

**ANTICIPATED TIMELINE /MILESTONES FOR DIFFERENT ACTIVITIES OF
PROJECT MANAGEMENT CONSULTANCY**

Ser No.	Activity	Duration	Remarks
1	Stage 1 : (a) Submission of complete scheme, design folder, line plan along with schematic diagram and approval of the Nodal Officer.	10 Days from Work Order.	
2	Stage 2 : (a) Submission of detailed BOQ, specifications , drawing i.e. complete DPR and all other documents required for issuing and finalising of tender documents including assistance during tendering process.	10 days from date approval of the Nodal Officer.	

**LIST OF WORK / ITEMS TO BE MANDATORILY INCLUDED IN DPR AND TENDER
DELIVERED AS PART OF PROJECT MANAGEMENT CONSULTANCY**

Ser No.	ITEM OF WORK
1	<p>Visit and recce of the site for preliminary data collection/detailed measurements. The consultant and/or his team shall visit the site alongwith requisite tools and instruments to carry out detailed recce and measurement at the site, advice client on the suitability of the site chosen including roof and building load bearing capacity for installation of roof top solar plant of 0.5 MW capacity. The consultant/ his team shall carry out detailed survey of existing electric supply distribution system, collect all the requisite data, prepare master plan of locality and analyse the electric power distribution from the substation, monthly/annual consumption. Based on the site observations and within the framework of the Adm Approval the consultant will make the detailed plan for the tender.</p>
2	<p><u>Solar PV array based on Crystalline silicon (Mono or Poly Crystalline) DC combiner box :</u></p> <p>Based on the site observations, detailed design of the solar panels for 0.5 MW AC out put or approximately 0.6 MW DC out put of the plant will be given :-</p> <p>(a) Consultant will lay down the detailed specification of Solar PV Module viz. nominal wattage and detailed PV characteristics of the module conforming to latest Solar PV module design philosophy and overall design of the solar plant, to obtain optimal power output. Solar modules including cells shall be made in India.</p> <p>(b) Consultant will give out the aggregate Wattage (DC) and number of PV panels to derive 0.5 MW peak AC output from the Roof Top Solar Power Plant System.</p> <p>(c) Consultant will design DC electric connection layout of Roof Top Solar Power Plant System, PV modules giving out No of modules in each string and number of strings in parallel conforming to inverter design and balance of system design.</p> <p>(d) Consultant will specify characteristics of module, strings and array to permit continuous power generation in case of part shading and necessary hardware and control will be part of the design.</p> <p>(e) Consultant will give out physical characteristics of the Roof Top Solar Power Plant System PV module including encapsulation by specifying manufacturing process to be adhered conforming to latest Industry Standards and requirements of site based on weather data at site.</p> <p>(f) Consultant will specify the minimum acceptable life cycle of each module that should be greater but not be less than 25 years from the date of commissioning of the plant as a whole.</p> <p>(g) Consultant will specify the maximum permissible degradation of the Solar PV modules as a percentage of rated output over the complete life period at annual intervals as per latest provision of MNRE.</p> <p>(h) Consultant will specify DC combiner box ratings and specifications as per suggested string configuration.</p>

(j) Consultant will design and specify DC cables from solar PV panels to combiners to inverter Layout, sizing, ratings and specifications for minimal DC losses and as per layout.

(k) Consultant will include in DPR the DC balance of system components including protection systems and switchgear.

(l) Consultant will prepare layout of Roof Top Solar Power Plant System PV array for optimal energy output including spacing, elevation, azimuth and tilt.

(m) SCADA system for monitoring and where required controlling all parameters on DC side of the inverter.

3 **Module Mounting structure :**

(a) Detailed design and drawings of mounting structures including specifications of materials .

(b) Dimensions and lay out to match site requirement for optimum generation of electricity and usage of available land.

(c) Structural design of mounting structure and its foundation to withstand extreme weather conditions & wind speed anticipated (to be specified) as per weather data of Bareilly. Drawing and design of MMS will be as per relevant Indian Standards and will be as per physical testing on site. MMS design will be certified by C Engineer (Chartered Engineer)

4 **Power Conditioning Unit (Inverters) :** For 0.5 MW peak AC output of the plant in as many number of Central Inverter units confirming to the design and layout of Roof Top Solar Power Plant System PV array and balance of system for synchronised grid connected operation.

(a) Consultant will lay down the detailed specifications of each unit of three phase inverter including nominal output wattage of each, alongwith detailed I - V characteristics & power factor range all conforming to latest inverter design philosophy, standards for grid connected operation and overall design of the Roof Top Solar Power Plant System as per latest provision of MNRE.

(b) Consultant will give out detailed physical, thermal and electrical specifications of important components of the inverter including the Power electronic devices and their control.

(c) Consultant will specify the MPPT algorithms permitted to be incorporated in the PCU and their broad implementation scheme (hardware and software) to be used in the PCU.

(d) Consultant will specify the Fault Ride Through and Low Voltage Ride Through capabilities of the inverter as required in local standards/ Grid regulations.

(e) Consultant will specify the Grid support characteristics for the inverter during generation and off generation as per latest standards of IEEE/ IEC for synchronized grid connected operation.

(f) Consultant will laydown specification for the Microprocessor based control architecture of inverters and implementation including all sensors, meters and control cables required for operation of inverters in power export mode from 1% to 110% of the nominal rated capacity in varying circumstances such as following :-

(i) Imbalance in generation between in inverters .

- (ii) Imbalance in generation between phases.
- (iii) Imbalance in evacuation.
- (iv) Partial evacuation.
- (v) All anticipated fault conditions.
- (vi) Any other contingency (to be specified by consultant).

5 **Balance system :** Design of all the components of SPV power plant upto LT side such as Solar PV modules, grid interactive battery bank, power conditioning unit with remote monitoring system, mounting structure, junction boxes, earthings, lightening protection, cables, accessories etc. Complete design layout and single line diagram and protection diagrams of balance of system including fault level calculations and protection system where applicable as per respective IEC/ BIS standards :-

- (a) Low voltage AC Collection and Control Board including switchgear Detailed design and specifications of LV collection on AC side of the inverter for power control in normal and fault situations.
- (b) LT Power Cables. Detailed sizing, specification and measurement of LT Power Cables from inverters to transformer(s) through the AC board.
- (c)Transformer(S). Detailed design, ratings, specifications, sizing for voltage transformation from the LV voltage output of inverters to 11 KV/0.433KV with adequate fixed and on load tap controls for sufficient range to enable matching with grid voltage in conformity with relevant IEC/BIS standards and Grid regulations and SERC.
- (d) Lightning Protection and Earthing scheme for the complete plant . Detailed scheme specification and measurements for the lightening protection of entire power plant including solar modules as per layout and substation building.
- (e) Weather Station. Detailed design, specification of weather station and data logging apparatus including all items and functions specified in Adm Approval.
- (f) Integrated SCADA and Control Station. Design and specification including all hardware and software necessary for setting up integrated control station at the substation buildings for monitoring all aspects and of the complete solar power plant including ancillaries, power evacuation cable, grid status at interconnection and load.
- (g) Preparation of plans, elevation, design and drawings, general arrangement and dimensioned layout, schematic drawing showing the arrangement of SPV panels, power conditioning units, inverter, battey bank, junction boxes etc.
- (h) Detailed circuit diagram, layout plan, sectional layout, for panels, inverter etc.
- (i) Cable root/cable trenches layout
- (j) Substation layout and single line diagram showing the earthing, import/export metering arrangement etc
- (k) Single line diagram and detailed circuit diagram for relay and control circuit/equipment panel.

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- 6 Civil works . Consultant will plan and design following civil works in conformity with design and requirements of rest of the solar power plant and within the frame of work of the Adm approval:-
- (a) Site development.
 - (b) Buildings required for SPV plant.
 - (c) Water supply including pipe cleaning network.
 - (d) Ancillary power, standby set, security lighting etc.
 - (e) Augmentation of existing external electrification for generation, supply, distribution and evacuation to MVVNL.
 - (f) Super structure for mounting of solar panel on car/ scooter parking.
 - (g) Air conditioning requirement if any.

Note: The above works will be excluding items catered in other schedules of services of Adm Approval.

- 7 HT 11 KV/0.433 KV Electric Cable Interconnection.

(a) Detailed design, specification and measurements for electric interconnection UG cable from existing local main electric LT Panel Board, Roof Top Solar Power Plant System, with the 11 KV/0.433 KV, MH Buildings, at 11 KV/0.433 KV pressure to evacuate 0.5 MW peak AC out put in synchronisation with MES supply.

(b) HT switchgear, isolators and busbar extension at the 11 KV/0.415 KV for connection with UPPCL supply and load at preferably the MH Bldgs.

(c) Single line diagram for the entire cable interconnection with the terminations.

(d) Selection of meter with net metering system as per SERC net metering Norms.

Note: Except items catered in measurable schedules.

- 8 **Design and Specification of any other item essential for the 0.5 MW Roof Top Solar Energy Project.**

Any other item or items not included in part or full in the above but required for successful generation supply, distribution and evacuation to PVVNL of 0.5 MW peak AC output from the Roof Top Solar PV plant to be included along with the necessity, purpose, detailed specification.

- 9 **Bill of materials Consultant will deliver the following as a result of the above listed items/works.**

(a) Table of items (Draft Costed Schedules of work), accounting units, quantities, specifications and lifecycle period.

(b) List of recommended makes of reputed items at least 03 numbers make of same price category as approved by MNRE and E-in-C's Branch.

(c) Costing with supporting quotes from reputed makes.

10 **Estimate of Yield from the plant designed :**

Detailed estimate of yield based on weather study at the site or proximal geographical location. The consultant shall prepare a detailed estimate of the electricity yield for a Half Mega Watt Roof Top Solar Power Plant System at the site based on software such PVSYST or other to be approved by the GE. The weather data can be the actuals measured at the site for geographical location 5 km radius of the actual site or synthetic dataset approved for such purpose by MNRE. The minimum period of such data shall be for ten years. The design of the simulated Half Mega Watt plant should conform to the design offered as part of deliverables of the consultancy. The design of the solar PV plant shall be approved subject to the satisfactory estimate of yield.

- 11 Evaluation of Bid documents and other pre-award activities :Providing assistance in issuance of clarification, technical evaluation, PG Test procedure submitted by contractor and approval for conformity to requisite codes and standard as per terms of contract be provided by the consultant.

Notes:-

- A All items shall comply with relevant updated IEEE/IEC/BIS standards. The standard should be referred in full along with editions.
- B Conformity of the design and specifications with CERC Grid regulations, IEGC, MNRE, E-in-Cs Br and any other regulation in vogue shall be ensured.
- C Consultant shall not include clause/ specifications that will lead to single vendor/ single OEM situation, CCI guidelines in this respect shall be adhered to and consultant shall certify to that effect.
- D Consultant shall include specifications that are compatible with each other (electrical and electronic machinery).
- E All experiments, tools, administrative requirements including travel, boarding and lodging of personnel for carrying out the tasks will be included in the quoted price.
- F Consultant shall be approved by MNRE and he will submit his approval with validity.
- G The scope of work shall include master plan of locality showing the building and PV Project.
- H The scope will also include analysis of electric power distribution from the MH sub station, monthly/annual consumption.
- J The scope of work shall include shadow analysis.
- K Techno Economical Evaluation shall be part of feasibility report solar PV System design optimization shall be carried out.