

Vesitiepäivä, Rauma
4.5.2023

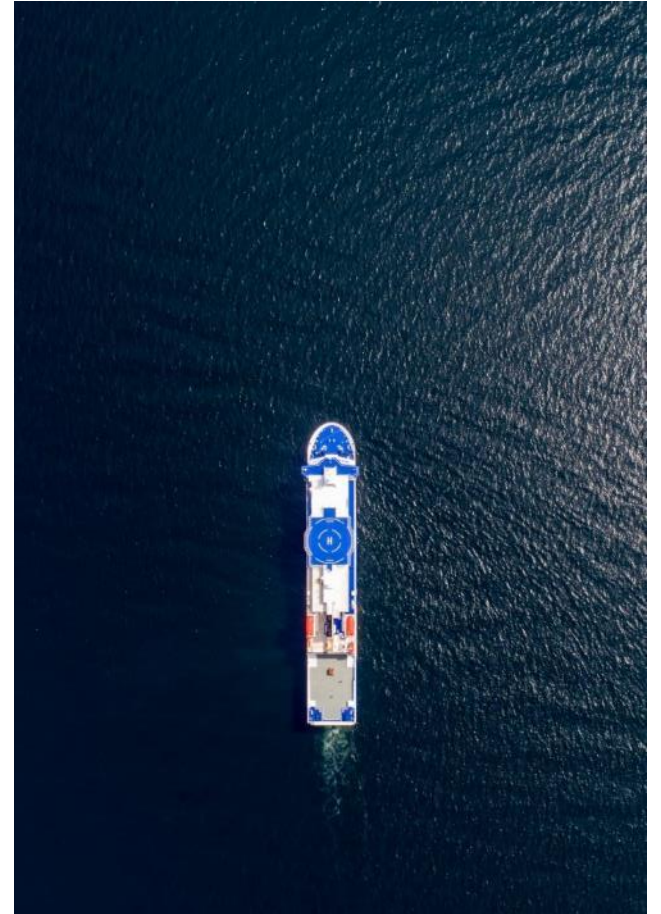
Vastuullinen Merenkulku ja uudet teknologiat

Mika Laurilehto / RMC



Rauma Marine Constructions

- **Olemme** vuonna 2014 Raumalla perustettu, kokonaan suomalaisessa omistuksessa oleva laivanrakennusyhtiö.
- **Edustamme** maailman korkeinta osaamista arktisessa laivanrakennuksessa, johon Suomen meriteollisuuden osaaminen ja kilpailukyky nojaa vahvasti.
- **Keskitymme** rakentamaan ja huoltamaan
 - matkustaja-autolauttoja
 - jäänmurtajia
 - viranomaisaluksia.

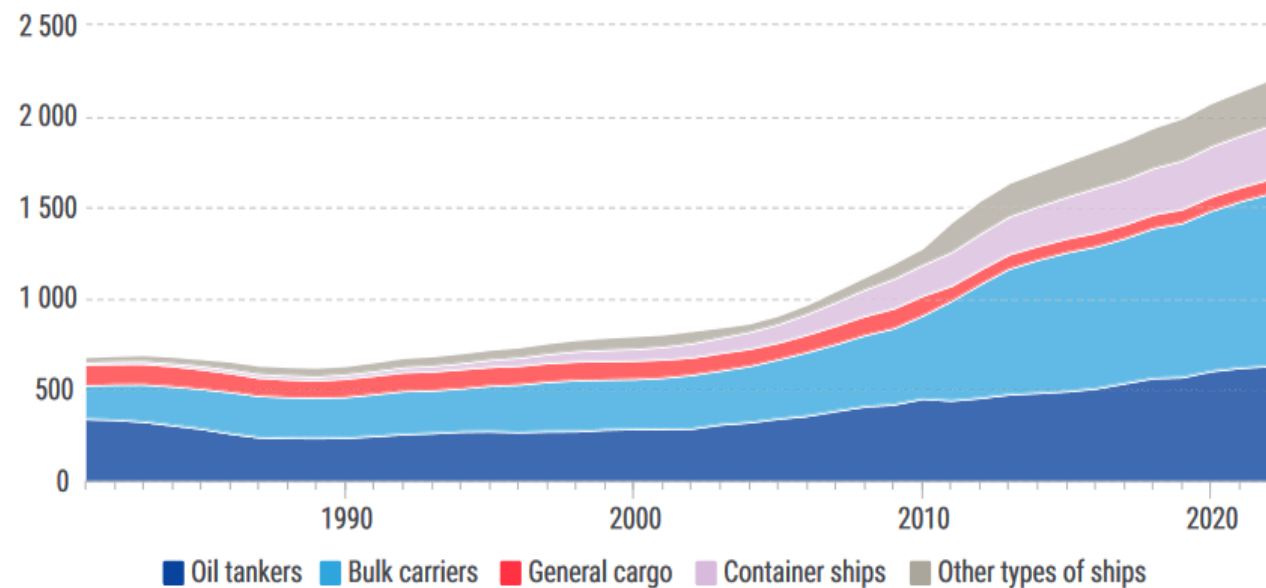




Yli 80% kaikista kuljetuksista kulkee laivoilla



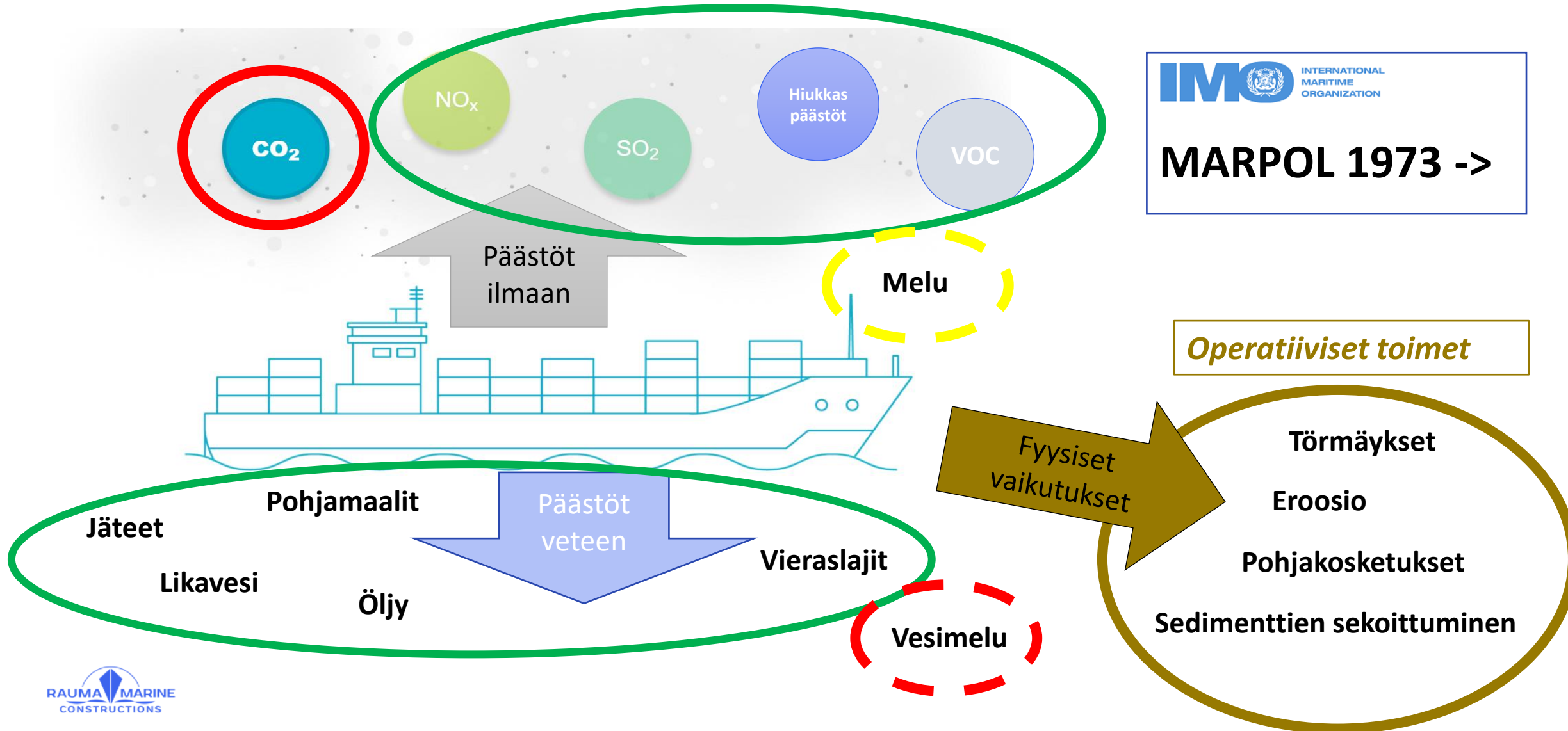
Figure 1 World fleet by principal vessel type
(Millions of dead-weight tons)



Sources: UNCTADstat (UNCTAD, 2022a); Clarksons Research.

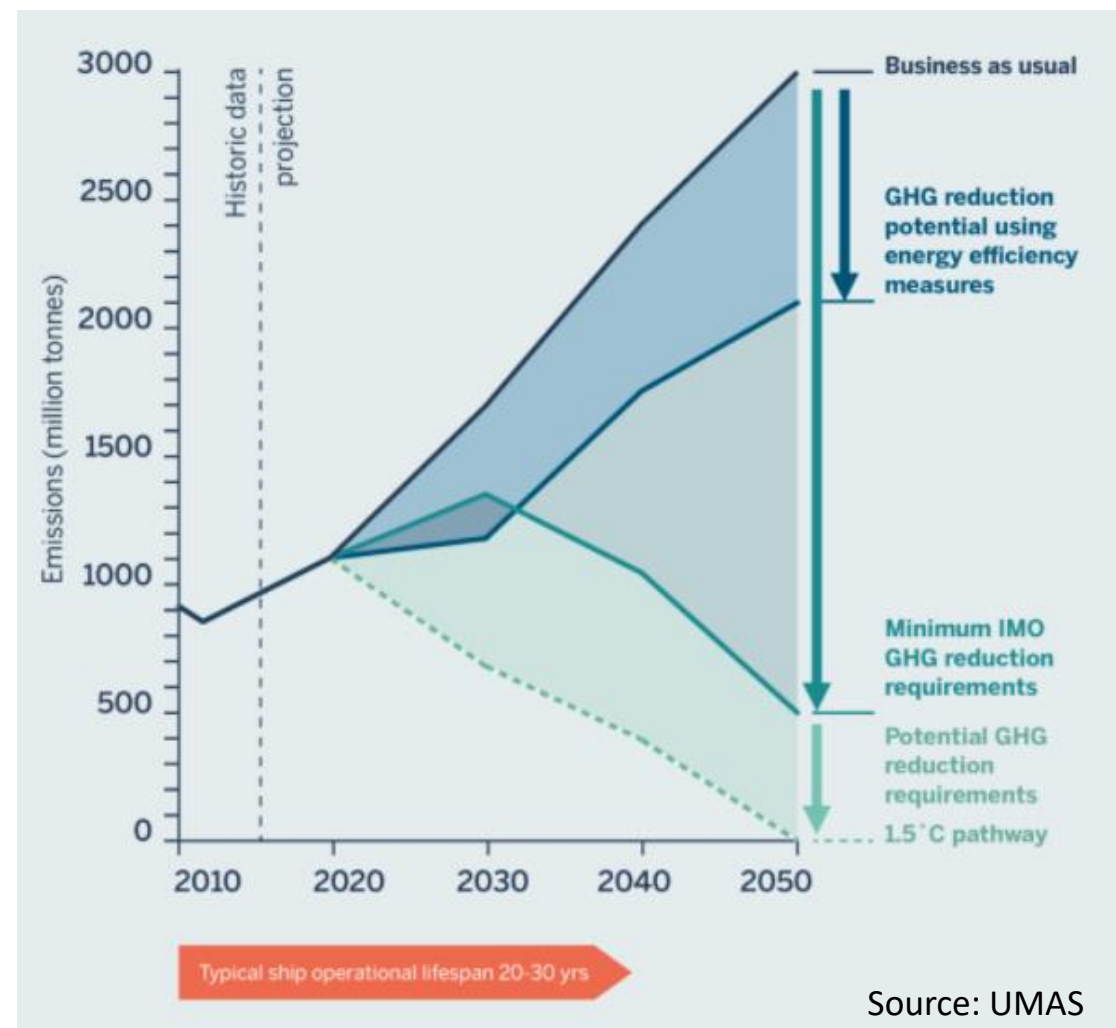
Note: Commercial ships of 100 gt and above. Beginning-of-year figures.

Laivojen ympäristövaikutukset



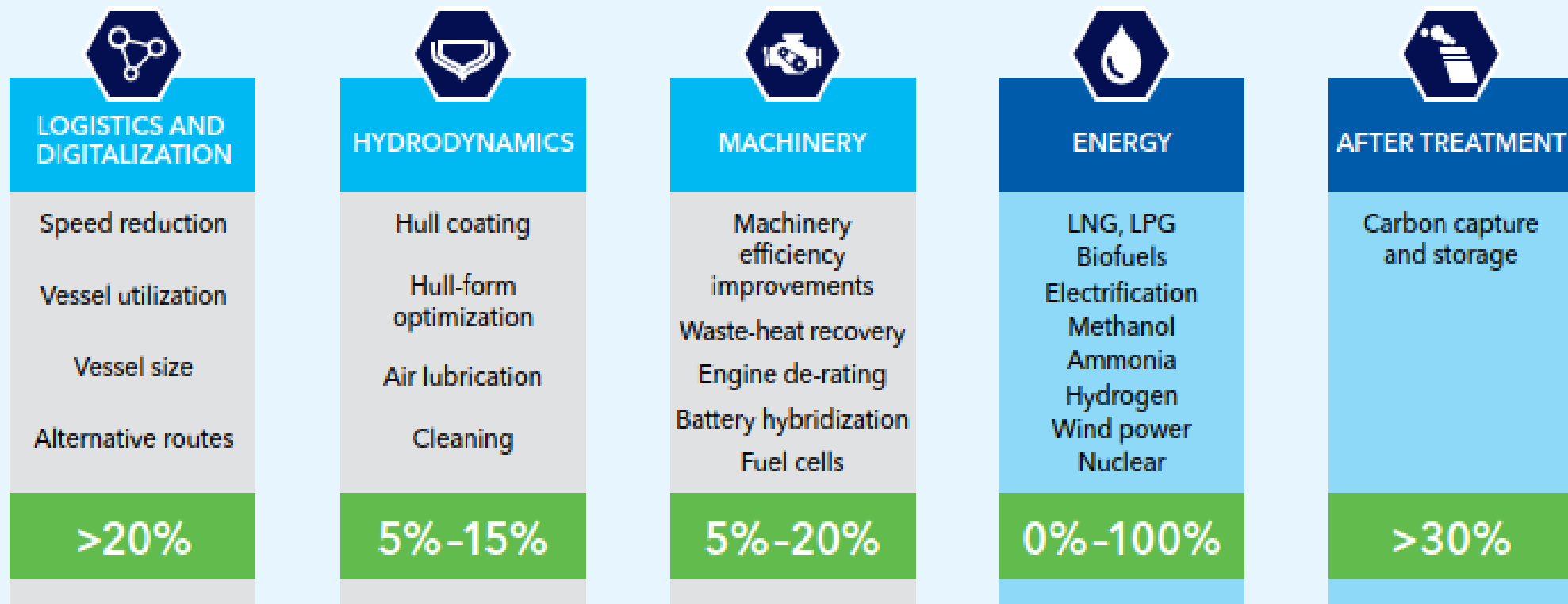
Laivojen kasvihuonepäästöt

**IMO:n Tavoite:
Kasvihuonekaasupäästöjen
puolittaminen vuoden
2008 tasosta vuoteen 2050
mennessä**



Kasvihuonepäästöt – miten vähentää laivoissa?

GHG emission-reduction potential of technologies that can contribute to shipping decarbonization



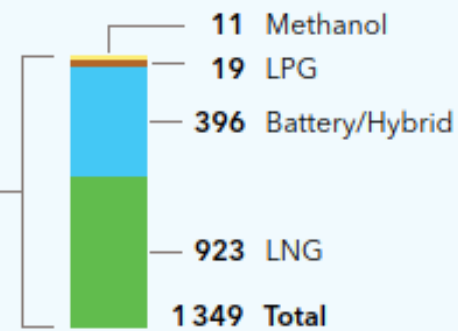
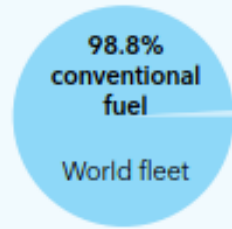
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Kauppalaiivaston tilanne tänään

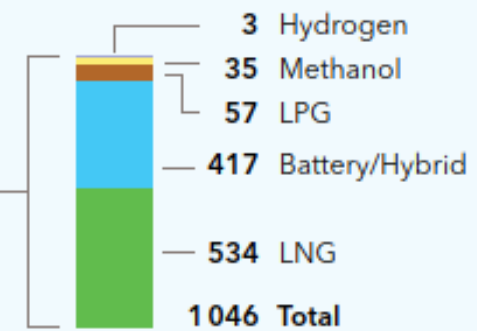
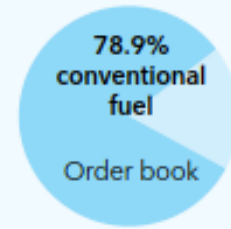
Alternative fuel uptake in the world fleet by number of ships and gross tonnage

NUMBER OF SHIPS

Ships in operation

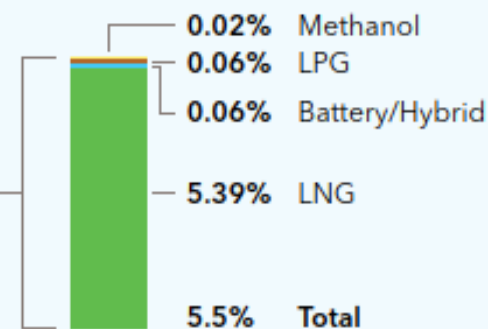
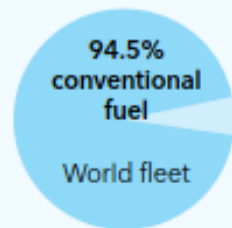


Ships on order

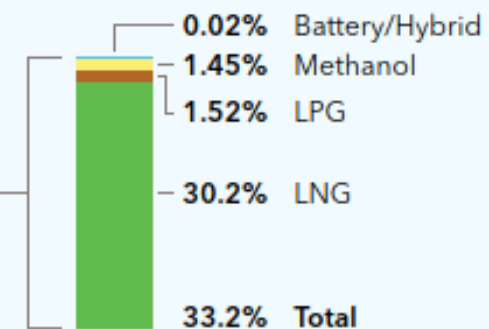
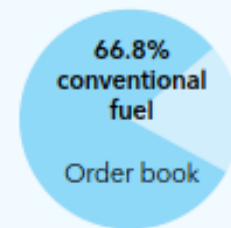


IN % OF GROSS TONNAGE

Ships in operation



Ships on order



Key: Liquefied natural gas (LNG); liquefied petroleum gas (LPG)

Sources: IHSMarkit (ihsmarkit.com) and DNV's Alternative Fuels Insights for the shipping industry - AFI platform (afi.dnv.com)

Vaihtoehtoiset polttoaineet – käytön edellytykset

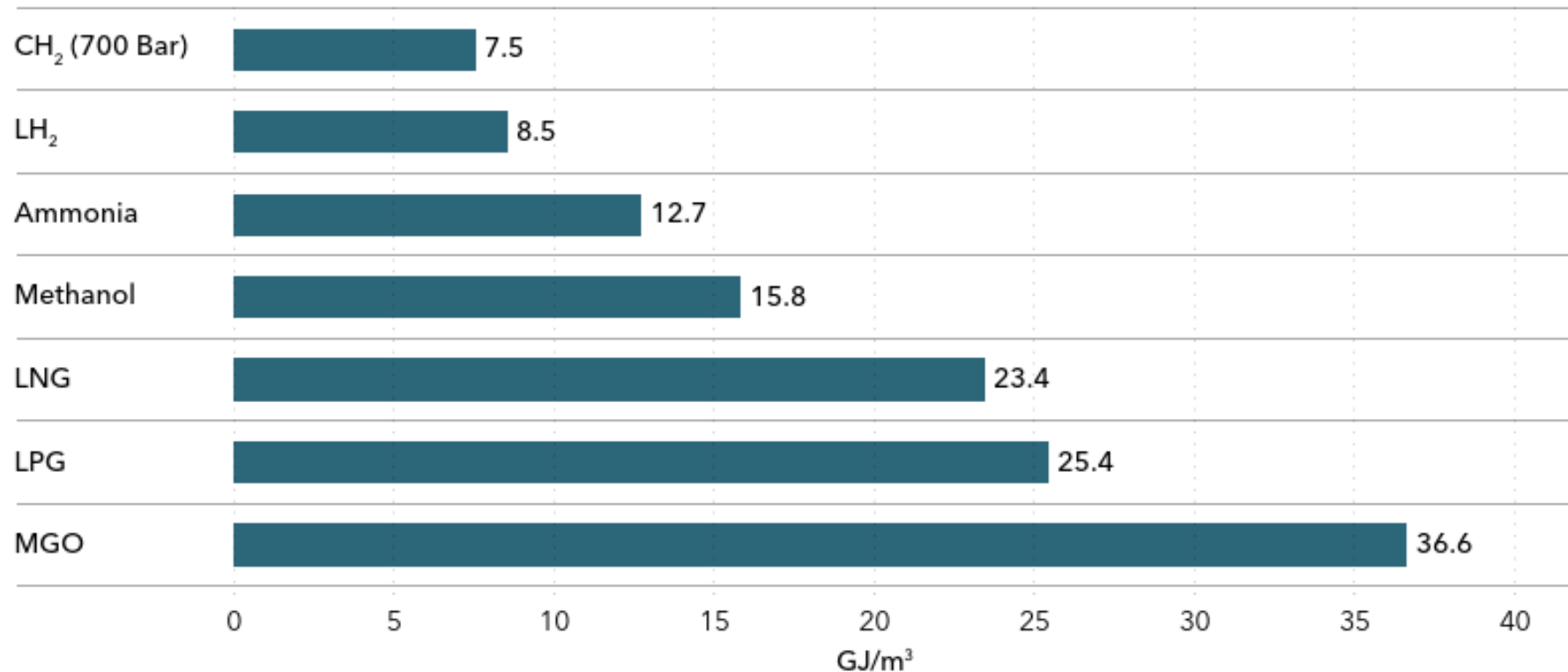
- Luotettava / uskottava teknologia
 - Säännöt ja lait – rakentamisen ja operoinnin turvallisuus
 - Standardit – liittymäpintojen toiminta (esim. tankkausyhteet)
 - Infrastruktuuri - tuotanto-jakelu-varastointi-tankkaus
 - Kaupallinen mielekkyys – investointi ja käyttö, saatavuus
-
- LNG -> LBG -> SNG OK!
 - Sähkö/akut (Hybridi) OK!
 - Vety, Ammoniakki, Metanoli, ??



Laivojen polttoaineet – energiatiheys

Volumetric energy density of alternative fuels

Units: Gigajoules per cubic metre (GJ/m³)



Key: Compressed hydrogen (CH₂); liquefied hydrogen (LH₂); liquefied natural gas (LNG); liquefied petroleum gas (LPG); marine gas oil (MGO)

Vaihtoehtoiset polttoaineet tulevat ...

Maersk secures green fuel supply for 12 methanol-powered boxships 10/03/2022



Maersk orders six methanol-prepared container ships 05/10/2022

CMA CGM orders its first methanol-powered containerships

06/06/2022



COSCO orders twelve methanol-fuelled 24,000 teu ships 31/10/2022

Merenkurkun lauttaliikenteen hiilijalanjäljen vähennys: AURORA BOTNIA



Aurora Botnia – design & operating aspects

- ❑ Tailored design for this particular route / operation requirements
- ❑ CLEAN (design) class notation
 - ✓ Requirements for minimization of harmful operational emissions to air and sea.
 - ✓ Additional design requirements for protection against accidents and for limiting their consequences
 - ✓ Requirements for operation: nominated environmental officer
 - ✓ Refrigerants and fire fighting substances non-ozone depleting
 - ✓ Holding tank capacities, distance to bottom and side, spill trays etc.
- ❑ RECYCLABLE class notation
 - ✓ Inventory of hazardous materials

Aurora Botnia – Technical solutions

- **Diesel Electric propulsion**
- **Azimuthing thruster units** (ABB Azipod) for high efficiency and maneuverability
- **Waste heat recovery** system in the exhaust gas and cooling water systems of the engines
- **Cold energy recovery** from the LNG system



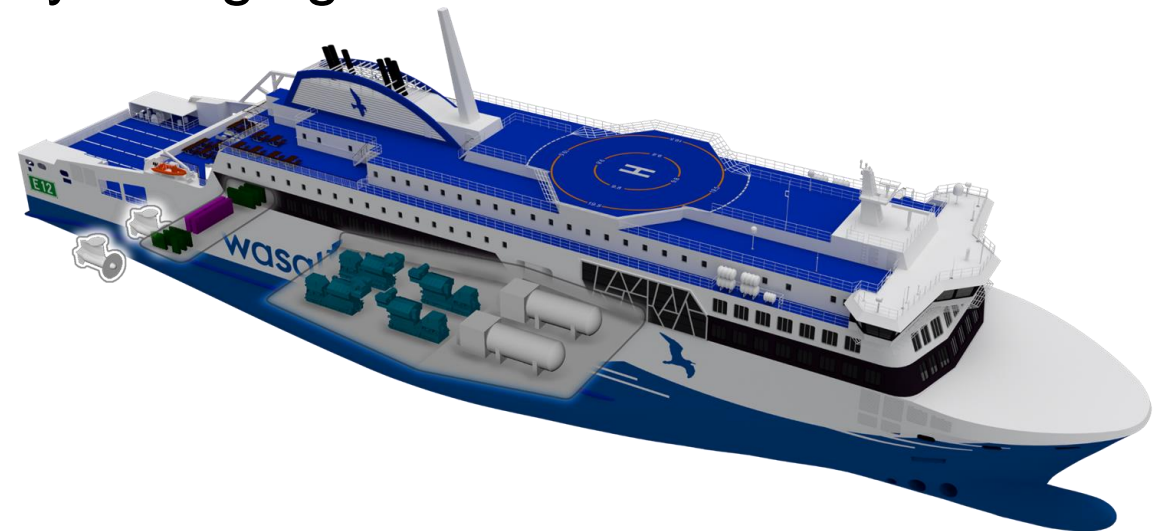
Aurora Botnia – technical solutions

- **LED lighting** throughout the ship
- **Energysaving mode** in cabins when not occupied (HVAC)
- Garbage and waste management, **recycling** level as high as reasonably practicable
- **Antifouling** applied only to limited areas, which are not cleared by ice during winter



Aurora Botnia – alternative fuels

- **LNG / Biogas / e-methane as main fuel**
- **Battery pack (2.2 MWh)** for zero emission operation at port proximity, peak power shaving and power boost during maneuvering or operations in ice
- **Shore connection** for electrical supply in ports
 - 2 MW capacity each side for battery charging and hotel load



Aurora Botnia / RMC NB 6002 for Wasa Line / Kvarken Link



“We were also able to reduce energy consumption by 21 percent per trip and our CO2 emissions by 19.6 percent. The strong financial result enables future investments to actions that benefit the environment. We are also on track to becoming climate neutral by 2030.”

Peter Ståhlberg, CEO, Wasaline, annual report 2022

MAIN DIMENSIONS

Loa	150.0 m
Lwl	137.8 m
Beam mld.	26.0 m
Draught, Design	6.10 m
Gross Tonnage, about	24,300
Deadweight, Design abt.	3,500 t
Max. persons onboard (LSA)	1,000

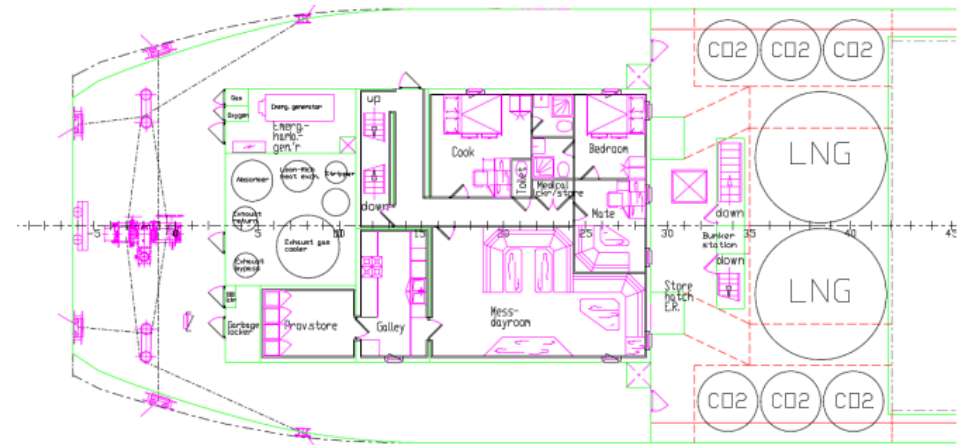
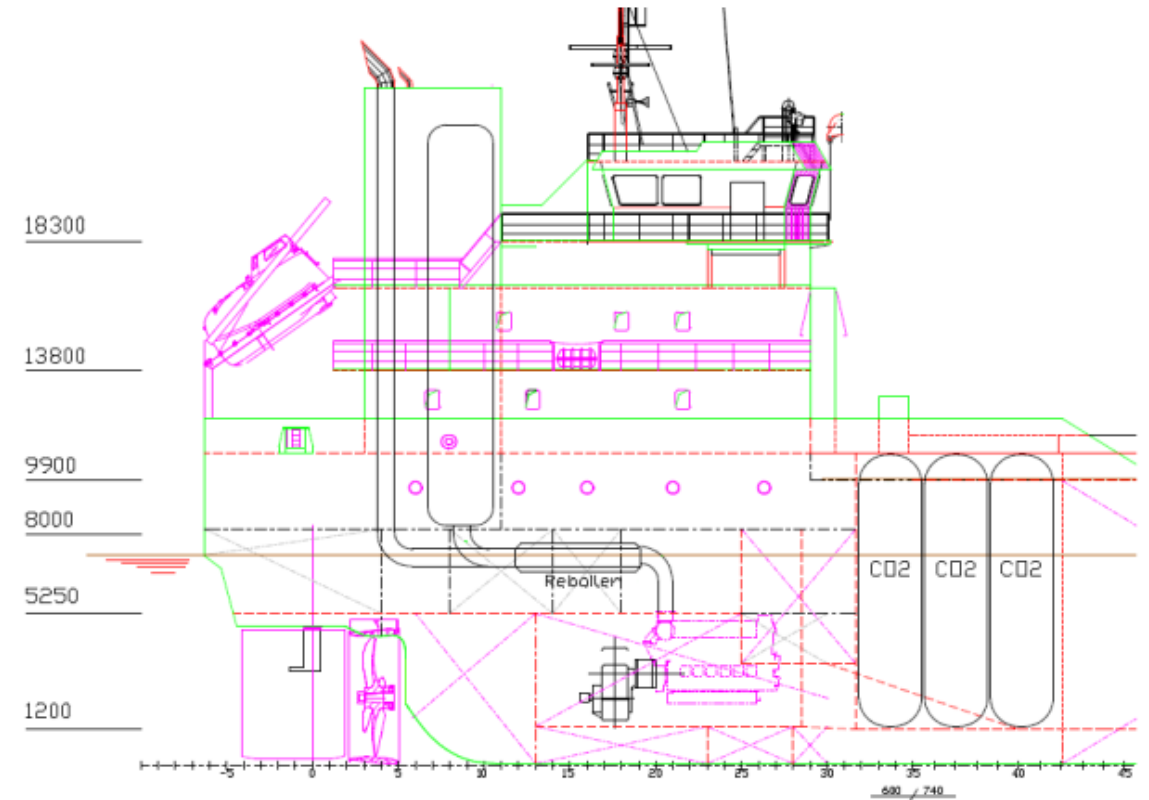
CAPACITIES

Passengers	800 pax
Lane metres	1,500 m
Cabins	68
Speed	20 kn
Public area decks	2
Route	Vasa – Umeå

... from zero carbon to carbon sink...CCS

L _{oa}	119.4 m
L _{wl}	118.5 m
B	16 m
D	9.9 m
T	7.3 m
DWT	8000 tonnes
Design speed	13 knots
Main engine	3000 kW
LNG capacity	300 m ³ , 135 tonnes

TABLE 4.1 MAIN PARTICULARS OF THE REFERENCE VESSEL



Source: MSc study / J.T.van der Akker / TU Delft

Kiitos!

