Section 6: Schedule of Supply

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| 1. List of Goods and Related Services |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lot No.: Not applicable | | | | |
| Lot Name: Not applicable | | | | |
| Item No. | Name of Goods or Related Services | Description | Unit of Measurement | Quantity |
| 1 | Procurement of Design, Build and Supply of Solar Powered-Battery Operated GRP Made Catamaran Type Passenger Ferry with Passenger Capacity of 75 Pax + 3 crews including Providing 2 Years Support for Operation, Maintenance and Training | See below | Set | One (1) |

**1. General Description:**

The vessel will be designed and built as a GRP catamaran solar powered passenger ferry with a minimum passenger capacity of 75 Pax + 3 crews, intended for operation at sea. The vessel will be registered with statutory authorities. The vessel will meet the requirements of the statutory authorities’ rules and amendments thereon and should be built under the leading International Association of Classification Societies (IACS) class (IRS/DNV/ABS/LR/NK/BV). Both propulsion motors and marine grade Lithium-iron phosphate batteries should have type approval from any of the above leading IACS classification societies. Firms must submit type approval certificate for the Battery and Propulsion motors along with technical bid. The overall design and construction of the vessel will be so as to maximize utilization of solar energy and propulsive efficiency and to ensure passenger safety and comfort.

Standard shipbuilding practices will be adopted in the construction of the vessel. Any material/fitting /equipment/procedure which is not mentioned in these specifications, but is considered normal or standard and necessary for the intended services of the vessel will be supplied/fitted /carried out by the builder without any extra charge. The builder will also carry out any extra work as per recommendations of the statutory authorities which are applicable as per the rules, without extra charge. The vessel shall be designed and constructed to operate at a speed of minimum 8 Knots.

**2. Operation, Maintenance and Training Support**

The successful Bidder will provide full support and training for operation, maintenance and training to purchaser’s personnel for the first two years of operation of the solar powered battery-operated passenger ferry. The Bidder shall provide technical instruction and training for the proper operation, preventative maintenance, and basic troubleshooting of the major machinery and control systems, to be conducted by the manufacturer's Technical Representative for up to six (6) Client’s personnel, for maintenance and operation of the following equipment:

* Main propulsion system – total six (6) hours.
* Main switchboard and electrical distribution – total four (4) hours.
* Plumbing – total two (2) hours.
* Safety systems – total two (2) hours.
* Wheelhouse controls – total eight (8) hours.

Training shall be scheduled and coordinated with the Client as required. Client shall make every possible effort to minimize duplication of training. Multiple sessions may be required in some or all areas listed above.

1. Delivery and Completion Schedule

The delivery period shall start from contract effective date.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item No. | Description  of Goods  or  Related Services | Delivery Schedule  (Duration) | Location | Required Arrival Date of Goods or  Completion Date for Related Services |
| 1 | Procurement of Design, Build and Supply of Solar Powered-Battery Operated GRP Made Catamaran Type Passenger Ferry with Passenger Capacity of 75 Pax + 3 crews including Providing 2 Years Support for Operation, Maintenance and Training | See Delivery acceptance conditions below | Male’ | 10 months from contract effective date. |

**1. Delivery and Acceptance**

*1.1 Delivery*

Bidder may not commence delivery of the vessel from its location until the Client has approved all dock trials and sea trials required to take place at the Contractor's location. Delivery will be considered complete after the Client or Client’s Engineers conducts a post-delivery inspection. Delivery does not constitute acceptance, nor does delivery include a transfer of any risk of loss.

1*.2 Insurance during delivery*

The bidder retains full responsibility, including risk of loss or damage to the vessel, until Operational Acceptance. Bidder is responsible for providing all necessary insurance, security, safety maintenance and operation of the vessel at all time, including during delivery. The bidder must procure and maintain and provide proof of insurance against any loss of or damage to the vessel or personal injury or death or damage to or loss of property caused during the delivery voyage including without limitation full form hull and machinery insurance in an amount equal to the Total Contract Price of the vessel, and full form Protection and Indemnity (P&I) insurance. Such insurance and proof must be at the bidder's sole expense, including all deductibles.

*1.3 Protection of vessel during delivery.*

The bidder is fully responsible for adequately preparing the vessel for all local transport. Whenever the bidder sails the vessel under its own power, the vessel must be under the command of an experienced Skipper, holding a valid license with a rating acceptable for the delivery voyage from the Bidder’s facility.

*1.4 Damage to vessel during delivery.*

Bidder must report to the Client of any reference of damage or other incident that may have caused damage to the vessel during the delivery.

*1.5 Delivery acceptance*

Following successful completion of delivering the vessel to Male’, the bidder shall conduct Delivery Acceptance Trials from Male’ Anchorage. Delivery Acceptance Trials shall demonstrate that the vessel has been delivered to Male’ in fully operational condition. Damage following the Client’s Sea Trials and Delivery shall be repaired. Other operational issues discovered during the delivery of the vessel will be corrected by the Bidder. Example criteria for Delivery Acceptance:

* Service speed requirement
* All physical work shall be completed, with all requisite regulatory approvals, certifications and letters of compliance obtained, and with the vessel ready for service in full compliance with the Contract to the satisfaction of the Client.
* The vessel shall be thoroughly cleaned to the satisfaction of the Client.
* All shop and installation tests and inspections shall be completed, with results demonstrating compliance with the Contract to the satisfaction of the Client.
* Any prerequisite tests to Operational Acceptance shall have been completed, with results demonstrating compliance with the Contract, and approved by the Client.
* Correction of all known deficiencies including deficiencies that develop or are identified after Delivery.

*1.6 Operational Acceptance*

Following Delivery Acceptance at the Male, the bidder shall conduct Operational Acceptance Trials. This Operational Acceptance shall be contingent upon the following:

* Completion of shipboard bidder‐responsible training.
* Round‐trip transit times achieved required.
* Compatibility with passenger‐loading facilities and demonstration of passenger loading/unloading rates as required.

If the Operational Acceptance testing and survey reveals only minor defects or deficiencies that Client may at its sole discretion Operationally Accept the Vessel. Client will certify Operational Acceptance by issuing Bidder a Certificate of Operational Acceptance.

The bidder shall immediately take appropriate action to correct and complete any work that is determined to be unsatisfactory or incomplete and shall be responsible for any delay in the Project associated with correcting deficiencies. The cost of such delay shall be at the bidder's expense.

Any work or operation of the vessel called for by the Client in the course of inspection of previously unsatisfactory or incomplete Work shall be performed at the bidder’s expense in advance of Operational Acceptance.

*1.7 Final acceptance*

Only after Operational Acceptance, Final Acceptance will occur when;

* All defects or deficiencies discovered through any test have been corrected and all open issues have been resolved to Client's satisfaction such that it deems the vessel capable of operating reliably and safely.
* Bidder has delivered to Client all manuals, drawing, reports, and other deliverables required by the Contract.
* Client will issue a Notice of Final Acceptance of the Vessel to the Contractor within seven calendar days of Client's determination that the bidder has satisfied the requirements of this Section.

Client will not provide Final Acceptance of the Vessel if it does not meet all Contract requirements and specifications, even if the bidder assures Client that any deficiencies will be handled under the warranty process. Any Warranty commences upon Final Acceptance.

1. Technical Specifications

|  |  |  |
| --- | --- | --- |
| Item No. | Name of Goods  or  Related Services | Technical Description,  Specifications, and  Standards |
| 1 | Procurement of Design, Build and Supply of Solar Powered-Battery Operated GRP Made Catamaran Type Passenger Ferry with Passenger Capacity of 75 Pax + 3 crews including Providing 2 Years Support for Operation, Maintenance and Training | See below |

1. **Operational Environmental Conditions**

The vessels shall be designed and constructed to withstand good seakeeping and maneuverability under the following environmental conditions:

Design Category: Seagoing

Significant wave height: BF sea state 6 with height to 4 meters

Wind velocity: 27 knots

Minimum ambient air temperature: 25°C.

Maximum ambient air temperature: 37°C.

Minimum ambient sea water temperature: 30°C.

Maximum ambient sea water temperature: 40°C.

1. **Propulsion System:**

*Propulsion Motors*

The vessel will be powered by minimum 2 x 25 kW AC synchronous/asynchronous motors. The electric motors will be of rugged and robust construction, reliable, lightweight and small with high efficiency. Propulsion motors shall have type approval from any of following classification societies IRS/DNV GL/ABS/LR/NK/BV. Electric Geared Motors shall be of reversible type. Propulsion motors will be specially designed for traction purpose and to handle temperatures up to 130oC. Each propulsion motor will have an individual variable frequency control system for speed control.

The electric motors will be capable of operating under the following conditions.

* Maximum ambient temperature of 50oC in engine room
* Maximum outside water temperature of 30oC
* Relative humidity of 95%

*Control & Monitoring Equipment*

Each power source and propulsion motor will have a control and monitoring console in the wheel house. The battery management system and power management system will monitor and control all the operations for the boat.

Relevant data required for live monitoring and analysis will be stored and transmitted to the operating center via WiFi/GSM network. The builder will provide the necessary back end software for monitoring the transmitted data.

*Remote Control*

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

*Power Source*

The electric propulsion motors will be powered by a battery bank located in each demi-hull which will be charged by solar panels mounted on the coach roof. The batteries will be capable of being charged by the solar panels through the MPPT charge controller and battery management system.

An additional battery charger of minimum power of 20 kW for fast charging at 380-400V with single connector gun of reliable make shall be provided to charge the batteries using three phase AC power from the grid on cloudy days and during the night for topping up charge.

*Propeller*

The vessel will be fitted with (2 nos.) fixed pitch open screw propellers of optimum diameter and pitch. The propellers will be designed to give maximum efficiency and thrust at the rated rpm and will have sufficient blade area to avoid cavitation.

Material used to make the propellers will be Nickel Manganese Bronze. The diameter of each propeller will not exceed 66% of the full load draft of the vessel. Adequate propeller clearances as specified by classification society will be provided from rudder, hull and keel line. The propeller blades and hub will have adequate strength to withstand normal loads without failure and will comply with class requirements.

*Propeller Shafts*

The propeller shafts (2 nos.) will be of make SS 316. The diameter of each shaft will be 5% in excess of classification society rule requirements. Extreme care will be taken to ensure proper alignment of the propeller shafts.

*Stern Tubes*

The stern tubes of mild steel or GRP (2 nos.) will be constructed conforming to classification society specifications and will be provided with water-lubricated bushes.

*Speed control mechanism*

A suitable electronic speed control for varying the vessel is to be provided.

1. **Solar PV system & storage:**

*PV Modules*

High efficiency mono PERC half cut solar PV modules will be fixed on the coach for generating electric power from the sun. The total capacity of the solar PV modules will not be less than 25 kW with PV module efficiency more than 20%. All modules should include bypass diodes.

Only “Class A” modules according to IEC 61730-1 and IEC 61730-2 shall be used. “Class B” Modules shall not be used as per IEC 62548.

Only PID free modules certified according to IEC 62804 shall be considered.

Minimum capacity of a single module shall be 400Wp with reverse current rating of 20A or more. Temperature co-efficient for power of the module should not be more than (-) 0.35%/oC.

*Material Warranty:*

The manufacturer should warrant the Solar Module (s) to be free from (i) defects and/or failures due to manufacturing defects and/or failures due to materials, including PID effect and (ii) non-conformity to specifications due to faulty manufacturing and/or inspection processes for a period not less than ten (10) years from the date of sale.

*Performance Warranty:*

Performance of all PV modules shall be warranted with more than 95% (first year maximum 2.5% including LID and next 24 years not more than 0.7% per year)

*Test Certification of PV modules:*

The solar PV modules must conform and be certified according to the latest edition of the following IEC standards: *Bidder has to provide valid test certificates for the following*

* IEC 61215- Part 1 for design qualification and type approval
* IEC 61730 Part 1 for requirements for construction
* IEC 61730 Part 2 for requirements for testing
* IEC 61701 for qualifying salt mist corrosion testing

The panels will be placed flat with proper securing arrangement. PV array will be designed as per IEC 62548: Design requirements for Photovoltaic (PV) arrays. A walkway of sufficient width will be provided on the coach roof between the solar panels for easy and efficient maintenance of the panels. A water cleaning arrangement with pipes , hoses and sprinklers will be arranged on the coach roof for periodic cleaning of the panel surfaces. All care shall be taken in order to avoid spot shadows on the PV modules from any object, to prevent hotspot formation on the PV modules.

*Solar Charge Controller*

A solar charge controller will be provided for each set of solar panels, batteries and propulsion system. Only MPPT (Maximum Power Point Tracking) type charge controller will be used, for optimized output. The charge controllers will comply with IEC 62109 or equivalent international standards.

*Battery Bank*

Lithium-iron phosphate type battery bank of minimum capacity 100 kWh (One hundred-kilowatt hour) will be provided as the energy storage option. They will be located in two separate battery compartments, one in each demi-hull. The battery bank in each demi-hull will be connected to its own independent solar charge controller providing redundancy in case of failure of any system.

Marine grade Lithium–iron phosphate batteries with type approval from any of the following classification societies IRS/DNV GL/ABS/LR/NK/BV will be provided as the energy storage medium. Batteries will be certified in accordance to IEC standard 62133-2: 2017 and or UL1642.

Battery enclosure must be made of stainless steel with ingress protection IP56 or above, with a forced ventilation system. Battery ventilation should be designed for an ambient temperature of 35oC in shaded conditions. Forced ventilation of the battery box must be independent of the forced ventilation of the battery room and be isolated from each other.

Batteries must have warranty for a “cycle life” of minimum 6000 cycles at 80% depth of discharge at 1C/1C at 25oC.

*Battery Management System (BMS)*

To ensure safety and long life of the batteries, a dedicated battery management system will be provided. The system will include cut-offs when the batteries are fully charged and also when the discharge exceeds a specified limit. The BMS will have provisions for PLC (programmable logic controller) based monitoring system for controlling temperature. The BMS will also continuously monitor battery state of charge which can be remotely accessed from the wheel house.

There should be different levels of warning displayed for critical components. The system should be able to provide warnings for temperature, state of charge, voltage, current and sensor failure to protect the system. The system should have an immediate shutdown facility to protect the system in case the breach of the safety level occurs.

*Shore Charging System*

A charger of minimum 20 kW capacity for fast charging at 380-400V with single connector gun of reliable make shall be provided to charge the batteries using three phase AC power from the grid.

1. **Construction of the Vessel:**

*Hull Structure*

The vessel will be built as a GRP catamaran boat with GRP cross-structure of adequate strength. The superstructure will be constructed out of Marine grade GRP. Good quality glass mat and resin conforming to classification society standards will be used for the lay-up. Standard practices conforming to classification society rules will be adhered to during the moulding process. The hulls, cross-structure and main transverse bulkheads will be built of GRP complying with classification society requirements in general. Hull and cross-structure will be transversely framed with frame spacing as per classification society rules. The hull will be of single-bottom construction. All opening in decks/bulkheads will have rounded corners complying with classification society requirements. Continuity of structural members will be maintained. Bidder/Firm should optimize the vessel for low propulsive power and it must submit power curve for speed of 5,6,7,8 knots.

*Subdivision*

The vessel is to be subdivided into 5 watertight compartments by means of watertight bulkheads.

* Aft peak,
* Engine room,
* Battery compartment,
* Additional compartment 1
* Fore peak

The subdivision will comply with statutory/class requirements and will be designed to meet the satisfaction of the registering authority. All subdivision bulkheads will be water tight and stiffened vertically with spacing conforming to classification society rules. All opening in decks/bulkheads shall have rounded corners complying with classification society requirements. Continuity of structural members shall be maintained.

**Bulkheads**

All subdivision bulkheads shall be watertight and stiffened vertically with a spacing conforming to classification society rules.

*Trim and Stability*

The vessel will be designed and built to have adequate intact and damage stability, in all normal conditions of loading. An inclining experiment will be conducted when the vessel is complete in all respects, in the presence of the authorized representatives of the owner and surveyors of classification society/statutory authorities. A trim and stability information booklet prepared by a qualified naval architect and duly approved by the classification society/statutory authorities will be submitted to the owner prior to handing over of the vessel. Stability and trim of the vessel in all standard loading conditions must satisfy the criteria laid down by the statutory authorities.

*Freeboard*

The vessel will be designed and built to have adequate freeboard as specified by statutory authorities.

*Light Ship Weight*

Light-weight materials and equipment will be used for construction of the vessel wherever possible. Weight control measures will be strictly followed during design and construction of the vessel to minimize the light ship weight. Increase in the light ship weight beyond design estimate will result in increased displacement and resistance and consequently a decrease in the speed, since the available solar panel area and battery bank are limited by the size of the vessel.

*Decks*

The main deck and superstructure decks will be transversely framed with no camber and no sheer. The coach roof will be sufficiently cambered to allow easy drainage of rain water. The coach roof will be adequately strengthened to support the weight of the solar panels and their accessories.

*Stern*

Each demi-hull will have a transom stern. A skeg will be fitted at center line of each demi- hull forward of the propeller, suitably strengthened to support the stern tube. A bracket will be fitted for holding Stern tube.

*Ventilation*

Engine rooms and battery compartments will be ventilated by forced inlet vents and natural exhaust vents of approved design.

*Materials and Workmanship*

All materials used for construction of the vessel, shall be approved by the Owner or statutory authority as applicable. All materials including nuts, bolts and other sundry items shall be of the highest quality and suitable of marine use.

1. **Hull outfit and deck equipment**

*Mast*

A small mast is to be provided forward on the coach roof for fitting the navigational lights as per statutory requirements.

*Hull Openings, Hatches & Manholes*

Each compartment within the hull will be provided with watertight hatches/manholes of standard dimensions. All openings will have sill height and rounded corners of adequate radii complying with classification society requirements. All doors will have adequate sill height complying with statutory requirements. Hatches will be capable of being opened from outside.

*Mooring Arrangement*

Mooring arrangement will comply with Classification Society/statutory requirements. A minimum of 4 nos. of 100mm single Bollards will be provided. Mooring lines made of synthetic fibre of adequate breaking strength will be provided. A ‘C’ type rubber fender will be fitted around the hull. In addition, suitable quantity of pontoon fenders will be fitted on the hull Port & Starboard close to the deck line to prevent abrasion of the hull while mooring.

*Anchoring Arrangement*

Anchoring arrangement will comply with Classification Society/statutory requirements based on the equipment number. Required number of high holding power bower anchors with rope of adequate length and diameter with necessary arrangement for effective operation will be provided on main deck forward or aft. A hand-operated anchor winch of suitable capacity will be provided to handle the anchors with wire rope.

*Rudder and Steering Gear*

2 nos. of single spade rudder of suitable size that can be operated from the wheelhouse shall be provided. The rudder shall be capable of turning 35 deg. Port or starboard. Hydraulic/hand-hydraulic steering mechanism shall be fitted. Provision shall be made to operate the tillers from the steering gear compartment in case of emergency. The Rudder Stock will be made of SS 316 and should comply with class requirements. Electric steering mechanism can be preferred to prevent use of hydraulic oil in the boat.

*Life Saving Appliances*

All the lifesaving appliances will be type approved and shall be supplied and installed in accordance with regulations of statutory authorities

*Fire Fighting Equipment*

All fire-fighting equipment will be as accepted by class. For the battery system, firefighting and monitoring will be incorporated in the module system complying IACS rules. Cell level monitoring for thermal run-away is to be incorporated. In case of a thermal run-away, due to any reason, containment system is to be provided, as per class requirement.

*Superstructure*

A rigid FRP roof coach of good marine quality and aesthetic design will be fitted above the main deck, giving adequate protection from sun and rain to the passengers on the main deck. The coach roof shall be given sufficient camber/slope in the transverse direction for fast and efficient draining of rainwater. The coach roof shall be adequately supported by girders and beams of aluminium with sufficient strength to support the weight of the solar panels and accessories. The coach roof shall have adequate thickness and shall be efficiently attached to the framework.

*Air Pipes*

All hull compartments and tanks will be provided with air pipes of galvanized steel, complying with classification society/statutory requirements. Air pipes will be located at the highest point of the compartment/ tank. Void spaces willel also be provided with air pipes only.

*Railings*

Stainless Steel or Aluminium railings of minimum 1 meter height, supported by stanchions, will be provided all around the open areas of the main deck. Railing shall comply with rule requirements of statutory authorities.

*Bilge System*

Submersible bilge pumps with a float switch will be provided in all compartments.

*Navigation Lights and Sound Signals*

Navigation Lights and Sound Signals will be provided in accordance with the rule requirements of statutory authorities.

*Automatic Washing System*

Automatic washing system for solar panels will be provided with sprinklers.

*Aft Platform*

A small platform with Stainless Steel or Aluminium ladders will be provided in AFT for accessing the solar panels in roof.

*CCTV Monitoring*

The CCTV surveillance system should consist of IP cameras, software, servers, power supply cables and other required materials to complete the project. The system will be rugged, durable, compact and suitable for marine application.

*Music Player System*

USB Music & FM system will be provided in the passenger area.

*Wiper*  
Motor operated cleaning wiper system will be provided for wheel house windows.

1. **Passenger Accommodation:**

*Accommodations for passengers with disabilities*

The bidder shall ensure ease of access for passengers with disabilities and senior citizens to embark and disembark the vessel. Provision shall be made in entrances and doors for wheelchairs that do not exceed the allowable slope (1:12 or 4.8-degree angle) and in areas where wheelchairs can be secured with approved fasteners.

*Wall & False Ceiling*

Walls, ceiling and partitions in the passenger area and wheelhouse will be made of aluminium composite panel or surface tissue mat. The clear ceiling height from top-of-deck flooring to ceiling will not be less than 2.2 m

*Passenger Seating arrangement*

Seating arrangement will be provided for minimum 75 passengers and 3 crew members. The dimensions, quality and leg room of the seating arrangement will ensure a comfortable ride to the passengers. The seating will be of cushion type equipped with life jacket holders.

*Windows in Passenger Area*

Windows in passenger areas will be of open type without glass, provided with light weight canvas covers for protection against sun and rain.

*Flooring*

Light weight, anti-skid, durable flooring will be provided in the passenger area and other open areas to be provided with anti-skid paint. Good quality floor mat is to be provided to enhance aesthetic appeal.

*Passenger Cabin*

The Builder will propose boat interior layouts, which incorporate a modern aesthetic approach with considerations to optimize passenger comfort, safety and security. The wheelhouse is to be separated from accommodation with access doors. The body-side and roof’s outer skin will have a suitable thickness of approved material bonded to their interior surfaces. All interior surface must be finished with good blending and slow-ageing properties to provide a pleasant, high-quality interior and for ease of cleaning and maintenance.

*Lighting System*

All the light fixtures in the passenger cabin will be of LED flush type arranged aesthetically, ensuring maximum comfort to the passengers. The passenger cabin will have illumination level between 150 lux - 200 lux.

1. **Wheel house:**

The wheelhouse will have sufficient windows on all sides to provide an all-round view during navigation. All wheelhouse windows will be suitable for navigation and fitted with toughened glass. Layout of the wheelhouse will be generally as per the guidance G.A. drawing attached. The wheelhouse front glass windows will be provided with an electric window wiper suitable for operation in heavy rain.

The wheel house will be provided with the following furniture and equipment.

1. Helmsman’s revolving chair - 1 no.
2. Cupboard - 1 no.
3. Steering wheel & accessories - 1 set
4. Remote control for propulsion motors
5. Manoeuvring Desk with navigational console - 1 no.
6. Engine Room
7. Electric horn – 1 no.
8. Switches and console for Navigational Lights, search light - 1 set
9. Echo Sounder – 1 no.
10. GPS – 1 no.
11. Console and instrumentation for Solar Charge Controller.
12. **Inspection and approval**

The owner’s representative will inspect and carry out specification surveys during the construction of the vessel. The vessel will be built under the specification survey of the owner and surveys done by Classification Society/statutory authorities. All materials used for construction of the vessel, procedures and personnel employed will be approved by the owner/statutory authorities as applicable. The owner’s representatives will inspect all stages of work against which stage payments are to be made before certification of stage completion.

All tests and trials will be pre-arranged and will be conducted in the presence of the concerned authorities and owner’s representatives. All test & trial reports approved by the concerned authorities will be submitted to the owner. Any defect found by the inspectors/surveyors during the surveys/inspections/tests/trials will be rectified by the builder at no extra charge. Two copies of the test certificates of materials and equipment will be submitted to the owner.

No major alteration or modification will be permitted without specific written approval from the owner or their authorized representative.

**Tank Testing**

A suitable tank testing scheme to check for water tightness of all hull compartments shall be prepared and submitted to the owner for approval. All compartments shall be tested in the presence of Classification Society/statutory authority surveyors and owners’ representatives. The tests shall be carried out after completion of the hull and before painting.

1. **Trials**

Dock trials will be carried out as per the program approved by the owner in the presence of their representatives and Classification Society/statutory authority surveyors as applicable. A report on the performance of various machinery and equipment during the trials will be submitted to the owner.

Trials will consist of speed trials, endurance trials, manoeuvring trials and any other trials as specified by the owner/Classification Society/Statutory authorities and will be conducted as per approved program in the presence of owner’s representatives and Classification Society/ statutory authority surveyors as applicable.

1. **Instructions Manuals and Books**

Two sets of instruction manuals , operation and maintenance manuals, spares catalogues and any other documentation for hull, machinery and equipment will be submitted to the owner. Two copies of the list of suppliers along with their addresses, phone/fax numbers and e-mail addresses if any, covering all machinery and equipment on board, will be submitted to the owner.

**12. Paint & Coatings**

The bidder shall propose a recognized marine paint manufacturer to the Client for approval. The paint formulation, specification, surface preparation, environmental constraints and application, shall be in accordance with that manufacturer's recommendation and warranties. The bidder shall provide a complete painting schedule to the Client for approval.

The Paint Schedule shall include information pertaining to paint formulation, surface preparation and cleaning, environmental constraints, and application techniques and tolerances.

Paint performance, including but not limited to anti‐fouling performance, shall be fully warranted by the bidder.

**13. Cathodic Protection**

All metallic parts of the vessel shall be fitted with passive anode‐type protection system. Bolt‐on passive anodes shall be provided on the hull bottoms, and at each main engine sea chest in sufficient numbers, locations and weight to protect the hull for at least one (1) year.

Unless otherwise noted, all hardware and fasteners used in the construction of the Vessel shall be 316 stainless steel.

1. Drawings & Documents

The following drawings and documents shall be submitted:

1. *Conceptual Design drawings and Documents*
2. General Arrangement
3. Midship section
4. Hydrostatic particulars and cross curves of stability.
5. Preliminary weight & C.G. estimates
6. Preliminary stability calculation
7. Electricity load chart
8. General machinery layout
9. List of main & auxiliary machinery, equipment
10. Any additional drawings required for construction shall also be prepared by the builder and submitted for the approval of the purchaser.
11. As Fitted Plans, Test & Trial Reports, Operating Manuals
12. General Arrangement plan
13. Structural Drawings
14. Sounding table
15. Docking plan
16. List of all outfit equipment
17. Draft marks Plan
18. Skeg fitting
19. Railings, ladders, Manholes & hatches
20. Mast drawings & Navigational light details
21. Painting scheme
22. All loose tank drawings
23. Ventilating fan details
24. Propeller drawing and details
25. Stern gear arrangements
26. Steering gear arrangement
27. Engine room arrangement
28. Details of tank capacities
29. Schematic piping drawings
30. 19.LSA, FFA equipment plan
31. Inclining Experiment report & Trim and stability booklet
32. Test results of material, machineries &equipment as required by the class
33. Reports of Trials
34. Particulars of all Machineries and equipment
35. Manuals and instruction books of all machineries and equipment
36. Spare part list of all machinery, manuals etc.

1. Valid test certificate for PV Modules
2. IEC 61215- Part 1 for design qualification and type approval
3. IEC 61730 Part 1 for requirements for construction
4. IEC 61730 Part 2 for requirements for testing
5. IEC 61701 for qualifying salt mist corrosion testing
6. LIP Battery bank
7. Valid test certificate for IEC 62133-2: 2017 and or UL1642.
8. Manufacturer’s “cycle life” guarantee for minimum 5000 cycles at an operating temperature higher than 30oC.

Hard copies of each drawing/document shall be submitted in duplicate along with a soft copy. One copy of operating manuals of all machineries and equipment shall be submitted.

The builder shall submit all drawings and documents to statutory authorities as applicable and obtain the necessary approval. Charges for the same shall be borne by the builder. One copy of each drawing/document approved by the statutory authorities and bearing their seal shall be submitted to the Owner.