Precious Shipping Public Company Limited

Future of Shipping – Investment Readiness

Webinar, 10 Sep 2020, 1600 SGT

Introduction

- Shipping is **most efficient means** of commercial transport.
- BUT it **accounts for about 3% of total CO2** emissions.
- **IMO committed to GHG reductions by 50% by 2050** compared to 2008.
- **PSL aims for sustainable long-term measures** to improve the environment.
- PSL has **implemented "Ship Energy Efficiency Management Plan"** (SEEMP) since January 2013.
- PSL is **ISO 14001: 2015 certified** for Environment Management Systems.
- **PSL's Zero Emissions strategy can be summarized as:**
    - a) **Monitor and Analyze Emissions** of existing vessels.
    - b) **Reduce Emissions** of Existing vessels.
    - c) **Replacement of older vessels with new Eco** design vessels.
    - d) **Participate actively as a Member of the Getting to Zero Emissions Coalition**.
    - e) **Off-set Emissions** by participating in Emission Trading Schemes.

Detailed Strategy Overview (1/2)

A) Monitor and analyze emissions of existing vessels

- Since 2014, **PSL vessels have maintained records of CO2 emissions**.
- Carbon intensity in **Grams CO2 per Tonne-Nautical Mile: 50gms CO2 in 2014, at 14gms CO2 in 2020**.
- PSL's '**Eco' ships recorded 7 - 10gms of CO2 per Tonne –Nautical Mile**.
- **CO2 emitted per tonne of cargo carried in 2018 was 60% lower than in 2008!**

B) Reduce emissions of existing vessels:

- **Improved voyage planning, reduced ballast passages** and port stays and optimizing speed.
- **Weather routing** to take advantage of currents and avoid rough weather.
- **Optimizing trim and maintenance** to improve performance and **retrofit vessels with fuel saving devices**.
- **Avoiding wastage** of electric power on board.
- **Disposing waste sludge generated at shore facilities**, despite the costs, rather than incinerate on board.

C) Replacement of older vessels with new eco design vessels:

- **'Eco' vessels are equipped with electronically controlled** diesel engines that are more fuel efficient, have better hull design, use waste heat more efficiently, and operate with 50% lower CO2 per transport work.

Detailed Strategy Overview (2/2)

D) Participate actively as a member of the Getting to Zero Emissions Coalition

- The coalition **aims to place zero-emission vessels in operations by 2030**.
- **LNG fuel is not a good option** to reduce GHGs due 'Methane Slip' from production, to storage and usage.
- The same amount of **Methane emission warms the planet by 30 times in 12 years as CO2 in 100 years**.
- **Careful monitoring of developments** in technology in the Marine field for zero emission ships.
- Zero carbon fuels range from **Biofuels, Methanol, Ammonia, Hydrogen, renewable energy options like Wind power, solar power and Electric propulsion are all largely in the research stage**.
- **Zero carbon fuels should be produced using zero carbon energy sources**.
- **Global availability** of such fuels will allow economies of scale to reduce cost.
- As viable options of **zero emission 'green' vessels** are available, they **will form part of our fleet**.

E) Off-set Carbon Emissions by participating in Emission Trading Schemes:

- **Invest in Non-Marine Carbon** emission reduction schemes like Solar or Wind Energy power sources ashore.
- **The off sets can be used to maintain net zero emissions** until vessels with zero carbon emissions are commercially viable.

Future Developments

Regulatory Developments

- **Goal #1: Reduce GHG emissions** per transport work by **40% in 2030, 70% in 2050** compared to 2008 levels.
- **Goal #2: Reduce aggregate GHG emissions by 50%** in 2050 compared to levels in 2008.
- **Marine GHG consists of CO2 at 91%, Black Carbon at 7%, Nitrogen Dioxide at 1.5% and Methane at 0.5%.**

Current Progress

- **The good news:**
  - **CO2 emissions per tonne mile have been declining since 2014**.
- **The bad news:**
  - **Total industry CO2 emissions are flat** despite reduction of carbon emissions on a per transport work basis due to trade growth.
  - There are **limits on the amount of emission reduction achievable** per ton mile based on existing technologies.
  - **Total CO2 emissions are expected to exceed 2008 levels in 2020 or 2021**.
  - The industry is making progress in respect of Goal #1 but **NOT in respect of Goal #2 which is to reduce total GHG emissions by 50% in 2050.**

How Can We Reduce aggregate GHG emissions by 50% in 2050 compared to levels in 2008?

Biofuels

- **Similar to fossil fuels and easiest to switch over** to from a technological perspective.
- But they have **questionable sustainability credentials**.
- **Unlikely available in sufficient quantity** due to competing demand from road and air transport.

Ammonia

- It has the **largest share of zero emission vessel prototypes world-wide**. The fuel has zero carbon emissions due to its molecular makeup (NH3).
- From 1920 till the 1990's, Ammonia was mainly produced from water through electrolysis (**Green ammonia**). Production of Ammonia from Methane since then has became more popular (**Blue Ammonia**) due to its low-cost advantages.
- **Global production of Ammonia is 180 MMT** of which about 17.5 MMT is traded on LPG Tankers.
- **Ammonia is available at 120 ports globally**.

Commercial Implications of Ammonia & Alternative Fuels

Commercial:

- **Cost of Blue Ammonia is equal to LSFO. Cost of Green Ammonia is higher** but could reduce substantially with further R&D.
- **Early adopters** of Ammonia as a fuel are likely to be:
  - **Niche vessels** operating in regions with strict emission controls and on fixed routes. Governments will underwrite these first movers.
  - **Ammonia Tankers and LPG Tankers** capable of transporting Ammonia.
  - Followed by **energy guzzlers such as large Cruise and Container carriers** on routes where Ammonia as a fuel is easily available.
- **Bulk carriers,** which consume about 5% of total marine fuel consumed globally **will unlikely be early adopters because of their varied trade routes.**
- **Engine manufacturers** are working on adapting engines for Ammonia. The first Ammonia powered marine engines should be **commercially available by 2024**.
- **Ammonia powered vessel designs could be available 2025/2026** onwards.
- **Key to adoption** of Ammonia powered vessels would be **establishment of safety and training standards** which could take several years given the more complex nature of the fuel and hence likely push back to widespread adoption.

Latest News from the Shipping Press (1/2)

- **Shipping will need to spend up to $1trn in the next decade** to replace the existing fleet, but uncertainty over technologies and financing will hamper its green transition. The challenge will be timing and technology. Uncertainty about the long-term futures of alternative fuels makes **it more important that shipping finds a fuel that can be a transition steppingstone**. (TradeWinds – 11 Sep 2020)

- The Oceanbird, capable of carrying 6,000 vehicles, has been created by the KTH Centre for Naval Architecture, maritime tech developer SSPA and Wallenius Marine. The Swedish government agreed funding the project. The ship design features sails 100m high. The vessel is expected to need 12 days, a bit longer than conventional ships, to cross the Atlantic but with Zero emissions. (Splash – 8 Sep 2020)

- As soon as you go to larger vessels or you need more autonomy, you are looking at green ammonia. CMB expects green ammonia will eventually be commercially viable. But it may take several years for cost to fall. (TradeWinds – 8 Sep 2020)

- The Sustainable Shipping Initiative and Copenhagen Business School are partnering to **define criteria for new fuels' sustainability** credentials and to **facilitate the certification of the fuels being explored**. (Splash247.com – 2 Sep 2020)

- According to the IEA's Energy Technology Perspectives 2020 report, the **maritime industry needs to put 36 ammonia-fueled vessels into service every month to meet any net zero carbon emission targets**. The industry's "**technology readiness" is only at the demonstration phase** and would need to reach the market in about 12 years' time. The retrofit takes about 50-60 days, costs $9 - $10m for each project, broken into $6.5m as equipment cost, $200,000 to engineering and $1.5m to yard costs, plus contingency. (Lloyd's List – 1 Sep 2020)

Latest News from the Shipping Press (2/2)

- According to Martin Stopford, the upcoming transformation is **akin to what occurred between 1860 and 1890**, when steamships began to replace sailboats **in a century-long transition**. “It took 50 years to get from the first steamship on the water to a ship vaguely capable of trading globally, then it was another 50 years to get from the first ship to have a global fleet ... These things take a long time.” (TradeWinds – 1 Sep 2020)

- Toshiba, Kawasaki Heavy and NYK Line have unveiled a **demo project for a H2-powered** 100 passenger ferry sponsored by the Japanese government. The project is Japan's first effort to develop a commercially available fuel cell vessel and carry out an operation involving the supply of hydrogen fuel. (TradeWinds – 1 Sep 2020)

- The state-of-the-art green ship design is the result of work by e5 Lab Inc, a joint R&D company that was established last summer between Asahi Tanker, MOL, Mitsubishi Corp and Exeno Yamamizu Corp. Powered by 3,500-kwh lithium-ion batteries, Asahi described the so-called e5 tanker design as “pure battery tankers”. The ships, two emissions-free **4,500-dwt tankers, will be delivered in March 2022 and March 2023**. (TradeWinds – 30 Mar 2020)

Thank You !

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