQUIREMENTS

Minimum requirements are mentioned hereunder.

- The cables shall be of type and design with proven record of similar power station installations.
- The colours of the cables (both AC & DC) should be so selected that there should not be any problem for identification of cables used for various circuits during inspection & testing.
- To facilitate easy identification of cores, multi-core control and instrumentation cables shall be colour coded by using PVC insulation of red, black, yellow, blue and grey colours in accordance with IS 1554 (Part I).
- Cable lengths shall be considered in such a way that straight through cable joint is avoided.
- Cable terminations shall be made with suitable cable lugs & sockets etc, crimped properly and passed through brass compression type cable glands at the entry & exit point of the cubicles.
- Cables shall be shipped in non-returnable drums, adequately braced, and with cable ends adequately sealed to prevent ingress of moisture.
- The contractor shall ensure that no bimetallic action takes place between the Aluminium conductor of the cable and the cable connecting lugs by filling the lugs with suitable compound.
- For the main cable ways, a system of cable racks and trays as well as cable ducts and trenches shall be provided. The power and the control cables will run on separate trays. The cables for emergency lighting, fire alarm systems, etc., shall run on separate trays. The power cables shall be laid on the uppermost rack to prevent spread of fire.
- In indoor installations, the cables must be laid through PVC conduit or GI pipe. In case of using metallic pipe as conduit proper grounding of the conduit must be done.
- Different voltage grade cables will be laid in separate trays when trays are run in tier formation. Power cables will normally be on top trays and control/instrumentation cable on bottom trays.
- Exposed cables, wherever, used, shall preferable have UV resistant jacket besides being water resistant.
- Cables for each equipment must be tagged with permanent metal tag of impregnated cable number as per drawings at MCC/switchgear end and

equipment terminal end as well as in the mid portion of the cables at certain distances as instructed by the owner or his authorized representative.

- The loop length shall be provided for various cables as per the relevant Indian Standard.
- All types of control cables shall have at least 10% spare cores.
- Cables shall be properly clamped at regular intervals with the help of non magnetic/molded fiber glass strip clamps/PVC sleeved clamps, of suitable size.
- When power cables are laid in the proximity of communication cables, the minimum horizontal and vertical separation between them may be 300 mm.
- Proper sealing arrangements at the points of cables entering the enclosures should be incorporated. Although not mandatory, manufacturers are however encouraged that the cables entering into the enclosures be sealed with modular EPDM based cable sealing and protection system based on multi-diameter technology.
- Cable selection criteria: In cable sizing the following are to be taken into consideration.
    - Short circuit current and duration
    - Continuous current.
    - Installation conditions.
    - Voltage drop under normal running and starting condition.
- Cable identification: Cable identification shall be provided by embossing on every meter

5.9.15.4 TECHNICAL REQUIREMENTS FOR CABLES AND CONDUCTOR

Minimum Technical requirements are mentioned below:

- All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions including High temperatures, UV radiation, rain, water, humidity, dirt, burial and attack by moss and microbes for 25 years and voltages as per latest IEC standards.
- The cables used in module/ array wiring shall be TUV 2Pfg 1169/08.2007 or VDE EPV 01:2008-02 or UL4703/ EN 50618certified.
- Temp. Range 0°C to +90°C. Cable must be able to withstand this ambient temp range while carrying max current. Maximum and minimum withstand

temperature of cable must be mentioned in engineering drawing for approval of purchaser with documentary proof.

- Fulfils IEC 60332-1 requirements. Accredited lab test report/Manufacturer's test report shall be attached.
- Conductor class IEC 60228 class 5. Accredited lab test report/Manufacturer's test report shall be attached. Only Copper conductor is to be used.
- All cables shall be Fire Retardant Low Smoke (FRLS) type. The cables shall be sized based on the following considerations:
  - Rated current of the equipment
  - The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during running condition, shall be limited to 3% of the rated Voltage
  - Overload protection is to be provided. Design Overload capacity for 10 sec of 125% of continuous rating. The principle aim in this protection is to reduce the over voltage to a tolerable value before it reaches the PV or other subsystem components. The source of over voltage can be lightning or any other atmospheric disturbance.
  - Short circuit withstand capability De-rating factor for various conditions of installations shall be considered while selecting the cable size
  - Variation in ambient temperature for cables laid in air
  - Grouping of cable
  - Variation in ground temperature and soil resistivity for buried cables
- HT cable shall be designed based on the short circuit conditions and LT cable shall be sized based on the voltage drop.
- For breaker protected circuits minimum size will be determined by short circuit rating.
- Size of aluminium power cable shall in no case be less than 16 mm^2 and copper power cable shall not be less than 6 mm^2. Where there is requirement of cables less than the above mentioned values, copper cable of appropriate size but not less than 4 mm^2 may be used.
- Minimum size of the control cable for CT circuit shall be 4 mm^2 and that for potential circuit shall be 2.5 mm^2.
- The cables shall be capable of satisfactory operation under a power supply system voltage variation of ± 10% and frequency variation of ± 5% and a combined frequency voltage variation of 10% (absolute sum). The cables shall have heat and moisture resistant properties.

- Conductor size of cables and wires shall be selected based on efficient design criteria.
- DC and LT Power cable Voltage drop criteria: From Module to Inverter end before connection individual voltage drop shall be limited to maximum 1.5 % of rated voltage. From Inverter to AC Grid interfacing panel i.e. Indoor HT Switchgear should be less than 2.5%.
- For all other LT cable, maximum voltage drop shall be limited to 2.5 % at rated voltage.
- All XLPE cables shall be rated at 90 deg C conductor temperature for AC voltage drop calculation and 80 deg c for DC Voltage calculation.
- The short circuit withstand temperature shall be 250^{0}C and 160^{O}C for XLPE and PVC cables respectively.
- All cables shall be suitably derated as per the laying condition for carrying the required load current and fault current. For derating the ambient temperature for directly buried cables or laid in air shall be taken as 50 deg C.
- All Power cables shall be XLPE, FRLSH.
- The Jointing Boxes shall comply in all aspects with the provision of the latest issue of relevant standards.
- The control cables shall be multi-core, colour coded, annealed, stranded high conductivity copper, single conductor, insulated with HR-PVC insulation, PVC sheathed, unarmored FRLS type conforming to IS 1554 (part I & II)/relevant IEC. The outer sheath is of specially formulated PVC compound.
- The instrumentation cables in addition to meeting the requirements of control cables shall be provided with electrostatic shielding by aluminium tape and screening by annealed tinned copper wire.
- Multipair, individual pair & overall screened, twisted pair instrumentation cable shall be provided for analog signals with stranded copper conductor.
- Multipair, overall screened & twisted pair instrumentation cable shall be provided for binary signals with stranded copper conductor.
- For connecting solar modules with solar inverter via array junction box, three winding transformer output with 33 kV Indoor Switchgear (33 kV) and 33 kV Indoor Switchgear (33 kV) with the 33 kV Switchyard (33 kV), cables of suitable size shall be provided.
- Cabling from Control Room to adjacent 33 kV Switchyard to be made through Cable Trench of suitable size as per relevant standard.

- Cable to be routed in standard manner through cable trays & cable marker to be placed for future identification.
- For physical protection of unarmoured cables (wherever used) suitable conduit to be provided wherever necessary. Armoured cable is to be used wherever required.
- The communication confined within the control/equipment room shall be through Shielded twisted Pair cable (STP) CAT 6.
- Single mode FO cable will be preferred, wherever FO cable is required.
- Dual redundant Optical Fiber Communication (OFC) cable shall be considered, wherever possible. Necessary ports/converters/hardware/software shall be provided.
- Separate system will have dedicated FO cable (as applicable).

5.9.15.5 TECHNICAL REQUIREMENTS OF CABLE RACKS AND TRAYS

Minimum technical requirements for cable racks and trays are mentioned below:

- The contractor shall fabricate and supply the mounting arrangement for the support and installation of all the cable trays on hot dip galvanized steel structure including channels, angles, rods etc at requisite spacing in the suspended cable trays, cable trenches. Supporting structures wherever necessary, shall be provided by the contractor.
- The contractor shall provide embedment/anchor fasteners for fixing the supporting structures.
- These supporting structures shall be fabricated from structural steel members (channels, angles and rods) of the required size.
- The vertical member of the support will be of ISRO12 threaded rod or ISMC100 channel. The horizontal member of the support will be of angle ISA 50X50X6. For the threaded rod support configuration the horizontal member shall be fixed by bolting whereas for channel configuration the horizontal member shall be fixed by welding to the channel.
- Trays shall be of ladder type. The trays shall be fabricated from Hot Rolled Carbon Mild Steel (conforming to IS 1079, Grade “O”, of chemical composition (C, Si, Mn, S, Ph) sheet of proper thickness as per IS.
- Cable trays shall be fixed with support by hold-down clamps. The clamps shall be fabricated from MS sheet of appropriate thickness and Hot Dip Galvanized.
- The contractor shall supply various tray fittings and accessories like coupler plate with fasteners, horizontal tees, vertical and horizontal elbows, vertical and

horizontal adjustable connectors required for the mentioned trays. All accessories, fittings, elbows and tees shall be Hot Dip Galvanized. The nuts, bolts and washers shall be cadmium plated or electrolytically galvanized.

- Proper earthing of the trays and continuity between tray components must be ensured by the contractor.
- The contractor shall install the cable trays in accordance with relevant standards.
- The cable trays shall conform to bending & galvanization tests as per the relevant standards.

5.9.15.6 TECHNICAL REQUIREMENTS OF BURIED CABLE

- DC Cable from the individual floating solar plant to the respective Inverter cum control room to be laid on the underground cable for safe movement of vehicles through the embankment of the pond. Necessary suitable arrangement shall be finalized during detail engineering.
- 33kV Outgoing evacuation and other cable between Inverter Room to Main Control Room:
  i) 33kV incomer feeder cable for 33kV Floating Solar Control Room Switchgear to be laid down on the Pond embankment as per the specification shown in the tender drawing No.SG-FSLP-DWG-E-002 (outdoor area) and SG-FSLP-DWG-E-004 (Indoor door). However new RCC cable trench to be installed inside the existing transformer yard of Main Control room for entry of all the HT, LT, Instrumentation cable including future provision.
  ii) Estimated distance from main control room to Inverter cum switchgear room is approx 500mtr however bidder may check actual position before bidding. Bidder shall laid buried cable through the central dyke with removal and reconstruction of the existing pavement..
- 33 kV Outgoing evacuation cable from Existing Main Control Room to New 220 kV Switchyard :

  Bidder shall provide cable tray through existing cable trestle subject to availability of space with necessary modification and the rest will be buried as per the specification shown in the tender drawing No.**SG-FSLP-DWG-E-002** Approx length of the root would be 650 Mtr.
- **However actual cable route through buried cable / cable trestle / cable trench shall be finalized after details engineering as per site condition not damaging any existing installation, cable, pipe lines etc. Bidder shall**

be responsible for all the damages of existing installation if any done during execution of the project, the same damages shall be rectified upto their existing standard by the bidder without any additional cost implication to WBPDCL.

5.9.15.7 APPROVAL

The Detailed Design Report Submitted by the contractor to WBPDCL must contain but not limited to the following details of the Cables and conductor and the accessories for their installation:

- Detailed design and specification of all the items.
- All necessary drawings
- Calculations for choosing cable size
- Type test reports and necessary certificates etc.

Before dispatch, sample pieces of the cable shall be subjected to type, routine, acceptance and FRLS tests at the manufacturer's works as stipulated in IS 1554 (Part I)/IEC in the presence of owner or his representative. Routine tests and acceptance tests as per relevant standards shall be carried out on each type of cable in presence of the owner or his representative.

Before commissioning of complete system all cabling system shall be checked as per cable schedule and complete report shall be prepared by Contractor and shall be submitted.

Prior to the delivery of the product, the contractor shall submit but not limited to the following documents:

- Guarantees
- Cable routing and layout drawings
- Detailed procedure adopted for the earthing of the trays
- Type test certificates for cable trays etc.

The contractor can deliver the product to the site only after receipt of such approval against their prayer in writing from WBPDCL.

5.9.16 DATA LOGGER:

a) Web enable data logging system may be an integral part of the inverter or a separate unit.

b) The data logger should have required transducer to monitor and record the required system parameters.

c) The data Logger, where the weather monitoring station shall be connected, shall keep record of **Global Solar Radiation, PV module temperature and ambient temperature and associated electrical parameters** at different stages to study performance of system as well as to study status of the system at a particular instant.

d) The Data logger shall continuously send data to the Web server.

e) If the Power Plants shall installed in distributed manner and at more than two buildings then necessary arrangement shall have to be provided so that compiled data shall be uploaded to the Website against each site.

f) The data logger shall have reliable data storage capacity (of minimum four months) to record all sorts of data simultaneously round the clock.

g) **SPD (surge protection device) Type II suitable for communication network, as much number at suitable locations are required must be provided with the system**

5.9.17 WEATHER MONITORING STATION

i) Weather Monitoring Station comprised of the following:

a) **Solar Irradiance:** An integrating Pyranometer (Class II or better) shall be provided, with the sensor mounted in the plane of the array. Readout shall be integrated with data logging, system.

b) **Wind Speed:** An integrated wind speed measurement unit shall be provided.

c) **PV module temperature sensor, ambient temperature:** Temperature probes for recording the PV Module temperature and ambient temperature shall be provided.

ii) The components of the Weather Monitoring Station shall be matched with the Data Logger system and Web based Monitoring system and connected with the Data logger.

iii) The data from the Weather Monitoring station shall be sent to the Web server through Data logger and shall be downloaded from the remote server from any where

5.9.18 WEB BASED ON LINE REMOTE MONITORING SYSTEM:

a) Web based Remote Monitoring system must be compatible with data logger (s).

b) The system(s) shall be provided with suitable modem and required SIM card for wireless communication or connection from internet service provider (Wire system)

c) The Modem shall be interconnected with all the locations of installation of PV power Plants at different buildings of the site through wires / wireless system/ or any other technology so that Beneficiary wise composite and for individual power plant data shall be observed and downloaded from the remote server through web.

d) The contractor shall provide the website address and password to the purchaser for asses the data from the remote server.

e) If there is communication signal at the site is weak, necessary antenna or any other suitable instrument as may be required must be provided with the communication system.

f) The Data logger shall continuously send data to the Web server.

g) The other required accessories, hardware and compatible software shall have to be provided as an integrated part of the system to monitor the real time data (maximum 20 minutes delay) through web server.

h) The system can be monitored from anywhere through internet without installing any special application software. The server shall be arranged by the contractor.

i) The rental and other costs of the SIM cards, IP address, Server charge (storage, access charge and other charges if any), Rental charge of data communication for remote monitoring system for a period of five (05) years shall be within the contract value.

j) If more than one data logger and web based monitoring system shall with different PV Power Plant installed at different location within a same campus, consolidated data and graphical representation of the parameters including the weather monitoring report shall be obtained through web.

k) The Web based monitoring system should have the provision of graphical representation of the data shall include but not limited to the following:

Sl. No.	Operating Parameter	Desired specification
1.0	Input data	PV Power PV Energy

2.0	Meteorological data	Global solar Radiation Module Temperature Ambient Temperature Wind Speed
3.0	Output data	
3.1	Inverter	Export Power Export energy

l) All data shall be recorded chronologically date wise. The data file should be MS Excel/XML/or any readable form compatible and should have the facility of easy downloads from the website and onsite.

5.9.19 EXPORT IMPORT ENERGY METER:

3 phase whole current Export Import Energy Meter. The Meter to be supplied must be tested. The export Import Energy meter shall be installed at the within the **Grid Interfacing Panel**.

The export Import Energy meters (Class 2S) shall be installed at

i) All the new incoming and outgoing feeders of 33 kV VCB panels,

ii) All outgoing feeders at the new section of 415V LT switchgear installed inside Main control room under this scope.

iii) CT of Class 2S and PT shall be used for all the aforesaid feeders for both 33 kV and 415 V LT Switchgear.

5.9.20 ILLUMINATION SYSTEM

5.9.20.1 SCOPE

The scope of work under this specification covers design, manufacture, assembly, shop testing, delivery, site erection, testing & commissioning of Illumination system comprising of main Illumination switchboards, distribution boards, sub distribution boards, switchboards, lighting fixtures, convenience and power outlets, conduits & fittings, cabling, outdoor lighting including mounting structures & poles, lighting for control rooms, security cabin, watch tower, access road (maximum 15 m between two adjacent lamps and Lighting Poles).

The illumination system shall be designed as per relevant Indian Standard / Guideline for different location of the plant. The lighting arrangement should be LED Based.

The scope of supply shall also include necessary spares required for normal operation & maintenance of illumination equipment for a period of 5 (five) years &

special tools & plants required for erection & maintenance. Corresponding parts of all the equipments & spares shall be of the same material & dimensions, workmanship & finish and shall be interchangeable.

5.9.20.2 STANDARDS

The material, equipment and its installation under the scope shall comply with all applicable provisions of the latest Indian standards and codes of practice. Some of the relevant standards are given below:

Sl. No.	Standards	Description
1	IS: 3646	Code of practice for interior Illumination (Part I, II, III)
2	IS: 6665	Code of Practice for Industrial Lighting
3	IS: 732	Code of Practice for Electrical wiring installations
4	IS: 9537	Conduits for Electric installations
5	IS: 2418	Tubular fluorescent lamps for general lighting service
6	EN 61347-2-13	Particular requirements for D.C. or A.C. supplied electronic control gear for LED modules
7	EN 62384	D.C. or A.C. supplied electronic control gear for LED modules
8	EN 61000-3-2	Electromagnetic compatibility (EMC). Limits for harmonic current emissions (Equipment input current < 16 A per phase)
9	EN 61000-3-3	Limitation of voltage fluctuation and flicker in low voltage supply systems for equipment with rated current < = 16 A

The installation shall generally be carried out in conformity with the requirements of Indian Electricity Act 1910 (latest Amendment) & Indian Electricity Rules.

5.9.20.3 REQUIREMENT

The lighting system for outdoor and indoor areas of Solar Power Plant shall be designed in such a way that uniform illumination is achieved.

In outdoor yard equipment / bus bar areas and the peripheral wall are to be illuminated and luminaires shall be aimed for clear view.

5.9.20.4 LIGHTING LEVELS

The complete switchyard shall be lightened with an average illumination level of 100 lux.

Lighting in other areas such as control room, office rooms and battery room & other areas (i.e. street light) shall be such that the average LUX level to be maintained shall be as under:

Sl No.	Area	LUX
1	Control Room and equipment rooms	500
2	Office	300
3	Battery & other rooms	150
4	Other areas including embankment	20
5	H – pole and metering point	20

5.9.20.5 EMERGENCY LIGHT POINTS

Light points using LED lamps at 220 V shall also be provided as per requirement of the following area:

- All emergency light shall be from 220 V DC Battery/ Local UPS.
- Control room and equipment room, Battery room, UPS Room/ Office, Corridor, Local Inver cum Control Room or any other place where light is required for clear vision.
- These lights shall operate on AC/DC changeover supply from the DC distribution Board. Separate wiring and distribution board shall be provided from these lights.
- Battery room shall be corrosion proof type lamp and fixtures.

5.9.20.6 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the illumination system:

- Detailed scheme and specification
- Illumination calculations for arriving at the number of lighting fixtures for different areas & rooms considering the required lux level as per relevant IS Code.
- Necessary drawings etc.

Drawings and scheme submitted by the contractor will be subjected to approval of the owner.

The contractor can deliver the product to the site only after receipt of such approval against their prayer in writing from WBPDCL.

C. MISCELLANEOUS WORKS:

5.9.21 FIRE PROTECTION SYSTEM

5.9.21.1 SCOPE

The scope of work under this specification covers design, engineering, quality assurance, manufacture, shop testing, transport, transit insurance, delivery to site, storage at site, site erection, testing & commissioning of fire protection system (fire extinguisher (type shall be selected as per requirement), fire buckets, fire alarms at all control rooms etc.) complete with all accessories.

The scope of supply shall also include necessary spares required for normal operation & maintenance of illumination equipment for a period of 5 (five) years & special tools & plants required for erection & maintenance. Corresponding parts of all the equipments & spares shall be of the same material & dimensions, workmanship & finish and shall be interchangeable.

5.9.21.2 STANDARDS

All equipment covered under this section will conform to the latest edition of following Indian Standards:

Sl. No.	Standards	Description
1	IS: 3034	Code of Practice for Fire Safety of Industrial buildings: Electrical generating and distributing stations.
2	IS: 3844	Code of Practice for installation of internal fire hydrants in multi-storied buildings
3	IS: 1646	Code of Practice for fire safety of buildings (General) Electrical Installations
4	IS: 2878	Specification for fire Extinguishers – Carbon dioxide type
5	IS: 2171	Specification for fire Extinguishers – Dry Powder type
6	IS: 933	Specification for fire Extinguishers – Foam type
7	IS: 2175	Specification for heat sensitive fire detectors for use in automatic electrical fire alarm system
8	IS: 2189	Code of Practice for installation of automatic fire alarm system using heat sensitive type fire detectors

5.9.21.3 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the fire protection system:

- Detailed scheme and technical specification
- Placing and type of fire extinguisher with justification
- Necessary drawings related to the system etc.

Drawings and scheme submitted by the contractor will be subjected to approval of the owner.

The contractor can deliver the product to the site only after receiving such approval against their prayer in writing from WBPDCL.

5.9.22 VENTILATION SYSTEM

5.9.22.1 SCOPE

The scope of work under this specification covers design, manufacture, shop testing, supply, transportation, delivery, storage at site, erection, testing and commissioning of ventilation system complete with all accessories at each Inverter cum control rooms, store room etc.

The Scope shall include supply of all blower fans, GS ducting, air plenum, exhaust fans air dampers etc as required to make the ventilation system complete in all respects for satisfactory operation.

The scope of supply shall also include necessary spares required for normal operation & maintenance of ventilating equipments for a period of 5 (five) years and special tools & plants required for erection & maintenance.

Corresponding parts of all the equipments & spares shall be of the same material & dimensions, workmanship & finish and shall be interchangeable. All the material & workmanship shall be of suitable commercial quality as have proven successful in their respective uses in similar services & under similar condition.

Pressurized ventilation shall be provided at switchgear rooms through Supply air fans, with filters, bird catcher etc and other necessary protection.

5.9.22.2 STANDARDS

The ventilating equipment shall comply with the requirement of the latest edition of relevant Indian standards or equivalent British Standards. Some of the relevant standards are given below:

Sl. No.	Standards	Description
1	IS : 3103	Code of Practice for industrial ventilation
2	IS : 2312	Specifications for propeller type A.C. Ventilating fans.
3	IS: 4894	Centrifugal fans

5.9.22.3 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the Ventilation system:

- Detailed scheme and technical specification
- Calculations showing air requirements at various locations
- Necessary drawings etc.

The successful bidder required to produce all necessary test certificates and approvals of the product as per relevant standard with the Detailed Design Report.

Drawings and scheme submitted by the contractor will be subjected to approval of the owner. The contractor can deliver the product to the site only after receiving such approval against their prayer in writing from WBPDCL.

5.9.23 AIR CONDITIONING SYSTEM

5.9.23.1 SCOPE

The scope of work under this specification covers design, manufacture, testing, supply, transportation, transit insurance, delivery, storage at site, erection, testing and commissioning of Air conditioning system with control and accessories at the operator's work station, SCADA room and UPS room with 100% redundancy at main control building.

5.9.23.2 STANDARDS

Equipment shall conform to the latest Indian standards or equivalent British Standards.

Sl. No.	Standards	Description
1	IS: 659	Safety code for Air conditioning
2	IS: 660	Safety code for Mechanical Refrigeration
3	IS: 655	Metal Air ducts

5.9.23.3 APPROVAL

The successful bidder required to produce all necessary test certificates and approvals of the product as per relevant standard with the Detailed Design Report.

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the Air Conditioning system:

- Detailed scheme and technical specification
- Necessary drawings etc.

Drawings and scheme submitted by the contractor will be subjected to approval of the owner. The contractor can deliver the product to the site only after receipt of such approval against their prayer in writing from WBPDCL.

5.9.24 DRINKING WATER

5.9.24.1 SCOPE

The scope of supply under this section shall cover the design, manufacture, shop testing, supply, transportation, delivery, storage at site, erection, testing and commissioning of drinking water system with water purifier unit and other related plumbing arrangement and accessories etc. for drinking water supply for the personnel at the Control Building. A drinking water point will be provided (within 500m from control building) and the contractor to draw pipelines to the requisite location.

5.9.24.2 STANDARDS

The whole system shall conform to the latest edition of relevant Indian Standard.

5.9.24.3 APPROVAL

The Detailed Design Report submitted by the contractor to WBPDCL must contain but not limited to the following details of the water purification unit:

- Detailed Technical specification
- Necessary drawings etc.

Specification submitted by the contractor will be subjected to approval of the owner. The contractor can deliver the product to the site only after receiving such approval against their prayer in writing from WBPDCL.

5.9.25 SIGNAGE:

5.9.25.1 Project information Signage:

The Signage will be made up of metallic base of minimum size 3'x 2'. The Signage provide with detail of the project as approved by WBPDCL. The font size on the signage has to be big enough so that everyone can read it easily. The Signage will be fixed **up two (02)** prominent place of the project area.

5.9.25.2 SCHEMATIC DIAGRAM SIGNAGE:

Schematic Diagram of Installation must be provided on a display board of minimum size 3'x 2' made up of metallic base. The schematic diagram must be fixed up at any prominent place of installation.

5.9.25.3 SAFETY SIGNAGE:

Safety Signage must be provided indicating the level and type of voltage and symbols as per IE Rule at different position as may be required. In the safety signage Voltage level and type of voltage must be mentioned

Each set of Safety Signage contain minimum 06 (six) nos. safety signage:

Location	Quantity
PV Array Field	Minimum 2 nos.
On PV Array JB	01 No. (Sticker)
Near Inverters	01 No
On Inverter Interfacing LT Panel	01 no. (Sticker)
On Grid interfacing Panel	01 No (Sticker)

5.9.26 FIRE BUCKETS AND HOLDING STANDS

Each set of Fire Buckets and Fire Bucket Holding Stand shall have four (04) Fire Buckets and one (01) Double Tier Fire Bucket Holding Stand with an arrangement of holding of minimum four (04) Fire Buckets. The Fire Bucket Stand shall be installed at the suitable location.

The minimum technical specification is a follows:

BIS Specification	IS 2546 (with latest amendments)
Fire Bucket Capacity	10 liters
Fire Bucket Body Material	Mild Steel Sheet

FIRE EXTINGUISHERS

Minimum three (3) nos DCP type dry power portable fire extinguishers of minimum capacity 5 kg shall be provided. Standard of Fire Extinguisher BIS 2171 (with latest amendments).

5.9.27 TOOLS, TACKLES AND SPARES

The Installer shall keep ready stock of tools, tackles and essential spares that will be needed for the day-to-day maintenance of the solar PV system. This shall include but not be limited to the following:

i. Screw driver suitable for the junction boxes and combiner boxes.

ii. Screw driver and / or Allen key suitable for the connectors, power distribution blocks, Circuit breaker terminals and surge arrestor terminals.

iii. Spanners / box spanners suitable for the removal of solar PV modules from the solar PV module support structure.

iv. Solar panel mounting clamps.

v. Cleaning tools for the cleaning of the solar PV modules.

vi. Spare fuses.

vii. Panel efficiency measurement tools

viii. One 20HP flattered Boat

5.9.28 OTHER CONDITIONS

The work includes necessary excavation, concreting, flooring, platform, necessary finishing, painting, back filling, shoring & shuttering, cable laying, location of installation of different component of PV Power Plant etc. if any , required for completion of the project in all respect shall be as per direction of Engineer-in-Charge.

5.9.29 SPECIFICATION OF 36kV OUT DOOR VCB

5.9.30.5.1 SCOPE

This specification covers design, manufacture, assembly, testing at manufacturer's works of Vacuum Circuit Breaker of 36 KV class (Outdoor) as detailed in the enclosed Schedule, complete with accessories required for efficient and trouble free operations.

The circuit breakers offered shall be as per specific technical parameters and suitable for outdoor installation.

The circuit breakers are required complete with structures, operating mechanism, all associated accessories and auxiliaries.

5.9.30.5.2 STANDARDS

The equipment to be furnished under this specification, shall unless and otherwise stated, be designed constructed and tested in accordance with the latest revisions of Indian Standards as follows :

IS-13118 - General requirements for circuit breakers for voltages above 1000 V

IS-9135 - Guide for testing of Circuit Breaker

IS-2099 - Bushings

IEC - 62271-100

IEC - 60694

IEC - 56

5.9.30.5.3 GENERAL INFORMATION

The circuit breakers of 36 KV Class shall be outdoor type vacuum circuit breaker

The equipment covered by this specification shall be complete in all respects. Any material or accessory which may not have been specifically mentioned but which is usual or necessary for satisfactory and trouble-free operation shall be within the scope of supply without any extra charge to the WBPDCL.

Two nos. trip coils shall be provided for circuit breaker for 36 KV (each pole operated individually). The support structure of Circuit Breaker as well as control cabinet shall be hot dip galvanized. All other parts shall be painted as per Specification.

5.9.30.5.4 DESIGN CRITERIA

a) The Circuit Breakers shall be used in neutral solidly ground system with symmetrical fault level of 25 KA for 3 sec at system voltage of 33KV. Earthing of 33KV system for 220/33KV transformer is under bidder scope of design as per system requirement.

b) All controls shall be suitable for 85% to 110% for closing and 70% to 110% for tripping of 220 Volts (±10%) D.C supply voltage for 33 KV & above. The A.C. supply shall be available at 400 V (±10%), 50 c/s, 3 phase 4 wire system or 230 V (±10%), 50 c/s, 1-ph 2-wire system.

c) Radio interference voltage shall not exceed 1000 micro volt when the equipment will be operated at maximum service voltage for circuit breakers rated 132KV and above.

d) The maximum temperature attained by any part of the equipment at specified rating should not exceed the permissible limits as stipulated in relevant standards. Equipment shall be designed taking 50°C as maximum ambient temperature.

e) The minimum safe clearance of all live parts of the equipment shall be as per relevant standards and electricity rules. Clearance of Phase to Phase low level pipe bus are as follows :

f) 33 KV : Phase to Phase (mm) 1500

g) In case of gang operated breaker of 36 KV class, the minimum clearance between poles shall not be less than 430 mm respectively and shall withstand the impulse/power frequency level as specified in our technical parameters.

h) Provision of electrical interlocks for safe and satisfactory operation of the Breaker shall be furnished. The interlocking device shall be of proven quality.

i) The breaker shall be able to function even under conditions of phase opposition that may arise due to faulty synchronisation or otherwise as per relevant IS standard or IEC Standard.

j) Breaker shall be capable of interrupting line/cable charging current as per IEC without any restriking and without use of opening resistors.

k) The breaker shall be capable of interrupting rated breaking current with recovery voltage equal to maximum line service voltage and at all indicative power factor of the circuit equal to or exceeding 0.15.

l) Breaker shall be capable of clearing short line fault without excessive rise of restriking voltage.

m) The breaker shall be suitable for interrupting low inductive currents (0.5A to 10A) as well as capacitance, without undue over voltage.

n) The Bidder may indicate in his offer the methods adopted for limiting over voltages.

o) The circuit breaker of 36KV rating shall be capable to withstand power frequency over voltage as per value specified in IEC 62271-100 or relevant IS.

p) Operating duty of all circuit breakers from voltage range 36 KV shall be as follows :

O-0.3 sec-CO-3.0 min-CO

q) The Circuit Breaker shall be re-strike free as per IEC under all duty conditions and shall be capable of performing their duties without opening resistors.

r) The Circuit Breaker shall meet the duty requirement of any type of fault or fault location also for switching when used on 33KV ungrounded system as well as non-effectively grounded but with NGR (if applicable) for

220/33KV substation and perform make and break operation as per duty cycles specified in above clause.

s) The breaker shall be capable of interrupting steady state and transient magnetizing current corresponding of power transformers.

t) If specifically mentioned in BOQ, Circuit breaker shall be provided with Control Switching device as per relevant standard.

5.9.30.5.5 CONSTRUCTIONS

Each 36KV VCB shall comprise of three identical poles linked together electro-mechanically for simultaneous operation of pole units.

Operation counter should be provided to monitor the no. of operations.

MAIN CONTACTS AND ARC QUENCHING CHAMBER:

The tips of the main contacts shall be of suitable design and adequately silver plated to withstand arcing.

5.9.30.5.5.1 OPERATING MECHANISM:

i. The operating mechanism shall be electrically controlled spring / spring operated for 36 KV class breakers. The mechanism shall have anti-pumping and trip free circuitry. The anti-pumping arrangement shall be initiated through Normally open (NO) type auxiliary contact of circuit breaker and shall be of 'self-hold' type. Type of such mechanism shall be mentioned. Local arrangement for operating the breakers both electrically and mechanically shall be provided in addition to remote electrical operation.

ii. There shall be mechanical ON/OFF indicator and number of operation counter for each pole of breaker in case of single pole operation and one mechanical ON/OFF indicator and provision for operation counter for 3 pole gang operated breaker.

iii. All three poles of circuit breaker shall operate simultaneously. Pole discrepancy feature shall be provided to trip the breaker if all the poles do not close/open simultaneously in case of single pole operation. For mechanically gang operated breaker pole discrepancy feature need not be provided.

iv. The operating mechanism box shall be fixed at a suitable man working height from ground level. View glass shall be provided on hinged door at the

front. Hinged door shall be properly earthed with main body through copper flexible braided conductor. In case operating mechanism box shall not be placed at a suitable man working height, platform is to be arranged /supplied for each such breaker by the contractor. Suitable arrangement at site has to be made near each breaker to climb on the platform and work comfortably.

v. Suitable arrangement shall have to be made for easy accessibility to the operating mechanism box. All necessary arrangements are within the scope of bidder.

vi. Indication for spring charged condition shall be provided for breaker with spring charging mechanism. The spring charging mechanism shall be motor operated. After failure of power supply to the motor, one CO operation shall be possible with the energy stored in the operating mechanism.

5.9.30.5.5.2 SPRING OPERATED MECHANISM:

i. Spring operating mechanism shall be complete with motor. Opening spring and closing springs with limit switch for automatic charging and other necessary accessories to make the mechanism a complete operating unit shall also to be provided.

ii. As long as power is available to the motor, a continuous sequence of closing and opening operations shall be possible. The motor shall have adequate thermal rating for this duty.

iii. Breaker operation shall be independent of the motor, which shall be used solely for compressing the closing spring. Facility for manual charging of the closing spring shall also be provided.

iv. Closing action of circuit breaker shall compress the opening spring ready for tripping.

v. When closing springs are discharged after closing a breaker, closing spring, shall be automatically charged for the next operation and an indication of this shall be provided in the local and remote control cabinet.

vi. Provisions shall be kept to prevent a closing operation of the breaker when spring is in partially charged condition. Mechanical interlocks

shall be provided in the operating mechanism to prevent discharging of closing springs when the breaker is already in closed position.

vii. The spring operating mechanism shall have adequate energy stored in the operating spring to close and latch the circuit breaker against the rated making current and also to provide the required energy for the tripping mechanism in case of tripping energy is derived from the operating mechanism.

5.9.30.5.5.3 COMMON CONTROL CUBICLE / MARSHALLING BOX:

A free standing outdoor type weather proof common marshalling box/cubicle shall be provided to house different accessories except those which must be located in the pole unit operating box. Rubberized gaskets of durable quality shall be provided to make it water proof, dust and vermin proof. Degree of protection shall be IP-55 as per IS:13947

This outdoor cubicle shall be of 3.00 mm thick steel sheet and shall have hinged doors at front and rear for access to the mechanism. Doors should be of proper design & adequate MS sheet thickness and providing adequate stiffener, for smooth opening and closing. There shall be arrangement for padlocking, individual door panel should be connected with the main panel body by flexible braided copper conductor for earthing purpose at two points.

A removable gland-plate, 3.00 mm thick shall be provided at the bottom of the cubicle for cable entry. Gland sizes shall be suitable for entry of adequate number of multicore cables separately for AC & DC as per approved scheme.

Terminal blocks for AC & DC shall be kept isolated. Terminals shall be suitable for at least three nos. 2.5 mm sq. copper leads. All control wiring shall be of 1100 Volt grade 2.5 mm sq. copper PVC insulated cables.

Thermostat controlled heaters shall be provided to prevent condensation within the cubicle /switchgear. Cubicle illumination lamps with switch shall be provided.

A 230 Volt combined 5A/15A three pin socket with neutral earthing and a control switch shall be provided inside the box.

Suitable arrangement i.e. platform shall be provided with support structure for easy access to the operating mechanism box for personnel of average

height. View glass shall be provided on hinged door for reading pressure gauge, ON-OFF indication mounted inside the cubicle.

Spring charged mechanism shall be placed within the operating mechanism box / marshalling box and contacts shall be provided for spring charged indication.

All controls, alarms, indications and interlocking devices furnished with breaker shall be wired up to the terminal block in common operating box / marshalling box. Not more than two wires shall be connected to one terminal. All spare contacts available in the pressure switches etc shall be wired upto terminal block.

All wires shall be identified at both ends with ferrule marking in accordance with approved wiring diagram.

The terminal blocks shall be of 1100 V grade and have continuous rating to carry the maximum expected currents on the terminals. Insulating barriers shall be provided between the terminals. The terminal block shall have locking arrangement to prevent its escape from the rails. The terminal blocks to be provided shall be fully enclosed with removable covers and made of moulded, non-inflammable plastic material. All terminals shall be clearly marked with identification numbers or letters to facilitate connection to external wiring. At least 20% spare terminals shall be provided.

5.9.30.5.5.4 INSULATORS:

The porcelain to be used in bushing shall be homogeneous, free from laminations, cavities and other flaws which may impair its mechanical and/or dielectric strength and shall be glossy, tough and impervious to moisture.

The bushings shall have adequate mechanical strength and rigidity for conditions under which they will be used.

Bushing insulation shall be coordinated with that of Circuit Breaker. The puncture strength of the bushings shall be greater than the dry flashover value.

When operating at rated voltage and under operation in heavily polluted area, there shall not be any electrical discharge between bushing terminal

and earth. No radio disturbance shall be caused by the bushings when operating up to the maximum system voltage. It shall also be free from corona.

All iron parts shall be hot dip galvanised.

All bushings of identical rating shall be interchangeable. Each bushing shall be provided with :

Terminal connector suitable for connection to either 'ACSR' Conductor / Aluminium pipe shall be provided as per requirement. Particulars of 'ACSR' Conductor / Aluminium pipe to be connected with terminal of different voltage classes are specified under Specific Technical Parameters.

All terminal connectors required for circuit breaker shall be guided by technical specification for Clamps and Connectors. Relevant drawings are to be submitted for approval before supply.

5.9.30.5.5.5 AUXILIARY CONTACTS:

The breaker shall be provided with 6 NO + 6 NC for 36KV CBs as spare auxiliary / multiplied contacts in addition to the auxiliary contacts required for breaker's own operational requirements.

The auxiliary / multiplied contacts shall have continuous current rating of at least 10 A. The breaking capacity shall be adequate for the circuits controlled, and at least 2 A at 220 V DC for inductive circuit with time constant of minimum 20 ms.

All auxiliary / multiplied contacts shall be wired up to terminal block in the control cubicle.

Auxiliary/multiplied contacts shall be suitably protected against arcing. Insulating materials of the base of the contacts shall be moulded plastic or other non-breaking, non-inflammable insulating material.

5.9.30.5.5.6 GROUNDING

Circuit Breaker shall be provided with two grounding terminals suitable for connecting G.S. Flat of 50×10mm (min) for all voltage classes per pole each with tapped holes. Necessary stainless steel bolts and washers, spring washers are to be supplied for connection to grounding strip, size of which shall be as per requirement.

5.9.30.5.5.7 PAINTING

All steel surfaces shall be cleaned by sand blasting or chemical process as required to produce a smooth surface, free of scale, grease and rust. Steel surface in contact with insulating oil shall be painted with heat resistant oil insoluble insulating varnish. External surfaces shall be given a coat of high quality red or yellow chromate primer and finished with gray colour (IS:631) with two coats of synthetic enamel paints. Paints shall be carefully selected to withstand tropical heat, rain etc. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling. Sufficient quantity of touch up paint shall be furnished by application at site.

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5.9.30.5.5.8 EQUIPMENT FOUNDATION AND SUPPORT STRUCTURE

Refer Technical Specification of Civil.

5.9.30.5.5.9 36 KV VACUUM CIRCUIT BREAKER:

Each vacuum Circuit breaker shall comprise of three identical poles linked together electrically and mechanically for synchronous operation.

5.9.30.5.5.10 VACUUM INTERRUPTER AND CONSTRUCTIONAL FEATURE

The vacuum interrupter, consisting of fixed contact and moving contact, shall be interchangeable among the same type interrupter. Short circuit capacity of vacuum bottle should be 25 KA and design life should be 100 nos. operation at rated short circuit level.

Constructional features of the vacuum chamber along with its functional arrangements are to be shown in a drawing submitted along with tender documents.

The gap between contacts of the Circuit Breaker inside interrupter should be capable of withstanding 1.5 time voltage to neutral at one atmospheric pressure at normal ambient condition within Breaker in the event of vacuum pressure drop due to leakage.

The circuit breakers and their components shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit current of the system without any damage or deterioration of material.

The circuit breakers shall have motor wound spring charged trip free mechanism with anti-pumping feature, and shunt trip. In addition, facility for manual charging of spring, shall be provided.

Each breaker shall be provided with manual close & open facility, mechanical ON-OFF indication, an operation counter and mechanism charge/discharge indicator.

For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open-close-open operation of the circuit breaker shall be possible after failure of power supply to the motor. A visual mechanical indicating device will also be provided to show the position of the spring.

36KV VCB, with duty cycle O- .3sec CO-3min CO, Class- C2-M2 as per relevant IEC, 1250A, 25KA for 3 sec, 70kvrms/170kvp, 3-Phase, Outdoor VCB with 2TC & 1CC, 220V DC.

The offered VCB shall be well proven in NTPC. Offered bottle shall be identical with Type tested one. Brochures/leaflet on technical data sheet for vacuum bottle shall also to be submitted.

The VCB shall be complete with structure, operating mechanism in a common Control cubicle with degree of protection IPW-55, situated at accessible man height, along with all associated accessories and auxiliaries and terminal connector as per specification and approved drawing during detailed engineering. The supply shall include 2 Set of complete bottle. (1 set comprises of one complete VCB i.e. inclusive of 3 poles).

The bidder shall submit detailed as well as complete Type test reports as stipulated in relevant IS and IEC with complete identification, date and serial no. of circuit breakers of identical design with identical bottle from CPRI, NABL accredited/a Government recognized test house or laboratory during detailed engineering.

Make & Type of VCB & Vacuum Interrupter with detailed literature shall be furnished along with bid.

5.9.30.5.6 TEST

A. Routine Test

During manufacture and on completion, all equipment, clamps, connectors and accessories shall be subjected to the Routine Tests as laid down in latest revision of IEC/IS.

In addition to above tests specified by IEC/IS, the following tests also have to be carried out for specific equipments :

The speed curves for 220 KV circuit breaker shall with the help of a suitable operation analyser to determine the breaker contact movement during opening, closing, auto-reclosing and trip-free operation under normal as well as limiting operating conditions (Control Voltage etc.)

B. Type Test

Type tests on circuit breaker, disconnecting switch, CT & LA shall carried out as stipulated in relevant IEC/Indian Standards.
Following additional type tests are to be conducted for 220 KV circuit breaker:

i) Out of phase closing test as per IEC-267 & IEC-62271-100.

ii) Line charging breaking current test. The breaker shall be able to interrupt the line charging current with a test voltage of 1.4p.u. instead of 1.2 p.u. as per IEC-62271-10

5.9.30.5.7 MANDATORY SPARE PARTS

Sl No.	33KV Breaker	Spare quantity
(i)	Closing Coil with resistor	3 Nos.
(ii)	Tripping Coil with resistor	6 Nos.
(iii)	Braker Auxiliary Contact	2Sets
(iv)	Set of O-ring	3Sets

5.9.30.5.8 AVAILABILITY OF SPARE

The successful bidder shall submit manufacturer's undertaking during submission of drawings of Circuit Breaker that the spares for the supplied breaker (for all voltage classes and all makers) shall be available for at least ten years from the date of placement of LOA. All the participating bidders shall have to confirm in writing submission that the above mentioned undertaking from the manufacturer shall be submitted in case they receive order.

5.9.30.5.9 FURNISHING DETAIL GTP FOR 36 KV VACUUM CIRCUIT BREAKERS) during approval

Sl. No.	Description	Particulars
1.	Conforming Standard	:
2.	Service (Outdoor/Indoor)	:
3.	Frequency	:
4.	Rated operating duty	:
5.	Rated (TRV) for terminal fault	:
6.	Short time Fault breaking capacity MVA	:
7.	Line charging current breaking capacity	:
	a) line charging current AMP	:
	b) Corresponding Over voltage (KV)	:
	c) Whether Switching Resistor is provided	:
	i) Value of Resistor	:
	ii) Time of insertion	:
	iii) Thermal Rating of Resistor	:
8.	Maximum shunt capacitor bank switching/breaking capacity in MVA and the over voltage factor.	:
9.	Maximum over voltage in Kilovolts on switching OFF Transformer on low load.	:
10.	i) Breaks per pole (No)	:
	ii) Length of each break per pole (mm)	
	iii) Length of moving contact travel mm	
	iv) Rate of contact travel (m/sec)	
11.	Make time (ms)	:
12.	Minimum reclosing time at rated interrupting Capacity from the instant of the trip coil energisation (ms)	:
13.	Minimum dead time for 1 phase & 3 phase reclosing With corresponding limits of adjustment of dead time, If any.	:
14.	Maximum radio interference voltage between 0.5 MHz to 2 MHz with Voltage of 110% of rated rms voltage between phase & ground (Micro-Volt)	:
15.	Details of manually/motor operated spring charging mechanism.	:
16.	i)Voltage and Power requirement for a) closing coil b) Tripping coil ii) No of Tripping Coil	:
17	Vacuum Bottle	
17 a)	Make, Country, Type & Designation of Vacuum Bottle used in VCB.	:
17 b)	Number of operation at full short ckt level,	:
17 c)	no. of operation at rated current and other details	:
17 d)	Whether Literature & Catalogue of offered Vacuum Bottle containing the specific particulars enclosed?	:
18.	Weight of Vacuum Circuit Breaker	:

Sl. No.	Description	Particulars
19.	No. of auxiliary contacts (Spring Charging LS) number of NO and NC shall be mentioned. No. of auxiliary spare contacts	:
20.	Power frequency withstand capability of breaker in open condition at :	:
	i) Atmospheric Pressure of Air/Zero Vacuum Pressure	:
21.	Actual opening time (from Trip Coil energisation to contact separation) (ms)	:
22.	Allowable time limit between breaker per pole (for multibreak type) and between poles (ms)	:
23.	Actual closing time (from Closing Coil energisation to contact touching (ms)	:
24.	Whether type tests report submitted in line with specification for similar breaker with offered vacuum Interrupter?	:
25.	Whether a) Dimensional GA Drawing Cross Sectional b)Drawing of interrupting Chamber and c)scheme diagram are furnished.	: a) b) c)
26.	Whether brochure/ leaflet on Technical data for Vacuum bottle enclosed?	

NOTE:
Any item/equipment not mentioned in the Technical Specification, but required for successful completion of the project shall be deemed to be a part of the scope of the work and the same shall be included by the bidder in their Billing Break Up (BBU).

D. APPROVED VENDOR LIST FOR BOIs:

Equipment	List of Vendor for various BOIs
SOLAR PANELS	Any Solar PV Manufacturer in India having MNRE Certification
INVERTERS	ABB/ HITACHI/SMA/ DELTA
TRANSFORMER	SUDHIR/VOLTAMP/BHEL/AREVA
POWER CABLES	KEI/ FINOLEX /POLYCAB /APAR
CONTROL CABLES	KEI / DELTON/ FINOLEX /POLYCAB /APAR
LT SWITCHGEAR	L&T / SIEMENS / SCHNEIDER/ABB

Equipment	List of Vendor for various BOIs
STEEL MEMBERS	TATA / VIZA STEEL/SAIL (GI coating done) or any equivalent ISI Mark
EARTHING/ LIGHTNING	CG Power/ELPRO INT. LTD/OBLUM
WEATHER MONITORING STATION	KIPP & ZONNEN / EPPLEY / EKO INSTRUMENTS /SOLAR L /GREEN POWER Monitoring
LT POWER PANEL	L&T / SIEMENS / SCHNEIDER/GE POWER
JUNCTION BOX	L&T / PYROTECH / SCHNEIDER
ENERGY METER	SECURE METERS/IMP/BHEL/RISHABH(L&T)
SCADA System	ABB / GE / ROCKWELL
33 kV INDOOR SWITCHGEAR	BHEL BHOPAL
UPS	EMERSON / HITACHI-HIREL / MERLINEGERINE /AEG (SAFT)
BATTERY (Ni-Cd)	HBL POWER SYSTEM
INDUSTRIAL PC ALONGWITH CRT (EWS/ OWS/ SERVER/ HISTORIAN)	DELL / HP (Pavilion)
Printer	HP
ETHERNET SWITCH	CISCO /MOXA
CONTROL PANEL/ LOCAL PANEL	PYROTECH / RITTAL / SCHEINDER / CONTROL & SWITCHGEAR / CONTROL DEVICE / SWITCHING CIRCUIT
OPTICAL FIBRE CABLE	TYCO / MOLEX / BIRLA ERICSSION / HFCL
220 V DC Battery Charger	Exide Battery
Battery Charger	Chloride
36 kV Outdoor VCB	SIEMENS LTD. / ABB INDIA LTD. / SCHNEIDER ELECTRIC / TOSHIBA T&D SYSTEMS (INDIA) / CG POWER & INDUSTRIAL SOLUTION LTD. (FORMERLY KNOWN AS CROMPTON GREAVES LTD.)

Equipment	List of Vendor for various BOIs
CCTV camera	BOSCH/PELCO/HONEYWELL

E. LIST OF MANDATORY SPARES

Sl. No.	Equipment/Package Name	Quantity
1.00.00	**Inverter Transformer (33/0.38 kV)**	
1.01.00	Bushing	
(i)	HV Bushing with metal parts, connectors and gaskets	1No.
(ii)	LV bushing with metal parts, connectors and gaskets	1No.
(iii)	Neutral bushing with metal parts, connectors and gaskets	1No.
(iv)	CT at Transformer each type and rating	1No.
1.02.00	33 kV Surge Arrestor complete with insulating base and surge monitor	1Set.
1.03.00	**33KVSwitchyard**	
1.03.01	33KV Breaker	
(i)	Closing Coil with resistor	6Nos.
(ii)	Tripping Coil with resistor	12Nos.
(iii)	Breaker Auxiliary Contact	2Sets
(iv)	Set of O-ring	3Sets
(v)	Set of Seals	3Sets
1.03.02	33 kV Isolator	
(i)	Complete set of motor operating mechanism box with all accessories including motor.	1Set for each type and rating
(ii)	Limit Switch	3 sets for each type and rating
(iii)	Copper contact fingers for female & male contacts	3Sets for each type and rating
(iv)	Drive Motor with gear	1No for each type and rating
1.03.03	33 kV CT	1No.for each type, rating & application
1.03.04	33 KV Switch yard Protection and Substation Automation System	
(i)	Numerical Relays	1 No of each make, type & range & rating.
1.04.00	**33 kV SWITCHGEAR**	
1.04.01	Pole of breaker of each type & rating	1 set (1set is complete for 3 phases)
1.04.02	Spring charging motor complete	2 nos of each type
1.04.03	Trip coil	10 nos of each type
1.04.04	Closing Coil	05 nos of each type

Sl. No.	Equipment/Package Name	Quantity
1.04.05	Current transformer	1 nos of each type and ratio
1.04.06	Fuse for Potential transformer of each type & ratio	3 no of each type
1.04.07	Relays	2 no of each type
1.04.08	Limit switches of each type	5 nos.
1.04.09	Operating mechanism rod for each rating	2 nos
1.04.10	Ammeter of each type & range	1 no of each type & range
1.04.11	Voltmeter of each type & range	1 no of each type &range
1.04.12	Indicating lamps	5 nos. each type
1.05.00	**Inverter**	
1.05.01	Control Unit	2 nos. Each Type and Rating and make.
1.05.02	Protection Switch	Do
1.05.03	Control Panel	Do
1.05.04	AC Fuse	Do
1.05.05	Fuse link	Do
1.05.06	I/O module	Do
1.05.07	AC Breaker	Do
1.05.08	AC and DC Contactor	Do
1.05.09	ARRESTER	Do
1.05.10	FAN	Do
1.05.11	SPD	Do
1.06.00	PV Module	Do
1.06.01	PV Module	100 nos each type and rating.
1.07.00	**Floater**	
1.07.01	Complete set of floaters with all accessories	100 Nos. each type and size
1.08.00	MC4 connector	250 pairs. each type and size
1.09.00	Lugs	10 Nos. each type and size
1.10.00	**AC and DC cable**	
1.10.01	DC cable	1000 meter each type and ratings
1.10.02	AC cable	500 meter LT cable each type and ratings

Bidder shall arrange and supply all the items during execution of the project to their site store and under Bidder's custody. Finally, all the above items shall be handed over to WBPDCL store after completions of defect liability period i.e. end of the O&M contract.

SECTION – VI
FORMS

Sl No	Form Name	Form No
01.	Check List	Form-1
02.	Forwarding Letter for submission of Bid Security and Tender Fee	Form -2
03.	Bid Form	Form-3
04.	Bid security (Bank Guarantee format)	Form- 4
05.	Summary Statement Of Yearly Turnover And Net Worth	Form-5
06.	Capability status	Form-6
07.	Statement of similar type of order orders executed as on date of issuance of the NIT	Form-7
08.	Curriculum Vitae Of Key Personnel	Form-8
09.	Format For Submission Of Pre-Bid Queries	Form- 9
10	Proposed modifications	Form-10
11	Joint Venture/Consortium Agreement	Form-11
12	Power of Attorney	Form-12
13	Declaration for Net Minimum Guaranteed Generation	Form-13

FORM-1: CHECK LIST: FORM

Sl. No.	Scanned Copy of Documents to be uploaded	Name of folder	To be submitted in cover	Submitted (Y/N)	If Y the File name
1.	Tender Fee **(Scanned copy)**	Drafts	Statutory Cover (Technical proposal)		
2.	Bid Security **(Scanned copy)**	Drafts	Statutory Cover (Technical proposal)		
3.	Check List **(Form – 1)**	Forms	Statutory Cover (Technical proposal)		
4.	Forwarding Letter for submission of Bid Security and Tender Fee **(Form – 2)** (**Scanned copy)**	Forms	Statutory Cover (Technical proposal)		
5.	Bid Form/Undertaking **(Form – 3)**	Forms	Statutory Cover (Technical proposal)		
6.	Summary statement of yearly turnover and net worth **(Form 5)**	Forms	Statutory Cover (Technical proposal)		
7.	Capability Status **(Form 6)**	Forms	Statutory Cover (Technical proposal)		
8.	Statement of similar type of order orders executed as on date of issuance of the NIT **(Form 7)**	Forms	Statutory cover (Technical proposal)		
9.	Curriculum Vitae of Key Personnel **(Form 8)**	Forms	Statutory Cover (Technical proposal)		
10.	Net Minimum Generation Guarantee **(Form 13)**	Forms	Statutory Cover (Technical proposal)		
11.	Copy of the CST / VAT / TIN Certificate	Certificates	Non-Statutory cover (Technical proposal)		
12.	Copy of the Service Tax Registration Certificate	Certificates	Non-Statutory cover (Technical proposal)		
13.	Copy of the PAN certificate/ PAN Card	Certificates	Non-Statutory cover (Technical proposal)		
14.	Declaration of PF Registration Number **or** Proof of PF Registration	Certificates	Non-Statutory cover (Technical proposal)		

Sl. No.	Scanned Copy of Documents to be uploaded	Name of folder	To be submitted in cover	Submitted (Y/N)	If Y the File name
15.	MNRE Chanel partner certificate under *"Grid Connected Ground Mounted and Small Solar Power Plants Programme"* / Website Download copy from MNRE	Certificates	Non-Statutory cover (Technical proposal)		
16.	Copy of the Registration Certificate under Company Act (Company Incorporation Certificate) o**r** copy of the Registered Deed for Partnership Firm	Company Details	Non-Statutory cover (Technical proposal)		
17.	Copy of the Order(s)/ Contract Agreement(s) with the Purchaser / any other Proof of Purchase, as primary agency **AND** Corresponding Copy of the Completion Certificate(s) /Commissioning report signed by the Purchaser / Ordering Authority to substantiate the proof of completion of the Solar PV Power Plant(s). **(As per declaration in Form-6)**	Credential (Technical)	Non-Statutory cover (Technical proposal)		
18.	Copy of the Audited Balance Sheet and Statement of Profit and Loss Account / Tax Audit report as per NIT	(Financial)	Non-Statutory cover (Technical proposal)		
19.	Copy Income Tax return Acknowledgement for assessment years as per NIT	(Financial)	Non-Statutory cover (Technical proposal)		
	Finance Proposal				
20.	BOQ (Financial proposal)	Bill of Quantities (BOQ)	Financial Proposal		
21.	Mode Of Transaction Statement Of Materials and Equipments	Mode of Transaction	Financial Proposal		

Date : (Printed Name).....

Place : (Designation).....

Signed and Upload

FORM-2: FORWARDING LETTER FOR BID SECURITY AND TENDER FEE

Date:
Bidder's Name and address

To
The Deputy General Manager-IC(M&C)
The West Bengal Power development Corporation Limited
Bidyut Unnauan Bhaban,
Plot No. 3/C LA-Block,
Sector-III, Bidhannagar,
Kolkata-700 106

Subject : Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10 MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1,2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance.

Reference : NIT No:

Dear Sir,
We are enclosing the following:

1. Account payee Demand draft / Bankers Cheque (No. ……[insert No.]……. dated ……. [insert date]……. drawn on ……..[insert name of the bank on which drawn]……. for …….. [insert amount in Rs. and words]……., drawn in favor of"**The West Bengal Power Development Corporation Ltd (WBPDCL)**." payable at Kolkata **towards Tender Fee.**

2. Account payee Demand draft / Bankers Cheque (No. ……[insert No.]……. dated ……. [insert date]……. drawn on ……..[insert name of the bank on which drawn]……. for …..[insert amount in Rs. and words]……., drawn in favor of"WBPDCL" payable at Kolkata **towards Earnest Money (Bid Security) Deposit.**

Or

Bank Guarantee in the prescribed proforma from a scheduled commercial bank in India in favour of WBPDCL for Rs. ……[Insert value]……/-valid for a period of one hundred and eighty days (180) days from the bid opening date with a further claim period of thirty (30) days.
[*Strike out whichever is not applicable*].

Enclosures:

1. …… (Tender fee : DD / BC in original)
2. …… (Bid security : DD / BC / BG in original)
3. ……

Thanking You,

……
(Signature of authorized signatory)
Name: ……

Designation: .....
Date: .....
Place: .....

FORM-3: BID FORM/UNDERTAKING

(To be executed on non-Judicial stamp paper of requisite value)

(For genuineness of the information furnished on-line and authenticity of the documents produced before Tender Committee for verification in support of his eligibility)

Reference : NIT No:

I, the undersigned, being the authorized signatory of .....(Name of the Bidder), having read and examined in detail the NIT including minimum eligibility criteria in particular, instruction to Bidders, general terms & conditions, special terms & conditions and specification, do hereby submitting our offer to execute the contract as per terms & conditions as said forth in your Tender document.

1. We are submitting Tender for the Work _____against Tender NIT. No. _____

2. We confirm having submitted the eligible criteria as required by you in your Tender Document along with this proposal. In case you require any further information or clarification in this regard, we agree to furnish the same in time.

3. We have submitted the requisite amount of "Tender Fee" of **Rs.XXXXX (Rupees XXXX)** only in form of (DD/BC) on .....(Bank name) DD/BC no: ..... Dtd:..... Payable at Kolkata

4. We have submitted the requisite amount of Earnest Money (Bid Security) of **.....(Bid Security Amount)..... (Rupees. In Word.....)** only in form of ..... (DD/BC/BG). Detailed as follows :

Mode of Financial Instrument (DD/DC/BG)	Details (No., Name of the Bank etc.)

5. We hereby furnish the following:

1.	Company / Partnership/LLP regeneration	

	i)Registration No: ii) Place of registration:	
2.	i) Central Sales Tax Regn. No: ii)VAT Regn. No:	
3.	Excise Regn. No	
4.	Service Tax Regn. No	
5.	PAN No	
6.	PF A/C No	
7.	Channel partner Certificate No of MNRE Government of India under **"Grid Connected Ground Mounted and Small Solar Power Plants Programme".**	

6. Our contact details related to this tender are as follows:

Information	**Local office (In West Bengal)**	**Head office**
Name of the Contact Person		
Designation		
Telephone No		
Fax No		
Mobile No		
Email Address		

7. We confirm that our bid in response to the NIT is consistent with all the requirements of submission as stated in the Tender Document and subsequent communications from WBPDCL.

8. We confirm none of the Partners of our firm is relative of employee of West Bengal State Electricity Distribution Company Limited (WBPDCL).

9. All information furnished by us in respect of fulfillment of eligibility criteria and qualification information of this Tender is complete, correct and true.

10. All documents/ credentials submitted along with this Tender are genuine, authentic, true and valid.

11. If any information and document submitted is found to be false/ incorrect any time, department may cancel my Tender and action as deemed fit may be taken against us, including termination of the contract, forfeiture of all dues including Earnest Money and banning / delisting of our firm and all partners of the firm etc.

12. Should this Bid be accepted, I/We* also agree to abide by and fulfill all the terms

and conditions of provisions of the above mentioned Bidding Documents.

13. We have neither made any statement nor provided any information in this Bid, which to the best of our knowledge is materially inaccurate or misleading. Further, all the confirmations, declarations and representations made in our Bid are true and accurate.

14. We declare that the submitted our offer is without any deviations and are strictly in conformity with the documents issued by WBPDCL.

15. We declare that content of the Tender Document including NIT, ITB, BDS ,GCC, SCC, Technical Specification and subsequent corrigendum, addendum, if any, are acceptable to us and we have not taken any deviation in this regard. This is to expressly certify that our offer contains **no deviation** either in direct or indirect form.

16. We also declare that in case any deviations are noticed which might have crept inadvertently, that such deviations without reservation of any kind are automatically deemed to have been withdrawn by us.

17. If you accept our offer, we agree to complete the entire work in accordance with work completion time given in the Tender document. We fully understand that the work completion time stipulated in is the essence of the contract, if awarded.

18. We offer to execute the work in accordance with the conditions of the NIT document as available in the website.

19. This Bid and your subsequent Letter of Acceptance / Work Order /agreement shall constitute a binding contract between us.

20. We hereby confirm our acceptance of all terms and conditions of the NIT document unconditionally.

21. We also declare that, we have never been blacklisted and / or there were no debarring actions against us as on date due to any reason what-so-ever, by any Government or Government Agencies. In the event of any such information pertaining to the aforesaid matter found at any point of time either during the course of the contract or at the bidding stage, our bid/contract will be liable for truncation / cancellation / termination without any notice at the sole discretion of WBPDCL.

Date : (Printed Name).....

Place : (Designation).....

Signed and Upload

FORM-4: BID SECURITY

FORM FOR BID SECURITY

BANK GUARANTEE FORMAT FOR EMD/ BID SECURITY

(To be stamped in accordance with Stamp Act, if any, of the Country of the issuing Bank)
Bank Guarantee No.: _____
Date: _____

To,
The GM(M&C)
The West Bengal Power Development Corporation Limited
Bidyut Unnayan Bhaban, Block– LA, Plot No. 3/C, Sector–III,
Salt Lake City, Kolkata– 700106, West Bengal, India.

Dear Sir,
In accordance with your NIT No. _____M/s XXX (Name of Participating Contractor) having its Registered Head Office at _____ (hereinafter called the Bidder) wish to participate in the said RFP/NIT for _____ (Name of Job).

As an irrevocable Bank Guarantee against Bid Security for an amount of ____ is required to be submitted by the Bidder as a condition precedent for participation in the said Tender, which amount is liable to be forfeited on the happening of any contingencies mentioned in the Tender Document, we, the _____ Bank at _____ having our Head Office / Registered Office at _____ (Address of Bank) guarantee and undertake to pay immediately on demand by the West Bengal Power Development Corporation Limited the amount of _____ (in words and figures) without any reservation, protest, demur and recourse. Any such demand made by said Procuring Entity shall be conclusive and binding on us irrespective of any dispute of difference raised by the Bidder.

This Guarantee shall be irrevocable and shall remain valid up to *Date*_____ (six months from the Closing date of submission of bid) with a claim period of another 3(three) months. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instructions from M/s XXX (Participating Bidder) on whose behalf this Guarantee is issued.

All rights of the West Bengal Power Development Corporation Limited under this Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities there under unless the WBPDCL brings any suit or action to enforce a claim under this Guarantee against the Bank within ninety (90) calendar days from the above mentioned expiry date of validity or, from that of the extended date.
In witness whereof the Bank, through its authorised Officer, has set its hand and stamp on this _____ day of _____ Year ..... at _____.
WITNESS:

_____
(Signature and Name) (Signature and Name)

_____ _____
(Engineer / Officer address) (Designation with Bank Stamp)
Attorney as per Power of Attorney No. _____
Date:

FORM-5: SUMMARY STATEMENT OF YEARLY TURNOVER AND NET WORTH

NIT No:

Bidder's Name & Address:

This is to certify that the following statement is the summary of the Audited /Tax audited Accounts of our Company/firm (The Bidder) arrived for the three consecutive years or for such period since inception of the Firm, if it was set in less than such three year's period as follows:

Sl. No.	**Financial**		**Remarks**
	Year	**Turnover rounded up to in lakh (two digit after decimal)**	
1.	20.. - 20..		
2.	20... - 20.....		
3.	20... - 20.....		
5.	Net Worth as at last financial Year		

Note:

1. Average turnover is to be expressed in rupees in lakh, rounded up to two digits after decimal.
2. The statement must be the individual bidder's turnover and not the consolidation as the result of accounts of group and associates.
3. Average turnover for 3 years is to be obtained by dividing the total turnover by 3.0. If the bidder was set up in less than 3 year's period, consider the turnover for the period from inception to the Year-1. It may be either 1.0 or 2.0. Average turnover is to be obtained by dividing the total turnover by 1.0 or 2.0, as the case may be.
4. In case, the bidder was set up in less than 3 year's period, mention the year of inception in the 'Remarks' column.

Signed and Upload

FORM-6: CAPABILITY STATUS

NIT No:

Bidder's Name & Address:

To
The GM(M&C)
The West Bengal Power Development Corporation Limited
Bidyut Unnayan Bhaban, Block– LA, Plot No. 3/C, Sector–III,
Salt Lake City, Kolkata– 700106, West Bengal, India.

Subject : Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10 MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1,2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance.

We provide the following details to conform that we have sufficient capacity to execute the supply of Goods covered in the NIT:

A	Manufacturing Capacity (applicable in case of original manufacturers only)	
B	Orders in Hand	
i	Total value of Orders	
ii	Value of work completed out of above value upto 31.01.2018.	

Details of orders in hand are as follows:

Sl. No	Purchaser / Client	Scope of works	Order Value	Schedule Time of Completion	Value of Outstanding work	Estimated Completion date

Note:

- Continuation sheets of like size and format may be used and annexed to this format if required.

Date : (Printed Name).....

Place : (Designation).....

Signed and Upload

FORM-7: SIMILAR TYPE OF ORDERS

STATEMENT OF SIMILAR TYPE OF ORDERS EXECUTED AS ON DATE OF ISSUANCE OF THE NIT

[Applicability up to the extent of meeting Technical QR].

NIT No:

Bidder's Name & Address:

To
The Deputy General Manager-IC(M&C)
The West Bengal Power development Corporation Limited
Bidyut Unnauan Bhaban,
Plot No. 3/C LA-Block,
Sector-III, Bidhannagar,
Kolkata-700 106

Subject : Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10 MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1,2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance.

Sl No	Name of the Installed Plants/ Project	Financial year	Order No. and date	Name of Purchaser / order issuing authority	Cumulative capacity of the order (Considering similar type of work) (scanned copy of certificate to be Submitted in non-statutory cover) (kWp)	Ordered Value/Time (extended time, if any) of Completion	Cumulative capacity installed (Considering similar type of work) (kWp)	Completion report of installed systems (scanned copy of certificate to be Submitted in non-statutory cover)	Remarks

- Continuation sheets of like size and format may be used and annexed to this format if required.

Similar type of work means Solar PV power plant each of minimum capacity as per QR of the tender

Date : (Printed Name).....

Place : (Designation).....

Signed and Upload

FORM-8:CURRICULUM VITAE OF KEY PERSONNEL

NIT No:

Bidder's Name & Address:

To
The General Manager(M&C)
The West Bengal Power development Corporation Limited
Bidyut Unnauan Bhaban,
Plot No. 3/C LA-Block,
Sector-III, Bidhannagar,
Kolkata-700 106

Subject : Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10 MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1,2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance.

S.No	Proposed Position	Name	Position Held since	Professional Qualification	Experience in relevant Field	Any other Information

Date : (Printed Name).....

Place : (Designation).....

Signed and Upload

Note:

- Continuation sheets of like size and format may be used and annexed to this Form if required.

FORM-9: FORMAT FOR SUBMISSION OF PRE-BID QUERIES

FORMAT FOR SUBMISSION OF PRE-BID QUERIES			
NIT No.			DTD.
Subject : Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10 MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1,2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance.			
NAME OF THE BIDDER:	<To be filled in by the bidder>		Work name : <To be filled in by the bidder>
PART A - TECHNICAL QUERIES			
Sl no	GCC Clause reference (if any)	BIDDER'S QUERY	WBPDCL's REPLY
1			
2			
3			
PART B: COMMERCIAL/GCC RELATED/CONTRACTUAL QUERIES			
Sl no	GCC Clause reference (if any)	BIDDER'S QUERY	WBPDCL's REPLY
1			
2			
3			
4			
5			
• Continuation sheets of like size and format may be used as per Bidders requirements and shall be annexed to this Form.			

Note:

i. To be submitted before Pre- bid meeting.

ii. This sheet must not the part of the offer submitted by the bidder and not to be upload

iii. This sheet to be mailed in Excel Format at email address : s.sengupta@wbpdcl.co.in

Date :	(Signature).....
Place :	(Authorized Representative of bidder)..
	(Designation).....
	Name of the bidder: .....

FORM-10: PROPOSED MODIFICATIONS

(To be submitted before Pre-bid meeting)

Ref:

Bidder's Name & Address:

To
The General Manager (M&C)
The West Bengal Power development Corporation Limited
Bidyut Unnauan Bhaban,
Plot No. 3/C LA-Block,
Sector-III, Bidhannagar,
Kolkata-700 106

Subject : Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10 MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1,2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance.

Reference : NIT No: _____

We have carefully gone through the Technical Specifications and the General Conditions of Contract and we have satisfied ourselves and hereby propose certain modifications as mentioned below:

S.No.	Sec./Clause & Page No.	Existing Clause	Modified clause (proposed by Bidder)	Reasons for modification

Note:

i. To be submitted before Pre- bid meeting.

ii. This sheet must not the part of the offer submitted by the bidder and not to be upload

iii. This sheet to be mailed in Excel Format at email address : s.sengupta@wbpdcl.co.in

Date : **(Signature)……**

(Authorised Representative of bidder)

Place :

(Designation)……

Name of the bidder: ……

FORM-11: PROFORMA FOR JOINT VENTURE/CONSORTIUM AGREEMENT

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

This Joint Venture/Consortium Agreement made and entered into on _____ day of..... (year)

BY AND BETWEEN _____ (Name of the Lead Member), a Company/Firm registered under the laws of _____ (Name of the Country) with its Head/Registered Office at _____ (Address of the Head/Registered Office) and a place of business in _____ (Address of place of business) (hereinafter referred to as "The Lead Member") and represented by Mr/Mrs/Ms. _____ (Name of Authorized Signatory).

AND

_____ (Name of the other Member), a Company/Firm registered under the laws of _____ (Name of the Country) with its Head/Registered Office at _____ (Address of the Head/Registered Office) and a place of business in _____ (Address of place of business) (hereinafter referred to as "The Member") and represented by Mr/Mrs/Ms. _____ (Name of Authorized Signatory).

WITNESSETH

WHEREAS WEST BENGAL POWER DEVELOPMENT CORPORATION LIMITED (hereinafter referred to as "The Procuring Entity") has issued RFP/ Notice Inviting Tender No. _____ Dated _____ for (.....Name of the Job.....). The Procuring Entity intends to select the suitable Bidder through competitive bidding process for the aforesaid Project/Works / Services.

WHEREAS the Parties are interested in jointly preparing and submitting an Application to Bid for the Project/ Works / Services mentioned above as a Joint Venture/Consortium.

1.0 PURPOSE OF THIS AGREEMENT

1.1. The purpose of this Agreement is to define the principles of collaboration among the Parties to:

1.1.1 Submit an Application jointly to Bid for the (.....Name of the Job.....) as a Joint Venture /Consortium.

1.1.2 Negotiate and sign Contract in case of award.

1.1.3 Provide and perform the supplies / works / services / EPC etc. which would be ordered by the Procuring Entity pursuant to the Contract.

1.2. For the purpose of participating in the Bid, the name of the Joint Venture /Consortium shall be "_____".

2.0 LEGAL RELATIONSHIP OF THE MEMBERS

2.1. This Agreement shall not be construed as establishing or giving effect to any legal entity such as, but not limited to, a company, a partnership, etc. It shall relate solely towards the Procuring Entity for (.....Name Of the Job.....) and related execution works to be performed pursuant to the Contract and shall not extend to any other activities.

2.2. The Parties shall be jointly and severally responsible and bound towards the Procuring Entity for the performance of the Job in accordance with the terms & conditions of the Tender Document and Contract.

3.0 LEAD MEMBER

_____ (Name of Member) shall act as Lead Member of the Joint Venture /Consortium. As such, it shall act as the coordinator of the Members' combined activities and shall carry out the following functions:

3.1. To ensure the technical, commercial and administrative co-ordination of the Project/Works / Services.

3.2. To lead the contract negotiations of the Project/ Works / Services with the Procuring Entity.

3.3. The Lead Member is authorized to submit bills, receive payments and instructions and incur liabilities for and on behalf of Joint Venture /Consortium Members.

3.4. In case of an award, act as a channel of communication between the Procuring Entity and the Joint Venture /Consortium to execute the Contract.

4.0 SCOPE OF WORK AND SERVICES OF EACH MEMBER

4.1 Scope of Work and Services: The Scope of Work and Services for each Member shall be defined as follows:

4.1.1. _____ (Name of Member) shall be responsible for the following (Define the Scope of Work):

a)

b)

4.1.2. _____ (Name of Member) shall be responsible for the following (Define the Scope of Work):

a)

b)

4.1.3. _____ (Name of Member) shall be responsible for the following (Define the Scope of Work):

a)

b)

4.2 Participation Share of each Member:

Lead Member_____ %

Other Member_____ %

Other Member_____ %

4.3 Financial Commitment of each Member in terms of Contract Value:

Lead Member_____ %

Other Member_____ %

Other Member_____ %

5.0 SECURITIES

Securities, in the form of Bank Guarantees or any other mode as required under the Tender Document and/or Contract shall be provided in the following manner.

Lead Member_____ Rs.

Other Member_____ Rs.

Other Member_____ Rs.

6.0 LIABILITY

Liability of the Parties with respect to Claims of the Procuring Entity: All the joint venture/consortium members are jointly and severally liable to the Procuring Entity for the Performance in terms of Scope of Work under the Contract in its entirety.

7.0 DURATION OF THE AGREEMENT

The present Agreement is valid until successful completion of the Contract including defect liability period, if any, and full and final settlement of all accounts and disputes, if any, between the Parties and the Procuring Entity, except if the Procuring Entity has decided not to award the Contract to the Parties, in such case the Parties are free from any obligation under this Agreement.

IN WITNESS WHEREOF, this agreement executed on the _____ day of _____ (month)..... (Year) by the duly Authorized Representatives of the Parties hereto.

For and on behalf of M/s. _____

(Lead Member)

Name:

Company Seal:

For and on behalf of M/s. _____

(Other Member)

Name:

Company Seal:

For and on behalf of M/s. _____

(Other Member)

Name:

Company Seal:

Notary Seal:

FORM-12: POWER OF ATTORNEY

Format for Power of Attorney to be provided by each of the other members of the Consortium in favour of the Lead Member

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution)

Whereas the West Bengal Power Development Corporation Ltd. (WBPDCL) (the "Procuring Entity") has invited Bids from bidders for " EPC Contract for Design & Engineering, Manufacture / Procurement, Supply, Installation, Testing and Commissioning of 10 MW Grid connected Floating Solar Photovoltaic Power Plants on Raw Water Pond No.1, 2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal, India in turnkey basis including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance"

Whereas, M/s....., and M/s..... (collectively the "**Joint Venture/ Consortium**") being Members of the Joint Venture/ Consortium are interested in bidding for the Project in accordance with the terms and conditions of the tender document and other Bid documents including agreement in respect of the Project/works/services,

AND

Whereas, it is necessary for the Members of the Joint Venture/ Consortium to designate one of them as the Lead Member with all necessary power to do for and on behalf of the Joint Venture/ Consortium, all acts, deeds and things as may be necessary in connection with the Joint Venture's/ Consortium's Bid for the Project/Works/Services and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, M/s..... having our registered office at ....., and M/s..... having our registered office at ....., (hereinafter collectively referred to as the "**Principals**") do hereby irrevocably designate, nominate, appoint and authorize M/s ..... having its registered office at ....., being one of the Members of the Joint Venture/ Consortium, as the Lead Member and true and lawful attorney of the Joint Venture/ Consortium (hereinafter referred to as the "**Attorney**"). We hereby irrevocably authorize the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Joint Venture/ Consortium and any one of us during the Bidding process and, in this regard, to do on our behalf and on behalf of the Joint Venture/ Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the Bid, including but

not limited to signing and submission of all applications, Bids and other documents and writings, participate in meetings, respond to queries, submit information/ documents, sign and generally to represent the Joint Venture/ Consortium in all its dealings with the Procuring Entity, in all matters in connection with or relating to or arising out of the Joint Venture's/ Consortium's Application.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us(Joint Venture/ Consortium).

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ……. DAY OF ……. 20…

For ……..

(Signature)

……..

(Name & Title)

For ……..

(Signature)

……..

(Name & Title)

For ……..

(Signature)

……..

(Name & Title)

(Executants)

(To be executed by all the Members of the Joint Venture/ Consortium)

Witnesses:

1.

2.

Notes:

1. The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executants (s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.

2. Also, wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.

FORM-13: DECLARATION FOR NET MINIMUM GUARANTEED GENERATION

DECLARATION SHEET – FOR NET MINIMUM GUARANTEED GENERATION
(To be submitted on official letter head by the bidder)

We ..... declare that the (project description)offered by us within the scope of this tender, will generate minimum 1.52MU/MWp/year measured in the Net Meter installed at the outgoing feeder. The Net Minimum Guaranteed Generation shall be calculated after deducting the Auxiliary Consumption for the plant.

The Net Minimum Guaranteed Generation shall be reduced @ 1% per year.

In case we fail to produce the Net Minimum Guaranteed Generation as stated above, the provisions of penalty according to Clause No. 4.3.5 of the Special Conditions of Contract of this tender shall be applicable.

I hereby certify that I am duly authorized representative of the Bidder whose name appears above my signature.

Bidder's Name: .....

Authorised Representative's Signature.....

SECTION – VII

ANNEXURES

Sl No	Annexure Name	Annexure No
01.	Proforma Of Contract Agreement	Annexure-1
02.	Proforma Of Bank Guarantee For Contract Performance	Annexure-2
03.	Proforma Of Bank Guarantee For Mobilisation Advance	Annexure-3
04.	Proforma For Extension Of Bank Guarantee	Annexure-4
05.	Proforma Of Indemnity Bond	Annexure -5
06	Completion Certificate	Annexure-6
07	Application for Payments	Annexure-7
08	Taking-Over Certificate	Annexure-8
09	No-Claim Certificate	Annexure-9
10	Indemnity bond to be executed by the contractor for the equipment handed over by the Purchaser for performance of its contract (Entire Equipment Consignment in one lot)	Annexure-10A
11	Application for Material Gate Pass	Annexure-10B
12	Authorization letter	Annexure-11
13	Material Receipt Certificate	Annexure-12

ANNEXURE-1: CONTRACT AGREEMENT

PROFORMA OF CONTRACT AGREEMENT

(To be executed on Non-Judicial Stamp Paper of Rs. 100/-)

THIS AGREEMENT made at this _____ day of _____, _____, between **The West Bengal Power Development Corporation Limited of Plot No. 3/C LA-Block, Sector-III, Bidhannagar, Kolkata-700 106** (hereinafter called "the Procuring Entity"), of the one part, and _____of _____ (hereinafter "the Contractor"), of the other part:

WHEREAS the Procuring Entity invited bids "<Tender Description> in WBPDCL" and has accepted the Bid offered by the Bidder/Contractor for the same in the sum of _____ (hereinafter "the Contract Price"). After due consideration, the procuring entity has decided to entrust to the contractor with the job/ work/ supply of **"Design & Engineering, Manufacture / Procurement, Supply, Erection, Testing and Commissioning of 10MW Phase-II Grid Connected Floating Solar Photovoltaic Power Plant on Raw Water Pond No.1, 2 & 4 in Sagardighi Thermal Power Project(SgTPP), Murshidabad, West Bengal including warrantee obligation with 05 (Five) years comprehensive Operation and Maintenance"**

FOR THE CONSIDERATION payable under this agreement, the contractor hereby agrees to complete the execution of job/ work/ supply in a satisfactory manner following scope of Work within the specified period.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:
   a) the Procuring Entity's Notification (LoA) to the Contractor of Award of Contract;
   b) the Bid Forms(including Price Bid) submitted by the Contractor;
   c) the Special Conditions of Contract;
   d) the General Conditions of Contract;
   e) _____
   f) _____

This Contract shall prevail over all other Contract documents which are not covered under Clause 2 above. In the event of any discrepancy or inconsistency within the

Contract documents referred under Clause 2, then the contract shall be governed by the documents in the order listed above.

3. In consideration of the payments to be made by the Procuring Entity to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Procuring Entity to provide the goods and services / to execute works and to remedy defects therein in conformity with the provisions of the Contract in all respects.
4. The Procuring Entity hereby covenants to pay the Contractor in consideration of the provision of the goods and services / execution of works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF, the parties through their duly authorized representatives have executed these presents (execution whereof has been approved by the competent authorities of both the parties) on the day, month and year first above mentioned at Kolkata.

Signed by for and on behalf of the Procuring Entity
.....
[Signature]

.....
[Title]

In the presence of
..... (Signature, Name and Title)

Signed by for and on behalf of the Contractor/ Lead Member
.....
[Signature]

.....
[Title]

In the presence of
..... (Signature, Name and Title)

ANNEXURE-2: BG (CONTRACT PERFORMANCE)

PROFORMA OF BANK GUARANTEE FOR CONTRACT PERFORMANCE

(To be executed in non-judicial stamp paper of Rs. 100/-)

(To be stamped in accordance with Stamp Act, if any, of the Country of the issuing Bank)

Bank Guarantee No.: _____

Date: _____

To,

The West Bengal Power Development Corporation Limited
Plot No. 3/C LA-Block, Sector-III, Bidhannagar, Kolkata-700 106

Dear Sir,

In consideration of the West Bengal Power Development Corporation Limited (Hereinafter referred to as the 'Procuring Entity' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) having awarded to M/s..... *[Contractor's Name]*..... With its Registered/Head Office at..... (Hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a Contract by issue of *Procuring Entity's* Letter of Acceptance No. ..... dated ..... and the same having been acknowledged by the Contractor, for ..... [Contract sum in figures and words] for ..... *[Name of the work]* and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to ..... (*)..... of the said value of the aforesaid work under the Contract to the Procuring Entity.

We..... *[Name & Address of the Bank]*..... having its Head Office at..... (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context of meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the *Procuring Entity* on demand any and all monies payable by the Contractor to the extent of ..... (*) ..... as aforesaid at any time upto..... (@) ..... *[days/month/year]* without any demur, reservation, contest, recourse or protest and/or without any reference to the Contractor. Any such demand made by the *Procuring Entity* on the Bank shall be conclusive and binding notwithstanding any difference between the *Procuring Entity* and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes

not to revoke this guarantee during its currency without previous consent of the *Procuring Entity* and further agrees that the guarantees herein contained shall continue to be enforceable till the *Procuring Entity* discharges this guarantee or till ……*[days/month/year]* whichever is earlier.

The *Procuring Entity* shall have the fullest liberty, without affecting in any way the liability of the Bank under this guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The *Procuring Entity* shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Procuring Entity and the Contractor or any other course or remedy or security available to the Procuring Entity. The Bank shall not be released of its obligations under these presents by any exercise by the Procuring Entity of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the *Procuring Entity* or any other indulgence shown by the *Procuring Entity* or by any other matter or thing whatsoever which under law would, but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Procuring Entity at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Procuring Entity may have in relation to the Contractor's liabilities.

Our liability under this Bank Guarantee shall not exceed ……..

This Bank Guarantee shall be valid up to and including ……..

We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if Procuring Entity serve upon Bank a written claim or demand on or before ……..@…….. Dated this…….. Day of ……..(Month)…….. (Year)…….. at……..

WITNESS

……..	……..
(Signature)	(Signature)
……..	. ……..
(Name)	(Name)

…… ……

(Engineer / Officer Address) (Designation with Bank Stamp)

……

Attorney as per Power of Attorney No.……

Dated……

Notes:

1. (*) This sum shall be 10% (ten percent) of the Contract Price.

2. (@) This date will be Ninety (90) calendar days beyond the defects liability period as specified in the Contract.

3. The stamp papers of appropriate value shall be purchased in the name of guarantee issuing Bank.

ANNEXURE-3: BG (MOBILISATION ADVANCE)

PROFORMA OF BANK GUARANTEE FOR MOBILISATION ADVANCE

(To be executed in non-judicial stamp paper of Rs. 100/-)

(To be stamped in accordance with Stamp Act, if any, of the Country of the issuing Bank)

Bank Guarantee No.: _____

Date: _____

To,

The West Bengal Power Development Corporation Limited
Plot No. 3/C LA-Block, Sector-III, Bidhannagar, Kolkata-700 106

We have been informed that _____ (hereinafter called "the Contractor") has entered into Contract No.: _____ dated _____ with you, for the execution of _____ (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum of Rs._____/- (_____) is to be made against an advance payment guarantee.

At the request of the Contractor, we _____ hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of Rs. _____/- (_____) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than toward the execution of the Works.

It is a condition for any claim and payment under this guarantee to be made that the advance payment preferred to above must have been received by the Contractor on his account number _____ at _____.

The maximum amount of this guarantee is valid shall be progressively reduced in proportion to the value of each part-shipment or part-delivery of plant and equipment to the site, as indicated in copies of the relevant shipping and delivery documents that shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of documentation indicating full repayment by the Contractor of the amount of the advance payment, or on the _____ day of _____, 2____, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No.: 458.

_____

[Signature(s) name of bank or financial institution]

ANNEXURE-4: FOR EXTENSION BG

PROFORMA FOR EXTENSION OF BANK GUARANTEE

Ref.....

Date.....

To

.....

.....

..... West Bengal

Sub: Extension of Bank Guarantee No.....for Rs..... favoring yourselves, expiring on.....on account of M/s.....in respect of Contract No.....dated..... (hereinafter called original Bank Guarantee).

Dear Sirs,

At the request of M/s.....,We.....Bank, branch office at.....and having its Head Office at..... .do hereby extend our liability under the above mentioned Bank Guarantee No..... dated..... for a further period of.....(Years/Months) from.....to expire on.....Expect as provided above, all other terms and conditions of the original bank guarantee No.....dated.....shall remain unaltered and binding.

Please treat this as an integral part of the original bank guarantee to which it would be attached. Yours Faithfully,

For ....

Manager/Agent/Accountant..... Power of Attorney No..... Dated.....

SEAL OF BANK

NOTE: The non-judicial stamp paper of appropriate value shall be purchased in the name of the bank who has issued the Bank Guarantee.

ANNEXURE-5: INDEMNITY BOND

PROFORMA OF INDEMNITY BOND

(To be executed on Non-Judicial Stamp Paper of Rs. 100/-)

BY THE PRESENT INDEMNITY BOARD EXECUTED by me/us on this.....Day of.....20.....,I/We having Registered Office / residing at.....(herein after called "OBLIGOR/OBLIGORS" which expression shall mean and includes my/our successors legal representatives, assigns) do hereby binds myself/ourselves and also our company/firm..... after having the power to bind so with the promise and undertaking in favour of 'The West Bengal Power development Corporation Limited' Bidyut Unnauan Bhaban, Plot No. 3/C LA-Block, Sector-III, Bidhannagar, Kolkata-700 106 (hereinafter called as OBLIGEE, which expression shall mean and include it's legal representative, administrators assigns.

Whereas OBLIGOR/OBLIGORS has/have been awarded to execute the job/works under letter no.....dated.....issued by the OBLIGEE after having observing necessary formalities, the details of which is described in the schedule given here under as per letter mentioned herein-above and whereas the said job/works will be/likely to be done in places covered under Employees' State Insurance Act (ESI) and/or the Employee Compensation Act, 1923 (W.C. Act) and/or other laws relating to the Labour Management and Welfare.

And whereas according to the condition of the contract the OBLIGOR/OBLIGORS is/are under obligation to execute this Indemnity Bond before the commencement of actual execution and OBLIGOR/OBLIGORS is/are aware that unless this Indemnity Bond is executed in accordance with the condition of contract before the actual execution in accordance with law the OBLIGEE shall have the power to deem that actual work has been stated within the meaning of the contract before the execution

of this Indemnity Bond.

Now this indenture witnesses that I/we the OBLIGOR/OBLIGORS do hereby undertake:

1. THAT the OBLIGEE shall not be held responsible for any type of accident which may take place during the course of work undertaken by the OBLIGOR/OBLIGORS.

2. THAT the OBLIGOR/OBLIGORS will take/adopt all safety norms in respect of each and every workmen labour personnel according to the rules or to the satisfaction of the OBLIGREE IN ALL CASES.

3. That the OBLIGOR/OBLIGORS undertakes/undertake to engage only those labour worker or any other personnel whether skilled or unskilled or any other person whether in technical management or non-managerial or any other capacity in the area covered under Employee' State Insurance Act, 1948 who has/have insurance coverage within the meaning of Employees' State Insurance Act and further undertakes NOT to engage any person in the area covered under Employees State Insurance Act., who does/do not has/have insurance coverage within the meaning of Employees' State Insurance Act,1948.

4. That the OBLIGOR/OBLIGORS further undertakes/undertake to engage only those labour, worker, or any other personnel, whether skilled or unskilled, whether in technical, managerial or non-managerial or any other capacity in the area NOT covered under Employees' State Insurance Act 1948, who has life insurance for the sum assured equivalent to the amount of Compensation under the Employees Compensation Act in case of accidental death or inquiry and such insurance has been effected by the OBLIGOR/OBLIGORS.

5. THAT the OBLIGOR/OBLIGORS undertakes/undertake to indemnify and keep harmless the OBLIGEE from all claims, action, proceedings and of risk, damage, danger to any person whether belonging to/or not belonging to OBLIGOR/OBLIGORS.

6. THAT the OBLIGOR/OBLIGORS shall keep harmless the OBLIGEE from all claims, compensation, damages, any proceedings in respect of any of its employee/workmen under the Employee Compensation Act or any other laws for the time being in force.

7. THAT, if during the course of execution of work as stated in the letter mentioned hereinabove issued by the OBLIGEE, it is found that the OBLIGOR/OBLIGORS has/have not complied with guidelines/formalities within the meaning of Employees' State Insurance Act or Employee Compensation Act or any other laws relating to the Labour Welfare for the time being in force, and also has not observed the safety norms in accordance with the law to the satisfaction of the OBLIGEE, the OBLIGEE shall have the right to stop the execution of work/job and the period of

such stoppage shall continue till adequate safety and other compliance mentioned hereinabove under the labour welfare legislation have been observed and such period of stoppage shall not be taken into account for the calculation of the total period of completion of work for which the OBLIGOR/OBLIGORS is responsible to complete the work/job and it will be deemed that discontinuance was due to default of OBLIGOR / OBLIGORS.

8. THAT, if at any time, due to exigency, the OBLIGEE i.e. the West Bengal Power Development Corporation Limited(WBPDCL) as the Principal Employer, becomes liable to pay any such compensation mentioned hereinabove, whether on failure of the OBLIGOR/OBLIGORS or for any other reason, the OBLIGEE shall have the right to recover the said amount from any amount receivable by OBLIGOR/OBLIGORS or any bank guarantee deposited or anything payable whether in connection with this contract or other contract by the OBLIGEE to the OBLIGOR/OBLIGORS.

9. THAT the OBLIGOR/OBLIGATOR is/are aware and accept that for the persistent or repeated violation of any condition mentioned in this Indemnity Bond, the OBLIGEE shall have right to terminate the contract of work issued by the OBLIGEE to OBLIGOR/OBLIGATOR.

SIGNED AND DELIVERED

BY THE OBLIGOR/OBLIGORS .....

Signature .....

WITNESS:

1) Name & Designation .....
Signature .....

1) Name & Designation .....
Signature .....

ANNEXURE-6: COMPLETION CERTIFICATE

Completion Certificate

(On the letter head of the Purchaser as per provisions of GCC 3.32)

Date: .....

Contract No.: .....

[*Name of Contract]*

To: *[Name and address of Contractor]*

Dear Sirs,

Pursuant to Clause GCC 3.32 of the General Conditions of the Contract entered into between yourselves and the WBPDCL dated *[date]*, relating to the *[brief description of the Works],* we hereby notify you that the following part(s) of the Works was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Purchaser hereby takes over the said part(s) of the Works, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below.

1. Description of the Works or part thereof: *[description]*

Billing Schedule Sl. No.	Description of item	Total	Quantity/Percentage (%)		
			Cumulative achieved up to last bill	Claimed in this bill	Cumulative achieved up to date

2. Date of Completion: *[date]*

3. Defects to be rectified, if any:

However, you are required to complete the outstanding items listed in the enclosure hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Works including Guarantee Test(s) in accordance with the Contract nor of your obligations during the Defects Liability Period.
Very truly yours,
……

Title
(Project Manager)

Encl: List of outstanding items to be completed

ANNEXURE-7: APPLICATION FOR PAYMENT

Application for Payments

Site	:		Lot No	:	
Name of the Package	:		Date	:	
Name of Contractor	:		Contract No.	:	
Contract Value	:		Application Serial Number	:	

To

…… *

Dear Sir,

1. Pursuant to the above referred contract dated …… the undersigned hereby submit claim for payment of the sum of …… (Specify amount for which claim is made)

2. The above amount is on account of : (Check whichever is applicable)

Advance payment (Schedule**)
Interim payment as advance (Schedule**)
Progressive payment against receipt of equipment at site (Schedule**)
Progressive payment against erection (Schedule**)
Transportation
Insurance
Price adjustment
Extra work not specified in contract
(Ref. Contract change order No.....)
Others (specify)
Final payment (Schedule**)

as detailed in the attached Schedule(s) which form an integral part of this application

3. The payment claimed is as per item(s) No(s) ..... of payment schedule annexed to the above mentioned Contract.
4. This application consist of this page, a summary of claim statement (**) and the following signed schedules:
   1) .....
   2) .....
   3) .....
   The following documents are also enclosed:
   1) .....
   2) .....
   3) .....

Signature and Seal of Contractor / Authorised Signatory

* Application for payment will be made to "Project Manager" designated for this purpose at the time of Award of Contract.

** Proforma for the summary of claim will be finalized during the finalization of the Contract Agreement.

ANNEXURE-8: TAKING OVER CERTIFICATE

Taking-Over Certificate

(On the letter head of the Purchaser as per provisions of GCC 3.33)

Date: .....
Loan/Credit No: .....
Tender Notice No: .....

[*Name of Contract]*

To: *[Name and address of Contractor]*

Dear Sirs,

Pursuant to clause GCC 3.33 of the General Conditions of the Contract entered into between yourselves and the Purchaser dated [date], relating to the [brief description of the Works], we hereby notify you that the Functional Guarantees of the following part(s) of the Works were satisfactorily attained on the date specified below.

1. Description of the Works: [description]

2. Date of Take-Over: [date]

This letter does not relieve you of your obligation to complete the execution of the Works in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

……

Title

(Project Manager)

ANNEXURE-9: NO-CLAIM CERTIFICATE

No-Claim Certificate

(To be issued by the Contractor)

Name of the Package: …… LoA No. /Contract No……

Name of the Contract: ……

Date……

This is to certify that we have received all payments due to us in respect of the above referred LoA/Contract and we have no claims whatsoever pending with WBPDCL for this Contract.

We further confirm that we shall have no claim against this Contract in future also.

Date : (Signature)……

Place : (Name)……

(Designation)……

ANNEXURE-10A: INDEMNITY FOR EQUIPMENT

Indemnity bond to be executed by the contractor for the equipment handed over by the Purchaser for performance of its contract (Entire Equipment Consignment in one lot)

(To be executed on non-judicial stamp paper of appropriate value as per provisions of clause GCC 33.5)

INDEMNITY BOND

THIS INDEMNITY BOND is made this .....day of ..... 20 ..... by .....(Contractor's Name) a Company registered under the Companies Act, 1956/Partnership firm/Proprietary concern having its registered office at ..... (hereinafter called as '**Contractor**' or "Obligor" which expression shall include its successors and permitted assigns) in favour of **The West Bengal Power Development Corporation Limited** having its registered office at ***Bidyut Unnayan Bhaban, Plot No.3C, LA-Block, Sector-III, Bidhannagar, Kolkata-700106*** and its project at ..... (hereinafter called "**WBPDCL**" which expression shall include its successors and assigns) :

WHEREAS WBPDCL has awarded to the Contractor a Contract for .....vide its Letter of Award/Contract No.....dated ..... and its Amendment No. ..... and Amendment No....., (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which WBPDCL is required to hand over various Equipments to the Contractor for execution of the Contract.

And WHEREAS by virtue of Clause No..... of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of WBPDCL for the Equipments handed over to it by WBPDCL for the purpose of performance of the Contract/Erection portion of the contract (hereinafter called the "Equipments")

AND THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (Currency and amount in Figures)..... (Currency and amount in words) ..... handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep WBPDCL indemnified, for the full value of the Equipments. The Contractor hereby acknowledges actual receipt of the Equipment etc. as per dispatch title documents handed over to

the Contractor as detailed in the Schedule appended hereto. The Contractor shall hold such Equipment etc. in trust as a "Trustee" for and on behalf of WBPDCL.

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the Equipment at WBPDCL project site against all risks whatsoever till the Equipments are duly used/erected in accordance with the terms of the Contract and the Works duly erected and commissioned in accordance with the terms of the Contract is taken over by WBPDCL. The Contractor undertakes to keep WBPDCL harmless against any loss or damage that may be caused to the Equipments.

3. The Contractor undertakes that the Equipments shall be used exclusively for the performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilised for any other work of purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.

4. That WBPDCL is and shall remain the exclusive Purchaser of the Equipments free from all encumbrances, charges or liens of any kind, whatsoever. The Equipments shall at all times be open to inspection and checking by the Project Manager or other employees/agents authorised by him in this regard. Further, WBPDCL shall always be free at all times to take possession of the Equipments in whatever form the Equipments may be, if in its opinion, the equipments are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of WBPDCL to return the Equipments without any demur or reservation.

5. That this Indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipments or the same or any part thereof is misutilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Project Manager of WBPDCL as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipments at its own cost and/or shall pay the amount of loss to WBPDCL without any demur,

reservation or protest. This is without prejudice to any other right or remedy that may be available to WBPDCL against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of WBPDCL, THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

Schedule					
Particulars of Equipments handed over	Quantity	Particulars of Dispatch title Documents		Value of the Equipments	Signature of the Attorney in token of receipt
		RR/GR/ Bill of lading No & Date	Carrier		

For and on behalf of
.....
(Contractor's Name)

1 1. Signature.....
2. Name.....
3. Address.....

2 1. Signature.....
2. Name.....
3. Address.....

Signature.....
Name.....
Designation of .....
Authorized representative*

(Common Seal)
(In case of company)

*Indemnity Bond are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the Power of Attorney issued under common seal of the company with authority to execute Indemnity Bond, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

ANNEXURE-10B: APPLICATION FOR MATERIAL GATE PASS

(On Company letter head of Contractor)

Application for Material Gate Pass

To,

(Project In-Chrge)
WBPDCL, SgTPP Site

Ref. No.

i. LOA no. _____ Dated: _____

ii. MDCC No._____ Dated:_____

iii. Invoice Details

No._____ Dated: _____

Quantity _____ Cost:_____
Dated:_____

Subject: *Name of the work*

Dear Sir,

1. Pursuant to the above referred LOA/contract, the undersigned hereby submit request for gate pass for the above referred invoice materials.

2. As per the clause no. 3.39 of the GCC of the contract document, *name of the contractor* is fully responsible for care of the materials after the entry of the materials in side WBPDCL premises until handover of the plant.

3. *Name of the contractor* is fully responsible for storage and safety security of the materials.

4. If at any time any loss or damage occurs to the Equipments or the same or any part thereof is misutilised in any manner whatsoever, then name of the contractor hereby agrees that WBPDCL will not be responsible in any way

Very truly yours,

(Project Manager)

ANNEXURE-11: AUTHORISATION LETTER

Authorization letter
(On the letter head of Purchaser)

Ref No: .....
Date: .....

To,

M/s ..... (Contractor's Name).....

Ref: Contract No .....Dated .....
for ..... awarded by WBPDCL

Dear Sirs,

Kindly refer to Contract No..... Dated ..... for..... (Contract Name).You are hereby authorised on behalf of WBPDCL having its registered office at ..... to take physical delivery of materials/equipments covered under dispatch Document/ Consignment Note no.....[mention LR/RR No].....dated ..... and as detailed in the enclosed Schedule for the sole purpose of successful performance of the aforesaid contract and for no other purposes, whatsoever.

(Signature of Project Manager)

Designation: .....

Date: .....

ENCL: As above

ANNEXURE-12: MATERIAL RECEIPT CERTIFICATE

Material Receipt Certificate

Name of the Work: .....
LoA No. /Contract No.....
Name of the Contractor: .....

Material Receipt Certificate No._____ Date:_____

BS Sl. No.	MDCC Ref. No.	LR No. & Dt	Gate Entry No. & Receipt dt	UOM	Qty as per Invoice	Material Description	Quantity							Remarks
							UOM	As per BS	Claim up to previous MRC		Claim in this MRC	Cuml. Received	Balance	
									MRC No	Qty				

Note: Above Materials received and verified and handed over the above to *name of the contractor* for their safe custody, erection and commissioning.

Contractor WBPDCL