

# ZEM

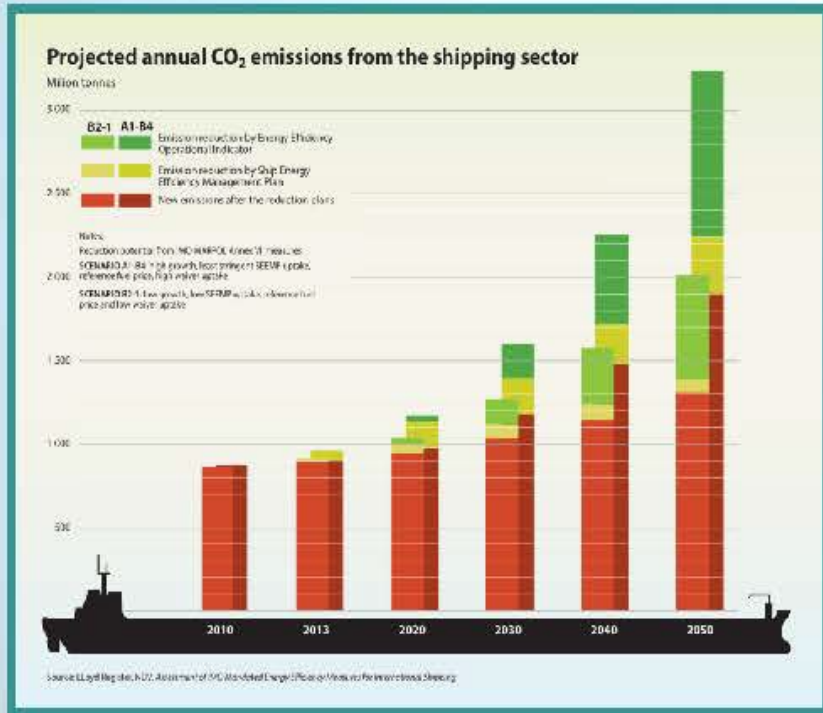
zero | emissions | marine

## ALL ENERGY 2023

ZEM Fuel Systems Limited

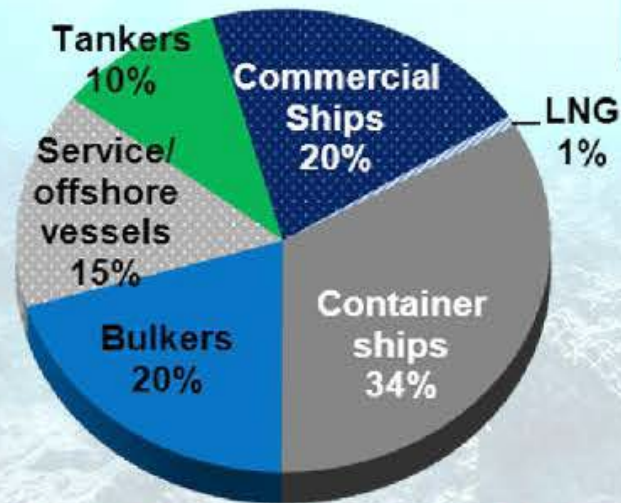
Fraser D Pritchard, CEO

# Background



## Responsible for

- 3% of carbon emissions and
- SO<sub>x</sub> and NO<sub>x</sub> air pollution



Total Market Volume: 50,000

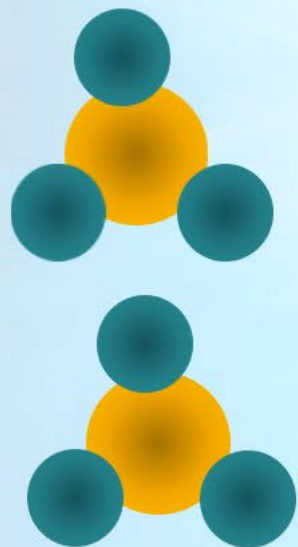
Total Market Value: >£30bn



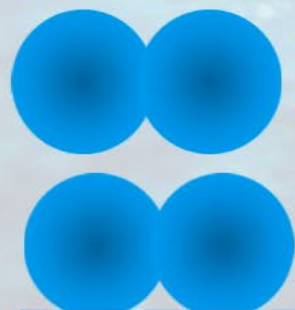
A new way fuelling the marine industry

Hydrogen is an ideal low carbon carrier, but its effective energy density is too low for marine applications

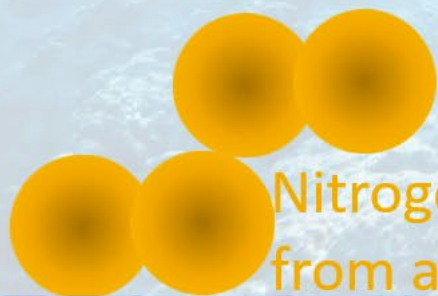
Ammonia is a perfect carrier



Ammonia



Oxygen  
from air



Nitrogen  
from air





# Target Markets

## Auxiliary Power Applications

### Early Demonstrations:

- Maritime auxiliary power unit on board
- Lighting, heating, and instrumentation



## Stationary Power Generation Applications

### Early Demonstrations:

- Cold ironing-portside battery charging applications



## Mobility Applications

### Short-term local opportunities:

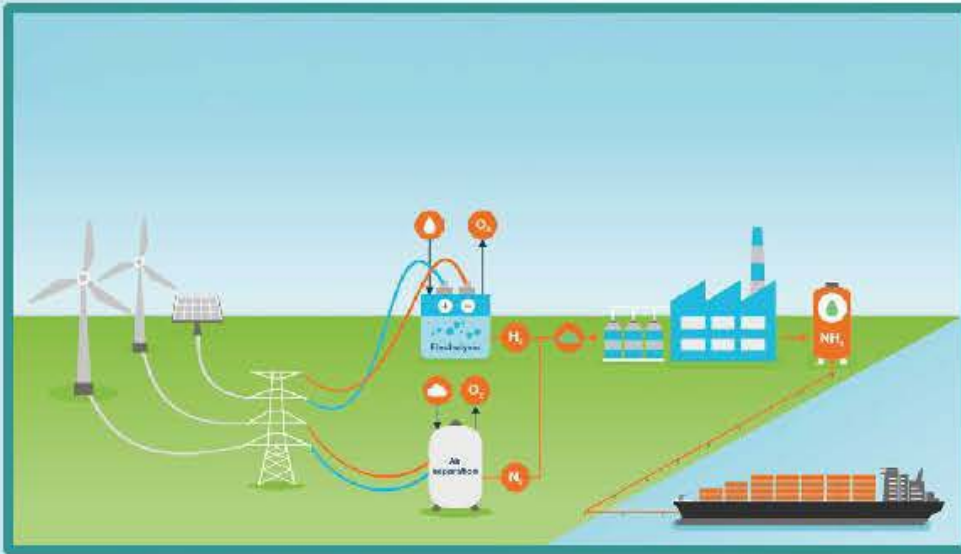
- Diving boats
- Fishing boats

### Long-term opportunities shipping





# Vision



Zero Emission Marine environment



Extended fleet life



Future fuels

Reduce emissions

Re-use

Zero carbon fuels



2022

Catalysis



2025

Direct Ammonia  
fuel cell



2030

Fuel Cell Ships

ZEM Technology roadmap

# THANK YOU

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