



भारतीय अन्तर्देशीय जलमार्ग प्राधिकरण (पत्तन, पोत परिवहन और जलमार्ग मंत्रालय, भारत सरकार)

मुख्यालय: जलमार्ग भवन, ए-13, सेक्टर-1, नोएडा-201 301 (उ०प्र०)

INLAND WATERWAYS AUTHORITY OF INDIA

(Ministry of Ports, Shipping and Waterways, Govt. of India)

Head Office : Jalmarg Bhawan, A-13, Sector-1, Noida-201 301 (U.P.)

Website: www.iwai.gov.in | www.iwai.nic.in

Tel. : +91-120-2544036, 2543972, 2527667, 2448101 Fax : +91-120-2544009, 2544041, 2543973, 2521764

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23.09.2026

To,

All Prospective Suppliers / OEMs / System Integrators
(As per circulation list)

Subject: Request for Inputs and budgetary offer from all Prospective Suppliers / OEMs / System Integrators for Retrofitting Traditional Passenger Boats (on turnkey basis) operating on National Waterway – 1 (Ganga-Bhagirathi-Hooghly River System) and various Other National Waterways, including associated Charging Infrastructure and Fleet Management System -reg.

Sir/Madam,

The Inland Waterways Authority of India (IWAI) is examining a programme for the retrofitting of traditional/ wooden passenger boats operating on various National Waterways with battery-electric propulsion systems, retaining the traditional/ wooden hull configuration wherever structurally suitable. Towards this, a technical specification and problem statement for the proposed retrofitting programme has been prepared and enclosed as Annexure to this letter.

2. You are requested to review the enclosed technical specification and to furnish your **assessment of technical feasibility, any modifications suggested on technical aspects and a budgetary estimate against the cost heads given therein in the Annexure.**
3. Responses may kindly be submitted electronically to lkrajak@iwai.gov.in and vpandey@iwai.gov.in on or before 30th September 2026.

Encl.: Technical Specification and Problem Statement (Annexure)

Yours faithfully,

(L.K. Rajak)

Chief Engineer (Technical)

Copy to:

1. Dr. K. K. Nath, Advisor Statistics (IWT-I & II, TRW), MoPSW - For favour of information.
2. The Chief Executive Officer (CEO), Kerala Maritime Board, 1st Floor, Mulamoottil Building, Pipinmoodu, Sasthamangalam, Thiruvananthapuram, Kerala-695010 - for your valuable inputs and with a request for circulation to all prospective manufacturers/Suppliers / OEMs / System Integrators as per your database.

3. Sh. K. K. Dhawan, Indian Register of Shipping, Delhi-for your valuable inputs and with a request for circulation to all prospective manufacturers/Suppliers / OEMs / System Integrators as per your database.
4. Director, RO Patna/Kolkata/Varanasi/Guwahati/Kochi/Bhubaneshwar/Mumbai-for circulation to all prospective manufacturers/Suppliers / OEMs / System Integrators under your jurisdiction.
5. The Automotive Research Association of India, Survey No. 102, Vetal Hill, Off Paud Road, Kothrud, Pune - 411 038, Maharashtra, India-for your valuable inputs and with a request for circulation to all prospective manufacturers/Suppliers / OEMs / System Integrators as per your database.
6. The Bureau of Indian Standards (BIS), Manak Bhawan, 9, Bahadur Shah Zafar Marg, New Delhi – 110002 - for your valuable inputs and with a request for circulation to all prospective manufacturers/Suppliers / OEMs / System Integrators as per your database.
7. PPS/Chairman, PS/Vice Chairman, PS/Member (Technical), IWAI, Noida – For favour of information.
8. PCSA, IWAI, Noida – for uploading on IWAI Website.

TECHNICAL SPECIFICATION AND PROBLEM STATEMENT

Design, Engineering, Supply, Retrofit, Installation, Commissioning, Testing and Five-Year Maintenance of Battery-Electric Propulsion Systems for Traditional Passenger Boats operating on National Waterways-1 (Ganga-Bhagirathi-Hooghly River System) and various other National Waterways, including Associated Charging Infrastructure and Fleet Management System

1. Preamble

- 1.1 The Inland Waterways Authority of India (IWAI), under the Ministry of Ports, Shipping and Waterways (MoPSW), Government of India, is examining the retrofit of traditional passenger boats operating on National Waterways-1 (Ganga-Bhagirathi-Hooghly River System) and various other National Waterways, with battery-electric propulsion systems, while retaining the traditional/wooden hull configuration wherever structurally suitable.
- 1.2 This document sets out the problem statement, the conceptual scope, and an indicative technical specification for the proposed programme. It is being circulated to prospective suppliers of electric OBMs and chargers, Original Equipment Manufacturers (OEMs), system integrators and marine engineering firms with relevant experience, in order to ascertain market capability, solicit technical feedback, and obtain indicative budgetary inputs prior to the finalisation of a formal tender/Request for Proposal (RFP).
- 1.3 This document does not constitute a tender, invitation to bid, or commitment on the part of IWAI to procure any goods or services. Response to this document does not confer any right, financial or otherwise, upon the responding party, nor does it bind IWAI to any subsequent tender terms.
- 1.4 All figures, specifications and cost estimates indicated herein are indicative and reference-level in nature, derived from a preliminary technical concept note, and are subject to revision based on site surveys, boat-wise structural assessment, market response to this document, and subsequent Detailed Project Report (DPR)/tender formulation.

2. Problem Statement

- 2.1 Large numbers of traditional/wooden passenger boats currently operate on the declared national waterways, providing tourist and/or pilgrimage river transport. These boats are presently powered by diesel propulsion, which results in continuing fuel dependence, exhaust emissions, engine noise and vibration in a densely used and, in many cases, culturally sensitive riverfront environment.
- 2.2 There is a need to reduce the environmental and operational impact of this fleet without displacing the traditional/wooden hull form that is integral to the character of the riverfront concerned, and without disrupting the livelihood of boat operators who depend on this fleet.
- 2.3 No standardised, performance-based technical specification currently exists for retrofitting such vessels with battery-electric propulsion at fleet scale in an Indian inland-waterway, low-

speed, displacement-hull operating context. Boats in the fleet vary in length, beam, displacement and passenger capacity, so a single propulsion and battery configuration cannot reasonably be imposed uniformly across the fleet.

- 2.4 IWAI accordingly seeks to establish a scalable, technically sound and technology-neutral retrofit framework-covering propulsion, energy storage, charging infrastructure, telematics, safety systems and hull-retrofit methodology that can be validated through a phased pilot before being scaled to the full fleet, and subsequently replicated at other national-waterway tourism destinations.

3. Objectives of the Programme

- Replace diesel propulsion on the existing traditional/wooden passenger boat fleet with battery-electric propulsion.
- Retain the traditional/wooden hull preserving the cultural character of the riverfront concerned.
- Reduce noise, exhaust emissions and fossil-fuel dependence associated with fleet operation.
- Establish a technically defensible, scalable and replicable model for electric inland river transport that can be extended to other national-waterway tourism destinations across the country.
- Adopt a technology-neutral, performance-based specification that defines minimum outcomes and safety requirements.

4. Proposed Scope of Work

The proposed procurement is envisaged as a turnkey, single-point-responsibility engagement, under which the selected supplier/contractor would be responsible for the complete chain of activities set out below, so that system integration, performance and warranty outcomes rest with one party rather than being fragmented across disconnected component suppliers.

Engineering → Design → Supply → Retrofit → Commissioning → Testing → Warranty → Five-Year Maintenance (AMC)

The scope is expected to cover, at a minimum:

- Boat-wise hull and structural assessment.
- Design, supply and installation of electric propulsion, battery energy storage, BMS and associated controls for up to 100 boats.
- Removal of existing diesel engines and fuel systems, and associated retrofit works (mounting, cable routing, waterproofing, steering integration, weight/balance verification).
- Design, supply and installation of distributed shore-based charging infrastructure (charging stations and points), including associated civil and electrical works.
- Supply and integration of GPS/IoT telemetry on each boat and a central fleet-management dashboard.
- Supply of onboard instrumentation, auxiliary power systems and safety equipment.

- Testing and acceptance certification of each retrofitted boat under defined load and river-current conditions.
- Crew training, documentation, initial spares, and five-year comprehensive maintenance support.

5. Technical Specifications (Reference / Indicative)

The specifications below define reference/minimum performance parameters. Prospective suppliers are encouraged to propose compliant alternative configurations that meet or exceed the stated performance, safety and lifecycle outcomes; IWAI does not intend to prescribe a specific proprietary make or model.

5.1 Electric Propulsion System

Parameter	Reference Specification
Power (continuous)	15 kW minimum continuous
Power (peak)	18–20 kW peak preferred; 15–20 kW range permitted based on boat-wise survey
Motor type	PMSM / BLDC marine electric outboard
Voltage class	Approx. 72–120 V DC
Cooling	Air cooled preferred, if not Water/liquid cooled
Ingress protection	IP67 / IP68
Propulsion/propeller	High-thrust, low-speed river propeller suited to a displacement hull
Steering	Remote/electronic
Controls	Electronic throttle with emergency-stop function

5.2 Battery Energy Storage System (BESS)

Parameter	Reference Specification
Chemistry	Lithium Iron Phosphate (LFP) preferred; alternative lithium-ion chemistries (e.g., LTO) may be proposed where justified, see Section 6
Capacity (minimum)	20 kWh
Capacity (standard fleet class)	20–25 kWh (25 kWh reference class)
Capacity (larger/heavier boats)	25–30 kWh, based on boat-wise assessment
Voltage class	Approx. 96 V class
Usable energy	≥ 90% of nominal capacity
Enclosure protection	IP67 minimum
Battery placement	Installed low and centrally in the hull to preserve stability
Operating reserve	Minimum 20% operating reserve to be retained in service

5.3 Battery Management System (BMS) and Controller Integration

The BMS shall provide, at a minimum: individual cell voltage and pack voltage monitoring; current monitoring; temperature sensing; State of Charge (SOC) and State of Health (SOH) estimation; charging-status reporting; CAN/RS-485 communication; over-current, over/under-voltage and short-circuit protection; and a contactor with pre-charge circuit and service disconnect.

The motor controller shall be compatible with 15 kW+ continuous / 18–20 kW+ peak operation, the 72–120 V system voltage, CAN/RS-485 communication, and shall provide over-current, over-temperature and short-circuit protection at IP67 or better.

The motor, controller and battery are preferably to be supplied as an integrated propulsion package by a single responsible party. A critical BMS fault shall automatically disconnect the battery. Regenerative capability shall be provided where supported by the propulsion architecture.

5.4 Charging System

Parameter	Reference Specification
Charger rating	7.2–7.5 kW AC (standard); higher-rate option to be assessed against route/duty cycle
Input	230 V AC, single phase
Output	Matched to battery voltage
Efficiency	≥ 92%
Protection	IP65 or higher; CAN/BMS compatible; automatic charging termination; RCCB/earth-leakage protection
Indicative full-charge duration	Approx. 3–4 hours for a 20-kWh battery (indicative; final duration subject to charger output and charging curve)

5.5 Fleet Charging Infrastructure

A distributed shore-based charging network is envisaged, indicatively comprising 8–10 charging stations (fixed/floating) and approximately 50 charging points (approx. 5–6 points per major station) at 7.2–7.5 kW per point, with load management and individual energy metering. Each station shall provide, as applicable: transformer/distribution equipment, LT panel, MCB/MCCB, RCCB, surge protection, earthing, lightning protection, emergency isolation, fire extinguishers, weatherproof charging cabinets, cable management, charging-status indicators and site-specific civil/electrical works. The final number, location and capacity of stations shall be established through site surveys and DISCOM quotations.

5.6 GPS/IoT Telemetry and Central Fleet Dashboard

Every boat shall be equipped with GPS/IoT telemetry reporting, at a minimum: position, speed, battery SOC, battery voltage/current, motor power, motor temperature, battery temperature, operating hours, distance travelled, energy consumption, charging history and fault codes. A central fleet-management dashboard shall present boat identity, location, speed, SOC, energy status, fault status and charging status across the fleet. Telemetry data is intended to establish

actual energy consumption, route duty cycles, battery utilisation and charging behaviour for optimisation of future battery sizing and programme scaling.

5.7 Onboard Instrumentation and Auxiliary Power

A waterproof digital display(preferably 8-10 inch) shall present SOC, battery voltage, current, power, motor RPM, speed, remaining range, motor temperature, battery temperature and warnings/faults. A DC–DC converter (96 V to 12/24 V class) shall supply navigation lights, horn, GPS, display, bilge pump, communications and other auxiliary loads, with an independent small 12 V auxiliary battery provided for emergency/navigation functions.

5.8 Propeller Selection and Hull Retrofit Works

Propeller selection shall not be standardised across the fleet; it shall follow boat-wise assessment of hull length, beam, displacement, passenger capacity, motor RPM, river current and desired cruise speed. A high-thrust, low-RPM propeller is preferred given the displacement-hull character of the fleet. Indicative hull retrofit works comprise: hull survey; structural assessment; removal of the diesel engine and fuel system; motor and battery mounting; cable routing and waterproofing; steering integration; and weight/balance verification. The original traditional/wooden hull shall be retained only where certified structurally suitable; otherwise appropriate remedial or replacement measures shall be proposed.

5.9 Safety Systems

Electrical, fire and operational safety shall form a major part of the specification and of supplier proposals, covering at minimum:

- Electrical: emergency isolation, main battery disconnect, fuse/contactors/pre-charge, insulation monitoring, over-current and short-circuit protection, waterproof connectors.
- Fire: suitable fire extinguishers, battery thermal monitoring, emergency procedures, crew training, a designated emergency isolation point.
- Operational: passenger capacity limits, life jackets, navigation lights, horn, first-aid kit, emergency communication, prescribed operating speed.

The battery compartment shall be physically protected from passenger access.

6. Battery Chemistry Selection — Technology-Neutral Guidance

6.1 LFP (Lithium Iron Phosphate) is recommended as the fleet-standard chemistry for normal tourist operation (typically 2–4 operating hours/day with overnight charging), on account of lower mass for a given energy content, lower upfront cost, wider availability supporting competitive procurement, good safety and thermal stability, and simpler standardisation of spares, training and diagnostics across the fleet.

6.2 LTO (Lithium Titanate) may be evaluated as a targeted option for high-utilisation boats (typically 8–12 operating hours/day with several charge cycles/day, where downtime has a high revenue/availability cost), on account of superior fast-charging capability, higher-

current capability and very high cycle life, notwithstanding higher upfront cost and lower energy density.

- 6.3** The final chemistry allocation shall follow a short operational pilot and a 10-year Total Cost of Ownership (TCO) analysis covering capital cost, electricity, maintenance, battery replacement and downtime using common duty-cycle assumptions.
- 6.4** Prospective suppliers may propose LFP, LTO, or an equivalent lithium-ion chemistry, provided the proposed chemistry meets all stated performance, safety and lifecycle requirements, and is supported by cell datasheets, BMS architecture documentation, thermal-management design and relevant test certificates.

7. Performance Specification and Acceptance Testing

7.1 Reference Performance Parameters

Parameter	Reference Value
Continuous motor power	15 kW minimum
Battery capacity	20 kWh minimum; 20–25 kWh preferred standard
Battery chemistry	LFP preferred (see Section 6)
Normal cruise speed	6–8 km/h at 0.5 m/s river current
Indicative target range	30–40 km (indicative; to be established through river trials)
Full charging duration	3–4 hours (indicative)
Fleet availability	≥ 95%
GPS/IoT coverage	100% of fleet
Battery warranty	≥ 5 years
Motor warranty	≥ 3 years

Final performance targets, including range, shall be established through technically justified test procedures based on actual river trials, since range is dependent on load, river current, water level, wind and speed; suppliers are not expected to offer an unsupported blanket range guarantee.

7.2 Acceptance Test Parameters

Every retrofitted boat shall be required to demonstrate performance under defined load and river-current conditions prior to acceptance, covering:

Test Parameter	Test Parameter
1. Full-load operation	6. Range / energy consumption
2. Upstream operation	7. GPS & remote monitoring
3. Downstream operation	8. Charging
4. Manoeuvrability	9. Battery temperature
5. Emergency stop	10. Motor temperature

8. Implementation Phasing

The programme is proposed to be implemented in two phases on pilot basis in one or two cities on National Waterways:

Phase	Scope	Purpose
Phase I	20 boats	Technical and operational validation
Phase II	Balance boats up to 100	Full deployment

Based on the success and learnings of Phase-II, future schemes shall be formulated and implemented.

9. Indicative Cost

The Prospective suppliers requested to provide their quotation against the indicative heads; they may indicate their own cost estimate against other heads

Cost Head	Indicative Amount
Boat conversion (100 boats)	
Charging infrastructure	
Spares	
With five-year comprehensive O&M	

Indicative per-boat retrofit cost should be worked out covering the electric outboard, battery, BMS, charging point (boat side), propeller, controls, hull modification, installation, testing and documentation for a single boat, however Prospective suppliers may provide their cost with detailed justification and breakup.

10. Procurement Philosophy

- Technology-neutral: minimum outcomes and safety requirements are specified; compliant alternative technical solutions are welcome.
- Performance-based: acceptance shall be based on demonstrated performance under defined load and river-current conditions.
- Single-point responsibility: the programme is intended to be procured on a turnkey basis (through five-year AMC) so that system integration, warranty and service outcomes rest with one contracting party.
- Boat-specific engineering: battery capacity and propeller selection are to be engineered per boat class rather than imposed uniformly across the fleet.
- Phased validation: full-fleet deployment shall follow demonstrated performance in earlier phases.

11. Information Sought from Prospective Suppliers

Prospective suppliers/OEMs/system integrators are requested to furnish the following, to assist IWAI in assessing market capability and finalising the tender specification:

- 11.1 Company profile, relevant experience in marine/EV propulsion, battery systems and/or fleet retrofit programmes, and relevant reference installations, if any.
- 11.2 Technical compliance statement against the specifications in Section 5, with proposed deviations (if any) clearly identified and justified.
- 11.3 Proposed battery chemistry and rationale, with supporting cell datasheets, BMS architecture and thermal-management approach.
- 11.4 Indicative budgetary quotation for (a) per-boat retrofitting cost(item-wise), and (b) charging infrastructure, on the indicative scale set out in Section 9.
- 11.5 Manufacturing/assembly capacity and indicative lead times for supply of components/systems at the scale of 100 boats and 500 boats.
- 11.6 Proposed warranty terms and post-warranty comprehensive maintenance service model, including spares support and marine service infrastructure.
- 11.7 Any suggested modifications to the technical approach set out in this document, including on propulsion sizing, battery chemistry/sizing, charging architecture, or acceptance-testing methodology.

12. Submission Instructions

- 12.1 Responses to this document may be submitted electronically to lkrajak@iwai.gov.in and vpandey@iwai.gov.in, on or before **30th September 2026**.
- 12.2 Queries or requests for clarification on this document may be addressed to the above address. IWAI reserves the right to invite respondents for further technical discussion.
- 12.3 This document is issued solely to obtain technical and indicative commercial inputs and does not constitute a tender. A formal Request for Proposal/tender, incorporating inputs received, will be issued (subject to approval of the scheme) separately in due course through the standard procurement process of IWAI.
