Decarbonization - Future Fuels

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Baleària is the leading shipping group in Spain, with almost 25 years of history in the maritime transport of passengers, vehicles and goods.

The company connects mainland Spain with the **Balearic Islands, Canary Islands, Ceuta and Melilla**. It is also the only shipping company that links the four islands in the Balearic archipelago.

Internationally, it operates in North Africa (**Morocco and Algeria**), the **south of France** and it links **the USA** and the **Bahamas**.


BALEARIA
A leading shipping company
BALEARIA
ABEL MATUTES
30
SHIPS
24
ROUTES
6
COUNTRIES
1,600
EMPLOYEES

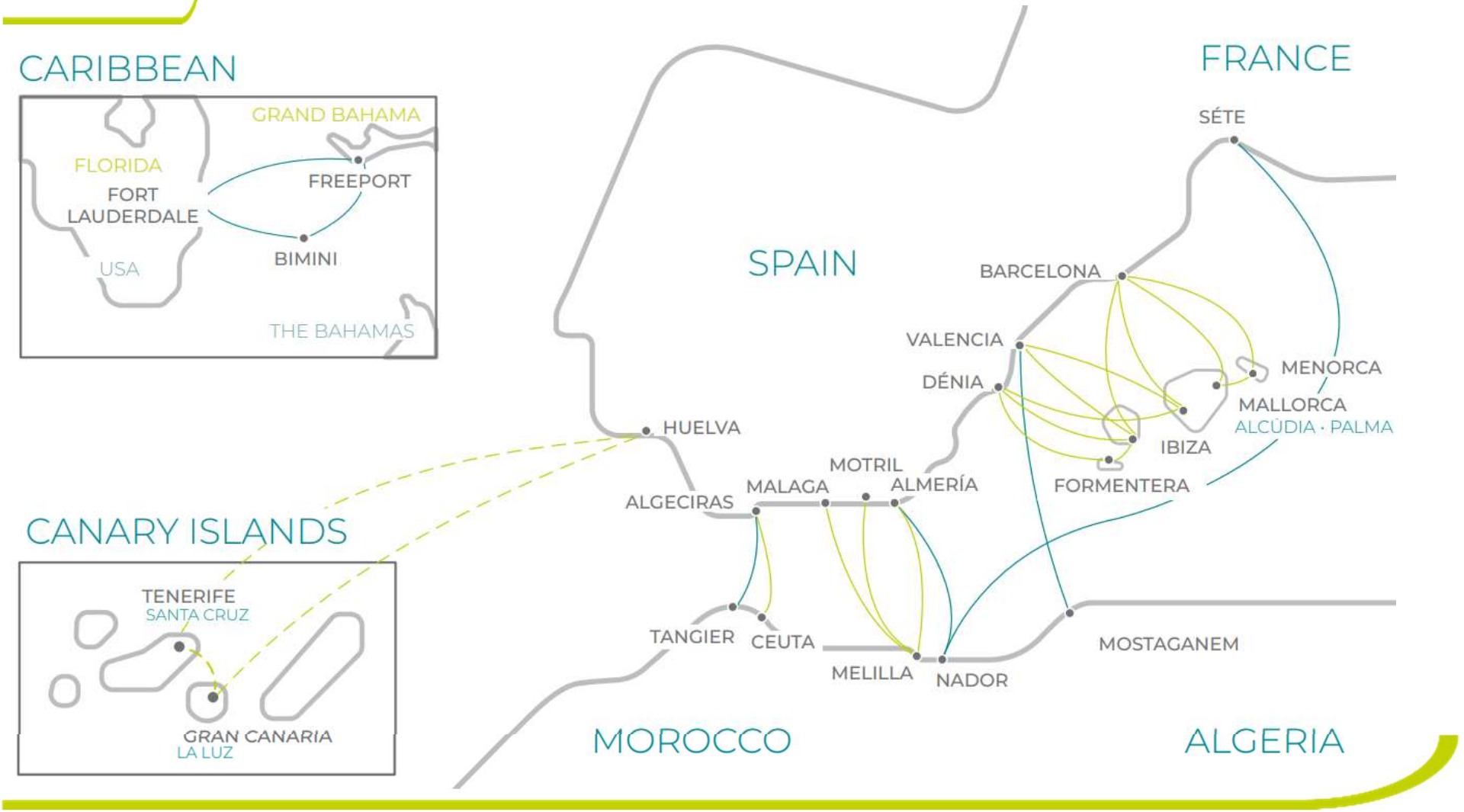
Business model

Scheduled maritime transport of passengers, vehicles and goods.

- **Passenger transport**
  Service excellence

- **Goods transport**
  'Just-in-time' cargo service

Routes


CARIBBEAN
GRAND BAHAMA
FLORIDA
FREEPORT
FORT LAUDERDALE
BIMINI
USA
THE BAHAMAS
FRANCE
SÉTE
SPAIN
BARCELONA
VALENCIA
DÉNIA
MENORCA
MALLORCA
ALCÚDIA · PALMA
IBIZA
FORMENTERA
HUELVA
MOTRIL
ALMERÍA
MALAGA
ALGECIRAS
CANARY ISLANDS
TENERIFE
SANTA CRUZ
TANGIER
CEUTA
MELILLA
NADOR
MOSTAGANEM
GRAN CANARIA
LA LUZ
MOROCCO
ALGERIA

Innovation for the customer

A fleet with the latest technology and innovation at the service of the customer.

- **12 smart ships** with internet connection, free WhatsApp use, on-demand digital entertainment, video surveillance of pets, and much more.

- **Chatbots and virtual assistants** to support the entire experience (booking, purchases and journey).

Digital cargo model

Digitalisation of the entire goods transport cycle.

- **Exclusive website** for booking cargo services.
- **Streamlined port operations and better logistics planning** for customers.
- **Mobile app** for hauliers aimed at reducing queues and paperwork.

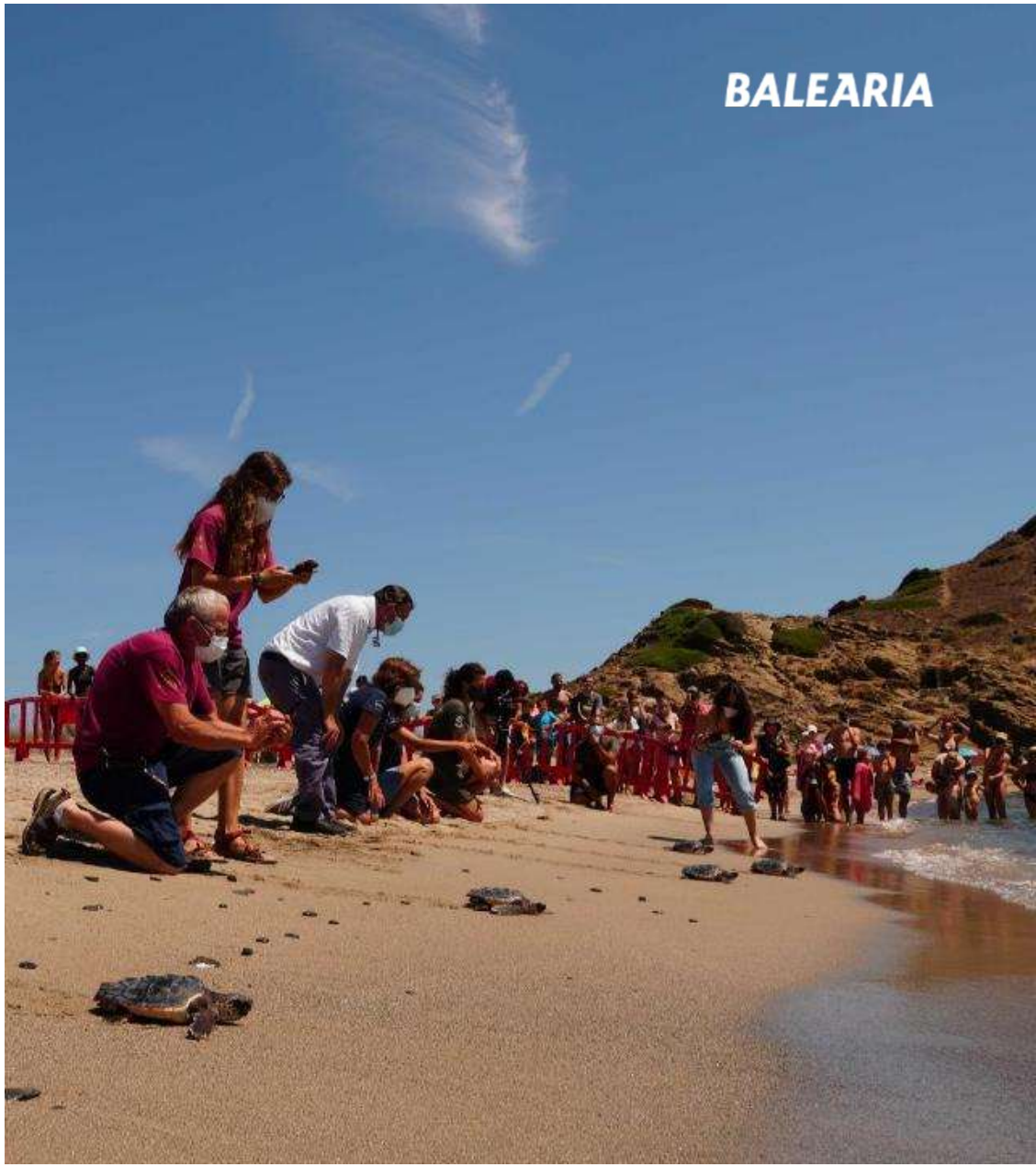
Social commitment

Involvement in the **social and economic development** of the regions.

- **Baleària Foundation**: organisation of activities to improve social cohesion, culture and environmental sustainability in the regions.

- Collaboration with **local suppliers.**

- **Commitment to the United Nations Sustainable Development Goals** (SDGs) and Agenda 2030.



Green course

Commitment to **sustainability** and **eco-efficient shipping.**

- Pioneers in the use of **natural gas.**

380
MILLION INVESTMENT

6
SHIPS RE-ENGINED

3
NEWLY CONSTRUCTED SHIPS

- **Electric ferry** project with **experimental use of hydrogen.**
- Projects linked to the use of energies of the future with the goal of **achieving zero emissions by 2050.**

Green course

Co-financed by the Connecting Europe Facility of the European Union

Retrofit of 6 ferries to dual fuel propulsion (LNG)

Napoles

Abel Matutes

Sicilia

Bahama Mama

Martin i Soler

Hedy Lamarr

Green course

4 New Buildings with dual fuel propulsion(LNG)

Hypatia de Alejandria

Eleanor Roosevelt

Marie Curie

Margarita Salas

Green course

1 New building with electrical propulsion

82 m	15,5 m	14 KN	350	14	240 ml
eslora	manga	velocidad	pasajeros	camiones	carga

Características principales:

- Length 82m.
- Beam 15,5m.
- Speed 14kn.
- Passengers 350
- Trucks 14 / 240ml
- Battery capacity 600kWh
- Sailing time 1h
- Zero emmissions at port

- 4 motores generadores Caterpillar de 940 kWe a 1800 rpm
- 2 propulsores azimutales Schottel impulsados por motores eléctricos de 1170 kW, capaces de girar 360°
- Diseño double ended (operativo por proa y popa)
- Ascensor hasta la zona de pasaje
- Toma de conexión de cold ironing

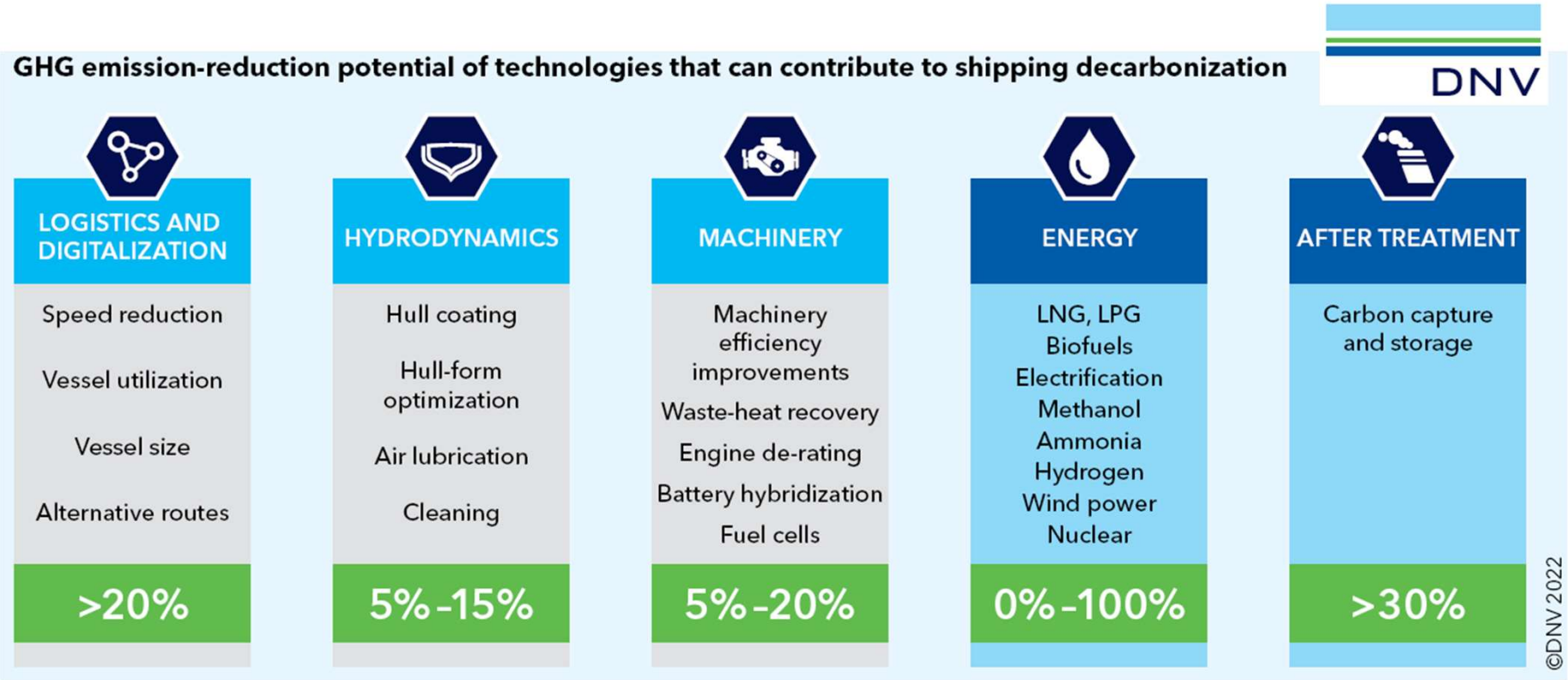
Green course

- Baleària also participates in the European project "Green and Connected Ports (GREEN C PORTS)".
- Connecting Europe Facility 2014-2020 (CEF Transport) call.
- The European unión will subsidize the 50 %.
- Fuel consumption and vessels emissions in real time monitorization, sensing vessels.
- 5 vessels: BAHAMA MAMA, SICILIA, ELEANOR ROOSEVELT, HYPATIA DE ALEJANDRIA and CECILIA PAYNE.

- Baleària also participates in the European project "DT4GS (Digital Twin for Green Shipping)".
- HORIZON-CL5-2021-D5-01 call.
- Living Lab for a Digital Twin of a RO-PAX (SIC). Improvement of efficiency and optimization in the operation, retrofits solutions and defining zero RO-PAX zero emissions of the fuure.
- Baleària also participates in the European project "GREEN HYLANDS".
- Techno-economic study for the implementation of the use of LNG/H2 blends in existing vessels/ferries.

Future Fuels

Actions to reduce the coeficients: CII, Fuel Eu, ETS



Future Fuels

Electrification: Battery Pack

Strength
- ✓ Available technology
- ✓ Public opinion (when ship is in harbour area)
- ✓ Consolidated Safety procedures
- ✓ Scalable for higher power demand (Battery pack)
- ✓ Still underdevelopment to increase battery power/m3

Weakness
- ✓ Available in few locations for shore power
- ✓ Requires huge investments ashore
- ✓ Partial solution for decarbonisation
- ✓ Volume per kW hours (low energy density)
- ✓ Fire risk
- ✓ Requires proper power management system

SWOT

Opportunities
- ✓ Easy retrofit
- ✓ Widely available when shore grids will be boosted
- ✓ Batteries can be charged during harbour stay (applicable for ferries)
- ✓ Together with other fuels (ex LNG) can support transition to decarbonisation

Threats
- ✓ Costs per kWh is fluctuating per area for shore power
- ✓ Production of battery will be used for all transport sectors
- ✓ Increase the price for battery pack systems

Biodiesel/Synthetic Diesel

Strength
- ✓ Availability
- ✓ Available regulations, no additional requirements affecting designs expected
- ✓ Liquid at ambient conditions
- ✓ Similar energy content compared to diesel
- ✓ Known technology
- ✓ Specifications available
- ✓ Blending with Fossil Diesels can be easily managed
- ✓ FAME standard EN14214
- ✓ Biodiesel standard EN 590

Weakness
- ✓ Available in few locations for shore power
- ✓ SP Requires huge investments ashore
- ✓ Partial solution for decarbonisation
- ✓ Volume per kW hours (low energy density)
- ✓ Fire risk
- ✓ Requires proper power management system

SWOT

Opportunities
- ✓ Availability to first movers
- ✓ Readiness of technology
- ✓ Possibility to blend with diesel

Threats
- ✓ Quantity of availability
- ✓ Price compared to fossil fuels
- ✓ Instability of blends with diesel/bunker (for bio Blends)

LNG

Strength
- ✓ Logistics and infrastructure availability
- ✓ Available safety regulations
- ✓ First step towards emission reduction
- ✓ Lower costs vs Diesel
- ✓ Fossil LNG can be blended with Bio and Synth LNG
- ✓ LNG Projects are financeable at regular banks
- ✓ Return of investments are positive

Weakness
- ✓ Higher Capex vs traditional diesel ships
- ✓ Limited availability at no standard Trade routes
- ✓ Higher Safety standards compared to diesel

SWOT

Opportunities
- ✓ Increasing of the LNG bunker locations
- ✓ H2 carrier
- ✓ Can be used as fuel for fuel cells

Threats
- ✓ Methane slip
- ✓ Political negative behaviour/opinion to use LNG
- ✓ Public negative behaviour/opinion to use LNG

RINA

Biogas / Synthetic Gas

Strength
- ✓ Logistics and infrastructure availability
- ✓ Available safety regulations
- ✓ First step towards emission reduction
- ✓ Lower costs vs Biodiesel
- ✓ Bio and Synth can be blended with LNG

Weakness
- ✓ Higher Capex vs traditional diesel ships
- ✓ Limited availability for the marine industry of Bio Blends
- ✓ Higher Safety standards compared to diesel

SWOT

Opportunities
- ✓ Increasing of the LNG bunker locations
- ✓ H2 carrier
- ✓ Can be used as fuel for fuel cells

Threats
- ✓ Methane slip

Future Fuels

Methanol

Strength
- Availability
- Actually Traded with Ships
- Available safety regulations
- Potential for zero carbon fuel
- Liquid at normal ambient conditions
- Can be used with fuel cells

Weakness
- Segregation required (cofferdam)
- Alcohol-resisting foam required for fire fighting
- Very low energy content (higher space requirements, or lower range)
- Pilot fuel necessary
- High vapor pressure – potential inertization of tanks
- Corrosive, special coating required
- Low flash point fuel - Explosion risk
- Class and IMO rules not issued
- Hazardous zones and toxic zones
- Regulations for Emissions limits to be modified in order to consider 'well-to- wake' emissions and negative contributions

SWOT

Opportunities
- Available to the first movers
- Available technology
- Ready to use
- Opportunity as refit

Threats
- Usage limited due to toxicity
- Quantity of availability (related to the world market/ Trade)
- Invisible flame
- Price
- Design impact due to safety regulations regulations (e.g. Current fire detectors not suitable)

Hydrogen

Strength
- Available safety regulations
- Can be used with fuel cells
- Zero carbon fuel If produced from renewable energy source

Weakness
- Segregation required (cofferdams, double walled piping)
- „complex" bunkering procedures – effect on bunker station design
- Lower energy content (higher space requirements, or lower range)
- Gaseous at ambient conditions
- High rate of Explosion
- Small molecules may pass through metals
- Boil off problem and low autonomy will need a frequent bunkering
- Fuel cells specific weight and volume are much higher
- High investment costs related to return of investments

SWOT

Opportunities
- Available to the first movers
- Available technology
- Ready to use
- Opportunity as refit

Threats
- Materials for handling
- Quantity of availability of green hydrogen
- Temperature
- Public opinion
- Price
- Design impact due to safety regulations
- WTW balance may be negative
- Insurance costs and liability

Ammonia

Strength
- Availability as commodity
- Available safety regulations land based installations
- Potential for zero carbon fuel

Weakness
- Toxic fuel (low emission max. 50 ppm is dangerous for human)
- No regulations for ammonia as marine fuel
- Segregation required (cofferdam)
- „complex" bunkering procedures – effect on bunker station design
- Lower energy content (higher space requirements, or lower range)
- Gaseous at ambient conditions
- NOx emissions (SCR required?)
- Pilot fuel necessary
- Highly specialised crew

SWOT

Opportunities
- Renewable
- Utilize LPG fleet for distribution
- Can be used as hydrogen carrier

Threats
- Usage limited due to toxicity
- Quantity of availability
- Corrosivity for material
- Regulations on ammonia slip
- venting (unexpected releases)
- Greenhouse gases (N2O)
- Price
- Public opinion
- Design impact due to safety regulations

RINA

Molten Salt Reactor / TMSR (Nuclear Power)

Strength
- Technology in development
- Thorium Molten Salt Reactor reactors are technologically "ready" since the 1960

Weakness
- CAPEX
- Limited regulations for use as marine fuel
- Highly specialized crew
- Not yet ready for marine industry (pre design phase)
- No experience in merchant and cruise ship sector (design, construction, supply chain, survey, operation)
- Class and IMO rules not available
- Design and approval process is expected to be very complex
- Radioacivity risk
- Unsolved nuclear waste problem also on shore power plant
- Minimum power load to be always guaranteed
- High impact on ship design for safety requirements segregation, additional ventilation, double barriers

SWOT

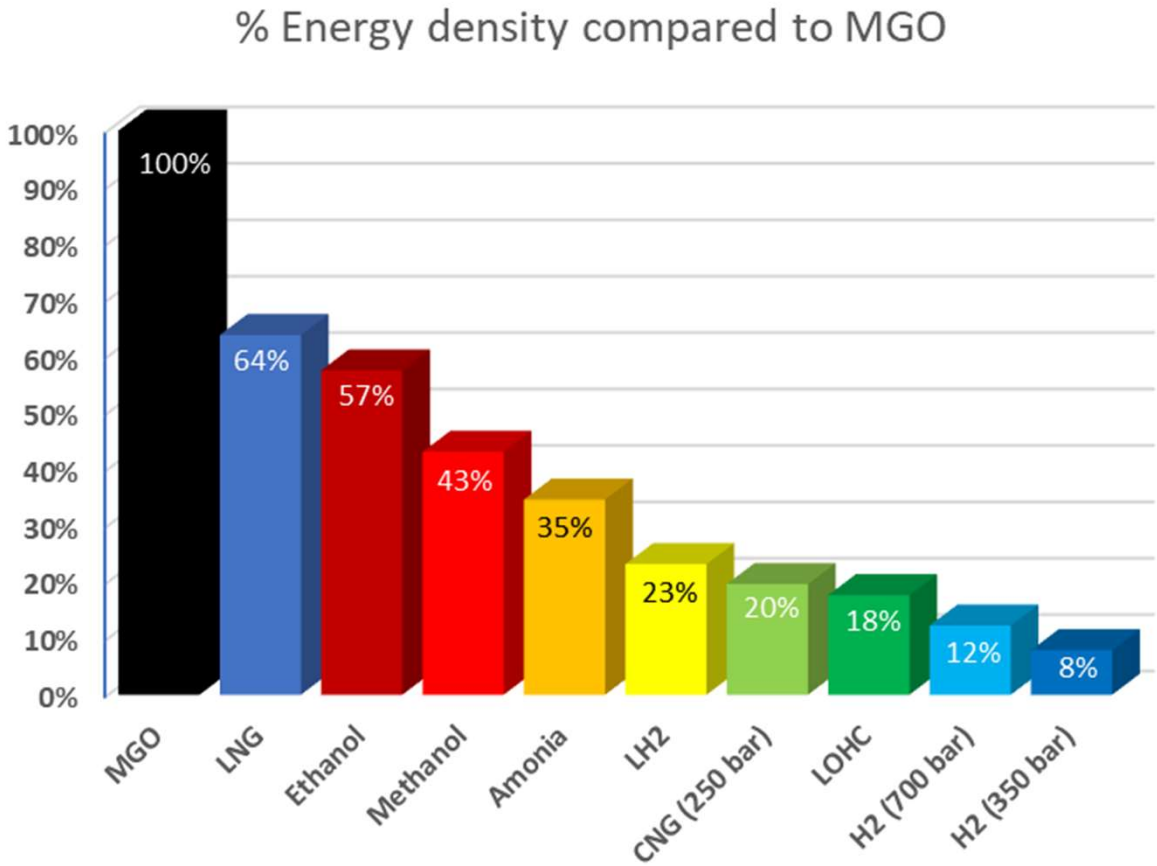
Opportunities
- Availability
- OPEX lower than endothermic engines
- Energy density (to be investigated)
- Can be used to produce (ashore) Blue H2
- Speed is not a limit

Threats
- Radioactive in case of incidents
- Public opinion
- Dismantling costs and waste
- End-of-life storage
- Insurance costs and liability

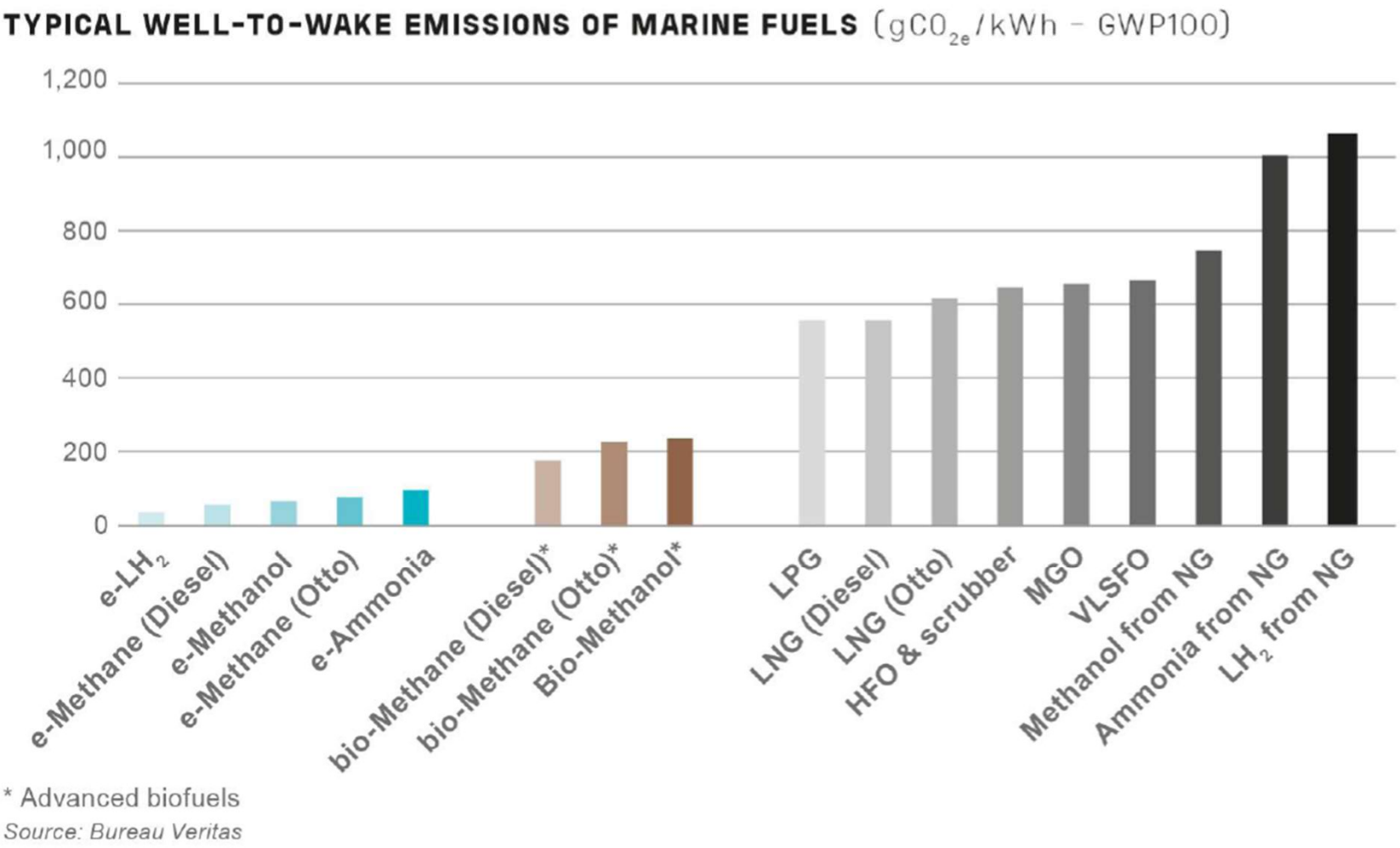
Future Fuels

Green fuels.

- **LNG** use of LNG, bio-LNG and e-LNG.
- **Hydrogen**: Fuel Cell, Blending, ICE.
- **Amonia**
- **Methanol**
- **e-Fuels** e-Diesel
- **Electric** Batery, Hybrid
- **Nuclear**



Future Fuels

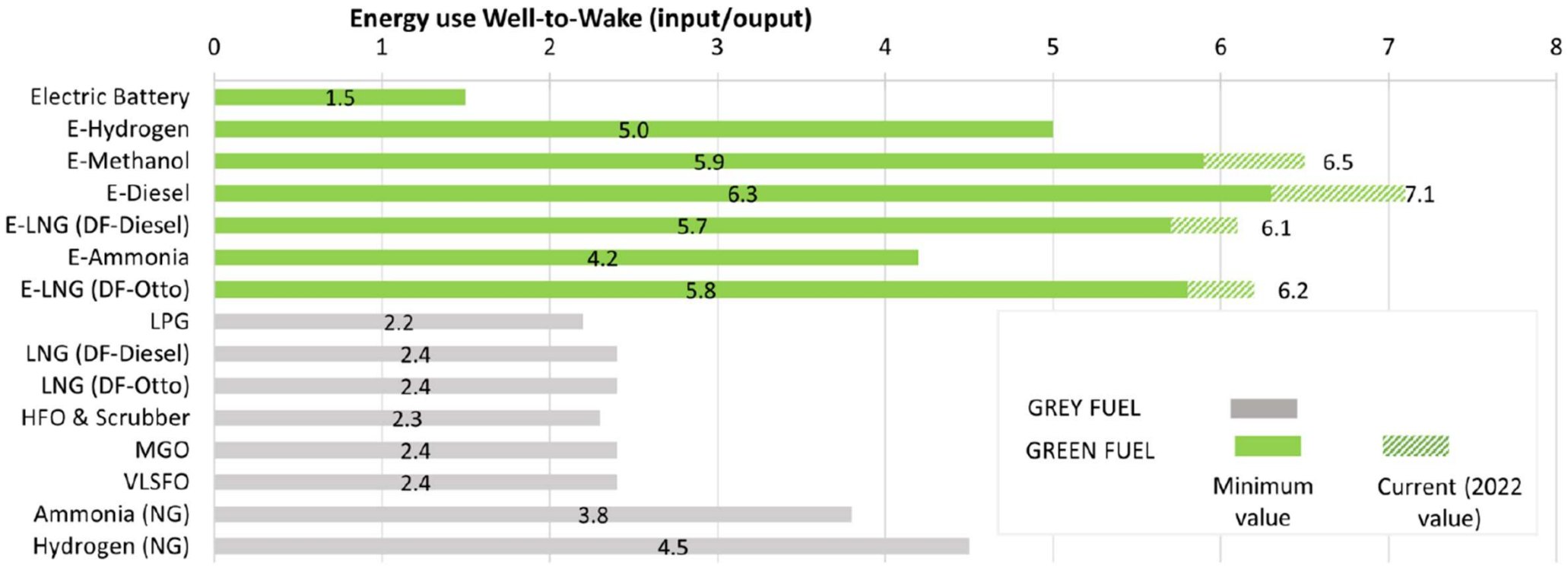


* Advanced biofuels

Source: Bureau Veritas

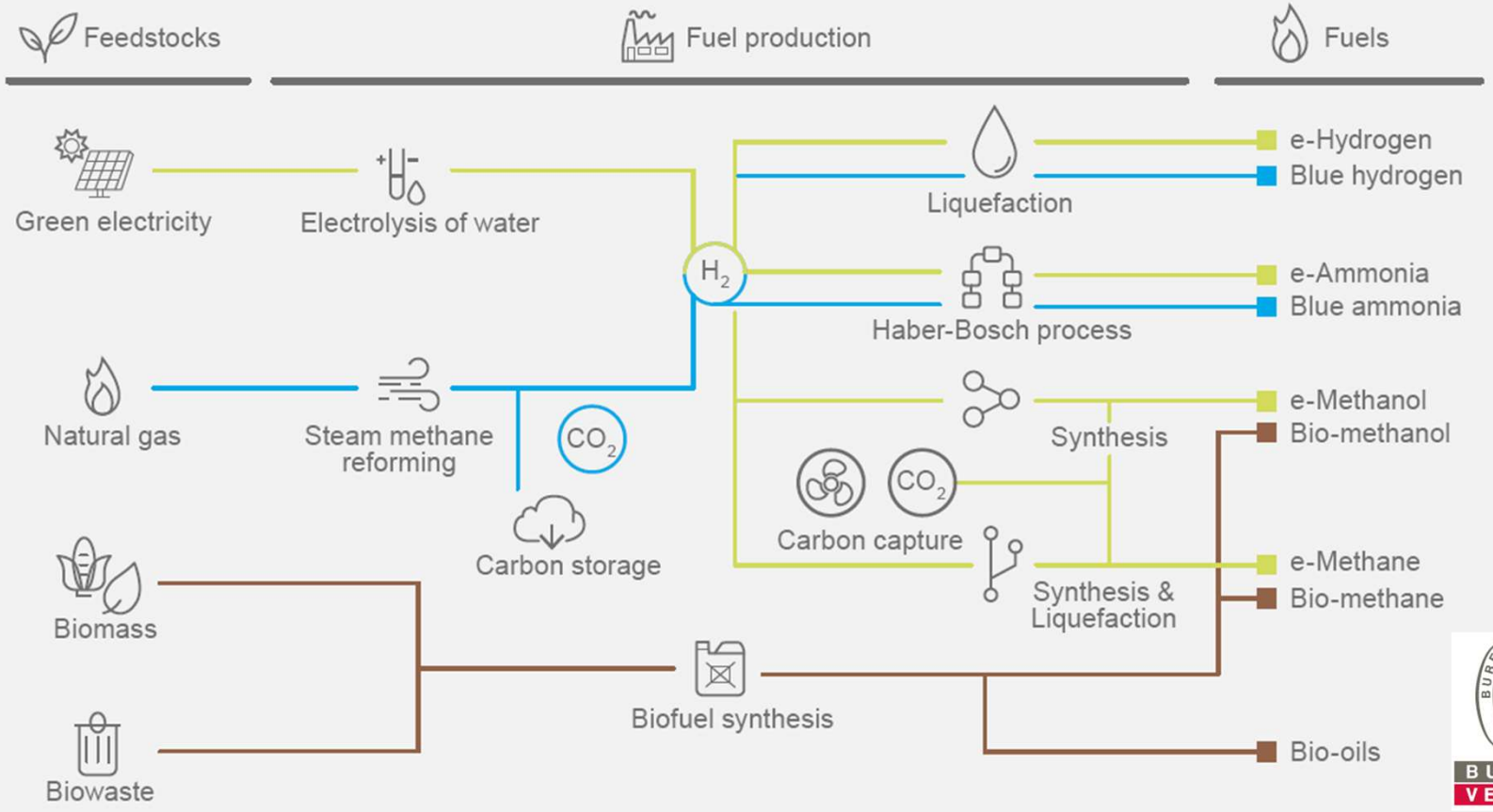
Future Fuels

SINTEF, 2022



Future Fuels

FIGURE 9: OVERVIEW OF ALTERNATIVE FUELS AND THEIR PRODUCTION PATHWAYS

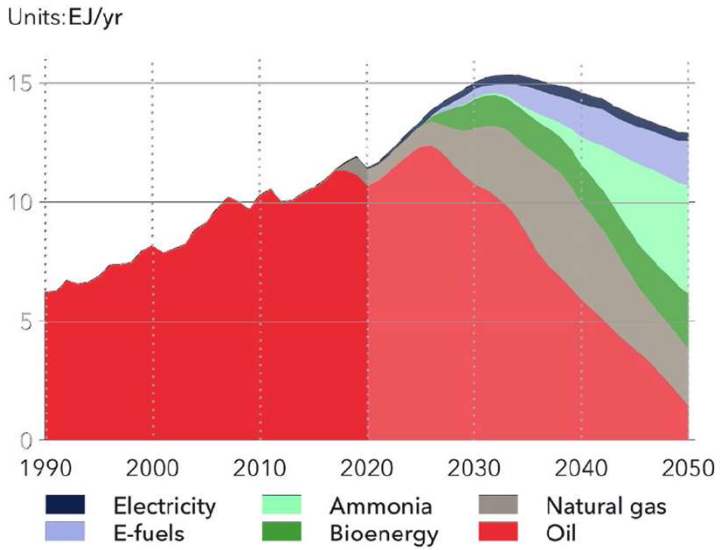


Source: MMMCZCS

Future Fuels

FIGURE 1.13

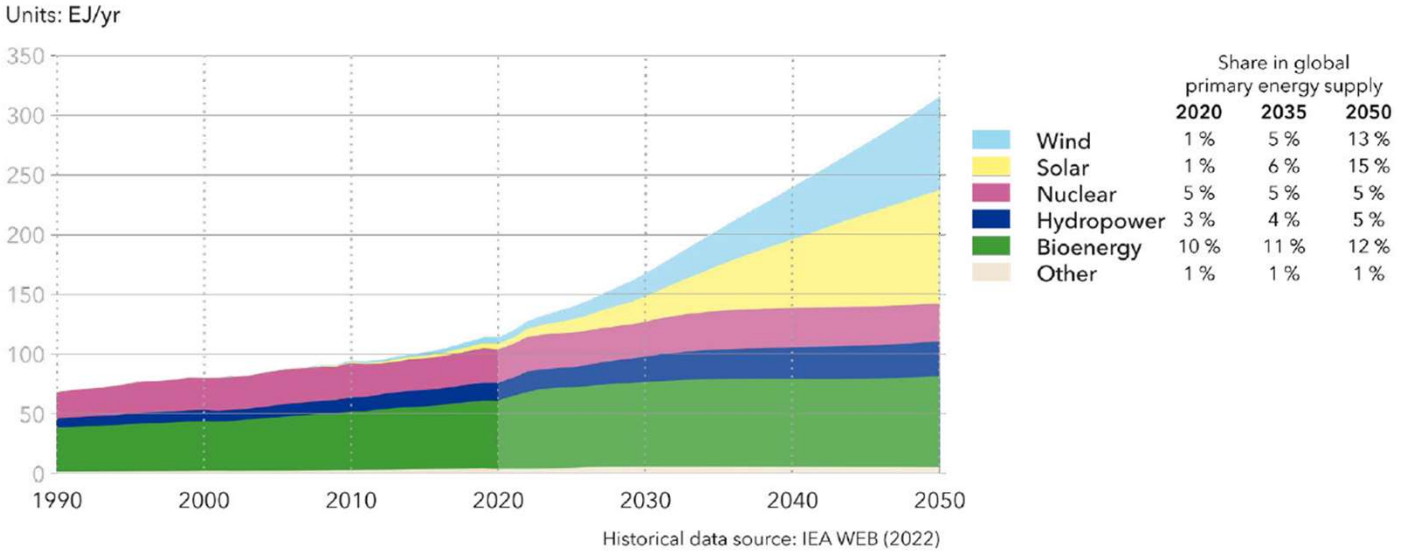
World maritime subsector energy demand by carrier



Natural gas includes LNG and LPG. Historical data source: IEA WEB (2022)

FIGURE 3.1

World non-fossil energy supply by source



Historical data source: IEA WEB (2022)

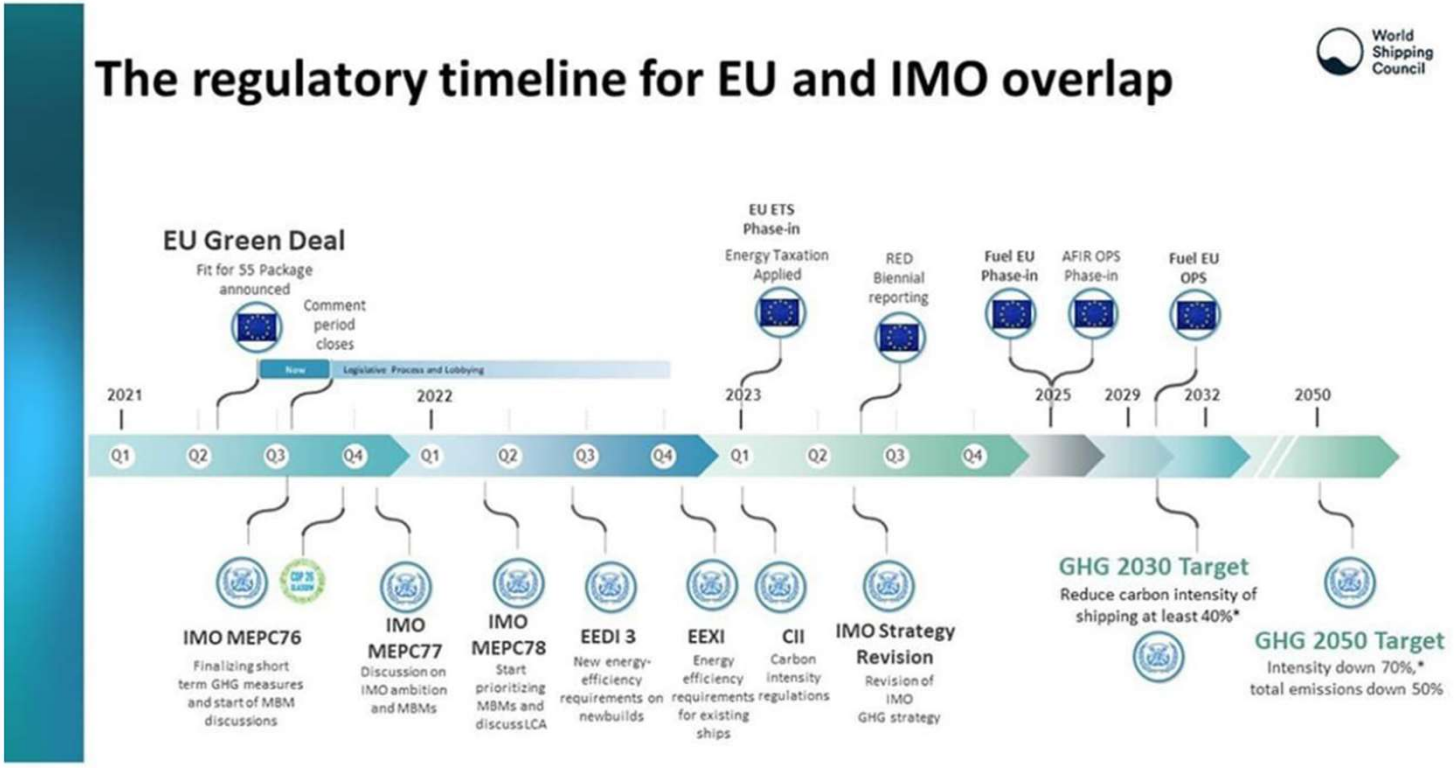
DNV

ENERGY TRANSITION OUTLOOK 2022

A global and regional forecast to 2050

Future Fuels

EU's Fit-for-55 regulation / Not fully aligned with IMO



Future Fuels

globalfactor

Impacto en las empresas navieras

Emisiones verificadas en el EU MRV constantes durante el periodo 2024-2030, incluido el efecto del Brexit: **90,5** Mt de CO_2 anuales

Exenciones hasta el 31 de diciembre de 2030:

- Regiones ultraperiféricas: **-7 Mt** de CO_2
- Buques clase hielo**: -4 Mt** de CO_2
- Exenciones a islas < 200.000 habitantes: **-4 Mt** de CO_2

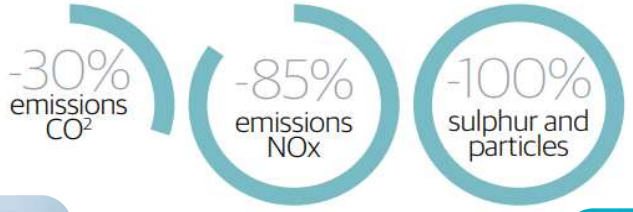
Ampliación del sistema:

- Buques de apoyo a plataformas en 2027: +**45 Mt** de CO_2
- Ampliación a otros gases de efecto invernadero (metano y N_2O) en 2026: **+13 Mt** de CO_2

Fuente: Lost at sea: EU States' €20 billion giveaway to the shipping industry
Analysis of European institutions' shipping ETS positions
Transport and Environment
September 2022

Future Fuels

- LNG is one of the most environmentally friendly fossil fuels. With a future pathway with bio-LNG and e-LNG
- Its use considerably reduces emissions, with an immediate impact on air quality and the greenhouse effect
- The use of LNG will lead to a percentage reduction in emissions of:



BALEARIA