



GHENOVA

ENGINEERING THE FUTURE



Decarbonisation Roadmap: Short, medium and long-term technologies



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1. CURRENT STATE OF THE REGULATIONS

MARITIME & PORTS & VEHICLES

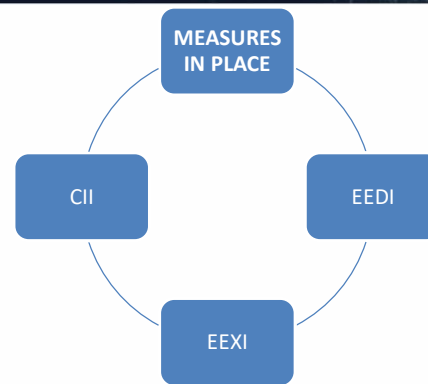


1. CURRENT STATE OF THE REGULATIONS FOR MARITIME TRANSPORT, ROAD TRANSPORT AND PORTS



STRATEGY 2030/2050 (UNDER REVIEW)

- Reducing the CI of shipping (40% by 2030 and 70% by 2050)
- Reduce total annual GHG emissions from shipping by at least 20%, struggling to reach 30% by 2030, compared to 2008; and 70% struggling to reach 80% by 2040, achieving zero GHG emissions by 2050
- Adopt technologies, fuels and/or energy sources with zero or near-zero GHG emissions by striving to reach 10% of the energy used by shipping by 2030.



EEDI ENERGY EFFICIENCY DESIGN INDEX IMPROVING THE TECHNICAL PERFORMANCE OF NEW BUILD SHIPS

<p>Ships which are designed and constructed today must be MORE ENERGY EFFICIENT than the baseline, thus reducing their carbon intensity</p>	<p>Performance targets are increasingly stringent over time, thus INCENTIVIZING INNOVATION in ship design</p>
<p>There are DIFFERENT GOALS FOR DIFFERENT TYPES OF SHIPS, recognizing the specificities of different types of ships</p>	<p>For example, THE LARGEST CONTAINER SHIPS (>200,000 DWT) built after 1 April 2022 must be 50% more efficient than the baseline</p>

CARBON INTENSITY INDICATOR (CII RATING) IMPROVING THE OPERATIONAL PERFORMANCE OF EXISTING SHIPS

<p>Each year, ships of 5,000 gross tonnage and above collect and report fuel consumption data. On the basis of this data, A CARBON INTENSITY RATING IS ASSIGNED TO THE SHIP, FROM A TO E</p>	<p>There are a variety of operational means to IMPROVE THE CARBON INTENSITY OF EXISTING SHIPS and achieve the Required CII, e.g.:</p> <ul style="list-style-type: none"> • Ship speed optimization • Weather routing • Just-in-time arrival • Trim, draft, and ballast optimization
<p>Poorly rated ships have to implement A PLAN OF CORRECTIVE ACTIONS, and the company is regularly audited incentives may be provided to best rated (A/B) ships</p>	<p>The requirements for CII rating ENTERED INTO EFFECT on 1 January 2023</p>

EEXI ENERGY EFFICIENCY EXISTING SHIPS INDEX IMPROVING THE TECHNICAL PERFORMANCE OF EXISTING SHIPS

<p>The requirements for EEXI certification ENTERED INTO FORCE on 1 November 2022</p>	<p>All ships are required to calculate their Attained Energy Efficiency EXISTING SHIP INDEX (EEXI)</p>	<p>The EEXI is a ONE-TIME CERTIFICATION for existing ships targeting design parameters</p>
<p>There are a variety of technical means to IMPROVE THE CARBON INTENSITY of existing ships and achieve the Required EEXI</p>	<p>A review clause requires IMO to REVIEW THE EFFECTIVENESS of the implementation of the EEXI requirements, by 1 January 2026 at the latest, and, if necessary, develop and adopt further amendments</p>	



1. CURRENT STATE OF THE REGULATIONS FOR MARITIME TRANSPORT, ROAD TRANSPORT AND PORTS

EUETS

- ❑ Objective is to reduce emissions by 62% from 2005 to 2030
- ❑ It covers greenhouse gas emissions from around 10,000 installations in the energy sector and manufacturing industry, as well as aircraft operators flying within the EU and departing to Switzerland and the UK
- ❑ The EU Emissions Trading System (EU ETS) will be extended to maritime transport emissions from 2024
- ❑ What kind of boats does it affect?
 - ✓ From 2024: cargo and passenger ships of 5000 gross tonnage (GT) or more
 - ✓ From 2027: Offshore vessels of 5000 GT or more

EUETS 2

- ❑ In 2023, ETS 2 was created covering fuel combustion in buildings, road transport, and other sectors.
- ❑ It is scheduled to begin implementation in 2027.
- ❑ ETS 2 achieves 42% emissions reduction in 2030 compared to 2005
- ❑ The revenue from the emission rights auction in the ETS will be allocated to the Climate Social Fund.



1. CURRENT STATE OF THE REGULATIONS FOR MARITIME TRANSPORT, ROAD TRANSPORT AND PORTS

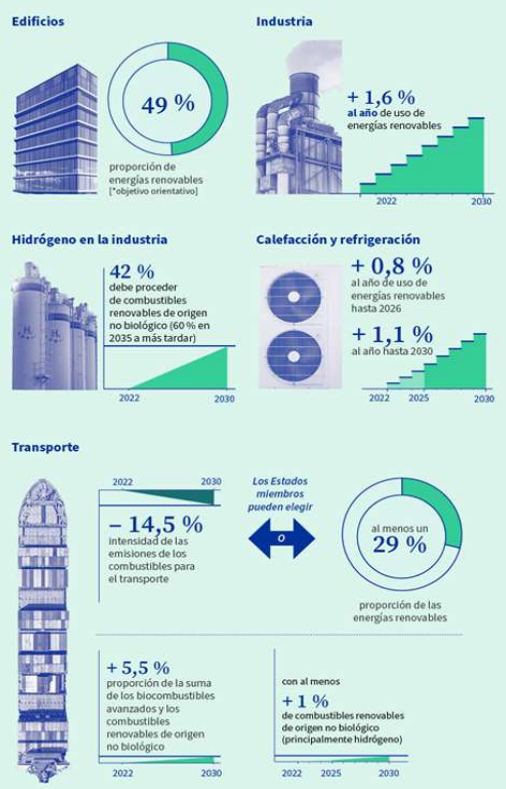
LEGISLATIVE PROPOSALS INCLUDED IN THE FIT FOR 55 PACKAGE

- EU FIT FOR 55
(UNDER REVIEW)



OBJECTIVES

- Reduction of emissions by at least 55% that the EU has set for 2030 compared to 1990 levels, as agreed in the EU Climate law



- EURO 7



OBJECTIVES

- Stricter limits (CO₂, NO_x & PM emissions) More rigorous and accurate testing to measure emissions
- It comes into force from 2025, aims to end the sale of combustion cars by 2035 and whose ultimate goal is to achieve the long-awaited carbon neutral footprint by 2050

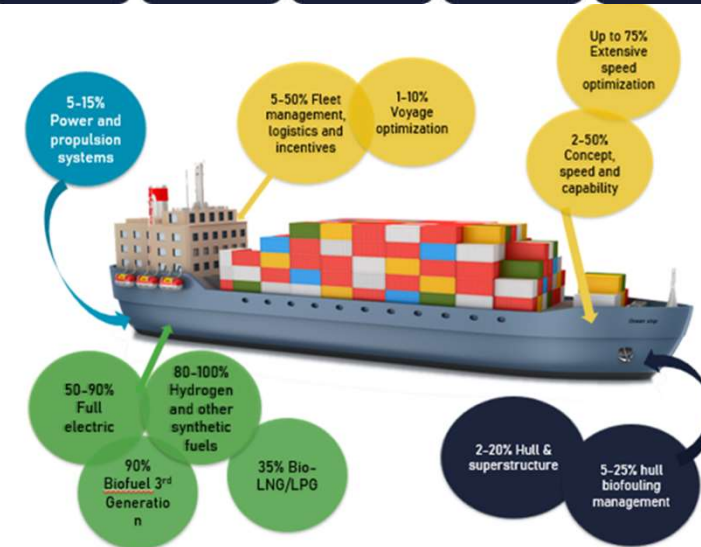
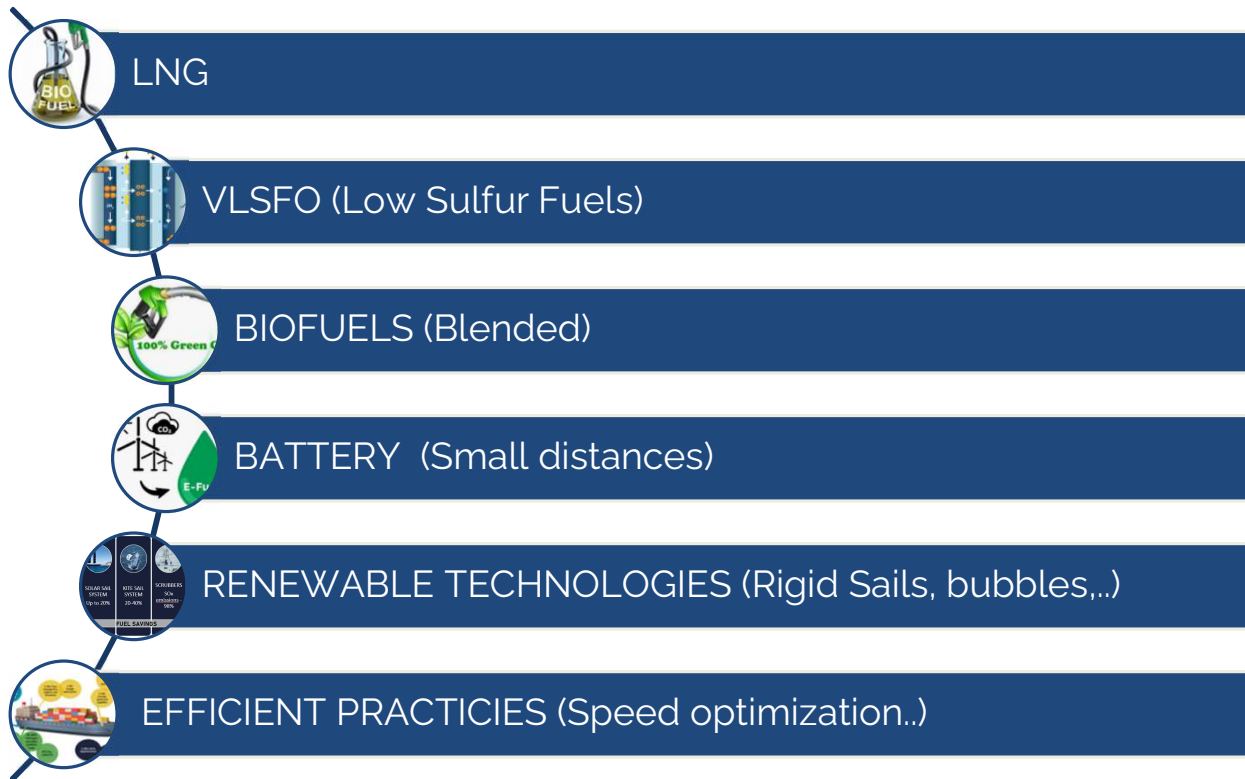


2. DESCARBONISATION TECHNOLOGIES IN MARITIME TRANSPORT



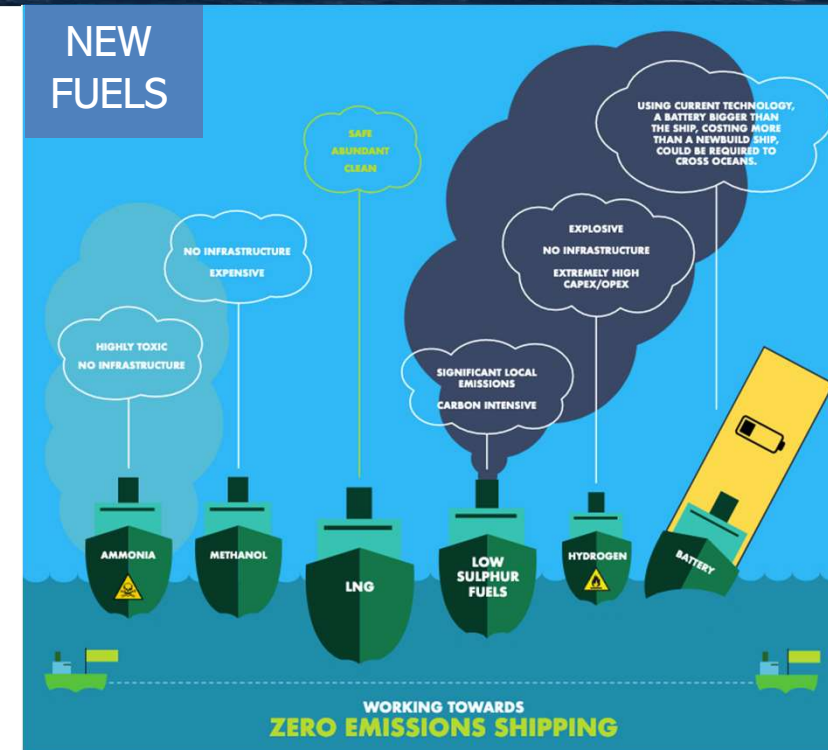
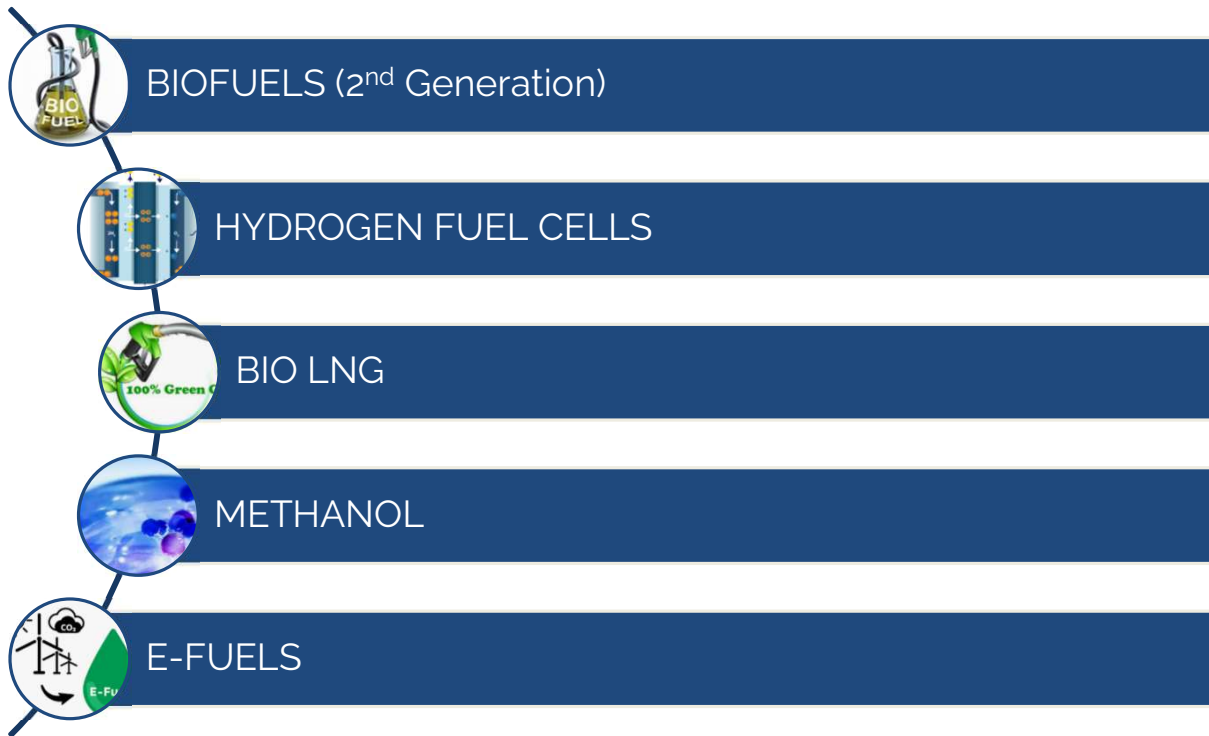
2. DESCARBONISATION TECHNOLOGIES IN MARITIME TRANSPORT

2.1 TECHNOLOGIES AVAILABLE IN THE SHORT-TERM



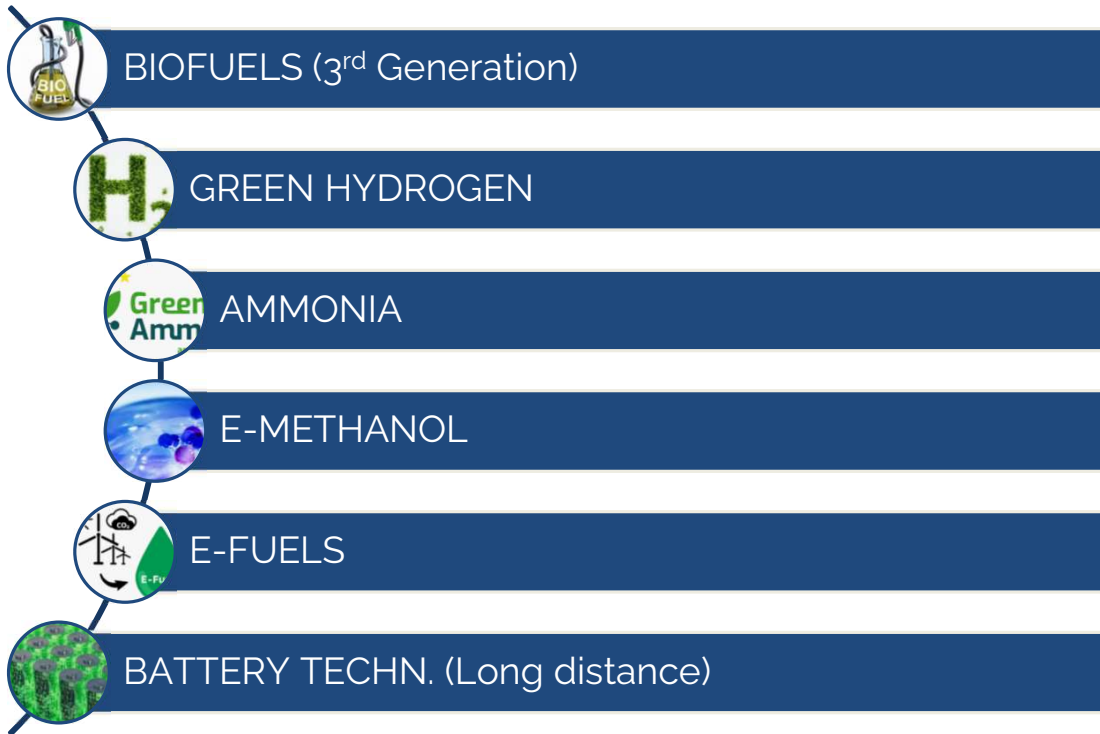
2. DESCARBONISATION TECHNOLOGIES IN MARITIME TRANSPORT

2.2 TECHNOLOGIES AVAILABLE IN THE MEDIUM-TERM

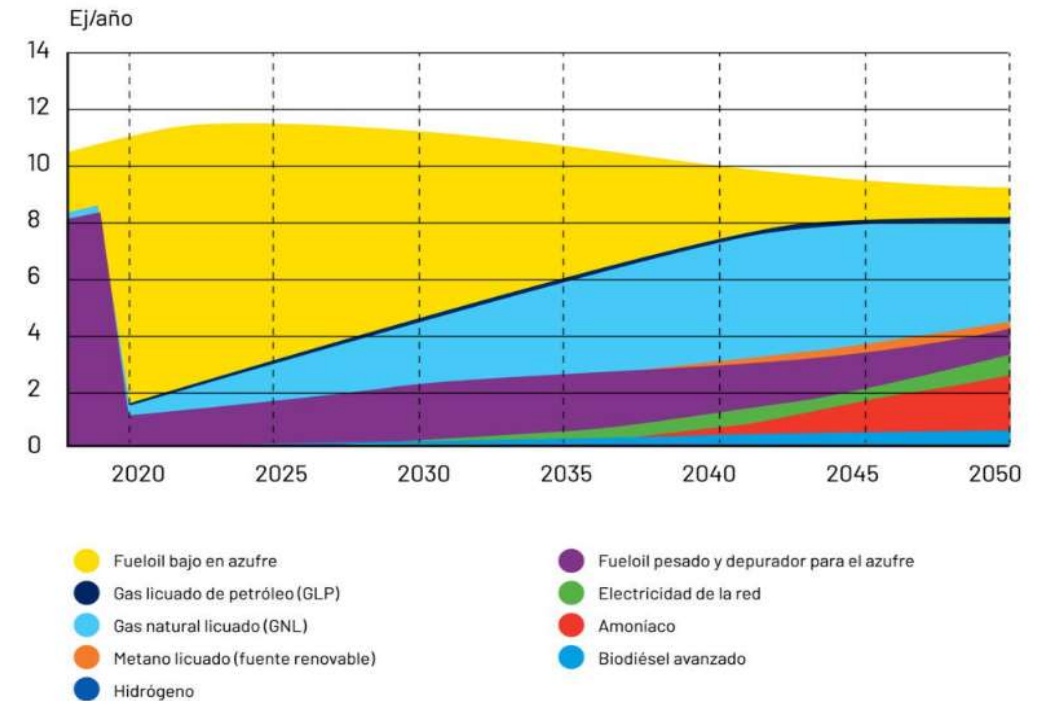


2. DESCARBONISATION TECHNOLOGIES IN MARITIME TRANSPORT

2.2 TECHNOLOGIES AVAILABLE IN THE LONG-TERM



DEMANDA DE ENERGÍA MARÍTIMA Y COMBINACIÓN DE COMBUSTIBLES PREVISTA









3. DECARBONISATION TECHNOLOGIES FOR TRUCK AND VEHICLE TRANSPORT



3. Decarbonisation Technologies for Truck and Vehicle Transport

3.1 Technologies available in the short-term

-  BATTERY ELECTRIC - BEVs
-  HYBRID VEHICLES
-  CNG – Compressed Natural Gas
-  LNG
-  BIODIESEL
-  E85 – Ethanol Blended



The challenge

The transport sector accounts for 23% of global energy-related GHG emissions

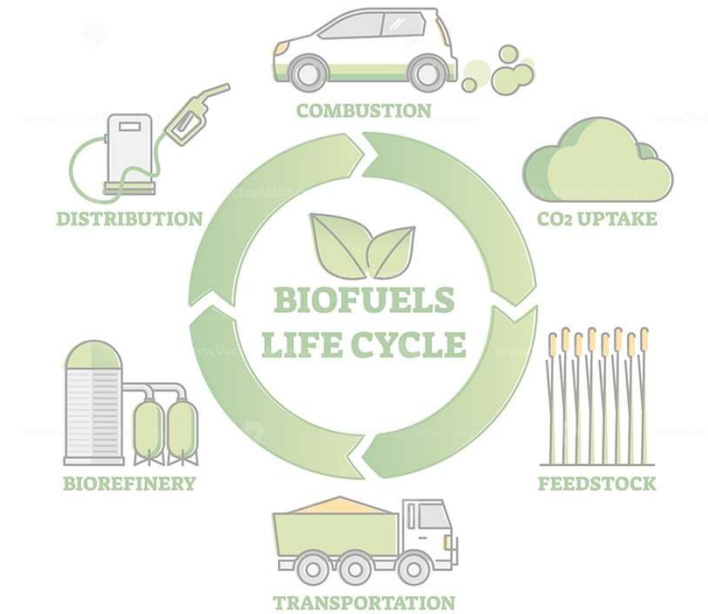
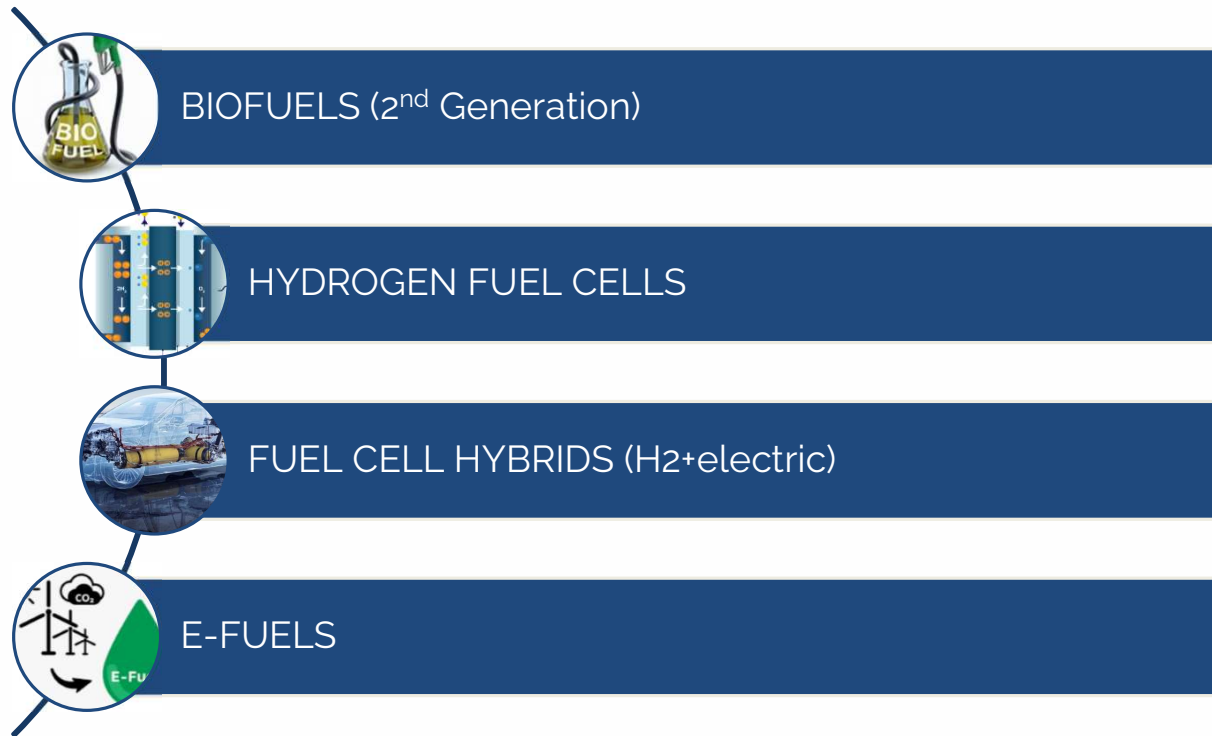
95% of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel

An additional 2.3 billion people are expected to live in cities by 2050, increasing pressure on urban transport systems








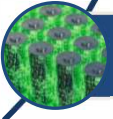
3. Decarbonisation Technologies for Truck and Vehicle Transport

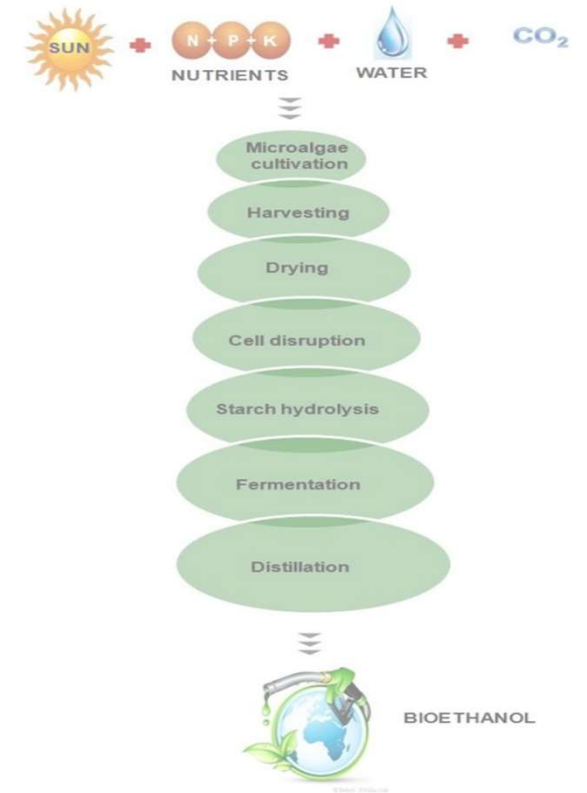
3.2 Technologies available in the medium-term



3. Decarbonisation Technologies for Truck and Vehicle Transport

3.3 Technologies available in the long-term

-  BIOFUELS (3rd Generation)
-  GREEN HYDROGEN
-  AMMONIA
-  E-METHANOL
-  SYNTHETIC FUELS
-  SOLID STATE BATTERIES










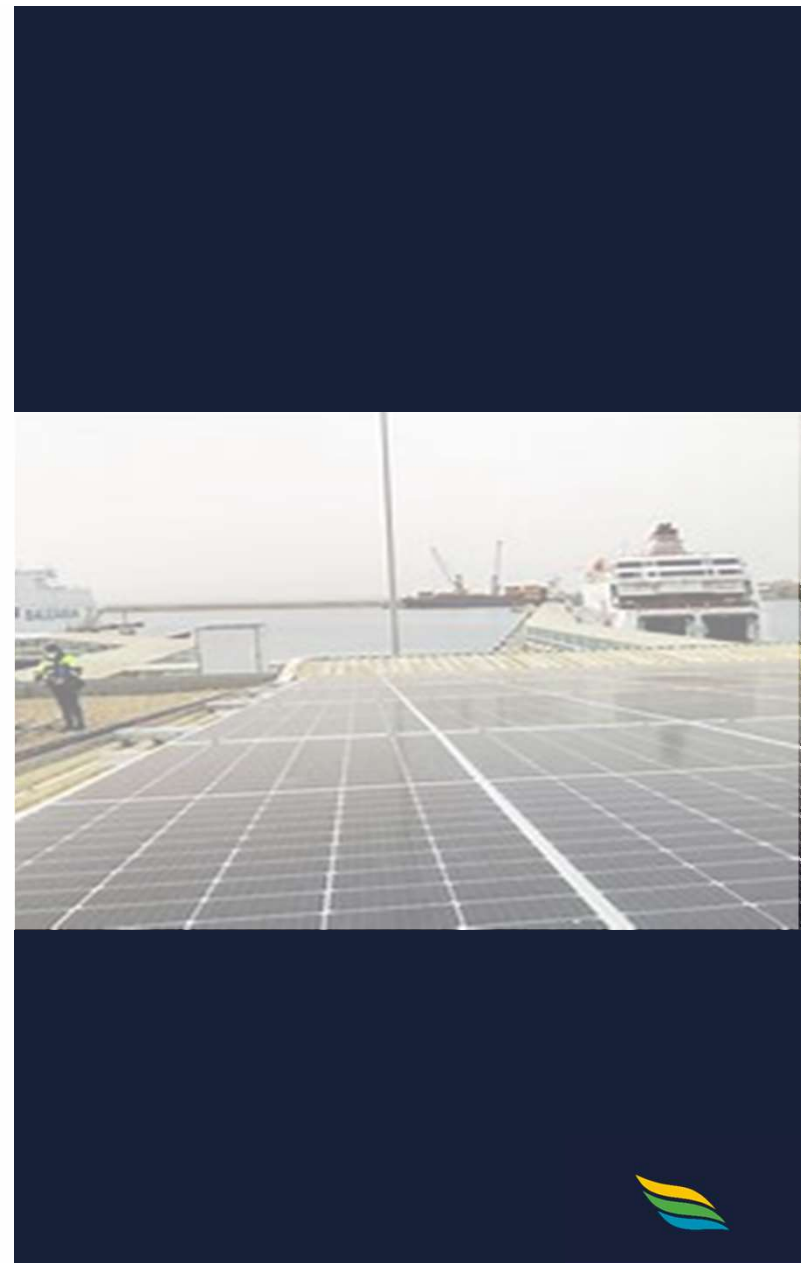
4. DECARBONISATION TECHNOLOGIES IN PORTS



4. Decarbonisation Technologies in Ports

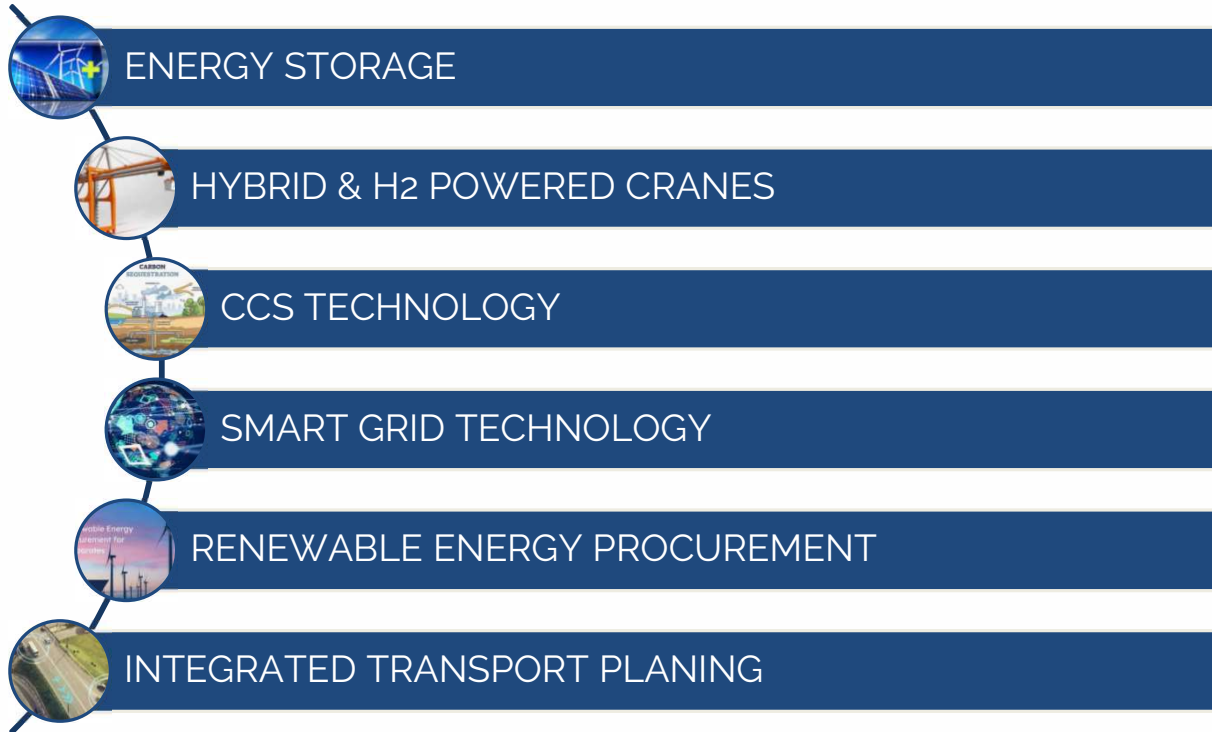
4.1 Technologies available in the short-term

-  ELECTRIFICATION OF EQUIPMENTS
-  HYBRID ELECTRIC VEHICLES
-  COLD IRONING
-  LNG & ALTERNATIVE FUELS FOR VEHICLES
-  DIGITALIZATION & AUTOMATIZATION
-  RENEWABLE ENERGY INTEGRATION
-  ENERGY EFFICENCY



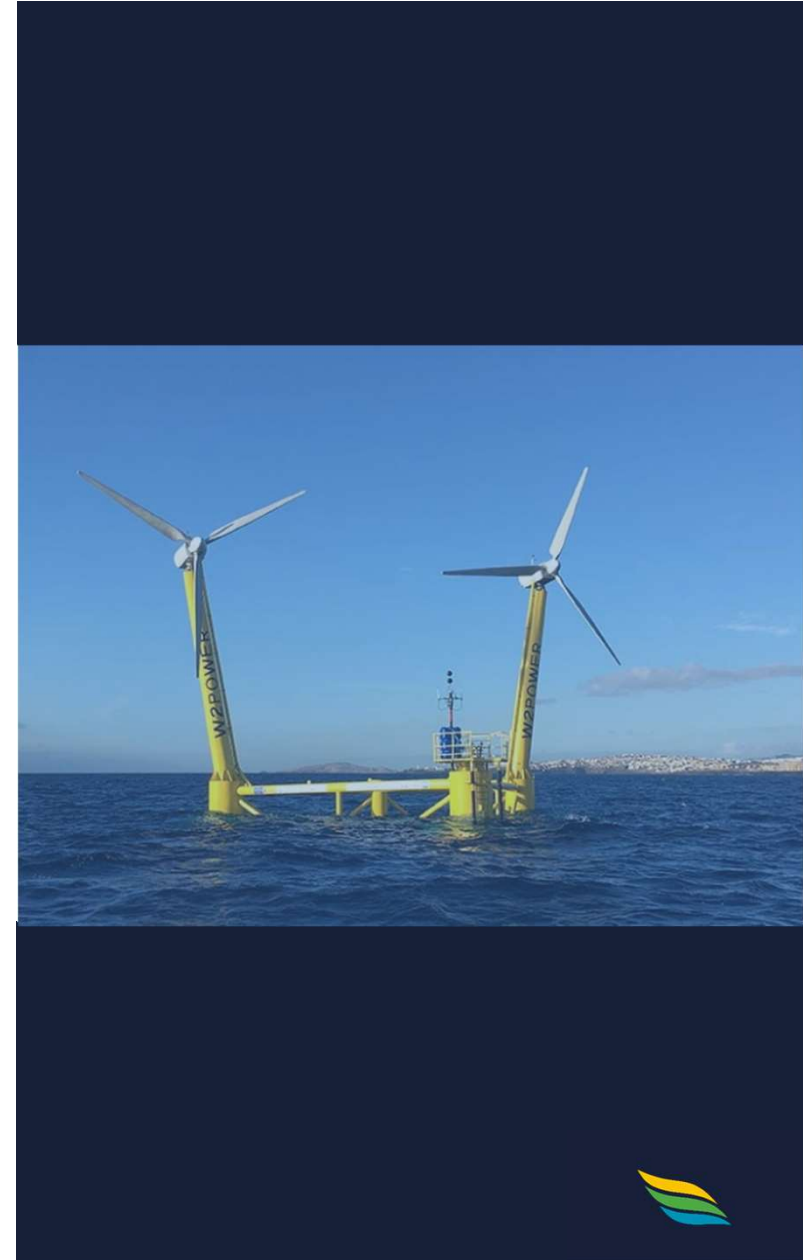
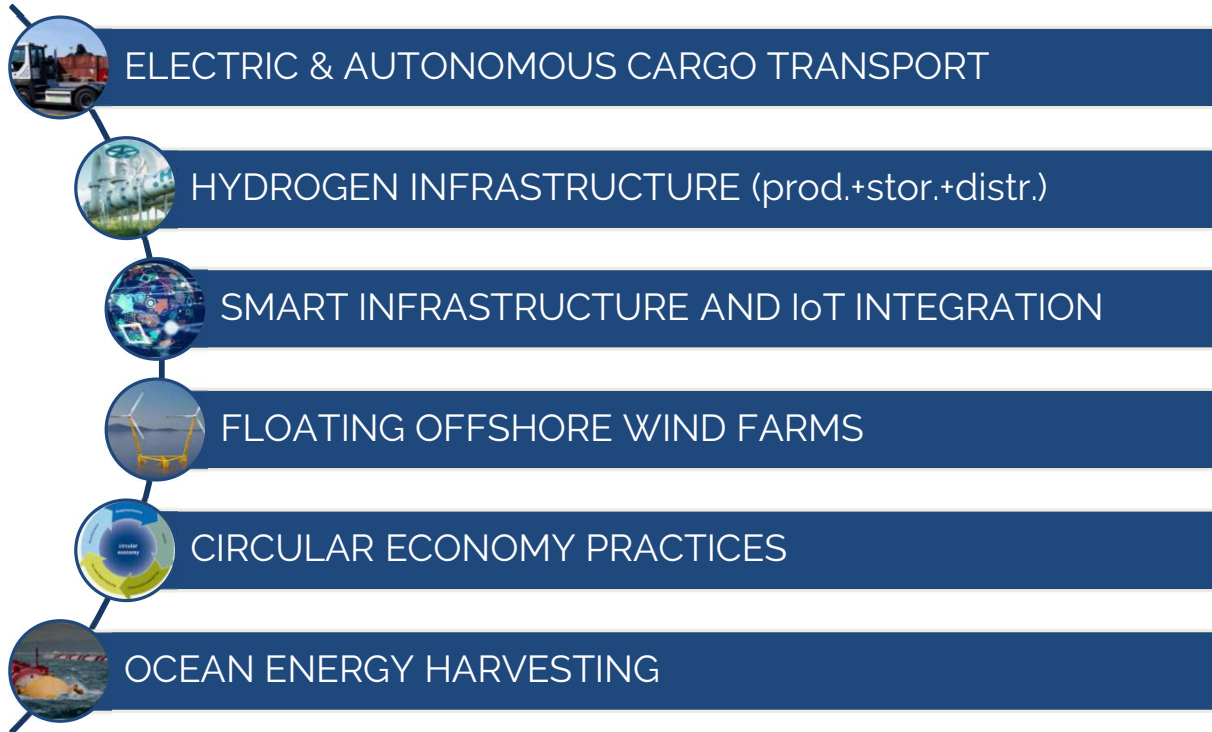
4. Decarbonisation Technologies in Ports

4.2 Technologies available in the medium-term



4. Decarbonisation Technologies in Ports

4.2 Technologies available in the long-term





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