

A-3 BASIC DESIGN DATA OF SPV, BESS AND INDUCTION COOKING SYSTEM

1.0 BASIC DESIGN DATA FOR SOLAR PV SYSTEM

A. Solar Insolation Data for Proposed Site

(i)	Location	:	E-3, Echo tech – I, Greater Noida
(ii)	Site Details	:	As per Plot Plant at Annexure A
(iii)	Country / State	:	Uttar Pradesh, India
(iv)	Geographic Bearing of Site	:	28° 26' 52" N, 77° 31' 29" E
(v)	Site Altitude	:	195 m
(vi)	Month wise GHI	:	Ref Table

Month	Solar Insulation (kWh/m ²)
Jan	119.35
Feb	135.12
Mar	173.41
Apr	209.09
May	222.00
Jun	187.87
Jul	159.45
Aug	177.98
Sep	173.01
Oct	156.69
Nov	127.29
Dec	106.31
	1947.57

- B.** Module Mounting : Fixed MMS type (Ground Mounted, Seasonal Tilt, min 20 deg (Winter))
- C.** Ambient temperature, °C - Design/Max/Min : 50°C/ 50°C/8°C
- D.** Seismic data & design criteria : Zone IV - As per Provisions of IS 1893 (Part 1).
- E.** Wind data & design criteria :

Basic wind speed shall be as per IS 875 (Part 3) (Based on survey of India Political map printed in 2002).

The minimum design wind pressure (pd) to be considered for design of MMS and Buildings/Rooms area as below:

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BASIC WIND SPEED IN m/s	Design Wind Pressure, P_d (N/m ²)
33	577.34
39	772.42
44	961.92
47	1073.57
50	1215.00
55	1437.66

For the purpose of design of equipment/systems, an ambient temperature of 50 °C and relative humidity of 95% (at 40 °C) shall be considered.

F. Technical Details

- i) Project Capacity : 4 MWp
- ii) DC system Voltage rating : 1500 V DC
- iii) Type of Solar PV Modules : Mono Crystalline Silicon / HIT
- iv) Peak Power Rating of Module : Not less than 330Wp
- v) DC:AC Ratio : > 1.25
- vi) Inverter Capacity : 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.
- vii) Maximum DC overload loading of inverter shall be limited to its design PV array Power to Inverter nominal AC power ratio. Bidder needs to submit all the relevant technical document/test report from inverter manufacturer (OEM) during detail engineering stage in support of Inverter design DC overloading capacity.
- viii) Outdoor containerized solution/compact substation with inverter, inverter transformer as inverter station are acceptable. However, technical specification of inverter and inverter transformer as per relevant chapters of technical specification shall be applicable.
- ix) Metering: Meters has to be provided as per specification
- x) DC and LT Power cable voltage drop criteria: From Module to Inverter Transformer shall be limited to 3% of rated voltage. For all other LT cables, Maximum Voltage drop shall be limited to 3% of rated voltage
- xi) Nos. of water tap points for Module cleaning system: 15 nos. Provision for module cleaning shall be as specified elsewhere in the Technical specification

2.0 BASIC DESIGN DATA FOR BATTERY ENERGY STORAGE SYSTEM (BESS)

- a) The primary application of BESS for the current Project shall be to provide power back up during night hours to meet the load demand of nearly 400 kW along with mitigation of intermittent fluctuations of 4MWp solar PV plant power generation (due to cloud, rain, tripping of solar inverter or any other reason) by smoothening of power output from the Solar PV plant. In addition to the above

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application requirement, BESS shall also have feature of manual mode operation, VAR support, anti-islanding operation and black start operation control mode.

- b) Only Li ion batteries having capabilities for providing services as per specification for entire offered service life periods from the date of successful completion of trial run should be offered by the bidder.
- c) The BESS shall be configured to perform multiple charge discharge cycles. Based on the performance and end of life of the battery, the bidder shall consider replacement of the batteries, if required, during the project tenure as per offered BESS system service life.
- d) The configuration and internal layout of the BESS shall provide suitable safe access to all equipment for installation, operation, maintenance and repair in all weather conditions.
- e) The maximum annual degradation of BESS system (MW and MWh) shall be limited to 0.7%.
- f) Year wise BESS MW and MWh capacity shall be constant throughout the year for operating ambient temperature of 0°-50° C and under all other ambient condition. Bidder shall install HVAC and other equipment's in case BESS capacity is dependent ambient condition as per manufacturer's recommendation.

3.0 INDUCTION COOKING SYSTEM

The primary application of Induction cooking System is to provide Flameless cooking environment in various canteens of NETRA. The cooking system envisage in this projects comprises of Idli, Dosa, Roti maker along with various utensils suitable for Induction cooking as per detailed technical specification specified elsewhere in the document.

4.0 OTHER COMMON DESIGN PARAMETERS

a) No of Earth Pit for DC System

For solar plant: 01 No earth pit at every 1MW. Nos. of earth pit indicated is valid if all the earth pits are interconnected in single mesh of earth pits and connected to main grid at the nearest available point .

For BESS plant: As per BESS system requirement and quantity shall be finalized during details engineering stage after submission and approval of necessary calculation as per relevant standard.

- b) **Cable sizing criteria for HT Cable** - The minimum size of cable based on 33 kV voltage level power application shall be as per protection time grading requirement subject to min. of 0.3 sec. For any cable feeder the minimum time for cable size calculation shall be the immediate one upstream breaker (towards grid) relay time setting plus 100msec
- c) **EMS and SCADA System**
 - i. Bidder is required to setup a single SCADA over LAN having its own controller, panels, networking, HMI & Workstation, etc. as per specification. The SCADA should have all the information of Solar PV as well as BESS Plant.
 - ii. In case bidder provided two independent SCADA for SPV and BESS plant, these two SCADAs shall communicate with each other on redundant communication link.

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- iii. The SCADA shall be OPC version 2.05a compliant and implement an OPC-DA2.05a server as per the specification of OPC Foundation. All data should be accessible through this OPC server.
- iv. HMIS and other equipment for Solar and BESS Plant

SI No	Description	Quantity
1	Engineering cum Operator workstation (EWS+OWS) / (PC + Monitor)	01 Set
2	Portable (laptop) based EWS	01 No
3	Time Synchronization equipment	01 No
4	Control Desk with necessary furniture etc	1 Set
6	Any other item required for EMS & SCADA	

**4MW Ground Mounted SPV System with BESS and
Induction based cooking system
at
NETRA, Greater Noida**

Project Document Title:

Technical Specification

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 1
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**4MW Ground Mounted SPV System with BESS and
Induction based cooking system
at
NETRA, Greater Noida**

Project Document Title:

Technical Specification

PART B Detail Technical Specification, Civil,
Safety and Quality Requirements

4MW Ground Mounted SPV System with BESS and Induction based cooking system at NETRA, Greater Noida	TECHNICAL SPECIFICATION	PART B	PAGE 2
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A. DC SYSTEMS

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A-1 SOLAR PHOTOVOLTAIC (SPV) MODULES

1.0 GENERAL

The Solar PV module comprises of PV cell(s) connected in any combination to achieve the required module power output. PV cells directly produces DC power on receipt of solar irradiation.

2.0 CRYSTALLINE SILICON MODULES (C-Si)

The technical details of Solar PV Modules shall be as given below:

Sl. No.	Description	Details
1.	Solar PV Capacity	4 MWp
2.	Type of SPV Module	HIT / Mono Crystalline Silicon
3.	Peak Power rating of Module	Shall not be less than 350Wp (No negative tolerance is allowed)
4.	Module Efficiency	Minimum 18 % at Standard Test Conditions
5.	Fill Factor	0.7 (Minimum)
6.	Temperature co-efficient of power	Not less than -0.30%/°C

3.0 CODES AND STANDARDS

The applicable codes and standards are as mentioned below:

Codes	Description
IEC 61215 / IS 14286 (Part 1)-2019	Terrestrial Photovoltaic (PV) Modules – Design qualification and type approval Part 1 – Test Requirements
IS 14286 (Part 2)-2019	Terrestrial Photovoltaic (PV) Modules – Design qualification and type approval Part 2 – Test Procedures
IS/IEC 61730 – 1 - 2016	Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction
IS/IEC 61730 – 2 - 2016	Photovoltaic (PV) module safety qualification – Part 2: Requirements for Testing
IEC 61701 – Edition 2.0 2011-12	Salt mist corrosion testing of photovoltaic (PV) modules
IEC 62804 – 1: 2015	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon

4.0 TECHNICAL REQUIREMENTS

- a. The temperature co-efficient of Power for the module should be better than -0.30% per deg C. Each and every SPV module shall conform to standards mentioned in 3.0 above and no negative power tolerance shall be accepted. Additionally, the Module wattage band/bin offered shall not be less than 5Wp.

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- b. Module shall be made up of mono crystalline silicon cells or Hetero Junction Intrinsic Thin Layer (HiT).
- c. Junction box(es) of the module should be of high quality IP 67 or better rated fitted at the back side which should be weather proof and designed to be used with standard wiring or conduit connection. Each Junction Box shall contain Bypass Diode.
- d. It is to be ensured that the Modules installed on MMS Table, in two rows, should be connected so as to minimize the shading effect and the MMS table should be in one level as much as practically possible. Bidder is suggested to visit the site before bidding for deciding the layout of the SPV system
- e. All the modules in the PV plant should be arranged in a way so as to minimize the mismatch losses.
- f. SPV module shall perform satisfactorily with ambient temperatures between -10°C & +60°C and shall withstand gust up to 120 Km/h on the surface of the panel.
- g. Solar PV modules used must be warranted for the product workmanship for a period of minimum 10 years. Further, they shall also be warranted for their output peak watt capacity, which should be as per the table given below from the completion of the trial run.

End of year	Guaranteed Output
1	98.5%
2	97.5%
3	97%
6	95.5%
8	94.5%
10	93.5%
15	91%
20	88.5%
25	86%

- h. In case of any deviation observed during operations from the performance guarantee parameters cited, the Contractor shall be informed in writing by NTPC. The Contractor shall be responsible to rectify the same within 10 days of notification without any extra cost to NTPC.
- i. The bidder shall provide the Solar PV module electrical characteristics including current-voltage (I-V) performance curves and temperature coefficients of power, voltage and current during detail engineering.
- j. The minimum design clearance (at the highest tilt angle) between the lower edge of the modules and the developed ground level shall be 400 mm. A tolerance of +/-50mm shall be allowed as per site conditions.
- k. Each PV module deployed must use a Radio Frequency identification (RFID) tag for traceability. One number RFID reader has to be supplied by the bidder which has to be compatible to read

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