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| ***EIL. NR.*** | ***TECHNICAL REQUIREMENT*** | | ***COMPLIANCE WITH THE REQUIREMENTS OF THE TECHNICAL SPECIFICATION***  ***(to be completed by the Supplier)*** | |
| **I. GENERAL** | | | | |
| **1.** | **1.1. Objective** The joint stock company Inland Waterways Authority (hereinafter referred to as the 'Buyer') plans to purchase an electric *inland water* pusher (hereinafter referred to as the 'pusher/boat') suitable for shallow waters, the motors of which are powered by electricity from batteries*.* The batteries must be removable from the vessel for charging. The pusher shall be designed to push a barge without propulsion.  This Technical Specification provides the basic information, standards and technical requirements to enable the Vendor to carry out detailed engineering and manufacturing work in accordance with the requirements of the applicable rules and regulations.  The Seller shall be responsible for the design and construction of the Vessel in accordance with the performance requirements set out and the recommended shipbuilding methodology and best practice. The Vendor is encouraged to use innovative solutions and existing designs.  The supplier's tender shall include all parts, machinery, works and services which, although not expressly provided for in the technical specification, are necessary for the manufacture, delivery, commissioning and safe operation of a vessel complying with the requirements of this technical specification, as required by law and by the rules of the classification society, and which are necessary and customary on equivalent vessels, without incurring any additional cost to the buyer. The choice of dimensions, quantities and manufacturer shall be in accordance with the general technical rules, requirements and normal shipbuilding practice. All drawings, diagrams and calculations shall be checked against the actual condition and, where necessary, submitted to the buyer for approval and, where appropriate, to the chosen classification society.  **1.2 Abbreviations**  The following abbreviations are used in the Technical Specification:   * AVMS - Automatic Control and Monitoring System. * BMS - Battery management system. * PMS - Power management system. * LTSA - Lithuanian Transport Safety Administration. * AC - alternating current. * DC - direct current. * BESS (Lithium Battery Energy Storage Systems) * 'Classification society' means a ship classification society, the national body for the classification and maintenance of ships. It prepares and issues rules for the design and classification of ships, establishes requirements for civil maritime safety and the protection of life and the carriage of cargo; examines the design of ships, their equipment and other technical documentation; supervises the construction and operation of ships by periodically inspecting the condition of the ships; carries out measurements of the ships and assigns classes according to the purpose of the ship, the strength of the hull, the reliability of the machinery and so on; and issues classification certificates authorising the ship to operate and granting better insurance conditions and benefits.   **1.3. Standards**  T he design and construction of the hull shall be in accordance with the vendor's standards, the classification society's rules and other applicable requirements and regulations in the field, and the construction of the other parts of the ship (other than the hull) shall be in accordance with the vendor's standards and other applicable requirements and in the fieldregulations.  The Vessel's machinery, systems and equipment shall be subjected to tests required for ESTRIN certification in accordance with ESTRIN regulations.  The metric system shall be used for the design and construction of the hull, machinery and equipment.  **1.4 Documentation and drawings**  During the performance of the Contract, the Seller shall provide the Buyer with a complete list of documents (with its planned timetable for issue and delivery) corresponding to the scope of work as specified in the tender documentation, to be approved by the classification society and necessary for the construction of the vessel. Such list of documents shall be updated at the request of the classification society. The documents submitted and the approvals granted shall not relieve the vendor of its responsibility for the performance of the work under the contract throughout the contract period.  The quality of design, construction, installation, inspection, testing and workmanship not covered by the Technical Specification shall be implemented in accordance with the Vendor's work plans for the construction of the vessel.  **1.4.1. Approval of drawings**  Before and during construction, all general drawings of the ship (general arrangement of the ship, arrangement of decks, arrangement of the control console, arrangement of machinery) shall be submitted to the classification society for approval.  All drawings must be detailed, showing the layout of assemblies and systems.  Within 15 calendar days from the date of submission, the buyer shall approve or comment in writing on the vessel design and drawings. If no comments are submitted within this period, the document shall be deemed to be approved. The Seller shall, taking into account the Buyer's comments, make the modifications within 20 calendar days or within a reasonable period agreed between the parties, the duration of which shall be justified by the Supplier.  At the time of approval, the seller shall incorporate the buyer's comments into the shipbuilding design and drawings if the changes are in accordance with this technical specification. Changes to the drawings will require an updated Buyer's approval.  **1.4.2. Completed drawings**  Two (2) sets of all drawings, plans, schematics in paper format and two (2) sets in digital format (PDF. format) shall be submitted prior to the handover of the vessel to the buyer. The drawings shall be scanned using AutoCad. The results of the stability and stability calculations shall be submitted in three (3) copies. Upon delivery of the vessel, the final master layout plan shall be submitted to the buyer in triplicate. The drawings (in colour) shall be submitted laminated and framed:   * Fire safety and rescue plan. * Drainage plan. * External fire-fighting plan. * Manoeuvrability information. * Tank measuring tables (without framing).   **List of drawings, diagrams, plans** The Seller shall deliver to the Buyer at the time of handing over the Vessel not less than the following drawings, diagrams and plans:   * + - general layout;     - midelio section;     - construction plan with cross-sections;     - a hull liner;     - all structural drawings of the hull, decks, etc. of the metallic , i.e. all metal structures;     - tank test plan;     - tank deployment plan;     - a docking plan with the positions and number of docking units;     - a fire safety and rescue plan;     - a general arrangement drawing showing the auxiliary machinery, piping, electrical cable routes, flooring, locations of electrical panels, etc., of these components:   + the engine room;   + battery rooms;   + pumping stations;   + a pipe tunnel;   + steering rooms;   + air-cooling and ventilation rooms;     - * mooring equipment (mooring winches, spars, outriggers, cleats, knuckles);       * anchoring equipment (anchor, chains, cleats, chain boxes);       * a drawing of the superstructure and wheelhouse layout with cross-sections;       * Furniture layout;       * Walls and ceilings in living areas;       * door plan;       * Window plan;       * floor plan;       * insulation plan;       * paint scheme and paint specification;       * Ventilation and air conditioning plan, ducts, filters;       * fire valves;       * deck layout;       * metal ladders, platforms and stairs;       * hatch plan;       * railing plan;       * Chart of marks (draught, freeboard mark, etc.);       * cathodic protection plan;       * stems;       * antenna plan;       * Sensor placement;       * Power plant layout;       * arrangement of the drive train;       * drawings of all pipes, with clearances between bulkheads and all details;       * drawings of fresh water, storm water, sewage, cargo, hydraulic, heating, electrical, radio and navigational equipment and other on-board systems;       * technical specifications with descriptions of equipment and machinery;       * List of approved fluids and oils;       * foundations (foundations) of major equipment (e.g. main, auxiliary gears, winches, etc.);   test protocol.  **1.4.4. Instruction documentation**  The seller shall provide two sets (in paper format) and two sets in electronic format of all equipment, machinery, certificates of conformity, descriptions, operator's *manuals*, *workshop manuals*, catalogues of *spare* parts and other documentation in accordance with the seller's list of documentation, of which one set shall be completed on board in accordance with the list of completed plans, at the time of delivery of the vessel to the buyer.  Spare parts lists (catalogues) for all equipment and installed equipment must state:   * a position number indicating a complete and legible drawing. * the name or description of the part. * unique part number. * Detailed specification (including make, type, relevant dimensions, standard material, etc.) of commonly sold parts such as fasteners, bearings (roller bearings, cylindrical roller bearings, etc.), seals (sealing rings, cylinder seals, etc.), hydraulic components, electrical components, couplings, hoses, tracking devices, attachments and fittings (valves, check valves, etc.).   The scope of completion of the completed plans shall be in accordance with the Vendor's standard, including any specific completed plan as required by the Contract Documents. The maintenance and repair manuals and spare parts catalogues provided shall ensure that the buyer is able to carry out all maintenance and repair work and spare parts orders properly. The instruction books and spare parts catalogues shall be supplied in the original form, as normally supplied by the manufacturers of the products concerned, in both English and Lithuanian.  Sufficient fuel, sewage, sludge or bilge piping diagrams, colour-coded piping diagrams, laminated safety and fire precautions plans, as required by the authorities, shall be affixed at appropriate locations on board.  **1.5 Occupational health and safety instructions**  The seller shall provide, together with all the ship's documentation, at the time of the acceptance of the pusher, the detailed occupational health and safety instructions for the crew to ensure the safe operation of the ship in different meteorological conditions:   * Instructions for use of the vessel and its machinery.   **1.6 Training of the Buyer's crew**  The seller shall, after handing over the vessel to the buyer within 14 calendar days at the latest, train the buyer's crew (captain and chief engineer) in the proper and safe operation of the vessel at the seller's expense. The duration of the training shall not be less than 5 calendar days. **1.7. Schedules**  The seller will be required to submit a design and construction action plan within the deadlines set out in the contract.  **1.8 Language**  All design and construction documents and drawings to be submitted to the buyer shall be in both English and Lithuanian, and the inscriptions and plates on the main engine, auxiliary machinery, electrical, steering gear and necessary valves shall be in both English and Lithuanian, using the metric system of measurement. **1.9 Model of the vessel**  The seller shall provide one model of the vessel in a scale of at least M1:50 before handing over the vessel to the buyer.  **1.10 Description of the vessel**  The pusher shall be designed and built as an environmentally friendly, green vessel powered by electric motor(s). The push boat will be operated on the Kaunas-Klaipėda route on the river Nemunas. The vessel shall be powered by electric motor(s), each driving one propeller.  The hull and superstructure shall be made of metal , the superstructure being located in the bow. The wheelhouse (bridge) shall be movable by means of hoists. The height of the lowered wheelhouse (bridge) from the waterline shall be not more than 5,5 m. The height of the raised wheelhouse (bridge) shall ensure good visibility (including that of the barge being pushed with a loaded cargo: a fully loaded formation) as provided for in the European Standards, , LTSA Orders. The height of the raised wheelhouse shall not be less than 12,0 m (at eye level) from the waterline.  **1.11. Rules and Documents**  The pusher craft shall be designed and its hull shall be built to the requirements of a classification society recognised by .  The vessel will be registered in the Inland Waterways Register of the Republic of Lithuania, sailing area - Inland Waters, Klaipeda port. The Seller shall be responsible for ensuring that the Vessel is designed and constructed in accordance with the requirements and regulations in force or coming into force on the date of signing of the Acceptance and Delivery Certificate.  Where there is a discrepancy between the requirements described in the legislation or standards, the requirements and legislation with the more stringent requirements must be followed.  The vessel will be required to have all the certificates and documents required for registration by the classification society to whose requirements it will be built and/or by the Transport Safety Administration of the Republic of Lithuania. Two copies of each certificate and document, an original and a copy, must be presented at the time of delivery.  The Seller undertakes to prepare all the documents necessary to register the vessel in the Register of Ships of the Republic of Lithuania in order to obtain a valid technical inspection, and the Buyer undertakes to ensure that the vessel is registered in the Register of Ships of the Republic of Lithuania and has a valid technical inspection. | | | |
| **II. FUNCTIONALITY** | | | | |
| **2.** | **2.1** The pusher shall comply with the operating environmental conditions:   1. Be capable of pushing a barge and cargo (total weight not less than 2000 tonnes) of not less than 75 m in length by not more than 16 m in breadth with a loaded height from the deck of the barge of not less than 6,5 m (in two rows of 40-foot high-cube container type); 2. Be able to ensure (pusher and barge) controllability of the convoy downstream, upstream, during turns and manoeuvres, moored at the berth, taking into account the total weight, length, breadth, height and area of the convoy (with cargo loaded on the barge); 3. To ensure the controllability and tractability of the pusher and of the train of at least 2000 tonnes in winds of at least 12 m/s; 4. It must be able to operate at an air temperature of at least -5°C to +35°C; Must be capable of operating at an outboard (river) water temperature of not less than 0°C to +30°C; 5. It must be able to reach a speed of at least 10 km/h when pushing the formation and at a maximum engine load of 80%; 6. The pusher must be able to swim a distance of 300 km; 7. The pusher must be new (unused). | | | Indicate compliance with the requirements of the environmental conditions in operation |
| **III. MAIN CHARACTERISTICS** | | | | |
| **3.** | **3.1.** Length of the pusher | Not more than 26 m | | Specify the pushrod length range |
| **3.2** Width of the pusher | Not more than 12 m | | Specify the range of pushrod width |
| **3.3.** Maximum draught of the pusher (with the correct number of batteries) | Not more than 1,4 m | | Specify maximum draught |
| **3.4** Maximum height of the pusher from the waterline | Not more than - 5,5 m | | Specify the maximum pusher height |
| **3.5.** be able to sail while pushing a 2000t formation at not more than 80 % engine load | Not less than 10 | | Specify the pusher speed |
| **3.6.** Pushing capacity of the formation (cargo and barge) | Not less than - 2000 t | | Specify pushing capacity |
| **3.7** Crew | The crew will consist of 3 people. Accommodation is provided in two double and two single cabins | | |
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| **IV. HULL AND SUPERSTRUCTURE** | | | | |
| **4.** | **4.1 General requirements**  All materials and equipment installed on board or delivered with the vessel must be new and certified. All ship's systems (piping, electrical cables, etc.) must be appropriately marked for their intended use. The vessel must be cleaned before delivery to the buyer. | | | |
| **4.2. Testing**  The ship's machinery, systems and equipment shall be subjected to static tests, dock tests and running tests in accordance with approved test programmes, in the presence of representatives of the purchaser . | | | |
| **4.3**. **Partitions**  The hull shall be divided into watertight transverse bulkheads which shall be located in such positions as the classification society requires. | | | |
| **4.4. Foundations of mechanisms**  Welded foundations of solid construction are used for the installation of motion mechanisms, generator sets, pumps, electrical equipment and other equipment. Foundations shall be designed to comply with the manufacturer's recommendations for weight and forces to be applied when the vessel is underway. | | | |
| **4.5 Off-board water abstraction**  The design will determine the need. | | | |
| **4.6 Water and ventilation outlets**  Drains and vents shall be provided in the internal structural members of all tanks, decks and main structures to ensure free movement of liquid and/or air to the . | | | |
| **4.7. Buttresses (support beams)**  All round the hull shall be fitted with round section tie beams (spars) of rubber or other material not inferior to rubber compound. The bulwarks shall be placed in a reinforced recess along the perimeter of the deck. The spacers shall be highly resistant to abrasion and tearing and shall withstand friction, impact during operation and mooring. | | | |
| **4.8. Other components**  All other components of the joining equipment in accordance with recommended shipbuilding methodology, best practice. | | | |
| **4.9 The stem**  The mast shall be of the retractable type mounted on the wheelhouse roof, The navigation mast shall be equipped with antennas and navigation lights. | | | |
| **4.10. Insulation**  Insulation in machinery spaces, battery compartments and all other areas of the ship shall be installed in accordance with the recommended shipbuilding methodologies and best practices recommended by | | | |
| **4.11 Windows, doors and hatches**  Doors, windows, hatches and covers, their arrangement and thickness shall comply with the mandatory legal requirements and be fitted in accordance with the shipbuilding methodologies and good practice recommended by . | | | |
| **4.12. Protection and painting of structural surfaces**  The surface of the entire hull and superstructure shall be prepared in accordance with the requirements of the painting scheme for priming and painting. | | | |
| **4.13. Cathodic protection**  The aluminium or zinc anodes for electrochemical protection shall be installed before the ship is launched and shall be located in the lines of the underwater part of the hull. | | | |
| **V. WHEELHOUSE AND ITS EQUIPMENT** | | | | |
| **5.** | **5.1. Wheelhouse**  The wheelhouse shall be hydraulically raised. The elevating wheelhouse shall not endanger the stability of the vessel. The raising and lowering of the wheelhouse shall not interfere with operations from . The maximum height of the wheelhouse in the down position shall be 5,5 m from the waterline. The wheelhouse in the raised position shall ensure that the helmsman's visibility above the waterline is maintained in accordance with the requirements for visibility from the wheelhouse. The position of the wheelhouse shall ensure good bow visibility when in formation with a full container barge. It shall be possible to enter and leave the wheelhouse safely in any position. The lifting mechanism shall be operable from inside the wheelhouse. Means shall be provided to prevent uncontrolled descent of the wheelhouse. Adequate safeguards shall be in place to prevent the risk of injury from lowering the wheelhouse. A prominent and audible warning signal shall be activated automatically at the start of the lowering operation. The wheelhouse shall be of ergonomic design with a fully equipped control panel from which all processes of the vessel and its equipment shall be monitored and controlled. All controls for navigation and manoeuvring equipment shall be easily accessible and legible to the helmsman at the control panel. The helmsman shall have good visibility. The wheelhouse shall be equipped with a console for the navigation lights, a ship's clock, a barometer, an outside air temperature thermometer or a metrological station and a loudspeaker. | | | |
| **5.2. Navigation and communication equipment**  The composition and quantity of navigation and communication equipment shall be based on the size of the vessel and the area of navigation, in accordance with the Inland Navigation Guidelines . | | | |
| **VI. LIVING LAMBS** | | | | |
| **6.** | **6.1 Main engines**  The engine compartment shall be equipped with an electric motor(s) with all necessary equipment. The power of the motors shall be at least sufficient to ensure the conditions specified in the preceding specification. The engines shall be loaded up to 80 % under operating conditions and shall be capable of a speed of at least 10 km/h when pushing a complete and loaded formation (pusher, barge, cargo). The engines and other equipment shall be installed in accordance with the shipbuilding methodologies, best practices for this type of vessel. Provision shall be made for the engines and machinery to be removed from the engine room. | | | |
| **6.2 Electric motors - generators**  The vessel shall be equipped with an electric motor-generator which, depending on the selected operating mode, is connected to the transmission to supply electricity to the vessel's consumers and to charge the main batteries. | | | |
| **6.3. Remote technical assistance system**  The ship shall be equipped with a system that allows the shipbuilder to remotely access the EMSA to perform troubleshooting of the ship's electronic systems, to configure electronic equipment or to provide other technical assistance remotely. The remote access to the EMSA shall be designed in such a way that access to the ship's EMSA is granted by the buyer to the shipbuilder on a case-by-case basis, i.e. the shipyard cannot access and control the EMSA system at random times. The AVMS shall be able to connect to the systems listed in clauses 8.4; 8.10; 8.11; 8.12. | | | |
| **6.4 Battery room**  The battery room shall be equipped in accordance with the requirements of the specific legislation , The room shall be equipped with ventilation, cooling, heating, security and other systems necessary to ensure the longevity and protection of batteries | | | |
| **VII. DENY'S EQUIPMENT** | | | | |
| **7.** | **7.1 Anchoring and mooring equipment**  Anchorage, mooring connection facilities shall be installed in accordance with the requirements of the specific legislation . The number and size of anchors shall be calculated in accordance with the EU-TRIN or equivalent rules, taking into account the size of the pusher and the convoy. | | | |
| **7.2 Rescue equipment**  The types, arrangement and quantity of life-saving appliances shall comply with the requirements of LTSA or equivalent for the size of the designed vessel, the sailing area and the number of persons on board. | | | |
| **VIII. SHIP'S SYSTEMS AND AUXILIARY MACHINERY** | | | | |
| **8.** | **8.1 General requirements**  The ship shall have piping diagrams corresponding to the final layout of the equipment, reflecting the actual dimensions and flow characteristics.  The installation of piping systems, including pipe diameters, thicknesses and all other parameters of each system shall be in accordance with recommended shipbuilding methodology, good practice | | | |
| **8.2. Heating, ventilation and air conditioning**  Air conditioning, ventilation and heating must be provided in all living and working areas and must comply with the applicable sanitary standards, .  The number, arrangement and management of fire dampers in accordance with recommended shipbuilding practices, best practice. | | | |
| **8.3. Sanitation system**  The fresh water system shall provide for the reception of water into the fresh water tank, the supply of water to the hot water heater, and the washbasins in the sanitary facilities. The capacity of the fresh water tank shall ensure the autonomy of the vessel during two shifts of at least 5 days.  There shall be a drainage system for the collection of waste water and faecal water from sanitary appliances. The system shall be equipped with a fixed fecal pump for the connection of waste water to the shore facilities. The capacity of the sewage tank shall be such as to ensure the autonomy of the vessel during two shifts of at least 5 days. | | | |
| **8.4 Drainage system**  An effective drainage system shall be in accordance with recommended shipbuilding methodology and best practice.In the case of sewage wells, the emergency alarm of water level and the control of the sewage pumps shall be via the EWMS. | | | |
| **8.5 Drainage system**  A deck drainage system shall be fitted to remove water from the deck overboard. A compartment drainage system shall be fitted to drain condensation from the compartments. | | | |
| **8.6 Ballast system**  The need for a ballast system to ensure that the pusher has the required draught and can float on a level keel shall be decided by the shipbuilder. | | | |
| **8.7 Fire extinguishing system**  All fire-fighting systems, appliances on board shall be designed and installed in accordance with recommended shipbuilding methodology, best practice. . | | | |
| **8.8. Hydraulic system**  The hydraulic system or systems shall be designed to supply hydraulic power to the hydraulic platform (steering gear) and other mechanisms such as steering gear as necessary. The hydraulic system or systems shall be designed and installed in accordance with best practice for ships under construction and the standards of the builder. | | | |
| **8.9 Vessel lighting system**  The ship shall be provided with sufficient lighting sources, their arrangement and intensity of light intensity in accordance with the applicable regulations and to ensure good lighting in accommodation, service spaces, main deck, gangways and wherever necessary for safe working. | | | |
| **8.10. Automatic Control and Monitoring System (ACMS)**  The vessel shall be equipped with a state-of-the-art Automatic Vessel Management and Surveillance System (AVSS), which shall include all the necessary functions to monitor and control the vessel's propulsion plant, batteries, machinery and systems when the engine room is without a duty officer. . The AVMS shall include at least:   * Control and monitoring of the ship's liquid levels in the tanks, the bilge water system. * Control and monitoring of the ship's lighting and navigation lights. * Control and monitoring of ventilation, cooling and heating systems. * Control and monitoring of pumps, valves (dampers). * Interface with BMS (Battery Management System.) and PMS (Power Management System.) systems. * Interface to fire detection and alarm system. * Alarm notification and memory storage.   The EWRS must be installed:   * 1 in the wheelhouse. * 1 in the main battery room or engine room - monitoring and control of the electrical part. * Other areas of the ship according to the vendor's standards.   Hardware and software shall be maintained by the manufacturer and shall be upgradeable throughout the service life of the vessel. | | | |
| **8.11. Energy Efficiency Monitoring System**  The ship shall be equipped with an energy efficiency monitoring system that visually displays electricity consumption and indicates the best energy efficiency to the crew and shore-based administration. The system shall be able to receive from the vessel's AVSS the sailing data (sailing speed, electricity consumption, position data for calculating the distance of passage and other data necessary for the efficient operation of the system) and shall be automatically sent to the buyer's server (in the cloud) where it shall be stored. | | | |
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| **8.12. Fire detection and alarm system**  A separate automatic fire/smoke detection alarm system shall be fitted in accordance with the requirements of for this type of vessel. | | | |
| **8.13. Video surveillance system**  The vessel shall be equipped with a video surveillance system comprising at least:   * 1 monitor in the wheelhouse, which must be able to monitor images from different cameras; * 1 CCTV camera in the engine room; * 1 CCTV camera in the battery room; * 1 CCTV camera in the bow; * 1 CCTV camera at the stern.   CCTV cameras shall be of the marine type. It shall be possible to connect the cameras from a push barge. | | | |
| **8.14. Inventory and equipment**  Professional navigational equipment shall be installed to support (Electronic Chart Display, Radar Imaging, RIS River Identification System or equivalent) systems. The following equipment shall be carried on board:   * audible signal with microphone. * the ship's bell; * a digital weather station that records wind speed and direction, outside temperature, humidity, atmospheric pressure, and is connected to all navigational equipment where required;   Spare parts and ship's stores shall be delivered in accordance with best practice.Special tools for the maintenance of main and auxiliary engines and machinery shall be included in the scope of the order and shall be carried on board. | | | |
| **IX. ELECTRICAL PART** | | | | |
| **9.** | **9.1 General requirements**  Electrical systems shall be designed and installed, materials selected, installed and tested in accordance with the applicable EU standards for ships. All electrical installations shall comply with IEC or equivalent standards. . The pusher shall be fitted with an electrical connection (barge to pusher) for monitoring the barge's navigation lights, bilge water alarms and other systems from the wheelhouse. | | | |
| **9.2 Ship's electrical network**  **9.2.1. Electricity distribution system**  The ship's power distribution system will consist of the following power systems:   * DC bus for propulsion system, batteries and 3-phase system * 3-phase AC system to supply power to pumps, fans and auxiliary deck equipment * 3-phase AC system to supply power to control systems, fans, auxiliary lighting, navigation equipment, etc. This shall be via system transformers. * 24VDC for navigation lights, alarms etc. This shall be done via 230V AC converters of the 230VAC/24VDC system.   ***Note: The exact voltage of the main DC bus must be selected according to the optimum voltage value of the main consumers, i.e. the propulsion system motors and the BESS.***  **9.2.2. Main distribution panel and DC bus**   * The main distribution panel will have to be located in the distribution panel room and will be subdivided into individual panels and will have all the necessary elements for control, power, protection and distribution of the battery system. * The Supplier is entitled to propose alternative options. | | | |
| **9.3 Shore power connection and charging of main batteries**  The shore connection will be part of the main distribution panel. It is assumed that the AC/DC converter will be part of the shore-side power supply infrastructure in order to reduce the weight of the vessel and save space. | | | |
| **9.4 Accumulators, batteries**  Main batteries shall be designed for heavy-duty operation, have a battery management system (BMS), good battery cooling, heating and hazardous gas venting, . The batteries shall be selected according to the ship's mode of operation and shall have a service life of at least 2 years. Batteries shall be removable from the vessel on shore for charging. | | | |
| **9.5 Electrical cables**  All cables shall comply with IEC or equivalent standards. | | | |

The supplier must submit with the tender documents demonstrating compliance with the characteristics proposed in the technical specification, such as drawings, documents complying with standards, technical specifications, etc. (optional). Technical specifications for batteries must be provided. The documents may also be submitted in English.