Maritime Singapore's Decarbonisation Efforts

Samuel Soo

Regional Director (Japan & Korea)

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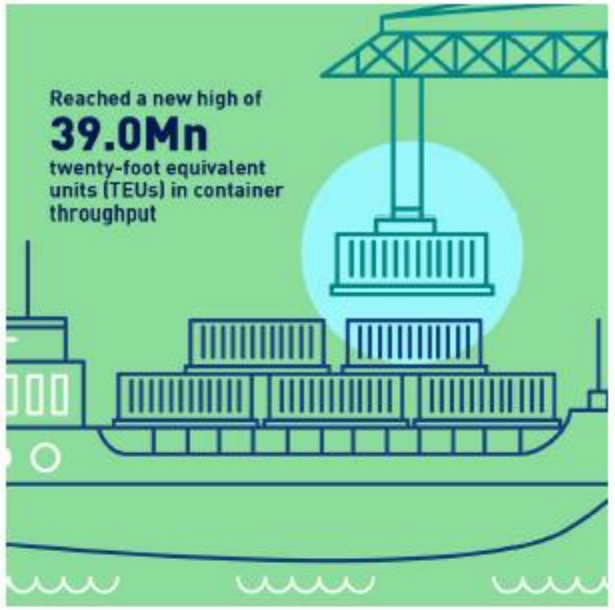
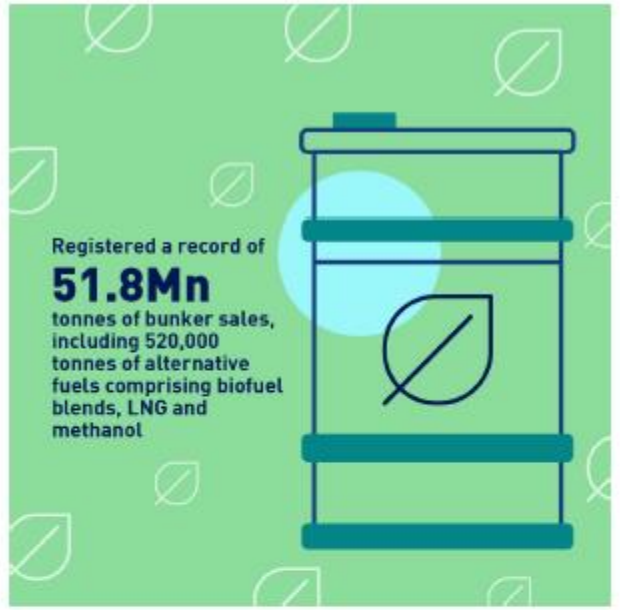
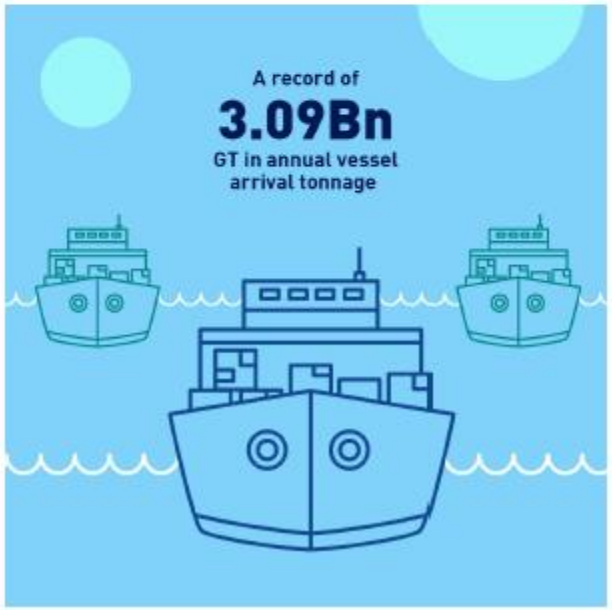
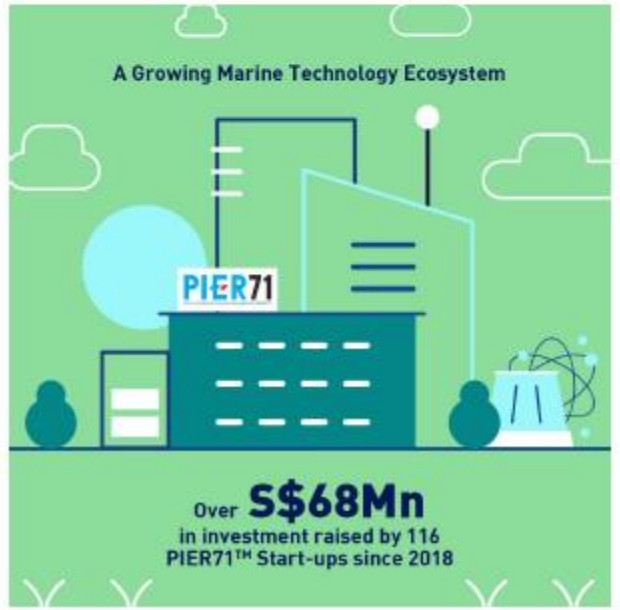
Overview | 2023

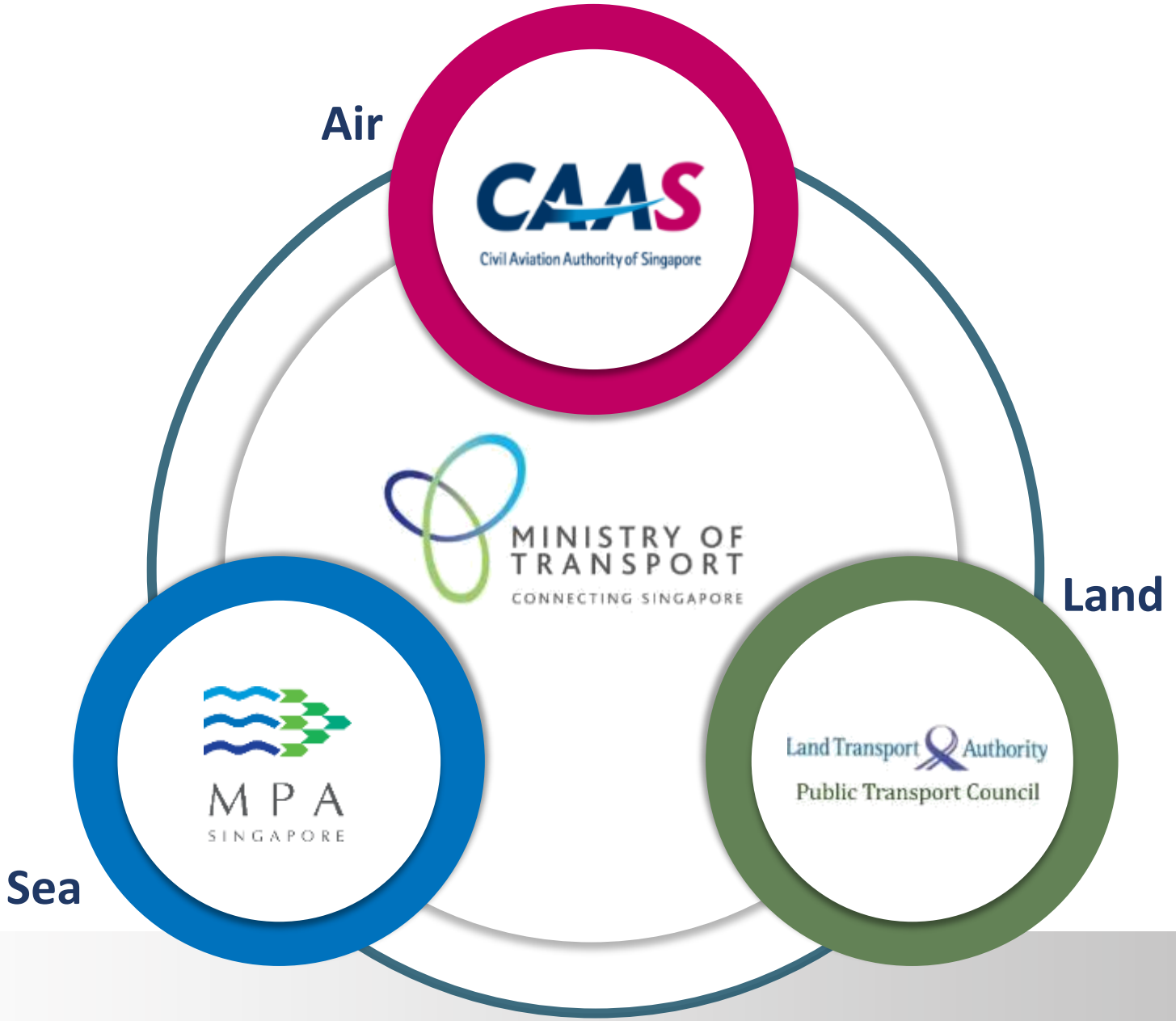








MPA - A Statutory Board under the Ministry of Transport



3 Key Mission Objectives

Premier global hub port

- Port Authority
- Port Regulator
- Port Planner

International Maritime Centre

- IMC Promoter
- IMC Developer

Advance & safeguard Singapore's maritime interests

- National Maritime Representative at IMO and other regional/international fora

The context

- In July 2023, IMO adopted revised GHG strategy

Revised 2023 IMO GHG Strategy

International shipping GHG emissions reduction targets:

- At least 20% (striving for 30%) by 2030
- At least 70% (striving for 80%) by 2040
- Net-zero by or around, i.e. close to 2050 compared to 2008.

- Uptake of zero/near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5% (striving for 10%) of the energy used by International Shipping by 2030.
- Reduce CO_2 emissions per transport work by at least 40% by 2030, compared to 2008.

IMO
INTERNATIONAL MARITIME ORGANIZATION

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The context

- In Oct 2022, Singapore announced the raising of its national climate target to achieve net zero emissions by 2050.

Achieve net zero emissions by 2050

Long-Term Low-Emissions Development Strategy (LEDS)

Reduce 2030 emissions to 60 $MtCO_2e$ after peaking emissions earlier

2030 Nationally Determined Contribution (NDC)

Port
Terminals

Domestic
Harbour Craft

Future Marine Fuels

Maritime Singapore's Decarbonisation Initiatives: Key Areas

Carbon Awareness, Carbon Accounting, and Green Financing

Singapore Registry of Ships

Driving International Collaboration

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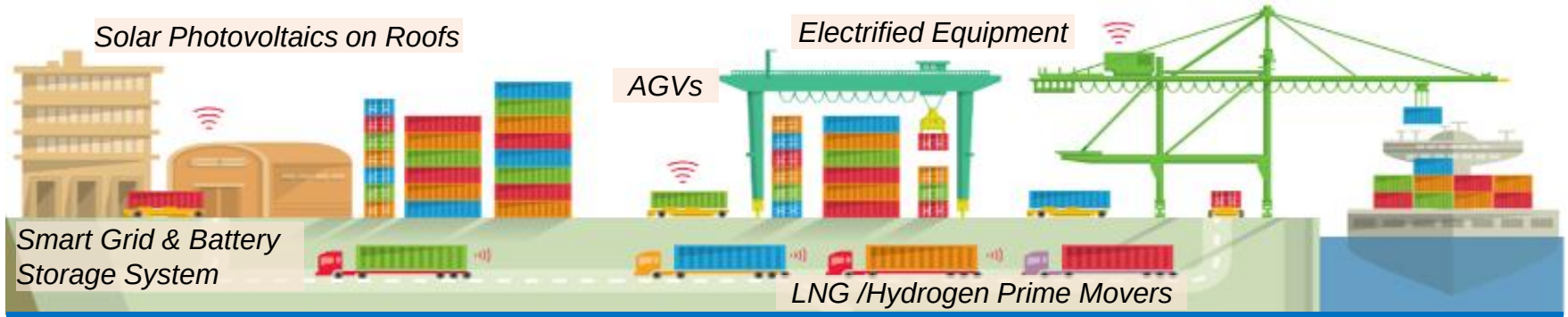
Port Terminals

Reducing emissions from port terminals

Singapore's port terminals will transit towards a low-carbon future, through the adoption of cleaner energy, automation and digitalisation.

By 2030, our port terminal operators aim to collectively achieve at least 60% reduction of total emissions from port operations as compared to 2005 levels, and to reach net zero emissions by 2050.

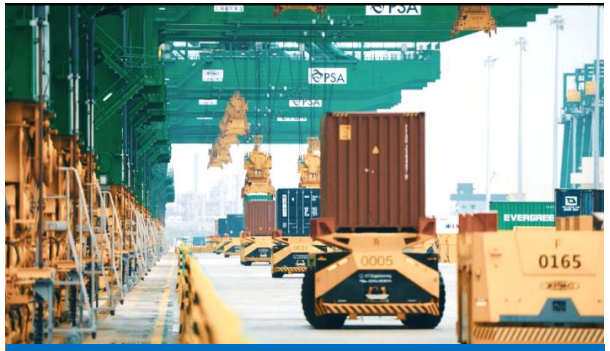


Port Terminals of the Future: Fully Electric Powered Quay Cranes, Yard Cranes, AGVs

Construction Phase (Tuas Port)

Energy Efficient Grab Dredger

Solar Photovoltaic Panels



Automated Guided Vehicles (AGVs)

Electrified Quay Cranes

Sustainable Reclamation

Tuas, sustainable port of the future

- **Green Buildings and Energy Efficiency**
  - The Tuas Maintenance Base Administrative Building is a Green Mark Platinum Super Low Energy Building.
  - Building uses 58% less energy compared to similar-sized structures and generates solar energy to offset its electricity consumption.
- **Automated and Intelligent Operations**
  - Tuas Port is designed to be automated and intelligent to optimise port operations.
  - digitalPORT@SG™ Just-In-Time platform enhances port operations' efficiency and reduces ship turnaround time.
- **Energy-efficient Operations**
  - Electrified equipment, automation, and intelligent management contribute to reducing overall energy consumption.
- **Smart Grid**
  - Smart grid management systems are employed to optimise energy consumption and distribution across the port's operations.

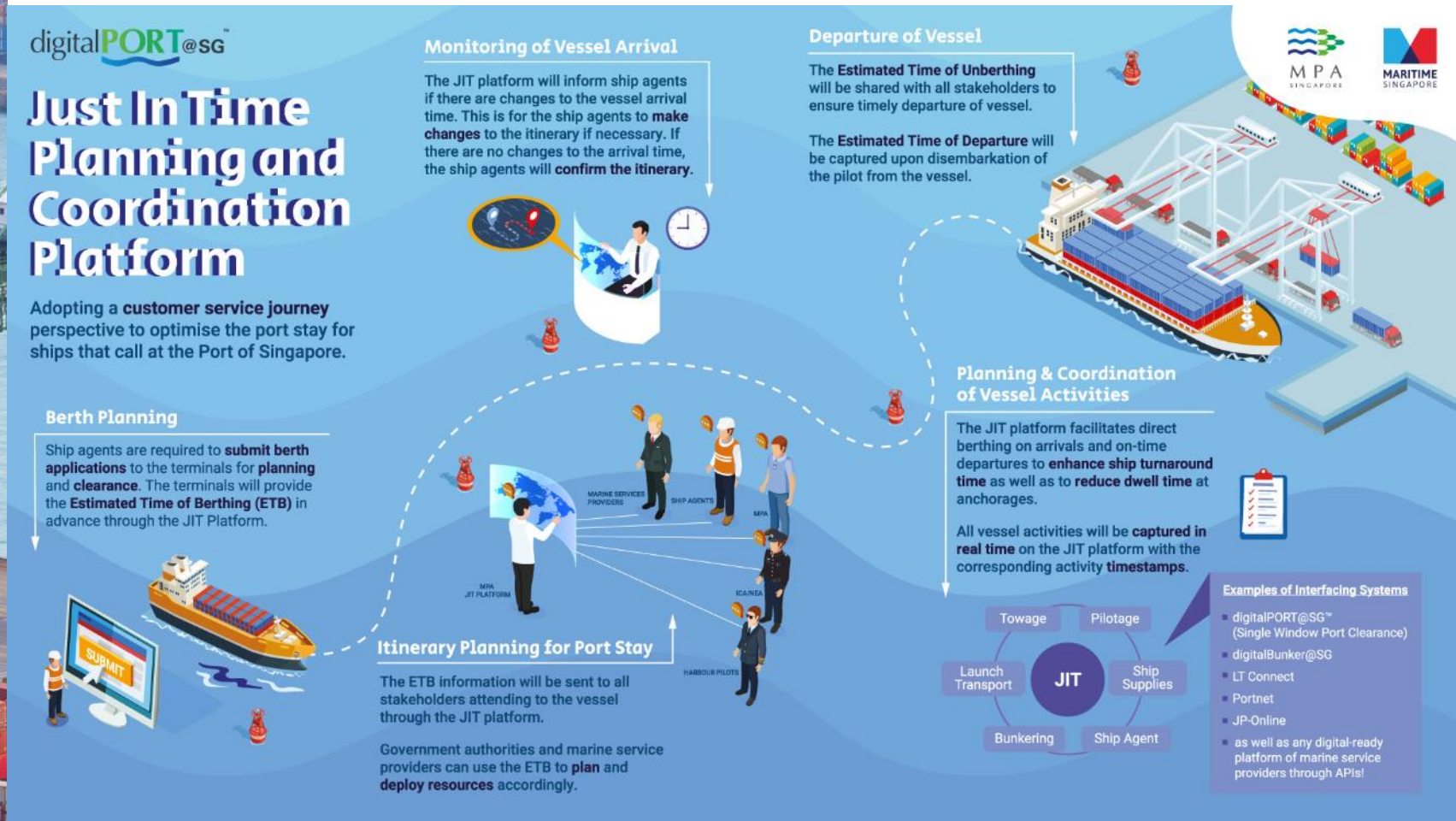
A key design feature of Tuas Port will be sustainability

PM Lee Hsien Loong at the Official Opening of Tuas Port, 1 Sep 2022.

JIT Vessel Arrival

Just-in-time vessel arrival facilitates **direct berthing on arrival and on-time departures**, enhancing ship turnaround time, scheduling of port resources and reducing carbon emissions

digitalPORT@SG™ is an **integrated digital platform** for the industry to facilitate the booking of JIT marine services



Domestic Harbour Craft

Cutting emissions from domestic harbour craft

Looking ahead

2030

From 2030 onwards, **new harbour craft** operating in our port waters must be **fully-electric**, be capable of using **B100 biofuels**, or be compatible with **net-zero fuels** such as hydrogen.

2050

Harbour craft sector is required to achieve **net zero emissions by 2050**

Fully Electric Harbour Craft

Charging Infrastructure

Passenger Craft (<12pax)	Lighters	Passenger Craft (>12pax)	Tugboat	Bunker Tanker
				

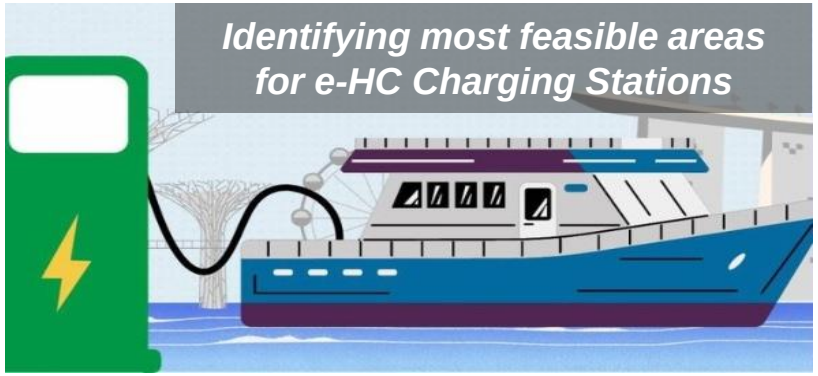
Cutting emissions from domestic harbour craft

Full-Electric Harbour Craft

Fully electric workboat "X Tron" launched March 2024

- **First full-electric ferry** started operations in 2023.
- Expression-Of-Interest (EOI) to **design and promote adoption of full-electric harbour craft (e-HC).** 11 proposals have been shortlisted.
- Work with the industry to co-develop **financing and insurance solutions** that can help lower barriers for early adopters.

Charging Infrastructure



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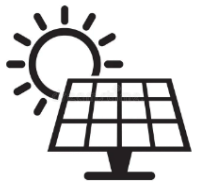
ENERGY MARKET AUTHORITY
S&TPPO
NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

- Development of charging infrastructure standards
- Charging infrastructure masterplan to study optimal deployment of charging points, using modelling.
- Call For Proposal (CFP) to submit proposals **to develop, commission, maintain** and **operate** e-HC charging points. 3 concepts have been selected to be piloted.

Harnessing renewable energy to support harbour craft electrification

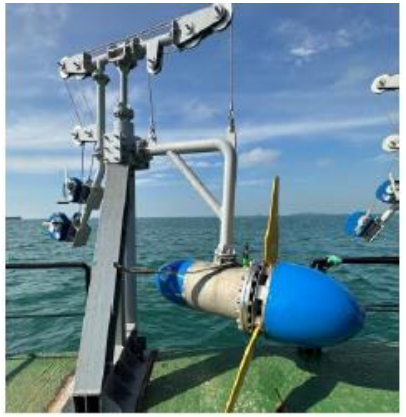
Solar



Nearshore Solar PV deployment at MPA's Piers

Industry collaboration on harnessing Tidal Energy in Singapore waters

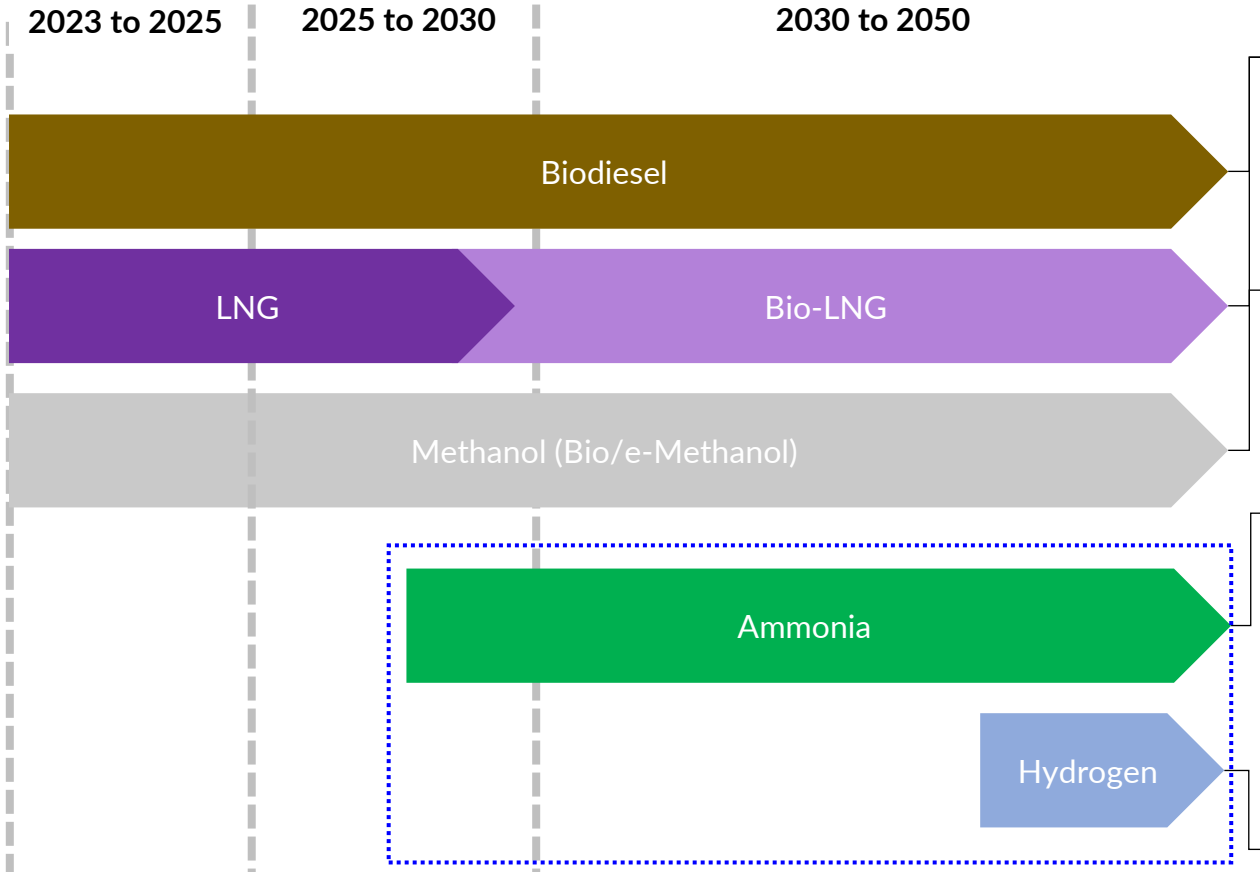
Tidal



Future Marine Fuels

A multi-fuel transition is likely for the maritime industry

Projected timeline for readiness as a marine fuel



Factors that will determine the future maritime energy mix may include, and are not limited to: supply availability, cost, fuel technology maturity, safety and standards, regulations, supply chain and infrastructure development, competition with other sectors for fuels (eg: aviation).

Biofuels/LNG are likely the interim or transition fuels for shipping in the near term, until other alternative fuels come online. These may continue to be a part of the fuel mix in 2050 (eg: renewable diesel, bio-LNG produced from biogas).

Methanol is gaining traction in the near-term, with increasing orders of methanol-fuelled ships.

Ammonia could emerge as the **most adopted maritime fuel in the mid to long term**, pending the commercialisation of ammonia engines, development of safety standards, regulations, ammonia bunkering infrastructure and training.

Hydrogen as a direct maritime fuel may come online in the long term. Though there are ongoing developmental projects in industry, maritime-specific hydrogen technologies, supply chain, regulations and safety standards are relatively nascent. In the interim, hydrogen is expected to play the role of primary feedstock in the production of alternative fuels.

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Enabling a multi-fuel transition: Methanol

Expression of Interest (EOI) for the Supply of Methanol as a marine bunker fuel

- In Dec 2023, MPA issued an EOI to invite interested parties to submit proposals for the development of end-to-end methanol bunkering solutions in Singapore from 2025.

Standards Development

- **Working Group on standard development** for methanol bunkering to develop a Technical Reference for methanol bunkering in Singapore that covers custody transfer requirements for delivery

Emergency Response / Table-top Exercises / Mitigation Measures

- **Table-top exercise (TTX):** Organised with the **International Chemical and Oil Pollution Conference and Exhibition** (ICOPCE) 2023. Reviewed existing safety measures and standards, identified potential gaps and new safeguards, strengthened cross-agency coordination for an effective response to a methanol spill incident.
- **HAZID/HAZOP Workshop.** Organised in May 2023 with methanol bunkering trial partners, working group members and relevant government agencies to develop prevention, control and mitigation methods.

Key milestones of the methanol bunkering operation

- **World's First Ship-to-Containership Methanol Bunkering Operation:** Conducted safely and successfully in the Port of Singapore.
- **Safety Measures:** Safety zone established, response vessels positioned, and environmental, metocean, and safety risk modeling conducted by various research organizations and institutions.
- **Methanol Detection:** Drones equipped with methanol detectors and infrared cameras deployed for additional detection points.
- **Customised Methanol Firefighting Program:** Conducted as part of bunkering operation preparations.

Enabling a multi-fuel transition: Ammonia

Joint Industry Projects (JIP)

Safety studies with Institutes of Higher Learning (IHLs) / Research Institutes (RIs)

Standards Development

- Drafting of the Technical Reference for ammonia bunkering.

EOI to develop ammonia power generation & bunkering solutions

- EMA/MPA have shortlisted 6 proposals under an Expression Of Interest (EOI) to develop end-to-end low or zero-carbon ammonia power generation & bunkering solutions in Jurong Island.

Emergency Response/Table-top Exercises

Managing accidents involving ammonia as fuel for ships

- Three-day workshop featuring 2 accidental release scenarios and involving 70 participants from 12 countries in May 2023.
- Collaboration between MPA, Embassy of France, Innovation Norway, with support of the EU-funded project “Enhancing Security Cooperation In and With Asia”.

Key milestones of the ammonia fuel trial

- **World's First Use of Ammonia as a Marine Fuel in a Dual-Fuelled Ammonia-Power Vessel:** Conducted on board the Singapore-flagged *Fortescue Green Pioneer*
- **Safety preparations:** HAZID and HAZOP workshops to identify potential risks during fuel transfer and engine trials. Onboard drills and training conducted to assess operational readiness and preparedness of crew during an incident.
- **Plume modelling:** Ammonia plume model developed by research institutes*.
- **Safety Measures:** Fuel trial conducted over seven weeks, tests done in phases. Safety zone established, response vessels positioned, monitoring via drone.

**Agency for Science, Technology and Research's Institute of High Performance Computing (A*STAR's IHPC)*
**Nanyang Technological University's Maritime Energy and Sustainable Development Centre of Excellence (MESD)*
**Technology Centre for Offshore and Marine, Singapore (TCOMS)*
**National University of Singapore's Tropical Marine Science Institute (TMSI)*

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Driving International Collaboration

Singapore's approach as a responsible flag and port State

Singapore seeks to **plays 3 key roles** on the global stage to **advance maritime decarbonisation**:

Standards-Setter

MPA formed the **Future Fuel Port Network** and joined the **Zero-Emission Shipping Mission** to develop harmonised **standards for clean marine fuels.**

Bridge-Builder

Actively contributed to discussions at IMO on the **Revised IMO Strategy adopted in July 2023**, including indicative checkpoints and strengthened levels of ambition for 2030, 2040 and 2050.

Advocate for Inclusive Climate Action

Working with the **IMO Secretariat and Norway's Ministry of Climate and the Environment** to develop **"NextGEN" portal** to visualise maritime decarbonisation projects and **"NextGEN Connect"** to facilitate inclusive route-based action plans in developing countries. Joint workshop in Oct 2023

Green and Digital Shipping Corridors (GDSCs)

Asia--Europe Green & Digital Shipping Corridor with the Port of Rotterdam

Transpacific Green and Digital Shipping Corridor with Port of LA, Port of Long Beach

'Slik Alliance' aimed at driving zero emission shipping across the Indian & Pacific Ocean

Green and Digital Shipping Corridor with Tianjin

Green and Digital Shipping Corridor with Japan

Green and Digital Shipping Corridor with Australia

Singapore Registry of Ships

Singapore Registry of Ships (SRS)

- The SRS is the administration responsible for executing proper registration of ships and ensuring that ships and owners meet the stringent criteria required for their ships to sail under the Singapore flag.
- The SRS is committed to **tackling GHG emissions** arising from international voyages made by Singapore-registered ships.

MPA will continue to build on our existing efforts to encourage the SRS towards a low-carbon future.

SRS Green Notation launched on 1 November 2021

- Singapore-registered ships is awarded to Singapore-registered ships that reduce their carbon intensity to a level that exceeds the IMO EEDI Phase 3 requirements by at least 10% through the adoption of energy efficient technologies and/or adopt the use of alternative fuels.
- Ships awarded the Notation are issued with a Certificate of Recognition, which serves to enhance the vessel's attractiveness to charterers. Qualifying Singapore-registered ships will receive additional benefits such as reduction in their IRF and rebates on their ATT.

Maritime Singapore Green Initiative (MSGI)

Maritime Singapore Green Initiative (MSGI)

Green Port Programme

Green Ship Programme

Green Energy and Technology Programme

Green Awareness Programme

Green Port Programme (GPP)

<u>Summary</u>

- Provides incentives for ocean-going vessels calling at Port of Singapore and MPA licensed harbour craft.
- From 1 May 2022 to 31 Dec 2024.
- Offers up to 30% reduction in port dues.

<u>Criteria for incentives</u>

- Exceed IMO Phase 3 EEDI requirement by 10% or more.
- Use low or zero carbon fuel in Port of Singapore.
- More details available on the MPA website (*Ref: Port Marine Circular No. 10 of 2022.)*

Green Ship Programme (GSP)

<u>Summary</u>

- Incentives for Singapore-flagged ships exceeding IMO environmental standards.
- From 1 May 2022 to 31 Dec 2024.
- Offers up to 100% reduction in initial registration fees.
- Provides up to 100% rebates on annual tonnage taxes.

<u>Criteria for incentives:</u>

- Exceed MARPOL Annex VI Phase 3 EEDI requirements by 10% or more.
- Use low-carbon fuels (e.g., (bio)-LNG, (bio)-methanol, (bio)-ethanol) with C_F equivalent to or lower than LNG.
- Use zero-carbon fuels (e.g., ammonia, hydrogen).
- *Reference: Shipping Circular No. 7 of 2022.*

Carbon Awareness, Carbon Accounting and Green Financing

Strengthening companies' capabilities in carbon accounting & promoting green ship finance landscape

MPA aims to support and enable a culture of carbon reporting and accounting amongst maritime companies.

Green Ship Finance

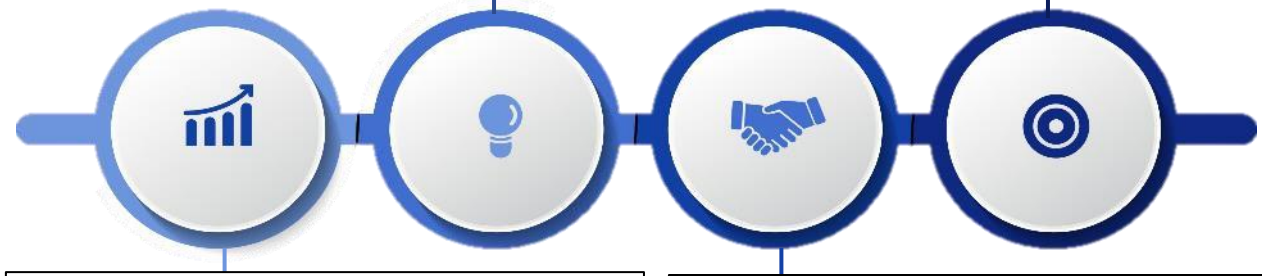
Raising Awareness

Continued education and promotion of green financing tools to shipping sector

Support shipping finance professionals to gain sustainability-related knowledge

Aligning Taxonomy

Standardisation of the vocabulary for green shipping via collaboration with fellow agencies i.e. the Monetary Authority of Singapore (MAS)



Expanding Sources of Financing

Attracting new finance providers and intermediaries

Promoting growth of new green products or financial models

Deepening Knowledge and Capabilities

Working with institutes of higher learning (IHLs) to build competencies in maritime green finance

Signed **tripartite MOU** with Singapore Shipping Association, Global Compact Network Singapore and MPA **to raise awareness on carbon management amongst local maritime companies**

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THANK YOU