EXPRESSION OF INTEREST (EOI) TO DESIGN AND DEVELOP ELECTRIC HARBOUR CRAFT ("PROJECT") IN SINGAPORE

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1 INTRODUCTION

1.1 Singapore raised its national climate target to achieve "net zero emissions by 2050" as part of the Long-Term Low-Emissions Development Strategy (LEDS). The transition to net zero emissions requires a collective effort from the public and private sectors comprising power generation, industry, transport, buildings, waste and water, and households. The domestic transport sector, which includes domestic maritime transport, actively contributes to mitigating Singapore's national emissions and has seen a number of digitalisation and decarbonisation initiatives from the public and private sectors working with the research community and partners.

1.2 In support of Singapore's 2050 national target, the harbour craft sector, including pleasure craft and tugboats, will correspondingly need to achieve net-zero emissions by 2050. Operators of new harbour craft are encouraged to inform MPA early of their plans, so that provisions to designs can be adjusted if necessary. Plans for harbour craft entering from 2030 should be highlighted to MPA from 1 January 2027. As of 2023, there are about 1,600 propelled harbour craft currently licensed by MPA. From 2030, all new harbour craft operating in our port waters can choose one or more of these pathways - be fully electric, be capable of using B100 biofuels, or be compatible with net-zero fuels such as hydrogen. The existing harbour craft are also expected to transit to net-zero emission types progressively.

1.3 Electrification of craft involves storing electricity in an onboard energy storage system for electric propulsion and loads. It is one of the major technological pathways to reduce the overall greenhouse gas emissions from the Singapore harbour craft and pleasure craft sectors. Carbon emissions and pollutants are expected to be lower when using electricity (from the grid), compared to those propelled by internal combustion engines (ICE) and fossil-based fuels, and can be reduced to zero if charged using renewables (e.g. solar energy). Furthermore, there are other beneficial outcomes from the electrification of these craft[1]. There will also be opportunities for our maritime workforce to upskill and take on wider roles arising from the electrification of the harbour craft sector.

[1] For example, a higher efficiency of the electric drivetrain and lower energy consumption during low-load operations, high torque at low-speed engine modes, reduced maintenance costs due to fewer maintenance checks and moving components, zero tailpipe emissions, low noise and vibration levels for enhanced comfort (Lam, Sze, Gou, & Yang, 2020).

1.4 MPA, in collaboration with the Maritime Energy and Sustainable Development Centre of Excellence[2], conducted a study of potential energy options for Singapore's harbour craft industry over a thirty-year horizon[3]. Some harbour craft have operating profiles that make electrification technically feasible and favourable, such as those with smaller engine sizes and fixed or predictable operation routes.

1.5 The development of electric harbour craft (e-HC) in Singapore is starting to gain traction[4]. There is scope to proliferate the use of e-HC with its attendant benefits. Electrification of craft signifies a change from the well-established ICE and low-cost Marine Gas Oil (MGO) as the main energy converter and fuel, respectively. The key industry consideration to enable this shift, beyond meeting the net zero emission goal, is the cost-benefit and ability of electrical systems to meet the operational profiles and demands of their ICE counterparts.

1.6 To catalyse wider-scale adoption of e-HC, MPA invites interested parties ("Participant") to submit a proposal ("Proposal") to a **non-binding Expression of Interest** ("EOI") to design and develop best-in-class e-HC reference designs, for commercialisation in Singapore ("Project").

1.7 MPA will partner the research community to work with identified partners to enhance the design of the harbour craft, with industry (i.e. harbour craft owners/ operators, manufacturers, etc.) and financial institutions to identify ways to lower the cost of adoption and mobilise support, such as green financing, for early adopters of new e-HC.

2 PURPOSE OF EOI

2.1 The EOI will allow MPA and other relevant agencies ("Government") to assess the feasibility of designing and developing best-in-class e-HC according to reference designs, engineered according to common design principles. As part of its optional scope, the EOI may also allow the Government to evaluate scalable and viable business models for the wider-scale adoption of e-HC that will consolidate demand for services, and concepts of potential ownership models or financing structures to enhance commercial viability (as elaborated in Section 4 – Optional Scope).

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[2] Launched in October 2017, MESD CoE is jointly funded by Singapore Maritime Institute (SMI) and Nanyang Technological University (NTU). MESD aims to develop innovative and sustainable solutions for port and shipping applications by working closely with all the key stakeholders within the maritime industry.

[3] Liu M. et al., A Study on the Future Energy Options of Singapore Harbour Craft, NTU MESD CoE Report, November 2020.

[4] In 2021, MPA and SMI awarded funding to two consortiums led by Seatrium New Energy Limited (formally known as Keppel FELS Pte Ltd) and SeaTech Solutions International (S) Pte Ltd to research, design, build and operate a fully electric harbour craft over the next five years. In 2022, the Coastal Sustainability Alliance signed a Memorandum of Understanding (MoU) to support decarbonization of Singapore's domestic harbour craft sector by developing an electric vessel ecosystem, including charging stations, marine logistics and services, as well as workforce upgrading. In 2023, MPA and Shell Eastern Trading Pte Ltd signed a five-year MoU to expand collaboration on the maritime decarbonisation efforts in Singapore, this includes working together to advance the adoption of electric harbour craft and collaboration on charging infrastructure.

2.2 The Project will enable the verification, demonstration, and building up of local capabilities to commercialise e-HC which are able to meet the sector's current operational requirements for relevant harbour craft types from 2027.

2.3 The Project allows the Government to partner the industry and collaborate with key domain experts, including Institutes of Higher Learning/ Research Institutes and the Singapore Maritime Institute (SMI) Maritime Research Centres of Excellence (COEs), Classification Societies[5], and MPA Port and Flag States, to further develop and refine applications to the project.

2.4 The Project aims to achieve the following desired outcomes:

2.4.1 Design and develop a reference point for a national design-approved e-HC and standards that adopt key design principles, taking into consideration efficient and optimised design specifications, operational performance, safety of operation, and affordability for wider-scale adoption and scale of e-HC in Singapore.

2.4.2 Share the outcomes of the Project at various national and international platforms (e.g. International Maritime Organization (IMO) and/or International Electrotechnical Commission (IEC)) with a view to internationalise the national reference e-HC designs.

2.5 MPA will assess the returns of the EOI and may refine the submitted e-HC design and launch a Request for Proposal (RFP) to implement the Project subsequently. MPA also reserves the right to approach EOI Participant(s) directly after the EOI closes and commence negotiations to award the Project directly without going through an RFP.

3 OVERVIEW OF REQUIREMENTS

3.1 The purpose of the Project is for the Participant to form partnerships with relevant stakeholders (within a consortium) across the value-chain of e-HC, to enable wider-scale adoption of e-HC by harbour craft owners/ operators. This will support the growth and development of enterprises in our region and beyond.

3.2 Participants are required to submit their Proposal for the design, mock-up/ scale model (digital and/or physical), and prototype of a best-in-class e-HC with a strong emphasis on a safe, efficient, optimised, adaptable, and future-proof design, versatile to general-purposed operational requirements.

[5] MPA and eight international recognised classification societies have signed a Letter of Intent to collaborate in the areas of maritime digitalisation and decarbonisation.

3.3 Harbour craft licensed under the SP, SC, and SR prefix, have been identified as frontrunners for full electrification. This group of harbour craft provide a wide range of services, including transporting passengers, cargoes, and other specialised uses such as project work, surveying, mooring, garbage collection and salvage work etc. Within this group of harbour craft, a large proportion[6] of harbour craft share common parameters suitable for aggregation as set out below. The EOI will primarily focus on this demographic of harbour craft.

a. Combined shaft power ranging between 200 and 400 kW;
b. Overall length ranging between 10 and 20 metres; and
c. Gross tonnage ranging between 20 and 40 tonnes.

3.4 The Participant may propose the design and development of the following types of e-HC within the targeted demographics (as elaborated at paragraph 3.3):

3.4.1 Type 1 Craft – carriage of a maximum of 12 passengers at a speed of at least 15 knots for 6 hours, or equivalent performance, at full load without disruption to the routine operations of the harbour craft; and

3.4.2 Type 2 Craft – carriage of fully laden dry or packaged cargoes and/or other purposes (e.g. survey works, garbage collection and salvage work etc.) at a speed of at least 12 knots for 8 hours, or equivalent performance able to meet current operational requirements, without disruption to the routine operations of the harbour craft.

3.5 To clarify, the Participant may also propose the design and development of:

3.5.1 Other types of e-HC within the targeted demographics (as elaborated at paragraph 3.3); or

3.5.2 Other types of e-HC which does not fall within the targeted demographics (as elaborated at paragraph 3.3) but falls within the description set out at paragraph 4.2 of this EOI.

3.6 The Project is expected to be operational by 2025 or earlier. The Participant shall propose a Project timeline and milestones to be met.

(a) <u>Requirements relating to the design of the e-HC</u>

3.7 The Participant shall design a highly efficient e-HC which is capable of meeting or exceeding the existing operational requirements of its conventional equivalent counterpart. In addition, the proposed e-HC design must be able to meet the following requirements:

[6] Approximately 25% of 1,600 propelled harbour craft

3.7.1 The hull type/ form shall be appropriately selected from a proven or derived hull form design with low hull resistance, thus minimising the required power. The material of the hull shall be appropriately selected of high structural strength and integrity.

3.7.2 The e-HC design shall be weight optimised to enable high operation efficiency and structural integrity. Appropriate selection of light-weight materials (e.g. hull, furniture, deck) shall contribute to a lower vessel weight of the e-HC (compared to its conventional equivalent counterpart).

3.7.3 The propulsion system and its interaction with the hull and engine shall be optimised to require low power/ energy to deliver highly efficient optimal cruising speeds.

3.7.4 The material of the superstructure shall be appropriately selected.

3.7.5 The design of the e-HC shall be based on safety, reliability, availability, and maintainability principles.

3.7.6 The design of the e-HC shall be approved by Classification Societies authorised by MPA as Recognised Organisations[7] and comply with existing regulatory requirements for harbour craft, including the Maritime and Port Authority of Singapore (Harbour Craft) Regulations, the Merchant Shipping Act[8], and Prevention of Pollution of the Sea Act.

3.7.7 The design of the e-HC should allow for a lower manning compared to current models, and support the development of autonomous operations in their useful lifespan.

3.8 In support of potential maritime use-cases (e.g. remote monitoring, automated and autonomous operations in the future), the Participant shall make provision for data exchanges (including the provision of cyber telemetry (e.g. network and system logs)) using digital network communications and connectivity capabilities (e.g. 4G/ LTE, 5G, satellite), designed to facilitate easy installation from the bridge to mast/ bridge top.

3.9 To facilitate future remote monitoring and management of marine activities, the Participant shall also make provision for data storage and transmission of key e-HC systems, including but not limited to:

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[7] American Bureau of Shipping (ABS), Bureau Veritas (BV), China Classification Society (CCS), DNV, Korean Register of Shipping (KR), Lloyd's Register (LR), Nippon Kaiji Kyokai (NK), Registro Italiano Navale (RINA)

[8] E.g. Merchant Shipping (Non-Convention Ships) Safety Regulations and Merchant Shipping (Load Line) Regulations

a. Energy storage system;
b. Battery management system;
c. Navigational communications system;
d. Fire detection system; and
e. Ship control management system; and
f. Cybersecurity system

3.10 The Participant shall in its Proposal provide the Government with technical and operational information which is capable of demonstrating that the proposed e-HC design is able to meet the requirements set out at paragraphs 3.7 and 3.8 to validate these operation efficiencies arising from the Project for the full duration of the Project. This may include:

3.10.1 Engineering, technical, design/ schematics/ drawings, calculations, and modelling where applicable;

3.10.2 Information related to operations and maintenance of the e-HC; and

3.10.3 Any other information which may be mutually agreed by all parties.

(b) <u>Requirements relating to the design of the energy storage and management systems of the e-HC</u>

3.11 The Participant shall design highly integrated and optimised energy storage and management systems to enable the e-HC to meet or exceed existing operational requirements of its conventional equivalent counterpart. In addition, the proposed design must be able to meet the following requirements:

3.11.1 The energy storage system shall be optimised to deliver the appropriate battery capacity to support high endurance operations (maximum range at an optimal speed).

3.11.2 Adopt a regulated e-waste management system (i.e. solar photovoltaic panels, batteries, electronic equipment) in its design and business model for e-HC, which takes into account the circular flow of regulated consumer e-waste.

3.11.3 The energy storage system shall be able to react to emergency/ redundancy power for “back-to-shore” contingency without the use of fossil fuel-based dual systems (e.g. battery swaps or backup vessels that can be activated as part of the overall fleet operating model).

3.11.4 The battery management system (BMS) and battery charging devices shall conform to all regulatory requirements and/or be in accordance with existing charging communication standards and be interoperable with various relevant charging systems.

3.11.5 The BMS shall be optimised and equipped with intelligent decision-making capabilities with appropriate selection of battery charging control strategies.

3.11.6 Battery charging and alternatives to battery charging (e.g. battery replacement, battery swapping) shall be ergonomic and seamless in transition during operations. The system shall be provisioned to facilitate battery upgrading (e.g. overhaul and replacement for maintenance, extension of battery capacity and/or higher energy-density batteries when technology readiness is higher).

3.11.7 The hotel load (auxiliary load e.g. lighting, heating, ventilation and air conditioning (HVAC)) shall be highly energy efficient to reduce unnecessary energy demands. The design should reduce thermal load to reduce cooling requirements.

3.11.8 Renewable energy (e.g. solar, wind, tidal, regenerative, etc.) generated onboard shall be considered to supplement energy supply to the energy storage system and/or as emergency/ redundancy power for “back-to-shore” contingency.

3.11.9 The integration of the energy storage and management systems shall be based on safety, reliability, and maintainability principles.

3.12 In designing the highly integrated and optimised energy storage and management systems of the e-HC, the Participant shall take into consideration the operational requirements of the e-HC and the technical requirements of the energy storage system which include but are not limited to the following:

3.12.1 Type(s) of battery chemistry (e.g. Li-ion (e.g. nickel manganese cobalt, lithium iron phosphate, lithium titanate), Na-ion) or working in concert with other energy systems (e.g. supercapacitors).

3.12.2 Type(s) of battery cells (e.g. cylindrical, prismatic, pouch)

3.12.3 Type(s) of battery system design (e.g. module, tray, rack, block)

3.12.4 Primary requirements (e.g. minimum required usable energy, maximum discharge power, maximum charge power, number of cycles per year, time per (dis)charge period, root mean squared value (dis)charge power)

3.12.5 Operation profile of harbour craft

3.12.6 Battery sizing (i.e. total installed capacity)

3.12.7 Battery lifetime

3.12.8 Charging approach (e.g. types of connectors, manual/ automated plug-in, battery swapping)

3.12.9 Location of battery bank (e.g. for battery swapping, battery should be housed where it is easily retrievable without heavy machinery)

3.12.10 3.11.10 End of use information for the recycling of battery systems

3.13 The Participant shall in its Proposal provide the Government with technical and operational information which is capable of demonstrating that the design for the energy storage and management systems is able to meet the requirements set out at paragraph 3.11 and 3.12. This may include:

3.13.1 Engineering, technical, design/ schematics/ drawings, calculations, and modelling where applicable;

3.13.2 Information related to operations and maintenance of the energy storage and management systems; and

3.13.3 Any other information which is to be mutually agreed by all parties.

(c) Requirements relating to the safety of the e-HC

3.14 To ensure the safe operation of the e-HC, the Participant shall include the following in its Proposal:

3.14.1 Infrastructure or systems to enhance safe boarding practices for shore-ship and ship-ship movement;

3.14.2 Appropriate thermal runaway (TR) propagation insulation (e.g. cell/ module level), TR propagation control (e.g. passive/ active), TR gas exhaust system (e.g. open/ closed) and location of ventilation exhaust, and TR response plans;

3.14.3 Appropriate provision and placement of gas detection sensors and gas detection response plans;

3.14.4 Appropriate external fire monitoring, early warning systems, and detection (e.g. heat sensors, smoke sensors, thermal cameras) and firefighting systems (e.g. gas, aerosol, foam, water mist/ sprinkler); and

3.14.5 Routine inspections of battery spaces and incident risk assessments and response plans.

3.15 The e-HC design proposed by the Participant must be able to meet the following safety-related requirements.

3.15.1 Ship steering and manoeuvrability shall be controllable from the primary source of power or emergency/ backup power (auto-switching feature when primary source of power fails) with an ergonomic design layout from the bridge (e.g. remote operation).

3.15.2 Advanced navigational equipment shall constantly monitor craft position, course, speed, surroundings (e.g. automatically acquires other vessel in its vicinity), operational from primary source of power or emergency/ backup power (auto-switching feature when primary source of power fails)

3.15.3 Cybersecurity requirements, including preventive and monitoring measures of shipboard systems against cyber threats, taking reference from industry best practices (e.g. NIST 800-53, ISO 27000, IEC 62443, IACS UR E26 and E27, etc.) for the cyber safety of the e-HC.

3.15.4 Provisions for the detection of malicious activities on the network and systems of onboard systems and equipment and to transmit those network and system logs to MPA for cyber detection and monitoring.

(d) Requirements relating to the manpower requirements of the e-HC

3.16 The Participant shall ensure the design and development of e-HC support human-centric and lean operations to achieve minimum manning requirements.

3.17 The Participant shall propose requirements for crew training including but not limited to:

a. Required enhancements to existing Certificate of Competency (COC) courses
b. Battery management and safety
c. Fire safety and training
d. Maintenance regime

(e) Requirements relating to the economic viability of the e-HC

3.18 The Participant shall demonstrate in its Proposal the value-proposition of the e-HC design with a focus on weight reduction while maintaining seaworthiness, emissions intensity, energy efficiency, and ability to meet or exceed operational requirements of its conventional equivalent counterpart, or propose ways in which the existing operational requirements can be better met through higher utilisation of a fleet of vessels. The number of vessels for the same operational requirements as a fleet should be less than the number of existing conventional equivalent counterpart.

3.19 To demonstrate economic viability of its Proposal, the Participant shall provide the following financial information in their Proposal. Amongst others, this may include:

3.19.1 Financial breakdown and projections related to capital costs for the design, build, testing, and delivery of one unit(s) of e-HC, fully equipped and outfitted as specified with consideration of value engineering. The Participant may perform a similar financial breakdown and projections for multiple units of e-HC with aggregated demand (e.g. 20, 50, 100 units) and clearly indicate capacity and cost projections at different stages of the scale-up.

3.19.2 Financial breakdown and projections related to operational costs for the insurance, consumables (e.g. cost of electricity), maintenance, repair, overhaul, disposal costs, and residual value (including battery recycling) over the lifecycle of the e-HC (i.e. hull, propulsion system, battery management system, and electrical equipment, etc.)

3.19.3 The total cost of ownership (TCO) shall be calculated over its estimated lifecycle, assuming 20, 25, and 30 years of operations. This should take the lifespan of the battery into consideration, assuming 5, 10, and 15 years of operations.

3.19.4 The cost of electricity where the TCO of the e-HC matches or is lower than the TCO of its conventional equivalent counterpart.

3.19.5 The Participant may demonstrate (e.g. via orderbook, commitments from prospective buyers, bulk pricing, or otherwise) a scalable and viable business model for the wider-scale adoption of e-HC, catered to a diverse group of harbour craft owners/ operators and use-cases.

3.20 In providing the information stated at paragraph 3.19.2, the Participant shall specify the scope of preventive and scheduled maintenance requirements and frequency for the harbour craft outboard, propulsion system, energy storage system and battery management system, and electrical components, etc.

3.21 In submitting its proposal, the Participant shall assess the financial viability of the e-HC design. The assessment shall be based on: (a) the TOC of the e-HC design; (b) the TOC of the e-conventional equivalent counterpart of the e-HC; and (c) the projected price of electricity and marine gas oil price. The Participant shall provide the said assessment to the Government.

4 OPTIONAL SCOPE

4.1 The Participant may, if it so wishes, design and develop a single interoperable e-HC that can be modified or refitted to fulfil the requirements of both types of craft (Type 1 and Type 2).

4.2 The Participant may suggest alternative types of harbour craft (e.g. bunker tanker, tugboat, other harbour craft with combined shaft power above 400 kW) to enable the Project, with due consideration of the requirements in Section 3.

4.3 To further encourage the wider-scale adoption of e-HC by the sector, the following components may help better ascertain cost parameters and corresponding financial structures. Participants may wish to include preliminary considerations of the following components in their submitted Proposals:

4.3.1 The Participant may demonstrate or propose a scalable and viable business model that would be able to meet various operation profiles, thus consolidating demand for services. The business model should maximise cargo/ passenger deliveries that can be performed per unit vessel and/or time.

4.3.2 The Participant may illustrate concepts of potential ownership models and financing/ insurance solutions to encourage industry adoption of e-HC on a commercially viable basis. Participants may also identify mechanisms required to enhance the cost efficiency of operating the e-HC.

4.4 As a next step, the Government may concurrently release a separate EOI to call for information or proposals from financiers and marine insurers to support the outcomes of the Project.

5 FORM OF EOI

5.1 The Participant shall submit the EOI using the format set out in **Appendix A.**

5.2 The Participant should provide supporting reasons if there are deviations to the requirements set out in this EOI or if it is unable to furnish any of the commercial and technical details in **Appendix A.**

6 ASSESSMENT CRITERIA

6.1 Proposals will be assessed based on:

6.1.1 Quality and strength of Participant's technical and commercial proposals including but not limited to: energy efficiency optimisation, reference design that allows for potential scale-up and further demand aggregation in the future, delivery timeline, TCO, and Participant's compliance to the requirements of the EOI summarised in Section 3 and detailed in **Appendix A**.

6.1.2 Robustness and completeness of safety and training requirements.

6.1.3 Proven financial strength, experience track record, and capability of the Participant in value-chain development.

6.2 Only proposals submitted before the closing date will be considered.

7 ADMINISTRATIVE DETAILS

7.1 Please submit your EOI in **Microsoft Word** and/or **PDF** formats[9] via email to:

MPA_Decarbonisation@mpa.gov.sg

7.2 A hybrid industry briefing will be arranged as follows:

Date and time : 31 Jul 2023, 4.00pm (SGT)

Physical attendees

Venue : mTower, 460 Alexandra Road, Level 18 Excellence Room
Singapore 119963

Virtual attendees

Microsoft Teams Meeting ID : 453 416 406 914

Passcode : RPAQQ9

Please note that attendance at the industry briefing is not a critical evaluation criterion for this EOI.

7.3 The closing date for submissions is 15 Sep 2023 Singapore time.

7.4 MPA will acknowledge receipt of each submission via email. If you do not receive an acknowledgement of your submission within two business days, please contact Mr Kester Kiong (Kester_KIONG@mpa.gov.sg).

7.5 MPA reserves the right to share any information submitted by Participants in their EOI for the purpose of assessing the Participant's Proposal. Any part of the submission that is considered by Participants to be confidential should be clearly marked. MPA reserves the right to aggregate/anonymise the information before sharing on a need-to basis. All EOIs submitted shall be on a non-binding basis and MPA shall not be bound or under any obligation to accept any proposal submitted.

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[9] The Participant shall validate its assumptions and calculations as requested by MPA, using digital software and models as required. These files shall be presented and shared with MPA during further clarifications.

Appendix A

FORM OF EOI

Instructions: Please use this form to submit your EOI and include any supporting documents, justifications or key assumptions where applicable.

1. Participant's name, registered business address, contact person's name, designation, email and contact number.

2. Profile of Participant and its partners, if any, in the Project consortium, and details of relevant experience. If the Participant consists of a consortium of companies, the Participant shall also list the key personnel from each company.

3. Most recent 3 years' financial information in respect of the Participant and its partners in the consortium, if any.

4. Technical Details

4.1 The Participant shall provide the following specific details on technical specifications of the proposed reference design for e-HC, which include but are not limited to the following:

(If the proposal includes plans for scale-up through demand aggregation, the participant shall also include the following details for the scale-up phase as separate line items within.)

1. General	
a. Basic function (Type 1 Craft/ Type 2 Craft)	
b. Hull type	
c. Hull material	
d. Superstructure material	
2. Dimensions	
a. Length moulded	
b. Beam moulded	
c. Draught (max)	
d. Gross tonnage	
3. Performances	
a. Maximum speed (kts)	

b. Operating/ service speed (kts)	
c. Range (nm)	
4. Propulsion system	
a. Type of propulsion system	
b. Make of propulsion system	
c. Propulsion power	
5. Energy management systems	
a. Battery capacity (kWh)	
b. Battery weight (kg)	
c. Type of battery chemistry	
d. Type of battery cells	
e. Type of battery system design	
f. Battery lifetime	
g. Charging current (i.e. AC, DC)	
h. Charging connections	

4.2 The Participant shall provide a detailed Proposal as set out in Section 3 of this EOI.

4.3 If applicable, the Participant may provide a Proposal as set out in Section 4 (paragraph 4.3) of this EOI.

5. The Participant shall provide details on the overall Project timeline, management, and risk details. These include but are not limited to the following:

5.1 Project Timeline. Key Project tasks and milestones, including but not limited to technical studies, regulatory and permitting approvals.

5.2 Project Management. Engineering, Procurement and Construction (EPC) date and Commercial Operational Date (COD). Phased or future expansion, if any, and associated timeline.

5.3 Project Risk Assessment. Identification of potential show-stoppers that may impact the technical and commercial viability of the Project and their associated mitigation measures, if any.

5.4 Technical and Commercial Non-Compliance. Participant shall state clearly any non-compliance to the technical and commercial

requirements stated in the EOI. For all non-compliance, Participant shall explain the extent and reason of the deviation and provide mitigation measures if possible.

5.5 Regulatory Non-Compliance. To state clearly any regulatory requirements or standards that could not be met, or are at risks breaching through the construction and operational lifetime of the project. Participants are to provide the amount of deviation, and explanations for such non-compliance.

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