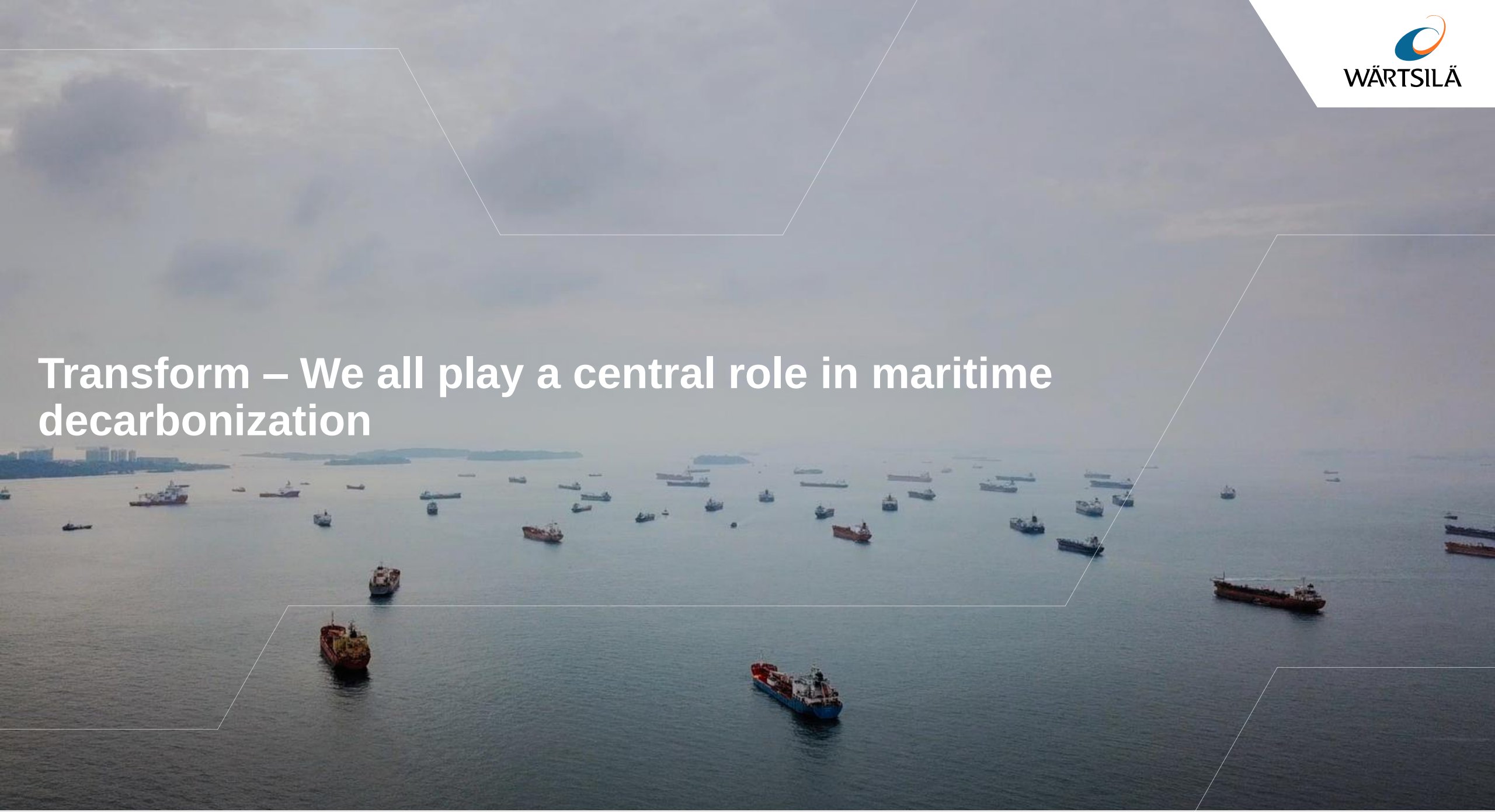
Greener future in a complex landscape

Nico Höglund
Product Manager W31
Marine Power Solutions

May 12, 2022

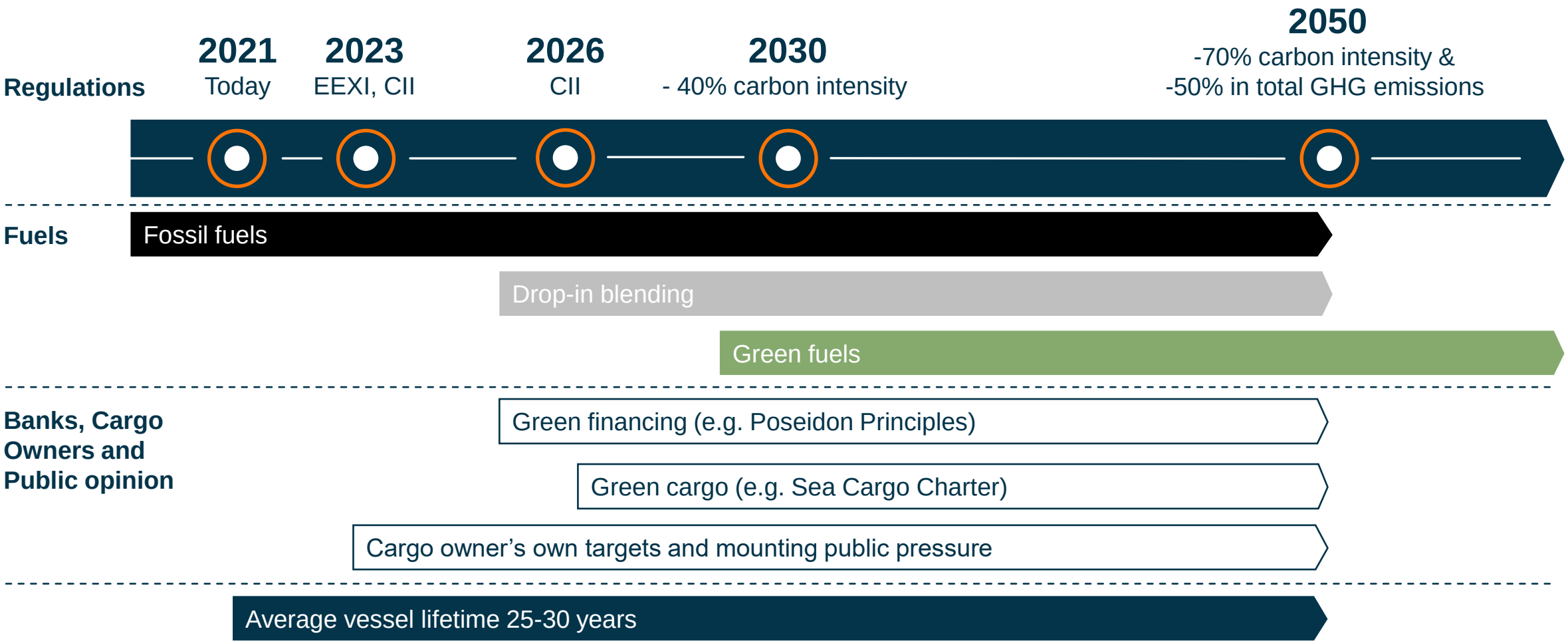
© Wärtsilä

Transform – We all play a central role in maritime decarbonization



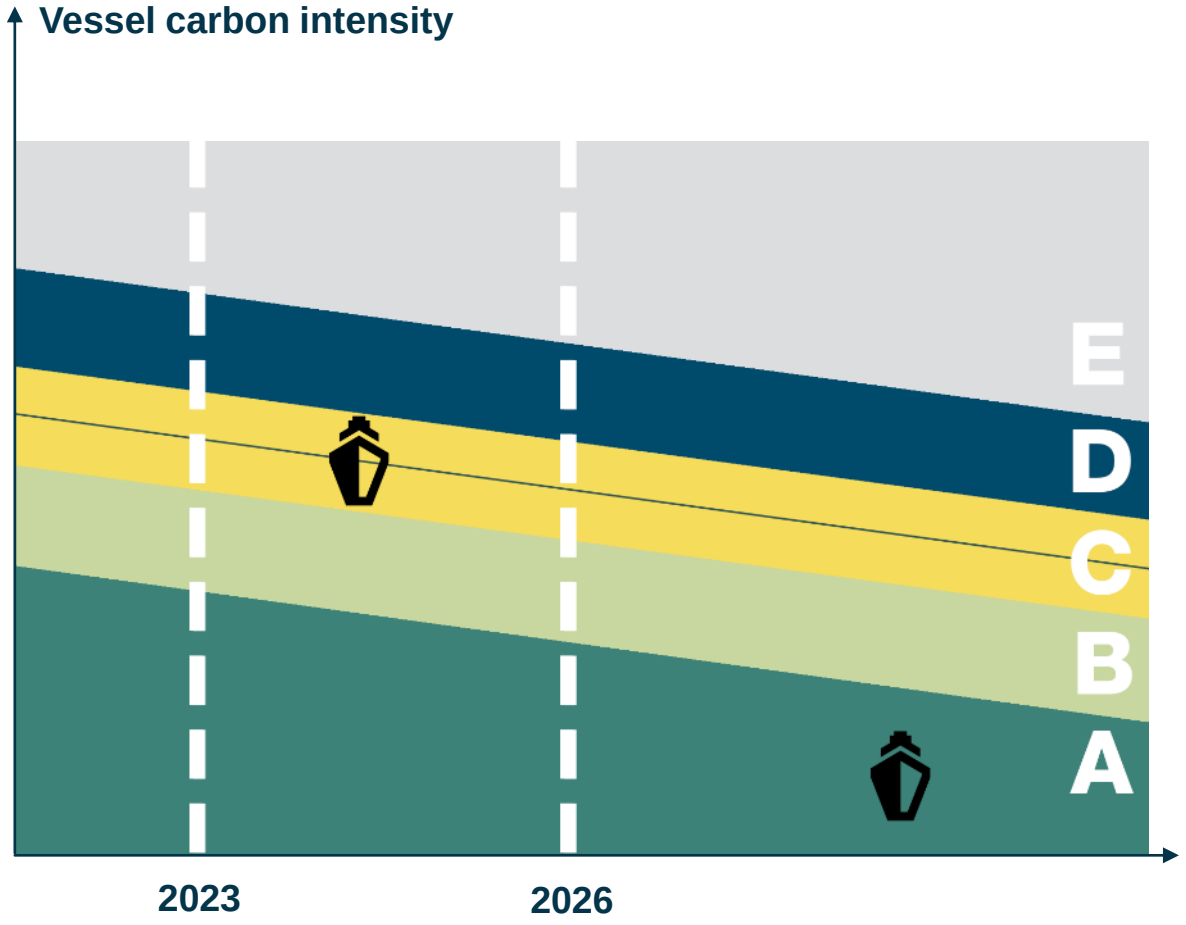
© Wärtsilä

Decarbonisation targets are shaping the future of our industry. Banks, cargo owners and public opinion have increasing influence in the speed of change



© Wärtsilä

CII introduces to the maritime industry a clear rating framework for differentiating vessels based on their GHG emissions performance



Key takeaways

- CII will **categorise ships from A to E**
- Cargo owners can easily establish their own **requirements on ratings to match own decarbonisation targets**
- If a ship wishes to **remain in the same category it will have to progressively improve GHG performance**

© Wärtsilä

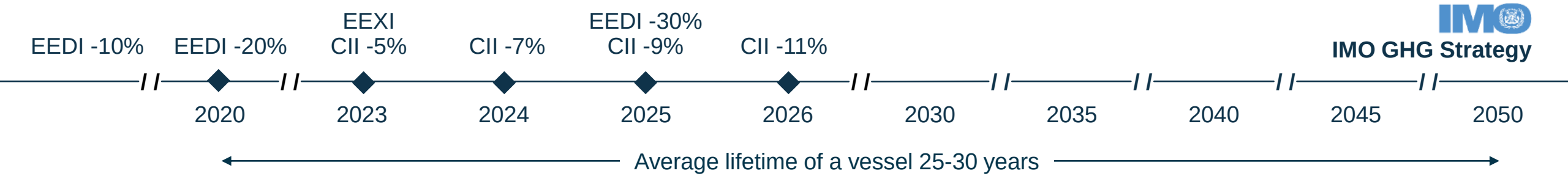
Ship owners need to plan their future fleet against moving targets and find trusted partners capable of future upgrades

New build

Invest in upgradable assets and a partner able to deliver upgrades throughout the asset's lifecycle

Build zero carbon ships

Build alternative fuel-ready assets



Existing fleet

Install energy saving devices and power limiters

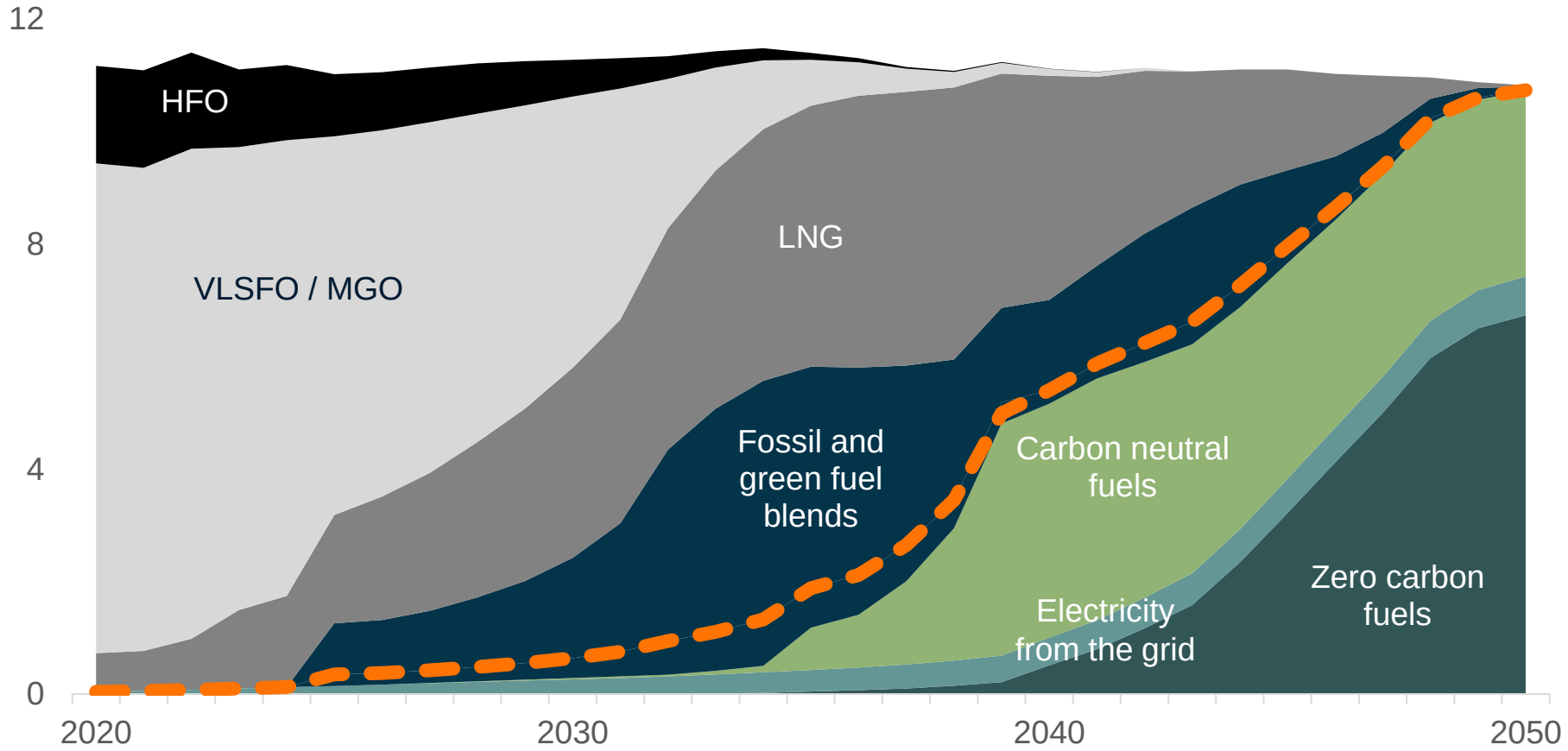
Convert to an alternative fuel or sell/scrap the asset

© Wärtsilä

Transition to green fuels will be slow yet relentless. 2050 is a single vessel's lifespan away – customers need to invest in fuel flexibility to avoid risk of stranded assets

Move from a single-fuel industry to a multi-fuel one

Distribution of fuel types for Decarbonisation 2050 (1.5ºC scenario), EJ



Owners will decide on technology partners now:

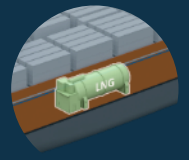
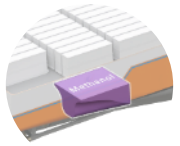
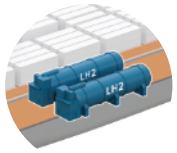
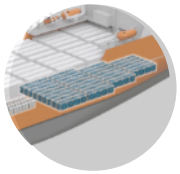
- Vessel life is 25-30 years
- Critical decision criteria:
  i) Multifuel capabilities for blending with green fuels
  ii) Conversion capabilities for future fuels

Carbon neutral and zero carbon fuels in maritime

Source: DNV Maritime Forecast 2050 model, Wärtsilä internal estimates

© Wärtsilä

Fuel conversions will play a vital role in the fuel transition for both existing and new vessels built during this and next decade. Fuel selection impacts the vessel structure

Fuel type	 **Heavy Fuel Oil** @ 20°C	 **Liquified Natural Gas** @ -162°C	 **Methanol** @ 20°C	 **Ammonia** @ -33°C	 **Liquid Hydrogen** @ -253°C	 **Compressed Hydrogen** @350bar	 **Marine Battery Rack**
Key considerations	▪ Standard tank arrangement	▪ Cryogenic system	▪ Mildly toxic ▪ Flexible tank arrangement	▪ Toxic ▪ Corrosive	▪ Highly reactive ▪ Cryo system	▪ High pressure ▪ Multiple tanks arrangement	▪ Marine adaptation reduces density
Fuel price factor (per GJ)	1X	0.7X [2)]	2.2X-5.4X [3)]	2.2X-4.5X [3)]	2.7X-4.5X [3)]	1.6X-2.6X [3)]	1.3X-2.3X
	Production cost estimate 2025 [1)]						
Gross tank size factor	1X [4)]	2.4X	1.7X	3.9X	7.3X	19.5X	~40X (future potential ~20X)

1) Sources: Maersk Mc-Kinney Møller Center for Zero Carbon Shipping – Industry transition strategy 2021, Wärtsilä-DNV collaboration; 2) fuel price for e-methane is expected to be in a range similar to e-methanol; 3) fuel price range spans across blue, bio and green-electro equivalent; 4) gross tank estimations based on Wärtsilä experience

© Wärtsilä

Infrastructure and availability of green fuels need time to mature. Our multi-fuel technology is the only viable upgrade path

Multi-fuel Engine

Technical Feasibility

Economic Viability

Our technology allows a progressive adoption of green fuels

Transition fuels ▶ **Drop-in** ▶ **Blending** ▶ **100% Pure**

Drop-in

Drop in the tank compatible bio fuels e.g. LNG and liquid bio-methane

Blending

Injecting into the engine different fuels e.g. fuel oil and green ammonia

Best TCO [1)] + **Vessel-long lifespan** + **Upgradability**

- ICE has the **lowest CAPEX**
- ICE has **predictable operational and maintenance costs**
- Independent techno-economic assessments show clearly that ICE has **the lowest TCO [1)] with alternative fuels**

Source: 1) DNVGL Maritime Forecast ed. 2020 and Lloyd's Register Techno-Economic Assessment of Zero Carbon Fuels ed. 2020

© Wärtsilä

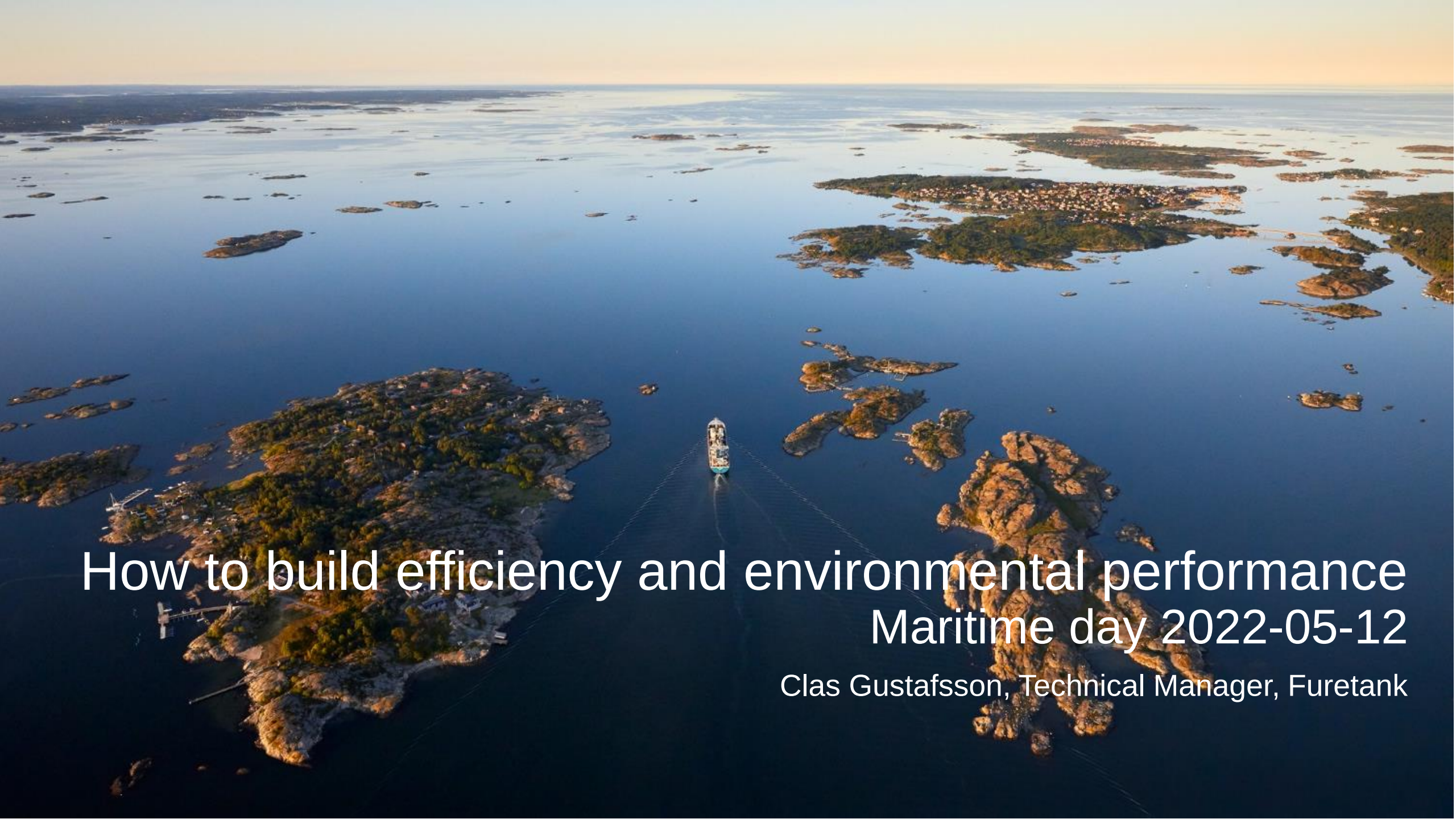
Front-runner in alternative fuel engine technology. Our portfolio goes beyond – we power vessels throughout the path towards decarbonisation

		2021	2022	2023	2024	2025
Engines	Diesel					
	FAME/HVO[1)]					
	LNG					
	Bio-methane					
	Synthetic methane					
	Hydrogen blends					
	Hydrogen 100%				Technical concept	
	Ammonia			Technical concept		
	Methanol					
Electric	Hybrid					
	Full electric			Short sea shipping / inland waterways		
Fuel cells	SOFC, PEMFC [2)]	Technology evaluation ongoing				
Energy saving devices	Propulsion energy saving devices					
	Air lubrication and flettner rotors					
	Other					

Own technology Through partnering Both in house development and partnering Concept development

1) FAME, HVO: biodiesel 2) SOFC: solid oxide fuel cell, PEMFC: proton exchange membrane fuel cell

© Wärtsilä



How to build efficiency and environmental performance
Maritime day 2022-05-12

Clas Gustafsson, Technical Manager, Furetank

Furetank Group

- Furetank is focused on product & chemical tankers below 20,000 dwt and has been active in the North European petroleum products trade since the early 1950's
- Integrated ship owning company that provide technical, safety, crewing and commercial management services to own vessels and external partners
- Owned by the Höglund family
- Offices in Gothenburg(Sweden) and Holbaek (Denmark)
- Have invested in five dual fuel powered low emission 18,000 dwt new buildings from China Merchant "Dingheng" Shipyard in China. Together with partners Älvtank and Thun Tankers, the series will comprise a total of eight sister vessels
- Founding partner of commercial joint venture Gothia Tankers Alliance, covering 44 vessels in sizes of 6,000-37,000 dwt

GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Gothia Tanker Alliance

- Formed by Furetank and Thun in 2013
- Office in Gothenburg
- 9 Members
- 44 Vessels – 4,200 dwt to 37,000 dwt
- Presently two newbuilding's on order + one option
- The largest operator of dual-fueled LNG powered product/chemical tankers
- In 2021 the GTA fleet performed more than 1800 voyages, more than 4000 port calls transporting 18,0 million tons of petroleum products, bio-fuels and chemicals
- The members in the Alliance cooperate on technical issues, vetting issues and operational best practices

Vessel	Built	Deadweight	Ice
FUREVIK	2005	37 000	1C
FURE FERDER	2003	18 736	1A
FURE FLADEN	2003	18 736	1A
FURE VINGA*	2021	17 999	1A
FURE VITEN*	2021	17 999	1A
FURE VEN*	2019	17 999	1A
FURE VALÖ*	2018	17 999	1A
RAMELIA*	2019	17 999	1A
RAMANDA*	2018	17 999	1A
GAÏA DESGAGNÉS*	2018	17 999	1A
THUN VENERN*	2018	17 999	1A
THUN LIDKOPING	2019	17 500	1C
THUN LONDON	2019	17 500	1C
THUN LIVERPOOL	2019	17 500	1C
THUN LIFFEY	2020	17 500	1C
THUN LUNDY	2020	17 500	1C
SELANDIA SWAN	2008	17 998	1A
JUTLANDIA SWAN	2008	17 998	1A
FURE WEST*	2006	17 557	1A
FURE NORD	2004	17 653	1A
RAMONA	2004	17 200	1A
ARSLAND	2008	16 791	1A
STAVFJORD	2009	16 635	1A
STAV VIKING	2009	16 628	1A

Vessel	Built	Deadweight	Ice
THUN EOS*	2018	7 999	1A
THUN EVOLVE*	2019	7 999	1A
THUN EQUALITY*	2021	7 999	1A
THUN EMPOWER*	2021	7 999	1A
THUN GREENWICH	2007	7 915	1C
THUN GARLAND	2009	7 550	1A
THUN GAZELLE	2009	7 550	1A
THUN GEMINI	2003	7 550	1B
THUN GENIUS	2003	7 550	1B
THUN GRANITE	2004	7 550	1B
THUN GRATITUDE	2003	7 550	1B
WISBY VERITY	2004	7 550	1A
WISBY WAVE	2009	7 550	1A
THUN GOLIATH	2004	7 100	-
THUN GOTHENBURG	2007	6 900	1A
WISBY TEAK	2011	5 850	-
WISBY ARGAN	2009	5 850	-
THUN GRACE	1999	6 535	1B
THUN BLYTH	2021	4 250	NAABSA
THUN BRITAIN	2022	4 250	NAABSA
Vessels under construction			
FURETANK TBN	2024	17 999	1A
THUN TANKERS TBN	2024	17 999	1A
FURETANK TBN (option)	2024	17 999	1A
*= Dual fuel / LNG			

BESIKTASGROUP

REDERI AB ÄLVTANK

WISBY TANKERS AB
WISBY SHIP MANAGEMENT AB

UNI-TANKERS

DSD

OHM

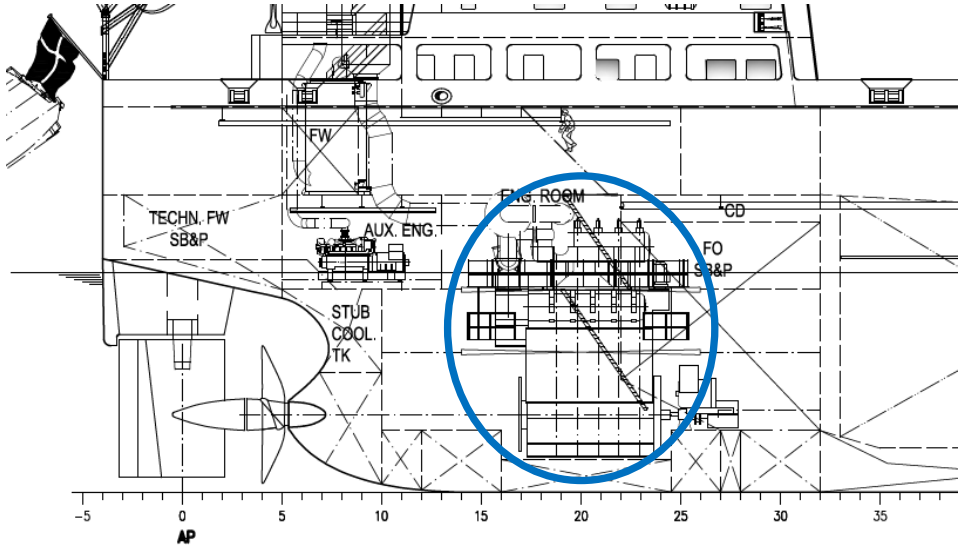
DESGAGNÉS

GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

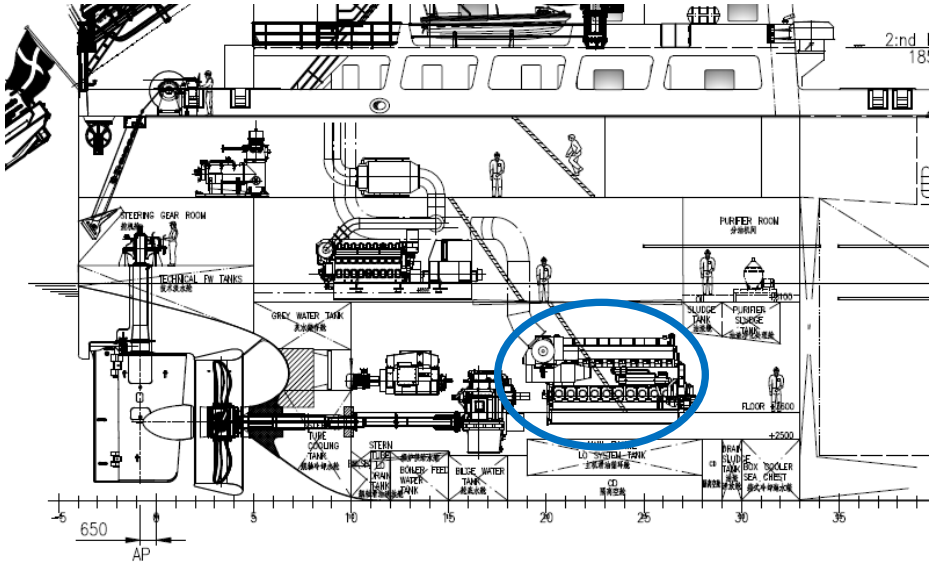
THUN TANKERS

FURETANK

Engine Selection



Output: approx. 5500 kW at MCR, 110 rpm

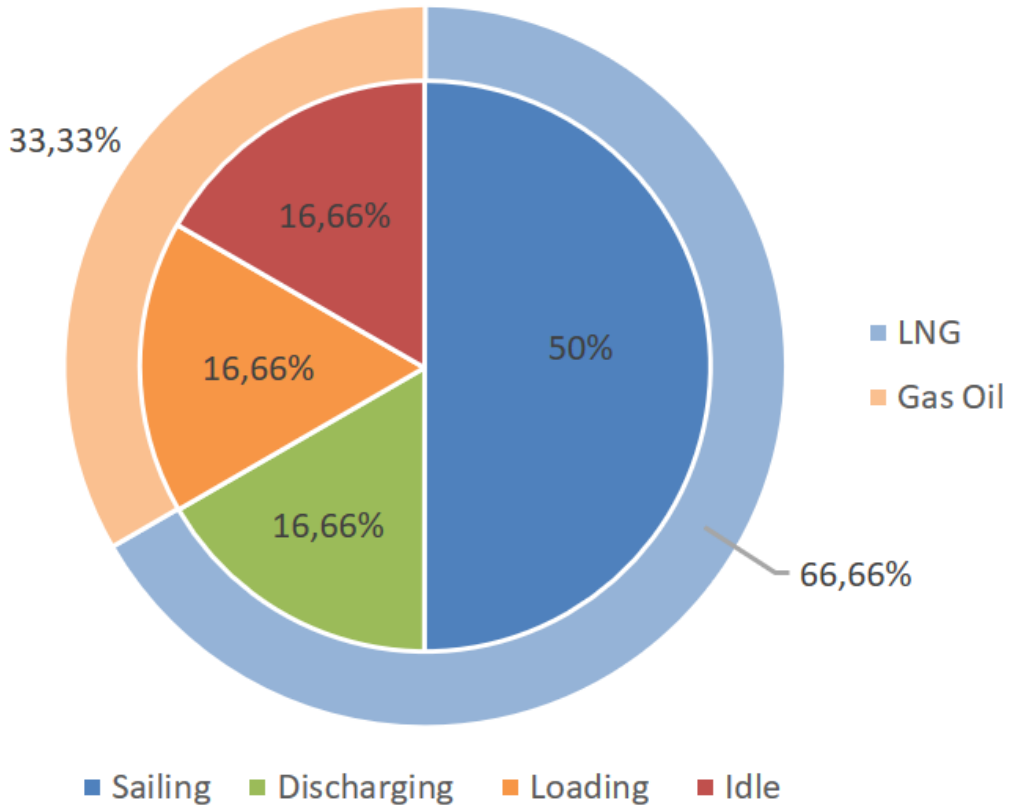


Output: 4500 kW at MCR, Propeller speed 109 rpm

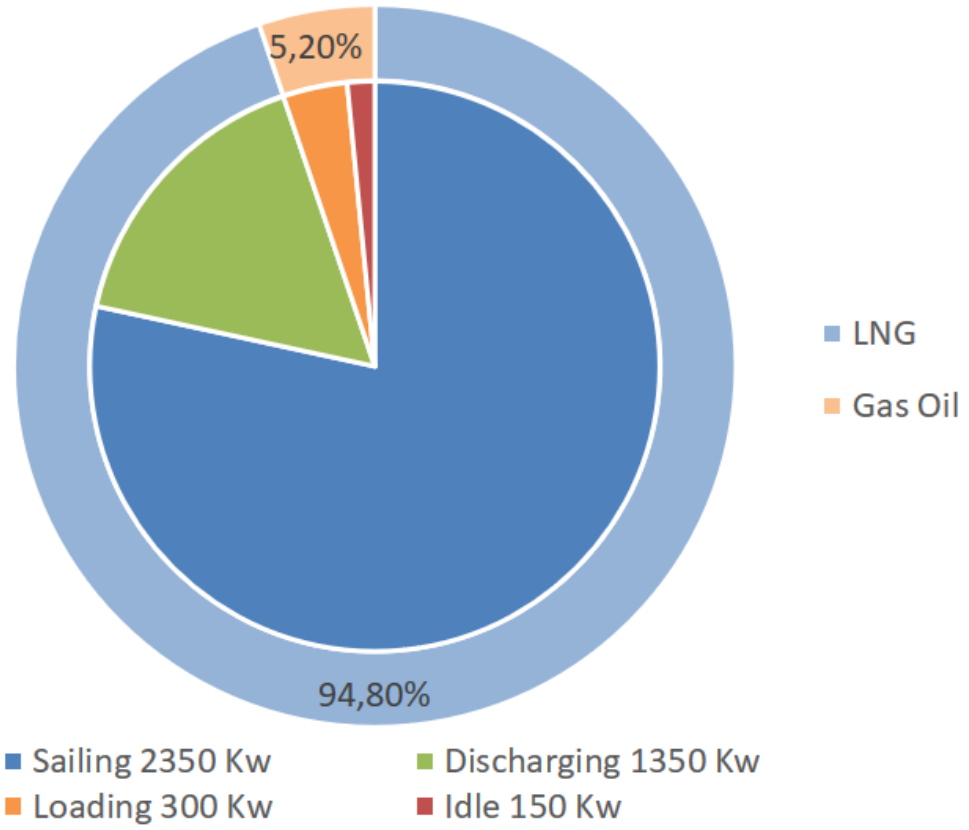
GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Decision on engine set-up based on activity/energy useage analysis

Time at different conditions / year



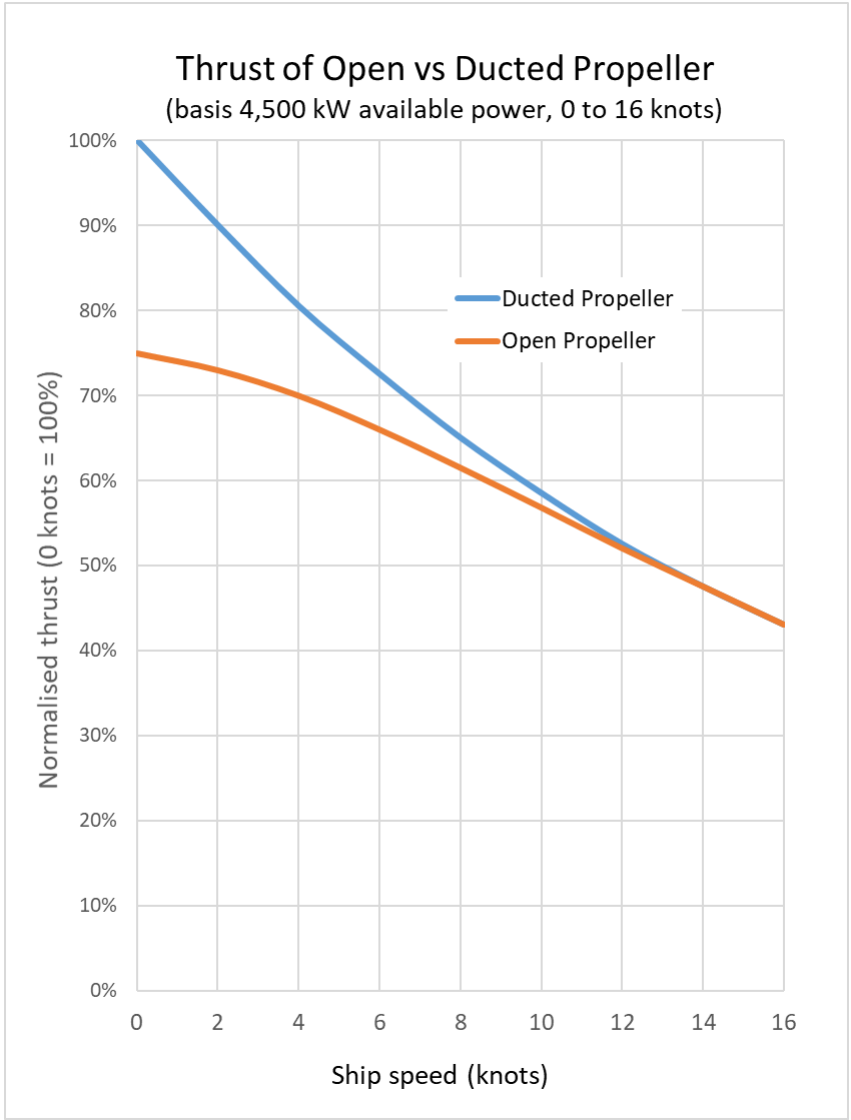
Energy at different conditions / year



GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

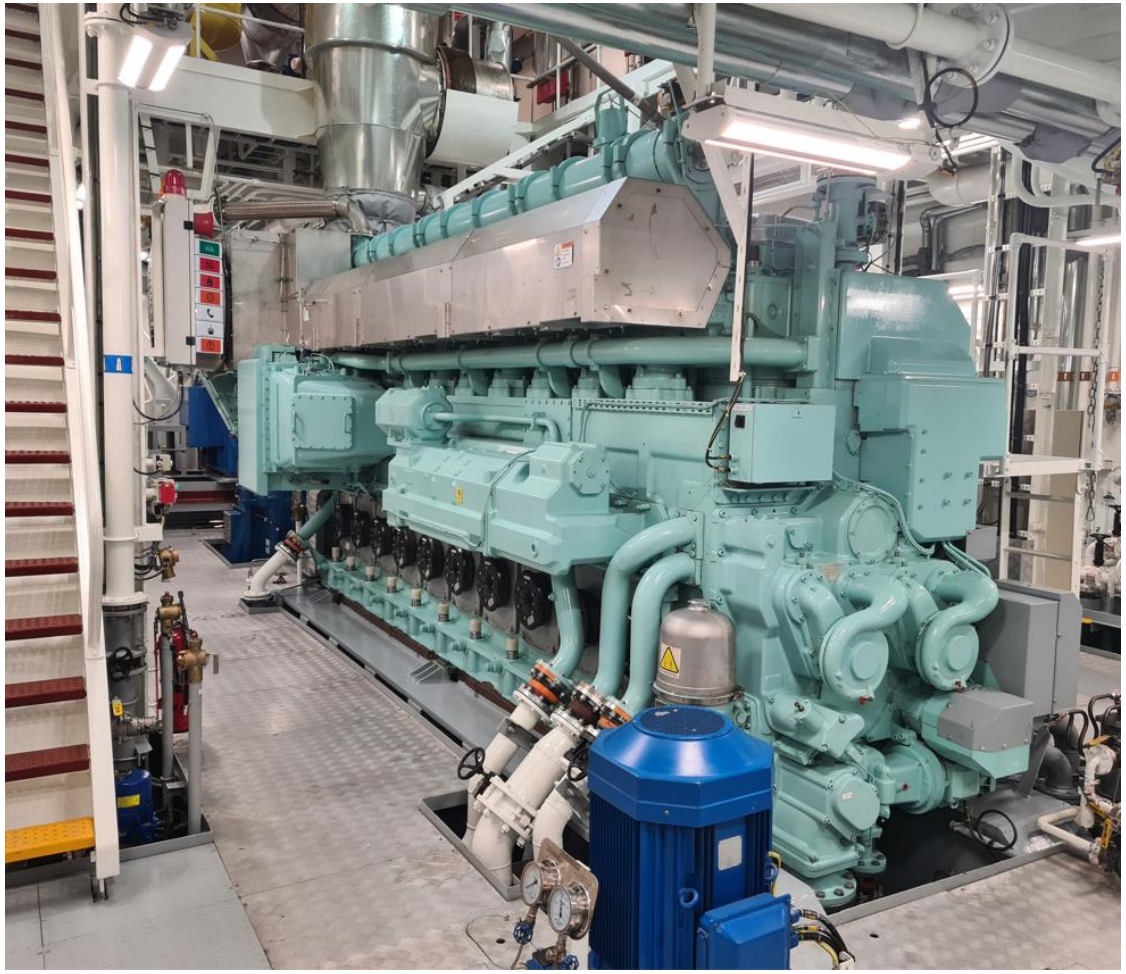
Wärtsilä EnergoPac

- The 5,000 mm ducted propeller increases the thrust and enables the notation ice class 1A with a lower engine power
- The vessels main engine of 4,500kW with ducted propeller equals 6,000 kw with open propeller at low speeds, like when trading in ice

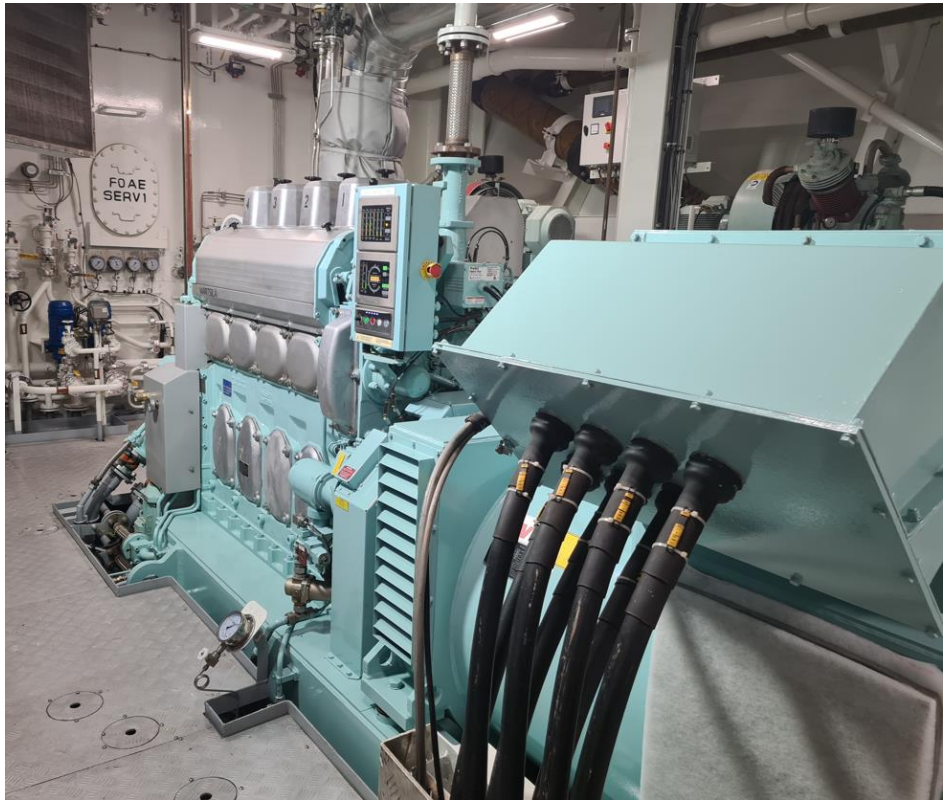


GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Wärtsilä Engine Package



Wärtsilä 9L34DF 4500kW



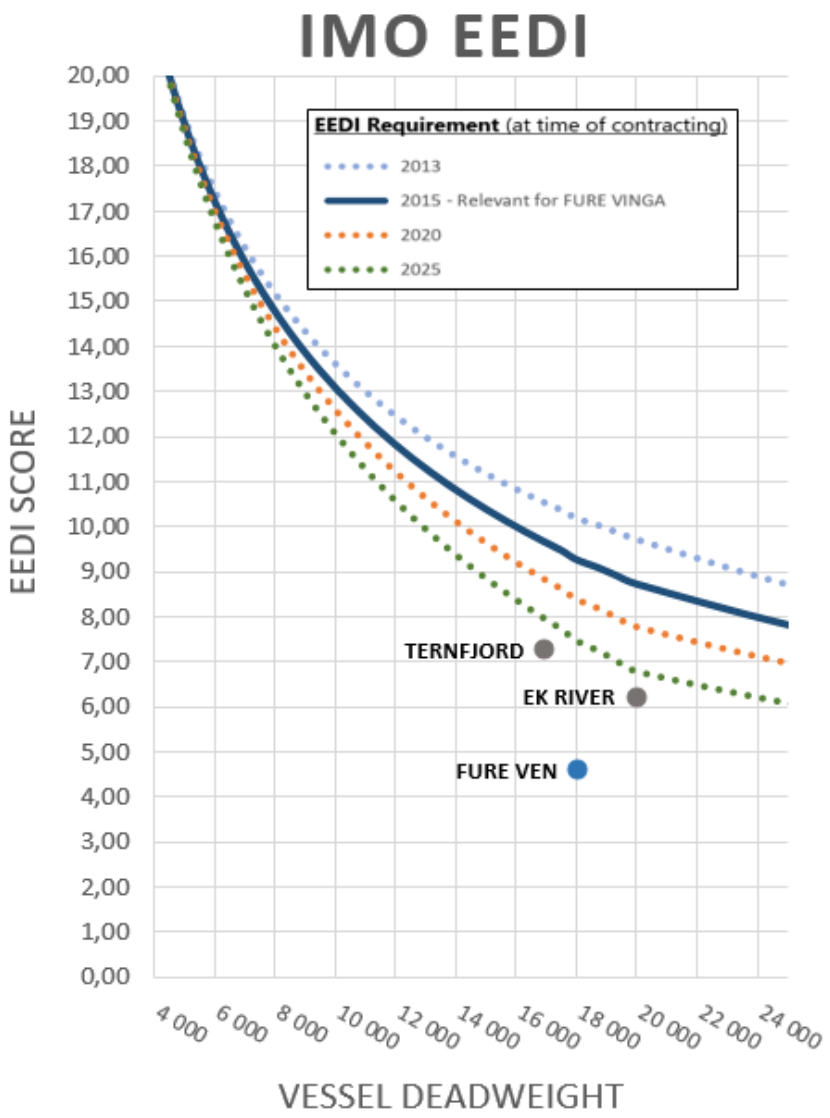
Auxpac 4L20 688kW

Auxpac 9L20 1600kW

GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

EEDI (Energy Efficiency Design Index)

- EEDI is a resolution under IMO Marpol Annex VI, adopted in 2013 and aims to promote the use of more energy efficient design and less polluting equipment and engines for new ships
- The score is calculated by a formula based on technical design parameters for a given ship, is non-prescriptive so it leaves the choice of technology to the industry
- Expressed in grams of carbon dioxide (CO_2) per ship's capacity-mile - the smaller the EEDI the more energy efficient ship design
- IMO EEDI Requirement for a 17,999 dwt tanker ordered in 2015 and delivered in 2018 is 9,37
- FURE VINGA EEDI score is 4,64 – a score which improved successively throughout the process; from design stage (6,09) via model test (5,44)
- The VINGA-series low score is a result of the unique combination with ducted propeller, floating frequency on main engine and hybrid technology where the batteries are used instead of the auxiliary engines – together this corresponds to about 3 EEDI points

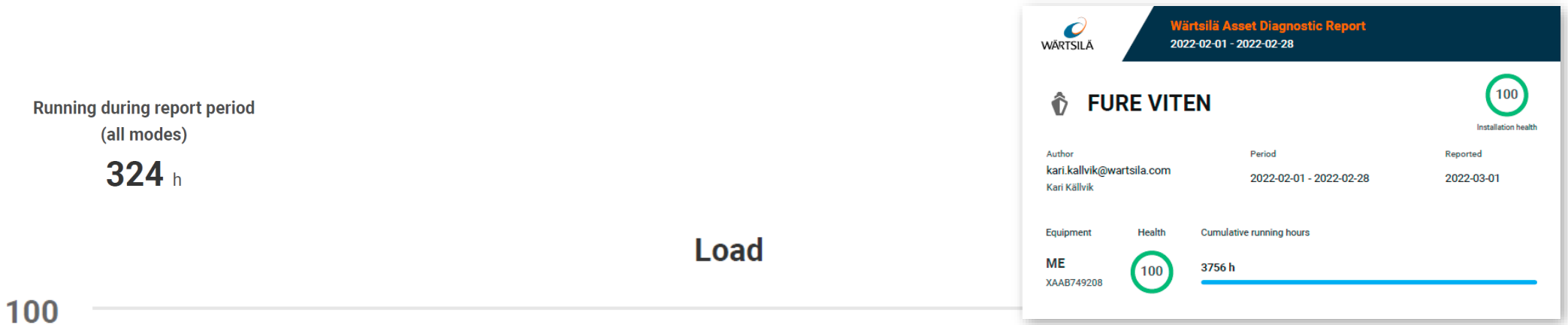


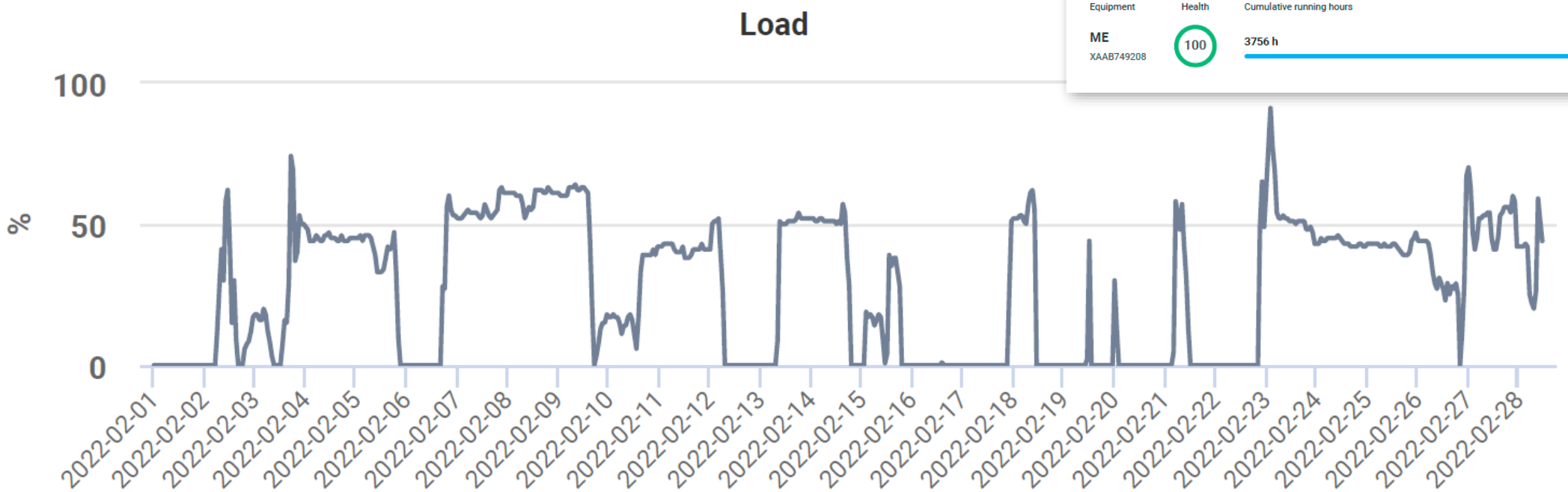
GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Main Enigne Load Profile (FURE VITEN, February 2022)

Running during report period
(all modes)

324 h





GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Hybrid/UPS Power Back-up & Shore Connection

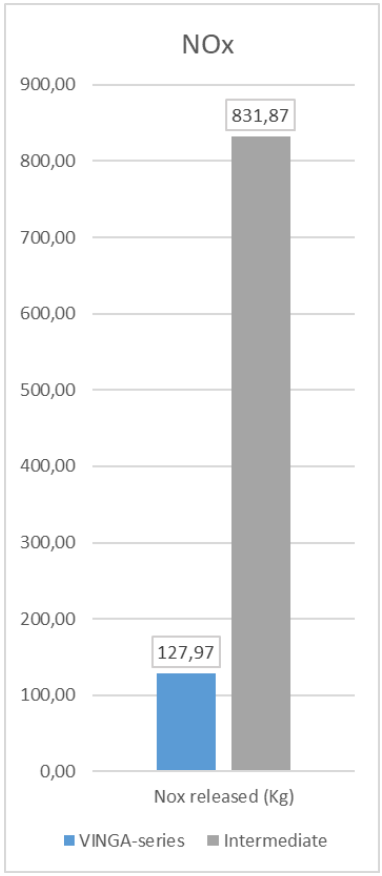
The hybrid solution with an UPS Power supply system minimizes the use of auxiliary engines and can supply all 24/230/440V necessary to operate:

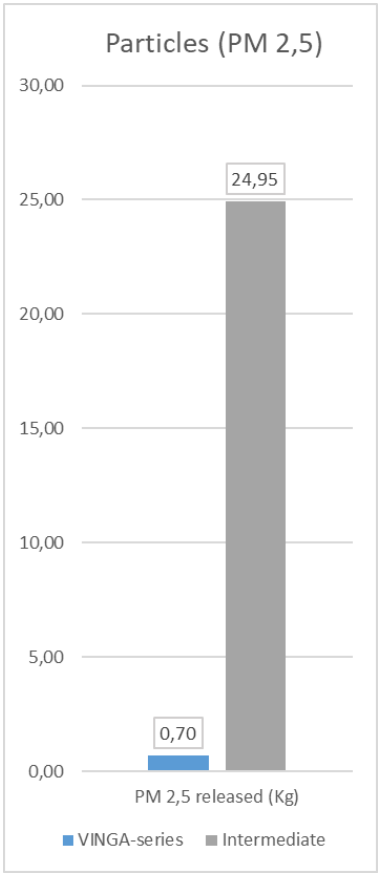
- Main engine
- One steering gear
- All navigation & communications equipment
- Emergency remote anchoring device
- Emergency switchboard
- All lights

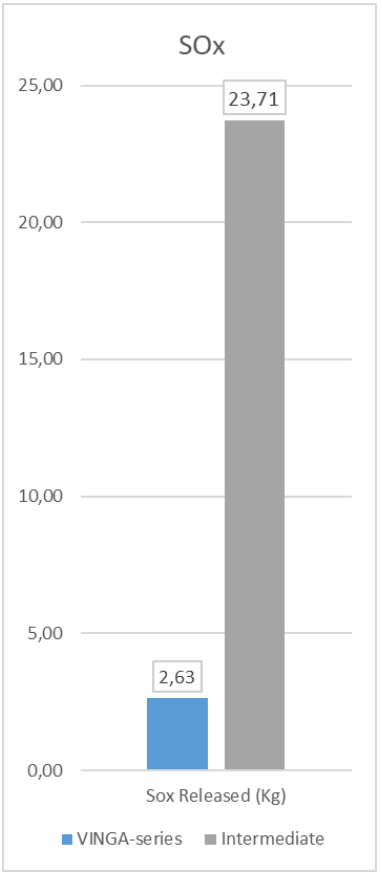
Using the UPS as the backup power source makes it possible to navigate in narrow waters (port entrances, canals etc.) with only the main engine running – thereby maximising the use of LNG and reducing emissions

Reduced Environmental impact – Discharge operation Antwerp

- Emissions of NOx and particles are damaging to human health and a major issue in densely populated regions
- The bars show VINGA-series total emissions in LNG-mode compared to a conventional vessel of 2008 design during passage in/out plus discharge operation in Antwerp

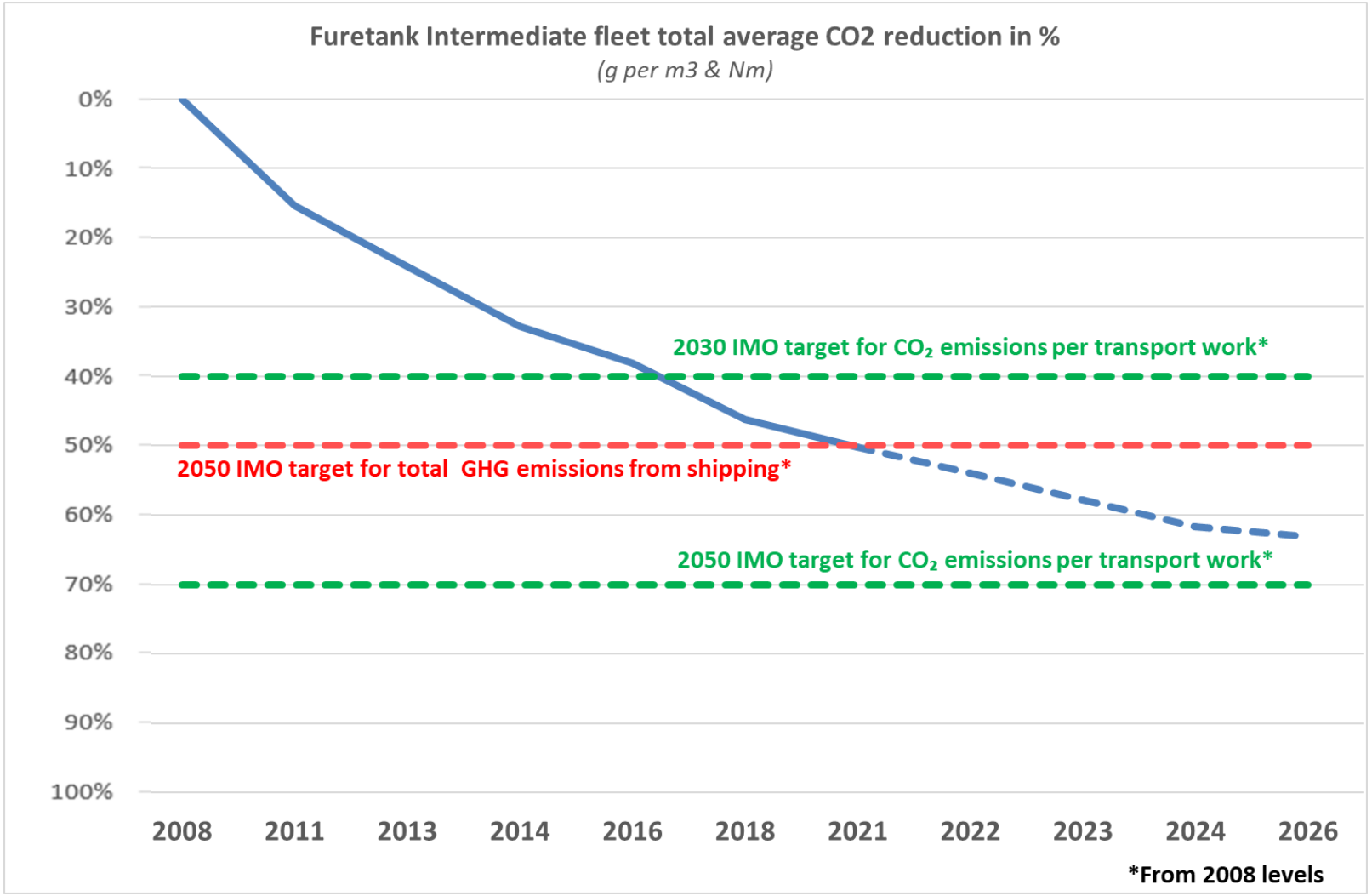






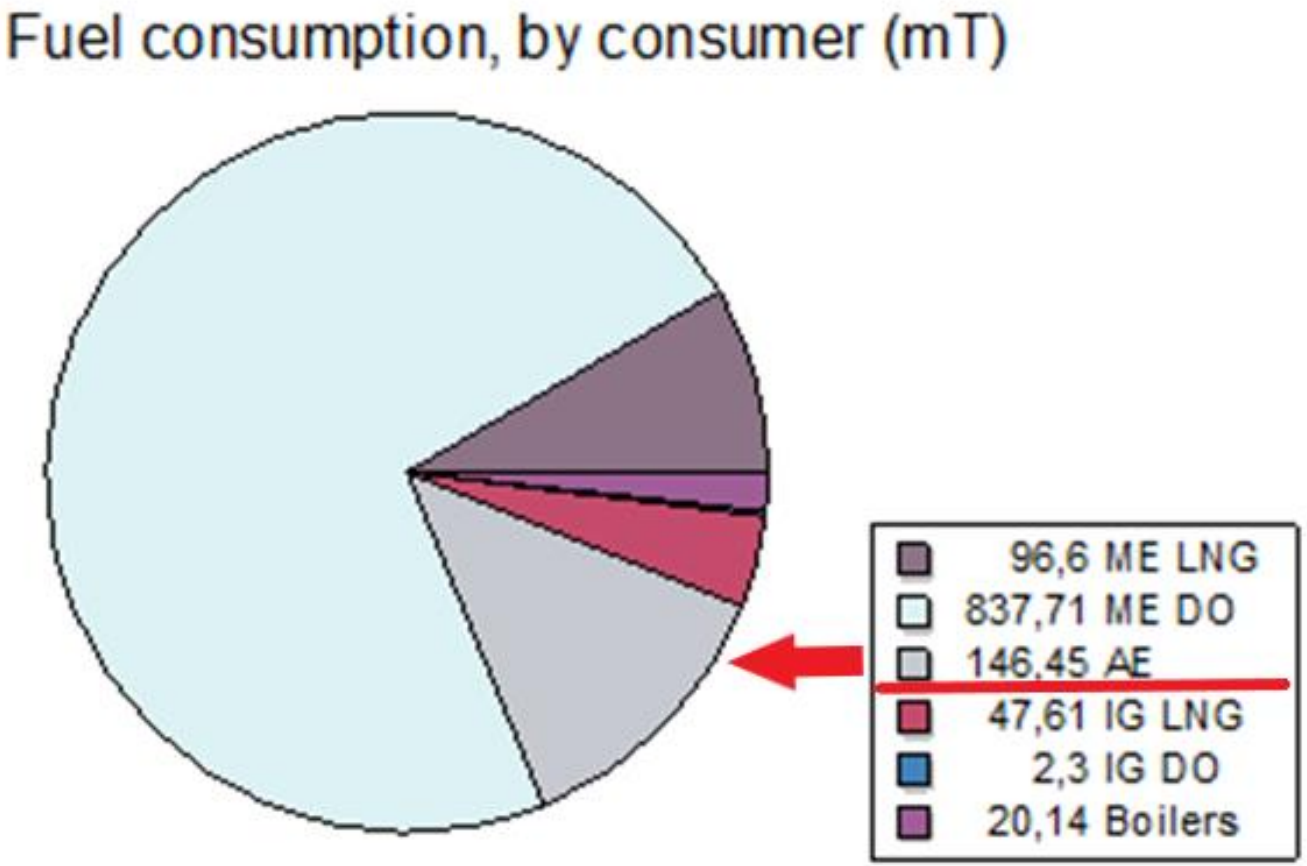
GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Furetank CO_2 Emissions – Drivers and Future Expectations



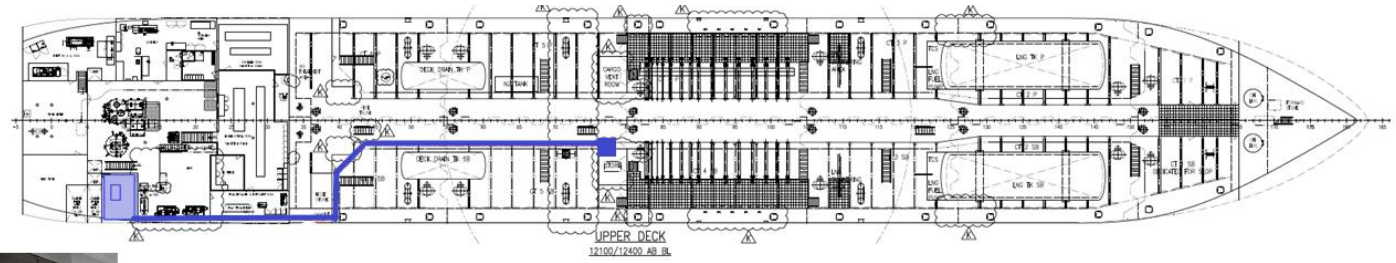
GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

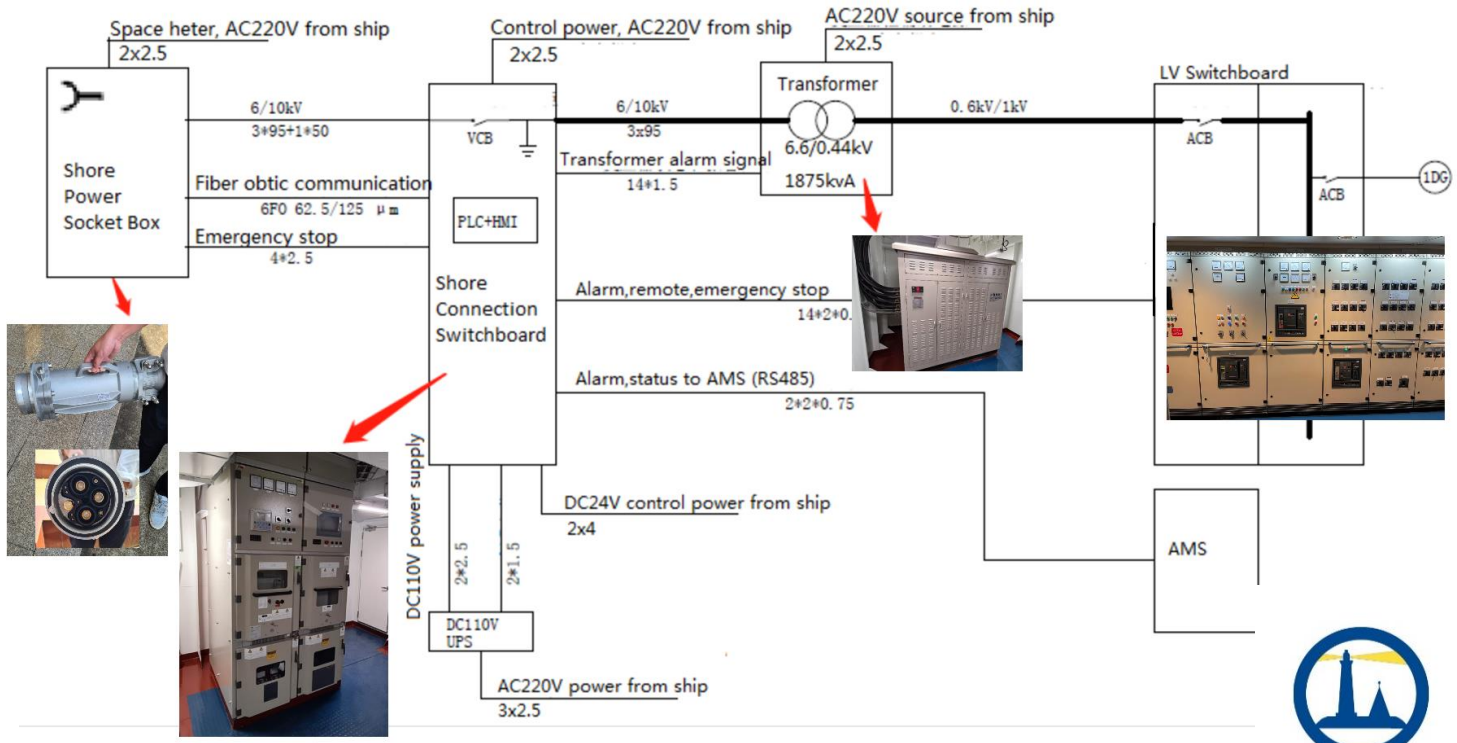
Fuel Consumption for two vessels in the VINGA- series 1/1-16/4 2022



GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

VINGA-series Shore Power Connection



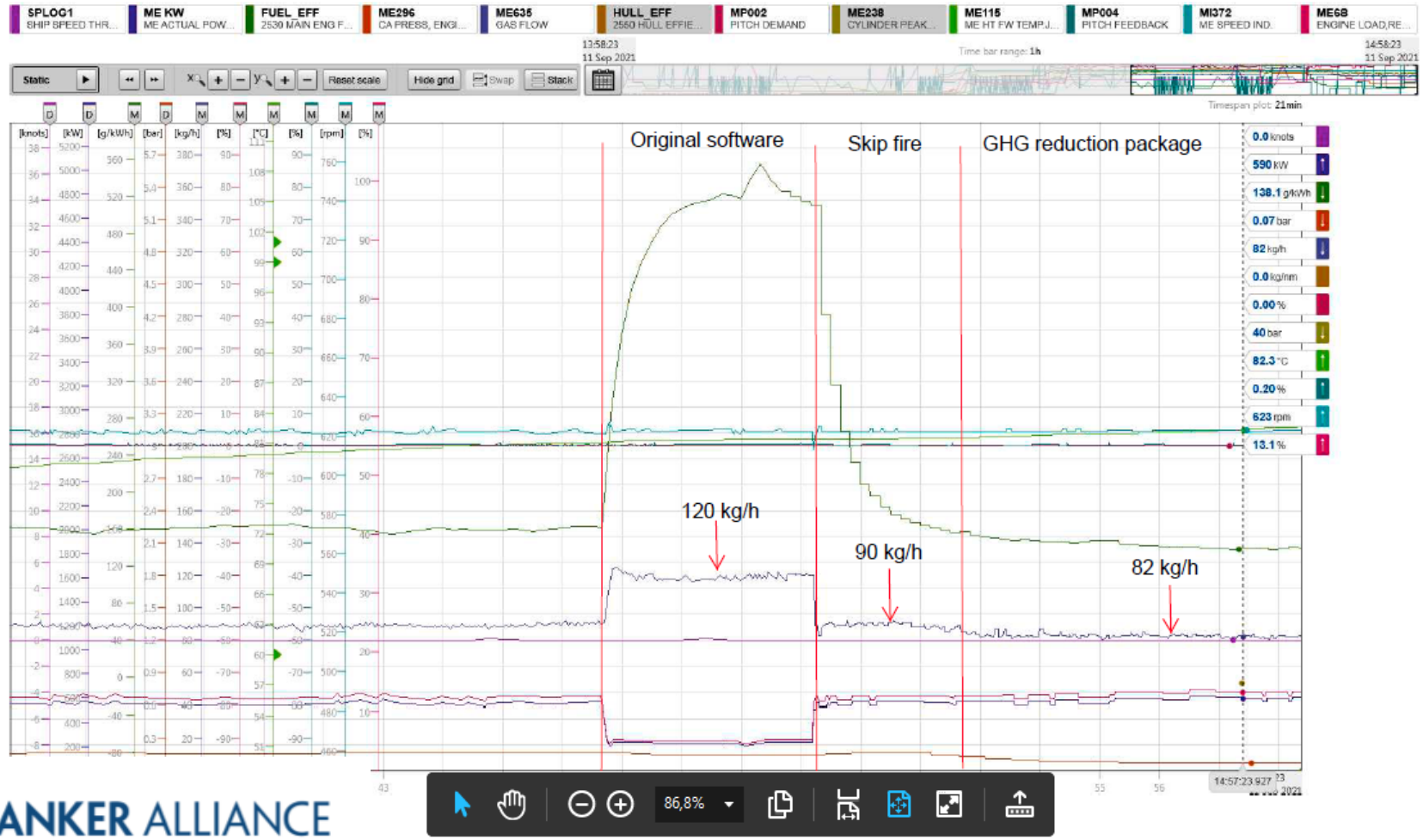


GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

Project to reduce fuel consumption and emissions with Wärtsilä

Vessel: FURE VINGA
IMO: 9890599
Trend view 1

Kongsberg Maritime K-Chief 600 - ROS2
Printed by: Chief 2021.09.11 12:59 UTC
Page 1 of 1



GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER

TradeWinds
The Global Shipping News Source

Latest News Tankers Bulkers Containerships Gas ESG e-paper

Furetank secures liquefied biogas made from manure to fuel new eco tankers

Swedish owner seals deal with Eskilstuna for 3,750 tonnes of green fuel each year

GOTHIA TANKER ALLIANCE
INCREASING EXCELLENCE TOGETHER