Decarbonisation of shipping

BIPC 2021

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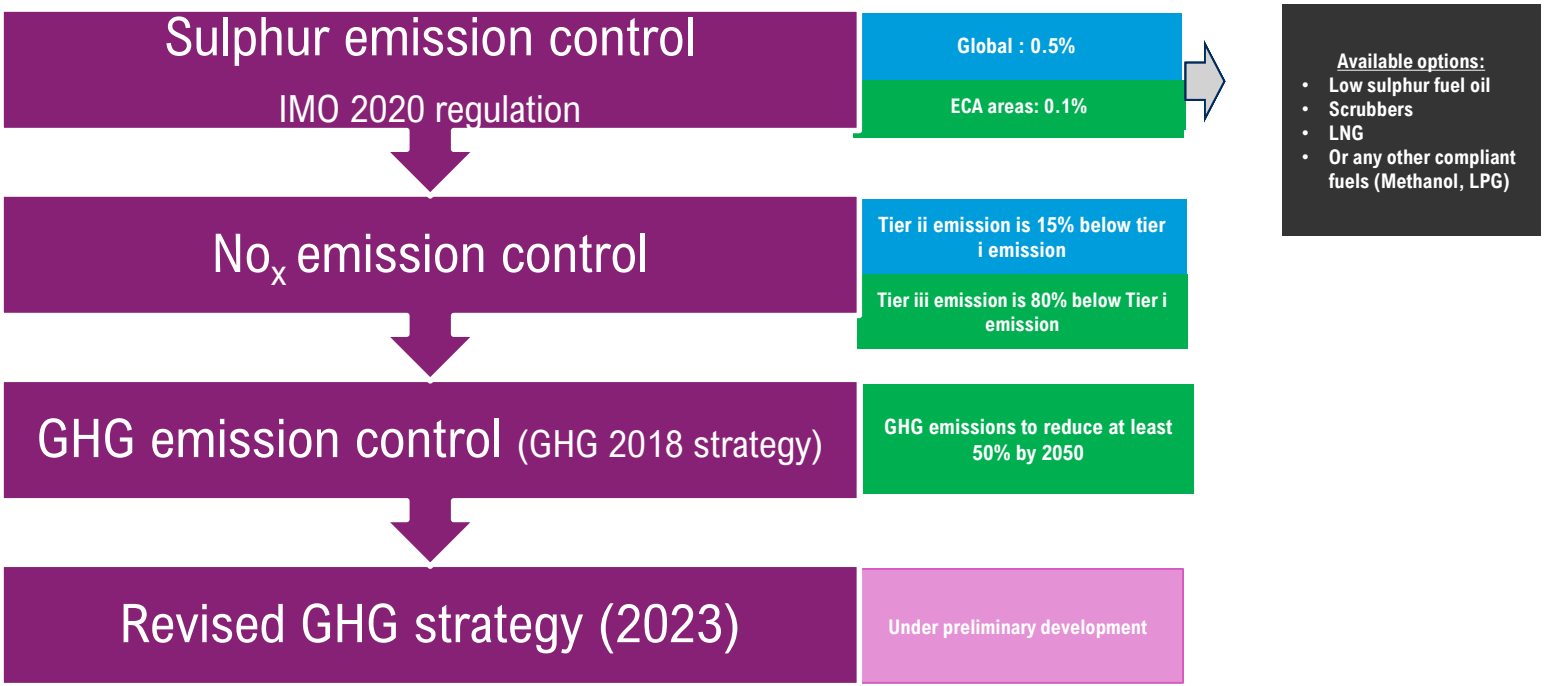
Date: **21st October, 2021**

Overview of emissions regulations

Sulphur, NOx and GHG are emitted from vessels due to fuel combustion; these gases are either harmful to humans or to the planet. The IMO has formulated regulations to limit emissions. Sulphur emission regulation was implemented from 1 Jan 2020.



Measures to reduce CO_2 intensity

During MEPC76 in June 2021, IMO adopted measures to reduce the CO_2 intensity of ships and established a ship rating system. These amendments combine technical and operational approaches to improve the energy efficiency of ships. These measures are aimed at reducing carbon emissions by 11% by 2026.

MEPC76 adopted following mandatory measures for ships to come into effect from 1 Jan 2023.

All ships to calculate their Energy Efficiency Existing Ship Index (EEXI)

- EEDI for existing ships
- To improve their energy efficiency

All ships to establish their annual operational carbon intensity indicator (CII) and CII rating

- Carbon intensity links the GHG emissions to the amount of cargo carried over distance travelled.
- Ships will get a rating of their energy efficiency (A, B, C, D, E - where A is the best).
- A ship rated D for three consecutive years, or E, is required to submit a corrective action plan, to show how the required index (C or above) would be achieved.

Phased Reduction of CO2 based on 2019

- **2020-22: 1%**
- **2023-2026: 2% per annum**
- **2027 onwards: not decided**

IMO to review the effectiveness of the implementation of the CII and EEXI requirements, by 1 January 2026 at the latest.

Note: Mid-term and long-term measure including the proposal for a greenhouse gas levy will be discussed in the next working group meeting in Oct 2021. Further discussions on International Maritime Research Board (IMRB) and Market Based Measures will be done in MEPC 77 in Nov 2021.

Source: IMO

Customers

Pressure from customers and activists will grow.

“The time to act is now and we welcome other cargo owner companies who want to lead on addressing climate change to join us in collaboration,”

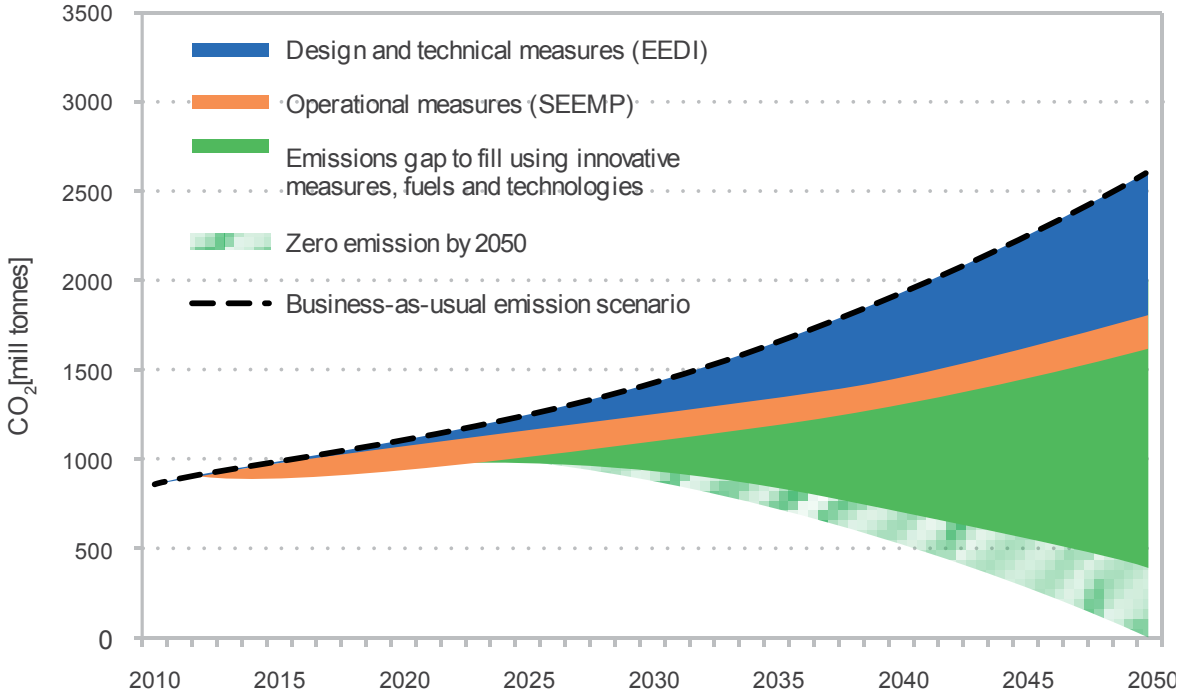
Edgar Blanco, director, net-zero carbon at Amazon

“We need to speed up the transformation towards zero emission ocean shipping. By collaborating with like-minded partners, companies, and organizations across the value chain we can create strong movements. Therefore, we have today signed the ambition statement Cargo Owners for Zero Emission Vessels,”

Elisabeth Munck af Rosenschöld, sustainability manager supply chain operations at Ikea

Ways to reduce CO_2 emissions

The reduction of CO_2 emission to the desired levels will require a combination of technical design measures (EEDI), operational measures (SEEMP), innovative technologies and new fuels.

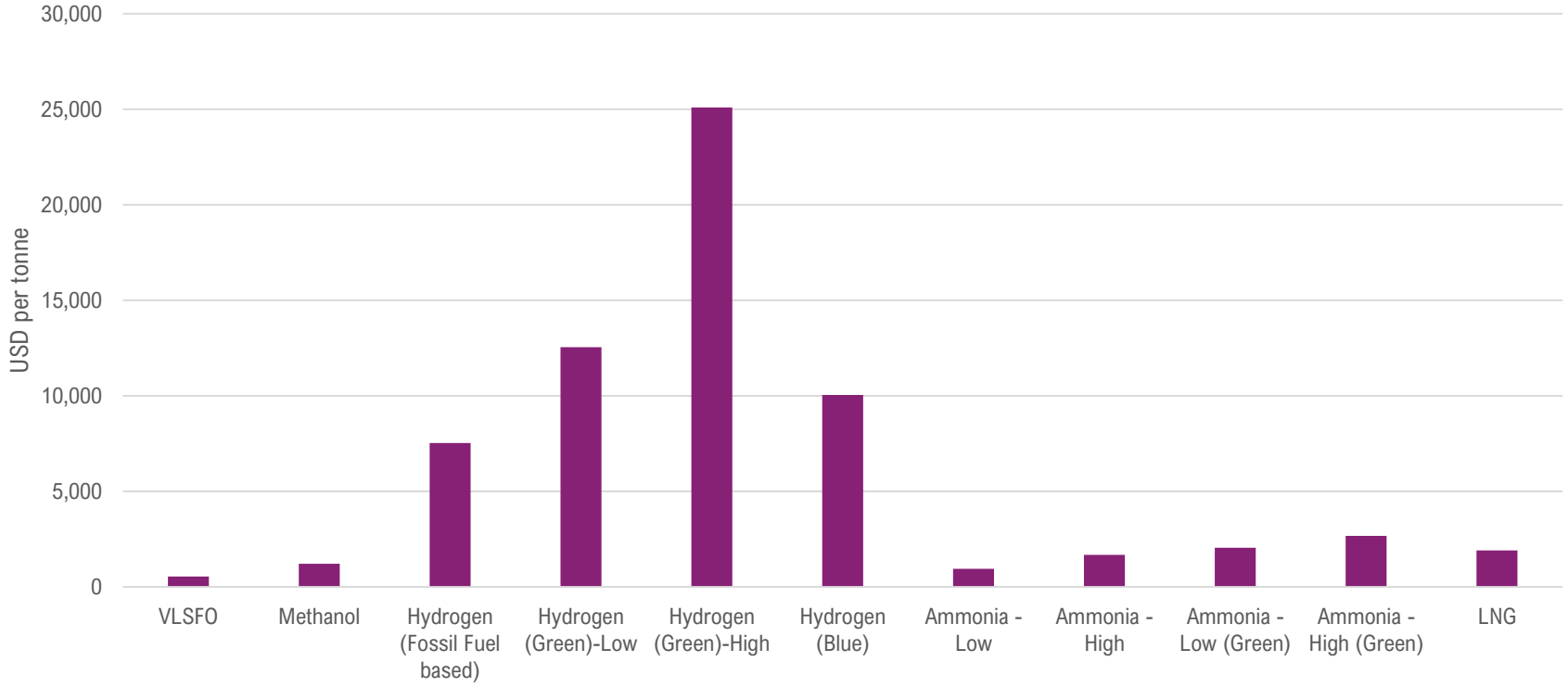


Source: IMO

Emissions reduction measures

Options available	Remark
Alternative fuels	Results in a significant drop in CO_2 emission. However, he fuel has to be selected carefully, considering the emission of other gasses and well-to-wake emission. May require considerable modifications.
Energy efficient technologies	Renewable energy sources, for example, wind assistance systems like kites, fixed sails, flettner rotors, solar panels.
Engine power limitation	This is lowering of the engine power, resulting in a lower speed of the vessel.
Energy saving devices	Propulsion optimisation or propulsion improving devices (PID) are propellers or rudder modifications like propeller Hi-FIN attachment, energy saving rudder with bulb fins, Becker Mewis duct, Propeller Boss Cap Fin (PBCF) etc.
Propeller/hull cleaning	By removing the marine growth on the hull, the speed of the vessel increases.
Engine optimisation	Variation of fuel injection time and pressure for more efficient combustion of fuel.
Hull modification	Bulbous bow modification, air lubrication system (bubble technology) reduces the friction and therefore, increases the speed.
Hull paints	Various paints are available to reduce marine growth on the hull which causes a reduction in speed.
Shaft generator	Installation of this on the propeller shaft, generates electricity and reduces the need for auxiliary engines.
Trim optimisation	For a given draft and speed, there is a trim which results in minimum resistance of the vessel through the water.
Weather routing using digital twin	A combination of weather parameters are applied to the digital twin of the vessel to reduce the fuel consumption.
New charterparty clauses	Slow steaming clause and virtual arrival clauses as well, as the Just In Time concept, allows the vessel to reduce speed and emission.

Fuel cost


30,000
25,000
20,000
15,000
10,000
5,000
0
USD per tonne
VLSFO
Methanol
Hydrogen (Fossil Fuel based)
Hydrogen (Green)-Low
Hydrogen (Green)-High
Hydrogen (Blue)
Ammonia - Low
Ammonia - High
Ammonia - Low (Green)
Ammonia - High (Green)
LNG

Market based measures may be a catalyst

GHG levy is increasingly being proposed as one of the tools for promoting decarbonisation. It can help finance research and development in the decarbonisation ecosystem such as alternative fuel, bunkering infrastructure etc and provide level playing field for alternative fuels. It may help in reducing the risk of investment in alternative fuel.

GHG Levy / Carbon tax

- IMF: a global average GHG price of $75 a tonne is needed
- Global Maritime Forum (carbon levy): $10 per tonne of CO2 rising to $50 - $75 per tonne after 10 years or around 2030.
- The Marshall Islands and the Solomon Islands (carbon tax): $100 per CO2 tonne.
- Trafigura: $ 250-300 surcharge for every metric tonne of CO2 equivalent, and the cost should be born by Charterers.
- Maersk (CO2 tax by 2025): starting at about $50 per tonne, and ramping up to at least $150-a-tonne

IMRB proposed Carbon dues

- To collect about USD 5 billion over a ten-year period via contributions of USD 2 per tonne of fuel consumed by every ship. Co-sponsored by all the major international shipping associations
- IMO had initially considered a proposal for a mandatory levy of $100 per tonne carbon dioxide equivalent on heavy fuel oil. It will be further discussed in intersessional working group.

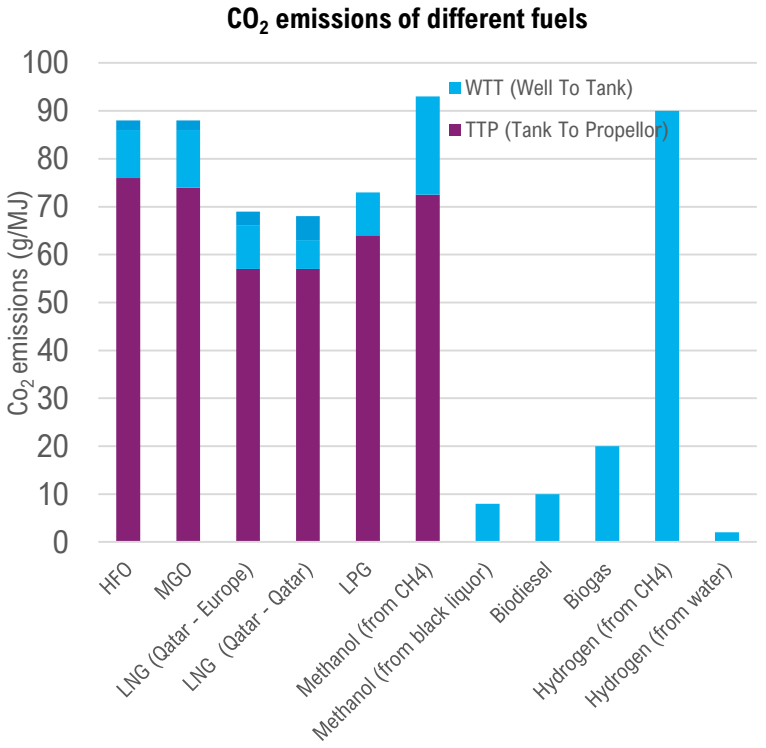
ETS (EU, Australia, China etc)

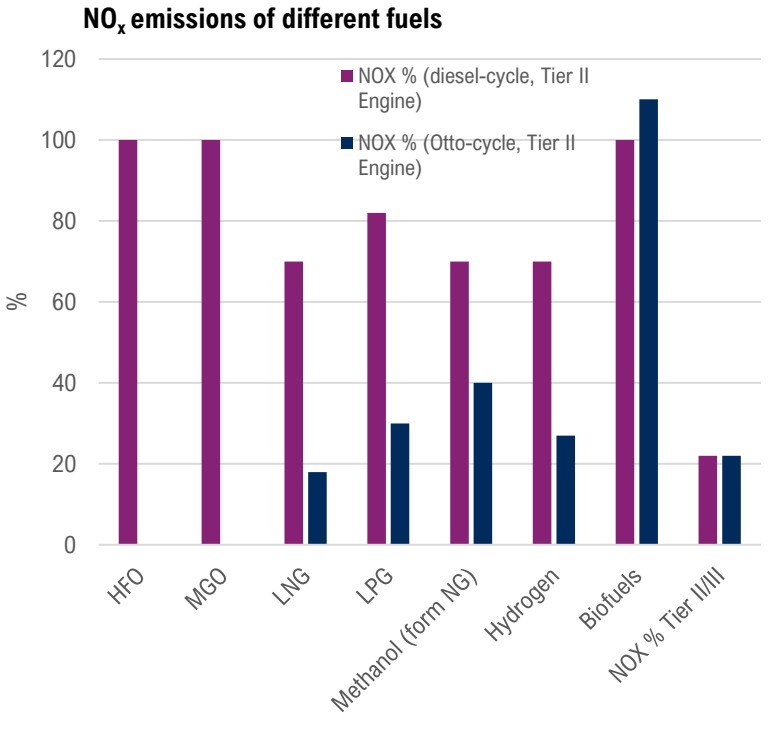
- The adoption of carbon pricing systems and associated revenues is growing worldwide.
- The expansion of carbon pricing in the coming decades presents an opportunity for substantial flows of carbon revenues to support investment in the developing world.

Note: ETS: Emission Trading Scheme

Emissions from different fuels

The main way to reduce NOx and CO_2 emissions is by changing from conventional fuels to alternative fuels. Some alternative fuels generate significant reductions in emissions, depending on the production technology and engine type.





Source: Assessment of selected alternative fuels and technologies by DNV

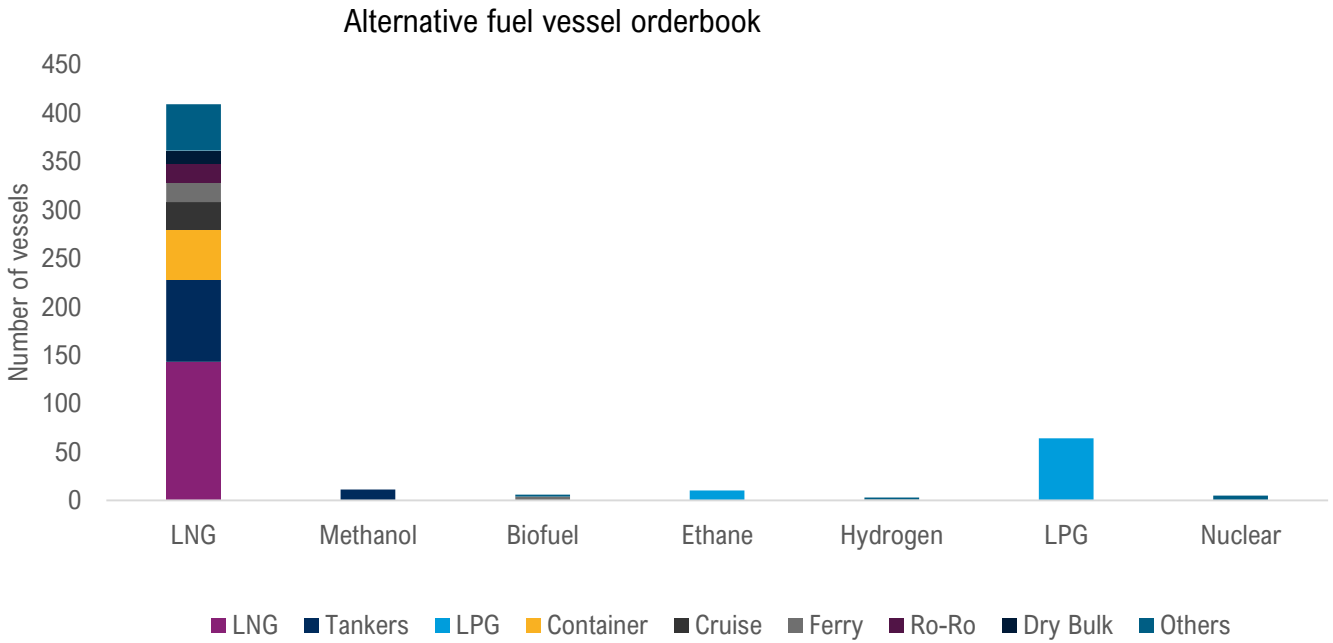
Key elements

Drivers for successful adoption of alternative fuel

- Plentiful zero carbon energy
- Marine engines and vessels design
- Fuel availability
- Bunkering infrastructure
- Shipowners motivation

Vessel orderbook

The absence of viable alternatives has left shipowners to concentrate on LNG, despite disagreements about its effectiveness in reducing GHG emissions



Summary

- Decarbonisation of container shipping and the wider industry will happen
- Regulatory demands will increase
- Customer pressure will increase
- Emissions reductions can be achieved by efficiency and operational measures, but these are not enough; new fuels are essential
- A complex ecosystem needs to be created to allow the deployment of alternative fuels
- Technology is not yet fully developed; this is a time of uncertainty for shipowners

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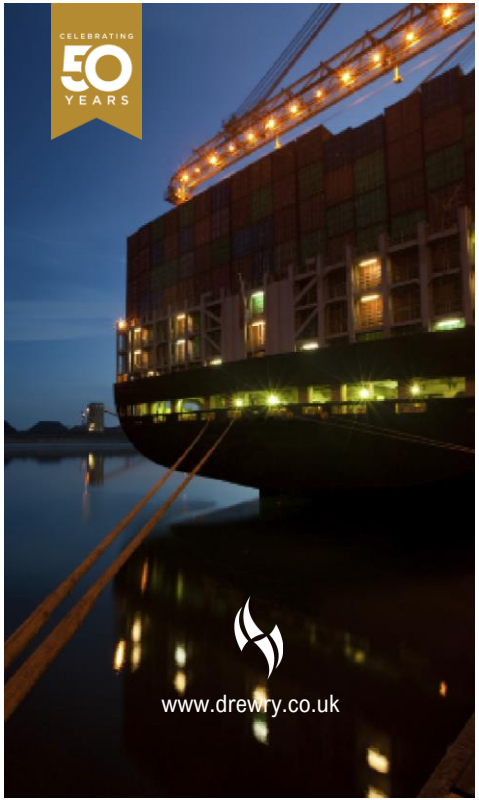
Drewry Supply Chain Advisors providing ocean freight procurement support to retailers and manufacturers;

Drewry Maritime Research publishing market-leading research on every key maritime sector; and

Drewry Maritime Financial Research delivering an Investment Research Service on listed companies operating in the industry.



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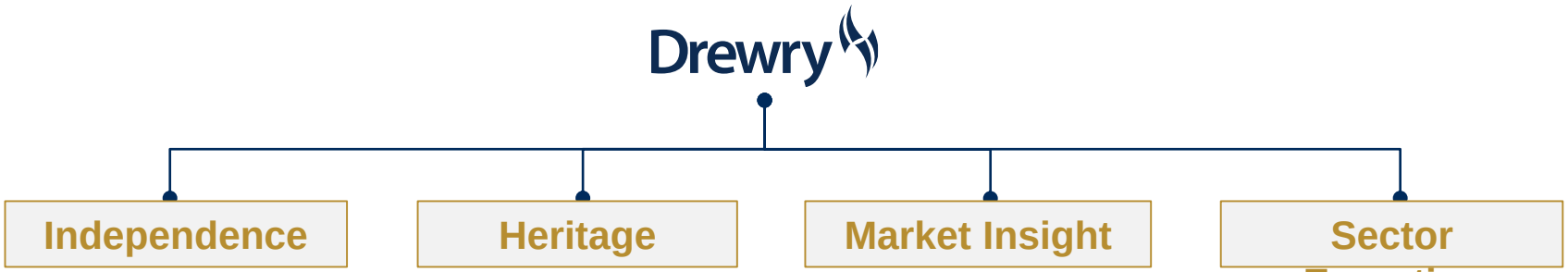

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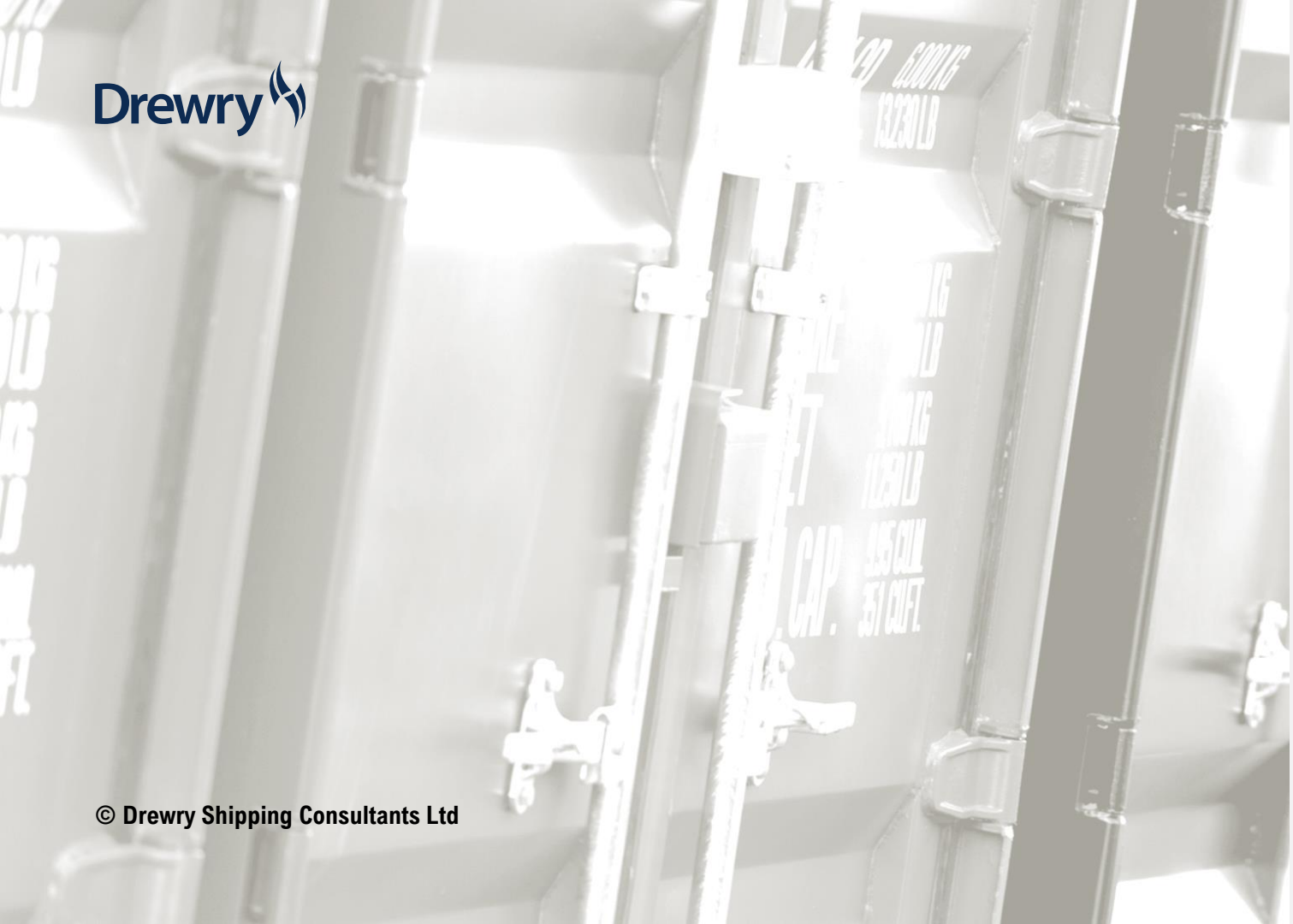

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