



## UTTAR HARYANA BIJLI VITRAN NIGAM LIMITED

(A Power Distribution & Retail Supply Utility, Govt. of Haryana)

Regd. & Corp. Office: C-16, Vidyut Sadan, Sector-6, Panchkula, Haryana

Ph no. 0172-2564205, Website-www.uhbn.org.in

CIN No. U40109HR1999SGC034166, Email: [cecommercial@uhbn.org.in](mailto:cecommercial@uhbn.org.in)

		distribution system under any operating conditions	
12.	PowerFactor	While the output of the inverter is greater than 50%, a lagging power factor of greater than 0.9 shall be maintained	
13.	Islandingand Disconnection	The Photovoltaic system in the event of voltage or frequency variations must island/ disconnect itself within IEC standard on stipulated period	
14.	Overloadand Overheat	The invertershouldhavethefacilityto automaticallyswitchoff in case of overload or overheating and should restart when normal conditionsarerestored	
15	Cable	For interconnecting Modules, Connecting modules and junction Boxes and junction boxes to inverter, DC copper cable of proper sizes shall be used. To connect inverter with AC panel aluminium cable of proper size shall be used. All the internal cables to be used in the systems shall be included in the cost while 100mtr. AC aluminium cable of proper size to be used to connect inverter/PCU to AC panel shall be included in the cost of the system.	Relevant CEA regulations 2013 and subsequent if any, (Technical Standards for Connectivity of the distributed generation resource)

a) All switches and the circuit breakers, connectors should conform to IEC



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60947, part I, II and III/ IS60947 part I, II and III.

- b) The change-over switches, cabling work should be undertaken by the bidder as part of the project.

### **JUNCTION BOXES FOR CABLES FROM SOLAR ARRAY:**

The junction boxes shall be made up of FRP (Hensel or equivalent make)/PP/ABS with dust, water and vermin proof. It should be provided with proper locking arrangements.

Series / Array Junction Box (SJB/AJB) (whichever is required): All the arrays of the modules shall be connected to DCCB. AJB shall have terminals of bus-bar arrangement of appropriate size Junction boxes shall have suitable cable entry with suitable glanding arrangement for both input and output cables. Suitable markings on the bus bars shall have to be provided to identify the bus bars etc. **Suitable ferrules shall also have to be provided to identify interconnections. Every AJB should have suitable arrangement Reverse Blocking diode of suitable rating. Suitable SPD, suitable Isolation switches to isolate the DC input to Inverter has to be installed in AJB for protection purpose.** Thus AJB should have DC isolator for disconnecting the arrays from inverter input. **If in any case diodes, HRC Fuses, SPDs and isolators are installed in the string inverters, then there is need to install these again in AJB. If some of these safety gadgets are not installed in String Inverter it should be installed in AJB.** Cable interconnection arrangement shall be within conduit pipe on saddles installed properly. **Cable connection should be done in such a manner that fault findings if any, can be identified easily. The cables should be connected in such a manner that clamp meter can be comfortably inserted around the individual cables to measure the data like**



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**current, voltage etc.** AJB should also be marked as A1, A2, & so on. Wherever conduits are laid on wall/roof or ground, then it should be suitably laid in cable tray or appropriate civil structure which should be at least four inches above roof/ground level.

However, if the inverter/PCU is equipped with Junction Box, the cables may be connected directly to the ports provided in the inverter/PCU and no separate Junction Box is required.

#### **PROTECTION & SAFETY:**

Both AC & DC lines have suitable MCB/MCCB, Contractors, SPD, HRC Fuse etc to allow safe start up and shut down before & after string inverter installed in the system. String inverters should have protections for overload, surge current, high Temperature, over/ under voltage and over/ under frequency & reverse polarity. The complete operation process & safety instructions should printed on the sticker & suitably pasted on the near inverters.

Inverter should have safety measures to protect inverter from reverse short circuit current due to lightening or line faults of distribution network.

**Inverter should be suitably placed in covered area on a suitable platform or wall mounted or concrete platform (on rubber mat) with complete safety measure as per norms.**

#### **INVERTER/ARRAY SIZE RATIO:**

- The combined wattage of all inverters should not be less than rated capacity of power plant under STC in KW.
- Maximum power point tracker shall be integrated in the inverter to maximize energy drawn from the array



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### AC COMBINER BOX BOARD (ACCB):

This shall consist of box shall consists of grid interphase panel of good quality FRP/ suitable powder coated metal casing. One Electronic Energy Meter (0.2S Class), ISI make, Single/Three Phase duly tested by DISCOMs (Meter testing Division) with appropriate CT (if required), of good quality shall have to be installed at suitable placed to measure the power generated from SPV Power Plant, as per HERC Net Metering Regulations. Proper rating MCCB & HRC fuse and AC SPDs shall be installed to protect feeders from the short circuit current and surges as per the requirement of the site. **Operation AC Isolator Switch of Grid Connectivity should be such that it can be switched ON or OFF without opening the ACCB.**

### CABLES/WIRE:

All cables should be of copper as per IS and should be of 650V/1.1 KV grade as per requirement. All connections should be properly made through suitable lug/terminal crimped with use of suitable proper cable glands. The size of cables/wires should be designed considering the line loses, maximum load on line, keeping voltage drop within permissible limit and other related factors. The cable/wire should be of ISI/ISO mark for overhead distribution. For normal configuration the minimum suggested sizes of cables are:

Module to module/AJB	: 4 sq mm (single core) DC Cable
AJBs to MJB/DCCB/Inverter/PCU	<ul style="list-style-type: none"><li>• Up to capacity of 10 kWp Solar Plant, minimum 4sq mm (Single/Double core) DC Cable, with respect to current ratings of designing</li><li>• For capacity more than 10 kWp&amp; up to 20 kWp Solar Plant, minimum 6sq mm (Single/Double core) DC Cable, with</li></ul>



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	respect to current ratings of designing <ul style="list-style-type: none"><li>• For capacity more than 20 kWp Solar Plant, minimum 10sq mm (Single/Double core) DC Cable, with respect to current ratings of designing</li></ul>
Inverter to ACCB/Distribution board	AC Cable as per design & rating

The size & rating of the cables may vary depending on the design & capacity of SPV Power Plant.

#### **CABLE TRAY:**

All the cables should be laid in appropriate GI cable tray as per the requirement of the site, No cable should be laid directly on ground or wall cable tray should be laid such that there is gap of at least two inches above ground/roof/wall.

#### **DISPLAY BOARD:**

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

- Plant Name, Capacity, Location, Type of Renewable Energy plant (solar), Date of commissioning, details of tie-up with transmission and distribution companies, Power generation and Export FY wise.
- Financial Assistance details from HAREDA/MNRE/Any other financial institution apart from loan. This information shall not be limited to project site but also be displayed at site offices/head quarter offices of the successful bidder
- The size and type of board and display shall be approved by Engineer-in-charge before site inspection.



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- **DANGER BOARDS:** Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date.

### **MANUAL DISCONNECTION SWITCH:**

It should be provided to isolate the system from Grid which should be outside of ACCB.

### **AC DISTRIBUTION PANEL BOARD:**

- a) AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.
- b) All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.
- c) The changeover switches, cabling work should be undertaken by the bidder as part of the project.
- d) All the Panel's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz
- e) The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.
- f) All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.
- g) Should conform to Indian Electricity Act and rules (till last amendment).
- h) All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions.



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

### **DATA ACQUISITION SYSTEM / PLANT MONITORING**

- (i) Data Acquisition System shall be provided for each of the solar PV Project.
- (ii) Web based remote monitoring access of each project shall also be provided to UHBVN through software monitoring system with latest configuration. If needed access to MNRE shall also be provided.
- (iii) PV array energy production: Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system provided. Energy meter along with CT/PT should be of 0.2S accuracy class. For Hybrid there shall be provision in built in the PCU to measure generated solar energy as there is no option to install separate solar generation meter.  

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.
- (iv) All instantaneous data shall be shown on the computer screen.
- (v) Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.
- (vi) Provision for instantaneous Internet monitoring and download of historical data shall be also incorporated.

### **PRIORITY FOR POWER CONSUMPTION:**

Regarding the generated power consumption, in case of string inverter, priority need to given for internal consumption first and thereafter any excess power can be exported to grid.





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## **PROTECTIONS**

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

### **Lightning And Over Voltage Protection:**

The SPV Power Plant shall be provided with lightning and over voltage protection. The principal aim in this protection is to reduce the over voltage to a tolerable value before it reaches the PV or other sub-systems components. The source of over voltage can be lightning or any other atmospheric disturbance. The Lightning Arrestor (LA) is to be made of 1¼" diameter (minimum) and 12 feet long GI spike on the basis of the necessary meteorological data of the location of the projects. Necessary foundation for holding the LA is to be arranged keeping in view the wind speed of the site and flexibility in maintenance in future. Each LA shall have to be earthed through suitable size earth bus with earth pits. The earthing pit shall have to be made as per IS 3043. LA shall be installed to protect the array field, all machines and control panels installed in the control rooms. Number of LA shall vary with the capacity of SPV Power Plant & location. Number of LA should be in such a manner that total layout of solar modules should the effective coverage of LA's.

For systems up to 10 kWp the lightning arrester shall of conventional type and for above 10 kWp systems it should be of Early Streamer Emission (ESE) type.

### **Earthing Protection:**

Each array structure of the PV yard shall be grounded properly. In each array every module should be connected to each other with copper wires, lug teathed washers addition the lightning arrester/masts shall also be provided inside the array field. Provision shall be kept for shorting and grounding of the PV array at the time of maintenance work. All metal





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casing/shielding of the plant shall be thoroughly grounded in accordance with Indian Electricity Act/IE rules as amended up to date. The earthing pit shall be made as per IS: 3043. All the array structures and equipments/control systems shall be compulsorily connected to the earth, separately. Number of earthing shall vary with the capacity of SPV Power Plant & location. G.I. /Copper strips should be used for earthing instead of G.I. wires. LA should be installed to protect the array field & machines installed in the control rooms. Number of LA shall vary with the capacity of SPV Power Plant & location. Earth resistance shall not be more than 5 ohms.

**Surge Protection:**

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

**Grid Islanding:**

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 RooftopPV 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.

A manual disconnect 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



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maintenance. This switch shall be locked, if required, by the utility personnel

### **CONNECTIVITY:**

The user has to take approval/NOC from the Concerned DISCOM for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network and submit the same to UHBVN before commissioning of SPV plant, however the supplier have to extend all technical help to the user for preparing the documents required for getting the above clearance from DISCOMs.

Reverse power relay shall be provided by bidder (if necessary), as per the local DISCOM requirement.

The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the Distribution Code/Supply Code and amended from time to time. Following criteria have been suggested for selection of voltage level in the distribution system for ready reference of the solar suppliers.

<b>Plant Capacity</b>	<b>Connecting voltage</b>
Up to 10 kWp	240V-single phase or 415V-three phase as per requirement of electric connection of the consumer
Above 10kWp and up to 100 kWp	415V – three phase
Above 100kWp	415V – three phase or as per site requirement based on the availability of grid level and as per DISCOM rules

Utilities may have voltage levels other than above, DISCOMS may be consulted before finalization of the voltage level and system shall be designed accordingly.

### **DRAWINGS & MANUALS:**

Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical



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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.

Approved ISI and reputed makes for equipment be used.

### **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. All work shall be carried out in accordance with the latest edition of the Indian Electricity Act and rules formed there under and as amended from time to time.

### **CODES AND STANDARDS**

The quality of equipment supplied shall be controlled to meet the guidelines for engineering design included in the standards and codes listed in the relevant ISI and other standards, such as :

IEEE 928 Recommended Criteria for Terrestrial PV Power Systems.

IEEE 929 Recommended Practice for Utility Interface of Residential and Intermediate PV Systems.

IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Controllers.

National Electrical NEPA 70-(USA) or equivalent national standard.

National Electrical Safety Code ANSI C2- (USA) or equivalent national standard.



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JRC Specification 503 (Version 2.2 March 1991) or JPL Block V standard for PV modules.

The inverter manufacturer should attach efficiency certificate from Independent Third party Testing laboratory i.e. IEC, TUV, SNL/ERTL & STQC. PCU should confirm to IEC 61683 for efficiency measurements and IEC 60068 2 for environmental testing. MPPT unit should confirm to design qualification IEC 62093.

IEC 62116 for Anti Islanding

IEC 62109-1, IEC 62109-2 for safety

IEC 61727 FOR UTILITY INTERFACE.



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## **SECTION –V: SAMPLE FORMS/ANNEXURES AND PROCEDURES**



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**Annexure-I**

**Bid Security Declaration**

(The Bidder shall fill in this Form in accordance with the instructions indicated)

Date: ----- (as day, month and year) of Bid Submission]

Tender No. ----- [insert number of bidding process]

To: -----[insert complete name of Purchaser]

We, the undersigned, declare that:

1. We understand that, according to your conditions, bids must be supported by a Bid- Securing Declaration.

2. We accept that we will automatically be suspended from being eligible for bidding in any contract with the UHBVN for the period of 5 years, if we are in breach of our obligation(s) under the bid conditions, if we –

(a) Withdraw our Bid during the period of bid validity specified in the bidding document; or

(b) Having been notified of the acceptance of our Bid by the UHBVN during the period of bid validity;

(i) Fail or refuse to execute the Contract, if required, or

(ii) Fail or refuse to furnish the Security Deposit, in accordance with the tender

3. We understand that this Bid Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of;

(i) Our receipt of a copy of your notification of the name of the successful Bidder; or

(ii) Upon expiration of the bid validity period, or any extension thereof pursuant to your request;

Signed: ----- [insert signature of person whose name and capacity are shown] in the capacity of [insert legal capacity of person signing the Bid Securing Declaration]

Name: [insert complete name of person signing the Bid Securing Declaration]

Duly authorized to sign the bid for and on behalf of: [insert complete name of Bidder]

Dated on ..... day of ....., ..... [Insert date of signing]



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**Annexure-II**

**INFORMATION IN SUPPORT OF MEETING ESSENTIAL ELIGIBILITY**

CONDITIONS REGARDING ANNUAL TURNOVER OF THE BIDDER IN LAST THREE FINANCIAL YEAR ENDING 31.3.2021

**Annual turnover of the bidder in last three financial year**

Name of Bidder: .....

Annual turnover data for last three years ending on 31 <sup>st</sup> March 2021		
S.No.	Year	Turnover (Rs. in Lacs) (in Figures)
1.	2018-19	
2.	2019-20	
3.	2020-21	
4.	Total turnover in last three years ending on 31 <sup>st</sup> March 2021	

Signature with seal of bidder

Dated:

Signature of Chartered Accountant with seal

Name \_\_\_\_\_

M.No. \_\_\_\_\_

**Note:**

1. Bidder must complete the information in this form.
2. The information provided shall be certified by Chartered Accountant.