Wind Hunter

～ Creating Zero Emission Vessels ～

Mitsui O.S.K Lines, LTD.

Technology Research Center, General Manager

Kentaro SHIMA

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MOL Initiatives to Reduce Our GHG Emissions

MOL will accelerate the introduction of clean alternative fuels which play a major role to reduce our GHG emissions.

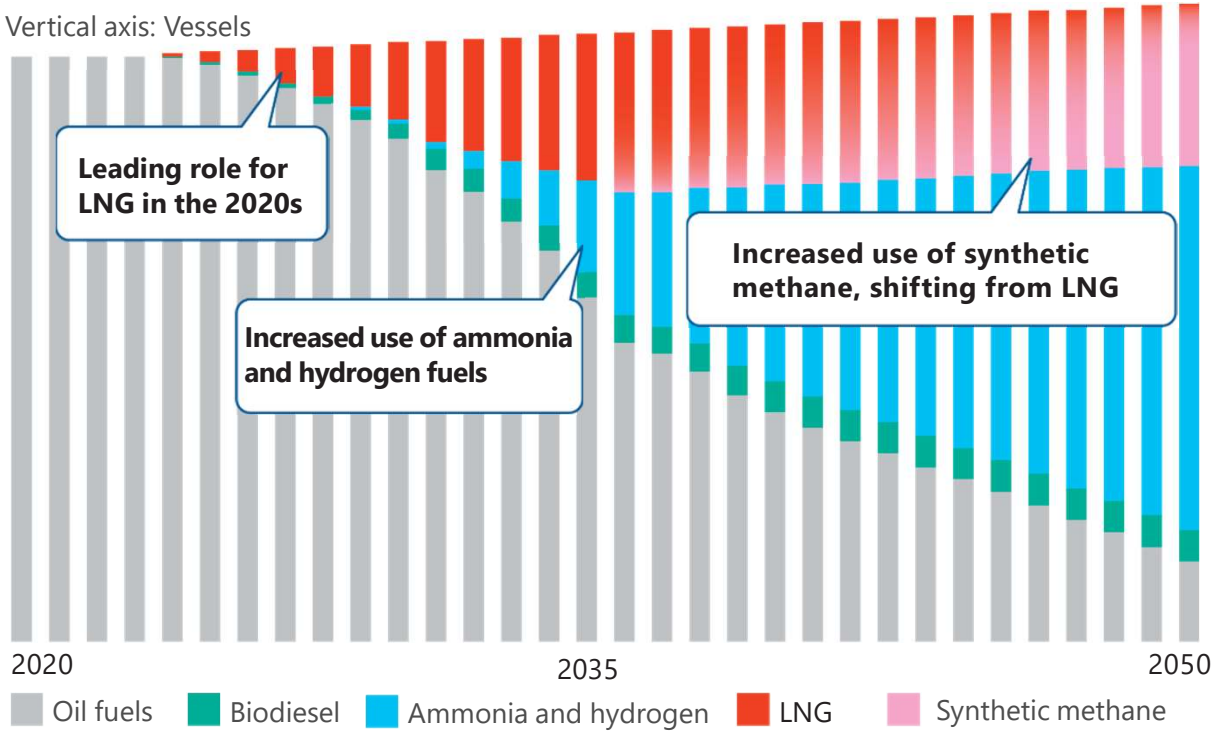
Like solar power and wind power, there are multiple clean renewable energy widely available on shore side.

On other hand, on marine side, net zero emission fuels for a large ocean-going vessel are under development so not available yet.

We aim to deploy net zero emissions ocean-going vessels in the late 2020s whilst MOL Group plans to deliver the first pure battery coastal ship in 2022.

In addition, we set a target to reduce GHG emissions intensity by approximately 45% by 2035 (versus 2019*) accelerating various initiatives and expanding the number of our net zero emissions ocean-going vessels to about 110. In the meantime, MOL will make sure to achieve our target adopting immediately available fuels such as LNG and biodiesel without waiting for next generation candidate fuels like ammonia becomes available.

Composition the MOL Ocean-Going Fleet by Fuel Type Going Forward*1



Milestones

During the 2020s	Deploy net zero emissions ocean-going vessels
2030	Approximately 90 LNG-fueled vessels*2
2035	Approximately 45% reduction in emissions intensity(Versus 2019, plan to acquire SBT certification). Approximately 110 net zero emissions ocean-going vessels(Use of synthetic methane, ammonia, hydrogen fuel, biodiesel, etc.)

*1 Only includes vessels operated by MOL that fall under Scope 1 emissions
*2 Excluding LNG carriers

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MOL Initiatives to Reduce Our GHG Emissions

ONE MILE AHEAD

We will deploy net zero emissions deep sea vessels in the 2020s.

The MOL Group has already realized multiple coastal ships that use clean alternative fuels. We will explore the application

Already Realized Multiple Coastal Ships That Use Clean Alternative Fuels

LNG-fueled tugboat ISHIN

Delivered in February 2019

LNG-fueled ferries

Plan to deliver two ferries I n stages between the end of 2022 and the first half of 2023

The world's first electric tanker, "ASAHI"

Pure battery tanker, powered by high-capacity lithium-ion batteries, was delivered in April, 2022. The tanker was completed first bunkering with MOL PCC successfully at Tokyo Bay.

PROJECT

Exploring Application to a Wide Variety of Ocean-Going Vessels

- Increasing the vessel types targeted for conversion to LNG
- Accelerating study of ammonia-fueled vessel adoption
- Considering hybrid pure car carrier equipped with a hydrogen fuel cell system and large-capacity batteries

Concept model of an electric Kamsarmax bulker

We are currently considering applying our knowledge of electric coastal ships to the development of ocean-going vessels.

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Wind Challenger Project

WIND CHALLENGER

Innovative Sails for a Sustainable Future

https://youtu.be/yXbvG6VrwNc

Coal Iron Vessel	
Length (OA)	: 235.00m
Breadth	: 43.00m
Depth	: 20.05m
Draft(d)	: 12.80m
Dead Weight	: 87,396ton
Cargo Space	: 7Holds, 7Hatches
Sail spec	: H＊B=54m＊15m
	Abt. 810m^2
Main Engine (B&W 6S60ME)	: 9,180kW x 84.0rpm
Vessel Delivery	: Oct. 2022

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As further development,

MOL launched

Wind Hunter Project

～ Wind energy utilization & **Green** Hydrogen production at sea ～

Sea Transpiration with **ZERO CO2 emission**!

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Wind Hunter Project Milestones

ONE MILE AHEAD

Stage 1 : //Complete// ～ Demonstration of H_2 generation onboard

Water electrolyzer, hydrogen storage alloy, fuel cell, generator turbine and electric propeller were retro-fitted at 40" size yacht. With natural wind, H_2 generation, storage & its usage demonstration was implemented and completed in Mar. 2022.

Stage 2 : 2024-2025 ～ Demonstration of H_2 production vessel

Based on feedback(lessons&lenarnt) from Stage 1, with Engineering partner as well as key vendors collaboration for successful FS by 2023 Beg., vessel size will be increased upto 60 meters long. H_2 storage will be planned with MCH instead of H_2 storage alloy. It also aims integration of big data such as weather and operational data for efficient routing to hunt wind/hydrogen, efficiently.

Stage 3: up to 2030 ～ Newbuilds for commercial vessels

Creating large cargo carriers/H_2 production vessels with zero emission

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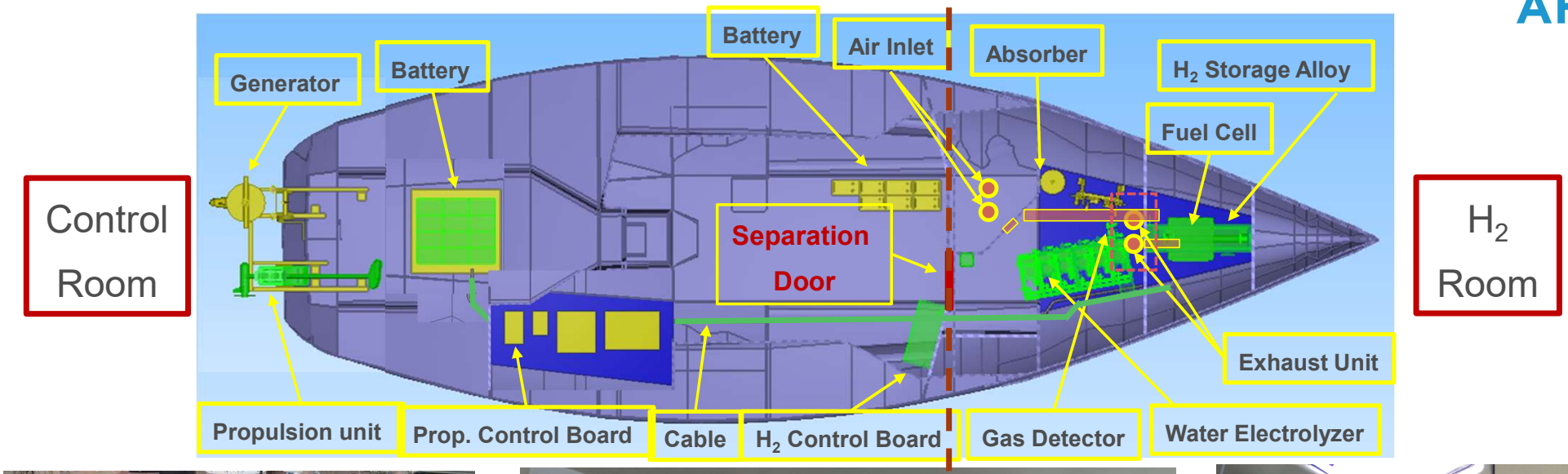
Retrofit work at Stage 1



Design(stability, safety incl. RA, operation manual etc)

-> Shore assembly and performance confirmation -> Installation onboard

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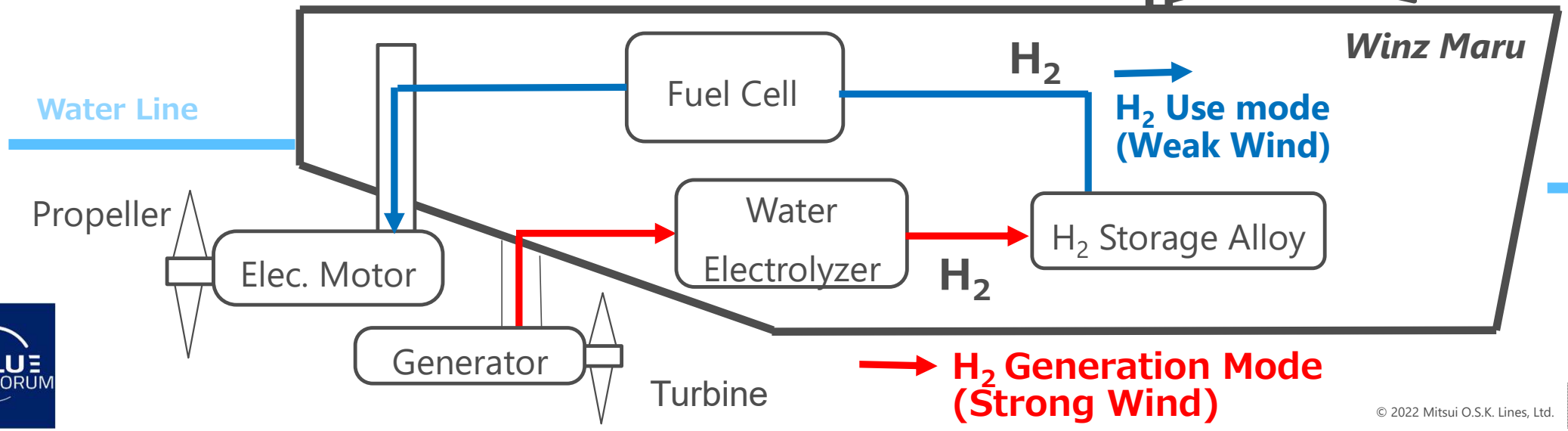
Stage 1: Wind x Hydrogen x Electric prolusion

- ✓ Trial period: Nov. 2021-Jan. 2022, Nagasaki, Japan
- ✓ Wind generate H_2 and H_2 Store onboard
- ✓ H_2 used for propulsion

=> **Successful Results**



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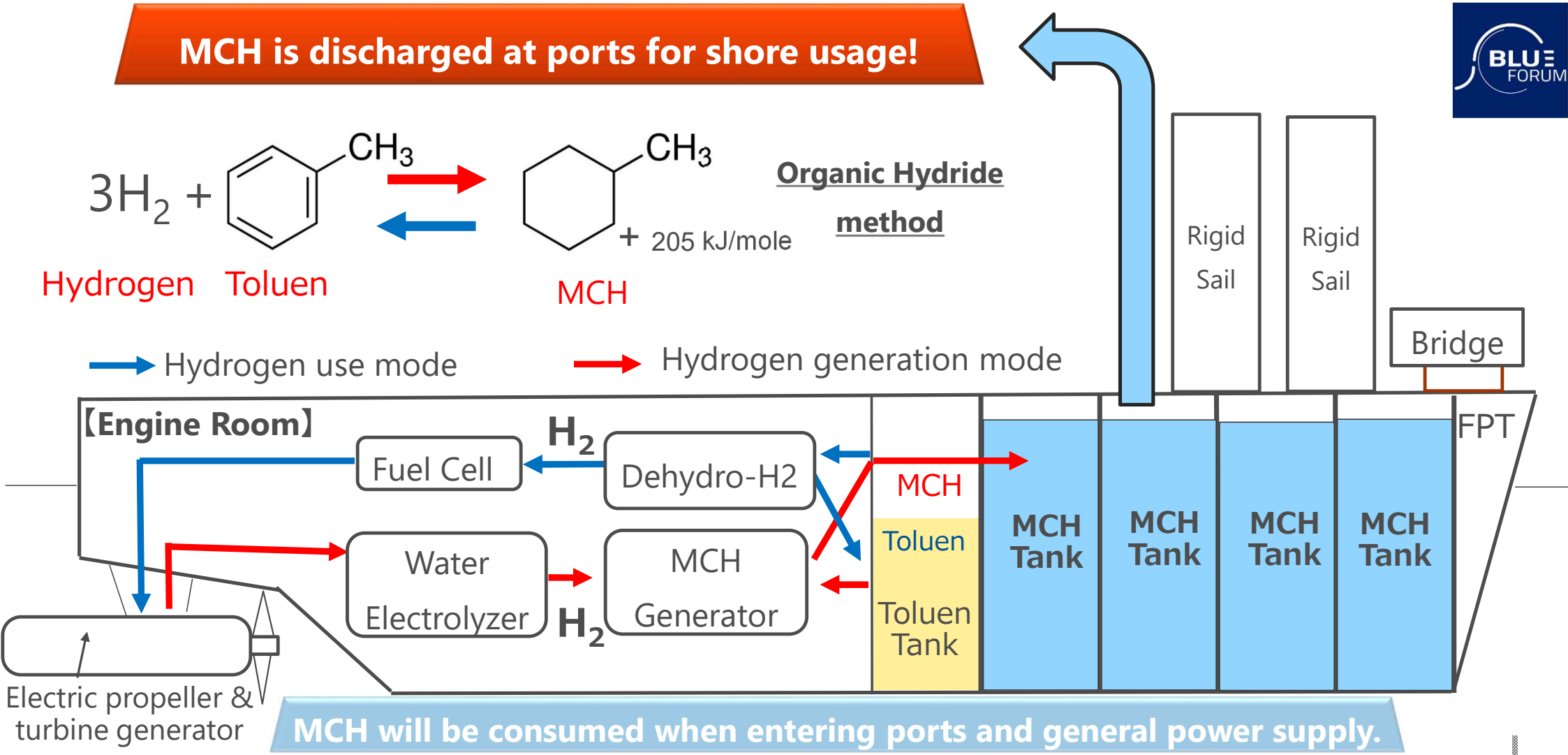
Stage 2: H_2 Production vessel

MCH is discharged at ports for shore usage!

Organic Hydride method



MCH will be consumed when entering ports and general power supply.

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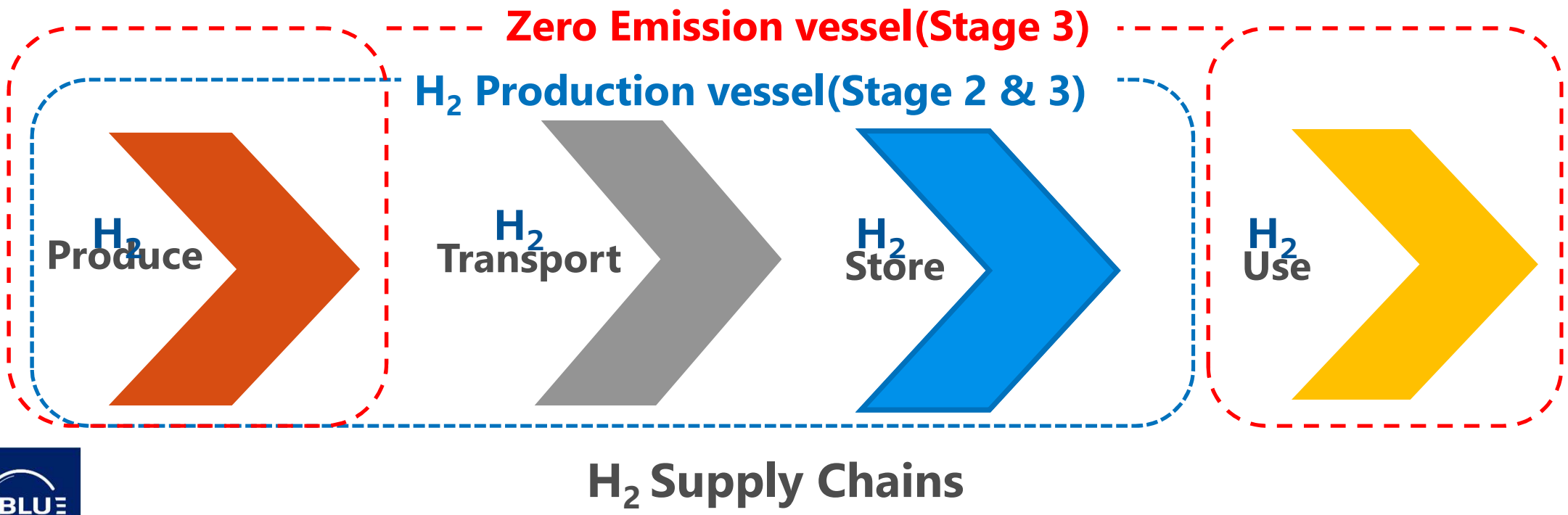
Wayforward

- ✓ **Creating/linking H_2 supply chains with Wind Hunter Project!**
- ✓ **Key technology parties/vendors welcome for our project!**



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ONE MILE AHEAD

MOL 商船三井

Mitsui O.S.K. Lines

Any Question?

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