Navigating the Net Zero Transition
for Singapore Harbour Craft

Recommendations for
Action and Collaboration



Developed by the Taskforce on Harbour Craft Decarbonisation | **April 2026**

MPA SINGAPORE

SSA SINGAPORE SHIPPING ASSOCIATION

Supported by:

SASS Singapore Association of Shipsuppliers and Services

Singapore Clifford Pier
Motor Boat Association

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Foreword

The Maritime and Port Authority of Singapore (MPA) has set a target for the harbour craft sector to achieve net zero emissions by 2050, in support of Singapore's national climate goals.



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Singapore is the world's busiest transhipment port – a key node in global maritime networks that facilitates trade flow across more than 600 ports worldwide.

Harbour craft are an integral component of this thriving ecosystem. They provide essential marine services to vessels calling at Singapore, including transportation of crew and personnel, delivery of ship supplies, towage and pilotage services, and supply of bunker and petroleum products. Today, they run almost exclusively on fossil fuels. Without action, emissions from the sector are projected to grow from 0.4 million tonnes of carbon dioxide equivalent ($MtCO_2e$) today to nearly 0.7 $MtCO_2e$ by 2050. This trajectory is incompatible with both our national climate goals and our ambition to remain a competitive and forward-looking global hub port.

Amidst global economic uncertainty, much attention is understandably focused on addressing immediate challenges facing the sector. At the same time, it is important not to lose sight of longer-term shifts that will shape the maritime industry and the Port of Singapore.

Maritime Singapore needs to continue to find opportunities to differentiate itself and remain competitive in a carbon-constrained world. Decarbonising harbour craft is therefore not only an environmental imperative but also a strategic one – to secure Singapore's long-term relevance as a key node within global shipping networks and trade flows.

In October 2025, MPA formed a Taskforce with the industry to forge a common vision and chart out an effective net zero plan for the harbour craft sector. The Taskforce was co-convened by MPA and the Singapore Shipping Association, with support from the Singapore Association of Shipsuppliers and Services, and the Singapore Clifford Pier Motor Boat Association, and comprised industry leaders representing their respective industry associations and segments. The Taskforce assessed the state of decarbonisation in Singapore's harbour craft sector to identify gaps and opportunities, reviewed technology trends, and developed recommendations to advance the net zero transition.

Based on its findings, this report sets out decarbonisation pathways for the harbour craft sector, a recommended strategy to support the transition, and an action plan to translate the strategy into concrete actions by the industry and MPA to work together to realise the goal to be net zero by 2050.

This report represents the collective views of the industry, developed through extensive consultation with a broad range of stakeholders.

Executive Summary

The harbour craft sector recognises the need to decarbonise and supports the goal to achieve net zero by 2050.

Singapore's harbour craft fleet is diverse in operational profile, necessitating multiple decarbonisation pathways, each suited to specific applications. Biofuel, electrification and net zero fuels are the three pathways available, each presenting unique opportunities and challenges, and are at differing levels of technology and commercial readiness.

Biofuel

Biofuel is already commercially available with mature engine technology.

While the long-term economics of biofuel is uncertain, it is likely to remain the primary option for vessels used in heavy-duty and long-range operations.

Electrification

Electrification is a potentially lower cost decarbonisation pathway as advancements in battery and charging technology continue.

Based on current technology readiness, some harbour craft types are more suited for electrification than others.

The Taskforce assessed the suitability of each harbour craft type for electrification, based on their operational profile and current technology readiness.

ALL OPERATIONS	MOST OPERATIONS	SOME OPERATIONS	NOT SUITABLE
Ferry	Passenger launch/ work boat	Pilot boat	Tanker
	Supply boat	Harbour tug	Towing tug
	Landing craft		
	Water boat		
	Shipyard tug		

Net Zero Fuels

The feasibility of net zero fuels – methanol, ammonia, and hydrogen – **depends on the development of the global supply chain and engine technology.**

While supply outlook remains uncertain, this option should not be foreclosed.

Strategy to Net Zero

The Taskforce's recommendations aim to position businesses to navigate the net zero transition in a cost-effective manner. In the near-term, developing the electrification ecosystem is a priority – opening a lower-cost decarbonisation pathway for the sector. This requires collective effort across stakeholders to develop the technology to mature and build the infrastructure needed to enable adoption of electric harbour craft to scale. Businesses must also begin transforming themselves for the transition – upskilling their workforce and embedding decarbonisation requirements into fleet renewal decisions.

In the longer term, a progressive regulatory shift is needed to create the economic conditions for a fuel switch. The transition also presents an opportunity to raise the professionalism of the harbour craft sector – raising productivity and service quality across the fleet. Underpinning the transition is a powerful synergy between digitalisation and decarbonisation. Electrification enables automation, while automation in turn strengthens the value proposition of electric harbour craft. Together, they are twin drivers of productivity improvement and emissions reduction.

On this basis, the Taskforce puts forth twelve key recommendations organised around four strategic thrusts to realise net zero ambitions by 2050.

THRUST #1 Develop the electrification ecosystem

- Derisk early movers to build confidence in electrification
- Facilitate the development of charging infrastructure
- Develop standards to optimise the electrification ecosystem

THRUST #2 Enable industry transformation to navigate the net zero transition

- Plan for decarbonisation during fleet renewal
- Strengthen organisational capabilities to navigate the transition
- Prepare for the fuel transition
- Promote decarbonisation through green procurement

THRUST #3 Introduce a progressive regulatory shift over 15 to 20 years to reach net zero

- Introduce a market-based measure (i.e. carbon price) to phase in a fuel switch
- Uplift professionalism of the sector through higher standards

THRUST #4 Harness synergies between digitalisation & decarbonisation

- Introduce smarter charging through digital solutions
- Develop "milk run" logistics model
- Realise manpower savings through automation

This is accompanied by an **Action Plan** which translates the recommendations into concrete action – by industry and MPA, through partnerships to realise the net zero goal. This concerted collective effort presents a unique and stable enabling environment for Singapore to achieve its decarbonisation goals and transform the sector.

INDUSTRY	INDUSTRY & MPA PARTNERSHIP	MPA
Support charger deployment at waterfront assets	Develop and pilot marine-specific charging solutions	Explore targeted support for early adopters of electric harbour craft
Strengthen organisational capabilities in carbon accounting & management	Develop standards to improve interoperability and cost-efficiency	Steward development of charging infrastructure
Develop a company-level net zero strategy that embeds decarbonisation as a consideration in fleet renewal	Develop fit-for-purpose Classification rules	Explore the use of green procurement to promote the use of greener harbour craft
Build new conventional vessels to be capable of using biofuel (B100), ahead of the 2030 requirements	Develop platform to show real-time charger availability	Study the need to further support the industry during the fuel transition
Upskill workforce for the net zero transition	Develop systems for booking of chargers	Study regulatory approach to phase in a fuel switch and signal trajectory in advance
	Develop "milk run" logistics model	Review regulatory requirements to raise professionalism of harbour craft sector *(e.g. Statutory age limits, engine standards, Classification & inspection requirements)*
	Develop automated capabilities to reduce manpower needs	

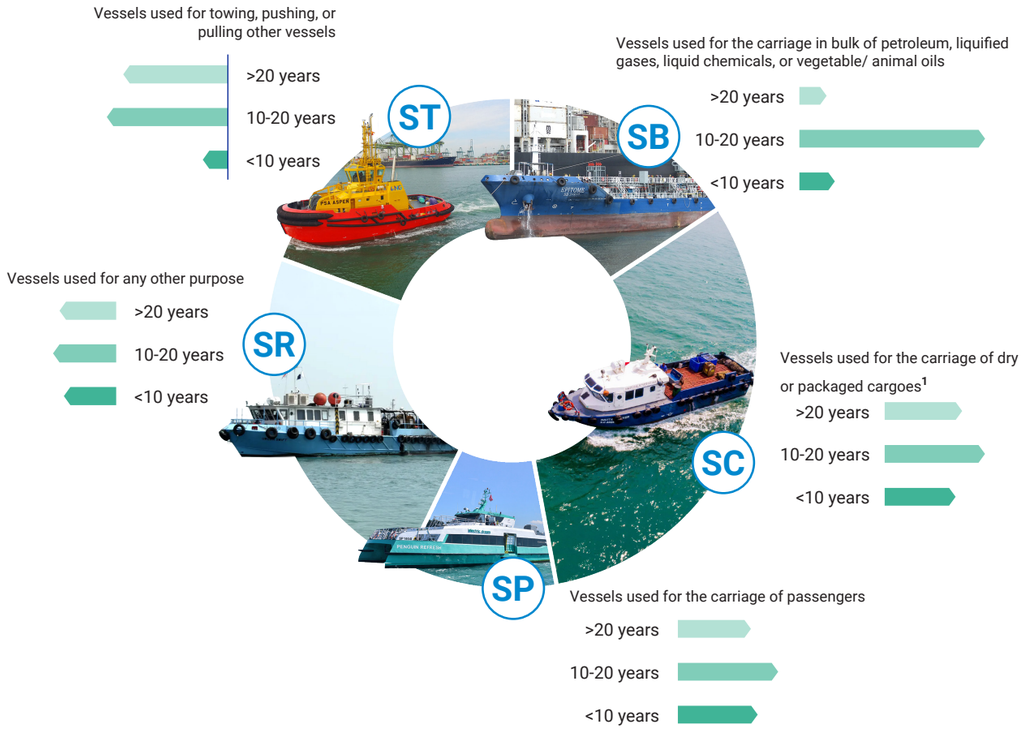


Decarbonisation Pathways

The diverse operational profile of the harbour craft sector necessitates multiple decarbonisation pathways, each suited to specific applications.

Singapore's harbour craft fleet currently comprises approximately 1,600 propelled vessels. The fleet is remarkably heterogeneous – vessels can vary widely in operation profile, size, power requirement, and age within each license category.

Figure 1 *| Proportion of harbour craft types according to MPA's licensing*



Biofuel, electrification, and net zero fuels are the three pathways for harbour craft to decarbonise. Each pathway presents unique opportunities and challenges, and are at differing levels of technology and commercial readiness. They play distinct and complementary roles in transitioning the harbour craft fleet to net zero.

The following sections analyse each decarbonisation pathway and its suitability for different harbour craft types.

1 Cargo harbour craft may carry passengers with endorsement on its licence by the Port Master.

Biofuel

Biofuel is already commercially available with mature engine technology. While the long-term economics of biofuel is uncertain, it is likely to remain the primary option for vessels used in heavy-duty and long-range operations.

Biofuel is regarded as a net zero fuel because of the biogenic nature of its carbon content. Carbon dioxide emitted upon combustion originates from the atmosphere during feedstock growth; its return does not constitute new addition to atmospheric carbon level. This treatment is consistent with international guidelines[2] used to account for national greenhouse gas inventories.

Today, most engines of existing harbour craft are compatible with at least a blend of marine diesel with 20% biofuel (B20)[3]. MPA and industry partners have also further studied the readiness of existing larger harbour craft like tankers and tugboats to use B100 in Singapore. Trials are ongoing and these will help harbour craft operators build confidence in its use.

B100-compatible engines are technically mature and commercially available today for most harbour craft types. The incremental cost of building new vessels to be B100-capable is marginal, giving operators a viable pathway to eventually decarbonise without substantial overhaul. However, not all engine manufacturers offer B100-compatible products yet, and it is important to ensure that all harbour craft types are well served by B100-compatible engines.



***Photo credit** | Pinnacle Marine (Singapore)*

The President 100 is a 16-metre harbour craft powered entirely by 100% biodiesel (B100), built by local shipyard Pinnacle Marine and launched in Singapore in July 2025. The vessel is equipped with two Weichai WP13C450-18BF marine engines and two CCFJ20J-W5BF generator sets, providing the core propulsion system for this milestone project.

Jointly developed by Weichai, the China Classification Society (Singapore), Nanyang Technological University's Marine Energy and Sustainable Development Centre (MESD), and Pinnacle Marine, the launch marked the start of full-scale operational testing for B100 marine fuel in real-world conditions.

President 100 has undergone a 1,000-hour continuous trial in Singapore's port waters. The trial aims to assess B100's long-term performance and reliability — providing data for the development of future refuelling, storage, and operational standards.

The supply of biofuel for domestic harbour craft is currently limited, but this reflects a lack of demand rather than any fundamental supply-side constraint. Bunker suppliers have indicated supply can readily scale up to meet demand once clear regulatory requirements are in place.

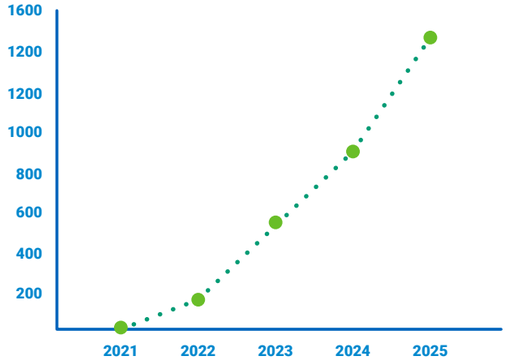


***Figure 2** | Biofuel bunker sales in Singapore*
(Source: Maritime and Port Authority of Singapore

At a broader scale, Singapore has been actively preparing for a multi-fuel future to strengthen Singapore's position as a leading bunkering hub. The volume of biofuel bunkered in Singapore has been rising steadily and is expected to maintain strong growth. In 2025, sales of biofuel blends rose nearly 60% from the previous year to about 1.4 million tonnes. A wide range of blends (up to B100) is commercially available. A new Technical Reference (TR 140:2025) was published in May 2025 to establish quality standards for biofuel supplied in Singapore. Today, 10% of Singapore's bunker tanker fleet can already carry and supply B100. In the near to medium-term, there should be no shortage of biofuel supply in Singapore.

Despite its advantages, the long-term economics of biofuel remain uncertain. Prices are projected to stay more than twice those of conventional fuel through 2050 and beyond, with upward pressure due to competing demand from aviation and international shipping sectors. The fundamental constraint is feedstock availability – it is unclear whether feedstock supply can scale sufficiently to meet demand across all sectors. Aviation has a structural advantage in this competition. Given that Sustainable Aviation Fuel (SAF) commands higher margins than marine bunker, the limited feedstock is likely to be directed towards SAF production, potentially leaving the shipping sector with limited and costly supply.

These cost pressures are compounded by the lower energy density of biofuel[4] relative to marine diesel, meaning more fuel is needed to achieve the same range. Biofuel is also susceptible to oxidative degradation over time, which can corrode and clog fuel systems and engine components – particularly in engines not designed to handle it. Managing this risk requires disciplined storage practices, regular inventory turnover, and diligent maintenance of fuel systems and equipment[5].

2 *Under the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines*

3 *Liu M. et al., Biofuel Compatibility Study for Singapore Harbour Craft, Nanyang Technological University Maritime Energy & Sustainable Development Centre of Excellence Report, August 2023.*

4 *Biofuel contains 14% less energy per unit mass compared to marine diesel. (Source: Liu M. et al., Biofuel Compatibility Study for Singapore Harbour Craft, Nanyang Technological University Maritime Energy & Sustainable Development Centre of Excellence Report, August 2023.)*

5 *This includes effective storage and handling practices (e.g. tank material selection, environmental controls, water and sediment management, microbial monitoring, additives, etc.)*

Electrification

Electrification is a potentially lower cost decarbonisation pathway as advancements in battery and charging technology continue.

The total cost of ownership of an electric harbour craft is estimated to be more than 20% lower than a vessel running on B100 over a 30-year lifespan. This is primarily because electricity is significantly cheaper than biofuel.

Battery technology improvements are expected to continue driving down battery prices while increasing battery energy density – advances that translate directly into better performing electric craft, as illustrated by developments in the Hydromover series.



***Photo credit** | Yinson GreenTech*

Singapore's first full electric cargo vessel, the Hydromover, was launched in November 2023. Building on its experience, the Hydromover 2.0 was introduced in Oct 2025 with several significant upgrades: increased energy storage capacity, an advanced hull form to minimises drag, and a redesigned electrical architecture to reduce power loss.

These improvements deliver a threefold increase in range, enabling the vessel to cover all anchorages within Singapore's port limits. It fully charges in under two hours, ensuring high uptime. The Hydromover 2.0 also offers 25% more cargo capacity and 75% more deck space, supporting cargo consolidation, offering greater operational flexibility.

Electrification is an opportunity to transform the harbour craft sector by enabling operators to modernise and enhance productivity. Its inherent compatibility with digitalisation and automation unlocks system-level efficiency gains that conventional vessels cannot easily replicate. In addition, electric craft produce no air pollutants (i.e. NOx, SOx, particulate matter) and generate little to no noise – creating a measurably healthier environment for crew, passengers, and other port users.

Electrification also creates new growth opportunities for Singapore, which is well positioned to capture emerging global demand for marine electrification. Several Singapore-based solutions providers are already developing and piloting electric harbour craft locally, using the domestic market as a springboard for global expansion. This is supported by a unique enabling environment in which MPA works in partnership with the industry to actively support innovation.

The principal barrier to wider adoption of electric craft is the high upfront cost – currently more than double that of comparable conventional vessels. This premium needs to reduce significantly for electrification to be commercially viable. Equally important is the need for charging infrastructure to support adoption at scale.

As of April 2026, Singapore has 10 electric harbour craft operating in port. This includes ferry boats, passenger launches, cargo boats, and tugboats. These early adopters have been critical in demonstrating technical feasibility, and in piloting new operating models required to make electrification commercially viable.

Not all harbour craft types are suited to electrification. The Taskforce assessed the suitability of each harbour craft type for electrification, based on their operational profile and current technology readiness. A summary of findings is provided, with further details in the Annex.

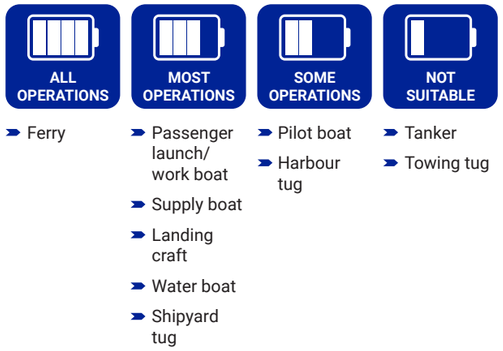


***Figure 3** | Taskforce's assessment of the suitability of various harbour craft types for electrification*

Net Zero Fuels

The feasibility of net zero fuels - methanol, ammonia, and hydrogen - depends on the development of global supply chain and engine technology. While supply outlook remains uncertain, this option should not be foreclosed.

Ammonia, methanol, and hydrogen are net zero fuels that can potentially be adopted by certain harbour craft.

Bunker tankers have the option to consume their cargo of net zero fuel. Dual-fuel engines capable of running on both net zero fuel and conventional fuel are growing in availability, giving operators the flexibility to hedge against fuel price fluctuations while contributing to decarbonisation. However, the safety risks associated with toxic, flammable, or explosive fuels will need to be carefully managed.

The longer-term feasibility of using hydrogen as a domestic marine fuel hinges on its global supply chain. While hydrogen end-use technologies such as fuel cell are proven and technically feasible for harbour craft propulsion, the supply outlook of hydrogen in Singapore remains uncertain. Singapore has limited capacity to produce low-carbon hydrogen locally given its constrained access to renewable energy, and importing hydrogen is challenging due to the economics of transporting hydrogen over long distances. Both factors will contribute to high cost, particularly for hydrogen with low lifecycle carbon intensity. While prices are expected to fall in the long run, hydrogen may remain structurally more expensive than alternatives.



World's First Use of Ammonia as a Marine Fuel in a Dual-Fuelled Ammonia-Powered vessel in the port of Singapore



Close to 1,340 metric tonnes of blended methanol was bunkered ship-to-ship for the Stena Prosperous in May 2024.

The Energy Market Authority of Singapore (EMA) and MPA have appointed a consortium led by Keppel Ltd to conduct the next phase of a project to provide a low- or zero-carbon ammonia solution on Jurong Island for power generation and bunkering.

In this phase, Keppel and its partners will undertake a Front-End Engineering Design (FEED) study to advance the power generation proposal, while Sumitomo Corporation will conduct a parallel FEED study for the bunkering proposal.

Subject to the findings of these studies and pending a Final Investment Decision, the project seeks to develop an end-to-end ammonia solution to: (i) generate 55 to 65 MW of electricity from imported low- or zero-carbon ammonia via direct combustion in a Combined Cycle Gas Turbine; and (ii) facilitate ammonia bunkering at a capacity of at least 0.1 million tons per annum.

Given the early development and evolving applications of ammonia for power generation and bunkering, the Government will work closely with Keppel to ensure that the potential project is designed for safe and effective operation.

The project is part of Singapore's National Hydrogen Strategy launched in 2022, which outlines Singapore's approach to explore low-carbon hydrogen as a decarbonisation pathway towards its net zero emissions goal by 2050. A key thrust of this strategy is to pilot advanced hydrogen technologies. Ammonia is a promising hydrogen carrier in this regard – it does not produce carbon emissions when combusted, benefits from an established international supply chain for industrial use, and can be stored and transported over long distances.

Strategy to Net Zero

THRUST #1

Develop the electrification ecosystem

The nascent electrification pathway requires collective effort across all stakeholders to realise its potential.

ACTION PLAN

INDUSTRY

- Support charger deployment at waterfront assets

INDUSTRY & MPA PARTNERSHIP

- Develop and pilot marine-specific charging solutions
- Develop standards to improve interoperability and cost-efficiency
- Develop fit-for-purpose Classification rules

MPA

- Explore targeted support for early adopters of electric harbour craft
- Steward development of charging infrastructure

Recommendation #1

Derisk early movers to build confidence in electrification

Early adopters of electric harbour craft face significant commercial risks and operational uncertainties. In 2025, prices of electric passenger launches and supply boats were approximately double those of equivalent conventional variants. Compounding this, many harbour craft operators are small and medium enterprises (SME) that face challenges in securing financing. The broad industry sentiment is that electric craft will only become commercially viable when price premium narrows to around 20%.

Technological obsolescence is a further concern for early adopters. Rapidly advancing battery technology coupled with long vessel lifespans raise the prospect of operators being left with outdated assets. This risk is compounded by limited resale and redeployment opportunities, as overseas markets may have yet to develop the charging infrastructure needed to take in second-hand electric craft.

From an operational standpoint, uncertainty over the availability, cost, and speed of charging makes it difficult for operators to assess the business case of adopting electric craft. Operators are also concerned about the loss of operational flexibility due to the limited range of electric harbour craft and downtime needed for charging.

Given these risks, targeted support from MPA could play a catalytic role by making it manageable for operators to take the first step to trial new technology. This gives early adopters the opportunity to gain operational experience and confidence in using electric craft, while demonstrating the viability of the technology to the rest of the industry. The lead demand generated would also help drive down prices through economies of scale, strengthening the commercial case for wider adoption.

Recommendation #2

Facilitate the development of charging infrastructure

Charging infrastructure is a prerequisite for electric harbour craft adoption, yet most operators lack the waterfront land needed to deploy chargers themselves. This leaves them dependent on waterfront asset owners who may have little incentive to support electrification and could potentially leverage their position to extract excessive rent. Charger deployment also requires substantial electrical infrastructure investments. The high-power draw of marine chargers typically necessitates sufficient grid capacity and substation upgrades. This represents a sizable capital commitment that many waterfront asset owners cannot take on – and those who can face significant demand risk over whether utilisation will be sufficient to recoup their outlay.

In a mature market, commercial charging operators could lead infrastructure development. However, the electric craft market is nascent; demand remains too uncertain and policy-dependent for the initial charger rollout to proceed on a commercial basis.

Stewardship of charger deployment by MPA is therefore essential in these early stages to ensure equitable, reliable access to charging at reasonable cost. This gives operators the confidence to invest in the electrifying their fleets. MPA is also positioned to work with the national grid operator to plan capacity upgrades that enable charging infrastructure to scale.

Industry has an equally important role. As electric craft adoption grows, it will be increasingly crucial for waterfront asset owners to open their premises for charger deployment – to enable scale and expanding operational flexibility for electric craft operators. This also represents a meaningful opportunity for asset owners to derive greater commercial value from their assets while contributing to broader electrification efforts.

Marine charging technologies remain nascent and require further research & development. Innovation is needed to overcome limited waterfront availability. Sea-based chargers – mounted on tankers or on-board floating platforms, could substantially expand charging locations. High-power chargers are also needed to enable the electrification of heavy-duty harbour craft such as tugboats. The Megawatt Charging System (MCS) technology remains nascent, there is a need to adapt it for marine application.

Recommendation #3

Develop standards to optimise the electrification ecosystem

The electrification ecosystem remains nascent, and there are substantial opportunities to further optimise it for interoperability and cost efficiency. While standards for chargers already exist, electric craft are typically bespoke in design, resulting in significant variation across the fleet. There is meaningful scope for greater standardisation on the vessel side – particularly around operating voltage and the management of electromagnetic interference during charging – which would promote more reliable interoperability between vessels and chargers, while reducing cost by narrowing the voltages range that a charger needs to accommodate. Current charging technology has largely been adapted from the land sector and may not be well optimised for operating in a marine environment. There is scope to develop marine-specific standards for communication and cable connections to better suit the operating context of electric harbour craft.

There is also scope to develop fit-for-purpose Classification rules for electric harbour craft. Existing classification rules are designed primarily to ensure the seaworthiness of ocean-going vessels – a risk profile that differs substantially from that of harbour craft operating with port limits. The development of classification rules that are tailored to the lower risk profile of harbour craft would ensure appropriate level of safety measure without imposing excessive requirements.

THRUST #2

Enable industry transformation to navigate net zero transition

Harbour craft operators need to transform themselves to navigate transitions and capture growth opportunities.

ACTION PLAN

INDUSTRY

- Strengthen organisational capabilities in carbon accounting & management
- Develop a company-level net zero strategy that embeds decarbonisation as a consideration in fleet renewal
- Build new conventional vessels to be capable of using biofuel (B100), ahead of the 2030 requirements
- Upskill workforce for the net zero transition

MPA

- Explore the use of green procurement to promote the use of greener harbour craft
- Study the need to further support the industry during the fuel transition

Recommendation #4

Plan for decarbonisation during fleet renewal

Harbour craft are long-lived assets with operational lifespans exceeding 30 years. New craft commissioned today will still be in service come 2050, by which point decarbonisation requirements are likely to be substantially more demanding. It is therefore important that new craft are future-proofed from the onset with a viable decarbonise pathway – to ensure they can meet future regulatory requirements during their operational lifespan.

To this end, MPA requires all new harbour craft operating in Singapore's port waters to be either fully electric, be capable of using B100 biofuel, or be compatible with net zero fuels. This will take effect from 2030 onwards.

B100 capability is a cost-effective way to future proof new harbour craft. The incremental cost to build a vessel to be B100-capable is marginal – estimated at less than 5% of total vessel cost. Many operators have already invested in B100-capable newbuilds.

The Taskforce recommends that operators consider adopting B100-capable newbuilds where feasible, even ahead of MPA's 2030 requirement. Operators are also encouraged to consider hybrid electric technology, which can deliver meaningful reductions in fuel consumption and associated cost savings. This is particularly relevant for harbour craft whose operational profile is not amenable to full electrification.

Recommendation #5

Strengthen organisational capabilities to navigate the transition

The transition to net zero will demand new skillsets from both crew and maintenance personnel. Electric harbour craft require a shift in technical competency from mechanical to electrical engineering, while many net zero fuels present toxicity and flammability hazards that demand rigorous training in handling protocols. Even the adoption of biofuel, while relatively straightforward, requires appropriate handling and storage procedures to ensure smooth operation. MPA has worked with institutes of higher learning to introduce relevant courses to build these competencies. It is now important for the industry to actively support the upskilling of the workforce in preparation for the transition ahead.

At the organisational level, businesses will need to develop the capabilities required to plan effectively for the net zero transition. MPA's ongoing collaboration with the Global Compact Network Singapore (GCNS) and various maritime industry associations under the Maritime SG LowCarbon50 Programme aims to strengthen the maritime industry's capacity in carbon accounting and management. Many companies have participated in the programme, and those that have achieved demonstrable emissions reductions have been recognised through the Maritime SG LowCarbon50 Awards. Businesses are encouraged to leverage these resources to build their carbon management capabilities and develop robust company-level net zero strategies.

Recommendation #6

Prepare for the fuel transition

The use of biofuel poses technical and operational challenges because its chemical properties increase the risk of clogging and corrosion in fuel systems. Operators need to adopt more robust maintenance and fuel management practices to manage these risks, and would benefit from opportunities to trial biofuel to build operational experience.

In addition, while B100 capable engines are commercially available, some harbour craft segments currently face limited choices where engine manufacturers have yet to offer B100 capable models – a gap that warrants further attention to ensure all segments are adequately served.

The Taskforce recommends studying both issues further to assess if support is needed to enable biofuel adoption. One possible way is to explore how the Maritime Singapore Green Initiative[6] (MSGI) can be enhanced to better support the early adoption of biofuel. This can also include non-financial incentives or perks to encourage behavioural shifts.

Recommendation #7

Promote decarbonisation through green procurement

As a significant user of harbour craft services, the public sector is well-positioned to catalyse change through the adoption of green procurement practices. By prioritising services provided by low or zero emissions harbour craft, the public sector can potentially strengthen the business case for operators serving as government contractors to decarbonise, especially to invest in electric harbour craft. This is particularly applicable for ferry and landing craft charters, as well as large-scale marine projects that employ work boats.

6 The Maritime Singapore Green Initiative (MSGI) seeks to reduce the environmental impact of shipping and related activities and to promote clean and green shipping in Singapore. In 2011, MPA pledged to invest up to S$100 million in the MSGI. In 2024, MPA committed another S$50 million to support the implementation of the refreshed MSGI which comprises of five voluntary programmes designed to recognise and provide incentives to companies that adopt clean and green shipping practices and port operations and underscores Singapore's commitment as a responsible flag and port state to clean and green shipping.

THRUST #3

Introduce a progressive regulatory shift over 15 to 20 years to reach net zero

The transition to net zero requires a carefully calibrated regulatory shift to meet national climate goals while staying competitive.

ACTION PLAN

MPA

- Study regulatory approach to phase in a fuel switch and signal trajectory in advance
- Review regulatory requirements to raise professionalism of harbour craft sector *(e.g. Statutory age limits, engine standards, Classification & inspection requirements)*

Recommendation #8

Introduce a market-based measure (i.e. carbon price) to phase in a fuel switch

The transition to net zero requires a regulatory shift. Biofuels and net zero fuels are expected to cost more than conventional alternatives, and it would not make business sense for companies to make the switch in the absence of regulatory requirements.

There are established precedents for driving the net zero transition through regulation. Singapore has applied a carbon price on approximately 80% of its greenhouse gas emissions since 2019, providing a price signal to drive emissions reduction across sectors. Internationally, IMO is developing plans to introduce a global emissions pricing scheme for international shipping through its Net Zero Framework – reflecting growing recognition that carbon pricing is an essential lever for maritime decarbonisation.

Two broad regulatory approaches exist. The first is a market-based approach – either a carbon tax or a cap-and-trade scheme – that puts a price on carbon. The second is by direct mandate, such as an emissions standard or a fuel mandate prescribing a minimum biofuel blend.

The Taskforce recognises the need for a regulatory shift and recommends a market-based approach. This is more economically efficient as it directs the market to seek out the lowest-cost decarbonisation solution. It also offers greater operational flexibility – allowing operators to deploy overseas assets for short periods without being constrained by the need to be compatible with a direct mandate. A market-based approach is also simpler to administer, and the industry already has experience and established mechanism to pass on the cost to end users through fuel surcharges.

Any regulatory intervention will inevitably drive up business costs, and it is therefore important that implementation is approached carefully to ensure the transition is manageable and the Port of Singapore remains competitive. The Taskforce recommends pacing the transition to net zero progressively over an extended period of 15 to 20 years to give the industry sufficient time to adapt. The pace of transition should be calibrated along the way, considering prevailing economic conditions and global decarbonisation trends, to avoid adverse impacts on competitiveness. Early signalling of the regulatory trajectory will be important to enable business to plan their long-term investment with confidence. The Taskforce further recommends that the revenue collected through a market-based measure be channelled back to support the industry to decarbonise and cushion the impact of the transition.

Recommendation #9

Uplift professionalism across the sector through higher standards

The transition to net zero presents an opportunity to raise the professionalism of the harbour craft sector. Today, segments of the harbour craft fleet remain aged and inefficient, operating under poor conditions that fall short of standards expected of a modern maritime hub. Some may be constructed with wooden hulls that present higher safety risks, while others have been retrofitted with outdated second-hand automotive engines that are pollutive and less fuel efficient. These older craft take up scarce manpower and mooring resources disproportionately, while their continued operation creates an uneven playing field that undermines the ability of the wider industry to decarbonise and modernise. Operators seeking to invest in newer, lower-emission fleets find themselves at a competitive disadvantage against incumbents taking advantage of lower standards and operating costs. Addressing this disparity is essential – not only to enable decarbonisation, but also to raise productivity and service quality.

The Taskforce recommends raising the safety standards and inspection regime for harbour craft and introducing a statutory age limit to progressively phase out older vessels in poor conditions. Together, these measures would facilitate the transition to a clean and modern harbour craft fleet, with higher productivity and service quality.

THRUST #4

Harness synergies between digitalisation and decarbonisation

Electrification and automation are mutually reinforcing twin drivers of productivity improvement and emissions reduction.

ACTION PLAN

INDUSTRY & MPA PARTNERSHIP

- Develop platform to show real-time charger availability
- Develop systems for booking of chargers
- Develop “milk run” logistics model
- Develop automated capabilities to reduce manpower needs

Recommendation #10

Smarter charging through digital solutions

Digital solutions can significantly improve the charging experience for operators of electric harbour craft. A single integrated platform consolidating the availability, speed and pricing of chargers across Singapore allow operators to plan their charging needs more effectively and eliminate the inefficiency of searching for available chargers. This capability could be implemented through MPA’s Maritime Digital Twin.

The introduction of a charger booking function would further enhance the experience, allowing operators to plan to schedule charging reliably within their operational plans, and avoid situations where an available charger gets taken when a vessel is on route to it. Better scheduling could potentially drive higher charger utilisation, creating the conditions for lower charging costs. The Taskforce recommends that charging operators consider implementing a booking function as part of their service offering.

Recommendation #11

Develop “milk run” logistics model

The traditional point-to-point delivery model has room for improvement. There are meaningful opportunities to consolidate demand so that operators serve multiple delivery points in a single run – a “milk run” logistics model. This approach enhances productivity, reduce emissions, and can potentially bring about cost savings for both operators and their customers.

The “milk run” model, while conceptually simple, poses complex challenges that needs to be worked through. Consolidating multiple deliveries require an effective logistics coordination framework, while ship suppliers may have reservations about sharing job information with competitors – a legitimate concern that must be addressed to secure industry buy-in. Piloting the model is therefore an important first step to demonstrate its practical viability and build stakeholder confidence needed for broader adoption.



***Photo credit** | Kuok Maritime Group*

The Coastal Sustainability Alliance (CSA), a multi stakeholder partnership platform led by Kuok Maritime Group (KMG) is advancing Singapore’s transition to low-carbon coastal logistics through complementary efforts: the development of Voltai, an electric supply boat; and the piloting of a milk run logistics model.

Voltai achieves speeds of up to 12 knots, with a range of approximately 80 nautical miles on a single charge, and a large payload of up to 40 tonnes suited for consolidated deliveries. She is also equipped with ship-to-shore data transfer technology, enabling real-time remote monitoring to support operational decision-making and planning. Voltai serves as a scalable reference platform demonstrating the operational viability of electric harbour craft.

Complementing the vessel, the milk-run logistics model aggregates multiple deliveries into optimised routes, resulting in higher-utilised boats, lower fuel consumption, and reduced port congestion.

Together, these initiatives address both hardware and operational constraints, maximising carbon efficiency and cost competitiveness for electric supply boat operators. They illustrate how cross value chain partnerships can collectively accelerate the transition to a cleaner and more sustainable coastal ecosystem.

Recommendation #12

Realise manpower savings through automation

The maritime sector faces chronic manpower constraints. It is crucial for the sector to shift away from the reliance on low-cost foreign labour, and pivot towards more effective use of technology such as automation to enhance productivity.

Electrification and automation are mutually reinforcing. Electrification is a key enabler of automation. Replacing conventional analogue mechanical systems with electronic, software-controlled components enable remote monitoring and control. The electric propulsion system also requires significantly less maintenance and offers more responsive and precise control. These characteristics make electric harbour craft a much better suited for automation. In turn, automation significantly strengthens the commercial case for electric harbour craft.

Realising the potential of automation would not only improves productivity but also enable adoption of electric harbour craft to scale. However, autonomous vessel technology is still nascent and has yet to establish a proven safety record. The Taskforce recommends further development and trial of the technology to gain the operational experience needed to support an informed and phased regulatory review of minimum safe manning requirements.

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Annex | Assessment by Taskforce on suitability of harbour craft type with electrification

Ferry

ALL OPERATIONS

Ferry boats (harbour craft licence prefix “SP”) transport more than 12 passengers from public landing places[7] and passenger terminals[8] across scheduled public routes to the Southern Islands, and commercial routes to private islands[9]. They also support marine construction projects, transporting personnel from staging grounds to land reclamation sites[10].

Ferry boats are well-suited for electrification given their predictable and short-range[11] point-to-point operations, which make battery sizing and charging planning more manageable around passenger boarding and downtime.

High volume commercial routes present a strong commercial case for bulk procurement of electric ferries, provided tenders are structured in an open-ended, outcome-based manner to allow for innovative and sustainable solutions. Electrification of popular public scheduled routes is also viable, though further design studies are needed to determine optimal battery capacity and charging speeds at key terminals. Broader adoption depends on the availability of public charging infrastructure at economically viable prices.



Figure 4 | Demographic snapshot of approximately 70 Singapore-registered ferry boats

7 *I.e. Marina South Pier, West Coast Pier*
8 *I.e. Pasir Panjang Ferry Terminal, Changi Point Ferry Terminal*
9 *E.g. Pulau Bukom, Pulau Sebarok, and Pulau Semakau*
10 *E.g. Tuas, Changi, and Pulau Tekong*
11 *Typically, less than 12 nautical miles*



***Photo credit** | Maritime and Port Authority of Singapore*

Penguin International Limited is the owner, builder, and operator of three fully-electric 1.2-megawatt hour (MWh) ferries and supporting onshore charging infrastructure at Pulau Bukom.

These ferries sail at 21 knots in the day and at 18 knots at night on the 3 nautical mile (nm) route from Pasir Panjang Ferry Terminal to Aster Bukom Chemicals and Energy Complex, in approximately 12 minutes. The 200-seater commuter ferries transport around 3,000 passengers daily. 7 megawatts (MW) of charging capacity is available on Bukom for the electric ferries as well as other electric harbour craft.

An estimated 1,952 tonnes of fuel is saved in total for the three ferries per year. Using batteries and motors, noise onboard for passengers is greatly improved, together with less vibration experienced.

Landing Craft

MOST OPERATIONS

Landing craft (harbour craft licence prefix “SC”) are versatile workboats designed to transport dry or packaged cargo via roll-on/ roll-off operations. They commonly serve routes between mainland terminals[12] and offshore islands[13], carrying project equipment and materials

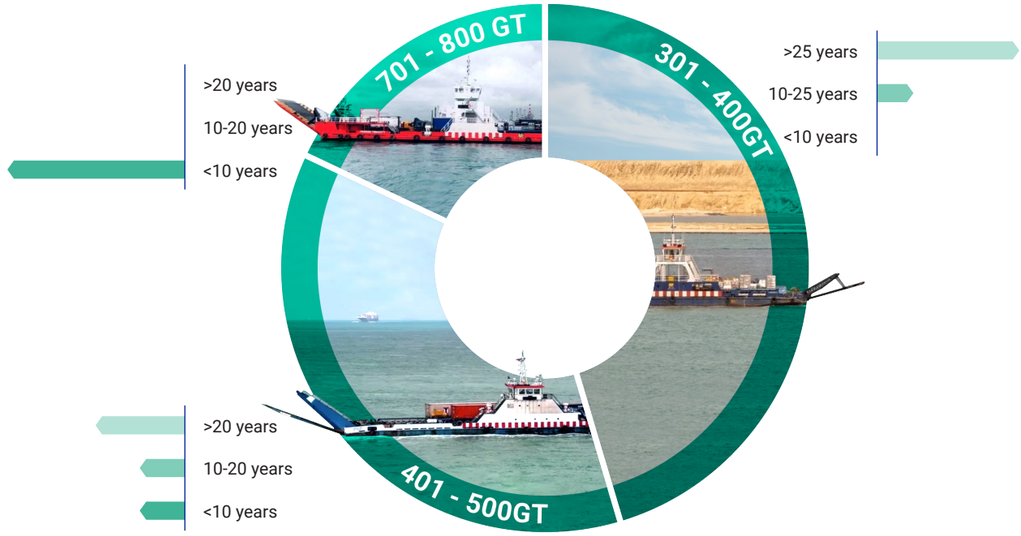


***Figure 5** | Demographic snapshot of about 10 Singapore-registered landing craft*

Electrification is **generally suitable for most landing craft operations**. Like ferry boats, their predictable point-to-point routes allow charging to be planned around cargo loading/ unloading, or during down time. Although some operations may require ranges of up to 40 nm, most can be conducted at energy-efficient speeds below 10 knots, making battery capacities and charging requirements more commercially manageable.

However, electrification presents notable cost and design challenges. Higher battery capacities and higher-power charging infrastructure will be required to match the operational capability of existing diesel-fuelled landing craft. As current landing craft designs are not optimised for energy efficiency, further design studies are needed to determine if the total cost of ownership of an electric landing craft would be lower than other alternative solutions.

12 *E.g. Pasir Panjang Ferry Terminal, Tuas Jetty, and the Singapore Armed Forces (SAF) Ferry Terminal*
13 *E.g. Pulau Bukom and Pulau Tekong*

Annex

Tanker

NOT SUITABLE

Tankers (harbour craft licence prefix “SB”) carry bulk petroleum, liquified gases, liquid chemicals, or vegetable/ animal oils. Three main categories operate in Singapore: bunker tankers, jet fuel tankers, and ancillary tankers.

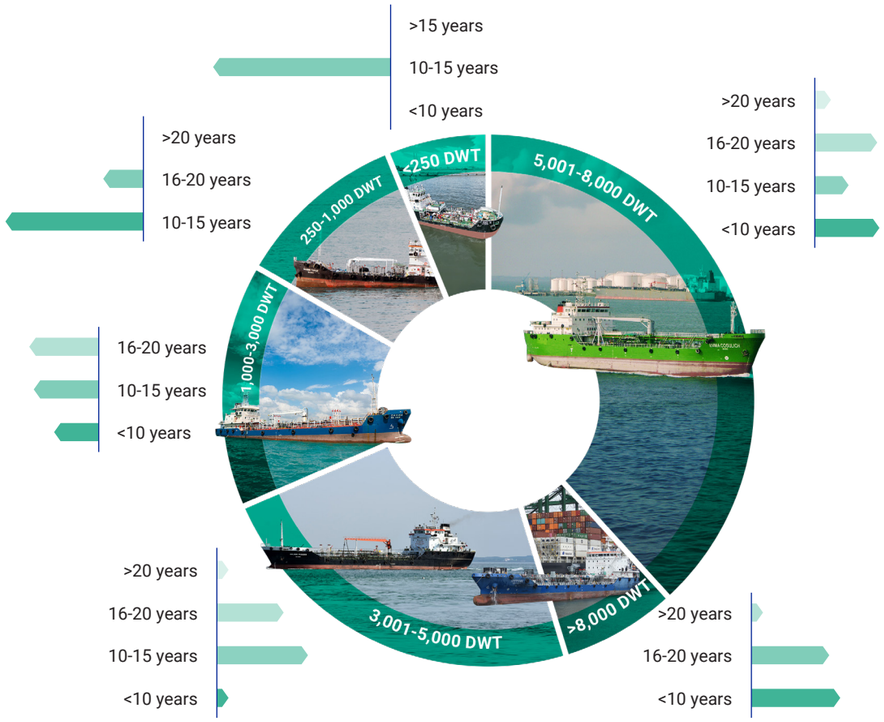


***Figure 6** | Demographic snapshot of approximately 200 Singapore-registered bunker tankers*

Singapore is the world’s largest bunkering port, supplying over a sixth of global shipping fuel. Over 200 bunker tankers operate around the clock, supplying marine fuel from oil terminals in the Jurong Island region and other regional sources[14] to ocean-going vessels across the Port of Singapore[15]. To date, 8 bunker tankers can use LNG and 10% of the fleet can carry biofuel (B100) or methanol.

Bunker tankers have low electrification potential. Their unpredictable operating patterns – involving multiple long-duration bunkering operations across various anchorages or terminals with very limited time at berth during cargo refuelling – severely constrains charging opportunities. Studies[16] indicate a median battery capacity requirement of 6 MWh for transit alone, excluding energy required for loitering and bunkering operations. This makes electrification impractical with current technology.

14 i.e. This includes regional oil terminals and floating storage units (FSU).

15 This includes vessels at anchorages or berthed at the numerous oil, bulk, and container terminals in Singapore.

*16 MPA worked with A*STAR Institute of High Performance Computing (IHPC) to study the locations of charging infrastructure and the electrical power required to support electric vessels plying domestic waters.*



***Figure 7** | Demographic snapshot of approximately 7 Singapore-registered jet fuel tankers*

Approximately 7 Singapore-registered jet fuel tankers operate on fixed schedules, transporting jet fuel from oil terminals in the Jurong Island region to the Changi Airport Fuel Hydrant Installation (CAFHI) to support operations at Changi Airport.

Despite their more predictable routes, **jet fuel tankers have low electrification potential at present**. Their long return journeys of approximately 55 – 70 nm demand high energy and endurance. While technically feasible, electrification is not currently economically practical given high asset costs and the requirement for specialised explosion-proof charging equipment – which is not commercially available today – due to the low flash point of jet fuel.

In the longer term, electrification may become a more cost-effective pathway to net zero than biofuel if high-powered, explosion-proof high-powered charging infrastructure is established at key locations. This leverages the predictable point-to-point route between CAFHI and major oil terminals in the western sector of Singapore, with sufficient time for charging during cargo operations.

Biofuel remains the primary decarbonisation option, as jet fuel tankers carry aviation fuels rather than net zero marine fuels like ammonia or methanol.

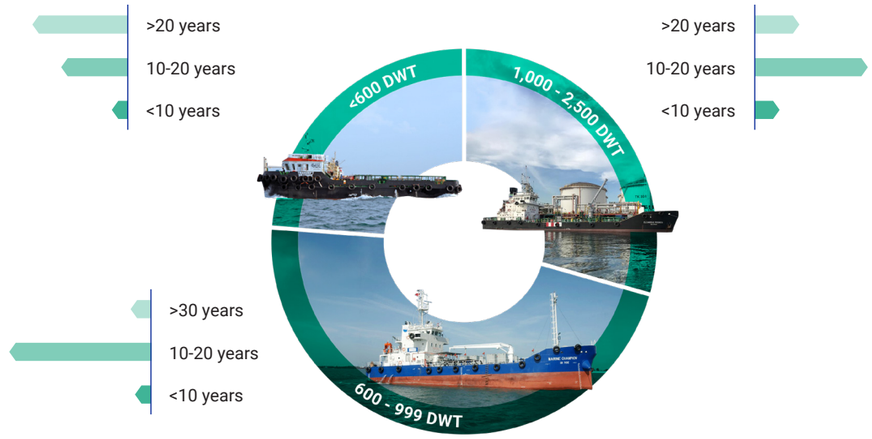


***Figure 8** | Demographic snapshot of approximately 55 remaining Singapore-registered tankers*

Approximately 55 remaining Singapore-registered tankers perform ancillary services such as supplying lubrication oil and collecting slop and waste from ocean-going vessels. As their operations closely mirror those of bunker tankers, they similarly have **low electrification potential**, with analogous constraints around unpredictable scheduling and high energy requirements

Annex

Tugboat

SOME OPERATIONS

Tugboats (harbour craft licence prefix “ST”) are used for towing, pushing, or pulling other vessels, used across several distinct roles: piloting vessels within port waters, supporting shipyard operations, towing barges and floating structures for marine projects such as land reclamation, and providing emergency response and salvage services.

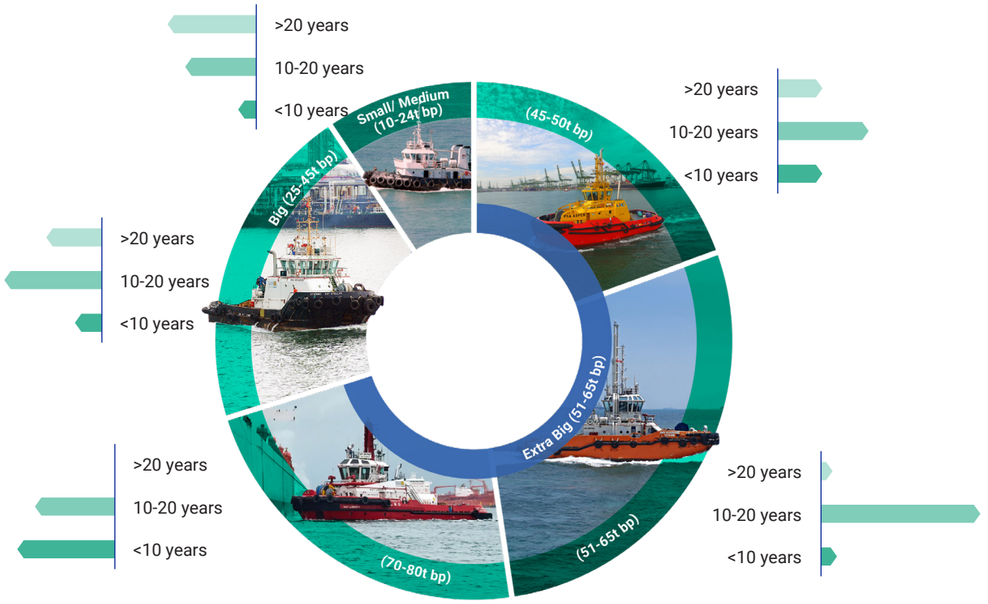


Figure 9 *| Demographic snapshot of approximately 100 Singapore-registered tugboats operated by licensed towage service providers*

As the busiest container transhipment hub and largest bunkering hub in the world, Singapore registers over 130,000 vessel calls annually, with over 100 harbour tugs operated by 6 licensed towage service providers supporting about 150,000 towage jobs annually. Today, five extra-big tugboats can use LNG, and one electric 50 bollard pull extra-big tugboat operates in Singapore.

While electric tugboats offer operational advantages – including superior torque control and thrust responsiveness over conventional internal combustion engines – near-term fleetwide electrification faces significant constraints.

Harbour tugs average 4 towage jobs daily, demanding high operational turnover. Big and extra-big harbour tugs are estimated to require 3 – 6 MWh of battery capacity for their operations, potentially rising to 8 MWh for those with higher utilisation. The resulting concurrent drawdown of 3 – 8 MW required, combined with current limitations in grid capacity and high-powered charging infrastructure, constrains the near term widespread adoption of electric harbour tugs.

Electrification is better suited for lower-intensity towage operations. Shipyard tugs are considered ideal candidates, given their shallow draft, proximity to base, and access to existing low-power shore infrastructure at shipyards. Lower-intensity operations like the escorting of smaller vessels like bunker tankers to designated berths at oil terminals are also suitable.



Photo credit *| Dundee Marine & Industrial Services*

Dundee Marine & Industrial Services, a Singapore headquartered shipbuilding & ship repair marine & offshore engineering company, has launched DM ETUG 1, a 13-meter electric tugboat, to support its own shipyard operations.

In a conventional setup, large diesel internal combustion engines are required to achieve the required bollard pull, this results in low efficiencies when operating at low loads while station keeping and slow sailing. In a fully electric setup, the propulsion is driven by electric motors powered by batteries, which delivers higher overall operating efficiencies.

The DM ETUG 1 electric shipyard tug translates concept into operationalisation and broadens the types of harbour craft operations that can use electric solutions in Singapore’s global hub port.

However, there are growing indications of increasing readiness of electric solutions to support more energy-intensive port operations as vessels entering Singapore increase in size and number.

Annex

Earlier this year, the Coastal Sustainability Alliance (CSA), an industry collaborative effort led by Kuok Maritime Group (KMG), launched EON, Singapore's first fully electric harbour tug operating in our port waters, and the first of its kind in Southeast Asia. The EON marks a significant milestone in Singapore's maritime decarbonisation journey. The operationalisation of an electric harbour tug signals the increasing readiness of electric solutions for energy-intensive operations in Singapore's port waters and strengthens industry confidence in Singapore's transition towards a net zero harbour craft fleet.

Designed and assembled in Singapore, EON was supported by MPA's Maritime Innovation and Technology (MINT) Fund. It showcases Singapore's growing capability to deliver high-value, next-generation electric harbour craft and reinforces Singapore's position as a leading maritime engineering and innovation hub.

Purpose-built to support demanding towage operations, EON is equipped with a 3MWh lithium-titanate oxide (LTO) battery system designed for fast charging, high-power delivery, and a 20-year operating lifespan. Compared with conventional lithium-ion batteries, LTO technology offers superior thermal stability and a near-zero risk of fire or explosion, significantly enhancing operational safety.



***Photo credit** | Kuok Maritime Group*

The vessel is engineered to deliver instant high torque during towing, with sufficient battery capacity to complete two or more berthing and unberthing operations on a single charge. This enables shipowners and port users to meaningfully reduce their Scope 3 emissions by at least 30% per operation, supporting their internal emissions-reduction targets while maintaining high operational performance.

Furthermore, EON has been designed with future-fuel readiness in mind. Spare capacity in the battery rooms can accommodate additional energy storage systems, and the vessel's architecture supports hybrid configurations that can incorporate ammonia, hydrogen, or methanol fuel cells as these technologies mature.

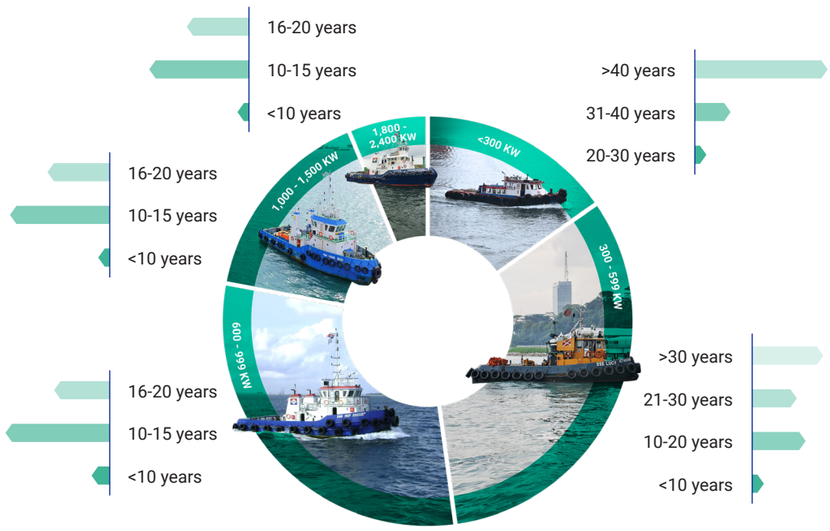


***Figure 10** | Demographic snapshot of approximately remaining 220 tugboats*

Towing tugs have low electrification potential. Their long-duration coastal voyages – often exceeding 8 hours and spanning multiple days – along unpredictable, non-fixed routes and occasional international waters make both endurance requirements and charging scheduling impractical with current battery energy densities.

Pilot Boat

SOME OPERATIONS

Pilot boats (harbour craft licence prefix "SP") carry 12 or less passengers. PSA Marine is the sole provider of essential pilotage services in Singapore, operating pilot boats from its base at West Coast to transport harbour pilots – who advice ship masters on safe and efficient navigation – to vessels in Singapore's busy port waters.



***Figure 11** | Demographic snapshot of more than 30 Singapore-registered pilot boats of 600 – 1,000 kW operated by PSA Marine*

Electric pilot boats would offer notable operational benefits, including a quieter, low-noise, pollutant-free, and a more comfortable working environment for harbour pilots operating in rough sea conditions. Energy-saving solutions like energy-efficient hull forms can further reduce overall energy consumption, which is particularly valuable given the high speeds and distances at which pilot boats operate. These solutions are key enablers of electrification, though they come at a premium.

Despite these benefits, **pilot boats have limited electrification potential** at current battery and charging technology readiness levels, owing to their extremely high operational intensity. PSA Marine supports 440 to 460 pilotage jobs daily, translating to approximately 12 to 15 return trips per pilot boat each day at speeds of 22 to 24 knots, covering 200 to 250 nm. Daily refuel sessions last only 20 to 30 mins, reflecting the tight scheduling required to maintain PSA Marine's service level of exceeding 90% within 30 minutes from service required time. The current lack of grid capacity and nascency of high-powered charging infrastructure further constrain near-term adoption of electric pilot boats.

Annex

Water Boat

MOST OPERATIONS

Water boats (harbour craft licensing prefix “SC”) supply fresh water to vessels within the Port of Singapore. Approximately 10 water boats are operated by providers including PSA Marine, DEWS Pte Ltd, and legacy wooden water boat operators.

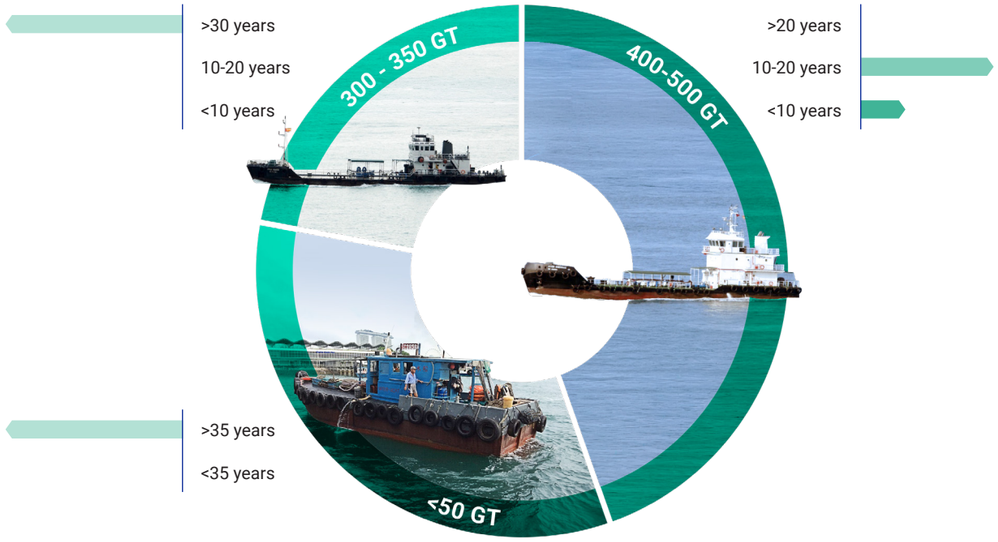


Figure 12 *| Demographic snapshot of about 10 water boats*

Electrification is **generally suitable for most water boat operations**. The relatively low demand[17] for water supply limits the number of consecutive supply runs per voyage before a water boat must return to its refuelling point. This natural operational rhythm, combined with transit at energy-efficient speeds below 10 knots and approximately 2-hour water refuelling windows, provides manageable and plannable charging opportunities. Battery capacities and charging requirements are therefore more commercially viable compared to higher-intensity vessel types.

However, electrification does present cost and design challenges. Higher battery capacities and higher-power charging infrastructure will be required to match the operational capability of existing diesel-fuelled vessels. As current water boat designs are not optimised for energy efficiency during transit, further design studies are needed to determine if the total cost of ownership of an electric water boat would be lower than other alternative solutions. Additionally, alternative water supply refuelling points that can accommodate charging infrastructure will need to be identified and developed to further support the viability of electric water boats.

17 *Compared to the fuel volumes handled by bunker tankers, for example.*

Work boat

MOST OPERATIONS

Work boats are versatile harbour craft supporting a broad range of functions including passenger transfer, ship supply, marine construction and repair, mooring assistance, and other safety and standby roles. They operate under “SC”, “SP”, or “SR” harbour craft licensing prefixes depending on their commercial activity, and vary considerably in size and operating profile, with some operating internationally.

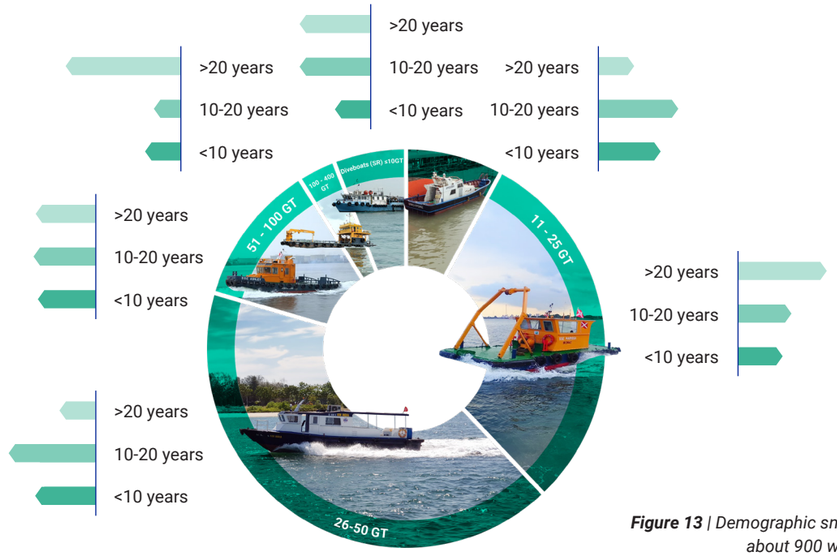


Figure 13 *| Demographic snapshot of about 900 work boats*

Ship supply is a key pillar of Singapore’s maritime economy, generating an annual turnover of S$1.5 to 2 billion. Central to this industry are Jurong Port’s two lighter terminals – Penjuru Lighter Terminal and Marina South Wharves[18] – which together handle approximately 800,000 metric tonnes of cargoes and 70,000 vessel calls annually. Of approximately 900 workboats, over 300 are registered as supply boats that operate from these lighterage terminals, with around two-thirds actively utilising the facilities in 2023.

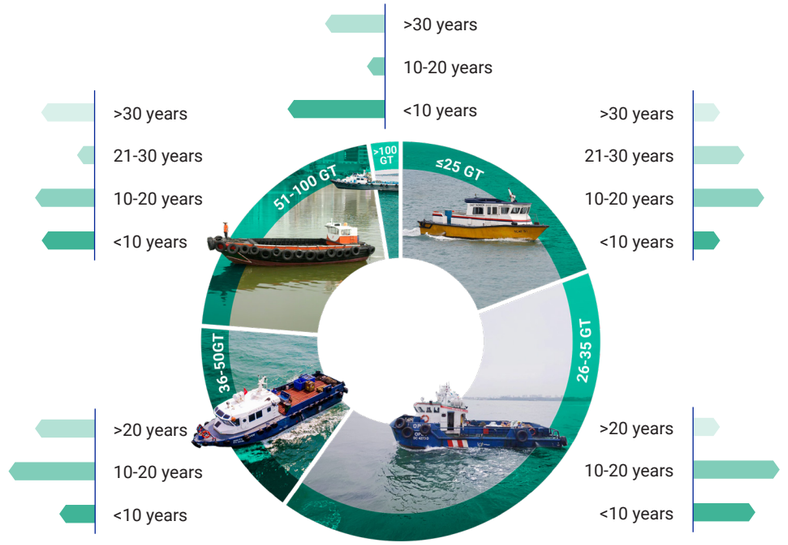


Figure 14 *| Demographic snapshot of about 350 supply boats that operate at Jurong Port lighter terminals*

18 *Marina South Wharves will eventually relocate to homeport by the end of 2026.*

Annex



***Figure 15** | Demographic snapshot of over 350 harbour craft moored at Marina South Pier, West Coast Pier, and Changi Point Ferry Terminal*

Singapore is widely recognised as one of the world's leading crew change hubs, supported by its strategic location at the centre of major trade routes and its strong maritime and aviation connectivity. Passenger launches operate from public landing places and passenger terminals serving the eastern, western, and northern sectors of the port to facilitate crew changes.

Electrification is **generally suitable for most launch boat operations**. Electric passenger launches are already capable of serving anchorages closer to shore, with coverage expected to expand as battery technology matures. Charging can be planned during downtime and concurrently during passenger boarding and downtime. Launches that regularly operate beyond Singapore's waters would face greater electrification challenges, though this option should similarly not be foreclosed given the improving trajectory of battery capacity and prices. Passenger launches that double as safety or standby boat for marine projects are less suited to electrification, owing to their long-range or extended-duration operational requirements.

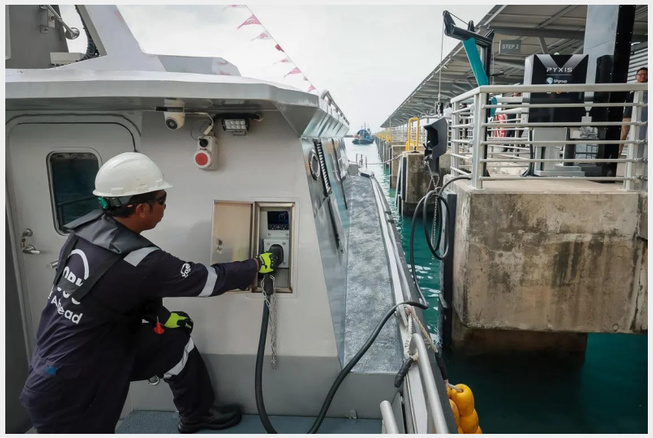


***Photo credit** | The Straits Times*

In 2024, MPA launched the first pilot trial for a public electric harbour craft charging point at the Marina South Pier (MSP) following an earlier call for proposals to develop and operate electric harbour craft charging points at various locations under a two-year pilot scheme. The charging point at MSP was awarded to the Pyxis Maritime Pte Ltd and SP Mobility Pte Ltd partnership. Pyxis's fleet of electric harbour craft operating at MSP will serve as the base offtake to ensure optimisation of the charging infrastructure and enable comprehensive data to be gathered.



***Photo credit** | Mitsui O.S.K. Lines, Ltd.*

Tailored specifically for the dynamic Singapore port market, the Pyxis One shuttles passengers between mainland Singapore and ships at anchorages. With a purpose-built aluminium catamaran hull, an efficient electric propulsion chain, and an IoT-enabled digital ecosystem platform, the Pyxis One pushes the boundaries of innovation and brings significant productivity gains compared to traditional diesel vessels.

Under this pilot, the Pyxis and SP Mobility partnership deployed a 150-kilowatt (kW) land-based Direct Current fast charger with a Combined Charging System 2 connector. This charger can charge electric harbour craft with approximate battery capacities of 500 kWh in around 3 hours and enable an operating range of about 50 nautical miles. Users of the electric harbour craft charger scan a QR code via the SP app to make payment, similar to users of electric vehicles. Insights from the data collected will contribute towards the development of a national electric harbour craft charging infrastructure masterplan, implementation plan, and national standards for electric harbour craft charging.

