

# SUSTAINABLE FUELS

## A BRIEF INTRODUCTION

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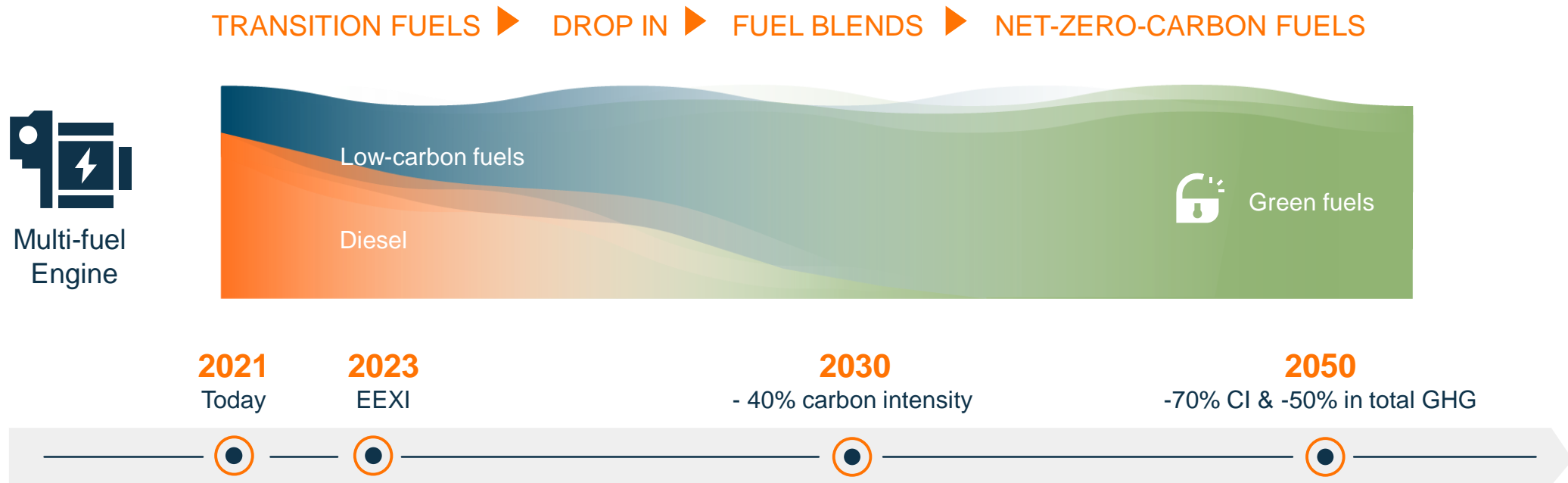
**Director, Sustainable Fuels & Decarbonisation**

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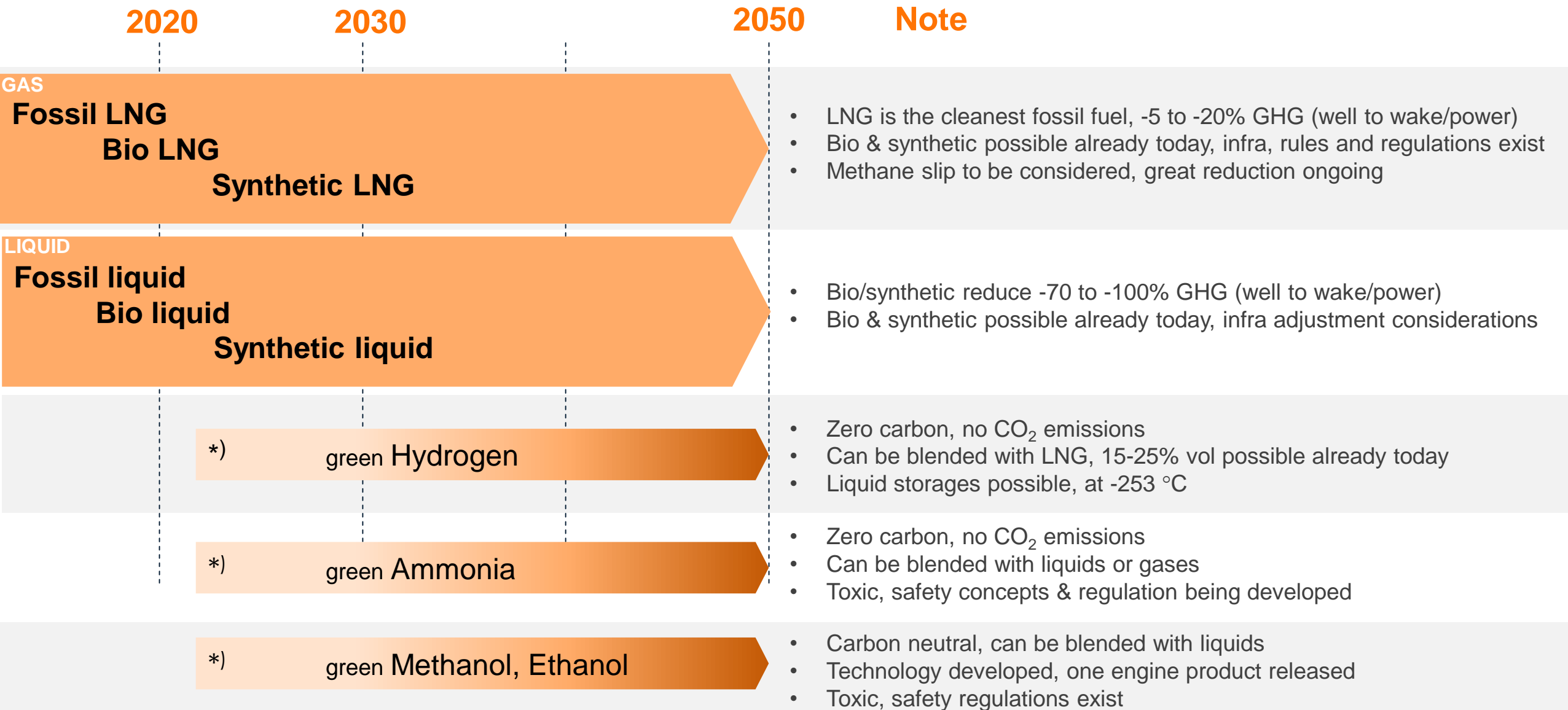


# CERTAINTY IN TRANSITION

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

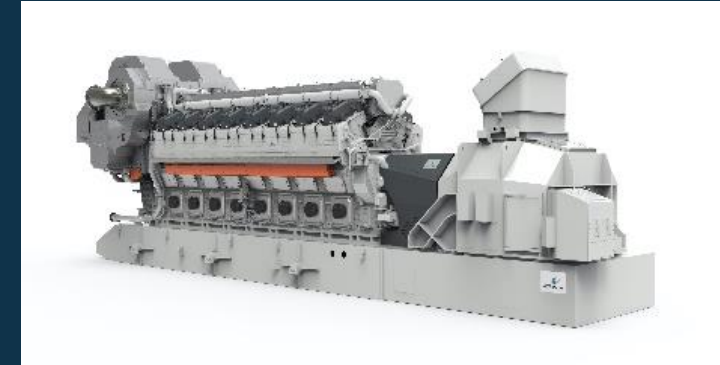
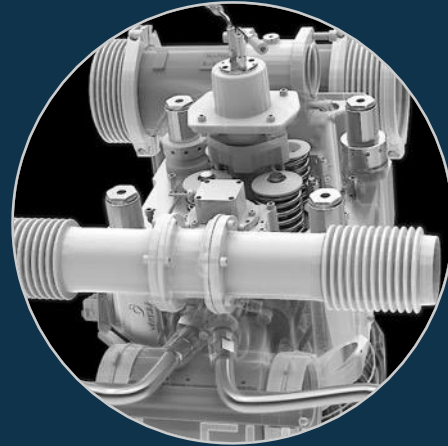


# FUEL ROADMAP – SUSTAINABLE SOLUTIONS EXIST ALREADY NOW



\*) timing depends on the market demand

# STEPWISE APPROACH IN DEVELOPMENT OF TECHNOLOGIES FOR FUTURE FUELS



Idea

**WE ARE CURRENTLY HERE**

## Proof of Concept

Laboratory engines operating on hydrogen, ammonia and methanol

PoC duration 2021 – 2022....2025

- Methanol industrialised on one product 2023
- Ammonia concept ready 2023
- Hydrogen concept ready 2025

## Industrialised solution

Can be done when PoC ready

Needed when

- green fuels available
- infra for them exist
- etc

# SYSTEMS TO BE CHANGED WHEN INTRODUCING A NEW FUEL



## FUEL-GAS SUPPLY SYSTEM

Materials  
Pressurisation  
Insulation  
Toxicity



## ENGINE TOP PART

Fuel-injection  
Cylinder heads  
Piston tops



## EXHAUST-GAS ABATEMENT

SCR  
Scrubbers  
Carbon capture

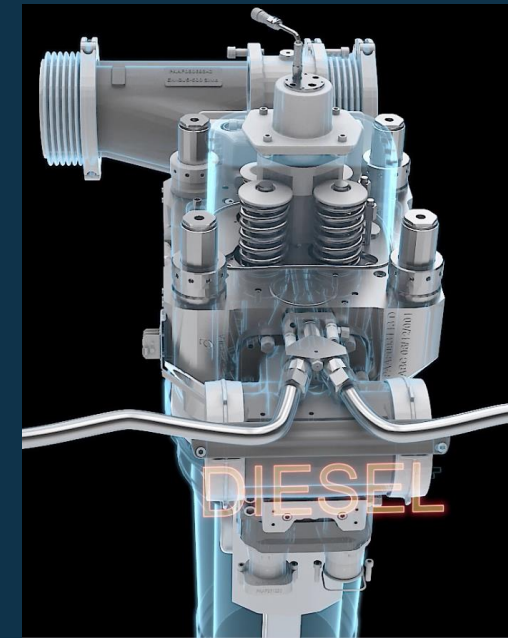
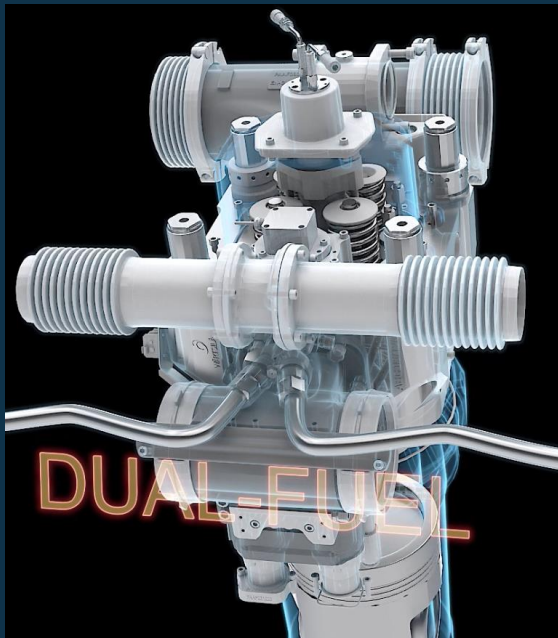


## SAFETY SYSTEMS

Impact on safety  
systems  
and regulatory bodies

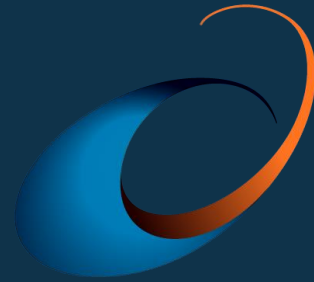
# THE COMBUSTION ENGINE: A TRUE OMNIVORE

HFO, MGO, HVO, LNG, LPG, HYDROGEN, METHANOL, AMMONIA, ...



**WITH 95% PARTS COMMONALITY, THE ENGINE IS NOT THE LIMITING FACTOR**

**Fuel availability, storage, safety and regulations determine the environmentally and economically sustainable solutions.**



# WÄRTSILÄ

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