

CESL, envisages the execution of green energy technologies by way of implementing rooftop and carport Solar PV Power Plant with BESS in the UT of Ladakh, India. This would not only be a leap towards harnessing the use of renewable energy for Ladakh but also be means of self-reliant and economical expenditure on energy requirement, which would capitalize the abundance of Solar Energy resource in the region. Energy storage is increasingly being examined as a solution for deploying electric vehicle charging in areas where the grid is constrained in areas like Ladakh. The standalone solar powered integrated with Lithium ion battery storage charging stations will ensure that the EVs driven are completely carbon neutral. The charging stations would charge 10 Hyundai Kona EV four wheelers with battery capacity of ~ 39kWh each.

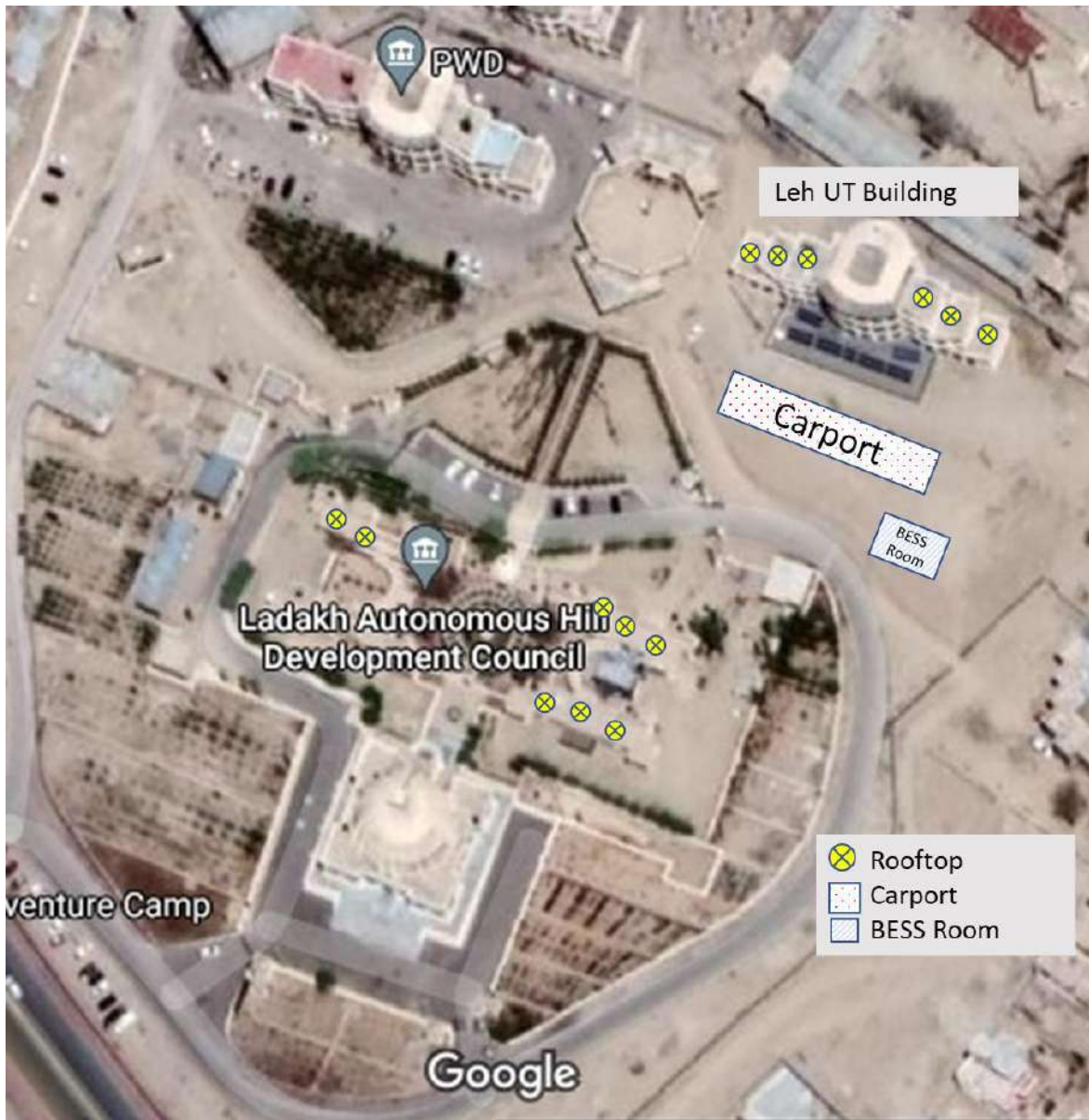
The overall solar PV capacity identified is around 242 kWp (tentative) with Li-ion battery storage of 762 kWh. (tentative). The contractor can submit revised capacity of both solar PV and battery based on actual site survey and on the following assumptions.

Car Specifications	
Hyundai Kona battery capacity (kWh)	39.2
Car Battery Voltage (V)	327
Number of Cars (Count)	10
Charging Infrastructure Specifications	
Please refer the Section A of Scope of Work for detailed specifications	

Location:

Latitude and Longitude: [34.151115, 77.579343](#)

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Note: The identified locations are tentative for installation of solar carport and rooftop systems, the actual area may be increased/decreased based on site assessments.

Indicative Site Images:

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NTT Bid Document No.: CESL/06/2021-22/BESS/212207023 dated
30.07.2021

SECTION-4
(Technical & SCC)

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3. SCOPE OF WORK/SERVICES

Brief scope of work

The successful contractor will Design, engineer, procure & supply of equipment and materials, testing at manufacturers' works, multi – level inspections, packing and forwarding, supply, receipt, unloading and storage at site, associated civil works, services, permits, licenses, installation and incidentals, insurance at all stages, erection, testing and commissioning of the following Solar PV Projects and performance demonstration with associated equipment and materials on turnkey basis with 05 (Five) years comprehensive operation and maintenance from the date of Operational Acceptance.

- (1) Solar carport at an area which can accommodate 10 Hyundai Kona cars; expected capacity 50 kWp
- (2) Solar rooftop power plant; approximate capacity 190 kWp
- (3) Battery Energy Storage System.

Design, Procurement & Supply and erection

- a) Solar panels including module mounting structures and fasteners along with the supply of BESS.
- b) All power conditioning systems including junction boxes, Inverters/ PCU, DC and AC circuit breaker(s).
- c) All associated electrical works and equipment required for interfacing line/ cable (i.e. transformer(s) – power and auxiliary, breakers, isolators, lightning arrestor(s), LT/other panels, protection system, cables, metering etc., but not limited to) as per technical specifications.
- d) Design, supply, erection, testing & commissioning defined in scope of work/ TS as per project requirement and associated switchgear equipment and metering equipment as per technical specification and state regulations
- e) All associated civil works, including design and Engineering, for: Earthwork for Site grading, cutting, filling, levelling & compacting, internal Roads, water drainage in the requisite project site as required for development of this Solar PV Power Plant
- f) Construction of Passage for Cleaning of Solar PV Project
- g) Construction of rain water drainage, if required
- h) Setting up of a comprehensive Fire Protection system as per the Hazardous area classification for the site
- i) Supply of mandatory spares & special tools and tackles
- j) Demonstration of performance of the plant as per the requirement specified
- k) Comprehensive operation & maintenance of the SPV plant for 05 (Five years)
- l) Obtaining all associated statutory and regulatory compliances ,clearances, permits and approvals for successful construction, commissioning and operation of plant for 5 years.
- m) Adequate and seamless insurance coverage during construction and O&M period to cater all risks (fire & allied perils, earthquake, terrorists, burglary, riots, power output warranty) related to construction and O&M of project to indemnify CESL.

Testing Equipment, Tools and Tackles

The Contractor shall arrange for all the necessary testing equipment, tools and tackles for carrying out all the construction, operation and maintenance work covered under this contract. All the instruments are required to be calibrated from NABL accredited lab before put in use. The certificate of the same shall be submitted to CESL for verification.

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4. Technical Specifications of the system

a)

Technical Specification of Solar Plant

PV Module:

- i. Photovoltaic Modules (as per list of manufacturers and models of Solar PV modules enlisted under ALMM order of MNRE) shall comply with the specified edition of the following standards and codes. The Photovoltaic modules must be tested & approved by one of the IEC authorized test centres, Test Certificates can be from any of the NABL / BIS accredited testing / calibration laboratories the module type must be qualified as per IEC 61215 (Second Edition). In-addition, PV modules must qualify to IEC 61730 Part I to II for safety qualification testing, IEC 61701-Salt Mist Corrosion Testing of Photovoltaic (PV) Modules, IEC 62716-Photovoltaic (PV) Modules – Ammonia (NH₃) Corrosion Testing, IEC 62804 (Technical Specifications)-Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation, and IEC 62759-1-Photovoltaic (PV) modules – Transportation testing, Part 1: Transportation and shipping of module package units. SPV module conversion efficiency should not be less than 18.0% under STC.
- ii. The PV module used in Grid Connected Solar Power system should have the latest addition of following BIS-PV Module qualification test or, equivalent IEC Standards: -
- iii. The power output of the module (s) under STC should be as given in section scope of work. Modules of minimum 350 Watts output each or above output should be used (Mono Crystalline or Bifacial). Photo/ electrical conversion efficiency of SPV module shall be greater than 18% under STC.
- iv. All materials used shall have a proven history of reliable and stable operation in external applications. It shall perform satisfactorily in relative humidity up to 100% with temperatures between 0° C and +85° C and with stand gust up to 200 km/h from back side of the panel. The terminal box on the module should have a provision for opening for replacing the cable, if required.
- v. Aluminum extruded frame structures with adequate strength and in accordance with relevant BIS standards can also be used with proof that the design of the structure can withstand the wind speed of 200 km per hour as per BIS Standards.
- vi. A strip containing the following details should be laminated inside the module so as to be clearly visible from the front side.
- vii. The PV Modules glass panel shall be: (i) Glass-glass Modules, with minimum of 2 mm glass thickness on each side. It shall be laminated using a laminator with symmetrical structure, i.e. heating plates on both sides. (ii) The glass used shall have transmittance of above 90%.

Module Mounting Structure and Carport Structure:

- i. The array structure shall be made of hot dip galvanized MS angles of size not less than 50 mm x 50 mm x 6 mm size. The minimum thickness of galvanization shall be at least 80 (Eighty) microns. All nuts & bolts shall be made of very good quality ISI grade stainless steel. The minimum clearance of the lowest part of the module structure and the developed ground level shall not be less than 500 mm or as per site situation(s).
- ii. Leg assembly of module mounting structure made of different diameter galvanized tubes may be accepted. The work should be completed with supply, fitting fixing of clamps, saddles, nut & bolts etc. While quoting the rate, the bidder may mention the design & type of structure offered. All nuts & bolts shall be made of very good quality stainless steel.
- iii. The structure shall be designed to allow easy replacement of any module and shall be in line with site requirements. The structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the

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- mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site.
- iv. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels at the same time it will withstand wind speed up to maximum 200 km/h.
 - v. The supplier/ manufacturer shall specify installation details of the PV modules and the support structures with appropriate diagrams and drawings.
 - vi. Separate drawings for carport structure and rooftop along with total load bearing capacity, considering snowfall; should be submitted by the bidder. It is the responsibility of bidder to design carport in such a way that it should not only able to accommodate electric vehicles but also be able to efficiently utilize space for charging stations.
 - vii. PCC ARRAY FOUNDATION BASE: The legs of the structures made with GI angles will be fixed and grouted in the PCC foundation columns made with 1:2:4 cement concrete. The minimum clearance of the lowest part of any module structure shall not be less 500 mm from ground level. While making foundation design, due consideration shall be given to weight of module assembly, maximum wind speed of 200 km/h and seismic factors for the site and the roof conditioning.
 - viii. It is sole responsibility of the bidder to repair/paint/waterproofing (if required) on the roof or levelling of ground/foundation works for carport, before submitting the final bid. In any case damage or low quality of work shall not be acceptable.
 - ix. After taking into consideration all aspects of the site, roof top strength etc., the bidder shall quote for civil works. The foundation design of module structure design shall be submitted to CESL for approval. The work will have to be carried out as per designs approved by CESL from time to time, considering high quality of work and output.

Power Conditioning Unit (PCU)/Inverter Standards and Specifications

The details of the Power Conditioning Unit are as given below:
Inverter of the suitable capacity per location has to be used.

The inverter must comply with the following standards as used in grid connected solar PV systems in terms of quality and safety measures: -

- i. The power conditioning unit should have multiple MPPT controls for multiple strings. The Individual Inverter should not be less than 1kVA and not be greater than 50kVA (3-phase). A multi-function power conditioning system combining the functionality of a Hybrid solar inverter with a highly efficient conversion unit having following Technical Specification:
- ii. IEC 62109-1, IEC 62109-2: Safety of power converters for use in photovoltaic power systems - Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)
- iii. IEC/IS 61683: Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
- iv. IEC 62116 or, IEEE 1547: Utility-interconnected Photovoltaic Inverters - Test Procedure of Islanding Prevention Measures
- v. In-addition, “IEC 61727:2004 Photovoltaic (PV) systems - Characteristics of the utility interface” is being added, along-with “Technical Standards for Connectivity of the Distributed Generation Resources” as published by Central Electricity Authority (CEA), Ministry of Power, Govt. of India.
- vi. IEC 60068-2 (1, 2, 14, 30 & 64): Environmental Testing of PV System – Power Conditioners and Inverters
- vii. IEC 60068-2 (1, 2, 14, 30 & 64): Environmental Testing of PV System – Power Conditioners and Inverters
 - IEC 60068-2-1: Environmental testing - Part 2-1: Tests - Test A: Cold
 - IEC 60068-2-2: Environmental testing - Part 2-2: Tests - Test B: Dry heat
 - IEC 60068-2-14: Environmental testing - Part 2-14: Tests - Test N: Change of temperature
 - IEC 60068-2-30: Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)

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- IEC 60068-2-64: Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance
- IEC 61000: Part 2 (Environment), Part 3 (Limits) & Part 6 (Generic standards): Electromagnetic Interference (EMI), and Electromagnetic Compatibility (EMC) testing of PV Inverters (as applicable)

The bidder shall use the original parts in case of any fault in the PCU/Inverter during the O&M period of 5 years. In case the original part/parts are not available with the manufacturer of the PCU/Inverter (Based on certificate from the manufacturer), the bidder shall use the new parts of other standard brands available in the market or will use the repaired parts but only with the prior permission of CESL

Cable and Connectors- All the cables and connectors used for installation of solar field must be of solar grade which can withstand harsh environment conditions for 25 years from the COD/Commissioning and voltage as per latest IEC standards. (Note: IEC standard for DC cables for PV systems is under development. It is recommended that in the interim, the cables of 600-1800 V DC for outdoor installations should comply with the BS EN 50618:2014/2pfg 1169/08.2007 for service life expectancy of 25 years.

Other sub-systems/components- Other subsystems/ components used in the SPV Power Plants (Cables, Connectors, Junction Boxes, Surge Protection Devices etc.) must also conform to the relevant international/national Standards for Electrical Safety besides that for Quality required for ensuring Expected Service Life and Weather Resistance.

Authorised test centres- The PV modules/ Power Conditioners deployed in the Power Plants must have valid test certificates for their qualification as per above specified IEC/ BIS Standards by one of the NABL Accredited Test Centres in India. In case of module type/equipment for which test facilities may not exist in India at present, test certificate from reputed ILAC member body accredited labs abroad will be acceptable.

Identification and Traceability- Each PV module used in any solar power Project must use a RF identification tag. The following information must be mentioned in the RFID used on each module (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions):

- a. Name of the manufacturer of PV Module
- b. Name of the Manufacturer of Solar cells
- c. Month and year of the manufacture (separately for solar cells and module)
- d. Country of origin (separately for solar cells and module)
- e. I-V curve for the module at Standard Test Condition (1000 W/m², AM 1.5, 250C)
- f. Wattage, Im, Vm and FF for the module
- g. Unique Serial No. and Model No. of the module
- h. Date and year of obtaining IEC PV module qualification certificate
- i. Name of the test lab issuing IEC certificate
- j. Other relevant information on traceability of solar cells and module as per ISO 9000
- k. Contractors would be required to maintain accessibility to the list of Module IDs along with the above parametric data for each module

Performance monitoring- The solar PV power projects must install necessary equipment to continuously measure solar radiation, ambient temperature, wind speed and other weather parameters and simultaneously measure the generation of DC power as well as AC power generated from the plant. They will be required to submit this data to CESL or any other designated agency on line and/or through a report on regular basis every month for the entire duration of project. In this regard bidder shall mandatorily also grant access to CESL or any other designated agency to the remote monitoring portal of the power plants on a 24x7 basis

Generation Criteria

CUF shall in no case be less than 17% (Seventeen Percent) in the first year (linear degradation of 0.75% is permitted after 1st year). It shall be the responsibility of the bidder, entirely at its cost and expense to install such number of Solar panels and associated equipment (including

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arrangement of extra land for such installation) as may be necessary to achieve the required CUF, and for this purpose bidder shall make its own study and investigation of the GHI and other factors prevalent in the area which have implication on the quantum of generation.

b)

Technical Specification of Battery Energy Storage System

- i. Battery Technology: Lithium ion battery technology with totally maintenance free characteristic suitable for operation in site-specific climatic conditions
- ii. Rated No of Cycles (Minimum): 4000 cycles at rated energy capacity at minimum 80% Depth of Discharge (DoD) at 25 Degree Celsius.
- iii. Power Rating: 242 KW (tentative)
- iv. Watt-hour rating: Dispatchable capacity shall not be less than 80% of Beginning of Life capacity at any point of time up to End of Battery Life.
- v. System ac-dc-ac efficiency: > 85%
- vi. Charge – Discharge Cycles: One discharge cycle per day is envisaged overall
- vii. Ventilation System inside the Container: Should be such as to maintain minimum and maximum Temperature as recommended by the manufacturer for optimum performance of the batteries on continuous basis.

c)

TECHNICAL SPECIFICATIONS OF CHARGER CCS 2.0 (50kW/60kW)

Charger	Charger Connectors*	Rated Voltage (V)	No. of Charging Points/No. of Connector guns (CG)
CCS 2.0 50kW (60kW)	CCS2 2.0 (Min 50 kW)	200-750 or higher	2/2 CG

(1) Energy transfer mode: Conductive

(2) EVSE type:

a. CCS 2.0

(3) No. of outputs:

a. CCS2 2.0 : 2 Output (Both CCS2 Connectors)

b. Operation sequence shall be as follows

i. When One EV is connected, the CCS2 charger connector/gun shall be able to dispense full output of minimum 50kW to EV.

ii. When both CCS2 charger connectors/guns are in parallel operation, the charger shall be able to do auto load sequencing with equal load sharing between the two connectors i.e.. minimum 25kW from each CCS2 gun to charge two connected EVs simultaneously.

iii. Parallel operation of both CCS2 connectors is a must.

(4) Charger CCS 2.0 (50kW/60kW) shall be Compact Pillar charger.

i. **System Structure**

a) Regulation: Regulated DC EV Charging station with combination of the modes: controlled voltage charging (CVC) and controlled current charging (CCC)

b) Isolation: Isolated DC EV charging station, according to the type of insulation between input and output: a) Double insulation

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- c) Environmental conditions: Outdoor use. EVSEs classified for outdoor use can be used for indoor use, provided ventilation requirements are satisfied.
- d) Power supply: AC mains to EVSE charging station
- e) DC output voltage rating: 200-750V or higher (CCS2)
- f) Charge control communication: Communicate by digital and analog signals
- g) Output Current: 200A DC
- h) Interface Inter-operability: Interoperable with any EV supporting CCS2

ii. **Input Requirements**

- a) Rating of the AC supply voltage
 - 1. The AC supply system would be 3-Phase, 5 Wire AC system (3Ph+N+E) Nominal Input Voltage is 415V (+15% and -15%). There shall be provision in the charger to set the input voltage range to $\pm 20\%$ of nominal input voltage.
 - 2. The Rated value of the frequency is 50 Hz \pm 1.5Hz.
- b) Battery back-up: The Input supply system should have a battery backup for minimum 1 hour for control and billing unit. The battery should be of high quality, and shall have a life of 10 years. The data logs should be synched with CMS during back-up time, in case battery drains out.

iii. **Output Requirements**

The CCS 2.0 chargers should allow charging of vehicle with power 50 kW, maximum upto 60kW.

- a) DC Output voltage: 200-750V or higher
- b) Output current: 200A
- c) Converter Efficiency: > 95% (10-100% load) for Input Voltage Range (415V \pm 15%)
- d) Power factor: > 0.98 (Full Load) for Input Voltage Range (415V \pm 15%)
- e) Current & Voltage THD < 5% for Input Voltage Range (415V \pm 15%)
- f) The standby power of charger shall be <50W.

iv. **Cable Requirements**

Charging Cable Assembly: The functional characteristics are defined below

- a) Functional characteristics: The maximum usable cord length will be 5000mm, straight cable
- b) Cable Connection Type: supply cable will be with EVSE as per Case C defined in section 6.3.1 of IEC61851-1.
- c) Connector must be in accordance with IEC 62196-3 with a voltage range upto 1000V (DC). DC connector must have **silver-plated power contact with replaceable mating frame for replacement of only plastic frame** and have **two temperature sensors** for measurement of **temperature for both the power contacts (DC+ and DC-)**. Connector must fulfill IATF 16949 automotive standard and ISO 9001 must be tested by **ARAI as Indian atmospheric condition or at an ambient temperature of 50degC**.
- d) The charging gun must have a feature to sound an loud alarm in case of any tampering done on the charging cable and the gun must be tampered proof.
- e) Cord Extension Set: No extension cord to be used
- f) Adaptors: No adaptors to be used
- g) Storage means of the cable assembly and vehicle connector: EVSE should have storage for cable and connector when not in use, at a height between 0.4m to 1.5m above ground level, as per IEC 61851-23 Section 101.1.3

Internal Cables: The functional characteristics are defined below

- a) the cables should be of FR grade
- b) Copper conductor has to be used in power cables & control cables. Conductors shall be stranded.

v. **Environmental Requirements**

- a) Ambient Temperature Range: **-20°C to 55°C** (Charger unit must be tested by ARAI/ICAT at specified temperature range for 8 hours at full load CC at 200A, 415V -15% Voltage)
- b) Ambient Humidity: 5% to 95%

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- c) Ambient Pressure: 86 kpa to 106 kpa as
- d) Storage Temperature: -20°C to 60°C (Charger unit must be tested by ARAI/ICAT at specified temperature range)

vi. **Mechanical Requirements**

- a) Ingress Protection: The minimum IP degrees for ingress of objects is IP 54 or higher
- b) Mechanical Impact: As per IEC 61851-1 Section 11.11.2. **The same impact conditions are applicable for charger display also. The bidder must produce the ARAI/ICAT test report for mechanical impact testing on display screen also)**
- c) Mechanical Stability: As per section 11.11.2 of IEC 61851-1
- d) Cooling: Air cooled or forced cool for protection and safety of equipment from any fire hazards.
- e) Floor Mount Pillar Type arrangement for stand-alone CCS2 (50kW) charger.
- f) Locking Arrangement: Three-point key lock key arrangement or better arrangement **AND** pad lock arrangement with supply of pad-lock of minimum 8mm shackle thickness with minimum 2-key arrangement.

vii. **Protection Requirements**

- a) Surge Protection Device Class C
The Sub-panel must be protected with Type-2 SPD, MoV and GDT based device in accordance with IEC 61643-11. SPD should be pluggable type (both L-N & N-PE) for ease of maintenance and have optics indication for fault detection along with remote monitoring feature. SPD shall have surge handling capacity of (8/20us) – 20kA nominal and 40kA maximum. Device must have third-party certification of KEMA-KEUR and UL.
- b) Protection against Electric Shock: As per IEC 61851
- c) Effective earth continuity between the enclosure and the external protective circuit, As per IEC 61851

viii. **Specific Requirements**

EVSE shall have provision of emergency switching, protection against uncontrolled reverse power flow from vehicle, Output current regulation in CCC, Output voltage regulation in CVC, Controlled delay of charging current in CCC, limited periodic and random deviation (current ripple) and limited periodic and random deviation (voltage ripple in CVC), as per Section 102.2 of IEC 61851-23.

The specific requirements defined in Section 102.2 of IEC 61851-23 except for the functions provided with descriptions:

- a) Rated outputs and maximum output power: The clause from Section 101.2.1.1 of IEC 61851- 23 is applicable except for the ambient temperature range to be -20 °C to 55 °C for Indian climatic conditions.
- b) Descending rate of charging current: In case of normal condition, EVSE should be able to reduce the descending current at a rate of 100A per second or more as per Section 101.2.1.4 IEC 61851-23.
- c) Load dump: In any case of load dump, voltage overshoot shall not exceed 110% of the maximum voltage limit of the battery systems, as per Annex BB 3.8.3 of IEC61851-23.
- d) EMI/EMC as per IEC 61000 for the complete unit
- e) The charger should have inbuilt functionality to store the charger down time logs for at least 6 months. These logs should clearly specify the nature of down time i.e. either due to mains power failure, SPD failure or emergency condition or etc. The charger should be capable to transmit the same data to the CMS.

ix. **Functional Requirements**

The functional requirements should be as per Section 6.4.3 of IEC 61851-1 and Section 6.4.3 of IEC 61851-23 except for the following functions, to be implemented as follows.

- a) Measuring current and voltage: The accuracy of output measurement of system B shall be within the following values:

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1. Voltage measurement: $\pm 0.2\% > 50V$, $\pm 0.5\% < 50V$
 2. Current measurement: $\pm 1 A$
- b) The charger should have the power limiting option, settable from display UI and CMS also. The option should have setting to set the power ranging from 25kW to 50(60kW) for individual gun and both guns also.

x. **Communication Requirements**

EV – EVSE Communication

The EV-EVSE communication would be as follows:

- PLC Communication (CCS2)

EVSE – CMS Communication

The EVSE should be able to communicate with CMS using Open Charge Point Protocol (OCPP) 1.6 or higher versions compatible to OCPP 1.6 & should be upgradable to OCPP 2.0 or any future protocol.

- Communication interface: Reliable Internet connectivity & communication between charger & CMS should be over secure protocol.
- Should enable handshaking between EVSE and CMS for its discovery, firmware version, vendor Version, vendor etc. It should authorize the operation, before electric vehicle can start or stop charging. EVSE should respond to CMS for the queried parameters. Reservation, cancellation addition and deletion of EVSE should be possible from CMS.
- Metering: Grid responsive metering as per units consumption of the vehicle. The monthly/quarterly total units consumed by charger and DISCOM meter should match. In case of deviation the bidder should coordinate with the Central monitoring station/system (CMS), DISCOM and CESL and the bidder should resolve the mismatching issue.
- Should be upgradable to next higher version of OCPP by bidder whenever it is released.
- WebSocket implementation should be compatible with OCPP 1.6,
- The charger shall be equipped with a modem (with minimum one(1) SIM slot) to communicate with the CMS
 - Reliable Internet Connectivity
 - The SIM shall be in CESL's scope and Modem shall be in bidder's scope.
 - 2G, 3G and 4G cellular network support
 - Auto fall back operation 4G to 3G or 2G and vice versa
 - SIM Make Support: Airtel, Vodafone, Idea, Jio, BSNL
 - SIM Support: m2m type
 - SIM Size: Standard
 - Antenna band: As per Indian Standard
 - Auto-Reboot via SMS and Timing
 - In case of poor connectivity, modem should be capable of rebooting itself so as to re-establish charger-CMS communication.
- Other Requirements:
 - PCB/PCA/Card/rectifier replacement notification to be transmitted to CMS through Status Notification packet.
 - All charger related events/faults with valid fault code should be transmitted to CMS through Status Notification packet.
 - Smart Profile function required
 - Length of alpha-numeric charger ID: 25
 - Charger should have the capability to transmit all the transactional messages to the server in case of power fail event or modem/controller failure

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- Charger should transmit all the error codes with description for all the faults that may occur during operation. In case of failure to start a charging session or a trip session, error code should tell the reason for the trip/stopped session. The reason should not be generic but self-explanatory so that necessary action can be taken to rectify the issue.
- Charger should support proper diagnostic logging so that any error in the charger can be easily analyzed using diagnostics logs.
- Apart from the complete OCPP profile some additional features might be required for public operations like:
- VIN transfer from charger to vehicle during charging session (where supported in the hardware protocol)
- One-time OTP support for offline operation (remote area support). Charger should support storing of list of OTP's with expiry date (similar packet as supported in OCPP 1.6J for Send local List profile) with the only exception that the charger should allow charging only once for one OTP.

xi. Integration with CMS platform

the charger should be compatible with interfacing with CESL's CMS and 'User App'

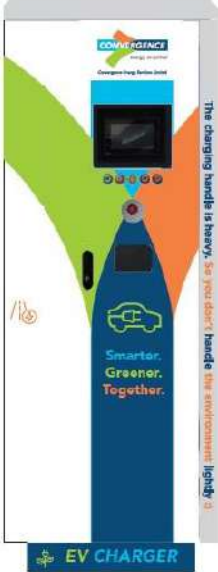
- a) metering for Billing: Based on grid responsive metering
- b) Metering: As per Indian metering standard

xii. User Interface and Display Requirements

1	ON- OFF (Start-Stop) switches	Mandatory, Only touch/switch is preferred. Key type lock is not preferred.
2	Emergency stop switch	Mushroom headed Push button type, latchable type in Red Color, visible and shall be protected by freely floating transparent acrylic sheet
3	Visual Indicators	Error indication, Presence of input supply indication, State of charge process indication and other relevant information
4	Display	Minimum 7" inches with 720 x 480 pixels TFT LCD Screen, user interface with capacitive touch screen or keypad. The display screen shall be clearly visible from a minimum distance of 10 meters in all climatic conditions. The Font shall be visible from a minimum distance of 1 meter from the charger. Toughened unbreakable glass for to be used for display screen. Any damage to display whatsoever shall be replaced by suppliers during the warranty period.
5	Support Language	English (with provision for additional regional languages including Hindi and regional language).
6	Display Messages	EVSE should display appropriate messages for user during the various charging states like: Suggestive sequence of charger operation Vehicle plugged in / Vehicle plugged out Duration since start of charge, kWh consumed. User authorization status Idle / Charging in progress: SOC Fault conditions Metering Information: Consumption Units Standby losses: Consumption Units
7	User Authentication	As per OCPP (through mobile application). OCPP gives only a mandate field, media to be used is open. Authentication to be done. Charging starts only after user authentication is successful.
8	End of Charging	Once the charging stops, the connector shall be released only after successful payment receipt / acknowledgement is received.

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xiii. **Miscellaneous Requirements**

1	Labels and Stickers	The labels and stickers should be UV and weather proof and shall not be degraded temperature. The life expectancy shall be of 10 years
2	Modem	The modem shall be kept inside the charger unit. The bidder has to ensure the design to avoid signal losses inside the charger cabinet.
3	Smoke Sensor	In case of any fire/smoke condition, the controller shall generate a fault and stop the charging and isolate the input power supply from the rest of charger. The bidder has to make sure that the smoke sensor shall not generate any false alarm due to external dust in case of weak IP protection of charger unit.
4	Meter Box cum Distribution box	The bidder has to provide one meter box cum power distribution box for housing energy meter and incomer MCB/MCCB The meter box should be IP55 rated minimum and should be provided with 5x7" acrylic sheet, pad lock arrangement with pad lock supply of 6mm shackle thickness of minimum 2 – key lock arrangement.
5	Labelling for Operational Charging Steps & Charger Branding	The operational charging steps must have been listed on the charger on metallic plate in both English & Hindi. The charger branding details shall be approved by CESL after submission of charger drawings to CESL. Charger branding design for reference is given below. It is bidder's responsibility to get the final drawing approved from CESL before supplying of charger. 

a) **Civil Structure:**

a) Conducting geotechnical investigation and topographical survey of the given area

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- b) Earthwork for site grading, cutting, filling, levelling & compaction of land.
- c) Construction of foundation for mounting structures whether roof top or carport or ground mounted for SPV panels
- d) Laying of underground / over ground cables (all types, as applicable) with proper arrangements
- e) Suitable earthing for plant along with earth pits as per standards

b) Warranty

- a) PV modules must be warranted with linear degradation rate of power output except for first year (maximum 3% including LID) and shall guarantee 80% of the initial rated power output at the end of 25 years. The modules shall be warranted for at least 10 years for failures due to material defects and workmanship. The mechanical structures, electrical works and overall workmanship of the solar power plants must be warranted for a minimum of 5 years. The Inverters/ PCUs installed in the solar power plant must have a warranty for 5 years. Defect liability will be for a period of 5 years from the date of operational acceptance.
- b) The bidder shall provide a warranty for the entire BESS and its constituent equipment. the bidder shall provide an unconditional, 5 (five) -year parts and labour warranty on all BESS equipment including battery. The warranty shall guarantee the availability of battery replacements delivered to the site within 2 weeks of notification during the battery warranty period.
- c) **EV Chargers Warranty:** The Successful Bidder shall ensure a warranty period of three (3) years or any better warranty period offered by the Supplier, whichever is later, to ensure trouble free services and supply of components of charger. The Successful Bidder should ensure availability of all spares and components required for the charging stations infrastructure for at least 10 years which may be procured against cost after expiry of warranty period. All internal & external equipment such as display screen, Surge Protection Devices, Meter Box, Internal controllers, meters, Internal backup battery and other necessary equipments as well should be covered in the warranty.

Completion time

Entire project is required to be completed within 6 months from the date of LoA. In case of delay, suitable action shall be taken against the contractor including right to cancel or termination of contract at CESL's discretion. Suitable relaxation will be provided to the bidder in case of delay not on account of bidder. However, extended timeline due to any delay not on account of bidder shall not have any financial liability on CESL

Operation and Maintenance of Solar +BESS:

Maintenance of the System

- a) Total Operation & Maintenance of the SPV Plant i.e. 05 years from the date of commissioning shall be with the bidder, after operational acceptance of the plant till culmination of the O&M period
- b) Procurement of spare parts, overhaul parts, tools & tackles, equipment, consumables, etc. required for smooth operation and maintenance of the plant as per prudent/ standard utility practices
- c) Continuous monitoring the performance of the Solar Power Plant and regular maintenance of the whole system including PV modules
- d) Whenever a fault occurs, the bidder has to attend to rectify the fault & the fault must be rectified within the 48 hours from the time of occurrence of fault. Apart from this all the measures/guidelines mentioned under maintenance subsection shall be followed.

a) Maintenance /SLAs for Solar + BESS

- A. The contractor shall prepare the preventive maintenance schedules and attend to the breakdowns keeping in view that the plant availability is always more than 95% and targeted/ claimed energy generation can be achieved.

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- B. The contractor shall carry out the periodical/ plant maintenance and perform minimum two certified services per year.
- C. Maintenance of other major equipment involved in SPV based Power Plant are SPV (SPV) Modules, Battery energy storage, Power conditioning Unit, Data logger, Module Mounting Structures, Cables and hardware's, Junction box and Distribution boxes, Earthing kit, and accessories etc. switchgears and metering panel. Particular care shall be taken for outdoor equipment to prevent corrosion. Cleaning of the SPV modules every 10 days interval (3 times/month) or whenever necessary. Resistance of the earthing system as well as individual earth resistance is to be measured and recorded at required interval as per normal practice. If the earth resistance is high suitable action is to be taken to bring down the same within the limits.
- D. Please clearly note that necessary maintenance arrangements for cleaning/ washing of SPV modules shall be done by contractor free of cost. All materials/ equipment shall be arranged for washing & cleaning by the contractor permanently/ whenever necessary free of cost. In case of unavailability of water, contractor has to make necessary arrangement. No excuse shall be entertained in event of improper/ non-satisfactory power generation due improper cleaning of SPV modules.
- E. The contractor will develop necessary CPVC pipe line network with necessary valves at the regular intervals which will cover all modules to improve the cleaning efficiency at all the solar carport as well as rooftop power plants.
- F. A maintenance record is to be maintained by the contractor to record the regular maintenance work carried out as well as any breakdown maintenance along with the date of maintenance reasons for the breakdowns steps have taken to attend the breakdown duration of the breakdown etc.
- G. The Contractor shall deploy enough manpower at SPV based Power Plant site to carryout breakdown and preventive maintenance schedules as specified.
- H. The Contractor will attend to any breakdown jobs immediately for repair/ replacement/ adjustments and complete at the earliest working round the clock.
- I. The Contractor shall immediately report the accidents, if any, to the Engineer In charge & to all the concerned authorities as per prevailing law of the state showing the circumstances under which it happened and the extent of damage and/ or injury caused. Maintenance contractor would be solely & fully responsible/ liable to pay for any losses/ damages/ claims, etc.
- J. The Contractor shall comply with the provision of all relevant Acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970 or any modification thereof or any other law relating whereto and rules made there under from time to time.
- K. The contractor shall at his own expense provide all amenities to his workmen as per applicable laws and rules.
- L. The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his or his Co-contractor or people around the premises.
- M. If in the event of negligence or mal-operation by the contractor's workmen, any failure of equipment take place such equipment should be repaired/ replaced by contractor at free of cost.

b) Maintenance and SLA aspects of EV Chargers

Service Level Agreement (SLA):

The Bidder(s) shall ensure that all information security aspects are exercised tested, implemented and where necessary enhanced not diluted at any point of time.

The uptime of the charger shall be monitored and logged by the CESL's CMS platform.

The SLA for EVCI is mentioned in the table below:

<i>Sr. No.</i>	<i>Defined Parameter</i>	<i>Service Level Requirement</i>	<i>Validation Procedure</i>	<i>Penalty</i>
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SECTION-4
(Technical & SCC)

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1	Supply of charging equipment: Bidder(s) must ensure that charging equipment Confirmatory Purchase Orders / Indents placed pursuant to issuance of LOA are supplied on site as per the scheduled date(s) set out in the order at the designated place, as agreed.	Within 1 month of issuance of Confirmatory PO/ Indent. Completion period and Supply schedule for details.	Delivery challan signed by representative of CESL.	0.5% penalty on prorated basis on the supply value of the delayed quantity confirmed through the Confirmatory PO/Indent for every one week's late delivery or part thereof, subject to a maximum cap of 5% of the value of the Confirmatory PO/Indent
2	Installation and Commissioning of Charging equipment: Bidder(s) must ensure that charging equipment Confirmatory Purchase Orders/Indents placed pursuant to issuance of LOA are supplied, installed & commissioned as per the scheduled date(s) set out in the order at the designated place, as agreed.	Within 1 month of issuance of Confirmatory PO/ Indent	Installation and Commissioning Report must be submitted to CESL after it is duly signed by the authorized representative from CESL and by DISCOM and local land authority	0.5% pro-rata penalty on the installation & commissioning value of the delayed quantity confirmed through the Confirmatory PO/ Indent for every one week's late delivery or part thereof, subject to a maximum cap of 5% of the value of the Confirmatory PO/Indent
3	Repair and Maintenance of Charging equipment: Non-functional or faulty or failed charging equipment's or components or systems to be replaced or repaired or rectified by the bidder(s) within defined duration.	The faulty charging equipment should be repaired and/or replaced within 8 hours of the complaint.	Acknowledgment by the charging station operator or CESL officer in writing.	<u>More than 8 hours and up to 24 hours:</u> 2% penalty of Comprehensive on-site extended warranty and AMC and/or (on presumptive basis charges for that period of the year for the duration of the faulty equipment as mentioned in the payment schedule. <u>More than 24 hours and up to 48 hours:</u> 4% penalty of Comprehensive on-site extended warranty and AMC and/or (on presumptive basis) charges for that period of the year for

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