

the data from the RFID Tag & download the data to Computer. All associated Software & Cables are to be provided along with the RFID reader. The following information must be mentioned in the RFID used on each module.

- i. Name of the manufacturer – PV Module
- ii. Name of the Manufacturer of Solar cells
- iii. Month & year of the manufacture of the module (separately for solar cells and module)
- iv. Country of origin (separately for solar cells and module)
- v. I-V curve for the module at STC
- vi. Wattage, I_m , V_m and FF for the module
- vii. Unique Serial No. and Model No. of the module
- viii. Date and year of obtaining IEC PV module qualification certificate
- ix. Name of the test lab issuing IEC certificate
- x. Other relevant information on traceability of solar cells and modules as per ISO 9001

- l. DC : AC ratio not less than 1.25 should be considered for designing the SPV system.
- m. 10% spare of the modules shall be provided as mandatory spare by the bidder.

5.0 NAME PLATE

All individual modules shall be provided with Name Plate label at the back of module which shall provide the information given below for identification. They shall be clearly visible and shall not be hidden by equipment wiring. Type of labels and fixing of labels shall be such that they are not likely to peel off/ fall off during the life of the panel.

1. Manufacturer's Name
2. Model Number, Serial Number
3. Overall Dimensions (W x L x D)
4. Weight (kg)
5. Maximum Power (P_{MAX}), Voltage (V_{MP}), Current (I_{MP})
6. Short Circuit Current (I_{SC}), Open Circuit Voltage (V_{OC})
7. Main System Voltage
8. Relevant standards, Certification lab. name
9. Warnings, if any

6.0 TYPE TEST

SPV modules must be tested and certified for the peak power as per the name plate and the certification should be from any of the accredited certifying agencies according to above mentioned International Standards at clause 3.0 above and the type test reports shall be submitted for approval.

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 8
--	-------------------------	--------	-----------

A-2 MODULE MOUNTING STRUCTURE (MMS)

1.0 GENERAL

The PV modules shall be mounted on metallic structures called Module Mounting Structures (MMS) having adequate strength and appropriate design, which can withstand the load of the modules and design wind pressure.

2.0 CODES AND STANDARDS

The applicable codes and standards are as mentioned below:

1.	IS 875: Part 1 & 2	Code of practice for the design loads for buildings and structures
2.	IS 875: Part 3	Code of practice for the design loads for buildings and structures-Wind Loads
3.	IS 800: 2007	Code of practice for use of structural steel in general building construction
4.	IS 4759	Hot-dip zinc coatings on structural steel and other allied products
5.	IS 1868	Anodic Coatings on Aluminium and its Alloys

3.0 TECHNICAL REQUIREMENTS

- Modules shall be mounted on non-corrosive support structure with Seasonal Tilt type of mounting arrangement. The arrangement shall have provision to adjust it at two or three angular positions. The angular difference between two consecutive tilt positions shall not be less than 5 degrees (For winter minimum tilt 20 deg C).
- Mounting structures shall be designed to withstand the extreme weather conditions in the area. The site design wind speed factors k1, k2, k3 and k4 shall conform to IS 875 (Part-3): 2015 for the design of MMS.
- The structural material, corrosion protection and design, shall be as per Design Criteria for Module Mounting Structures (MMS) described elsewhere in this specification.
- The proposed foundation system for MMS shall be as per the geotechnical investigation report.
- The design philosophy and the calculations for the MMS and the foundation system shall be submitted for prior approval of NTPC before the commencement of construction.
- Further details related to structures and foundations have been mentioned in the chapter on civil works of this specifications.
- In case, String Combiner Box (SCB) shall be mounted on the Module Mounting structures, bidder to take into consideration the load of SCB during the design of MMS. Further suitable supporting members for mounting the SCB on the MMS shall also be within the scope of the bidder.

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 9
--	-------------------------	--------	-----------

8. Suitable provision of a mechanized arrangement for seasonal tilting of the Module Mounting Structure shall also be provided. The same may be provided using the jacks placed below the MMS at few locations and used for lifting the MMS. The Bidder may also propose alternate mechanized arrangement subject to NTPC approval.

A-3 DC CABLES

The DC Cables used for Interconnecting SPV modules, From SPV Modules up to SCB, from SCB up to the Inverter and BESS system shall meet following specifications:

1.0 DC CABLES (Interconnecting SPV MODULES and from SPV Modules TO SCB)

Cables used for inter-connecting SPV modules as well as Modules to SCB's shall conform to the requirements of EN 50618:2014 applicable for DC cable for photovoltaic system. This shall be applicable for both 1000V and 1500V modules.

The connectors used for interconnecting the modules and connectors used for connecting the strings and/or to the String combiner Box, i.e. field connectors to be mated shall be of same make and model otherwise they shall be tested for Inter-compatibility as per detailed specification of Field Connectors given elsewhere in this specification.

These cables shall also meet the fire resistance requirement as per the above standard.

All cables except module cable used for (+) ve and (-)ve shall have distinct color identification.

In addition to manufacturer's identification on cables as per EN50618:2014, following marking shall also be provided over outer sheath.

- (a.) Cable size and voltage grade
- (b.) Word 'FRNC' at every 5 meter
- (c.) Sequential marking of length of the cable in meters at every one meter

The Printing shall be progressive, automatic, in line and marking shall be legible and indelible.

Type test, routine, acceptance tests requirements for these cables shall be as per **EN50618:2014**. All test charges shall be deemed to be included in the cable price. Sampling for acceptance tests will be as per IS 7098.

A maximum of 8 Cables (4 Circuits) shall be laid in one HDPE Pipe for DC Cable from Module to string monitoring box (if applicable). The fill factor of the pipe should not be more than 40%. However, in case of necessity to lay more than 8 cables (4 circuits) in one pipe, the same shall be allowed during detailed engineering and as per the derating factors recommended by the cable manufacturer. Fill factor criterion is still to be maintained.

2.0 DC CABLES (STRING COMBINER BOX TO INVERTER)

Cables used between SCB's and Inverters shall be of 3.3 kV (E) grade. These Power cables shall have compacted Aluminium/copper conductor, XLPE insulated, PVC inner-sheathed (as applicable), Armoured/Unarmoured, FRLS PVC outer sheathed conforming to IS: 7098 (Part-I).

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 10
--	-------------------------	--------	------------

These cables shall confirm to the requirements of the standards & codes specified in Chapter titled LT Cables or any other relevant standard.

3.0 DC CABLES SIZING CRITERIA

The maximum overall voltage drop from Module to Inverter shall be limited to 3% of rated voltage.

A-4 STRING COMBINER BOX

1.0 GENERAL

String Combiner Box (SCB) shall have protection devices to protect the PV modules from current/voltage surges. Nos. of input to each SCB shall be decided during detail engineering based on the approved Single Line Diagram (SLD) submitted by contractor. Vendor to note that DC system 1500-Volt rating only is acceptable. Accordingly, component/assembly shall comply with 1500 V rating as applicable.

SCB shall be equipped (but not limited to) with the following:

- i. DC Disconnect /Breaker to disconnect the PV strings from the Inverter for maintenance purpose as per specification mentioned in this chapter.
- ii. All component in the SCB shall be suitable for operation within temperature range of 0-65 Deg C.
- iii. Fuse in each SCB input (both positive and negative) shall be provided to prevent the reverse short circuit current flow. However, in case of negative string fuse is not required as per recommendation of inverter manufacturer, string cable shall preferably be terminated with field connector with SCB.
- iv. Surge Protection Devices for protection against surge currents and voltages, other associated items like cable glands, lugs, vents and items required for the protection and completeness of the system shall be provided in the SCB.
- v. The common collection bus bars should be made up of zinc/tin coated copper and shall be suitably sized to limit temperature rise within safe operating limits.
- vi. Mounting plate inside the SCB for mounting/fixing of devices shall be made of FRP/GRP or equivalent non-conducting material
- vii. SPD shall consist of Metal Oxide Varistors (MOV) type surge arrestors which shall be connected from positive and negative bus to earth. The discharge capability of the SPD shall be at least 12.5kA at 8/20 micro second wave as per IEC 61643-12 and shall be rated for MCOV 1500 Volt DC. SPD shall have local visual indication and potential free contact for remote indication
- viii. String fuses in the SCB shall be of gPV category and dedicated to solar applications and conform to IEC 60269-6 or UL-2579 standards and fuse base shall comply with IEC 60269-1. Fuse holders shall be suitable for DIN rail mounting. PCB mounted fuses are not acceptable
- ix. SCB enclosure shall be made of UV Protected, Halogen Free, and Fire-retardant GRP/FRP/Polycarbonate material with self-extinguishing property and shall be at least IP 65. All the part shall be corrosion resistant and enclosure surface shall be free from crazing, blistering, wrinkling, color blots/striations. There should not be any mending or repair of surface.
- x. In each SCB 5 % spare terminals along with cable glands and fuse rounded off to next higher integer shall be provided to connect the PV strings.
- xi. In case, SCB is proposed to be mounted on structure in open, it has to be protected from top, suitable canopy/rain shed shall be provided on top of SCB extending minimum 50mm from all four sides. Design and dimensions of SCB structure must be such that minimum 600 mm of

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 11
--	-------------------------	--------	------------

ground clearance is available below SCB at site for repair and maintenance. All the erection hardware and mounting accessories shall be galvanized steel.

- xii. Solar PV on-load Isolator shall be suitable for minimum 1500 Vdc operational voltage, with minimum 250 Vdc per pole breaking. Any multipolar device achieving this configuration with Shorting links will not be acceptable. The Solar PV Isolators need to have a positive break indication and will have to comply with IEC 60947-3 and PV-2 for critical current

2.0 CODES AND STANDARDS

S No.	CODES	DESCRIPTION
1	UL 94V	Fire Resistant/ flammability for Enclosure
2	UL 746C	UV Resistant for Enclosure
3	IEC 62262/EN 50102	Mechanical Impact Resistance for Enclosure
4	IS 2147/IEC 60529	Degrees of protection provided by enclosures (IP Code)
5	IEC 61643-12	Surge Protection
6	IEC 62208	Enclosure for low voltage Switchgear and control gear assemblies

3.0 DC plug-IN CONNECTORS FOR FIELD CABLING

- i. Field connectors to be used for connecting SPV modules and String combiner boxes shall be in accordance with IEC 62852: 2014.
- ii. Connector shall be of plug and socket design to be plugged together by hand but can be separated again using a tool only. Contractor shall ensure that field connectors to be mated shall always be of same make and model or shall be tested Inter-compatible as per IEC 62852: 2014 for offered make(s). Mating of connectors of different makes/model shall not be acceptable if not tested for inter-compatibility by any accredited lab.

3.1 TECHNICAL REQUIREMENTS

Rated Current, IEC (85°C)	30 A (4 mm ² , 6 mm ²), 40 A (10 mm ²)
Rated Voltage	Min 1500 Volts
Connector Design	Snap-In locking Type
Protection Degree	IP68 (Mated)
Ambient Temperature	(-) 40° C to (+) 85° C
Protection/Safety Class	Class II
Contact material	Cu
Contact surface material	Silver/Tin
Contact resistance for plug connector	≤ 0.5 milli-ohms
Stripping length	10 mm
Inflammability class	UL 94-V0
Insulating Material	PPE / PPO/Polyamide
Pollution degree	3
Certification	UL/TUV/CSA/EAC or Equivalent

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 12
--	-------------------------	--------	------------

A-5 POWER CONDITIONING UNIT

- 1.00** The Power Conditioning Unit (PCU) shall consist of solid-state electronic switch along with all associated control & protection, filtering, measuring instruments and data logging devices. The PCU shall have suitable maximum power point tracker (MPPT) for operating the input PV Array at its maximum power point. The continuous combined rating of all PCUs shall not be less than plant capacity at unit power factor at ambient temperature of 50 deg and 0.95 p.f. at 40 deg.

2.00 CODES AND STANDARDS

The PCU shall conform to all applicable IEC standard. Where an applicable IEC standard is not available, IS/ any applicable international standard shall be referred to as best practice.

IEC-61683	Energy efficiency requirements
IEC 61000	Emission/ Immunity requirement
IEEE 519	Recommended practices and requirements for harmonic control in electrical power systems.
IEC 60068	Environmental testing
IEC 62116	Testing procedure—Islanding prevention measures for power conditioners used in grid-connected photovoltaic (PV) power generation systems
IEC 62109-1 & 2	Safety of power converters for use in photovoltaic power systems
EN 50530	Overall efficiency of grid connected photovoltaic inverters.
IEEE 1547/IEC 61727/ BDEW 2008	Standard for interfacing solar PV plant with utility grid.
IEEE 1547	Standard for interconnecting distributed resources with electrical power systems
IEC 60529	Ingress protection test
Grid Connectivity	Relevant CEA regulations (including LVRT/HVRT compliance) and Indian grid code as amended and revised from time to time.

3.00 GENERAL REQUIREMENTS

Applicable both for Central and String Inverter

- 3.01 As the SPV system is intended to be used without grid with BESS connected at the PCC, the offered PCU must be hybrid type suitable for the operation in absence of grid.
- 3.02 The minimum euro efficiency of the PCU as per IEC 61683 shall be 97%. The bidder shall specify the conversion efficiency at following load conditions i.e. 25%, 50%, 75% and 100% during detail engineering, which shall be confirmed by type test reports.

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 13
--	-------------------------	--------	------------

- 3.03 The PCU shall remain connected to the grid as per Central Electricity Authority Technical (standards for connectivity to the grid) regulation 2007 with all latest amendments and its components shall be designed accordingly.
- 3.04 The PCU shall be capable of operating in the frequency range of 47.5 Hz to 52 Hz and shall be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz.
- 3.05 The PCU shall be capable of supplying reactive power as per grid requirement (manual intervention through SCADA) during solar generation hours. However, reactive power support, below 0.95 power factor, might be as the behest of active power. PCU shall have night SVG function (Q at night).
- 3.06 The PCU must be self-managing and stable in operation.
- 3.07 The PCU shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU's safe operating range due to internal or external causes. The self-protective features shall not allow signals from the PCU front panel to cause the PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices.
- 3.08 PCU shall have active power limit control, reactive power and power factor control feature. Plant operator shall be able to provide (manual intervention) Active power, reactive power and power factor control/limit set point through SCADA HMI and local control display unit (or Laptop computer). PCU shall be provided with remote start and stop facility from SCADA HMI. All required hardware and software required for this purpose shall be provided by Bidder.
- 3.09 PCU shall have the following feature,
- AC & DC overcurrent protection.
 - Synchronization loss protection.
 - Over temperature protection.
 - DC & AC under and over voltage protection.
 - Under & over frequency protection.
 - Cooling system failure protection
 - PV array ground fault monitoring & detection
 - PV array insulation monitoring
 - LVRT
 - Anti-islanding protection
 - Grid monitoring
- 3.010 One number of laptop shall be provided for PCU configuration and troubleshooting purpose. Laptop shall be supplied with complete set of hardware & software accessories. Laptop detailed configuration must ensure suitability for the required applications. Supplied Laptop shall be protected with the latest anti-virus software and shall be provided 3 Years onsite warranty including its battery. At least two sets of communication cable for Laptop to PCU communication shall be provided.
- 3.011 DC Overloading: Maximum PCU DC overloading shall be limited to its design PV Array power to PCU nominal AC power ratio. Bidder needs to submit all the relevant technical documents/test report from PCU manufacturer (OEM) during detailed engineering stage in support of declared PCU design DC overloading capacity.

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 14
--	-------------------------	--------	------------

- 3.012 All-important alarm and trip signals shall be configured in the PCU and their corresponding modbus address shall be provided for SCADA configuration. Signal shall necessarily be included such as LVRT in action and trip operated, HVRT trip, islanding protection operated, over current operated, Inverter cabinet temperature high alarm and all other important signals. Details shall be finalized during details engineering stage.
- 3.013 **EARTHING OF INVERTERS:-** The PCU shall be earthed as per manufacturer recommendation. Bidder needs to submit the details earthing arrangement of PCU and system earth pit requirement during detail engineering stage. The detail specification for panel earthing for safety has been mentioned elsewhere in this specification.
- 3.014 **OPERATING MODES OF PCU**
- a) **Low Power Mode:-** The PCU shall be able to wake-up automatically when PV array open circuit voltage value is equal/more than preset value in the PCU program. Once its start generation the PCU shall automatically enter maximum power mode.
- b) **Maximum Power Point Tracking (MPPT):-** In order to maximize the energy collection from solar PV array, the PCU shall have inbuilt MPPT controller and same shall be able to operate the PV array at its maximum power point by adjusting output voltage of PV array system according to atmospheric condition. PCU MPPT controller shall ensure that it operate the PV array system at its global maximum power point under all operating conditions of PV array including cloudy atmospheric condition. The PCU shall operate within its MPPT operating input DC voltage range (window). The PCU MPPT operating DC voltage range shall be large enough so that it shall be able to satisfactorily operate the PV modules exposed to the maximum ambient temperature of 50°C or any other condition. In case the solar PV array operating maximum power point voltage fall below (or above) the PCU MPPT operating voltage range, then the PCU controller shall automatically adjust the PCU input voltage so that PCU shall not enter into sleep mode. If the PV array output power fall below the PCU minimum preset power value then PCU shall automatically switched to sleep mode. In case, PV modules connected to Inverter are in Flickering shading zone of Wind turbines, Suitable MPPT algorithm shall be adopted for those Inverters to optimize Energy Yield.
- c) **Sleep Mode :-** PCU shall automatically go into sleep mode when the output voltage of PV array and/or output power of the inverter falls below a specified limit. During sleep mode the inverter shall disconnect from grid. Inverter shall continuously monitor the output of the PV array and automatically start when the DC voltage rises above a pre-defined level. During evening and night (nonsolar generation hours) the PCU shall be in sleep mode in order to minimize the internal power losses. The maximum power loss in sleep mode shall be less than 0.05% of the rated power of PCU.
- d) **Standby Mode:-** In standby mode the PCU DC & AC contactor are open, inverter is powered on condition and waiting for start command.
- 3.015 PCU shall meet the following technical parameter

1.	Maximum Input voltage DC	1500 V _{dc}
2.	Nominal output voltage frequency	50Hz
3.	Continuous operating frequency range	47.5 Hz to 52 Hz
4.	AC Voltage Range	± 10% of rated AC voltage

5.	Euro efficiency	Minimum 97% (as per IEC 61683)
6.	Number of MPPT	Single MPPT or Multi-MPPT
7.	Surge Protection Device (SPD)	Type-I & II DC side
		Type-II AC side
8.	Operating power factor range	0.8 Lead to 0.8 Lag (adjustable)
9.	Night SVG (Q at Night)	Required.
10.	Current harmonics	As per CEA regulation requirement
11.	Current THD value	< 4% at nominal power
12.	DC Injection	<0.5 % at rated current
13.	Operating ambient temperature	0 to 50 ° C
14.	Humidity	95 % non-condensing
15.	Maximum Noise level (at 1 Meter distance)	75 dBA (for indoor application)
16.	Flicker	As per IEC 61000
17.	Auxiliary supply backup for LVRT operation	Minimum 10 sec
18.	Remote start and stop facility from SCADA	Required
19.	Active power limit control, reactive power, and power factor control features.	Required. Possible both from PPC and SCADA.
20.	PCU designed DC fault current level	Maximum short circuit current of PV array connected to PCU and duration one sec.
21.	PCU designed AC fault current level	Maximum short circuit current of LV side of Inverter Duty transformer and duration one sec.
22.	(i) AC & DC overcurrent protection. (ii) Synchronization loss protection. (iii) Over temperature protection. (iv) DC & AC under and over voltage protection. (v) Under & over frequency protection. (vi) Cooling system failure protection (vii) PV array ground fault monitoring & detection (viii) PV array insulation monitoring (ix) LVRT protection (x) Anti-islanding protection (xi) Grid monitoring	Required.

4.00 CENTRAL INVERTER

- 4.01 PCS must have provision to be isolated from grid through Air Circuit Breaker/MCCB. The ACB/MCCB as required can be provided as a part of PCS/its Modules or separately based on standard design and configuration of PCS manufacturer. The ACB and MCCB shall be able to withstand the maximum fault current for minimum one sec duration. ACB/MCCB shall be able to isolate PCU from AC grid under all fault current condition.

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 16
--	-------------------------	--------	------------

- 4.02 PCU shall have suitable rated DC Isolator/Contactor/MCCB for isolation of PV array from inverter. Suitable rated fuse shall be provided (at inverter end) in incoming DC cable from each string combiner box (SCB). Fuse requirement (at inverter end) in the negative side of incoming DC cable shall be as per inverter manufactures recommendation. In case fuse are not recommended by the inverter manufacturers, then suitable rated link in place of fuse shall be provided in the negative side of incoming DC Cables from each string combiner box. One set spare terminals with fuse/link (as applicable) and holder shall be provided for the future use.
- 4.03 String Monitoring facility: PCU shall be provided with current monitoring transducer at incoming DC cables from each string combiner box (SCB) for PV array zone monitoring purpose. The current transducers used for this purpose shall have accuracy of 0.5 class or better. The PCU shall be able to provide the measured DC current values and calculated DC power and energy value of incoming SCB DC cable to SCADA system for remote monitoring, storing and report generation. In case PCU does not have the facility/capability for power and energy calculation within its controller, then Bidder can provide the same facility in SCADA system
- 4.04 The PCU should be designed for parallel operation through galvanic isolation. Solid state electronic devices shall be protected to ensure smooth functioning as well as ensure long life of the inverter. Parallel operated PCU system are also accepted subjected to recommendation of PCU manufacturer. In such case, PCU design shall also ensure that no abnormal interaction shall take place among the PCU unit during any grid operating condition which may result in outages.
- 4.05 Local Display unit for viewing important parameters, configuration and troubleshooting purpose shall be provided. Display shall include all important electrical parameters. Inverter shall be provided with the required software along with accessories (2 sets) for interface with Laptop/PC for viewing, configuration and troubleshooting purpose.
- 4.06 PCU shall have suitable communication card (Modbus on TCP/IP protocol) for networking and SCADA integration and same shall support dual master communication. PCU shall include all important measured & internal calculated analog values and alarm & trip signals for remote monitoring, storing and report generation purpose in SCADA system. Details list of above such parameters shall be provided along with their Modbus address during detail engineering stage.
- 4.07 In case of modular design of PCU is offered, the Contractor shall ensure that no abnormal interaction shall take place among the various PCU modules during any grid operating condition which may result in outages. The PCU controller offered by the Contactor shall be such as to ensure stability, reliability, and a good dynamic performance. The Bidder shall indicate the control scheme adopted for modular PCU and its merits and the test which will check its performance.
- 4.08 Bidder may offer liquid cooling system subject to NTPC approval. In case Liquid cooled inverters are offered, Bidder to ensure that coolant is used in closed cycle. Complete inverter along with cooling system shall be of proven design.
- 4.09 The Inverter shall have suitable arrangement for negative grounding of solar PV array system and the ground current shall be limited to safe limit. Ground current shall be measured continuously, and alarm shall be generated in case ground current reaches to predefined set value. Inverter shall trip in case ground current more than safe operating limit.

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 17
--	-------------------------	--------	------------

- 4.010 Inverter shall have emergency stop push button for tripping of inverter with complete DC & AC electric isolation.

INDOOR CENTRL INVERTER

- a) The PCU enclosure protection class shall be IP 20 or better protection.
- b) **COOLING AND VENTILATION:-**

To prevent the maximum permissible temperature in the inverter room from being exceeded because of internal heat emission of inverters and other auxiliaries in the inverter room, the inverter room in the PV plant shall be adequately ventilated. The Ventilation plant capacity and air quality of inverter room shall as per inverter and other auxiliary's system manufacturer's recommendations. Filter banks at the air inlet of the inverter room shall be provided to prevent dust ingress. Bidder shall furnish peak power consumption of cooling system (cooling fans, pumps etc.) of the PCU along with the data sheet.

Ventilation shall be designed in such a way that the temperature rise of the inverter rooms does not exceed the maximum designed temperature of Inverters and other auxiliary equipment's placed inside the inverter room. Accordingly, the air velocity through the filter shall be suitably chosen to remove the heat from the inverter room. ACs of adequate capacity to be provided.

OUTDOOR CENTRL INVERTER

- a) Outdoor PCU enclosure (including containerized solutions) must be suitable to withstand the harsh environmental conditions for complete life of plant.
- b) The PCU enclosure and electronics compartment protection class shall IP 65.
- c) Bidder to submit temperature endurance test report of complete assembly during detail engineering stage.
- d) For Outdoor PCU (without containerized solution) the complete assembly should be placed inside a shed made of structural steel section preferably tubular/hollow section and color coated metal sheets for roof with BMT 0.5 mm and at least 60cm projection in all side. For containerized solution separate shed is not required, however, the container shall have projection of at least 60cm wherever an opening in the inverter door exposes the inverter component to outside environment. Structural steel and paints for shed shall be as per ISO 12944-5.

Alternatively, Bidder can also provide integrated protection to the inverter enclosure through suitable other arrangement (s) subjected to NTPC approval.

5.00 STRING INVERTER

- 5.01 The string inverter enclosure protection class shall be IP 65 or better protection.
- 5.02 The string inverter should be placed under a canopy shed with at least 15 cm in all direction, if installed in open. Alternatively, the Bidder can also install the inverter on the column post of the

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 18
--	-------------------------	--------	------------