

Detailed Technical Specification for 20 KWp Solar Plant on GT annexe roof.

S.No	Material	Description/Make	Quantity	UoM	
1	Grid-Tie Inverter for 20KWp Solar System	Make: Schneider Electric/ Delta Power Solutions/ ABB/Refusol/SMA	1	Nos	
		Total output power (AC)			To match solar PV plant capacity while achieving optimum system Efficiency
		Input DC voltage range			As required for the solar grid inverter DC input
		Maximum power point (MPPT) tracking			Yes
		Number of independent MPPT inputs			2
		Output AC voltage			Three phase 400V (+ 12.5%, -20%)
		Operating Frequency range			45 – 55 Hz
		Nominal frequency			50 Hz
		Power factor of the inverter			>0.98 at nominal power
		Total harmonic distortion			Less than 3%
		Built-in Protection			AC high / low voltage; AC high /low Frequency
		Anti-islanding protection			As per VDE 0126-1-1 or IEC 60255.5 or IEC 62116 or equivalent standards
		Operating ambient temperature range			the temperature range-10 degree Celsius to +60 degree Celsius
		Humidity			0 – 95% Rh
		Inverter efficiency			>=95%
		weighted efficiency			94%
		Protection degree			IP 65 for outdoor mounting, IP 54 for indoor mounting
		Communication interface RS 485 / RS 232 and RJ45 Safety compliance			IEC 62103, IEC 62109-1, IEC 62109-2 Galvanic Isolation
		Cooling Convection Display type			LCD for data display. LCD / LED for status display
		Display parameters to include			Output power (W), cumulative energy (Wh), DC voltage (V), DC current(A), AC voltage(V), ACfrequency(Hz), AC current(A); cumulative hours of operation
Compliance with standards and codes	IEC 61683 / IS 61683 & IEC 60068 - 2(1,2,14,30)				

2	Module Mounting Structure	Fixed type Hot dip galvanised (90 Microns) iron based, capable of supporting (BHEL Supplied) 82 Nos Solar PV Modules of 250 Wp at and angle ranging from 11 to 17 degrees. The Dimensions of BHEL make Solar PV module are 69 x 39.5 x 2 inches.	2706	Kgs	
		Wind velocity withstanding Capacity			120 km / hour
		Structure material			Hot dip galvanised steel with galvanisation thickness of min 100 Micron.
		Bolts, nuts, fasteners, panel mounting clamps.			Stainless steel SS304
		Mounting arrangement for elevated structures			The elevated structure has to be securely anchored to the supporting Surface. Concrete foundations of appropriate weight and depth for elevated structures mounted directly on the ground; Bolted with anchor bolts of appropriate strength for elevated structures mounted on RCC surfaces.
		Installation			The structures shall be designed for Simple mechanical on-site installation.
		Minimum distance between roof edge and mounting structure (Horizontal Clearance)			>= 0.60m
		Minimum clearance between lowest part of panel and mounting structure (Vertical Clearance)			Shall not be less than 150mm
		Access for panel cleaning and Maintenance			All solar panels must be accessible from the top for cleaning and from the bottom for access to the junction box.
Panel tilt angle	North – south orientation with a fixed tilt angle of 11 – 17 degrees. Depending on location) south facing.				
3	Solar Array Fuse	The cables from the array strings to the solar grid inverters shall be provided with DC fuse protection. Fuses shall have a voltage rating of 1,000V DC, current rating as required and shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers.	As required	Nos	
4	AC Distribution	Make: ABB, L&T, GE, Legrand	1	Nos	
		MCCB of 100 A Capacity with IP65 Enclosures			

	Box	<p>An AC distribution box shall be mounted close to the solar grid inverter. The AC distribution box shall be of the thermo plastic IP65 DIN rail mounting type and shall comprise the following components and cable terminations:</p> <ul style="list-style-type: none"> - Incoming 5 core cable from the solar grid inverter - AC circuit breaker, 4 pole - AC surge protection device (SPD), class 2 as per IEC 60364-5-53 - Outgoing cable to the building electrical distribution board. 		
5	DC Distribution Box	<p>A DC distribution box shall be mounted close to the solar grid inverter. The DC distribution box shall be of the thermo plastic IP65 DIN rail mounting type and shall comprise the following components and cable terminations:</p> <ul style="list-style-type: none"> - Incoming 2 core(Positive and negative DC) cables from the DC Combiner Box; - DC circuit breaker, 2 pole (the cable from the DC Combiner Box will be connected to this circuit breaker on the incoming side); - DC surge protection device (SPD), class 2 as per IEC 60364-5-53; - Outgoing 2 core cable (Positive and negative DC) to the solar grid inverter. <p>As an alternative to the DC circuit breaker a DC isolator may be used inside the DC Distribution Box or in a separate external thermoplastic IP 65 enclosure adjacent to the DC Distribution Box. If a DC isolator is used instead of a DC circuit breaker, a DC fuse shall be installed inside the DC Distribution Box to protect the DC cable that runs from the DC Distribution Box to the Solar Grid Inverter.</p>	1	Nos
6	DC Cables	<p>All cables shall be supplied conforming to IEC 60227/ IS 694 & IEC60502/ IS 1554 Voltage rating: 1,500V DC. XLPE insulated and PVC sheathed, UV stabilised single core flexible copper cables shall be used. Multi-core cables shall not be used. The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%. The minimum DC cable size shall be 4.0 mm² copper. The DC cables from the SPV module array shall run through a UV stabilised PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.(Conduit pipes are also under the scope of vendor. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors and couplers. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors. DC Cable with positive, negative and neutral with correct color coding.</p>	As per the requirement	Meters

7	AC Cables	<p>All cables shall be supplied conforming to IEC 60227/ IS 694 & IEC60502/ IS 1554 Voltage rating: 1,100V AC. PVC or XLPE insulated and PVC sheathed single or multi-core flexible copper cables shall be used. Outdoor AC cables shall have a UV-stabilised outer sheath. The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%. The minimum AC cable size shall be 4.0 mm² copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires.</p> <ul style="list-style-type: none"> – AC single phase: Phase: red; neutral: black – AC three phase: Phases: red, yellow, blue; neutral: black – Earth wires: green <p>Cables and conduits that have to pass through walls or ceilings shall be taken through a PVC pipe sleeve. Cable conductors shall be terminated with tinned copper end-ferrules to prevent fraying and breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.</p>	As per the requirement	Meters
8	MC4 Connectors	Make: Bizlinc or equivalent	8	Pairs
9	Junction Boxes	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. Cable terminations shall be taken through thermo-plastic cable glands. Cable ferrules shall be fitted at the cable termination points for identification.	2	Nos
10	Earthing	<p>The PV module structure components shall be electrically interconnected and shall be grounded.</p> <p>Earthing shall be done in accordance with IS 3043-1986, provided that earthing conductors shall have a minimum size of 6.0 mm² copper, 10 mm² aluminium or 70 mm² hot dip galvanised steel . Unprotected aluminium or copper-clad aluminium conductors shall not be used for final underground connections to earth electrodes.</p> <p>A minimum of two separate dedicated and interconnected earth electrodes must be used for the earthing of the solar PV system support structure with a total earth resistance not exceeding 5 ohm. The earth electrodes shall have a precast concrete enclosure with a removable lid for inspection and maintenance. The entire earthing system shall comprise non-corrosive components.</p> <p>Earthing strip for both AC and DC earthing: Galvanised strips to be used of 25mm width and 3mm thickness.</p> <p>Earthing Pit: Copper plated Galvanised iron electrode of 4 feet to be used for earthing pit.</p>	As per the requirement	Nos

11	Surge Protection	<p>Surge protection shall be provided on the DC side and the AC side of the solar system.</p> <p>The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter.</p> <p>The AC SPDs shall be installed in the AC distribution box adjacent to the solar grid inverter.</p> <p>The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system. The SPDs shall be of type 2 as per IEC 60364-5-53.</p> <p>Arrester used to be of reputed make.</p>	2	Nos
12	Installation and Commissioning	<p>All 82 Nos of Solar Panels supplied by BHEL and the above system is to be installed and commissioned by the vendor. All materials need for the work has to be taken care by vendor. Shifting of all the equipment is under the vendor scope.</p>		
13	Prequalification	<p>The vendor should have executed atleast a 20KWp Solar Rooftop system or a Solar rooftop of above capacity. A performance certificate of the same should be given.</p>		