

MPA and SMI Joint Call for Proposals 2020 on Harbour Craft Electrification

Background

1. International shipping contributes to about 3% of man-made carbon emissions (this would make it the 4th largest country emitter). The International Maritime Organization (IMO) has adopted the Initial IMO Strategy on Reduction of GHG Emissions from Ships with the target to reduce total annual greenhouse gas (GHG) emissions from shipping by at least 50% by 2050, compared to 2008 emission levels (known as “IMO2050”).
2. The Maritime and Port Authority of Singapore (MPA) together with the Singapore Maritime Institute (SMI) have identified 4 focus areas under maritime decarbonisation where there are R&D opportunities, namely: **Electrification of Harbour Craft, Sustainable Marine Fuels, Shipboard Carbon Capture, Utilisation and Storage (CCUS) and Future Marine Fuels.**
3. In particular, on the domestic front, harbour crafts operating within the Port of Singapore contributes towards the national GHG emissions. To support Singapore’s Enhanced Nationally Determined Contribution (NDC) and Long-Term Low-Emissions Development Strategy announced in February 2020¹, there is a need to develop new technologies suitable to support their transition towards a low-carbon future.
4. One pathway identified is towards electrification of harbour crafts. Current challenges include the charging stations, the integration of technologies and energy management, and the technology cost is estimated to be 1.6 to 2 times the cost of current diesel based technologies. Therefore, to prepare for eventual adoption, the cost factor should strive towards a sustainable level (e.g no more than 1.2 times) compared to a conventional vessel operating on Internal Combustion Engine (ICE) propulsion.

Call-for-Proposals

5. To advance the research and development in maritime decarbonisation to technology translation and deployment, MPA and SMI are issuing a joint Call-for-Proposals (CFP) with a total co-funding of S\$9 million (S\$4 million under MDRP and S\$5 million under GETP – see Annex D) to support up to 3 consortiums for the next 5 years. The CFP, targeting the first focus area - **Electrification of Harbour Craft**, aims to:
 - a. **Develop, deploy and commercialise** technologies and solutions to support local harbour craft industry in reducing their GHG emissions, in line with Singapore domestic emission NDC;
 - b. **Encourage Industry Consortiums approach through Joint Industry Projects (JIPs)** under the **consortiums which** consist of maritime industry players, publicly funded Institute of Higher Learning (IHLs) and Research Institutions (RIs);

¹ National Climate Change Secretariat, 28 Feb 2020, “Singapore’s Enhanced Nationally Determined Contribution And Long-Term Low-Emissions Development Strategy”, retrieved from: <https://www.nccs.gov.sg/media/press-release/singapores-enhanced-nationally-determined-contribution-and-long-term-low-emissions-development-strategy>

- c. **Facilitate cross-sharing** of domain expertise and know-how to enable the maritime industry in meeting IMO 2030 and 2050 emissions reduction targets and the local harbour craft industry in meeting Singapore's 2030 enhanced NDC target.

Formation of Consortiums

6. Through this joint CFP, MPA and SMI seek to catalyse the formation of **industry-led, mission-centric maritime consortiums** comprising like-minded maritime companies and IHLs/RIs to deliver the expected outcomes under the identified CFP focus area. (See Annex A for more details)

- a. **Each consortium shall consist of the following members, and their general roles and responsibilities are as stated**

- i. The Lead Applicant shall have **strong interest in developing the solution(s) and deploying the JIP outcomes**. The general role of the Lead Applicant is as follows:

- Identify and secure the necessary consortium partners required to participate in the JIP
- Negotiate and manage the "Master Agreement" with the consortium partners in close consultation with MPA/SMI on the key principles for Research Collaboration
- Provide overall project management and oversight of the JIP in compliance with MINT Fund T&Cs
- Ensure timeliness of project milestones and deliver the targeted project outcomes, and update MPA and SMI on the project progress on a half-yearly basis, seek variations or change requests for the project
- Deploy the product and solution(s)

- ii. Industry collaborators should consist of participants such as but not limited to end-user(s) (e.g. ship owners/ ship management companies), shipyards, technology developers, original equipment manufacturers (OEMs), battery solution providers, and classification societies with **strong interest to work with the Lead Applicant to commercialise the JIP outcomes**. The general role of the industry collaborators are as follows:

- Provide the necessary in-kind (trial ships, facility, data and people) and cash contribution towards meeting the project outcomes
- Support the project in providing technical and operational expertise relevant for the project to meet its intended objectives
- Facilitate any test-bedding or pilot trials

- iii. IHLs/RIs shall be from publicly funded Institutes of Higher Learning (IHLs), Research Institutions (RIs) in Singapore with **strong interest to work with the industry to translate research into industry solutions**. The general role of the participating IHL/RIs are as follows:

- Provide relevant background research IP and technical expertise necessary to address the project challenges
- Develop the core enabling technologies and know-how to support maritime decarbonisation
- Support the translation of research outcomes to industry for trials in actual operating environment
- Undertake additional research during the course of the project to address new challenges where necessary

- Undertake project management and oversight of the project in compliance with SMI's Grant T&Cs

CFP Focus Areas, Expected Outcomes and Project Duration

7. The project scope to be proposed and deliverables should meet the following expected outcomes, with a total project duration of no more than 5 years:

Focus Areas for CFP	Expected Outcomes	Challenge Areas
<p>Electrification of Harbour Craft</p>	<p>Shore Charging Infrastructure for Electric Harbour Craft</p> <ul style="list-style-type: none"> • Develop/adapt and pilot trial technologies for Charging Infrastructure with international standards, if any • Identify list of standards required and gaps needed to be addressed in order to support the proliferation of common or interoperable charging infrastructure in the Port of Singapore with commercialisation potential in overseas market • Develop new planning and optimisation tools for optimal charging capacity, charging schedule for optimal vessel operations <p>Full Electric Harbour Craft & Shipboard Systems</p> <ul style="list-style-type: none"> • Develop the full electric harbour craft and demonstrate its operations with equivalent or better operational performance envelops using similar conventional harbour craft as a benchmark • Develop new energy management systems (EMS) to ensure optimal and safe operations of electric harbour craft • Develop new design/optimisation tools to simulate and optimise electric harbour craft design and integration and to identify other cost reduction opportunities <p>Interoperability of Charging Infrastructure and Electric Vessels</p> <ul style="list-style-type: none"> • Demonstrate the interoperability and compatibility between the charging infrastructure and the full electric harbour craft developed by the different consortium JIPs <p>Commercial Viability and Business Model</p> <ul style="list-style-type: none"> • Demonstrate a commercially-ready electric harbour craft based on CAPEX and OPEX with a viable business model for scalability 	<ul style="list-style-type: none"> • Lack of common charging infrastructure to test bed different solutions • High cost of adoption of full electric harbour craft. Limited capability in rapidly assessing different propulsion configurations and operating profiles to optimise Total Cost of Ownership and realistic emissions reductions • Lack of interoperability will result in low asset utilisation thus reducing cost recovery from sale of energy vector or other services. • Traditional business models may not take into consideration the Total Cost of Ownership

		as a measure of commercial viability
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Table 2: CFP Focus Area and Expected Outcomes

8. In addition to the above outcomes, a comprehensive project report on the commercial viability assessment of the developed solution should be provided.

Eligibility and Proposal Requirements:

9. The proposals will be evaluated by a joint project evaluation panel formed by MPA, SMI and relevant technical experts, where necessary. Project proposals with clear strategies for commercialisation and demonstrate clear collaboration between consortium partners would be preferred.
10. All the work should be conducted in Singapore. This includes the system design and engineering, integration, test bedding, certification and eventual deployment.
11. For technologies to be test-bedded on vessels, these vessels should either be harbour crafts licensed to operate within the Port of Singapore or flagged with the Singapore Registry of Ships.

Whitepaper Submission:

12. A Joint Whitepaper should be submitted **by 9 Nov 2020 and should contain:**
- a. **Project description** (proprietary or confidential information must be clearly indicated in the proposal)- No more than 4 pages
 - i. Consortium aspiration, composition, broad work packages, indicative budget (detailed budget in full proposal)
 - ii. Project scope, challenges identified and to be addressed
 - iii. Key milestones and deliverables for each milestone
 - iv. Company profile and respective manpower participating in the industry consortium including details on the role and contributions
 - v. Project risk assessment and mitigation plan
 - vi. Brief description of the Intellectual Property (IP) arrangements to facilitate eventual commercialisation of the project IP developed
 - b. **Project Budget-** 1 Page, refer to Annex B
 - c. **Project Schedule-** 1 Page, includes work packages and partners supporting each work package
 - d. **Project Performance Indicators-** 1 Page, refer to Annex C
 - e. **Letter of Interest (LOI) from companies joining as consortium partners which includes the following information**
 - Brief introduction of the organization who is offering the LOI and its relationship to the grant applicant
 - Provide a short paragraph on the understanding of the project scope and its objective and how this implementation will help in addressing the current issues/challenges faced by the organisation.
 - Identify the key drivers and critical success factors in supporting the implementation of the project.
 - Provide description & details on the partners' cash and in-kind contribution towards the entire project duration in terms of its involvement and scope of works
 - f. **Duration:** The total project duration shall not exceed 5 years, with no more than 3 years of R&D activities by the IHLs/RIIs.

- g. **Submission:** Interested applicants shall submit the completed proposals to mint@mpa.gov.sg and yangyang@maritimeinstitute.sg.
- h. **Deadline:** The application deadline is **9 Nov 2020, 6pm Singapore Time**

Funding support:

- 13. MPA and SMI will be setting aside a combined pool of S\$9 million to co-fund up to 3 consortiums through the **Maritime Decarbonisation R&D Programme (MDRP) and Green Energy and Technology Programme (GETP)**. More information can be found under Annex D.

Proposal Evaluation and Award Process:

14. Whitepaper Stage:

- a. The joint whitepapers will be assessed by MPA and SMI on project scopes and eligibility, MPA and SMI may seek additional information / clarifications from the applicants to assist the assessment.
- b. **Shortlisting of whitepaper will be based on the following:**
 - i. Strength of consortium
 - ii. Ability to address the stated challenge areas with clear plan to deliver the project outcomes
 - iii. Reasonability of project budget and value of industry and IHL contributions
- c. MPA and SMI may also take into consideration
 - i. The diversity of harbour craft types across the different shortlisted projects during the selection process
 - ii. Willingness of the different consortiums in allowing cross-use of charging infrastructures

15. Full Proposal Stage:

- a. Applicants with the shortlisted whitepaper will be notified earliest by **mid November 2020**. An industry sharing workshop will be arranged in mid-end Oct to seek additional collaborators and the Lead Applicant will be required to submit a detailed proposal by **31 December 2020** using the following templates:
 - i. **Full Proposal Template for GETP** (click [here](#))
This form shall be completed by **industry Lead Applicants**, to describe the scope of work by the industry in JIP, including the detailed work packages, milestones, deliverables and budget sought by the industry from MINT Fund.
 - ii. **Full Proposal Template for MDRP**(click [here](#))
This form shall be completed by **IHLs/RIs applicants**, to describe the scope of work by the IHLs/RIs in JIP led by the Industry Lead Applicants, including the detailed research scope, work packages, milestones, deliverables and budget sought by the IHLs/RIs from SMI.
 - iii. **Overall Budget Template** for Joint Industry Projects that involve both Industry and IHLs/RIs (Refer to Annex B)
- b. Applicants with the shortlisted detailed proposals will be invited to make a proposal presentation to the Project Evaluation Panel (PEP) formed by MPA and SMI for review and evaluation based on the following:
 - i. Innovation and novelty

- ii. Clear commercial viability and advantage over current solutions / practices in the market
 - iii. Economic benefits to Singapore, local value capture and creation
 - iv. Technical competencies of project team and commitment; and
 - v. Project management and budget
 - vi. Clear quantitative and qualitative milestone targets
 - vii. Applicant should also provide the cost factor over conventional vessel design based on the Total Cost of Ownership (or any other models to assess commercial viability) over 15 years
- c. The Review Panel may seek additional information to elaborate or clarify areas described in the detailed proposal during the review process.
 - d. All applicants will be notified by no later **end Apr 2021** on the outcomes of their applications.
 - e. Projects should commence within 3 months of award.

Project Monitoring and Review:

- 16. Each project will be assessed for progress every six (6) months to ensure the proposed milestones and deliverables are on-track. Successful applicants will be required to present the progress update and submit a progress report to the joint project review team comprising industry experts appointed by MPA and SMI.

Further Clarifications

- 17. Please direct further queries to:
 - a. Lau Wei Jie (MPA): [Lau Wei Jie@mpa.gov.sg](mailto:Lau_Wei_Jie@mpa.gov.sg)
 - b. Yang Yang (SMI): yangyang@maritimeinstitute.sg

Annex A: Information on Industry-led Consortiums

Industry-Led
<p>1. Clear work packages should be identified based on the following:</p> <ul style="list-style-type: none"> ○ IHL/RI² Driven ○ Industry Driven <p>2. IHL/RI Driven work packages would require in-depth R&D with the following outcomes, supported by the industry partners:</p> <ul style="list-style-type: none"> ○ Advance technologies to higher TRL ○ Significantly improve the system performance envelope ○ Contribute to industry standards and policy formulation ○ Trial for technologies / prototypes prior to system integration ○ Undertake additional research to support system integration <p>3. Industry Driven work packages would focus on the following areas:</p> <ul style="list-style-type: none"> ○ Integration of outcomes from different work packages ○ Translate research outcomes for live trials ○ Deploy & Commercialise new technologies / products <p>4. IHLs/RIs shall also support technology translation and deployment</p> <p>5. <u>Total duration for JIP should not exceed 5 years, with no more than 3 years of R&D activities by the IHLs/RIs</u></p>
<p>The diagram illustrates a four-stage process flow: Research, Development, Trials / Translation, and Deployment. Research and Development are linked by a light blue bar labeled 'IHL Driven: Funded through MDRP'. Development and Trials / Translation are linked by a light green bar labeled 'Industry Driven: Undertaken by Maritime Industry, Funded through GETP. IHLs/RIs Participating can be supported through MDRP'. A large green arrow points from Trials / Translation to Deployment.</p>

² Eligible local Institutes of Higher Learning (IHL) and Research Institutions (RI)

Annex B: Overall Project Cost and In-kind Contributions from Each Party

Budget Categories	Detailed Line Items	Industry Applicant	Lead Applicant		Industry Partner B		Industry Partner C		Industry Partner D		IHL/RI Applicants 1		IHL/RI Applicants 2	
			Cash	In-kind	Cash	In-kind	Cash	In-kind	Cash	In-kind	Funding Sought from MDRP	In-kind	Funding Sought from MDRP	In-kind
Industry Manpower	Personnel A													
	Personnel B													
IHL/RI Manpower	Personnel C													
	Personnel D													
Equipment (for Industry only)	Equipment 1													
	Equipment 2													
Equipment (for IHL/RI only)	Equipment 3													
	Equipment 4													
Shared Equipment (Shared by Industry and IHL/RI)	Equipment 5													
	Equipment 6													
Other Operating Expenses (for Industry)	OOE 1													
	OOE 2													
Other Operating Expenses (for IHL/RI)	OOE 3													
	OOE 4													
Overseas Travel (for IHLs/RIs only)	Conferences													
Total														
%														

Note:

1. For each budget items required by the industry, cash contribution from industry should not be less than 50% of the total cost of the item.
2. For Shared Equipment between Industry and IHL/RI, cash contribution from industry should not be less than 33% of the total equipment cost.

Annex C: Project Performance Indicators

MDRP Performance Indicators

	Key Indicators	Target
1	No. of technologies developed and transferred/licensed to industry to support maritime decarbonisation meeting the different GHG reduction targets, this includes	
1.1	Patents filed or IP generated, and	
1.2	Technology solutions translated to industry	
2	Industry cash / in-kind contribution to the project	
	Tracking Indicators	
3	No. of RSEs trained by the IHLs/RIs	
4	No. of academic papers / maritime trade papers published (including contribution to IMO papers)	

GETP Performance Indicators

	Key Indicators	Target
1	No. of new solutions/products commercialised/deployed meeting IMO and / or Singapore's 2030/2050 GHG reduction targets	
2	Target vessel CAPEX of adoption at no more than 20% above conventional propulsion systems	
	Tracking Indicators	
3	No. of RSEs hired and trained by the industry	

Annex D: Factsheet on Maritime Decarbonisation R&D Programme and Green Energy and Technology Programme and Funding Arrangements

Programme Name	Maritime Decarbonisation R&D Programme (MDRP)	Green Energy and Technology Programme (GETP)
Funding Entity	SMI	MPA
Aim	<ul style="list-style-type: none"> • Translate core enabling technologies and know-how to support maritime decarbonisation 	<ul style="list-style-type: none"> • Commercialise products / technologies to support maritime industry meeting different GHG reduction targets
	<ul style="list-style-type: none"> • Deliver economically viable solutions to promote eventual industry adoption • Develop capabilities to support the maritime industry in decarbonisation 	
Eligible Applicants	Principal Investigators (PIs) from publicly funded Institutes of Higher Learning (IHLs), Research Institutions in Singapore ³	<ul style="list-style-type: none"> • Singapore-based companies with R&D office in Singapore • R&D to be conducted in Singapore • Complies with all other MINT Fund Criteria⁴
Funding Support	Up to 100% of all qualifying costs under the IHL/RIs	Up to 50% of the total qualifying project costs
Notes	The co-funding awarded to each consortium will be based on the actual project budget required and may differ across each consortium	

³ More details about SMI Fund can be found under <https://www.maritimeinstitute.sg/SMI-Fund>

⁴ The MINT Fund eligibility criteria can be found under <https://www.mpa.gov.sg/web/portal/home/maritime-companies/research-development/Funding-Schemes/mint-fund-criteria>