The bidder must upload valid test certificate of PCU/Inverter issued by NABL/IECQ/MNRE accredited/ Specified test laboratories for the model offered stating its conformation to IEC 61683/ IS 61683 as well as IEC 60068-2(1, 2, 14, 30).

(l) INTEGRATION OF PV POWER WITH GRID:

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

(m)DATA ACQUISITION SYSTEM / PLANT MONITORING

i. Data Acquisition System shall be provided for each of the solar PV plant .
ii. Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis with the high quality, suitable PC. Metering and Instrumentation for display of systems parameters and status indication to be provided.
iv. Temperature: Temperature probes for recording the Solar panel temperature and/or ambient temperature to be provided complete with readouts integrated with the data logging system
v. The following parameters are accessible via the operating interface display in real time separately for solar power plant:
a. AC Voltage.
b. AC Output current.
c. Output Power
d. Power factor.
e. DC Input Voltage.
f. DC Input Current.
g. Time Active.
h. Time disabled.
i. Time Idle.
j. Power produced
k. Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage.
vi. All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.
vii. PV array energy production: Digital Tri Vector Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system provided. TVM Energy meter along with CT/PT should be of 0.5 accuracy class.
viii. Computerized DC String/Array monitoring and AC output monitoring shall be provided as part of the inverter and/or string/array combiner box or separately.
ix. String and array DC Voltage, Current and Power, Inverter AC output voltage and current (All 3 phases and lines), AC power (Active, Reactive and Apparent), Power Factor and AC energy (All 3 phases and cumulative) and frequency shall be monitored.
x. Computerized AC energy monitoring shall be in addition to the digital AC energy meter.
xi. The data shall be recorded in a common work sheet chronologically date wise. The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.
xii. All instantaneous data shall be shown on the computer screen.
xiii. Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.

xiv. Provision for instantaneous Internet monitoring and download of historical data shall be also incorporated.
xv. Remote Server and Software for centralized Internet monitoring system shall be also provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and temperature monitoring system.
xvi. Ambient / Solar PV module back surface temperature shall be also monitored on continuous basis.
xvii. Simultaneous monitoring of DC and AC electrical voltage, current, power, energy and other data of the plant for correlation with solar and environment data shall be provided.
xviii. The bidders shall be obligated to push real-time plant monitoring data on a specified interval (say 15 minute) through open protocol at receiver location (cloud server) in XML/JSON format, preferably. Suitable provision in this regard will be intimated to the bidders.

(e) Protections (Earthing, Lightning, Grid Islanding etc).

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

LIGHTNING PROTECTION

a) The SPV power plants shall be provided with lightning & overvoltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etcThe entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per NFC 17-102:2011 standard.
The protection against induced high-voltages shall be provided by the use of SPD type II and suitable earthing such that induced transients find an alternate route to earth.

SURGE PROTECTION

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

EARTHING PROTECTION

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

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

GRID ISLANDING:

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

islanding protection. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.
b) A manual disconnect 4-pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

(f) IR/UV protected PVC Cables, pipes and accessories.

CABLES
Cables of appropriate size to be used in the system shall have the following characteristics:
i. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards
ii. Temp. Range: –10oC to +80oC
iii. Voltage rating 660/1000V
Excellent resistance to heat, cold, water, oil, abrasion, UV radiation
v. Flexible
vi. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the mini-mum (2%).
vii. For the DC cabling, XLPE or, XLPO insulated and sheathed, UV-stabilized single core multi-stranded flexible copper cables shall be used; Multi-core cables shall not be used.
viii. For the AC cabling, PVC or, XLPE insulated and PVC sheathed single or, multi-core multi-stranded flexible copper/Aluminium cables shall be used; Outdoor AC cables shall have a UV-stabilized outer sheath.
ix. The cables (as per IS) should be insulated with a special grade PVC compound formulated for out-door use. Outer sheath of cables shall be electron beam cross-linked XLPO type and black in colour.
x. The DC cables from the SPV module array shall run through a UV-stabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.
xi. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers
xii. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm; the minimum DC cable size shall be 4.0 mm2 copper; the minimum AC cable size shall be 4.0 mm2 copper. In three phase systems, the size of the neutral wire size shall be equal or half to the size of the phase wires.
xiii. Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified. In addition, cable drum no. / Batch no. to be embossed/ printed at every one meter.
xiv. 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, humidity, dirt, salt, burial and attack by moss and microbes for 25 years and voltages as per latest IEC standards. DC cables used from solar modules to array junction box shall be solar grade copper (Cu) with XLPO insulation and rated for 1.1kV as per relevant standards only.
xv. The ratings given are approximate. Bidder to indicate size and length as per system design re-quirement. All the cables required for the plant shall be provided by the bidder. Any change in cabling sizes if desired by the bidder shall be approved after citing appropriate reasons. All cable schedules/ layout drawings shall be approved prior to installation.
xvi. Multi Strand, Annealed high conductivity copper conductor PVC type ‘A’ pressure extruded insula-tion or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured

cable for under-ground laying. All cable trays including covers to be provided. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below:
BoS item / component Standard Description Standard Number Cables General Test and Measuring Methods, PVC/XLPE insulated cables for working Voltage up to and including 1100 V, UV resistant for outdoor installation IS /IEC 69947.
xvii. The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%.
xviii. The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%.

METERING AND GRID CONNECTIVITY

(a) Metering and grid connectivity of the roof top solar PV system under this scheme would be the responsibility of the Bidder in accordance with the prevailing guidelines of the JSEB/DVC / or CEA (if available by the time of implementation). BCCL shall facilitate connectivity; however, the entire responsibility lies with bidder only.

b)The bidirectional electronic energy meter (0.5 S class) shall be installed for the measurement of import/Export of energy.
c) The bidder must take approval/NOC from the Concerned DISCOM/DVC for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network and submit the same to BCCL before commissioning of SPV plant.
d) Reverse power relay shall be provided by bidder (if necessary), as per the local DISCOM/DVC requirement.

CONNECTIVITY
All the power will be evacuated at 240V-single phase or 415V-three phase at the option of the consumer

POWER CONSUMPTION
Regarding the generated power consumption, priority need to be given for internal consumption of BCCL first and thereafter any excess power can be exported to grid through microgrid system.

TOOLS & TACKLES AND SPARES:
a) After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the bidder for maintenance purpose. List of tools and tackles to be sup-plied by the bidder for approval of specifications and make from BCCL.
b) A list of requisite spares in case of PCU/inverter comprising of a set of control logic cards, IGBT driver cards etc. Junction Boxes. Fuses, MOVs / arrestors, MCCBs etc along with spare set of PV modules be indicated, which shall be supplied along with the equipment. A minimum set of spares shall be maintained in the plant itself for the entire period of warranty and Operation & Maintenance which upon its use shall be replenished.

DANGER BOARDS AND SIGNAGES:
Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date. Signage shall be provided at control room, solar array area and main entry. Text of the signage may be finalized in consultation with BCCL.

FIRE EXTINGUISHERS:
The firefighting system for the proposed power plant for fire protection shall be consisting of:
a) Portable fire extinguishers in the control room for fire caused by electrical short circuits
b) Sand buckets in the control room
c) The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided in the control room housing PCUs as well as on the Roof or site where the PV arrays have been installed.

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

PLANNING AND DESIGNING
a) The bidder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labour. The bidder should submit the array layout drawings along with Shadow Analysis Report to BCCL.
b) BCCL reserves the right to modify the landscaping design, Layout and specification of sub-systems and components at any stage as per local site conditions/requirements.
c) The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidder submit three sets and soft copy in CD of final drawing .

DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT
a) The Contractor shall furnish the following drawings Award/Intent and obtain approval
b) General arrangement and dimensioned layout
c) Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
d) Structural drawing along with foundation details for the structure.
e) Itemized bill of material for complete SV plant covering all the components and associated accessories.
f) Layout of solar Power Array
g) Shadow analysis of the roof.

SOLAR PV SYSTEM ON THE ROOFTOP FOR MEETING THE ANNUAL ENERGY REQUIREMENT
The Solar PV system on the rooftop of the selected buildings will be installed for meeting upto 90% of the annual energy requirements depending upon the area of rooftop available and the remaining energy requirement of the office buildings will be met by drawing power from grid at commercial tariff of DISCOMs/DVC.

SAFETY MEASURES:
The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.

DISPLAY BOARD

The bidder has to display a board at the project site mentioning the following:

a. Plant Name, Capacity, Location, Date of commissioning, estimated Power generation.

b. The size and type of board and display shall be approved by Engineer-in-charge before site inspection.

Manpower Training

The supplier/contractor shall train the users for the operation & maintenance of the plant.

ANNEXURE –J

Format for Monthly OPERATION& MAINTAINENCE

Component	Activity	Description	Date	Name / Signature	*Remarks
	Cleaning	Immediately clean any Bird droppings / dark spots on module.			
	Cleaning	Clean PV modules with plain water or mild dishwashing detergent.			
	Inspection	Infrared camera			

PV Module	>	inspection for hot spots; bypass diode failure.			
PV Array	Inspection	Check PV Modules & array for any damage			
		If any objects such as vegetation causing any shading of the array , to be removed			
	Vermin Removal	Remove Bird nests & vermin from array area .			
Junction Box	Inspection	Inspect electrical boxes For corrosion,intrusion Of water or vermin.			
		Check Position of switches &breakers , and all the protection devices .			
Wiring	Inspection	Inspect cabling For signs of cracks, defects, lose connections, corrosion, overheating, arcing, short or open circuits, and ground faults.			
Inverter	Inspection	Observe Instantaneous operational indicators on the faceplate.			
	Service	Clean or replace any air filters.			

Instruments	Validation	Verify monitoring instruments (Pyranometer etc.) with standard instruments to verify their operation within tolerance limits.			
Transformer	Inspection	Inspect transformer oil level, temperature gauges, breather, silica gel, meter, connections etc.			
		Daily Operation and			

Plant	Monitoring	Performance Monitoring.			
Spare Parts	Management	Manage inventory of spare parts.			
Log Book	Documentation	Maintai daily log n records.			
Tracker (if any)	Inspection	Inspect gears, gear boxes, bearings, motors.			
	Service	Lubricate bearings, gear as required.			

Date	Generation	Grid Outage	Inverter Down Period	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

25				
26				
27				
28				
29				
30				
31				

Total generation for the month in kWh:
Cumulative generation since commissioning in kWh:
CUF for month in %:
Cumulative CUF since commissioning in %:

(Signature of Authorized Signatory)
Name:
Designation:
Company Seal:

*Provide details of any replacement of systems/components, damages, plant/inverter shut down (planned/forced), breakdown, etc under remarks.

*Daily register is to be maintained by the bidder at each location. The same may be inspected by BCCL at any time 5 years of O&M period. The Register will have the information about the daily generation, Inverter downtime if any, Grid outages.

ANNEXURE-K

Certificate towards Local Content to be uploaded by the Bidder on his Letter Head during submission of bid online in compliance to clause no: 7(H)& 9(b) of NIT

We certify that the works/services offered by us against the tender for the work "……(Name of work)" against NIT No/Tender ID. ..... Dated……, meet the minimum local content requirement and has local content:

* Equal to or more than 50% *(Select this, in case of Class-I Local Suppliers) i.e……%* *(indicating the percentage of local content)*

* Equal to or more than 20% but less than 50% (Select this, in case of Class-II Local Suppliers*) i.e……%* *(indicating the percentage of local content)*

***Delete whichever is not applicable.**

Note:

1. This document is digitally signed by the DSC holder authorized by the bidder. Hence, no physical signature is required.