This is Wärtsilä

Shaping the decarbonisation of marine and energy

190 years of innovation

1834

Our story begins when a sawmill is established in a Finnish village, Värtsilä.

1950s

Our first marine engines.

1970s

The first-ever 4-stroke engine operating on heavy fuel oil.

We enter the energy sector.

1995

Our pioneering dual-fuel engine can switch between fuels during operation.

2012

World's first hybrid system on-board a vessel.

2015

Guinness World Records names Wärtsilä 31 as the most efficient 4-stroke diesel engine in the world.

First engines of a customer are converted to run on methanol.

2022

Our first newbuild methanol engines.

2023

As we stand among TIME's 100 most influential companies, our story continues with world's firsts:

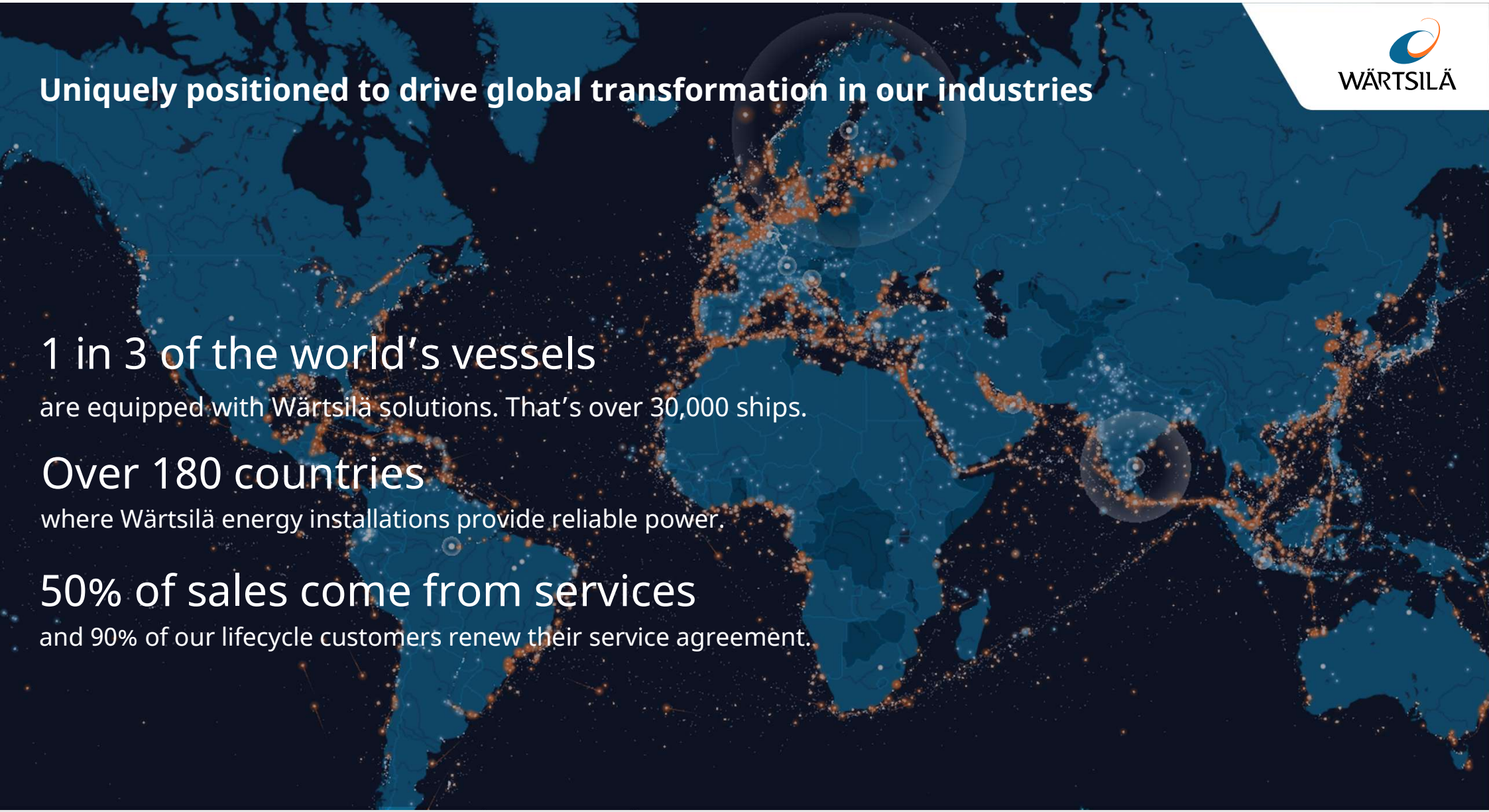
- 4-stroke engine-based ammonia solution for marine.
- Wärtsilä engine runs on 25 vol% hydrogen blend.

Our purpose

Enabling sustainable societies through innovation in technology and services

We are shaping the green transition in marine and energy with our advanced technologies, expertise in sustainable fuels and lifecycle service offering.

Uniquely positioned to drive global transformation in our industries



1 in 3 of the world’s vessels

are equipped with Wärtsilä solutions. That’s over 30,000 ships.

Over 180 countries

where Wärtsilä energy installations provide reliable power.

50% of sales come from services

and 90% of our lifecycle customers renew their service agreement.

A global team of experts fuelling change since 1834

17,800
people

280+
locations

130
nationalities

79
countries

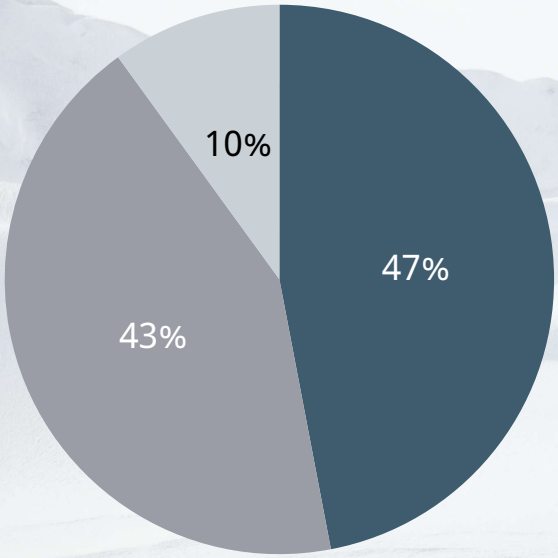
6,015
net sales, MEUR

52%
service sales of total

Figures from 2023

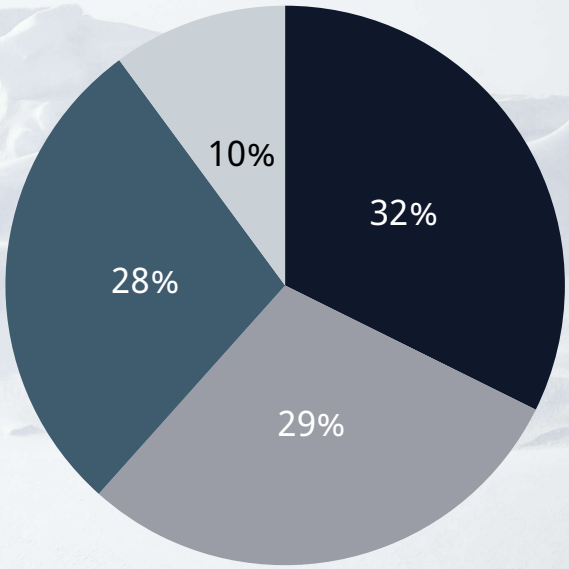
Sales by businesses and geographical areas in 2023

6,015 MEUR net sales per business



Wärtsilä Marine Wärtsilä Energy Other

Geographical net sales



Europe Americas Asia Other

52% of our net sales came from services.

Our decarbonisation targets for 2030

- Provide a product portfolio which will be ready for zero-carbon fuels
- Become carbon neutral in our own operations

Håkan Agnevall,
President & CEO

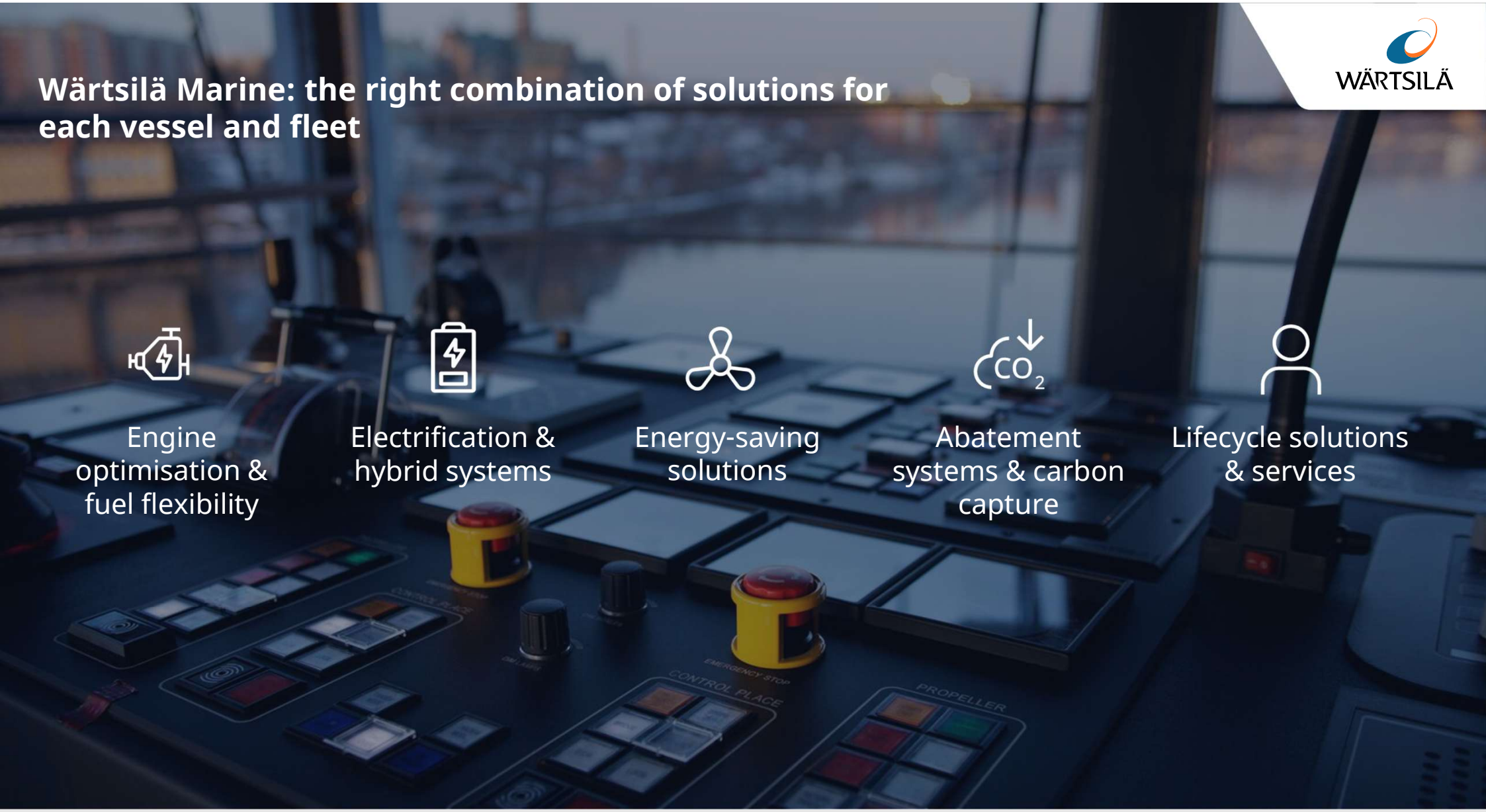
The decarbonisation of marine and energy industries is accelerating

Decarbonising the marine ecosystem requires collaboration and connectivity

- Fuel distributors
- Fuel producers
- OEMs
- Ports
- Regulators
- Shipyards
- Ship financing
- Ship operators
- Ship owners

Our solutions and know-how enabling the transition

Wärtsilä Marine: the right combination of solutions for each vessel and fleet



Engine optimisation & fuel flexibility

Electrification & hybrid systems

Energy-saving solutions

Abatement systems & carbon capture

Lifecycle solutions & services

Bio LNG

or Synthetic methane

MeOH

Green Methanol

EtOH

Green Ethanol

An Ethanol engine is being investigated.
Ethanol has been tested in Q1 of 2024.

Verified: 2024
Volume ramp-up:
Non-pressurised tanks.
Local (NOx) and GHG emissions

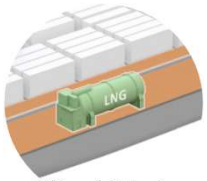
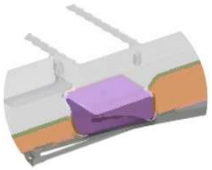
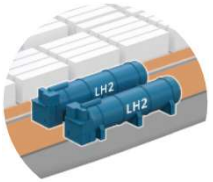
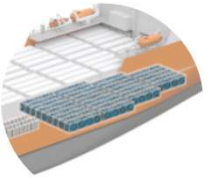
NH_3

Green Ammonia

H_2

Green Hydrogen

Marine Fuels Today and in the Future

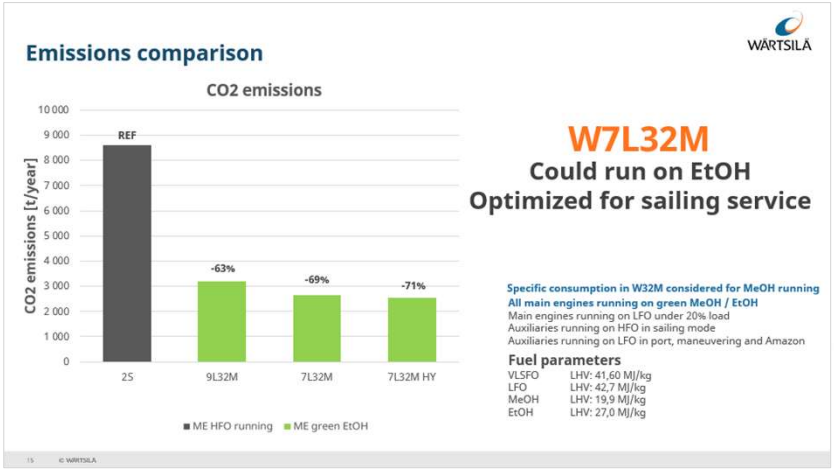
Fuel type	 **Low Sulphur Fuel Oil** @ 20°C	 **Liquified Natural Gas** @ -162°C	 **Ethanol** @ 20°C	 **Methanol** @ 20°C	 **Ammonia** @ -33°C	 **Liquid Hydrogen** @ -253°C	 **Compressed Hydrogen** @350bar
Key considerations	▪ Standard tank arrangement	▪ Cryogenic system	▪ Lower toxicity compared to methanol ▪ Flexible tank arrangement	▪ Mildly toxic ▪ Flexible tank arrangement	▪ Toxic ▪ Corrosive	▪ Highly flammable ▪ Cryogenic system	▪ High pressure ▪ Multiple tanks arrangement ▪ Highly flammable
Regulation readiness	✓	✓	✓	✓	✗	✗	✗
Volumetric energy equivalent	1x	1,6x	1.7x	2.3x	2,9x	4.3x	11.7x
Tank hold space compartment volume	1x	1.7x – 2.4x *)	1.3x	1.7x	3.9x	7.3x	19.5X

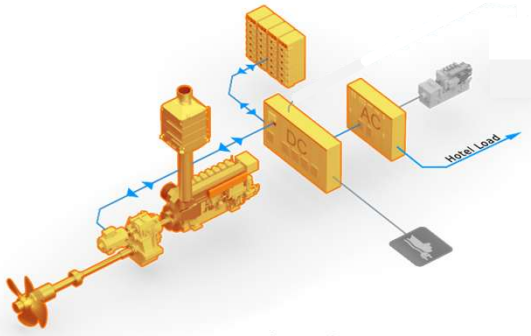
Gross tank estimations based on Wärtsilä experience considering inspection spaces needed around the tanks. Cylindrical tanks only considered for LNG, if stored in prismatic tank then LNG gross tank size factor is better for LNG than for methanol.
*) 1.7x membrane tanks, 2.4x type C tanks

Tankers to Transpetro

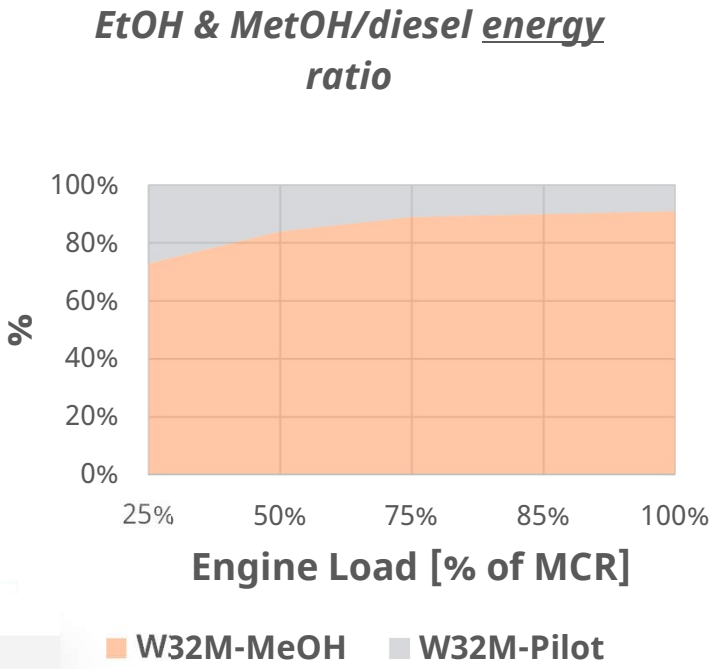
Decarbonization Scenario

It is possible to combine Biodiesel and Ethanol – high impact on GHG Emissions

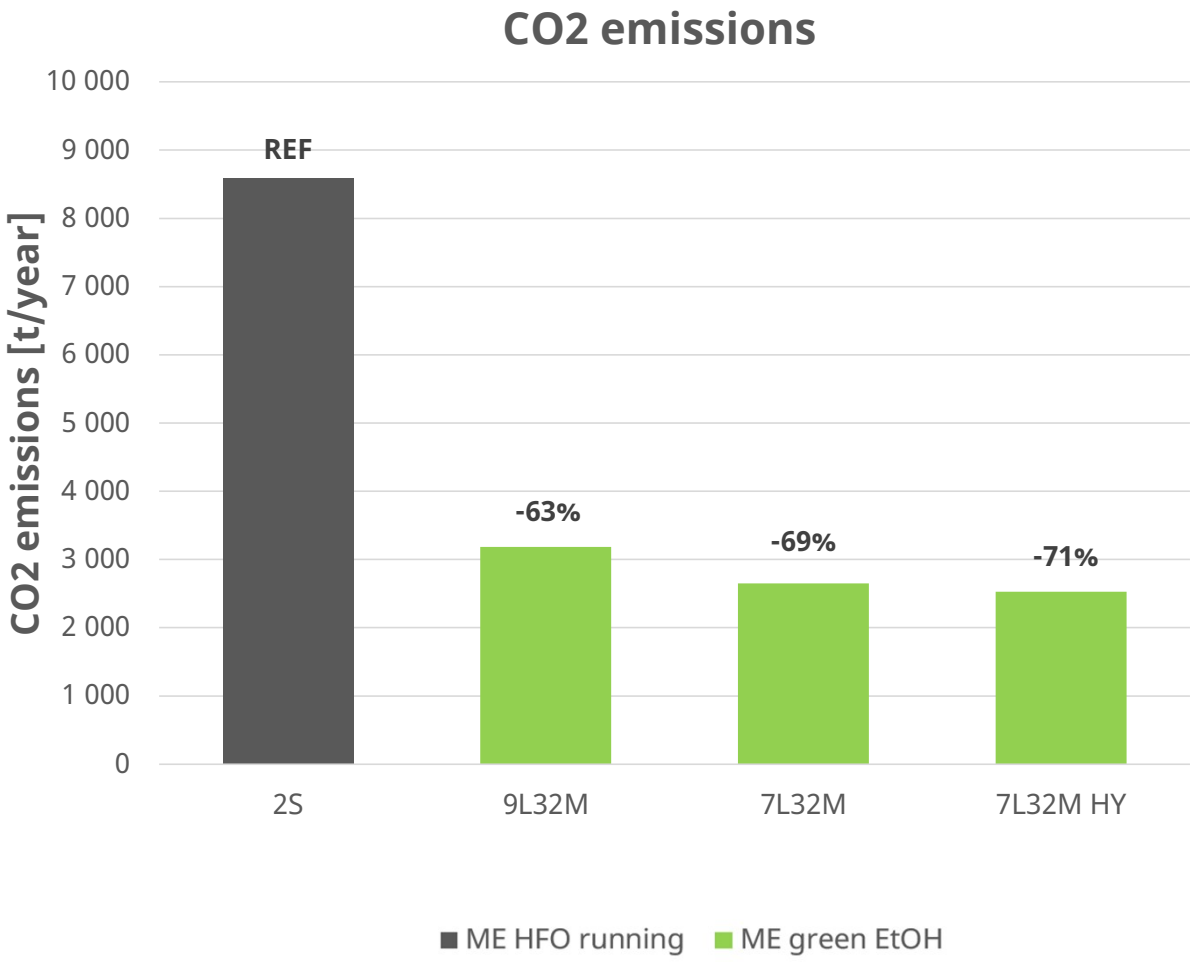




Hybrid



Emissions comparison



W7L32M
Could run on EtOH
Optimized for sailing service

Specific consumption in W32M considered for MeOH running

All main engines running on green MeOH / EtOH

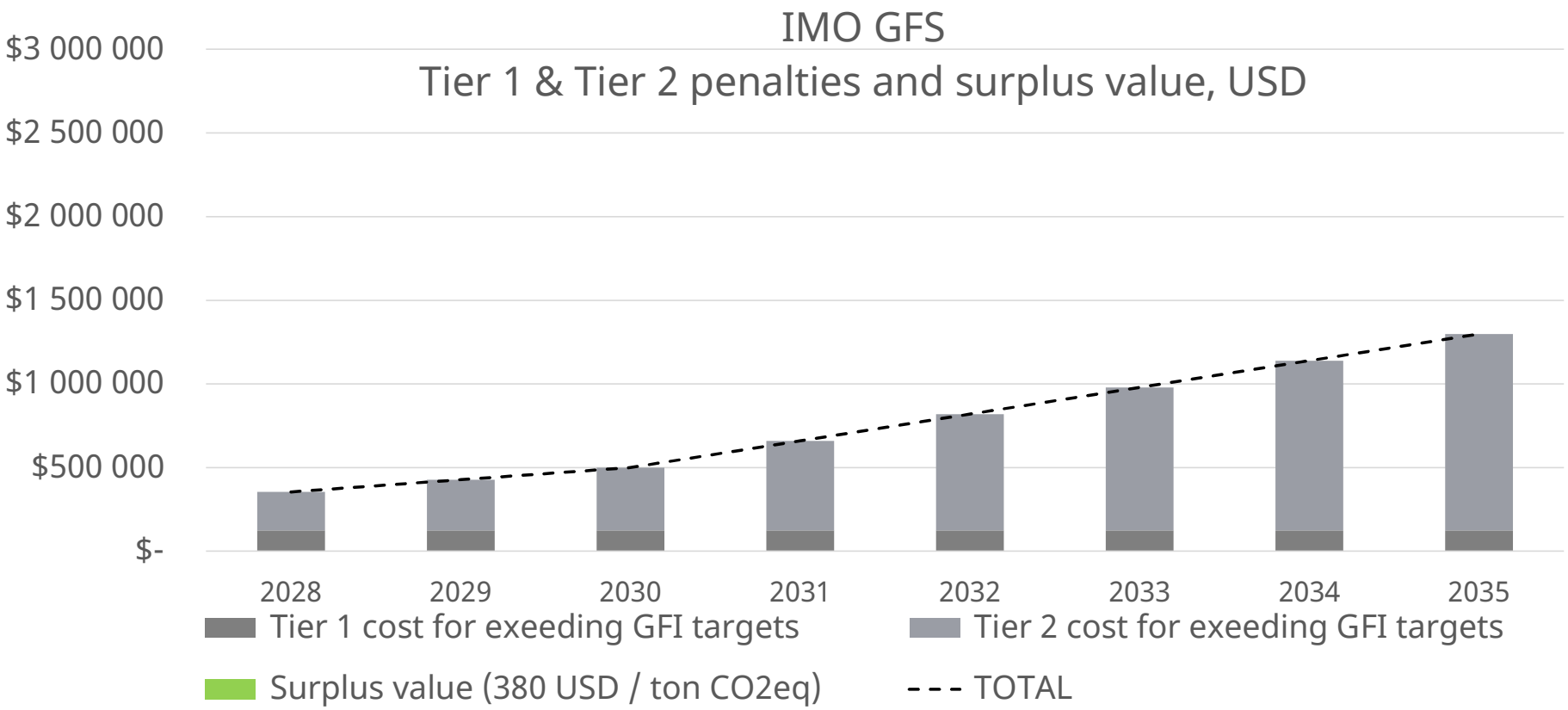
Main engines running on LFO under 20% load
Auxiliaries running on HFO in sailing mode
Auxiliaries running on LFO in port, maneuvering and Amazon

Fuel parameters

VLSFO	LHV: 41,60 MJ/kg
LFO	LHV: 42,7 MJ/kg
MeOH	LHV: 19,9 MJ/kg
EtOH	LHV: 27,0 MJ/kg

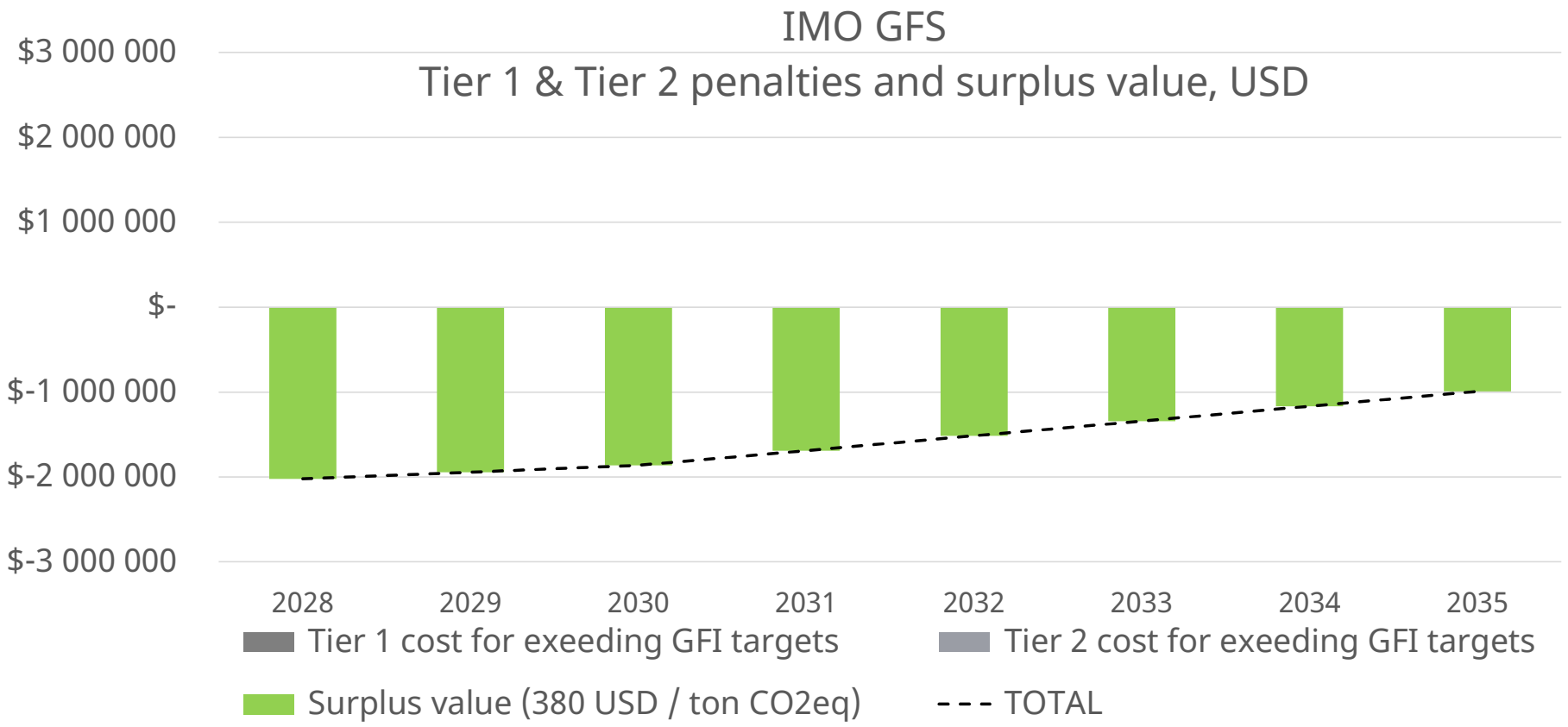
Estimated IMO annual GFS impacts

2-Stroke Engine runnning on HFO



Estimated IMO annual GFS impacts

4 Stroke W8L32 with EtOH



Estimated IMO annual GFS impacts

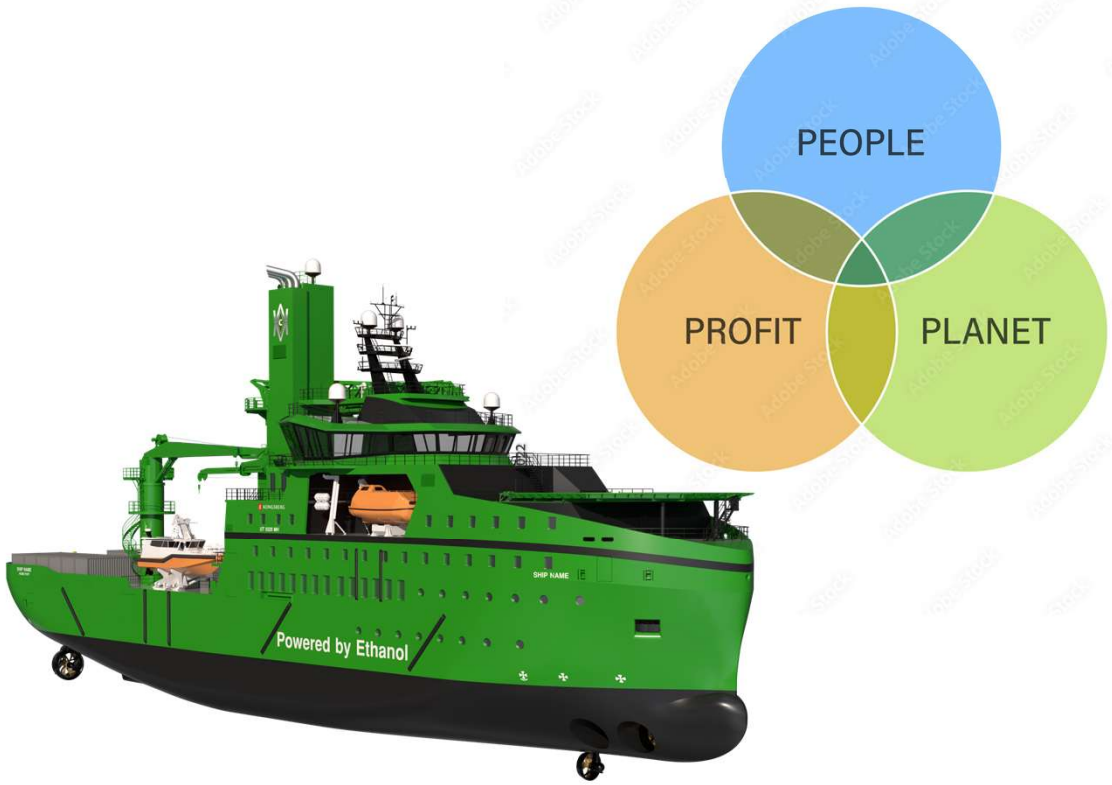
W8L32 with EtOH:

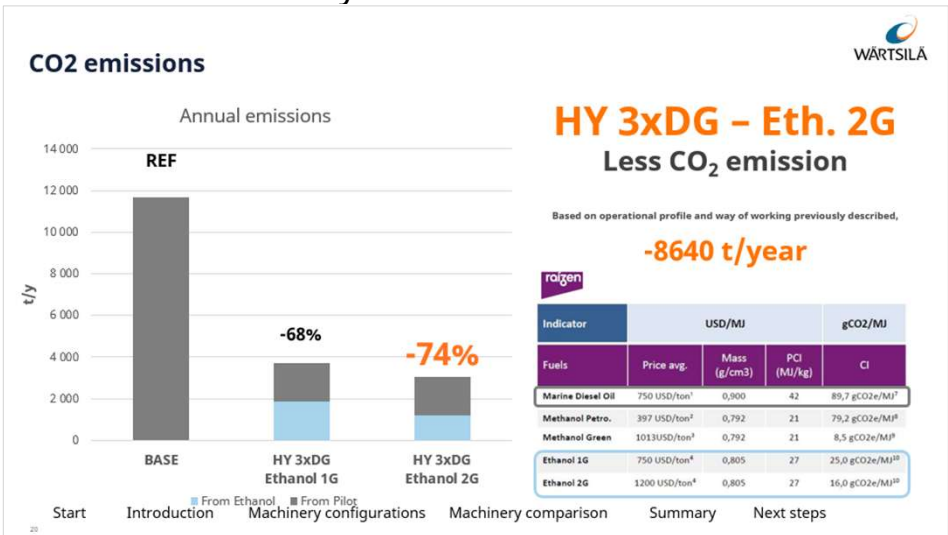
On average 2,3 M€ / year saving potential in IMO GHG costs due to surplus / banking vs. 2-Stroke with HFO

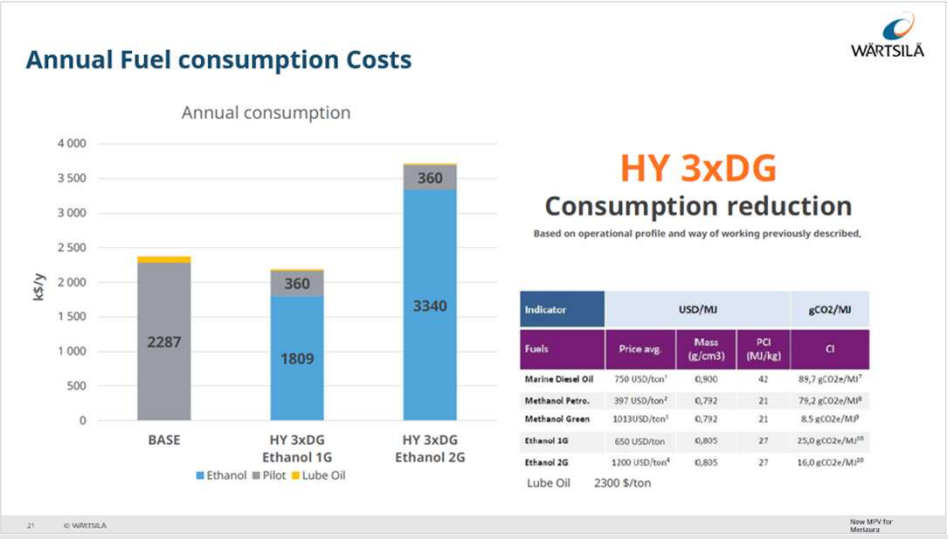
(Assumed 100% time operating in an area where IMO GHG rules apply)

New OSV Program

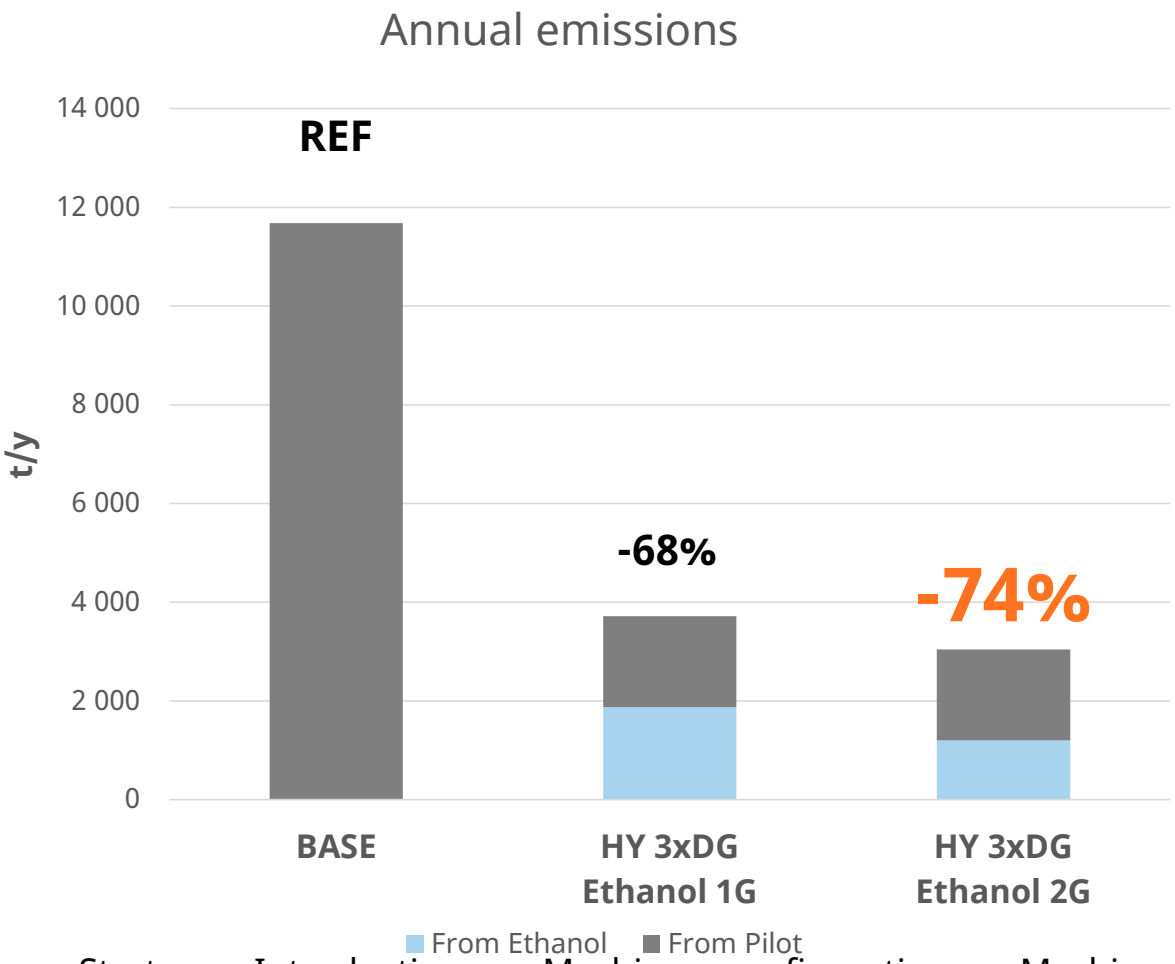
Growing Demand on OSV's in Brazil – Wartsila and CMM sign a MOU for new vessels Powered by Ethanol
It is possible to combine Biodiesel and Ethanol – high impact on GHG Emissions







CO2 emissions



HY 3xDG – Eth. 2G

Less CO_2 emission

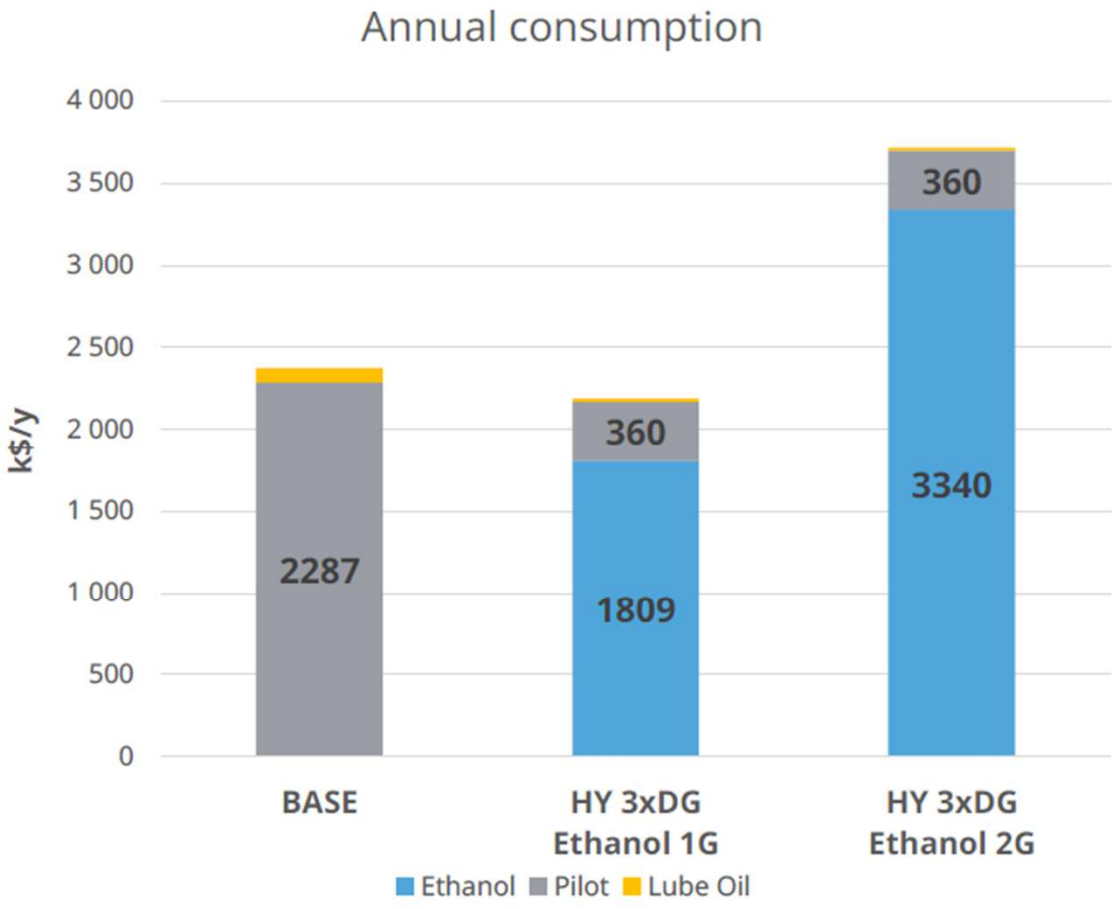
Based on operational profile and way of working previously described,

-8640 t/year

raizen

Indicator	USD/MJ			gCO2/MJ
Fuels	Price avg.	Mass (g/cm3)	PCI (MJ/kg)	CI
Marine Diesel Oil	750 USD/ton[1]	0,900	42	89,7 gCO2e/MJ[7]
Methanol Petro.	397 USD/ton[2]	0,792	21	79,2 gCO2e/MJ[8]
Methanol Green	1013USD/ton[3]	0,792	21	8,5 gCO2e/MJ[9]
Ethanol 1G	750 USD/ton[4]	0,805	27	25,0 gCO2e/MJ[10]
Ethanol 2G	1200 USD/ton[4]	0,805	27	16,0 gCO2e/MJ[10]

Annual Fuel consumption Costs



HY 3xDG

Consumption reduction

Based on operational profile and way of working previously described,

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Methanol Green	1013USD/ton[3]	0,792	21	8,5 gCO2e/MJ[9]
Ethanol 1G	650 USD/ton	0,805	27	25,0 gCO2e/MJ[10]
Ethanol 2G	1200 USD/ton[4]	0,805	27	16,0 gCO2e/MJ[10]

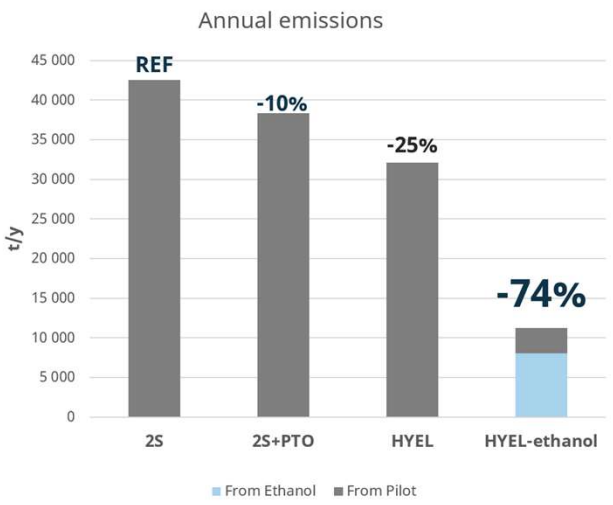
Lube Oil 2300 $/ton

Shuttle Tankers

Decarbonization Scenario

It is possible to combine Biodiesel and Ethanol – high impact on GHG Emissions

CO2 emissions



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HYEL– Eth. 1G

Less CO_2 emission

Based on operational profile and way of working previously described,

-31300 t/year

raizen

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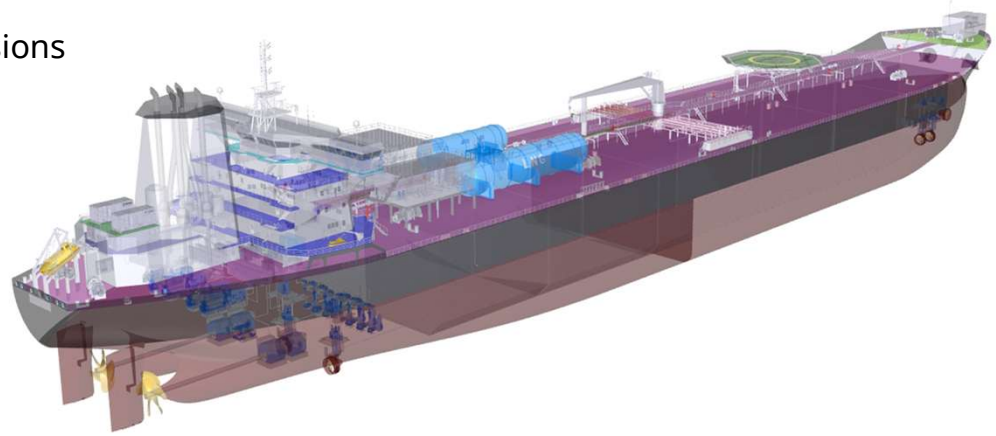

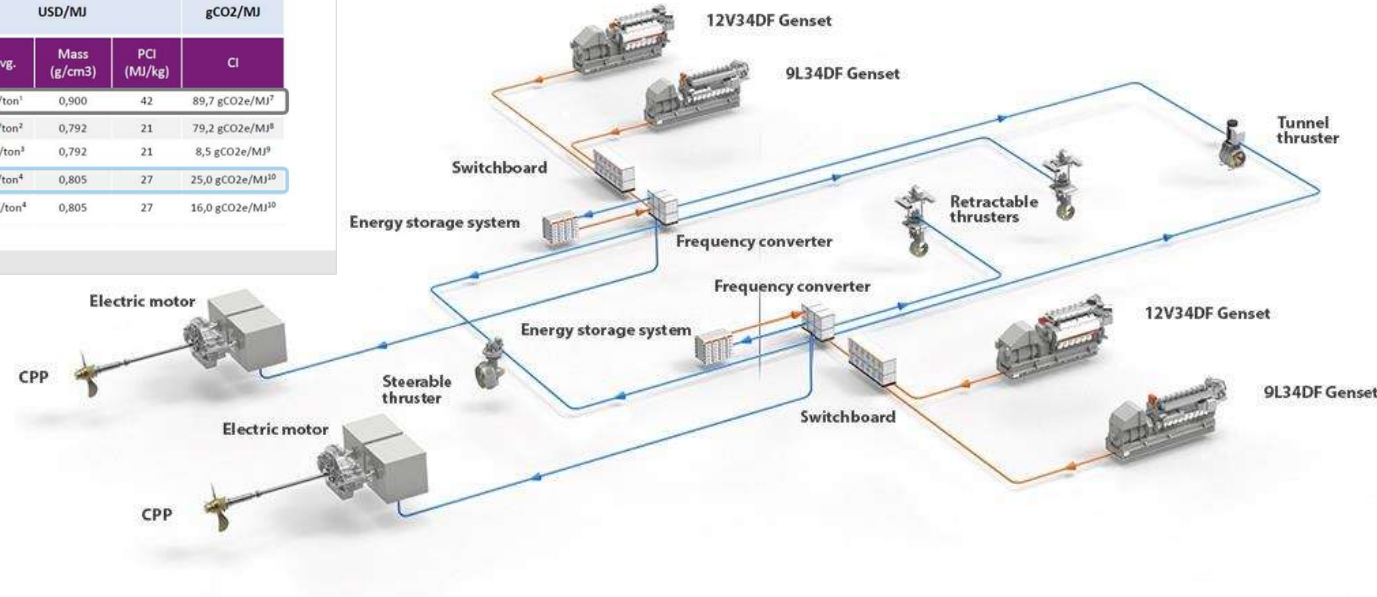

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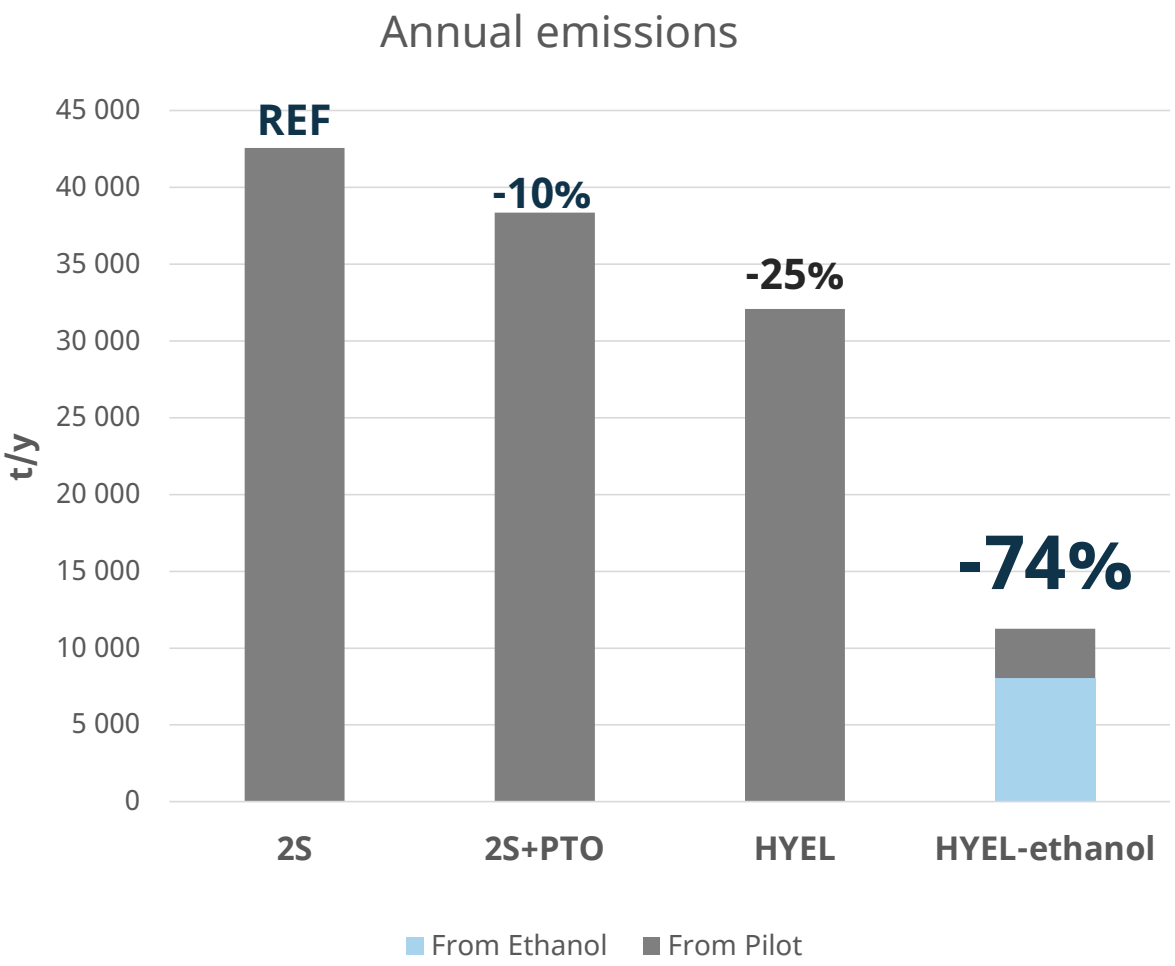

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