



Biowave
FUELS FOR LOW CARBON SHIPPING

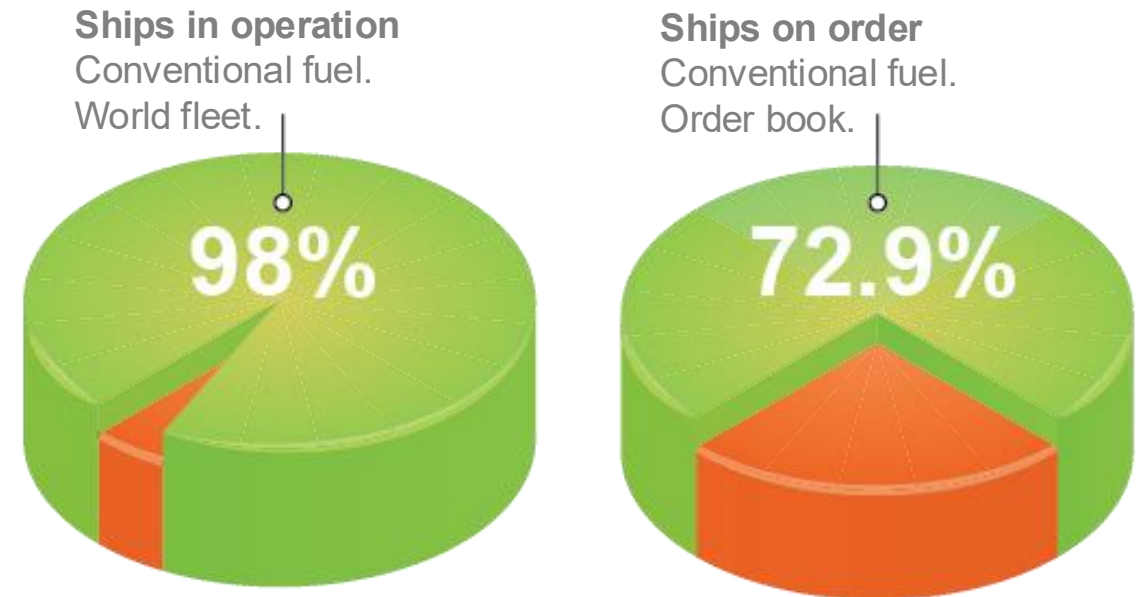


Paul Bennett

The world is demanding low-carbon solutions and maritime shipping is next.

- Global shipping emissions rival aviation – 3% and rising.
- Zero-carbon shipping by 2050.
- Maritime sector critical to long-term economic security.
- Limited decarbonisation solutions to meet fuel demand.
- Fuel decisions made today shape emissions for decades.

Alternative fuel uptake in the world fleet by number of ships (as at July 2024)



Source: DNV Maritime Forecast to 2050 – Energy Transition Outlook 2024

Unlocking maritime decarbonisation potential.

A cost-competitive, 'drop-in' marine biofuel that supports New Zealand's export sustainability, enables global shipping decarbonisation, and integrates with existing fuel infrastructure.



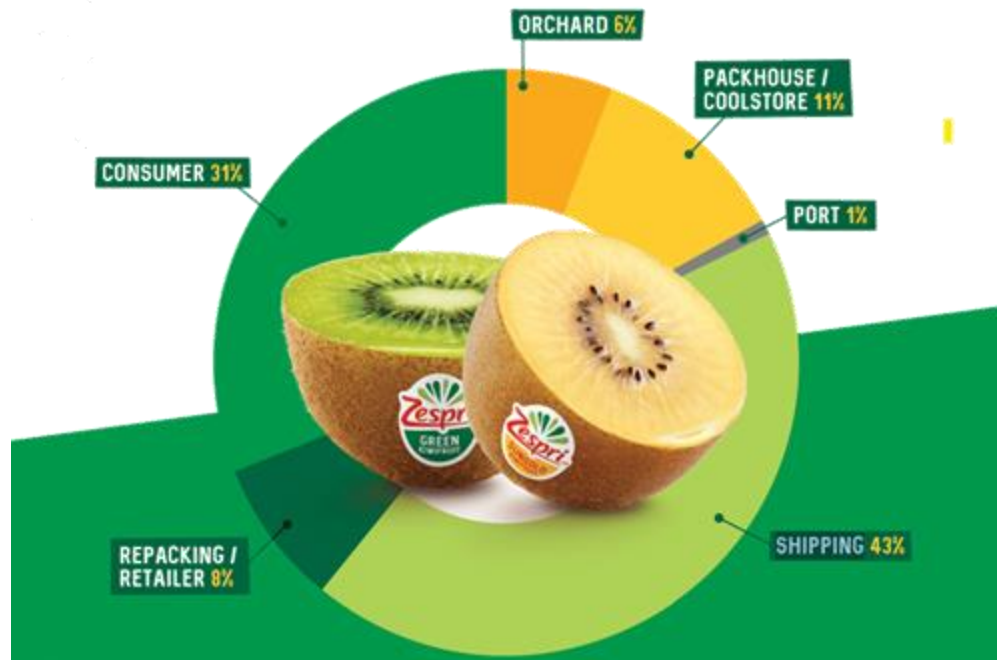
“The need to cut emissions is one of the most important challenges facing shipping right now.”

*Christian M. Ingerslev,
Maersk Tankers’
Chief Executive Officer*

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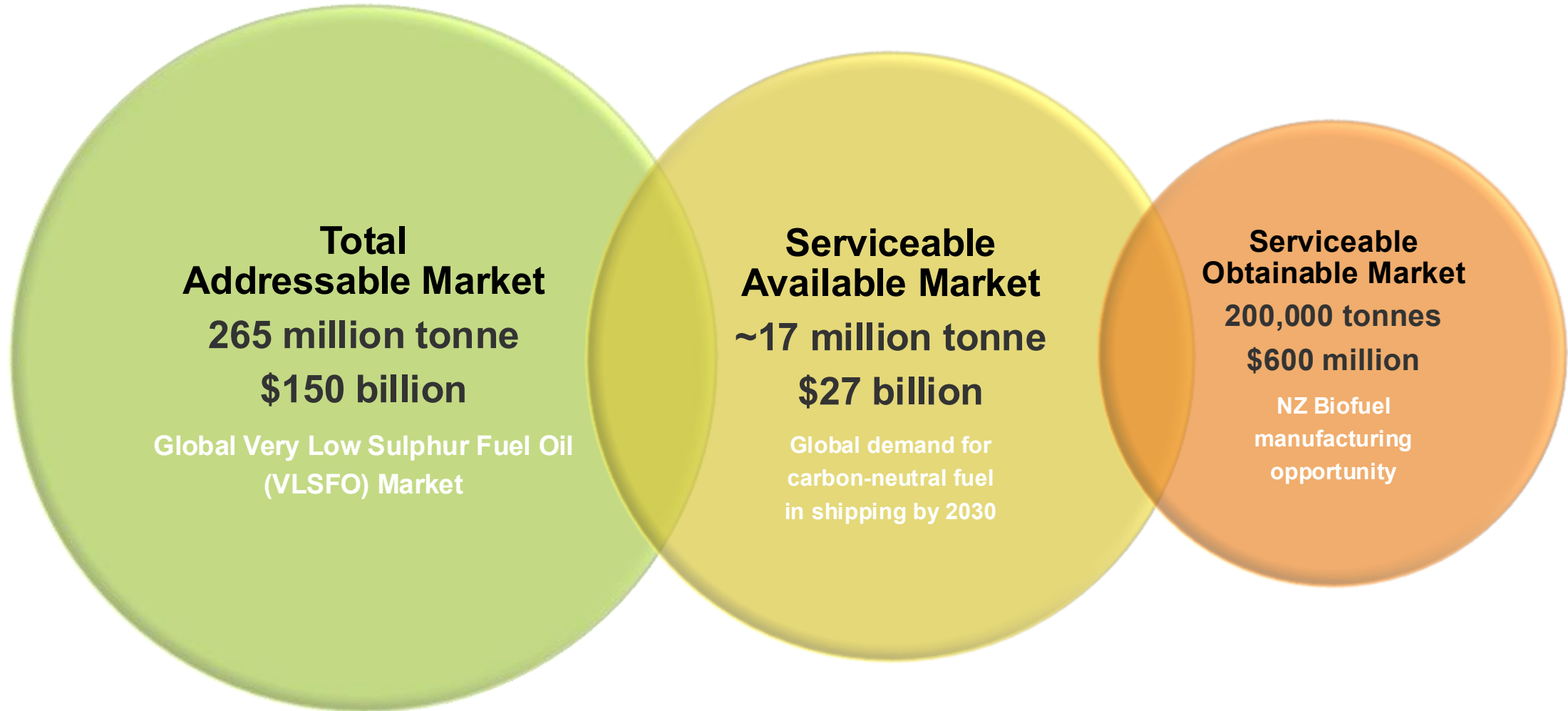
Carbon footprint of Zespri kiwifruit produced in New Zealand and consumed globally.



“Biofuel is an important step in the decarbonisation of international shipping, as it is a “drop in fuel” that can be used in conventional vessels, requires no engine modification and can reduce carbon emissions up to 20 percent (depending on the blend used)..”

Tim Mackle,
Zespri
Chief Supply Chain Officer

Massive market ready for adoption.



Global rules, local impact.

- Net-Zero mandates by 2050
- Low-carbon fuel uptake target 5% by 2030
- Carbon pricing imminent - US\$100–380/tonne CO₂
- Financial incentives for action

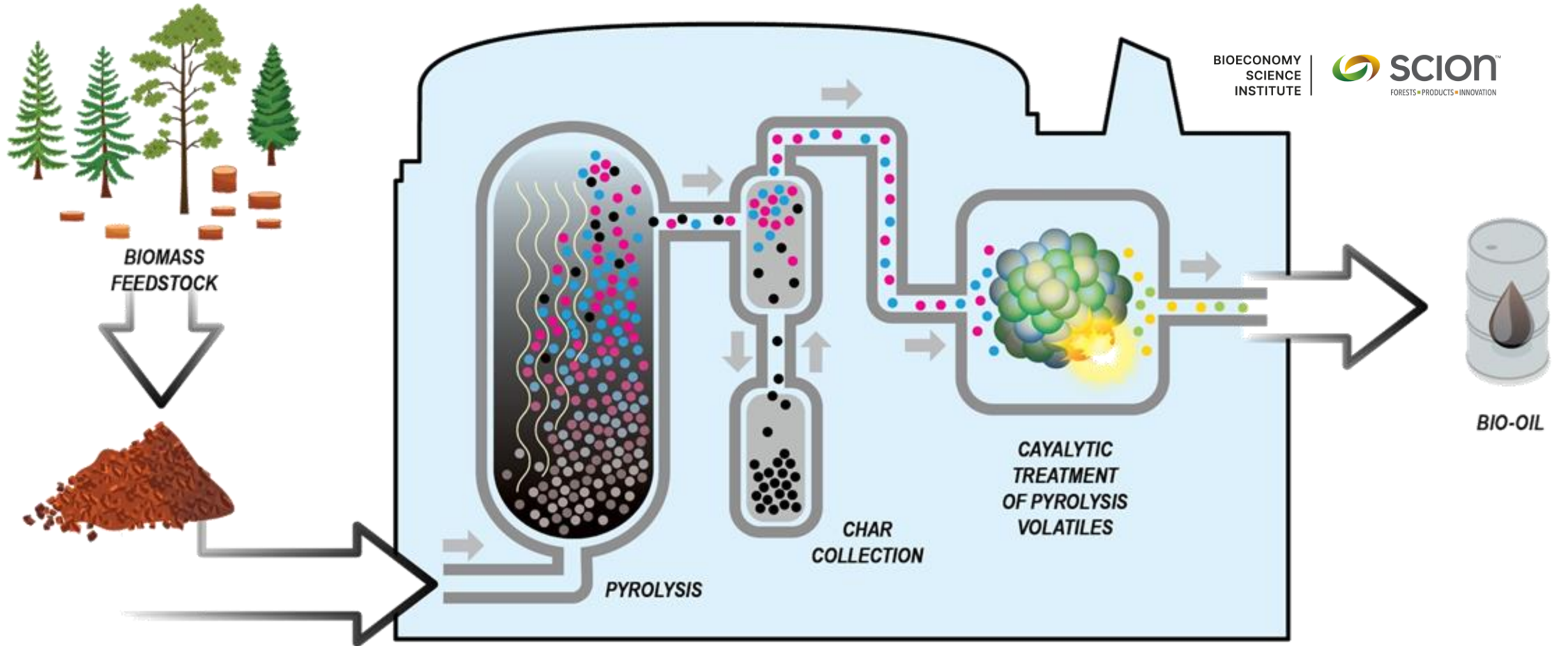


Immediate benefits, strategic fit, high impact

- Compatible 'drop-in' to meet near-term fuel needs.
- Enables net zero or offset potential.
- Aligned with global compliance targets.
- Cuts emissions without vessel upgrades.
- Local supply chain boosts resilience and growth



All-in-one catalytic fast pyrolysis process



BIOECONOMY
SCIENCE
INSTITUTE

 **SCION™**
FORESTS • PRODUCTS • INNOVATION

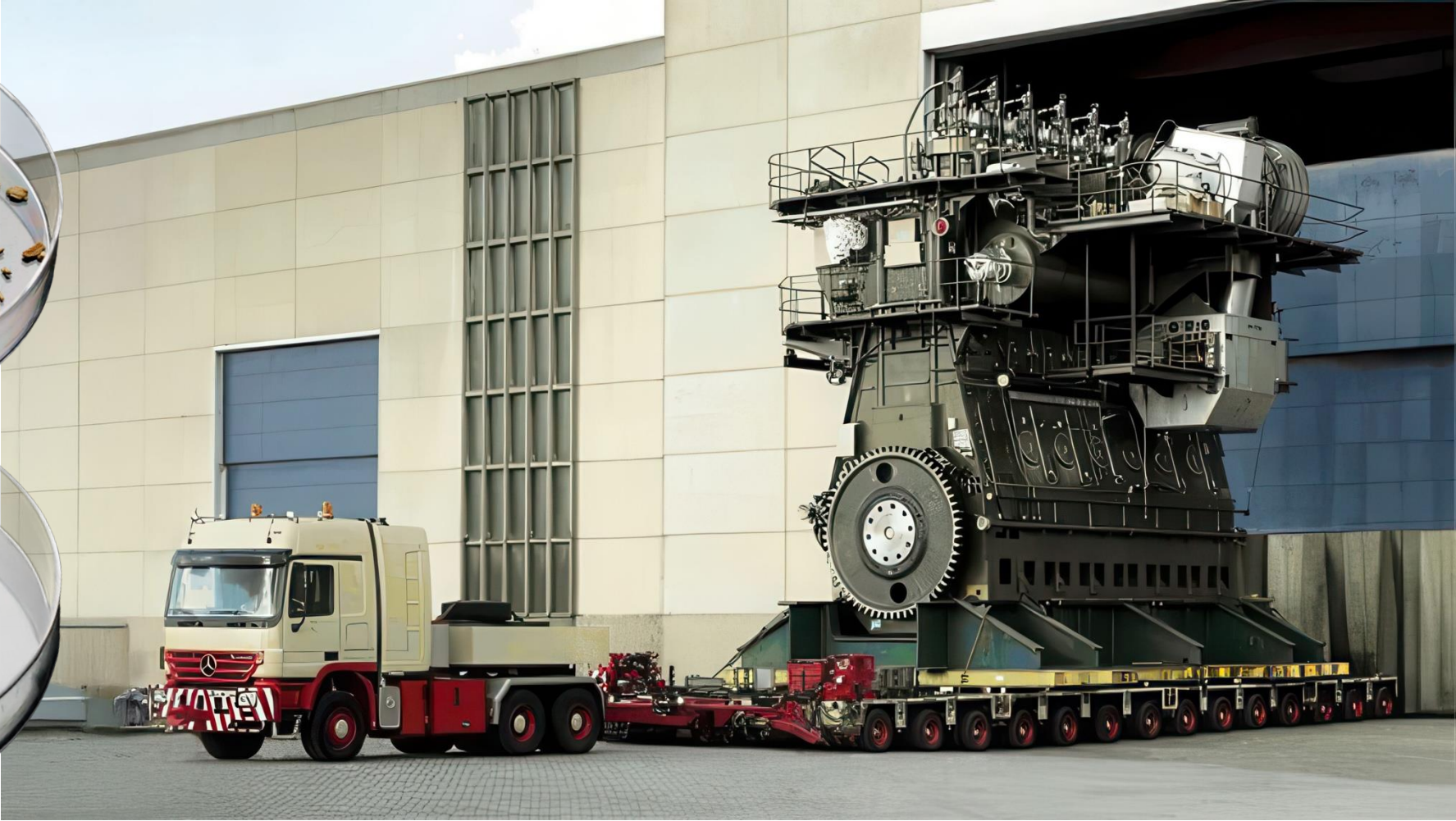
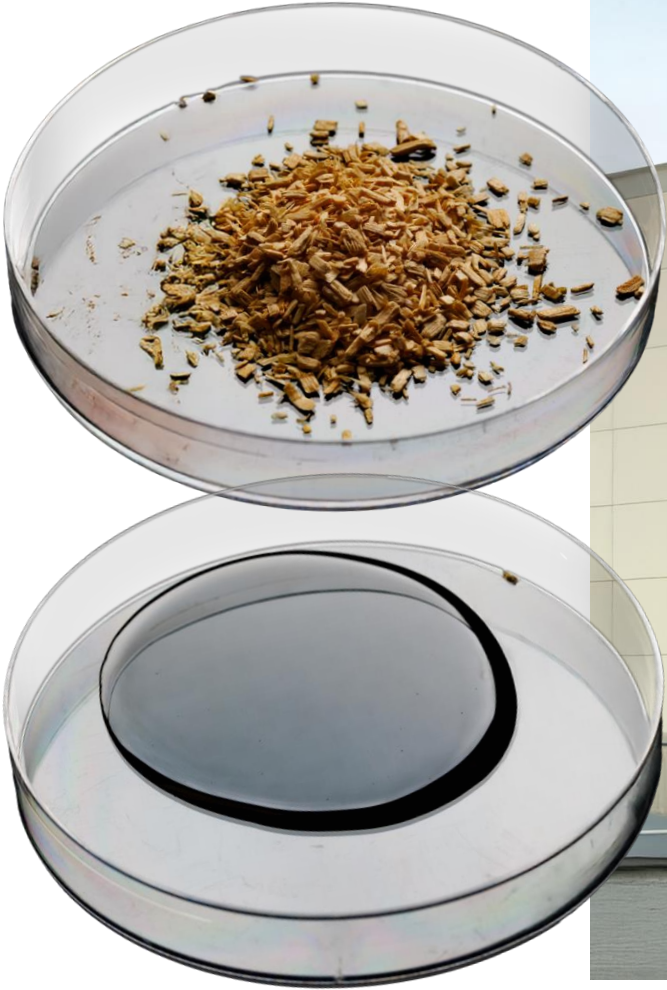
Product-Market Fit

Fuel Properties	Residual Marine Fuel Specification	20% Biowave Bio-oil + 80% Low Sulphur Fuel Oil (July 2024)	20% Biowave Bio-oil + 80% Low Sulphur Fuel Oil (February 2025)
Lower Energy Density (MJ/L) - dry basis	39-41 (FAME: 33)	38.8	40.0
Sulphur (wt.%)	0.5 Max	< 0.4	< 0.4
Acid Number (mg KOH/g)	2.5 Max	2.6 – 4.6	1.0 - 2.1
Water Content (v/v)	0.5 Max	1.2 – 1.6 *(0.6 -1.0)	0.3 - 0.5
Blend Compatibility - Total Sediment Potential (%)	<0.1	0 - 0.16	0.02
Flash Point (°C)	>60	Not measured	>60

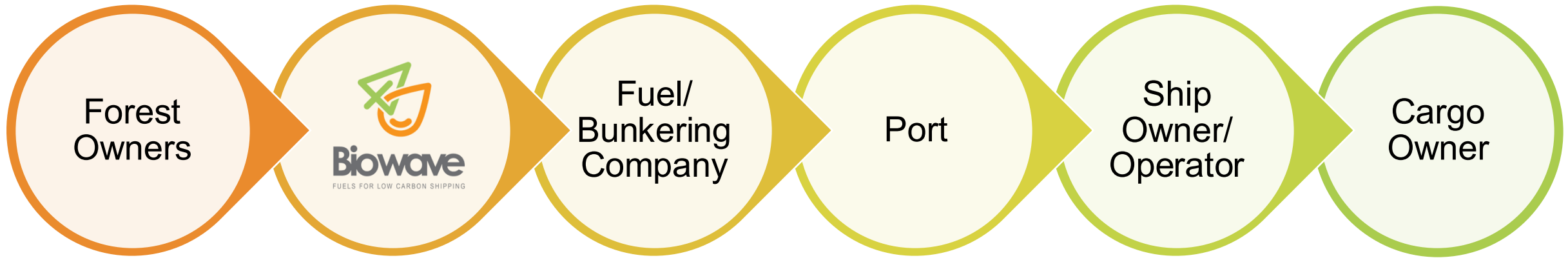
Additional Benefits

- Meets market need for near term **‘drop-in’ fuels.**
- Potential to achieve **net zero** or provide ability to offset (up to 35% negative emissions).
- Favourable compliance & risk management - unblended Biowave bio-oil flash point = > 70 °C – **low hazard flammable liquid.**
- Social responsibility – **non-food, renewable feedstock.**

The scale-up journey ahead.



Value Chain Engagement



 **Manulife**
Investment Management
Forest Management (NZ) Limited

 **KAINGAROA**
TIMBERLANDS

 **bp**

 **GoodFuels**
FincoEnergies

 **Lloyd's**
Register

 **Port of**
Tauranga

 **PORTS OF**
AUCKLAND
TĀMAKI HERENGA WAKA

 **CMA CGM**

 **ANL**

 **SWIRE SHIPPING**

New Zealand
Council of
Cargo Owners
The association for NZ's
largest shippers


 **Zespri**
KIWIFRUIT

 **Biowave**
FUELS FOR LOW CARBON SHIPPING

Go to Market Strategy

COMMERCIALISATION PATHWAY

2026



Scale-Up Pilot
15 Litres

2028



In Service Trial
360 tonnes

2032



First Plant
28,500 tonnes

2034



Global
Licensing



Biowave
FUELS FOR LOW CARBON SHIPPING

Driving impact across Aotearoa and the world.

Serviceable Obtainable Market
200,000 tonnes
\$600 million





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