

Annexure-I

TECHNICAL SPECIFICATIONS

16 PAX SOLAR POWERED FRP CATAMARAN BOAT

1. GENERAL

General Requirement

The boat must be developed and supplied as a solar-powered electric catamaran passenger boat with a minimum passenger capacity of 16 + 2 crew members, intended for operation in Ganges at Sunderban areas of West Bengal. The overall design and construction of the vessel must be such as to maximize utilization of solar energy and propulsive efficiency and to ensure passenger safety and comfort. The vessel must be developed and supplied under the Inland vessel rules and registered with statutory authorities of West Bengal. The supplier must provide all the necessary documents for getting approval from statutory authority and registration of boat in West Bengal.

1.1. Main design parameters:

Type	: Catamaran
Length	: min 9.0 m
Breadth	: min 3.0 m
Depth	: min 1.0 m
Lighthouse draft	: max 0.45 m
Loaded draft	: max 0.55 m
Speed (Cruise)	: 6.0 knots
Speed (Max)	: 7.0 knots
Main engines	: Minimum 2 x 8 kW Electric outboard motors (Marine grade)
Propulsion Solar Panels	: Minimum 3.0 kWp (Flexible Monocrystalline)
Passenger Capacity	: 16 + 2 crew members
Max load capacity	: 2.5 tons
Propulsion Battery Capacity	: Minimum 2 x 12 kWh LiFePo4 battery

A maximum of 2% deviations in the main dimensions are accepted.

1.2. Construction

The vessel is required to be supplied as a FRP catamaran boat with FRP cross – structure of adequate strength to withstand the usage condition of deployment site.

1.3. Subdivision

The vessel hull is required to be subdivided into watertight compartments by means of transverse watertight bulkheads for keeping battery bank and other accessories.

1.4. Trim and Stability

The vessel is required to be developed and supplied to have adequate intact and damage stability, in all normal conditions of loading. An inclining experiment must be conducted when the vessel is complete in all respects in the presence of representatives of the CSIR-CMERI.

A trim and stability information booklet prepared by a qualified Naval Architect and duly approved by statutory authorities is required to be submitted to CSIR-CMERI prior to handing over of the vessel.

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2. HULL STRUCTURE

2.1 Coating

Marine grade Isophthalic gel coat must be used for the exterior coating to the hull. Anti-fouling paint needs to be applied to prevent the fouling in the hull. Additional aesthetic painting for better appearance above waterline must be provided.

2.2. Decks

The main deck must be transversely framed with no camber and no sheer. It must be of sandwich core construction. The coach roof must be sufficiently cambered to allow easy drainage of rainwater. The coach roof is also required to be adequately strengthened to support the weight of the solar panels and their accessories.

3: HULL OUTFIT AND DECK EQUIPMENT

3.1 Mast

A suitable mast needs to be provided forward on the coach roof for fitting the navigational lights.

3.2 Hull Openings, Hatches & Manholes

Each compartment within the hull must have watertight hatches/manholes of standard dimensions as per inland vessel rule. All doors must have adequate sill height complying with statutory requirements.

3.3. Mooring Arrangement

Cleats of suitable size and quantity must be provided on the deck. Mooring lines made of synthetic fibre of adequate breaking strength need to be provided.

3.4 Steering Gear

Electric steering mechanism must be fitted in boat.

3.5 Life Saving Appliances

Lifesaving appliances such as lifebuoys, lifejackets etc must be supplied and installed in accordance with inland vessel rules of statutory authorities of West Bengal. Minimum 20 nos of life jackets and 4 nos of Lifebuoys are required to be provided.

3.6 Fire Fighting Equipment

Firefighting equipment must be supplied and installed in accordance with the inland vessel rules of statutory authorities of West Bengal

3.7 Coach Roof and Covers

A rigid FRP coach roof of good marine quality and aesthetic design must be fitted above the main deck, giving adequate protection from sun and rain to the passengers on main deck.

3.8 Navigation Lights, Shapes and Sound Signals

Navigation Lights, Shapes and Sound signals must be provided in accordance with the rule requirements.

A suitable level sensor must be placed at the middle section of the boat and integrated with the wheel house console for over-draft warning.

4. ACCOMMODATION

All the surfaces of passenger accommodation and wheel house must be made of good quality

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marine grade laminates with aesthetically pleasing colors and design as approved by CSIR-CMERI.

4.1 Passenger Seating

Seating arrangement must be provided for 16 passengers. Seating arrangement must be facing forward. There must be a separate seating for the boat operator. The dimensions, quality and leg room of the seating arrangement must ensure a comfortable ride to the passengers. Good quality cushioned seats must be provided to ensure maximum passenger comfort

4.2 Passenger Area

Passenger areas need to be partially open type provided with light weight canvas covers for protection against sun and rain. Canvas when rolled down must provide visibility to passengers. Good quality LED lighting arrangements must be in the passenger area and wheelhouse. Additionally, suitable arrangement such as steel rod/bar with handle along the middle of the boat etc must be made for the passengers.

4.3 Flooring

Light weight, anti-skid, durable flooring must be provided in the passenger areas including open decks.

4.4 Passenger Access

For passenger embarkation and disembarkation doors must be provided.

5. NAVIGATIONAL CONSOLE

The wheel house navigational console must have Electric horn, GPS etc.

6. PROPULSION SYSTEM

6.1 Propulsion Motors

The vessel is required to be equipped with 2 nos of minimum 8 kW DC electric motor (Outboard). The electric motor must be air cooled, reliable, lightweight and small with high efficiency.

6.2 Remote Control

The propulsion motors must be operated by remote control from the wheelhouse, capable of changing the rpm and direction of rotation.

7. ENERGY STORAGE SYSTEM

7.1 Solar Panels

Flexible monocrystalline (efficiency $\geq 16\%$) solar PV modules must be fixed on the coach roof for generating electric power from the sun. The total capacity of the solar PV modules of minimum 3 kWp is to be provided.

Solar panels must qualify IEC 61215 / IS 14286 requirements for testing and safety qualification, IEC 61701 for Salt Mist Corrosion Testing.

7.2 Battery Bank with Battery Management System (BMS)

Two battery banks along with battery management system (BMS) having minimum rated capacity of 12 kWh, 48V each (i.e. 2x12 kWh) lithium-iron phosphate type batteries suitable for marine application are required to be provided to meet the energy deficiency in cloudy conditions. The battery bank must be placed in battery compartment within each demihull. Batteries must have minimum three year warranty. Batteries must have IEC standard 62133:2012 and Ingress protection standard IP 56. The BMS must have safety and protection features including overvoltage protection, overcurrent protection etc. Further, the BMS must include cut-offs when the batteries are fully charged and when its discharge exceeds a specified limit.

7.3 Charging System

7.3.1. Solar battery charger: The boat must have onboard MPPT based solar battery charger of rating 48V, 3 kVA or higher for charging onboard lithium ion battery from coach roof solar PV modules.

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7.3.2. Shore DC charging: A suitable port/connector is required to be provided to charge the battery from suitable shore DC charging station in addition to the onboard solar battery charger.

7.3.3. Shore AC charging: In addition, a suitable shore charging system must be provided to charge the battery using AC power from grid and generator.

The shore DC charging station and AC generator is in the scope of CSIR-CMERI.

8. ENDURANCE

The boat must run continuously for minimum 3 hours at 6 knots speed on battery bank alone without solar support.

9. ASTHETICS

Colour Scheme of the boat must be as per the choice of the CSIR-CMERI.

10. TRAINING

Necessary training must be provided for the operators and monitoring of the boat operation for at least one week at the site of operation. The supplier has to bear the necessary costs (boarding, lodging etc) during training and monitoring.

11. WARRANTY

Boat must be warrantied for a minimum period of 1 year. The Manufacturer's warranty for individual machinery/equipment must cover a minimum period as given below.

Batteries - 3 years

Solar panels performance warranty - 20 years; Product warranty-5 years

Solar charge controller - 2 years

Motor warranty- 2 years

12. Installation and Commissioning: The boat is required to be supplied, installed and commissioned at Ghoramara Project Site (Near Kakdwip, South 24 Paraganas), West Bengal

ESSENTIAL QUALIFICATIONS:

- 1) Bidder must have experience in supplying of FRP catamaran solar boat of similar or higher capacity to any Government department / undertakings in India within last 3 years. User list and PO copies are required to be enclosed. Failing to meet the above may lead to the rejection of bids.
- 2) The bidder must provide documentary evidence from the users for successful operations of the boat for 3 years since commissioning.
- 3) The OEM must have a boatyard facility either owned, rented or leased and must have a state / central government registration for building and supplying.
- 4) The bidder, other than OEM, must enclose authorization certificate from the OEM.

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