Details of Empanelled Vendors & Pricing for Solar Cold Storage 6MT (for for Rural Areas) 2022-23

Sno	Total Payable Amount inclusive of Centage & GST per kW (in ₹)	Empanelled Vendors	Address	Email	Contact	Validity of Agreement
1	1999771.56	M/s Ecozen Solutions Pvt Ltd	Survey No 134/1, 134/2, 134/3, Dehu Road-katraj Bypass, Tathawade, Pune 411033	psinghal@ecozensolutions.com, jaison@ecogensolutions.com	8888821754	24-08-2022

TECHNICAL SPECIFICATION FOR 6 MT SOLAR POWERED COLD STORAGE

INTRODUCTION

The cold storage unit runs on power generated from Solar Photovoltaic. During sunshine hours, the electricity generated from solar photovoltaic is used to provide cooling to cold storage unit as well as charging in the Thermal Storage System (TSS). The thermal storage solution is configured in a manner that solar energy generated from solar photovoltaic panels is converted into cold form through a vapor compression cycle. This cold energy is stored in water as ice and transferred to the cold storage unit depending on the usage needs. During non-solar hours, the cooling need of cold storage unit is met through the cooling energy stored in the thermal storage.

The bidder will design the system as per the requirements given in the subsequent technical specification section.

The solar based cold storage unit must have a valid test certificate in the name of the bidder from MNRE/NISE/ NABL accredited test laboratory.

Adequate Protection must be provided as per the requirement of the site by taking lightening and other climatic conditions etc.

COMPONENTS

A 6MT solar powered cold storage with Thermal Storage System consists of following components:

1. Cold Storage

The external body of cold storage shall be configured to have Pre-painted Galvanized iron (PPGI) sheet of minimum 0.8 mm thickness on the outside. The PUF paneled cold storage body is pre-assembled and placed on a mild steel superstructure - which is designed to handle the load of cold storage, product stored inside it and the solar panels mounted on top. The superstructure body is to be permanently sealed from top by mild steel sheet which will allow longer life of PUF paneled room in outdoor environment and no seepage of water inside the cold storage. Appropriate concrete foundation is to be provided as a base for the cold storage system. The entire cold storage system needs to be grouted in concrete foundation through appropriate fasteners.

Items	Specifications
Storage Capacity	6MT
External dimensions without solar structure (L x W x H) and body type	20 feet x 8 feet x 9.5 feet; External body of minimum 0.8mm thickness Pre-painted galvanized iron (PPGI)
Internal Volume of Cold Storage	Minimum 720 CFT (As per MIDH Guidelines)
Temperature range	3 – 20 ^{o}C (Setpoint control available to user)
Internal Walls & Ceiling	Minimum 100±2 mm thick Polyurethane Foam of density 40±2 kg/m3 and 0.5mm PPGI sheet on the inner side
Flooring	Minimum 100±2 mm thick Polyurethane Foam (PUF) of density 40±2 kg/m3, 9 mm marine grade plywood on both sides of PUF and 0.5mm Aluminium checkered sheet on the top
Door type	Minimum Opening of 6 feet Height x 3 feet Width. 100 mm Polyurethane Foam with density of 40±2 kg/m3, and 0.5mm PPGI sheets on both sides
Door curtain	PVC curtain before the door

2. PV Array

The indicative solar photovoltaics system capacity shall be minimum 6.9 kWp. The solar photovoltaic array shall have following specifications:

a) Crystalline silicon cell PV modules of 200Wp or higher capacity.

b) The PV module have IEC 61215 qualification certification for solar PV modules.

c) The PV module conforms to IEC 61730 Part-1 requirements for construction & Part-2 requirements for testing for safety qualification.

d) The PV modules qualifies relevant IEC standard.

e) The PV modules used in solar power plants/ systems are warranted for their output peak watt capacity, which is not less than 90% at the end of 10 years and 80% at the end of 25 years.

3. Mounting Structures

The PV modules are mounted on metallic structures of adequate strength and appropriate design, which can withstand load of modules and high wind velocities up to 150 km per hour. The support structure used is galvanized iron. The PV system can be installed upon the mounting structure at tilt angle as per latitude or as per the requirement of the system. The PV system shall be mounted over the cold storage body to reduce direct solar radiation over cold storage and to maximize space utilization. The mounting structure design should be approved and duly certified by a charted engineer certifying its wind sustainability capacity. The certificate should be submitted at time of submission of acceptance to the LOI.

4. Refrigeration Unit

Refrigeration system consisting of condensing unit and evaporating unit working on HFC refrigerants with zero Ozone Depletion potential. The refrigeration system shall generate minimum of 150 MJ of cooling capacity in a day with 5.5 kWh/m2-day of global tilted solar irradiance and ambient temperature of 40 ^{o}C. The generated cooling capacity will be utilized for charging the thermal energy storage system through charging loop.

Refrigeration Rated Capacity	Minimum 2.5TR @ -5 ^{o}C evaporating and 40 ^{o}C condensing temperatures, when compressor is running at full speed
Cooling System Type	Vapor Compression System with Variable Speed Compressor
Refrigerant	R134a / R404a / R407c
Evaporator Unit	Air cooled aluminium fin and copper tube type heat exchanger with refrigerant based cooling. 2 x 300mm fans of maximum 85W and minimum 1000 CFM each

Datasheet of the compressor from the manufacturer is required to ascertain its rated capacity.

The following details should be marked indelibly on the compressor

a) Name of the Manufacturer or Distinctive Logo.

b) Model Number

c) Serial Number

d) Rated Capacity

5. Solar Controller for Powering Condensing Unit

The solar photovoltaic system shall run the compressor and fan of the condensing unit using solar MPPT drive with no electrical batteries. Manual changeover system is required to switch the power source between solar photovoltaic and 3-phase grid electricity.

6. Thermal Storage System

There is a provision to store cooling in a thermal storage system for providing cooling during the off-sunshine period and store excess solar energy in case it is not utilized. The charging and discharging of the thermal storage shall occur simultaneously. Energy storage medium should be pure water. The purpose of using water is that it has longer life than electrical batteries to store energy. Water is also more cost effective, energy efficient and the most environmentally friendly way to store energy.

When cold storage is not operational, thermal storage will not be providing any cooling to the cold storage. The purpose is to avoid energy wastage of already harvested solar energy. The energy storage capacity shall be minimum 200 MJ. The need of high energy storage capacity is to avoid wastage of solar energy on days when cold storage is not utilized for its full load capacity. The excess solar energy will be stored in thermal storage, which will be utilized to provide higher pull down (precooling) capacity or increased autonomy for cloudy/rainy days. The energy storage capacity of thermal storage should be monitored and displayed with a minimum eight linear graduations from minimum to maximum storage capacity. It will allow the user to pre-plan the cold storage operations and avoid spoilage of agriculture commodities.

Thermal Storage Medium	Water
Cooling Storage Capacity	Minimum 200 MJ enough to precool 1200 kg of agriculture commodities from 30 to 4 ^{o}C primarily on thermal storage system assuming door is opened for maximum 8 times in 24 hours with each opening cycle is less than 30 seconds. Potatoes is assumed for testing and qualification purposes.
Heat Transfer medium from thermal storage to the evaporator unit of cold storage	Refrigerant (R134a/R404a/R407c)
Thermal Storage Capacity Indication	Linear with minimum 8 graduations between maximum and minimum thermal cooling capacity
Self-leakage from thermal storage	Maximum 300 Watt at the ambient temperature of 40 ^{o}C

7. Solar and Electric Battery System for Auxiliary components

The combination consists of solar photovoltaic panels, MPPT charge controller and electric batteries. It is meant to provide electricity for auxiliary electrical loads such as fans of evaporator unit, lighting, data monitoring system and controller of thermal storage. The battery backup should be able to operate the entire system for minimum 24 hours with no door opening and temperature achieved to steady state prior for conducting such a testing.

Battery Type	Lead Acid Tubular Type with 36 months of warranty

Electrical load on Electric Batteries	Auxiliary components such as cooling pump, evaporator fan, controller etc but not condensing unit
Capacity	Minimum of 48V and 150Ah

8. Temperature set controller

Temperature controller in the range 3-20 ^{o}C by using set point control as per requirement with minimum 1 ^{o}C of setpoint differential.

9. Remote Monitoring system

Remote Monitoring system with per minute logging of data, GPRS based, viewable on desktop and smart phones, indicating cold storage temperature, ambient temperature, thermal storage capacity, compressor speed, electric battery voltage levels and electricity generated by solar. The system will be able to send notification to the user whenever the system needs to be change over to grid.

WARRANTY

The PV Modules are warranted for output wattage, with not less than 90% at the end of 10 years and 80% at the end of 25 years. The entire system is warranted for 1 year. Required spares for trouble free operation during the warrantee period shall be provided along with the system.