LOW CARBON MARITIME FUELS

DECARBONISING MARITIME TRANSPORTATION

Green Shipping PT

May 4th, 2023

Galp is an international player in the energy and mobility sectors, focused on developing sustainable solutions to improve people's lives

Upstream

Oil and natural gas exploration and production

Industrial & Energy Management

Refining, supply and trading, cogeneration and logistics of oil products, gas and electricity

Commercial

Marketing of products and services for customers and companies

Renewables & New Businesses

We develop a sustainable and diversified portfolio of renewable energy generation, H2 and new businesses in other areas

Galp present throughout the green hydrogen value chain

with the strategy supported on four pillars

1

Develop of large electrolyser capacity in Sines

Replace all grey H_2 by green H_2 in Sines refinery

2

Reduce our products **carbon footprint**

Develop the production of **maritime** and **aviation e-fuels**

3

Active presence in **heavy-duty road transport decarbonisation**

Build HRS network in Iberia with direct supply to our **B2B customers**

4

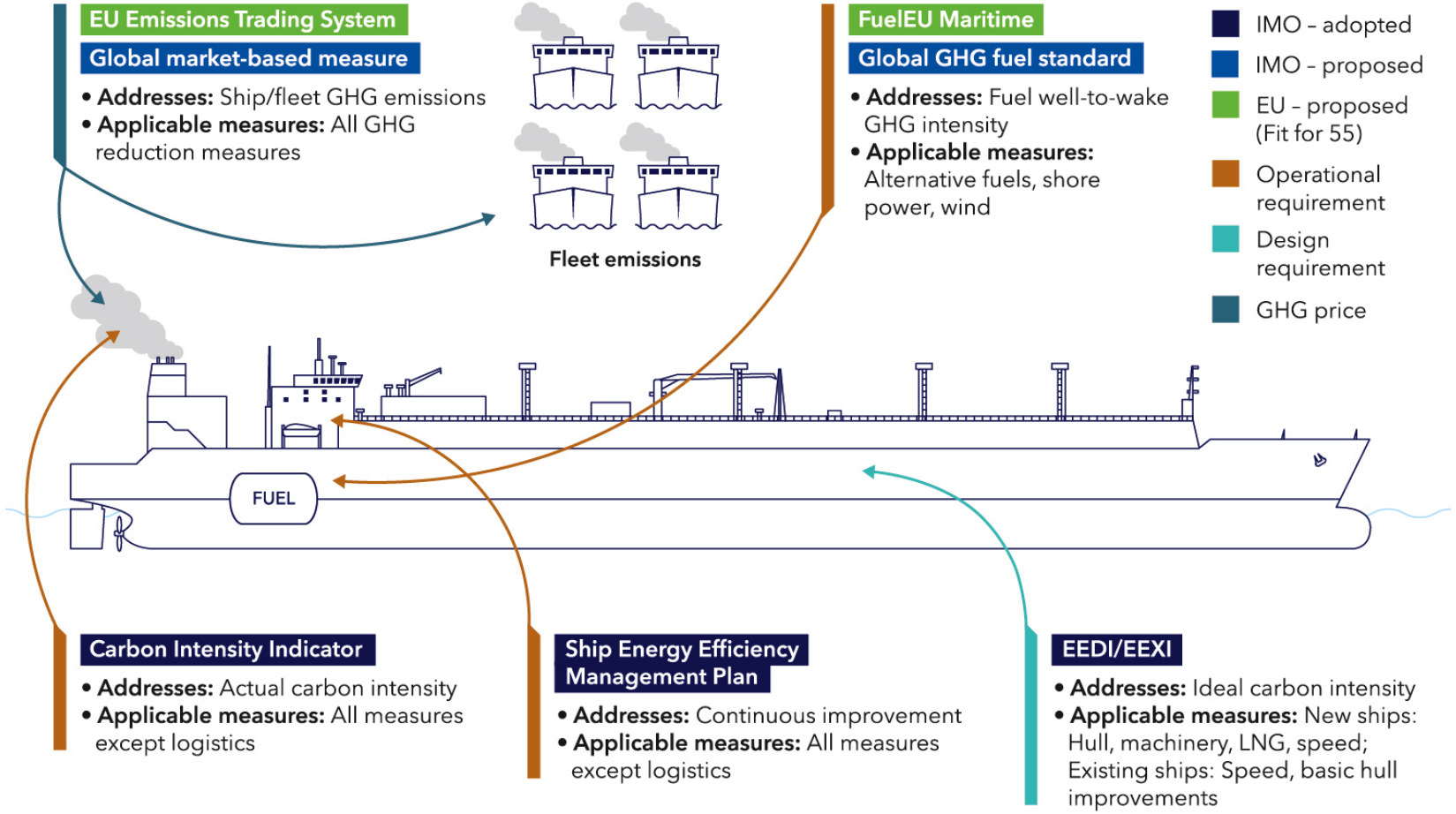
Key partner of our industrial customers in the energy transition path

Provide **green H_2 solutions to our B2B industrial customers**

Regulation is pushing for lower emissions in the shipping industry

Moving from sulphur to carbon changes everything

IMO and EU regulatory framework for GHG emissions reduction from international shipping

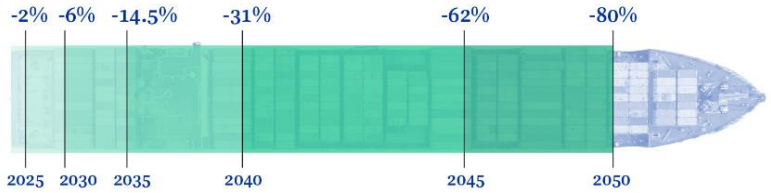


Source: "Maritime Forecast to 2050", DNV

Maritime transportation accounts for 14% of EU emissions and 3% of global emissions

EU reached a provisional agreement on FuelEU Maritime in March 23

FuelEU Maritime - Annual average carbon intensity reduction compared to 2020

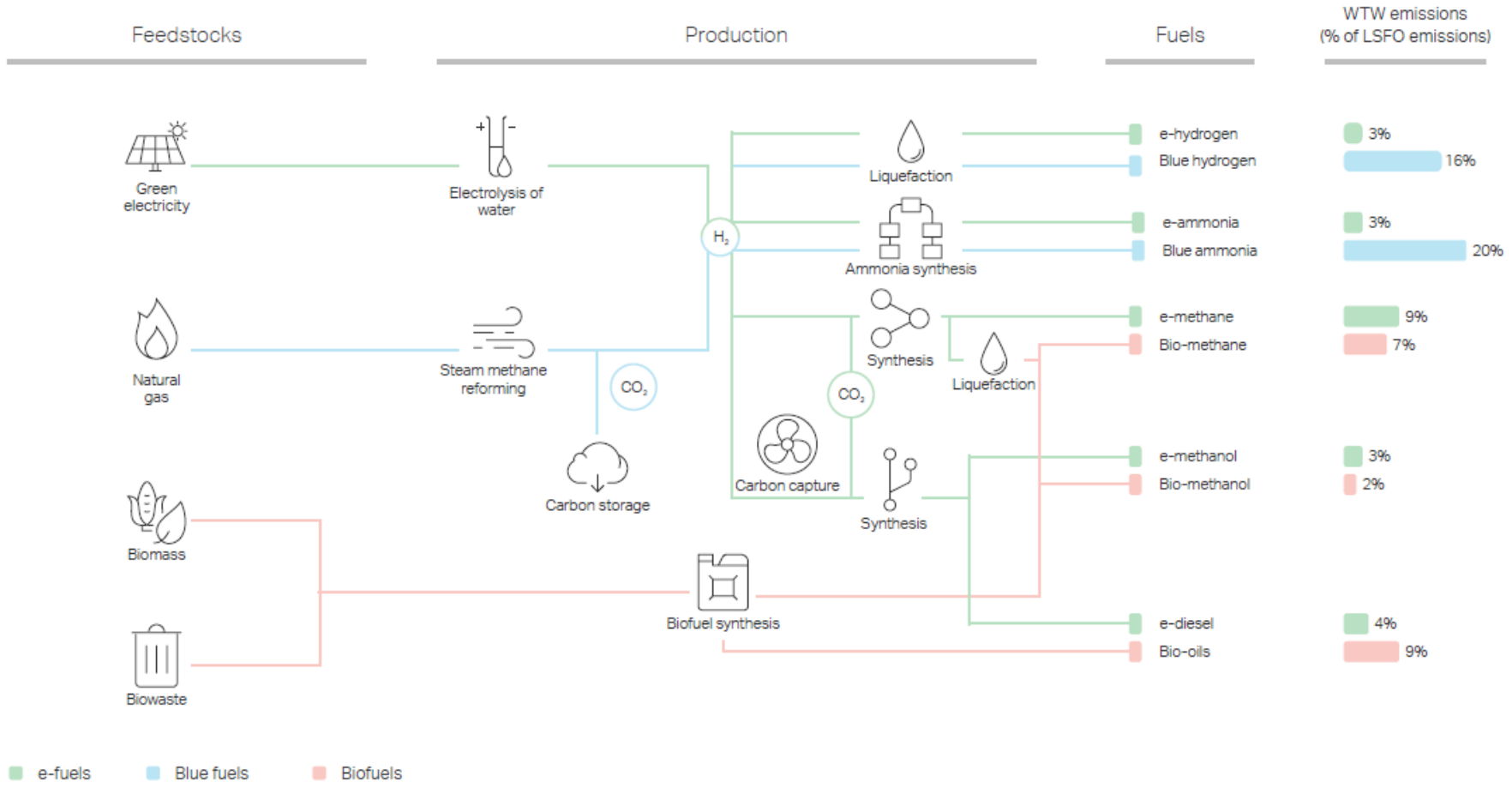


IMO GHG reduction target will be revised in July and could be significantly strengthened

Different possible routes towards zero carbon shipping

There is no miracle solution to decarbonise maritime transportation

Alternative fuel production pathways in shipping



Source: "Maritime Decarbonization Strategy 2022", Maersk-McKinney Moller Center for Zero Carbon Shipping

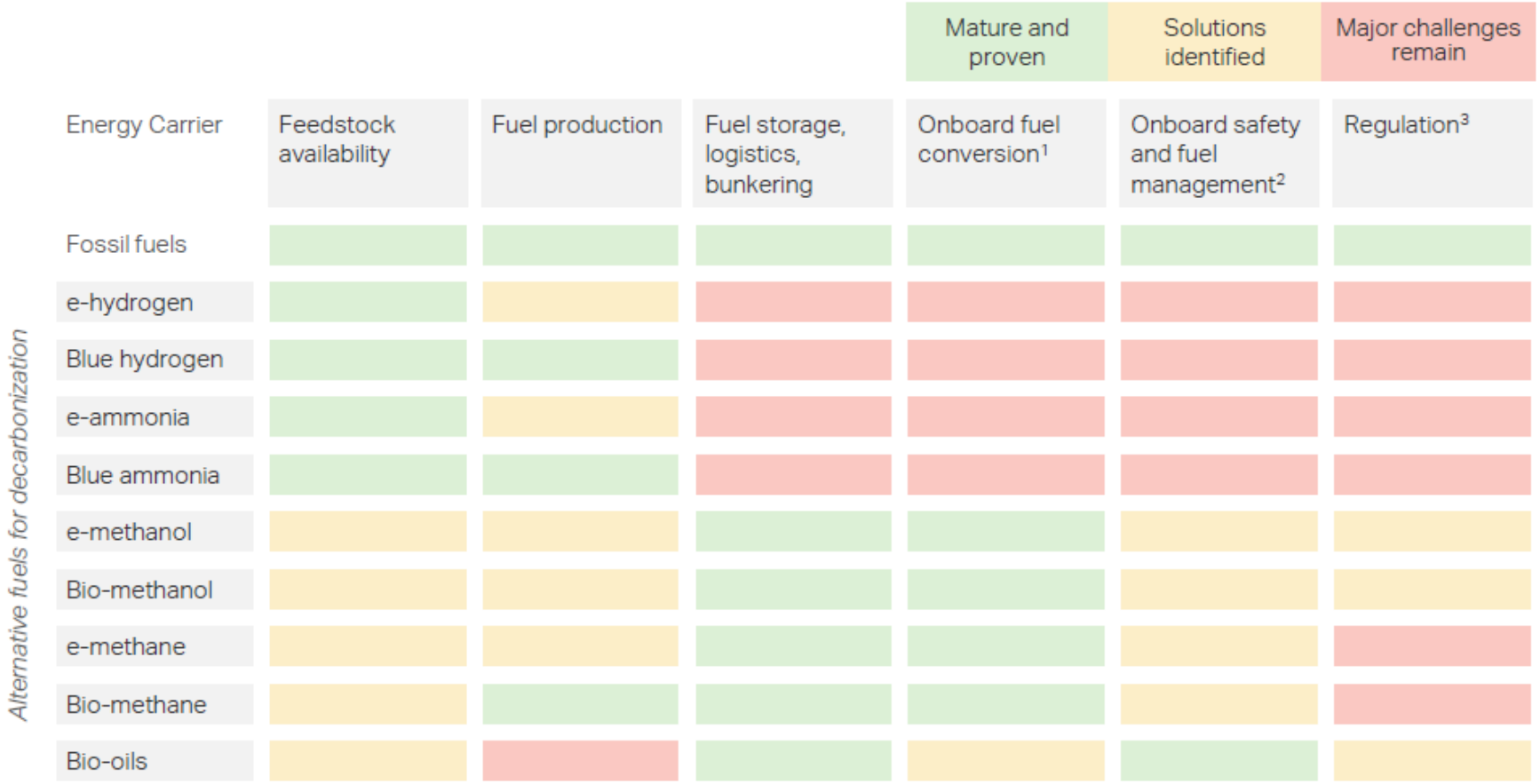
Electrification is not an option for shipping, requiring higher energy density solutions.

Market has three main technological highways to decarbonise:

1. Biomass
2. Natural Gas + CCS
3. Synthetic Fuels

Each alternative with its challenges and at different stages of development

Massive investments will be required



Source: "Maritime Decarbonization Strategy 2022", Maersk-McKinney Moller Center for Zero Carbon Shipping

Each option has pros and cons, taking into account economics, technological maturity and required logistics.

Biofuels are already available as a drop-in solution, but will face supply challenges going forward.

Methanol allows for easier logistics, but with a higher cost.

Ammonia and hydrogen face many operational issues and are still in an early stage.

Our view towards an integrated low carbon portfolio for shipping

Galp plans to support decarbonisation by producing and supplying sustainable fuels for vessels

Biofuels

FAME

Galp owns a FAME plant in Sines producing 26kton/y and plans to start supplying DMA/FAME blends to market in 2023.

2023

HVO

Galp coprocesses 25 kton/y of HVO in the Sines refinery with diesel and plans to start production of HVO plant in 2025, which could produce >200kton of biodiesel.

2023

E-fuels

Methanol

Feasibility studies for e-methanol production, taking advantage of synergies from green H_2 projects.

2025+

Hydrogen

Galp plans to have large scale green H_2 production (100MW) in Sines by 2025, expanding to 600^{+}MW by 2030.

2025+

Ammonia

Feasibility studies for green ammonia production, taking advantage of synergies from green H_2 projects.

2030+

FAME - Fatty Acid Methyl Ester; HVO – Hydrotreated Vegetable Oil

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