

# Future fuels for marine – the path to decarbonization

Kaj Portin, Wärtsilä

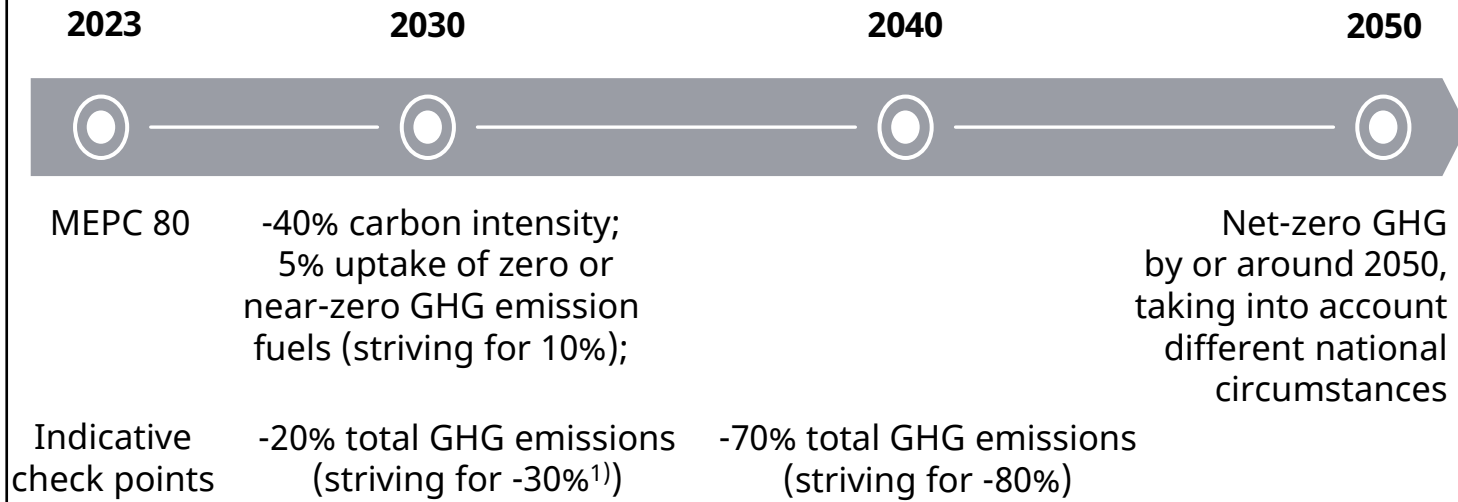
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# 2023 IMO GHG Strategy to reduce GHG emissions to net-zero, by or around 2050

## Initial GHG strategy (2018)



## Revised GHG strategy (2023)



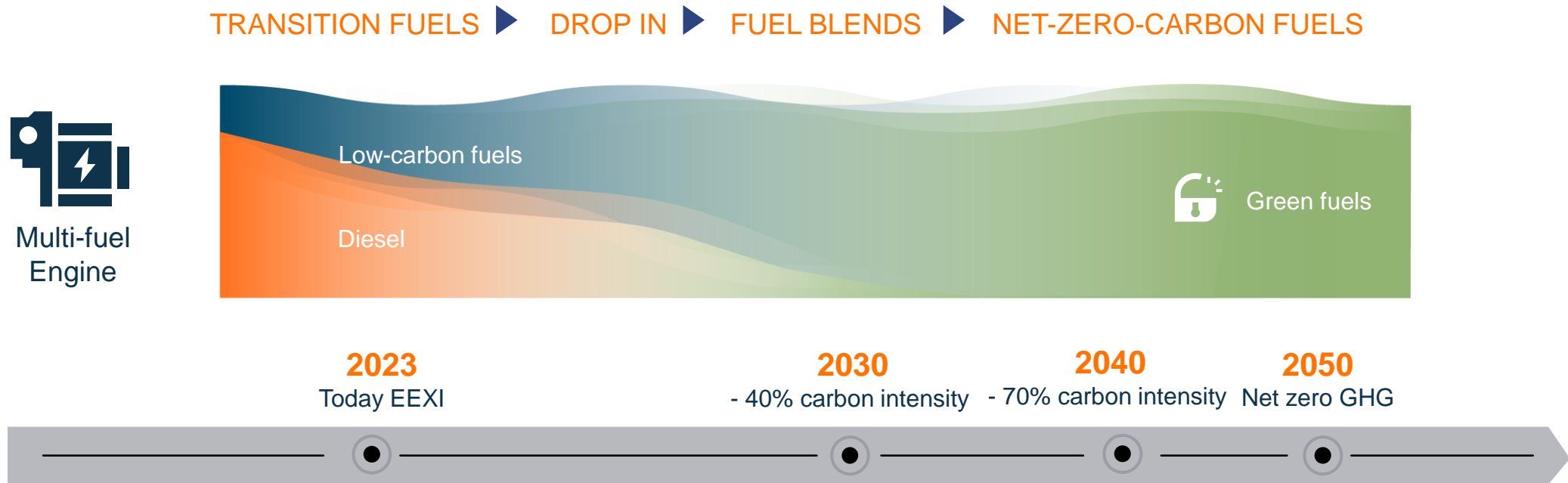
Reduction figures are compared to 2008;

## Key takeaways

- IMO MEPC 80 adopted a **revised 2023 IMO GHG Strategy** July 7<sup>th</sup> 2023.
- Milestones of the new strategy support the Vision to phase out GHG emissions as soon as possible.
- A basket of **mid-term technical and economical measures** should be agreed by 2025 and entry into force 2027. Measures should take into account well-to-wake GHG emissions.
  - Technical element = goal based marine fuel standard regulating the reduction of fuels GHG intensity
  - Economic element = GHG emissions pricing mechanism
- Less ambitious countries have strongly emphasized “a just and equitable transition”, and strategy includes e.g. set of guiding principles to note the different national circumstances, and emphasizes impact assessment and evidence-based decision-making
- The strategy will be subject to a 5-year review period, first due in 2028.
- some still see it as **insufficiently ambitious**: the deal is not aligned with 1.5°C goal, and the “taking into account different national circumstances” linked to the 2050 target leaves room for developing countries to move at slower pace.

# Certainty in transition

Infrastructure and availability of green fuels need time to mature - current Wärtsilä multi-fuel Wärtsilä multi-fuel technology offer a viable upgrade path



# Fuel Roadmap – Focus on Renewable Fuels

2020

2030

2040

2050

Natural gas

Bio gas (bio-methane)

Synthetic gas (e-methane)

MDO/HFO

Bio fuel

Synthetic liquid fuel

green Hydrogen

green Ammonia

green Alcohols (methanol, ethanol...)

# Marine Power Product Development - Methanol

## Current Status

### Technology Development

Developing combustion technologies, fuel systems, automation systems and safety features to operate on future fuels

### Product Development

W32 Methanol engine now available to market and scheduled for delivery in 2023

## Current Plan

### Product Development

Applying technologies to specific product types

### Roadmap of Development<sup>1)</sup>

Indicated product timelines remain subject to change

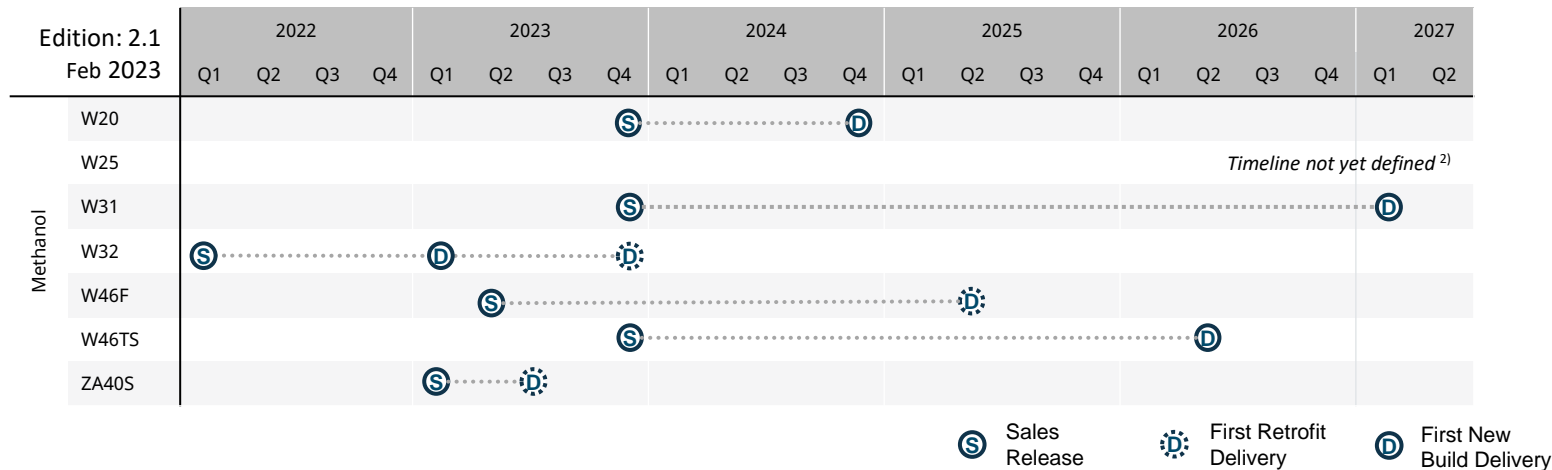
## Ambition

### Industrialised Solution

Decarbonise the marine industry with portfolio of engines running on future fuel applications

### At Which Time

Methanol is available with supporting infrastructure to meet customer demand and these fuels are economically viable



1) Disclaimer: Subject to sufficient technology progression and quality, while ensuring maximum safety in these developments, the following indications in development have been made. It should be noted that both engine model and timeline remain subject to change based on market demand and other influencing factors.

2) The W25 Methanol timeline is not yet defined. Tentative plans indicate a sales release may occur not earlier than 2027

# Marine Power Product Development - Ammonia

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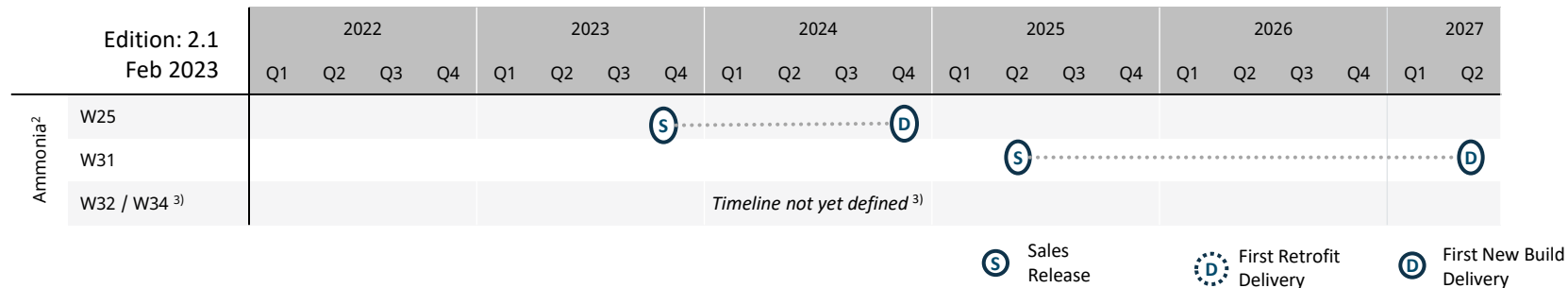
Current indications predict first Ammonia engine available for delivery as early as 2024

## Roadmap of Development<sup>1)</sup>

Indicated product timelines remain subject to change

## At Which Time

Ammonia is available with supporting infrastructure to meet customer demand and these fuels are economically viable



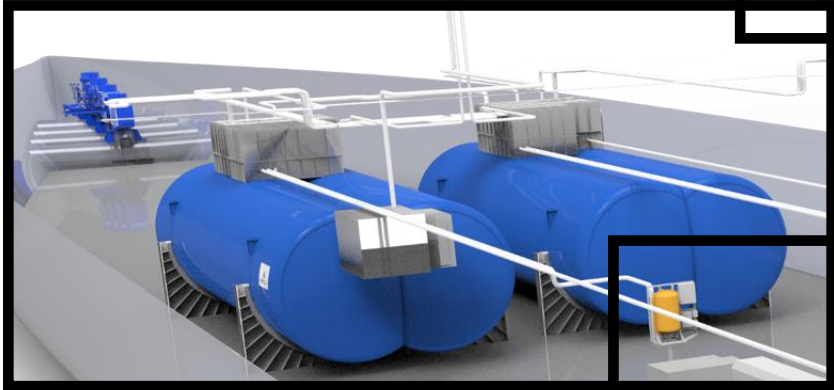
1) Disclaimer: Subject to sufficient technology progression and quality, while ensuring maximum safety in these developments, the following indications in development have been made. It should be noted that both engine model and timeline remain subject to change based on market demand and other influencing factors.

2) 40-60% blend based on fuel volume

3) Retrofit package is under planning. Sales release and first delivery dates are dependent on results from on-going technology tests. Tentative plans indicate a sales release not earlier than 2024.

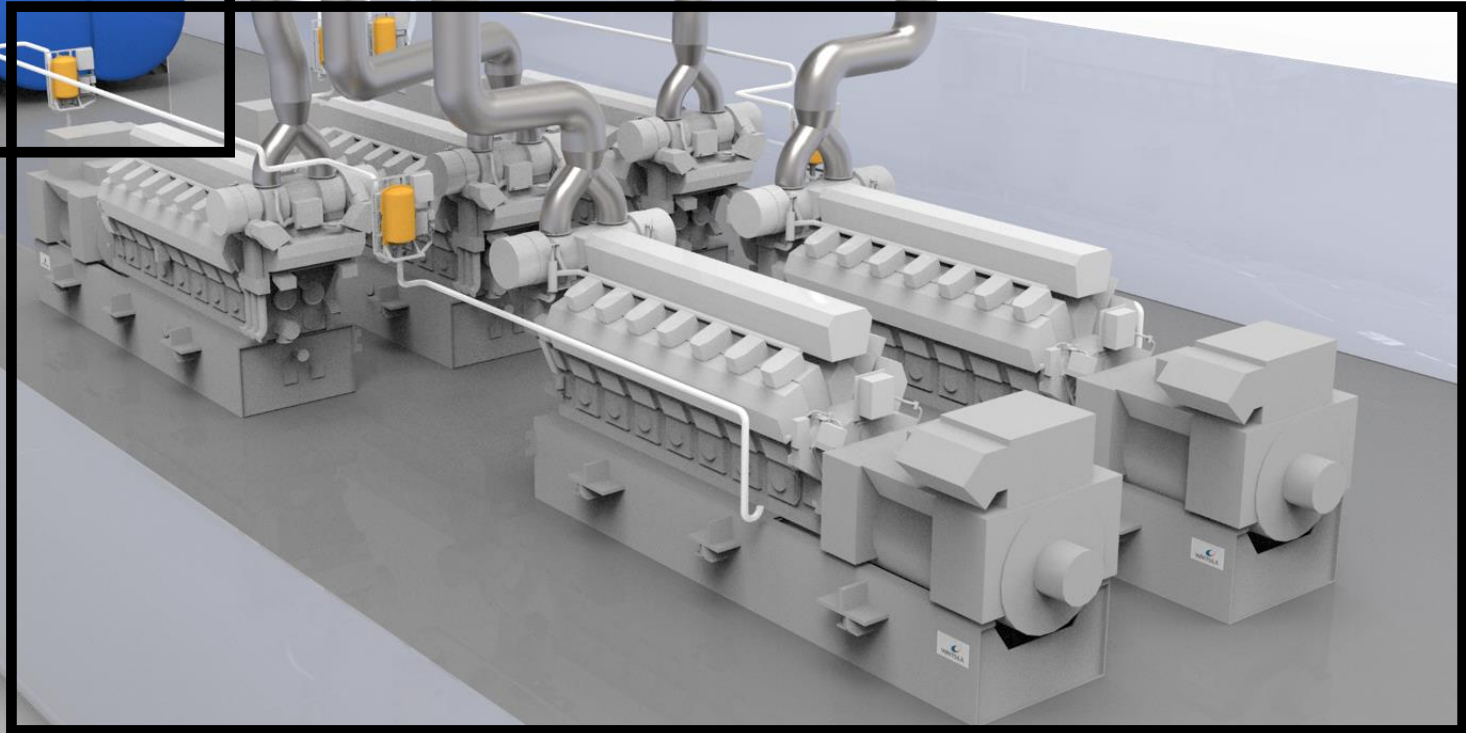
# The ship power solution

Fuel supply system



Aftertreatment system

Engine system



## Wärtsilä & US partners succeed with world's first-of-its-kind power plant fuel tests using blended hydrogen

Wärtsilä Corporation, News 8 November 2022 at 13:00 UTC+2



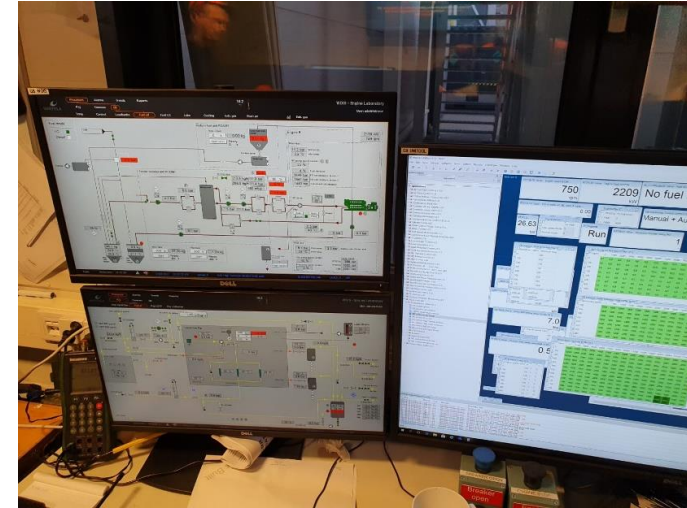
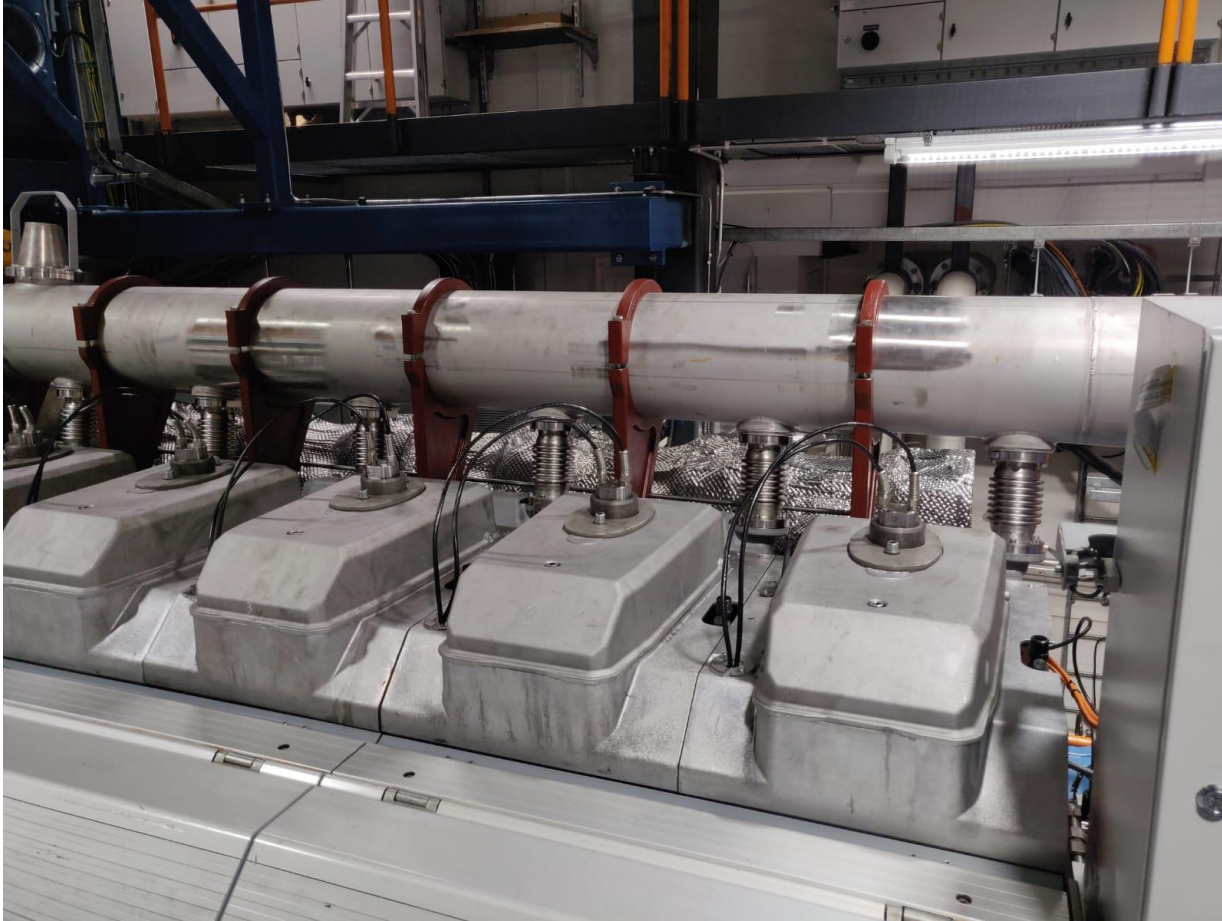
The testing of hydrogen blended fuel carried out by the technology group Wärtsilä in collaboration with WEC Energy Group, EPRI and Burns & McDonnell has been concluded. The tests were made at WEC Energy Group's 55 MW A.J. Mihm power plant in Michigan, USA using an unmodified 18 MW Wärtsilä 50SG engine. The hydrogen and hydrogen blending skid was provided by Certarus Ltd. The tests were completed in October 2022.



# Hydrogen



# Ammonia engine testing - 30 June 2021



# Demo 2000 – Ammonia demonstration project at Stord

## Partners



SUSTAINABLE ENERGY | NORWEGIAN CATAPULT CENTRE

 Forskningsrådet

 **REPSOL**

 Knutsen OAS Shipping

equinor 

  
WÄRTSILÄ

2020 - 2023

## Ammonia safety

- Master's Thesis by Laura Sariola in 2020 on engine, fuel system and engine room setup
- System approved by TUKES ( Finnish authority) in June 2021
- Cooperation with Marine classification societies for Ammonia rules
- Verification of the robustness and functionality of the safety systems
- Personal Protection Equipment definition.



## M/V Stena Germanica Methanol conversion

- Conversion of the ro-pax ferry owned by Stena Line in 2015
- 4 x main engines converted for the methanol combustion



## First Wärtsilä 32 Methanol order

- Owner: Van Oord
- 5 x W32 Methanol main gensets
- Delivery of equipment Q2 2023

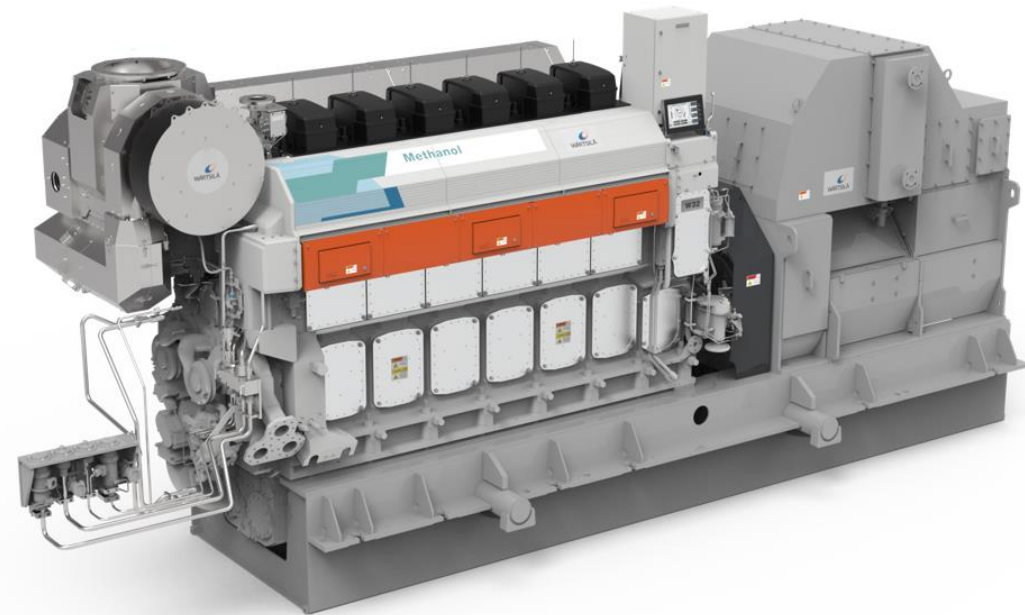


Van Oord   
Marine Ingenuity

Wärtsilä 32 Methanol - the power to reach carbon-neutral

## W32 Methanol available in March 2023 ExW

- Based on proven and reliable W32 engine concept
  - Experience from earlier W32GD engine design, and Sulzer ZA40 methanol
- Back up fuel operation possible (LFO + LBF, HFO)
  - Fuel switch (Methanol ↔ Liquid) can be made without loss of power
- Auxiliary engine (AE), Diesel electric engine (DE) and Variable speed Main Engine
- Variable speed Main Engine October 2023 Exw



# Summary

- Decarbonising of the marine sector is urgent and requires a wide range of measures
- A successful development requires expertise and actions from many contributors
- Wärtsilä's portfolio provides several solutions towards a net-zero future
- Fuel flexibility secures a future proofed solution
- Concepts for ICE operation on the future fuels like Ammonia, Hydrogen, and Methanol are already being developed and demonstrated.

