e) **SIM card should be recharge one week prior to the expiree of validity of data pack. In absence** Remote Monitoring and data acquisition due to expire of validity of data pack **considered as loss of generation.**

## 11. METERING:

As per the technical Specification WBSEDCL. (https://www.wbsedcl.in/irj/go/km/docs/internet/new_website/technicalSpecification.html)

## 12. POWER CONSUMPTION:

Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any surplus power can be injected in to the grid.

## 13. PROTECTIONS

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

### a. LIGHTNING PROTECTION:

The SPV power plants shall be provided with lightning & over voltage 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 SPDs should also be employed to provide the protection against the surges in Distribution boxes and wherever found necessary. The source of over voltage can be lightning, atmosphere disturbances etc. The 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 IEC62305 standard. The protection against induced high-voltages shall be provided by the use of Metal Oxide Varistors (MOVs)/Franklin Rod type LA/Early streamer type LA and suitable separate maintenance free earthing such that induced transients find an alternate route to earth. The current carrying cable from lightning arrestor to the earth pit should have sufficient current carrying capacity according to IEC 62305.According to standard, the minimum requirement for a lightning protection system designed for class of LPS III is a copper conductor with a cross section of 16 mm2 orequivalent.

Wiring up to 30 meter wire length is included in Project Cost, beyond 30 meter, the cost of wiring shall have to be borne by the beneficiary. Separate pipe for running earth wires of Lightning Arrestor shall be used.

## b. SURGE PROTECTION

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

## c. EARTHING PROTECTION

i. 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.
ii. Earth resistance should be as low as possible so as to meet the safety and protection requirements.
iii. All the earthings required as per the technical specifications should be maintenance free earthings.
iv. Each array structure of the PV yard, LT power system, earthing grid for switchyard, all electrical equipment, inverter, all junction boxes, etc.shall be grounded properly as per IS 3043-1987. All metal casing/ shielding of the plant shall be thoroughly grounded in accordance with CEA Safety Regulation 2010 .
v. Each string/ array and MMS of the plant shall be grounded properly. The array structures are to be connected to earth pits as per IS standards.
vi. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance.
vii. The complete earthing system shall be mechanically and electrically connected to provide independent return to earth.
viii. Earthing bus bar shall be terminated at both ends of the switchgear to suit the connections to outside earthing conductor. All components and the module are required to be earthed individually and are to be looped and connected to the earthing grid.
ix. Separate three earth pits shall be provided for individual three earthings viz.: DC side earthing, AC side Earthing and Lightning arrestor earthing. The earthing shall be done in accordance with latest Standards.
x. Earthing system shall consist of earth grids and electrodes buried in soil in the premises, embedded in concrete inside the buildings/rooms to which all the electrical equipment, metallic structures are connected to have earth continuity for safety reasons.
xi. The earthing shall be maintenance free type earthing and shall be done through at least 1.5 meter Electrode.

## d. GRID ISLANDING:

i. 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 immediately. 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 Anti islanding features. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.

ii. A manual disconnect 4 / 2 pole isolation switch (RCCB may also be used) 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.

**14. CABLES**

Cables of required 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: –10°C to +80°C.
iii. Voltage rating 660/1000V
iv. 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 minimum. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use.
vii. Cable Routing/ Marking: All cable/wires are to be routed in a RPVC pipe/ 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.
viii. The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25 years.
ix. The ratings given are approximate. All the cables required for the plant are to be provided by the bidder. Any change in cabling sizes if desired by the bidder/approved after citing appropriate reasons.
x. Multi Strand, Annealed high conductivity copper conductor PVC type ‘A’ pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground 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. Aluminium cable may be used on the AC-side of the PV system.
xi. The size of each type of DC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 1%.
xii. The size of each type of AC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 2 %.

## 15. CONNECTIVITY

The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the WBERC regulation for Grid connectivity and norms of WBSEDCL and amended from time to time.

## 16. DRAWINGS & MANUALS:

i. Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be provided to beneficiary. Agency shall upload scanned copies of complete technical datasheets for each equipment giving details of the specifications along with make/makes along with basic design of the power plant and power evacuation, synchronization along with protection equipment on the Web portal of Solar Roof top before commissioning.

ii. ISI marked (wherever applicable) and reputed makes equipment be used.

## 17. SOLAR PV SYSTEM ON THE ROOFTOP

The Solar PV system on the rooftop of the premises will be installed for PV capacity permitted by WBSEDCL as per regulation issued by WBERC.

## 18. 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 Safety Regulation 2010 etc.

## 19. Fire Buckets and Holding stand

### Type-II (Single Tier)

Each set of Fire Buckets and Fire Bucket Holding Stand shall have two (02) Fire Buckets and one (01) single Tier Fire Bucket Holding Stand with an arrangement of holding of minimum two (02) Fire Buckets. The Fire Bucket Stand shall be installed nearer the Array field.

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 Extinguisher:** DPC type dry power portable fire extinguishers of minimum capacity 5 kg shall be provided. Standard of Fire Extinguisher IS 13849 (with latest amendments)

**The Contractor shall also pay necessary charges periodically for refilling of the Fire Extinguisher till 5 Years of CMC period**

## 20. DOCUMENTATION:

Operation & Maintenance manual / user manual shall be supplied along with the each power plant. The manual shall include complete system details such as array lay out, schematic of the system, inverter details, working principle etc. Step by step maintenance and troubleshooting procedures shall be given in the manuals and provided to the beneficiary.

### e. SHADOW ANALYSIS:

The shadow analysis report with the instrument such as Solar Pathfinder or professional shadow analysis software (preferably the map based software's) of each site has to be submitted by Bidder and shall be his responsibility to educate the user to install the system only in shadow free space. Lower performance of the system due to shadow effect shall be the responsibility of the bidder and shall be liable for penalty for lower performance.

### f. CAPACITY UTILIZATION FACTOR (CUF):

The performance of a PV power plant is often denominated by a metric called the capacity tilization factor. It is the ratio of the actual output from a solar plant over the year to the maximum possible output from it for a year under ideal conditions.**CUF shall be minimum 11** % throughout the five year maintenance period, and necessary efforts shall be made to achieve it by the bidder.
**Capacity utilization factor is usually expressed in percentage.**

**Capacity Utilization Factor(C.U.F) =**
**(Actual energy from the plant (kwh)) / (Plant Capacity (kWp) x 24 x 365)**

**Illustration:**

- Installed system DC capacity = 1 $kw_p$
- Actual Energy Generation from 1 kWp Plant = 964kWh
- Plant Capacity= 1 kW

CUF = **(Actual energy from the plant(kwh)) / (Plant Capacity (kwp) x 24 x 365)x100**
**=((964/(1*365*24))*100**
CUF **=11.00%**

QUALITY CERTIFICATION, STANDARDS AND TESTING FOR GRID-CONNECTED ROOFTOP SOLAR PV SYSTEMS/POWER PLANTS

Quality certification and standards for grid-connected rooftop solar PV systems are essential for the successful mass-scale implementation of this technology. It is also imperative to put in place an efficient and rigorous monitoring mechanism, adherence to these standards. Hence, all components of grid-connected rooftop solar PV system/ plant must conform to the relevant standards and certifications given below:

| | |
|---|---|
| **Solar PV Modules/Panels** | |
| IEC 61215 and IS 14286 | Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules |
| IEC 61701:2011 | Salt Mist Corrosion Testing of Photovoltaic (PV) Modules |
| IEC 61853- 1:2011 /<br>IS 16170-1:2014 | Photovoltaic (PV) module performance testing and energy rating –:<br>Irradiance and temperature performance measurements, and power rating |
| IEC 62716 | Photovoltaic (PV) Modules – Ammonia (NH3) Corrosion Testing<br>(As per the site condition like dairies, toilets) |
| IEC 61730-1,2 | Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction, Part 2: Requirements for Testing |
| **Solar PV Inverters** | |
| IEC 62109 & IS : 16221 | Safety of power converters for use in photovoltaic power systems –<br>Part 1: General requirements, and Safety of power converters for use in<br>photovoltaic power systems<br>Part 2: Particular requirements for inverters. Safety compliance (Protection<br>degree IP 65 for outdoor mounting, IP 54 for indoor mounting) |
| IS/IEC 61683 latest<br>(as applicable) | Photovoltaic Systems –Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions) |
| IS :16169 :2014/<br>IEC 62116:2008 | Utility-interconnected Photovoltaic Inverters – Test Procedure of Islanding Prevention Measures |
| | |

| | |
|---|---|
| IEC 60068-2 / IEC 62093<br>(as applicable) | Environmental Testing of PV System – Power Conditioners and Inverters |
| **Fuses** | |
| IS/IEC 60947 (Part 1, 2 & 3), EN 50521 | General safety requirements for connectors, switches, circuit breakers (AC/DC):<br>1)Low-voltage Switchgear and Control-gear, Part 1: General rules<br>2)Low-Voltage Switchgear and Control-gear, Part 2: Circuit Breakers<br>3) Low-voltage switchgear and Control-gear, Part 3: Switches, disconnectors<br>switch-disconnectors and fuse-combination units<br>EN 50521: Connectors for photovoltaic system-Safety requirements and tests |
| IEC 60269-6:2010 | Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the<br>protection of solar photovoltaic energy systems |
| **Solar PV Roof Mounting Structure** | |
| IS 2062/IS 4759 | Material for the structure mounting |
| **Surge Arrestors** | |
| BFC 17-102:2011 | Lightening Protection Standard |
| IEC 60364-5-53/ IS 15086-5 (SPD)<br>IEC 61643-11:2011 | Electrical installations of buildings – Part 5-53: Selection and erection of<br>electrical equipment – Isolation, switching and control<br>Low-voltage surge protective devices – Part 11: Surge protective devices<br>connected to low-voltage power systems – Requirements and test methods |
| **Cables** | |
| IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)/ IEC69947 (as applicable) | General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation) |

| | |
|---|---|
| BS EN 50618 | Electric cables for photovoltaic systems (BT(DE/NOT)258), mainly for DC Cables |
| **Earthing /Lightning** | |
| IEC 62561 Series<br>(Chemical earthing)<br>(as applicable) | IEC 62561-1<br>Lightning protection system components (LPSC) – Part 1: Requirements for connection components<br>IEC 62561-2<br>Lightning protection system components (LPSC) – Part 2: Requirements for conductors and earth electrodes<br>IEC 62561-7<br>Lightning protection system components (LPSC) – Part 7: Requirements for earthing enhancing compounds |
| **Junction Boxes** | |
| IEC 60529 | Junction boxes and solar panel terminal boxes shall be of the thermo-plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use |
| **Energy Meter** | Bi-directional Energy Meters shall be provided by Empanelled Agency as per the specification of WBSEDCL |

**PART-H- All the annexures are required to be filled up with correct information and Submitted with the Technical Bid Cover**

## Annexure -1
## EOI condition Undertaking

(To be submitted in 'on-line' and physical mode by Both 'Category-A' and 'Category- B' bidders on the their letter head)

**From:- (Full name of EOI Applicant ) …….. …….**

**Address of the Organisation…… …….**

**Email ID:……**

**PHONE /MOBILE NO.:……**

**To:**

**The Chief Engineer**

**Solar Power Generation Department**

**5th floor,B-Block**

**Vidyut Bhavan**

**Kolkata-700091**

**Sub: Expression of Interest (EOI) for Empanelment of Agencies for Design, Supply, Installation, testing & Commissioning of Grid connected Rooftop Solar Photovoltaic Systems in Residential premises, aggregating to 50 MW, including five years' comprehensive maintenance in the State of W.B during the Year (2021-22).**

**Ref: EOI No: WBSDCL/SPGD/RTS Phase-2/2020-21/NIT-28 Dt: 25.08.2021**

**Dear Sir,**

In connection with the above subject, I / We confirm the following:

1. I/We, the undersigned [insert name of the 'Bidder'] having read, examined and understood in detail the EoI document hereby submit our "Expression of Interest" in full compliance with terms & conditions of the above referred EOI. A copy of the EOI documents, duly signed on each page is also submitted as a proof of our acceptance of all specifications as well as terms/ Conditions. I/ We have submitted the EOI offer in electronic form on ON-LINE mode.

2. I/We have paid the requisite amount of EMD in online mode as per WBSEDCL office order No. 1997 dated 14.06.2021 . I/we understand that without payment of the EMD by us, our offer shall out rightly be rejected.

3. If, I/we are selected and shortlisted for the empanelment, we agree to pay the non-refundable Empanelment Registration fee of Rs. 25,000/- plus GST (Twenty-Five Thousand plus GST).

4. We agree to pay Security Deposit (SD) and Performance Guarantee (PG) – which is to be retained for the Empanelment period and performance guarantee period as per the EOI terms. I/We understand that I/we shall not be empanelled if we fail to pay complete registration fee in stipulated time.

5. I/We agree to treat the bid document and other records connected with the Works as secret and confidential documents and shall not communicate information described therein to any person other than the person authorized by you or use the information in any manner prejudicial to the safety of the Works.

6. I/We understand that you are not bound to accept the lowest or any proposal you may receive.

7. I/ We are participating, as Bidders, in note more than one Bid in this Bidding process

8. I / We declare that our offer is strictly in line with EOI Document Specification and there is no deviation. Further, I/We also agree that additional conditions / deviations, if any, found in our offer, the offer shall be out rightly rejected without assigning any reason thereof. We shall ensure that we execute such EoI Documents as per the provisions of the EOI and provisions of such EOI Documents shall be binding on us. I/We confirm that we have not taken any deviation so as to be deemed non-responsive.

9. I/We hereby unconditionally and irrevocably agree and accept that the decision made by WBSEDCL in respect of any matter regarding or arising out of the EoI shall be binding on us. We hereby expressly waive any and all claims in respect of Bid process.

10. I/ We confirm that there are no litigations or disputes against us, which materially affect our ability to fulfill our obligations with regard to execution of projects.

11. I / We hereby submit our offer and undertake to keep our offer valid for a period of 120 days from the date of opening of technical offer. I / We hereby further undertake that during the said period, I / We shall not vary/alter or revoke my/ our offer.

12. I/We also agree to abide by and fulfill all the terms, conditions and provisions of the above mentioned offer documents.

13. I/We also agree to abide by and fulfill all the terms, conditions and provisions of the mentioned in the condition 61.(B).(I) –MINIMUM ELIGIBILITY CONDITIONS: 'Conflict of Interest among Bidders/ Agents':-

**(Signature of EOI Applicant bidder)**
**With Seal**

**ANNEXURE-2**

**Details of the EPC work Execution Capacity**

(To be submitted in 'on-line' and physical mode by Both 'Category-A' and 'Category- B' bidders)

EPC Project execution capacity of the bidder per month for: Design, Supply, Installation, testing & Commissioning of Grid connected Rooftop Solar Photovoltaic Systems including Five years Maintenance in Residential premises executed under F.Y (2021-22)

| Sr. No. | Solar Rooftop PV System Capacity/Capacity range in KW | Aggregate Capacity of execution of EPC work per month in KW |
|---|---|---|
| 1 | 1 kW | |
| 2 | >1.00 to 2.00 kW | |
| 3 | >2.00 to 3.00 kW | |
| 4 | >3.00 to 5.00 kW | |
| 5 | >5.00 to 6.0 kW | |
| 6 | >6 to 10 kW | |
| 7 | > 10 KW and up to 100 KW | |
| 8 | > 100 KW and up to 500 KW | |
| | **Total Aggregate Capacity** | |

**(Signature of EOI Applicant bidder)**

**With Seal**

**ANNEXURE – 3**

**Details of the Experience and declaration of Category of the bidder**

(To be submitted in 'on-line' and physical mode by Both 'Category-A' and 'Category- B' bidders)

## Category: A / B

**Submission of information in support of Experience:**

'Category-A' bidders who have experience of successful installation of minimum aggregate 200 KW capacity of solar rooftop systems in residential sector before the scheduled date of submission of Technical Bid. Such experience should be of the BIDDER himself.

OR

Category-A' bidders who have experience of successful installation and Commissioning of minimum aggregate 1000 KW capacity of any Grid connected systems in any sector viz. residential, social, industrial, commercial, government, under SKY Scheme or any other, before the scheduled date of submission of Technical Bid. Such experience should be of the BIDDER himself.

| Sr. No. | Name of the Beneficiary | Address, Phone No./ Mobile No. | WBSEDCL<br><br>Registration No. & Date<br>Or<br>SECI No. &Date (for the Project registered at above respective Government Organization ) | Other Order No/ Reference no. and date, if any | Date of WBSEDCL's Net-Meter installation / Date of Commissioni-ng | Capacity of the SPV System installed and commissioned in KW |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| **Total of above Experience in KW----------- >** | | | | | | |

| | |
|---|---|
| Note:- | If Experience as mentioned above fulfils, the Bidder category shall be 'Category-A' otherwise the bidder shall be of the category-B (Category B Experience Not Applicable) |
| | Please write down applicable category of bidder below i.e. "Category-A" or Category-B" |

**I/We hereby confirm that the experience mentioned above by us are actual for Soalr Rooftop/ grid connected SPV System installed & Commissioned by us as a bidder only and considering the EOI Criteria, I/we declare that my/our bidder category is "_____".**

(Self-Certified Copies of Work orders, WBSEDCL Registration No, SECI Project No. etc, if any, along with Work completion certificates shall be attached with this information. If necessary, separate sheet may be used to submit the information.)

**(Signature of EOI Applicant bidder)**

**With Seal**