VESSEL ENERGY MANAGEMENT SYSTEMS

EUROPORT 2025

6th November 2025 | Rotterdam Ahoy

Alewijnse Netherlands B.V.

What's Happening

Alewijnse

What's Next?

Alewijnse

What's happening lately?

Alewijnse

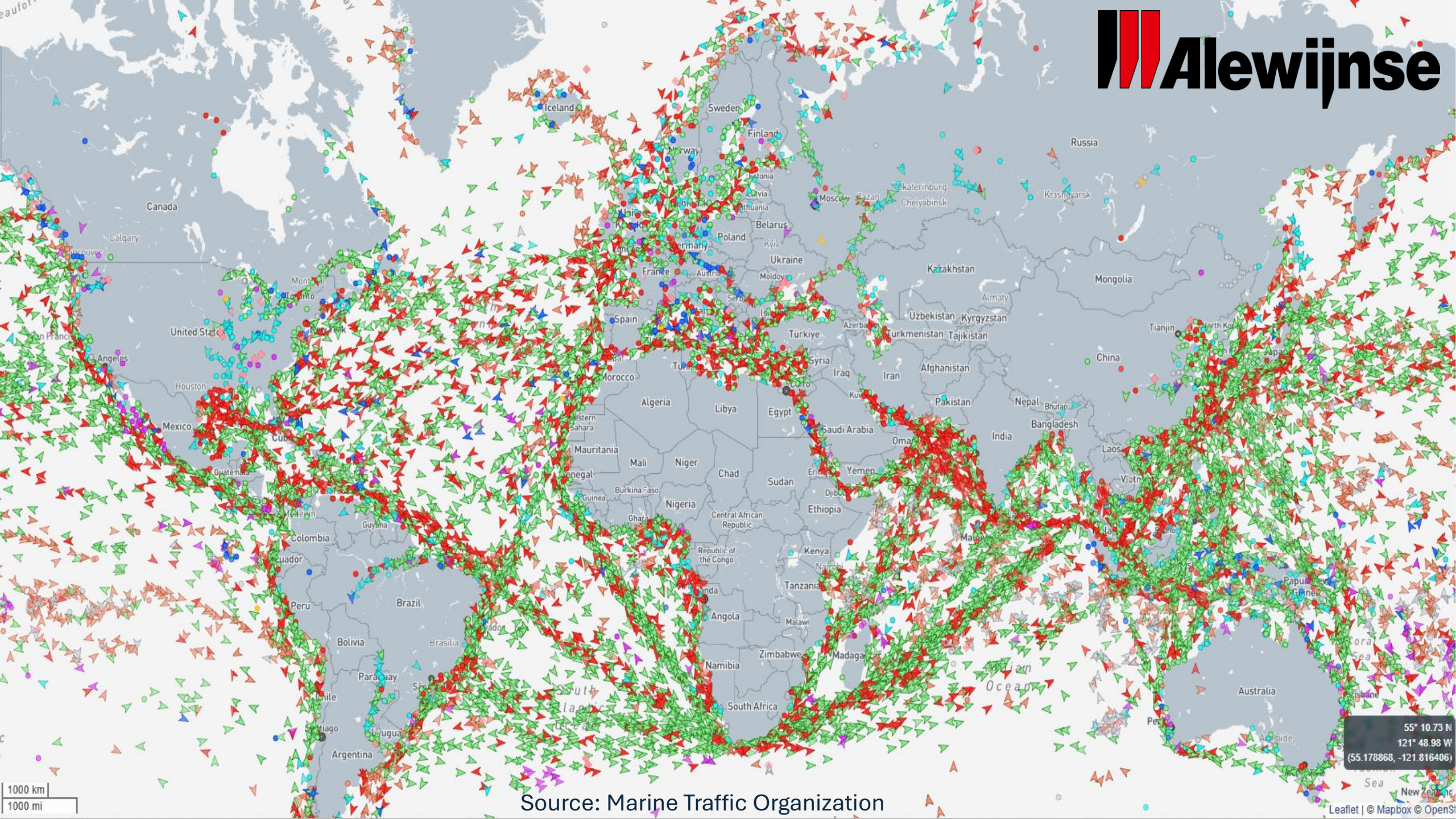
SUSTAINABLE DEVELOPMENT GOALS

IMO

EMSA

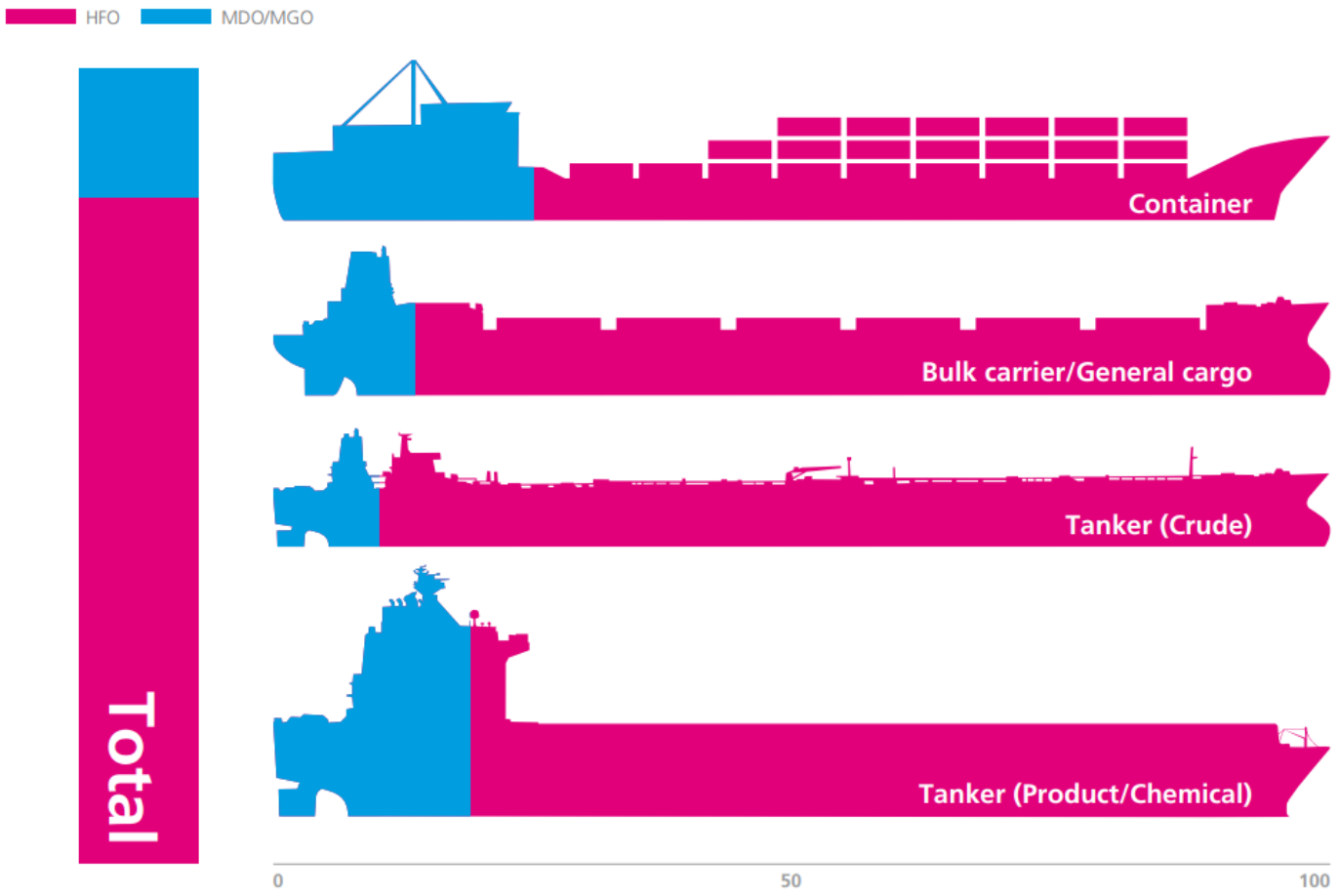
European Maritime Safety Agency

Inspectie Leefomgeving en Transport
Ministerie van Infrastructuur en Waterstaat



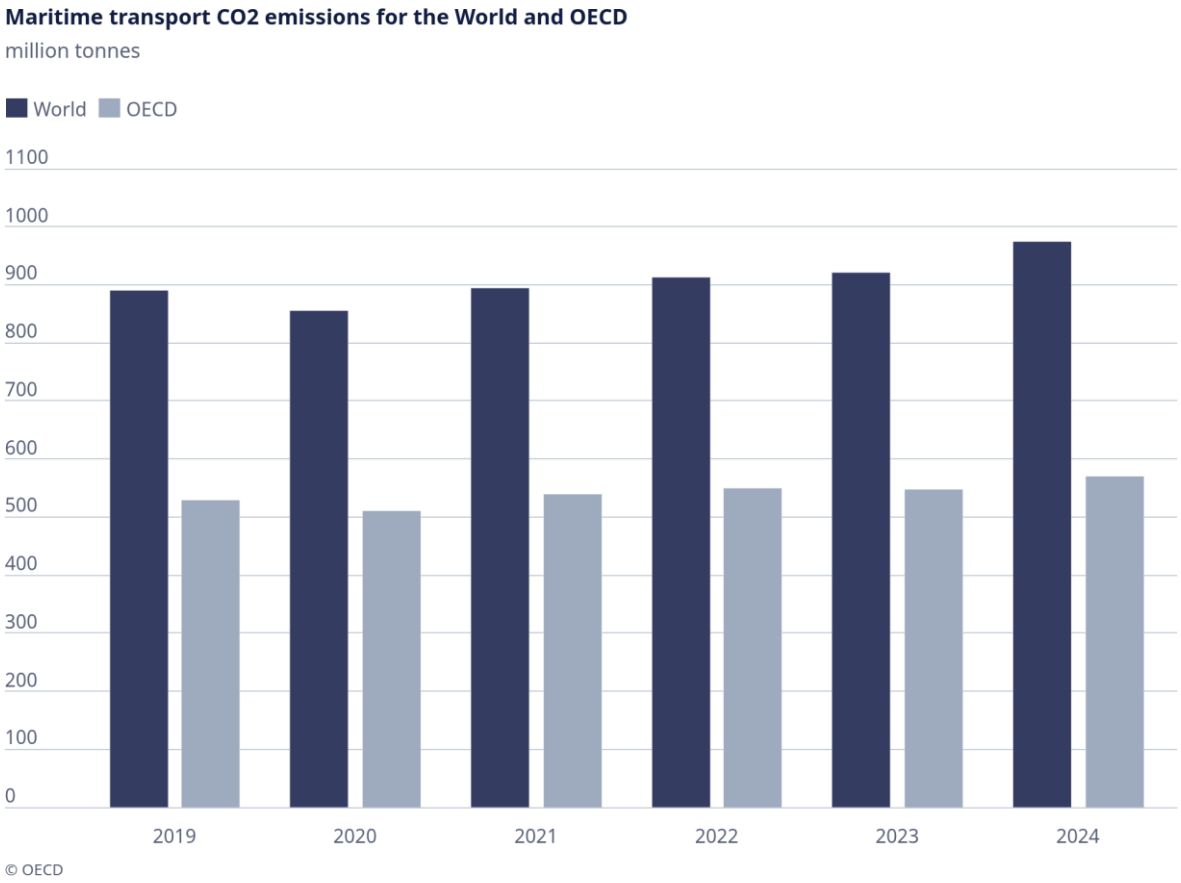
Source: Marine Traffic Organization

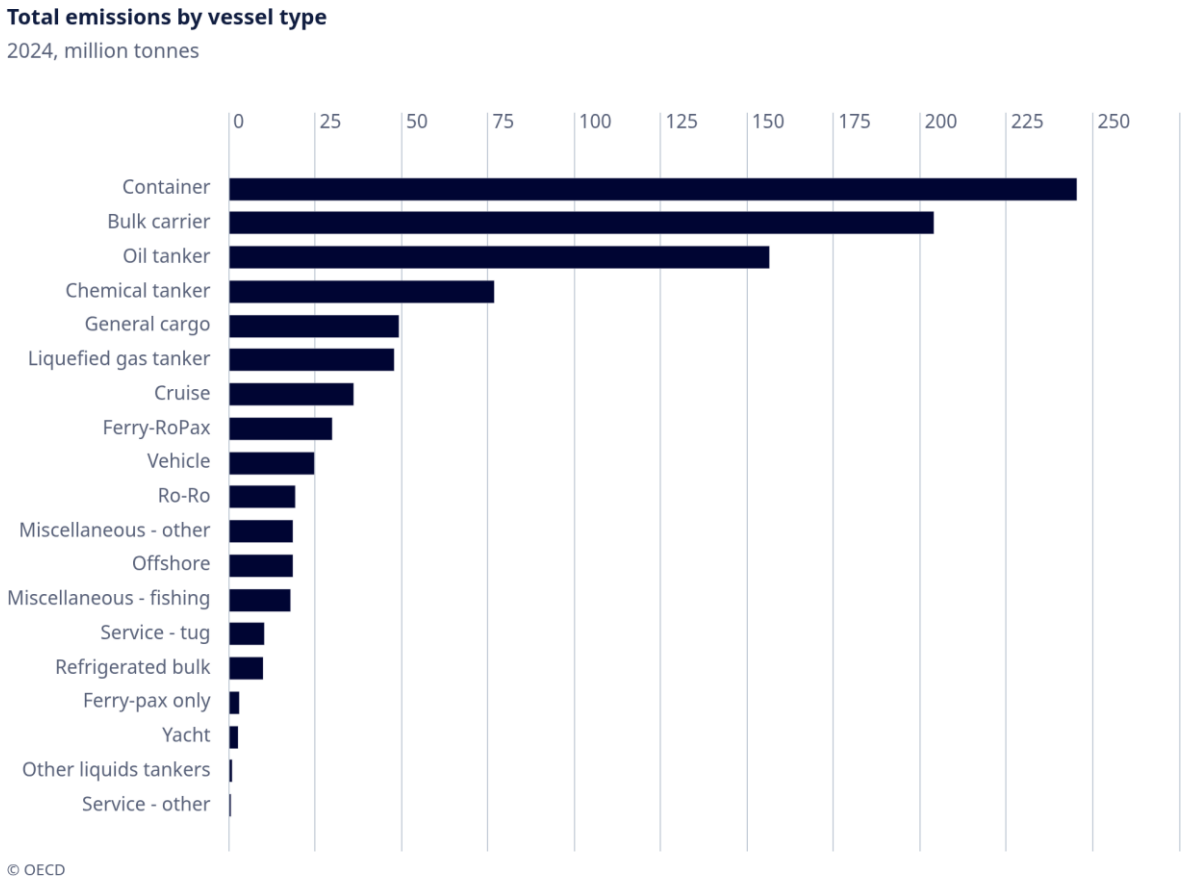
Maritime Fuel Mix 2010



Source: Smith, T. W. P., Raucci, C., Sabio, N., & Argyros, D. (2014). *Global marine fuel trends 2030*. Lloyd's Register Marine / UCL Energy Institute

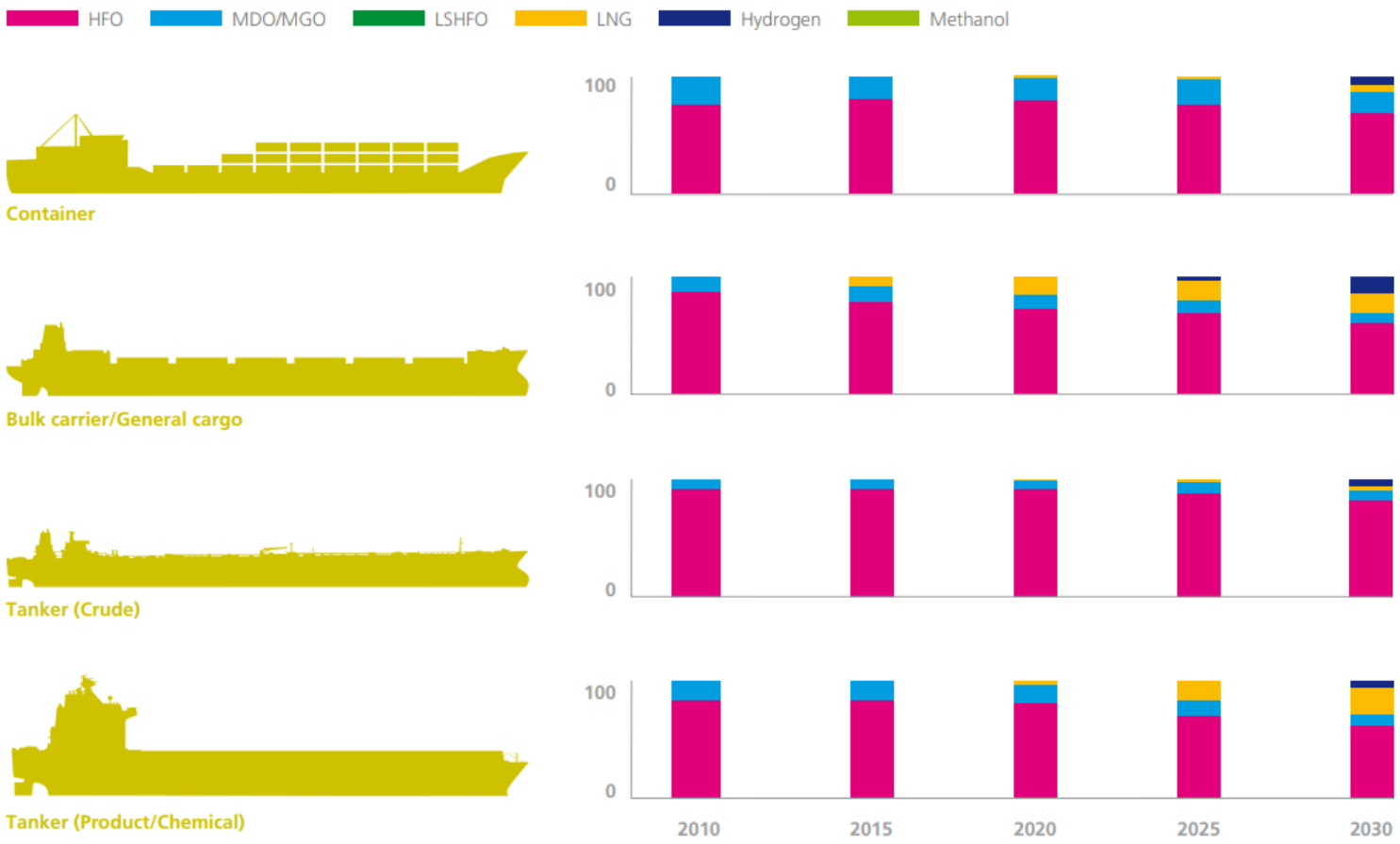
Maritime CO_2 Emissions





Source: OECD (2025) (Maritime Transport CO2 emissions (experimental)) OECD Data Explorer. Updated 7th October 2025.

Maritime Fuel Trends



Source: Smith, T. W. P., Raucci, C., Sabio, N., & Argyros, D. (2014). *Global marine fuel trends 2030*. Lloyd's Register Marine / UCL Energy Institute

Why can’t we go fully green right away?

- Size of Vessel
- Power and Energy Requirements
- Vessel Operational Requirements
- Technological Limitations
- Lifetime Concerns
- Investment Costs

Solution? Hybrid Power Vessels!

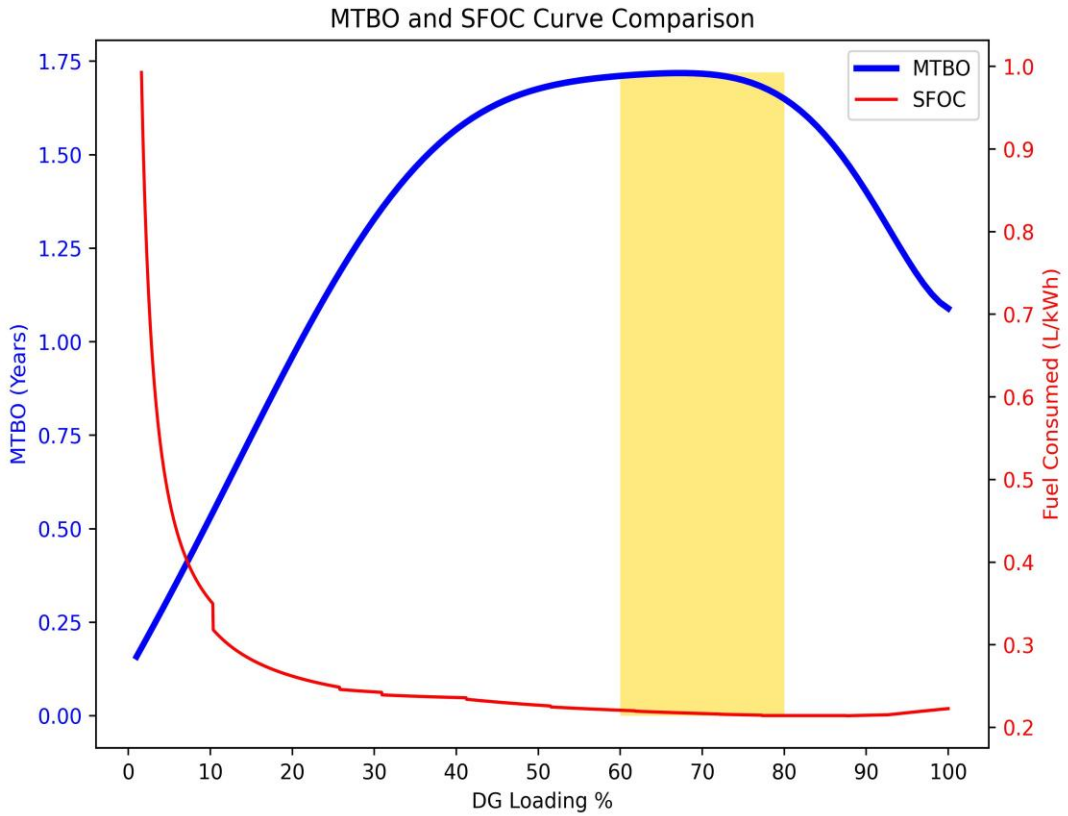
- Battery Hybrid
- Fuel Cell Hybrid
- Biofuel Hybrid
- Combination of Different Fuels

Challenges

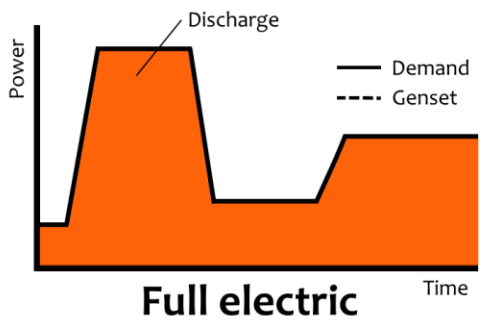
- Different Operational Capabilities
- Different Fuel Consumption Rates
- Different Gravimetric and Volumetric Densities of the Fuel and Storage System
- Limited availability of certain fuels in different parts of the world
- Investment costs
- Improper use leads to expensive maintenance and overhaul costs
- Different Operations by Different Vessels

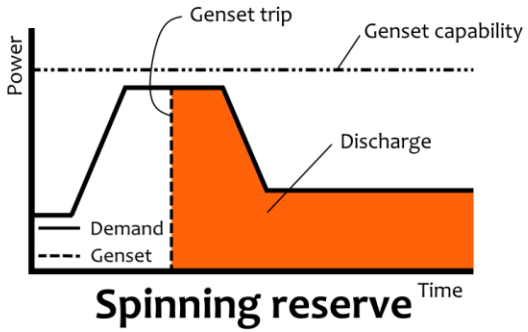
No Two Vessels are the Same

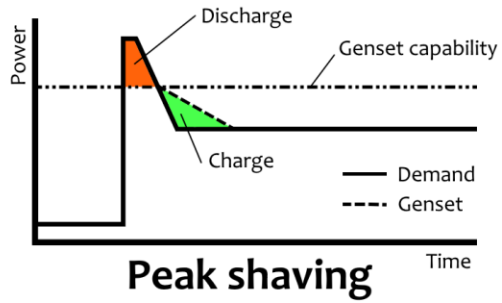
Diesel Generators Constraints

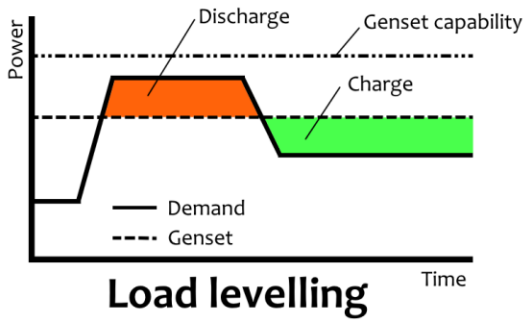


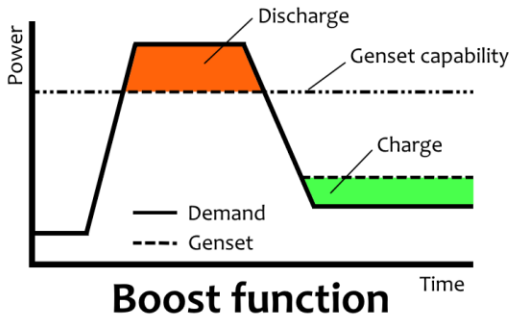
Energy Storage Applications on a Vessel

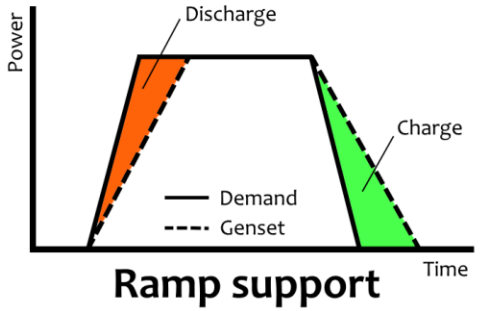


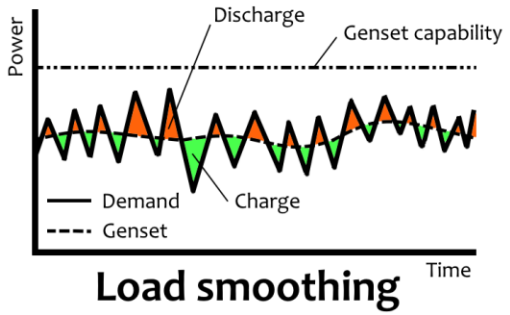




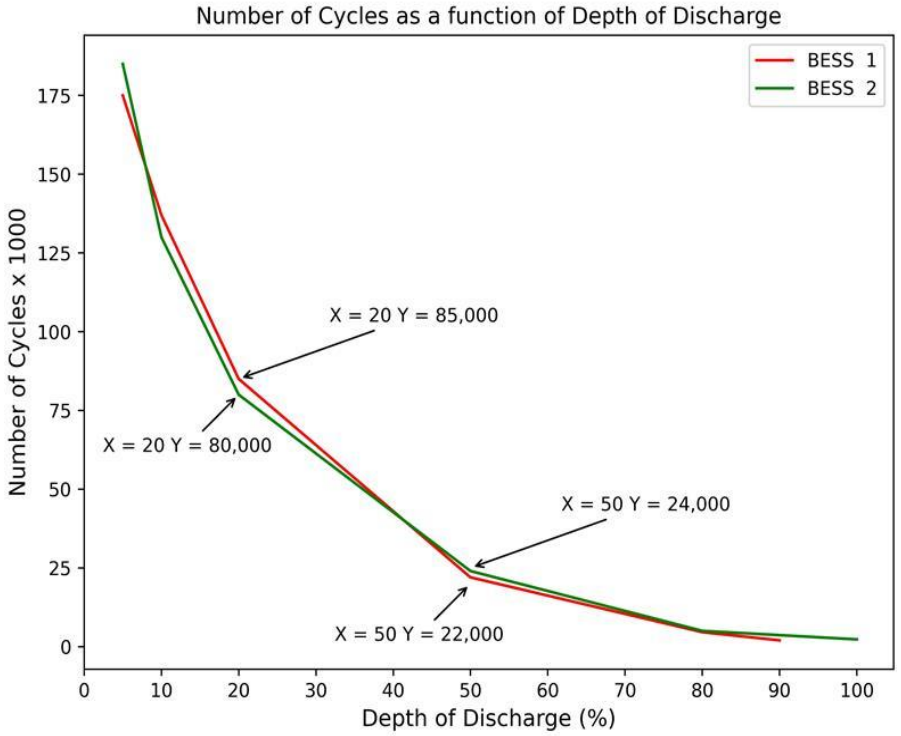








Battery Energy Storage System Constraints



- BESS is an additional load during recharge
- BESS has Calendric Ageing
- C-rate restriction
- Depth of Discharge should be limited to extend longevity

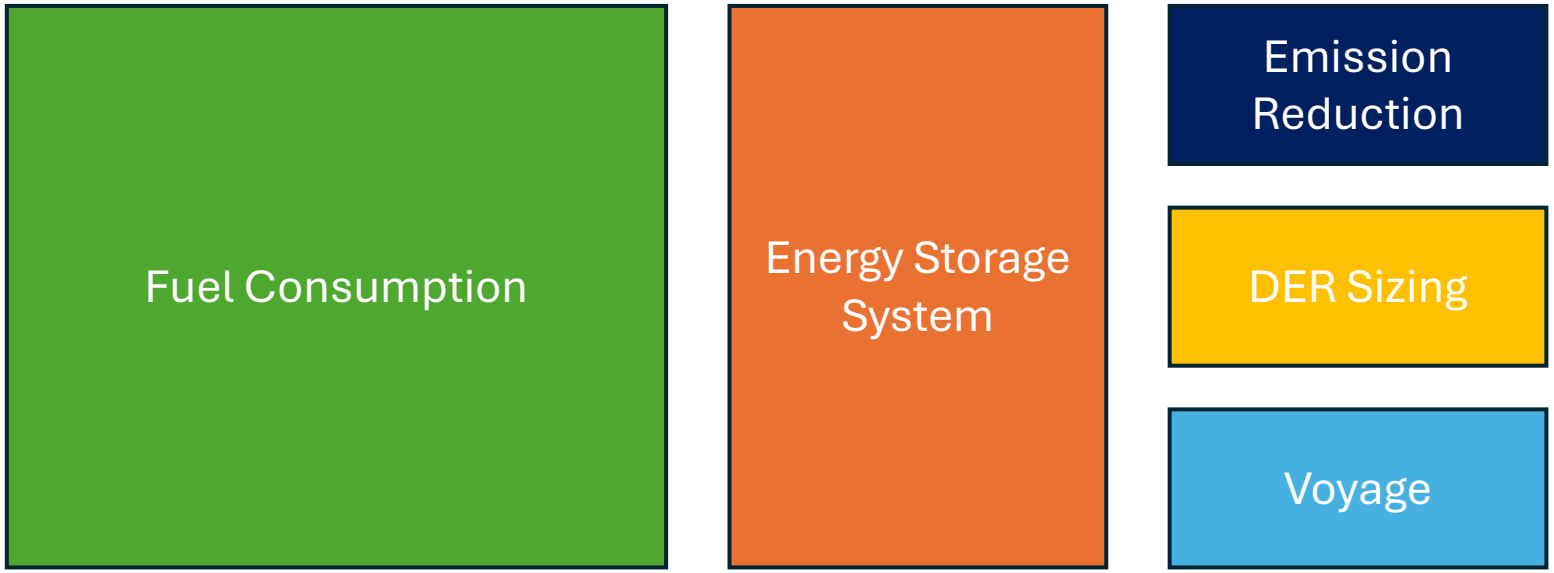
What should the EMS do?

- Optimize the Generator Fuel Consumption and Load Factor
- Optimize BESS usage and maintain its integrity
- Optimize the usage of the PTO in propulsion systems
- Optimize the power system efficiency and reliability

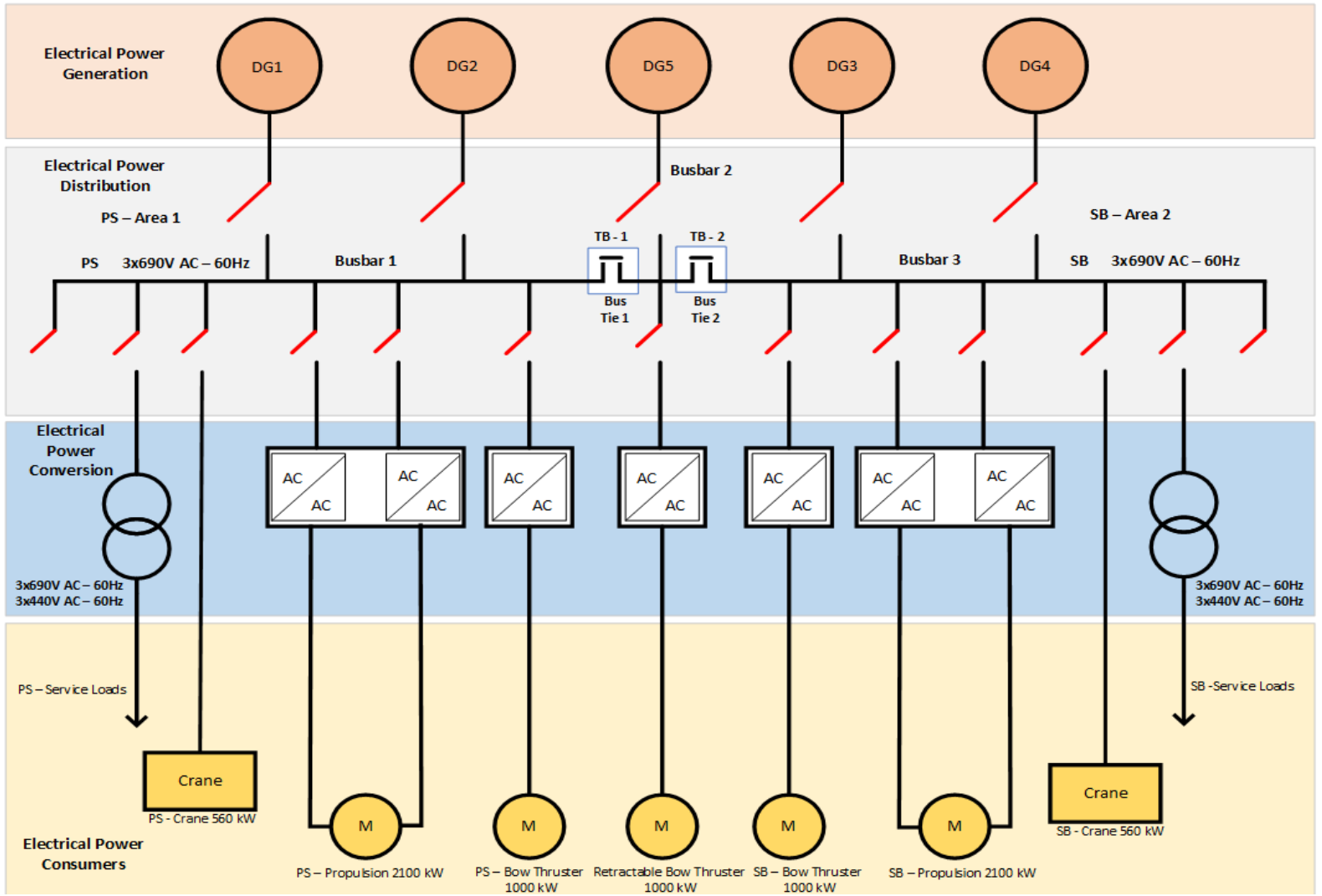
Benefits of EMS

- Helps the vessel reduce fuel consumption, greenhouse gas emissions and stay within the guidelines/ limitations set by the IMO and EU ETS.
- Helps the vessel reduce its downtime.
- Ensures the vessel operates at a high level of energy efficiency.
- Maintains integrity of the DERs from an operational perspective.
- Helps achieve payback times for Capital Invested into DERs.

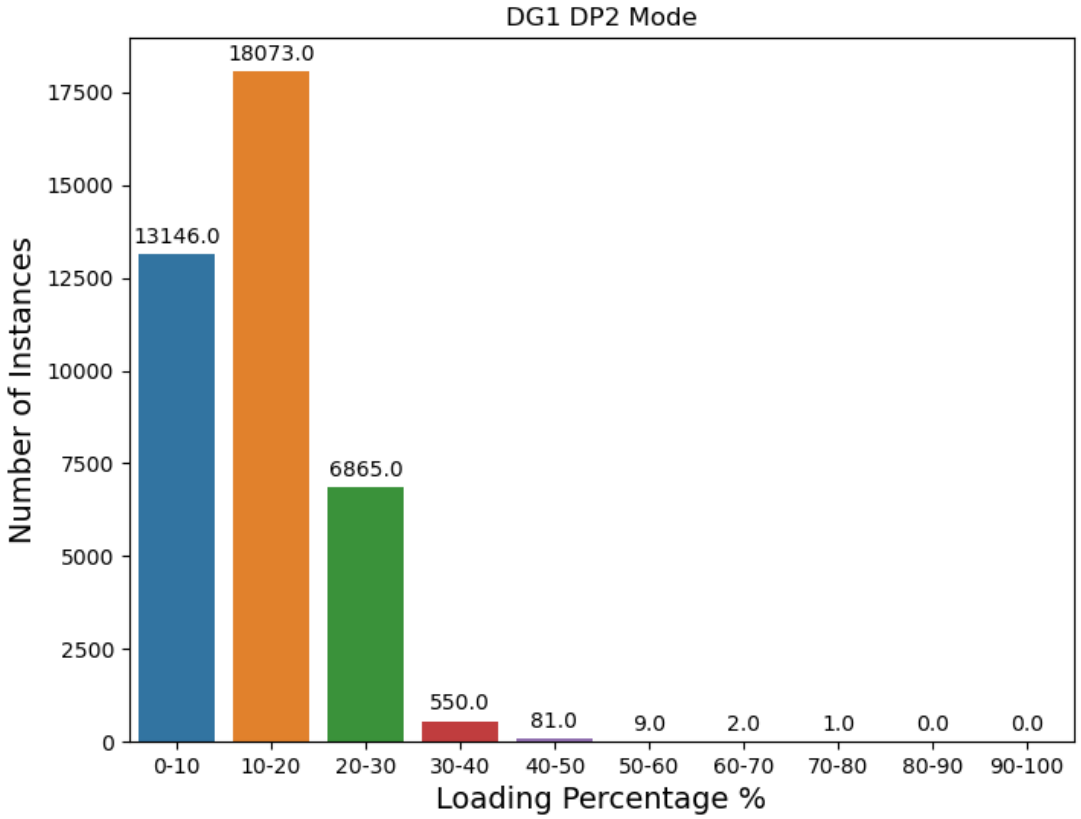
What are current studies optimizing?

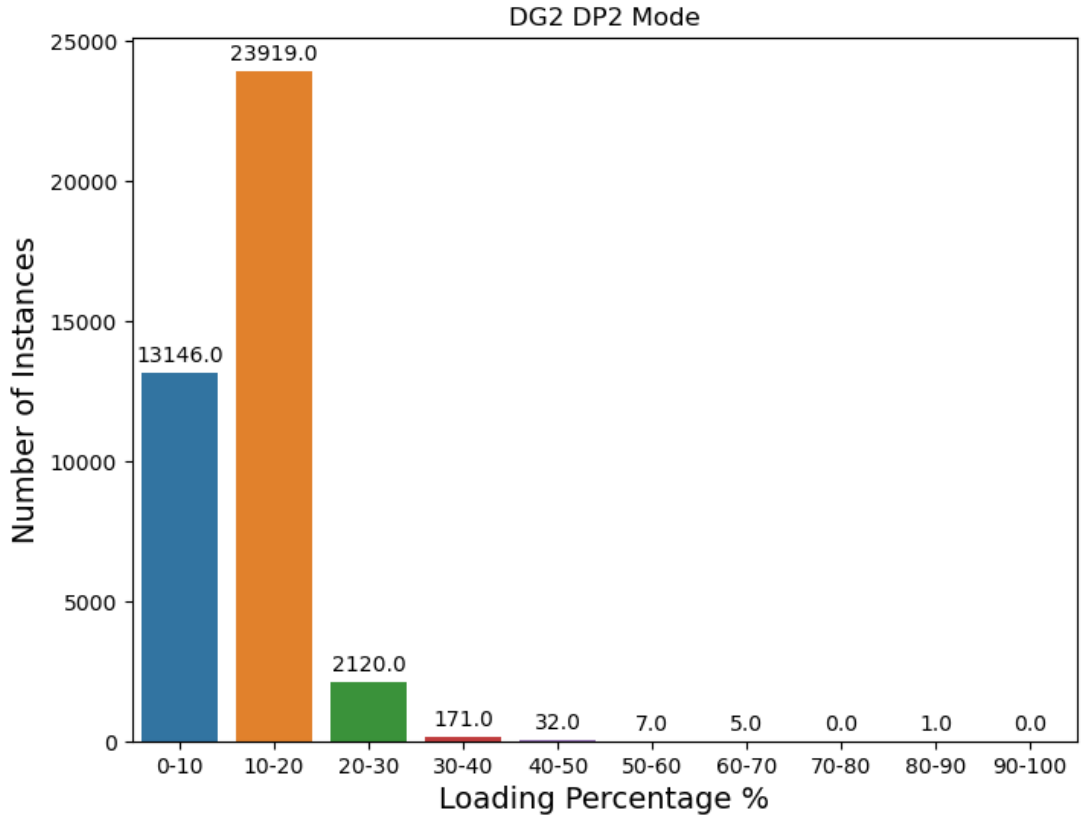


What is Alewijnse doing?

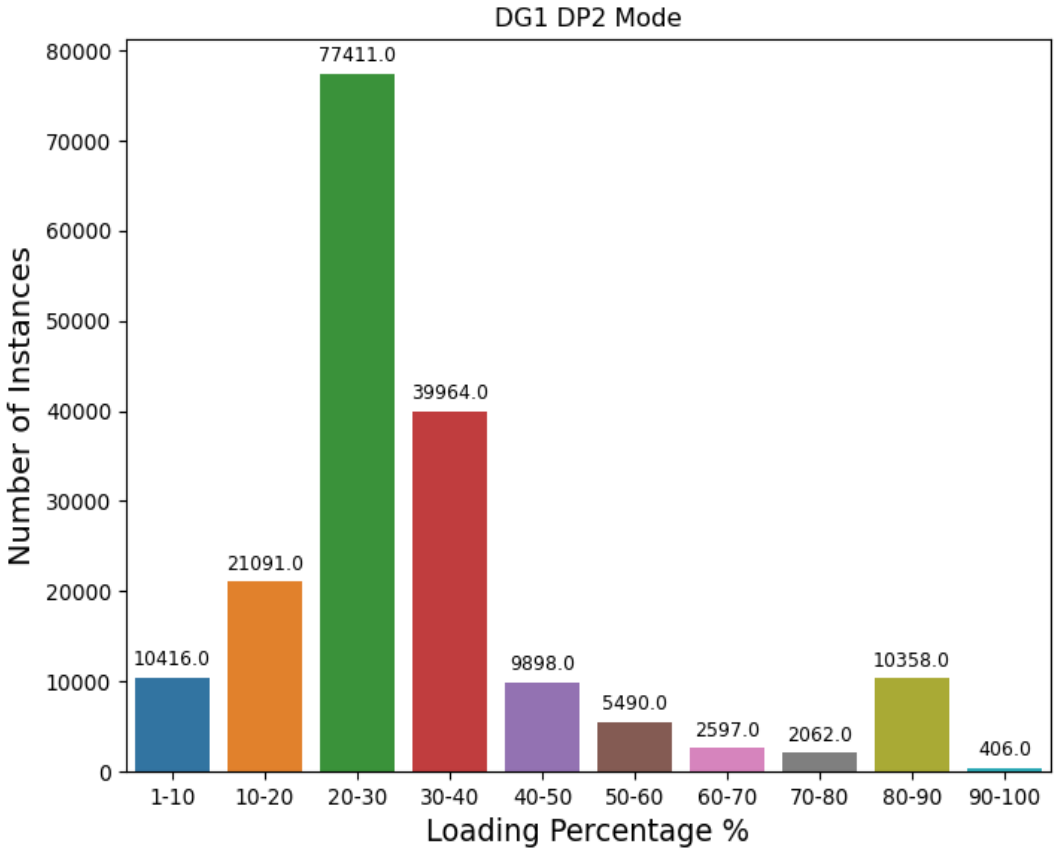


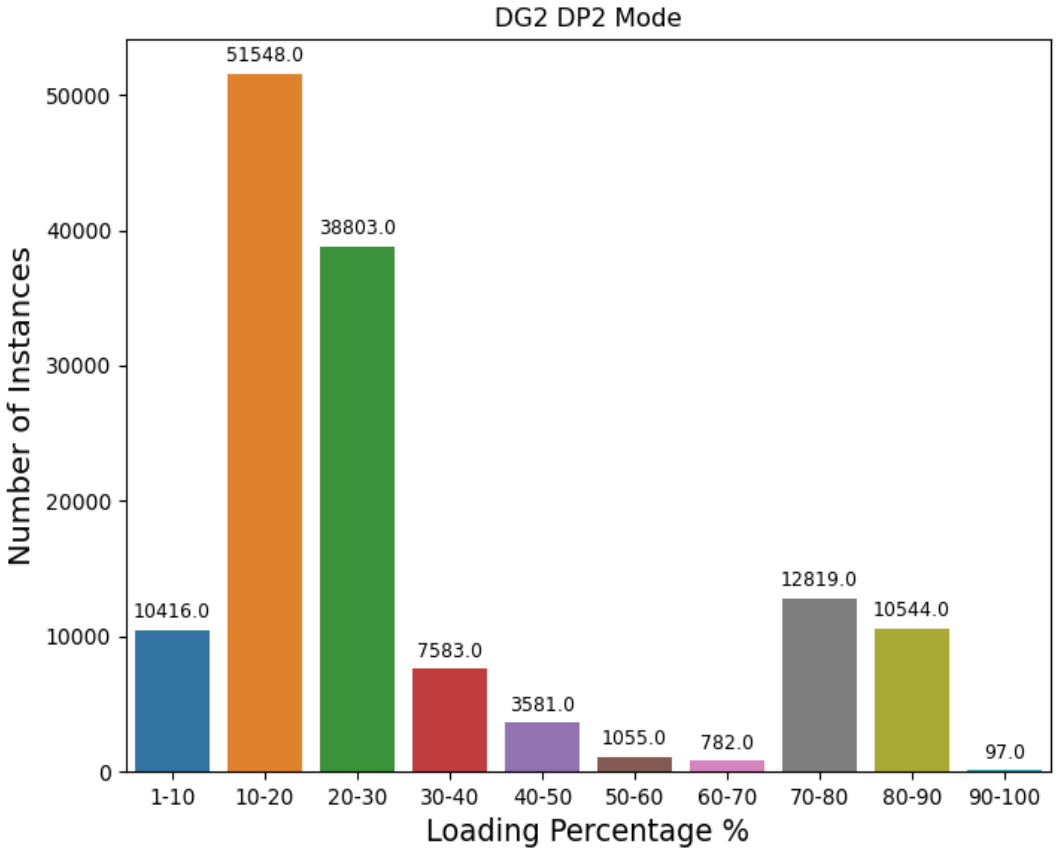
Data Analysis Results on the Taiwan Strait





Data Analysis Results on the North Sea





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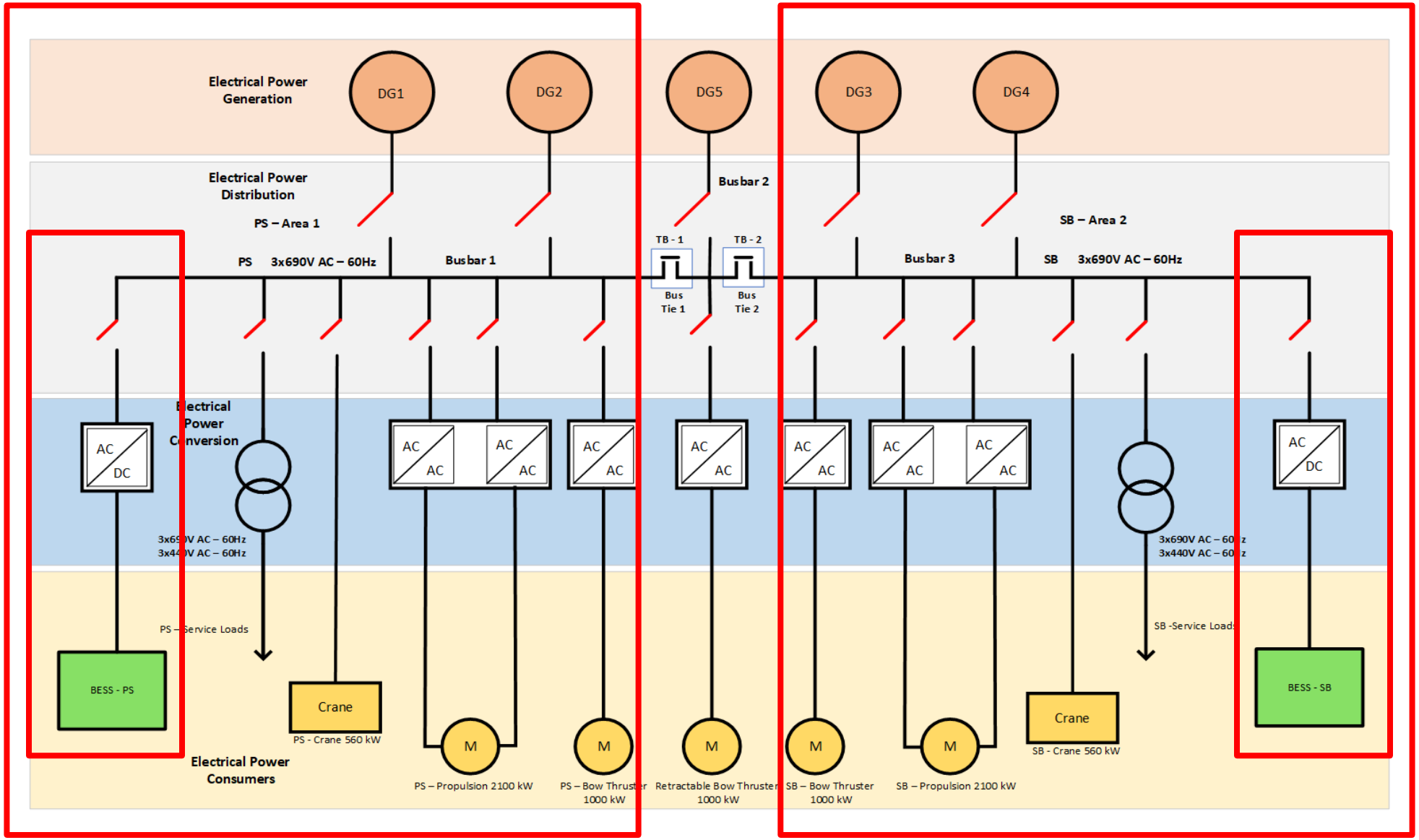

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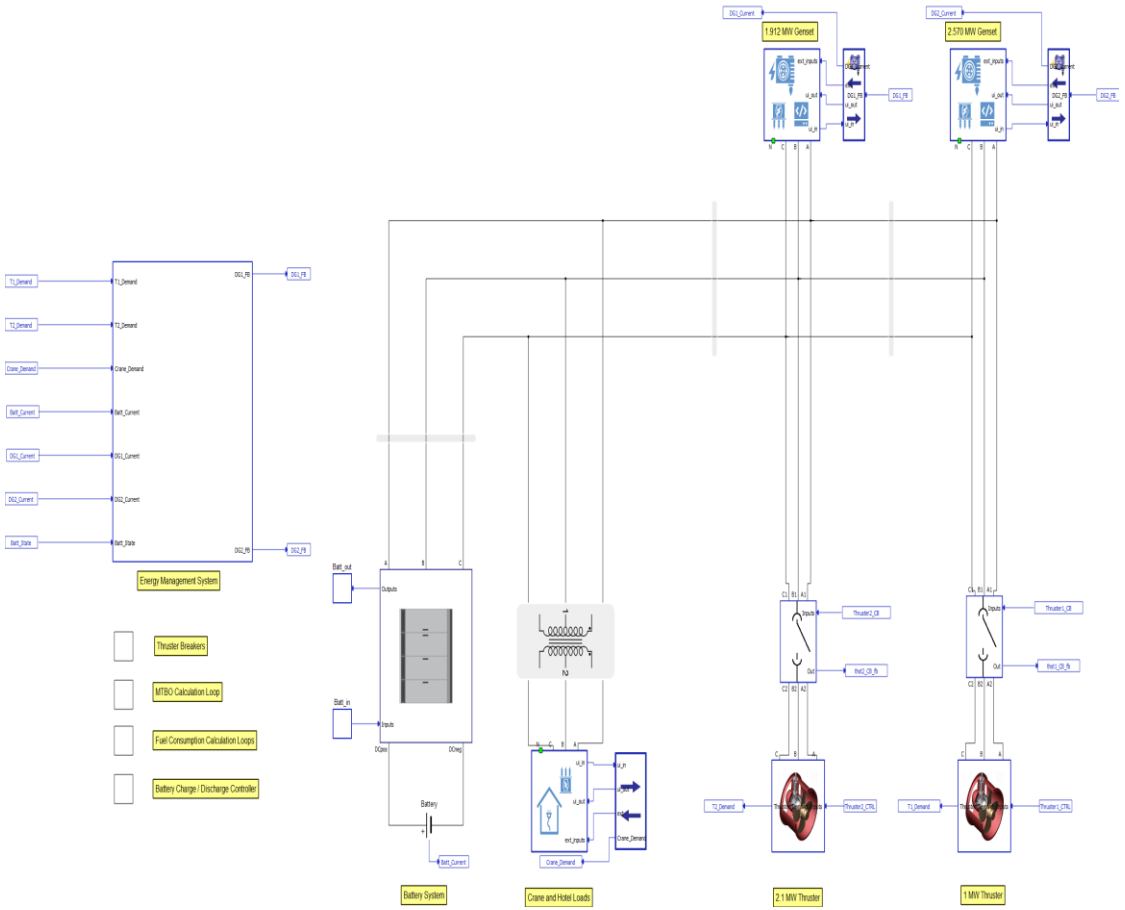
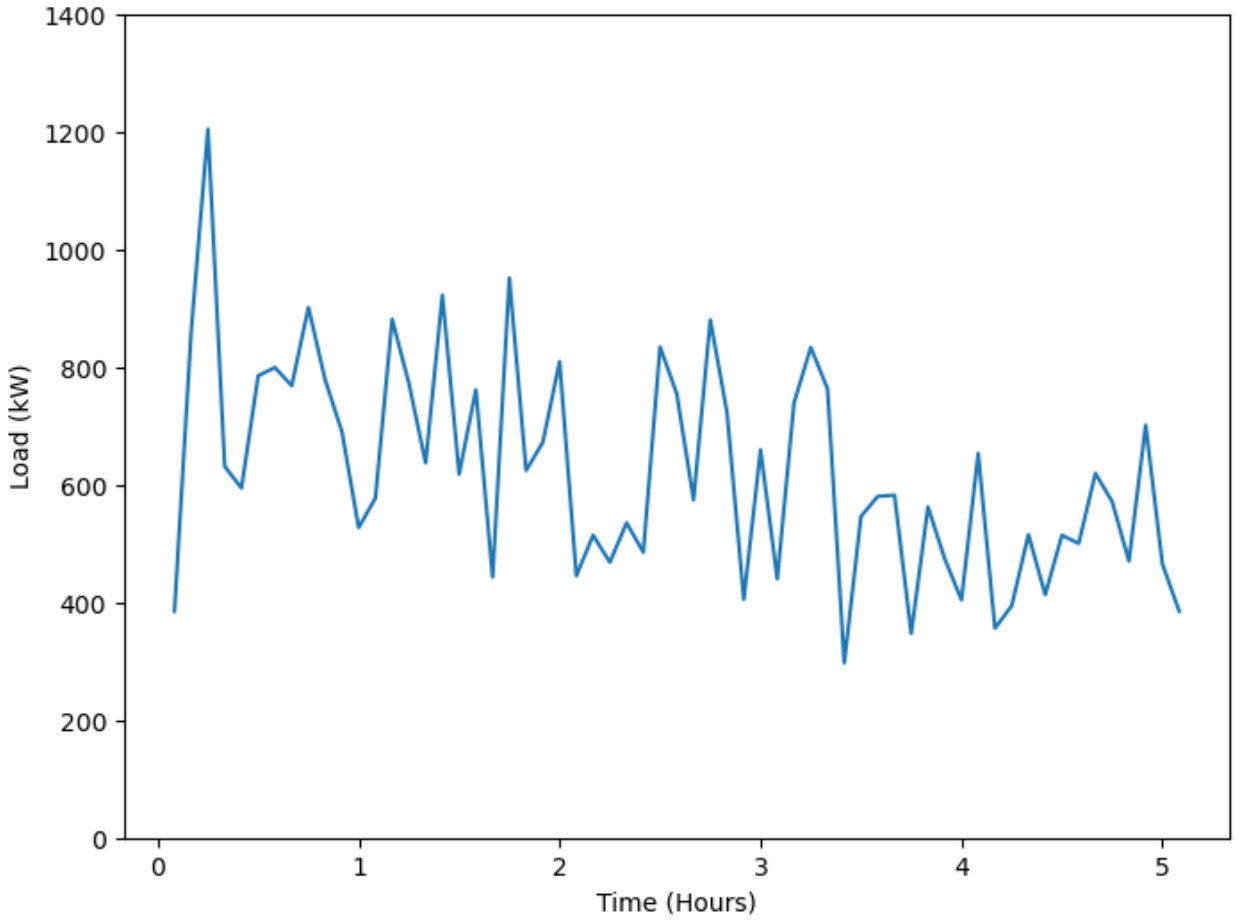
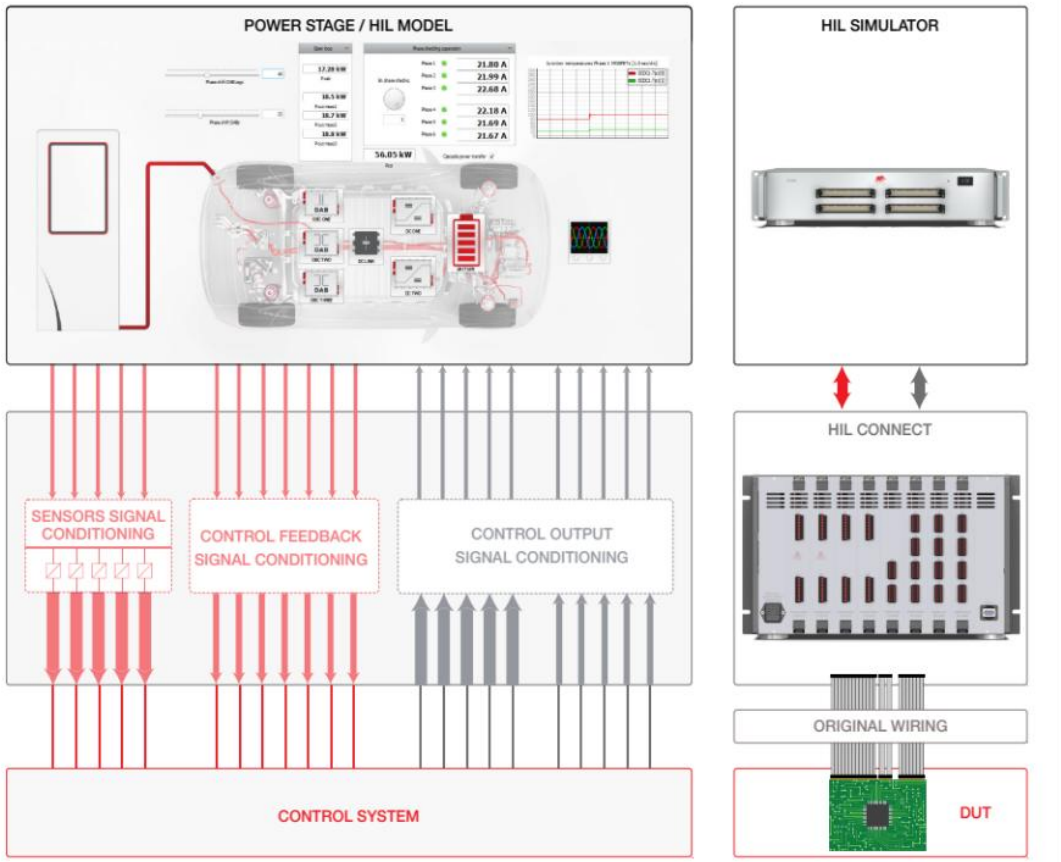
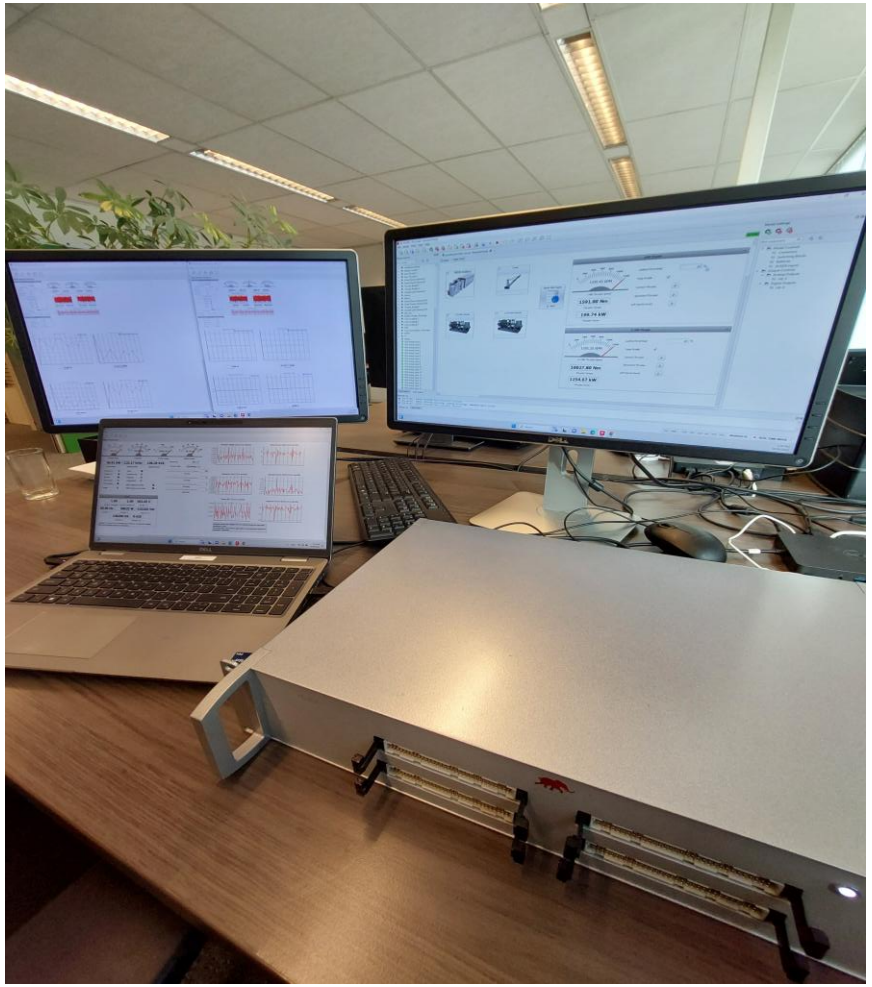




Hardware in Loop Testing





HIL Software Study Results

Parameter	With EMS	Without EMS
Net Fuel Consumption in Cycle	908 L	966.39 L
DG1 Loading %	73.4 %	29.51 %
DG2 Loading %	Standby	30 %
DG1 MTBO	1.71 years	1.29 years
DG2 MTBO	> 1.71 years	1.29 years
DG1 Annual Maintenance Cost	€ 50,904	€ 67,084
DG2 Annual Maintenance Cost	€ 40,000	€ 67,084

HIL Software Study Results

- Fuel Saved per annum - 58 tons ~ 6% improved efficiency
- Annual Maintenance Costs offset – approx. € 50k per generator
- CO_2 emissions offset per annum – 186 tons

Fuel Price	€ 700/ton	€ 800/ton	€ 900/ton
Net Savings and Maintenance (year)	€ 303,946	€ 309,746	€ 315,547
Simple Payback Time (SBT)	6.34 years	6.22 years	6.11 years

Future Work

- Approval from Classification Societies
- Data Driven models to improve designs and controls
- Incorporate forecasting models to better understand vessel load demands
- Incorporate algorithms to improve fuel consumption efficiency, voyage paths and scheduling DER usage and maintenance

Interested?

- Join us!
- Collaborate with us!
- Connect with us!

Thank you for your attention!