



Catanduanes State University

**PURCHASE OF MACHINERY AND
EQUIPMENT
(250KW HYBRID SOLAR FARM)**

SCOPE OF WORKS

PDISS – Technical Planning Committee

October 2021

PHOTOVOLTAIC SOLAR POWER SYSTEM

All electrical works shall comply with the provisions of the Philippine Electrical Code (PEC) 2017 Edition with rules and regulations of the national and local authorities concerned in the enforcement of electrical laws and regulations of the utility companies concerned.

All electrical works shall be performed by a Registered Master Electrician (RME) or a non-licensed electrical practitioner under the immediate supervision of a Registered Electrical Engineer (REE).

1. The contractor shall quote for the supply, installation, training of local staff and commissioning of photovoltaic solar power plant.
2. The solar power system will be hybrid on grid connected with a total capacity of 250KW and will be connected to buildings stated on table 1.0

TABLE 1.0

PROPOSED 250KW HYBRID SOLAR FARM

ITEM NO.	BUILDINGS
1.0	Admin Building
2.0	CBA
3.0	CICT
4.0	Main Library
5.0	BSND
6.0	CAS LAB
7.0	CIT B
8.0	ENTREP
9.0	PG TABUZO
10.0	GYMNASIUM
11.0	CSU AUDITORIUM

3. The solar power plant installation shall include but is not limited to support structures, foundations and fixing, PV modules, inverter, control system, circuit combiners and cabling
4. The contractor shall provide details of the manufacturer and the technical specifications for each item of equipment included in the design and quotation. This shall include separate details for all components parts of each installation.
5. The scope of work covers furnishing of all materials, labor, equipment, accessories, and all necessary services to complete the electrical system of the project as per plan and specifications.
6. Items, materials, and equipment not specifically mentioned in this scope or drawing but are necessary and critical for safety and efficient operation of the entire electrical system shall be deemed as included within this scope and shall be provided by the Contractor.

7. All installations shall be designed and installed to facilitate inspection, cleaning and maintenance and to ensure continued operation under conditions prevailing at the site and under such voltage and load variations encountered in operating the system.
8. All equipment shall be suitable for use from -5°C to 40°C and all external equipment shall be IP65-rated
9. All materials & equipment shall be brand new and approved type for the purpose and location.
10. Precise locations of all equipment shall be agreed on site with the Technical Planning representative prior to installation
11. The contractor shall include for full site investigations in the system designs, including route surveys, ground testing and any other testing necessary to complete the installation. The contractor shall be responsible for any difficulties encountered in the site condition that could reasonably have been foreseen or investigated.
12. Installation and termination of inverter, panel board, battery storage, disconnect at PV power house to generator house shall be included in this scope.
13. The Contractor shall include all associated civil and construction works necessary for the complete installation of all equipment, including but not limited to excavation, concrete works, building alteration and repairs.
14. Upon completion of all works, the Contractor shall apply for the permanent electrical service connection of the building (if required by FICELCO). Any additional fees required shall be charged to the contractor.
15. The Contractor shall verify site conditions and dimensions before ordering equipment or performing work to avoid conflicts and ensure compatibility before installation.
16. All materials & equipment shall be installed as per manufacturer's specifications and instructions.

SYSTEM COMPONENTS SPECIFICATION:

Following are the minimum requirements of the proposed PV system component:

PV Modules:

The PV Panel is a packaged, connected assembly of photovoltaic cells, with the following specification:

- a) The Photovoltaic should be from a well-known Tier 1 Modules Manufacturer.
- b) The Photovoltaic modules should be grade A.
- c) Cell Type: mono-crystalline or poly-crystalline modules are acceptable
- d) The output power of the modules should not be less than 300 Wp at (STC) using higher output modules, Conversion efficiency (not less than to 19.5%)
- f) Operating PV temperature should be between -10°C and $+85^{\circ}\text{C}$.
- g) Modules temperature sensitivity at peak power should not exceed $-0.40\%/^{\circ}\text{C}$.
- h) PV module frame should be Anodized Aluminum.
- i) The PV modules maximum system voltage should not be less than 1,000 V.
- j) The PV modules should be PID resistant.
- k) The PV modules should have a positive power tolerance only +3%.

- l) The modules shall have individual serial numbers behind each front glass.
- m) Electrical connection shall be on a robust terminal block in an IP65 junction box or higher.
- n) The warranty for module defects after installation should be at least 10 years.
- o) The awarded Bidder shall provide a manufacture power guarantee for all PV modules that will be installed with serial numbers that guarantees that the loss of output is not more than 10% during the first 10 years and up to 20% in the total after 25 years. The warranty must state that the malfunctioning solar PV module must be exchanged by the manufacturer the replacement solar module must be identical to, or an improvement upon, the original design of the malfunctioning solar module
- p) Mechanical stability – IEC 61215: Design qualification and type approval for crystalline silicon terrestrial photovoltaic modules.
- q) PV module safety qualification standard: IEC/EN 61730 for safety class II test.
- r) Along with TUV, CE compliant and UL certification, salt mist/ammonia resistance should be provided.
- s) Mechanical load tests up to 5400 Pa, Damp Heat, Thermo Cycle and Humidity and Freeze tests. Flash reports of PV modules (SN, Voc, I_{pmax}) shall be provided

Inverter:

Three Phase Inverters which converts the variable direct current (DC) output of solar PV modules into utility frequency alternating current (AC) that can be fed into electrical grid with the following specification:

- a) Three phase power inverters.
- b) The inverters must comply with the British standard ENA, G99 Code.
- c) The inverters shall comply with the EMRC and Electrical Company regulations and standards.
- d) The Inverter should be equipped with 2 or more MPPT.
- e) Efficiency should not be less than 97%.
- f) The Inverter shall be provided with LED Indicators to provide an instantaneous information about the system status.
- g) The Inverter shall have the following protections: reverse current, input over voltage & over current via circuit breaker
- h) Temperature operating range: -20 °C to 60 °C
- i) Total harmonic distortion (THD) should not exceed 3%.
- j) Protection degree is IP65 or higher (outdoor).
- k) TUV and CE compliant.
- l) Warranty after installation should be for 5 years at least. The warranty must state that the malfunctioning inverter must be exchanged by the manufacturer. The replacement inverter must be identical to or an improvement upon the original design of the malfunctioning inverter.
- m) All Outdoor installed inverters should be covered with Metal shades including the existing inverters if needed