

Fincantieri Wave 2 the Future

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Wave 2 the Future



- Fincantieri Company Profile
- Fuels for Maritime
- Fuel Cells for Maritime
- Wave 2 the Future
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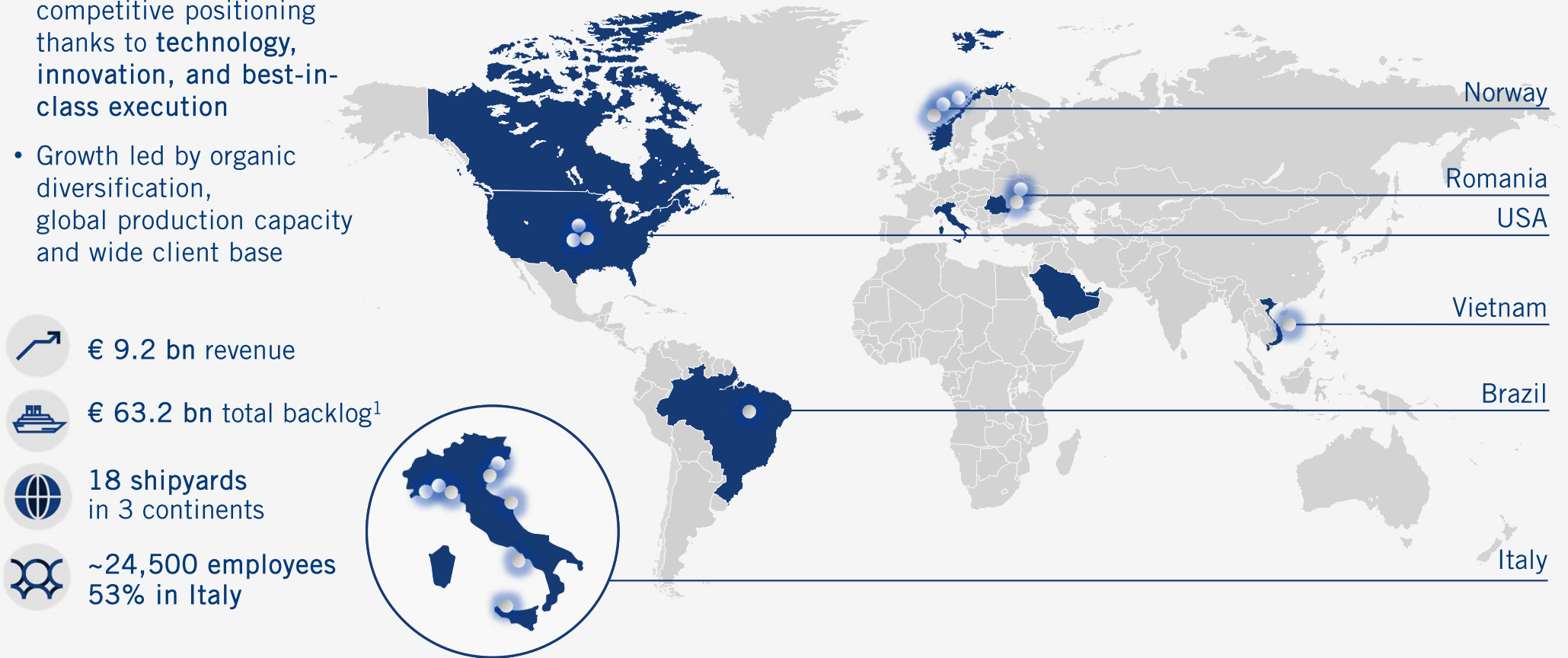
Wave 2 the Future



A leading global Group with widespread international presence

- Leading player in Shipbuilding with a strong competitive positioning thanks to technology, innovation, and best-in-class execution
- Growth led by organic diversification, global production capacity and wide client base

● Shipyards



€ 9.2 bn revenue

€ 63.2 bn total backlog¹

18 shipyards in 3 continents

~24,500 employees 53% in Italy

Note: Values as of FY25

1. Total backlog is the sum of backlog and soft backlog. Soft backlog includes the value of existing contract options and letters of intent as well as of contracts at an advanced stage of negotiation, which are not yet reflected in the order backlog. The soft backlog also reflects the programs included in the Defense Multi-Year Plan (Documento Programmatico Pluriennale - DPP); Fincantieri refers to this document in its financial reporting to ensure full transparency on the expected impact of these programs on future order intake and revenues

Portfolio of unique complex shipbuilding assets with economies of scale, cross-fertilization, multiplier of value



CRUISE



DEFENSE



OFFSHORE



UNDERWATER



INFRASTRUCTURE

Leader in market share (>40%)

Diversified client base and complete segment coverage

Main supplier to the Italian Navy

Partner of the US Navy

Partner of choice of leading navies worldwide

Prime player in Offshore Energy

> 30% market share for orderbook for CSOVs and SOVs¹

Strong competitive positioning in highly-specialized complex vessels including cable layers and icebreakers

Consolidated competences in conventional UW technologies (submarines, effectors, sonars)

Extensive cross-domain expertise, from surface to seabed, from hardware to software

Expansion of the commercial offer in unconventional technologies

COMPETITIVE STRENGTHS

Leadership & scale in the 4 core Businesses

Vertical integration to drive the new paradigm

Global production to address geopolitical macro-trends

DIGITAL ENABLING TECHNOLOGIES

Automation and Digital design authority capabilities evolving into AI and Data analytics applications

MARINE SYSTEMS AND COMPONENTS

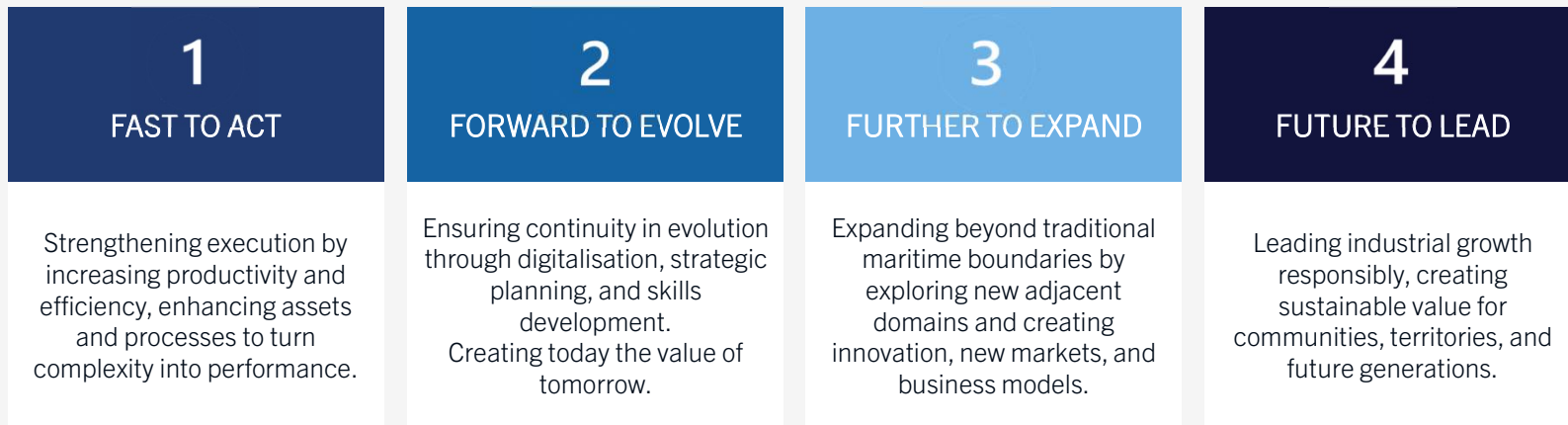
Proprietary equipments and components delivering and innovating state of the art naval propulsion systems

1. CSOV: Construction Service Operations Vessel; SOV: Service Operation Vessel



Industrial Plan 2026–2030

F4 – FAST | FORWARD | FURTHER | FUTURE





Focus on backlog execution



**INCREASE IN
PRODUCTION
CAPACITY**

Capacity Boost



**PRODUCTIVITY
INCREASE**

Operations Excellence
Supply Chain Evolution
Long Term Resource Plan



**STRENGTHENING
OF ONGOING
STRATEGIC
PROJECTS**

Procurement Excellence
Clean Transition Solutions
FDE - Navis Sapiens



**GROWTH IN
ADJACENCIES**

Underwater Development
M&A

KEY DIVISIONAL INITIATIVES

INTEGRATED SUSTAINABILITY PLAN



Funded by
the European Union
NextGenerationEU



Ministero delle Imprese
e del Made in Italy



IPCEI
HYDROGEN



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

Strengths of Fincantieri's technological and operational excellence

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A) Global and flexible production network

- Global engineering and production network with 18 shipyards
- State-of-the-art facilities
- Flexible capacity

B) High flexibility

- Highly customized products
- Flexible utilization of resources globally
- Tailored project set-up to meet client needs

C) Superior system integrator capabilities

- Ability to coordinate a broad network of specialized suppliers (> 3.000 just in Italy)
- Integrated production model
- Proven track record of on-time deliveries

D) Technological leadership

- Best-in-class know-how and leadership in high-end vessels
- Strong commitment to R&D
- Innovation across full product offering

High flexibility



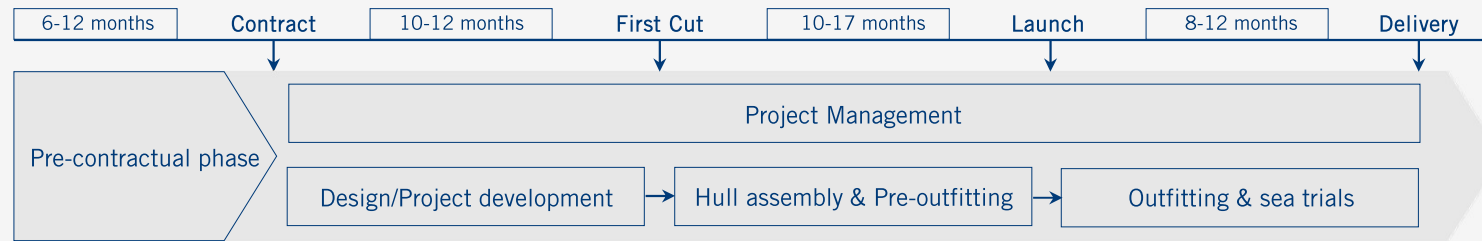
- Due date defined since order
- Any delay would significantly penalize the shipbuilder (e.g. penalties, reputation)

Superior system integrator capabilities

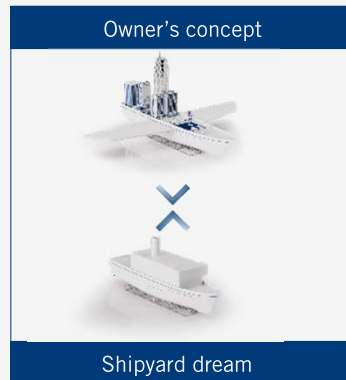
“Prime/General contractor” role with:

- **Direct development of design & engineering:** starting from ship configuration in close cooperation with shipowner, ensuring high flexibility also during construction
- **Project management of a whole construction:** sole interface & coordinator of all parties involved interacting with suppliers for engineering and production
- **Hull construction + integration of parts & components provided by suppliers:** active management of make-or-buy strategies
- **Responsibility of project performance and results**

Cruise ship example



Engineering:
responsible of overall project



Hull:
direct construction in Group shipyards



Outfitting:
integration & coordination in Group shipyards of a large number of suppliers with dynamic management of any modification

Shipbuilder 20-30% → Suppliers 70-80%

- | | |
|--|--|
| <ul style="list-style-type: none"> • Design • Project Management • Hull | <ul style="list-style-type: none"> • Furniture/Public rooms • Pools/SPA • Entertainment/Theaters • Engines |
|--|--|

1. Maritime Hydrogen Foundations

The Fuel

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Environmental impact of the maritime sector



2,9%
Of global
CO₂
emissions

1.076
million ton
Maritime
CO₂
emissions

Decarbonization targets:
CO₂ emissions w.r.t. 2008

2030:	- 20%
2040:	- 70%
2050:	- 100%



3,2-3,3%
EU's total
CO₂
emissions

127
million ton
Maritime
CO₂
emissions

Decarbonization targets:
GHG emissions w.r.t. 1990

2030:	- 55%
2050:	- 90%

Source

- World data: IMO, Fourth Greenhouse Gas Study 2020.
- European data: 2024 Report from the European Commission on CO₂ Emissions from Maritime Transport, Brussels, European Commission



From global governance to European regulation



Worldwide: defining the Global Net-Zero Framework

The International Maritime Organization (IMO) is leading the global effort to decarbonise international shipping:

- Adoption of the **Revised IMO GHG Strategy (2023)**, setting the objective of net-zero GHG emissions by or around 2050
- Ongoing work on a global *Net-Zero Emissions Framework*, including:
 - A GHG Fuel Intensity standard
 - Market-based measures and carbon pricing mechanisms



Europe: from emission regulation to an integrated maritime strategy

Europe has entered an advanced, highly coordinated regulatory phase:

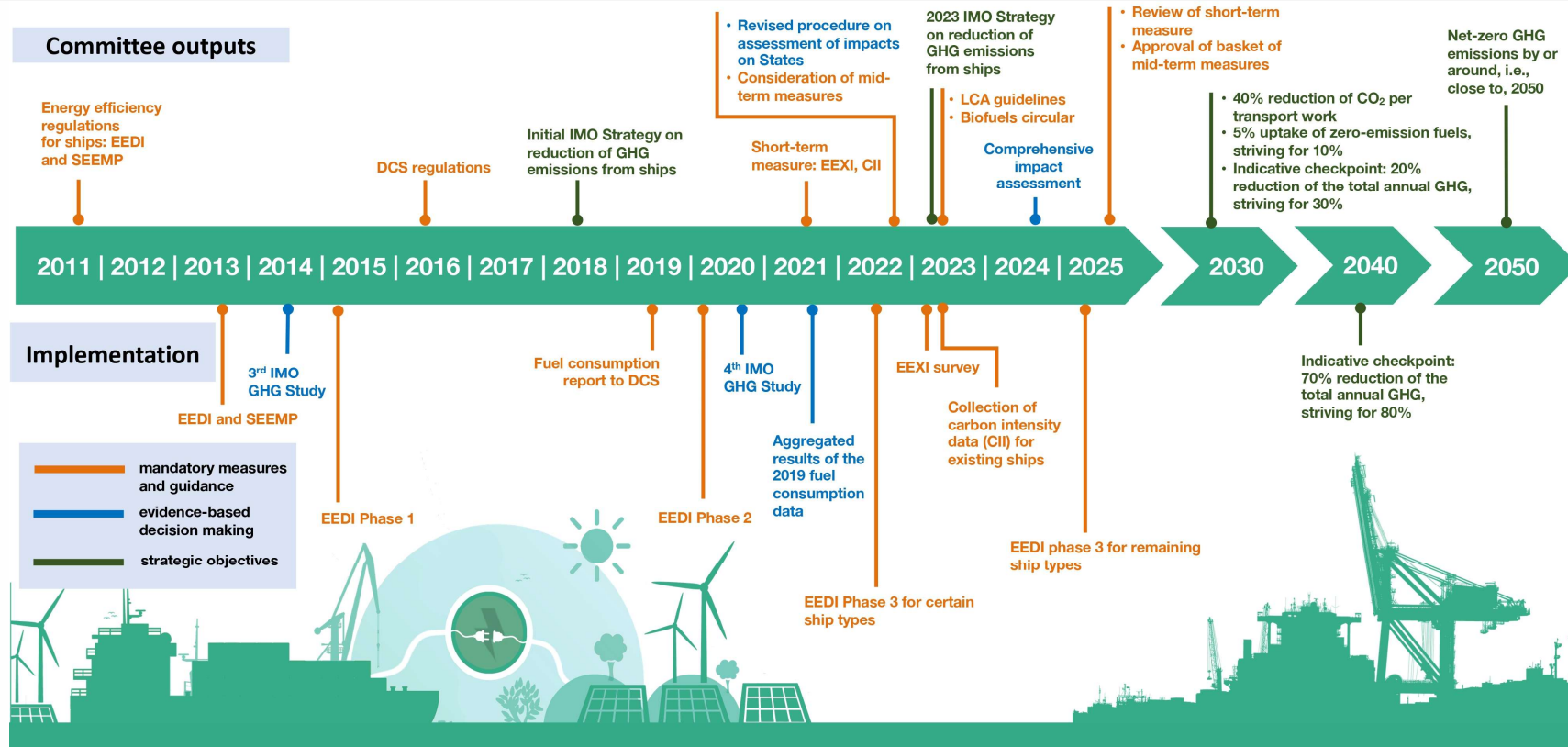
- ✓ **Fit for 55:** Aligning maritime transport with the EU climate target of – 55% GHG emissions by 2030
- ✓ **EU ETS (Maritime):** Introducing carbon pricing for shipping emissions on EU and extra-EU voyages
- ✓ **CBAM:** Preventing carbon leakage and protecting EU climate ambition
- ✓ **FuelEU Maritime:** Reducing the GHG intensity of energy used on board ships

Adopted in March 2026, the **EU Industrial Maritime Strategy** translates regulatory ambition into concrete industrial action.

Built around 3 pillars - Build & Equip, Transport & Connect, and Secure & Protect - it targets the supply or retrofit of 10,000 sustainable vessels by 2035, while strengthening Europe's shipbuilding competitiveness, digital transition, and strategic autonomy through the new Maritime Industries and Ports Board.



IMO path towards maritime decarbonization





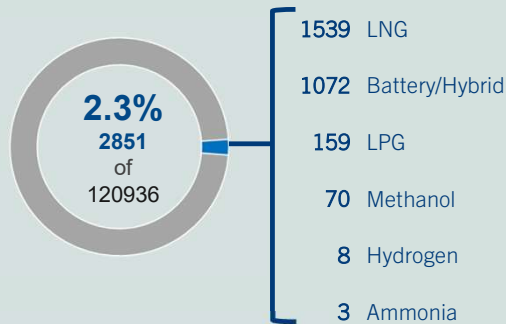
Alternative Marine Fuels: Key Characteristics

	H ₂ HYDROGEN	CH ₃ OH METHANOL	NH ₃ AMMONIA
Carbon & GHG at point of use	Zero CO ₂ at point of use (water only product)	CO ₂ produced; lifecycle depends on feedstock (fossil/ bio/ e-methanol)	Zero CO ₂ ; NO _x & N ₂ O possible production route is decisive
Physical state & storage	Compressed gas or cryogenic LH ₂ at -253 °C	Ambient liquid, no cryogenics, conventional tanks	Refrigerated liquid (-34 °C) or pressurised up to ~10 bar
Volumetric energy density	~8.5 GJ/m ³ (LH ₂) Largest tank volumes needed	~15.8 GJ/m ³ most space-efficient of the three	~12.7 GJ/m ³ significant but less extreme than LH ₂
Dominant hazards	Wide flammability, near-invisible flame, cryogenic burns, embrittlement	Flammable & toxic; pool fires; vapour cloud formation	Toxic & corrosive; explosive mixtures; cold-burn; NO _x /N ₂ O
Onboard system complexity	HIGH - cryogenic/HP storage, BOG management, dual containment	MODERATE ambient tanks; toxicity & spill controls required	MODERATE/HIGH refrigeration or pressure + toxicity ventilation
Regulatory maturity (IGF/IMO)	Evolving mainly AD&A and interim guidelines	Most mature prescriptive framework for alcohol fuels	Under active development; AD&A/goal-based approach
Role in decarbonisation	Long-term high-impact; zero tank-to-wake CO ₂ ; major infra changes	Near-to-medium term transition; depends on bio/e-methanol supply	Promising zero-C candidate for deep sea; tempered by toxicity

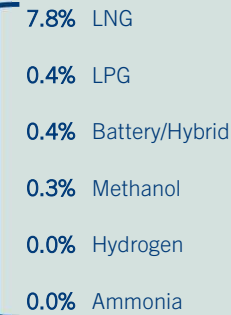


Alternative fuel uptake in the world fleet in number of ships (2025)

N of ships in operation

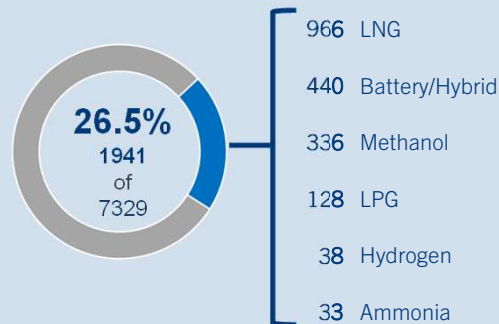


8.9%

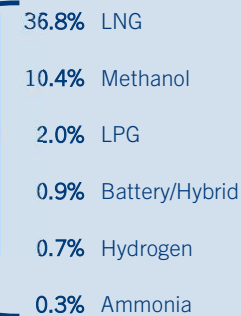


Gross T of ships in operation

N of ships on order



51.1%

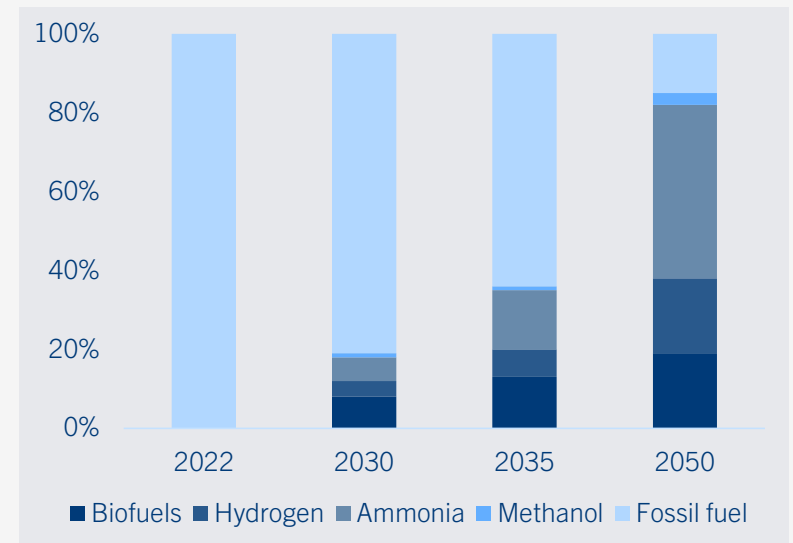


Gross T of ships on order



Maritime alternative fuels roadmap

Milestone	2022	2030	2035	2050
International shipping activity (trillion tonne-kilometres)	125	145	165	265
SHARE IN FINAL ENERGY CONSUMPTION				
Biofuels	0%	8%	13%	19%
Hydrogen	0%	4%	7%	19%
Ammonia	0%	6%	15%	44%
Methanol	0%	1%	1%	3%
Fossil fuel	100%	81%	64%	15%

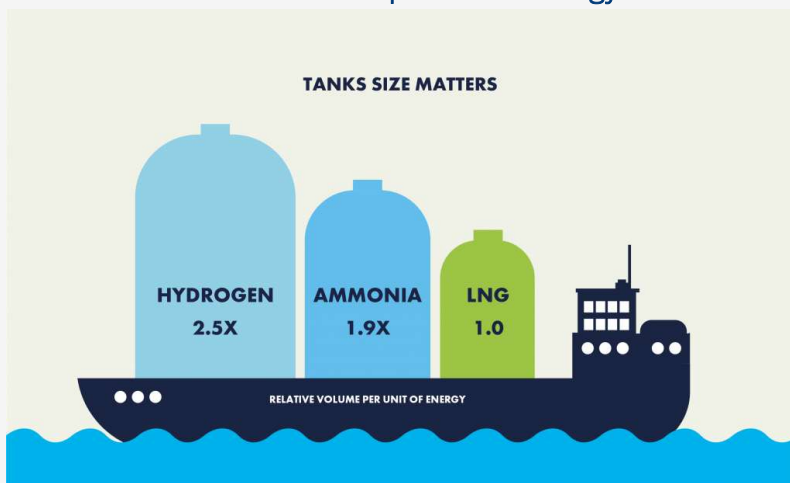


Source: Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach



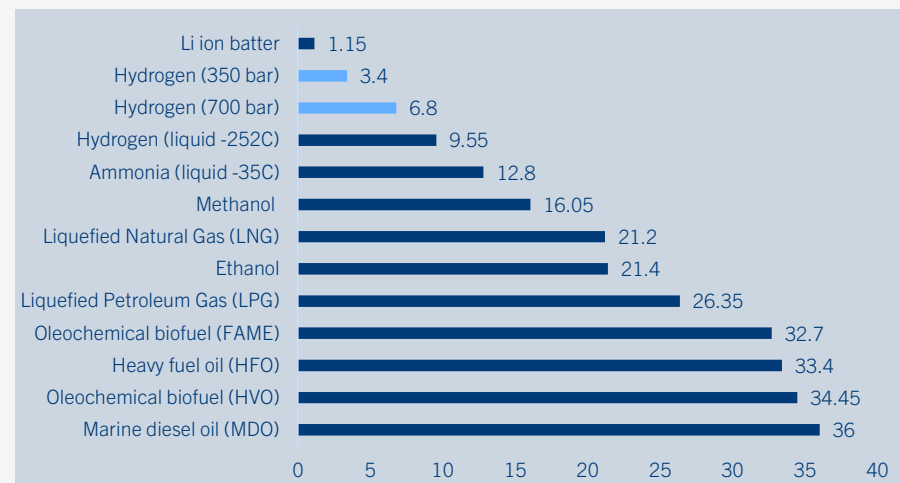
H₂ Gravimetric Vs Volumetric energy density

Relative volume per unit of energy



Source: SEA-LNG, Understanding energy density of future fuels could be key to clearer decarbonisation decision-making

Energy density of maritime fuels in 2020, by fuel type (in megajoule per liter)



Source: Statista: Energy density of maritime fuels in 2020, by fuel type



Hydrogen has one of the highest gravimetric energy densities, while its volumetric energy density is one of the lowest.



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MILESTONES

	2022	2025	2026	2027	2030	2035	2050
MILESTONES	Completed efficiency initiatives and new propulsion setups		1 st cruise ship with hydrogen	1 st offshore ship "Net Zero capable"	Zero emissions in port	1 st cruise ship Net Zero with alternative fuels	Zero-emission shipowners' fleets



NEW FUELS IMPLEMENTATION ROADMAP

	MGO	LNG	PEM fuel cells (liquid H ₂)	Methanol-ready SOFC fuel cells (LNG/H ₂)	Methanol	Nuclear
CRUISE				→		
OFFSHORE	Ammonia-ready			→	Ammonia	
	Battery			→	Full-battery Full-biofuel	
		Methanol-ready	→	Methanol		
					Delivered	Contracted for delivery
						To be confirmed

2. Maritime Hydrogen Foundations The Power Generation System

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Fuel cells



A fuel cell is a device that generates electricity through an electrochemical reaction, not combustion.

Fuel cells application



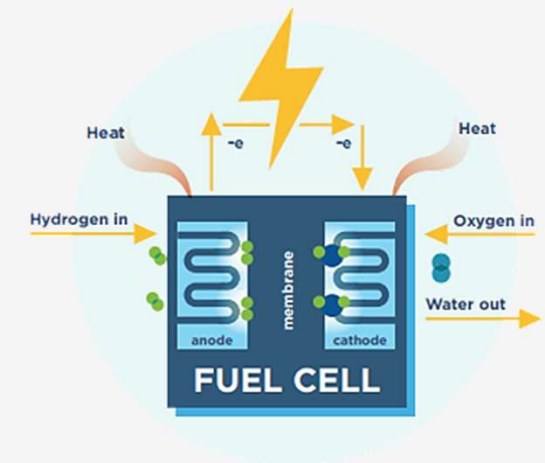
Providing power to homes and businesses



Keeping critical facilities up and running



Moving a variety of vehicles like cars, buses, trucks, forklifts, trains, and more



Source: Fuel Cell & Hydrogen Energy Association, Fuel Cell Basics



Fuel cells

Fuel cells that use pure hydrogen fuel are completely carbon-free, with their only byproducts being electricity, heat, and water.



Benefits of fuel cells



Low-to-Zero Emissions



High Efficiency



Reliability



Scalability



Quiet Operation



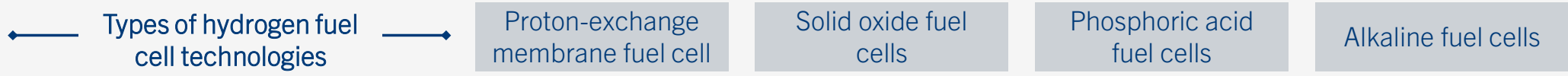
Fuel Flexibility



Energy Security

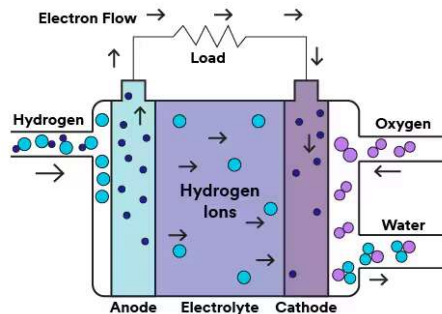
Source: Fuel Cell & Hydrogen Energy Association, Fuel Cell Basics

PEM – SOFC



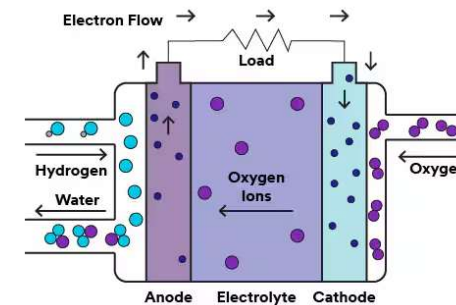
Proton-exchange membrane fuel cell

They are being developed primarily for transportation, including passenger and commercial vehicles as well as potential aerospace applications.



Solid oxide fuel cells

Solid oxide fuel cells are highly durable and energy efficient, and are ideal for applications in which waste heat can be harvested.



Source: 3M, Hydrogen Technology.



PEM – SOFC



	Common Electrolyte	Operating Temperature	Typical efficiency	Applications	Advantages	Disadvantages
PEM	Perfluoro sulfonic acid	50-100°C	60 % transportation 35% stationary	Backup power , Portable power, Distributed generation, Transportation, Specialty vehicles	Solid electrolyte reduces corrosion and electrolyte management problems Low temperature Quick startup	Expensive catalysts Sensitive to fuel impurities Low temperature waste heat
SOFC	Yttria stabilized zirconia	700-1000°C	60%	Auxiliary power Electric utility Distributed generation	High efficiency Fuel flexibility Use a variety of catalysts Solid electrolyte Suitable for CHP & CHHP Hybrid/GT cycle	High temperature corrosion and breakdown of cell components High temperature operation requires long start-up time and limits





Hydrogen Propulsion Technologies Under Investigation

PEMFC Proton Exchange Membrane Fuel Cell

Low-temperature electrochemical conversion. Fast dynamic response, high power quality. Best suited for hotel services, auxiliary loads and low-speed manoeuvring.

Best for: dynamic loads & auxiliary power

SOFC Solid Oxide Fuel Cell

High-temperature ceramic electrolytes; high electrical efficiency; fuel-flexible (H₂ or H₂-enriched fuels). Ideal for steady-state baseload; requires thermal inertia management.

Best for: high-efficiency baseload generation

H₂ ICE Hydrogen Internal Combustion Engine

Adapts established marine engine architectures to hydrogen. Preserves familiar maintenance regimes and transient capability; integrates into hybrid propulsion architectures.

Best for: hybrid propulsion & retrofit scenarios

H₂-GT / CCGT Gas Turbine & Combined-Cycle Concept

High specific power and rapid load response. Combined-cycle arrangements recover waste heat for substantial efficiency gains. Key challenges: material compatibility and cryogenic-to-hot regime management.

Best for: high power density & efficiency recovery



The main challenges identified



H₂ compatible engines need to be scaled up to the desired MW scale while simultaneously addressing durability, compatibility with maritime conditions Sustainability.

TECHNOLOGY



Vessels have to be designed and built taking into account limited availability of spaces, volume, payloads and safety issues, in particular in case of passenger ships. These issues lead to the necessity of development of proper and safe solutions for the on-board storage of H₂.

SAFETY



Refuelling facilities and high-volume fuel bunkering systems will be required, particularly for larger vessels, posing a significant challenge. Infrastructure needed.

INFRASTRUCTURE



Regulations, codes and standards (RCS) related to H₂ issues are still immature.

RULES & REGULATIONS





Fuel cell ship implementation

Main challenges



– Application in the **marine sector** suffers of the **lack of standards and regulations** from IMO and Classification Societies; urgency to develop new rules and regulation for designing, installing, testing and managing of Hydrogen Powered Fuel Cells.



– Fuel Cells have not yet reached a level of development that **guarantees powers of the order of megawatts unless several modules are used at the same time**. Volume need to be found to allocate not only the storage but also the necessary number of fuel cell modules, fuel treatment and management system and batteries: **severe reduction in the volume dedicated to the ship payload**.



– Fuel cell output voltage is not regular, thus, **voltage converters** (DC-DC; DC/AC) should be installed downstream.



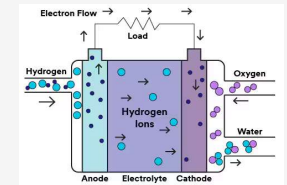
– Fuel Cell load cannot be rapidly changed as happens for ICEs gensets. Thus, when fuel cells are employed, **an energy storage system is also required to sustain fast change in electric power demand**. In addition, battery modules need to be installed to compensate for load peaks in case of bad weather, maneuvering or in cold start/back-up conditions. **Such accumulation systems should be increased for SOFCs**, which have a slower response to load variations.



– Many aspects of their actual use and implementation on board are currently unknown (response to load variations, operational stability and lifespan in a brackish environment, consumption of auxiliary systems, deterioration of components, system maintenance).



Fuel cell ship implementation - PEMFC



Main challenges



- Where LH₂ cryogenic tanks are supposed to be installed, challenges are related to the management of extreme low temperatures, energy requirements for liquefaction, boiloff losses and the need of dedicated equipment not readily available for naval application.



- PEMFC can use only hydrogen gas; thus, a purifier to remove any other substance from the fuel is required. Moreover, this technology must rely on a concrete infrastructure at port able to provide the required H₂ fuel in the required timing.



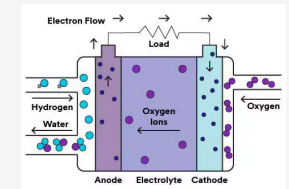
- Cooling and ventilation system required since PEMFCs operate at temperatures about 80–100 °C.



- Low operative temperature makes waste heat recovery more difficult, which could be fundamental to have high energy efficiency ship.



Fuel cell ship implementation - SOFC



Main challenges



– SOFCs operate at higher temperatures compared to PEMFCs (about 600–800 °C).



– Fuel product composition can change and needs to be checked in order to avoid SOFC degradation.



– SOFCs have low power density, about 8–80 kW/t and 4–32 kW/m³.



– SOFCs start-up requires several hours, and they are slower in load changing compared to PEMFCs.



From Prescriptive Rules to Goal-Based Functional Requirements

IGF Code Hierarchy for Hydrogen Fuel Systems

GOALS

Equivalent level of safety to conventional fuels (SOLAS / IGF Code)

FUNCTIONAL REQUIREMENTS

Performance expectations: detection, isolation, controlled discharge, ventilation

PRESCRIPTIVE PROVISIONS

Detailed LNG-based rules, useful reference but not always transferable to H₂

PROJECT-SPECIFIC RISK ARGUMENTS

H₂ applications rely on quantitative risk assessment (QRA) & Alternative Design & Arrangements (AD&A) to demonstrate design intent is met even when prescriptions require adaptation

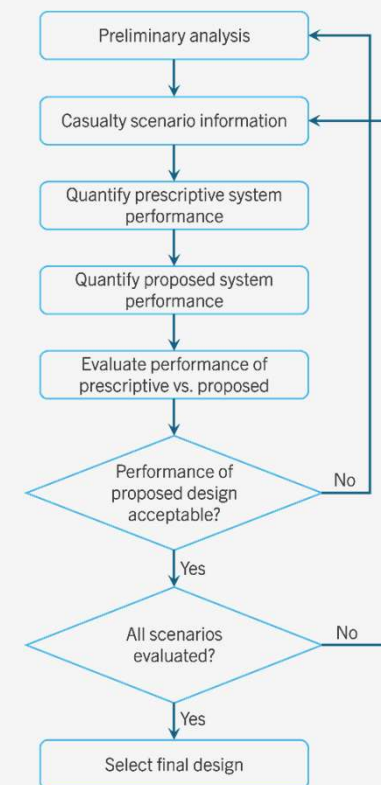
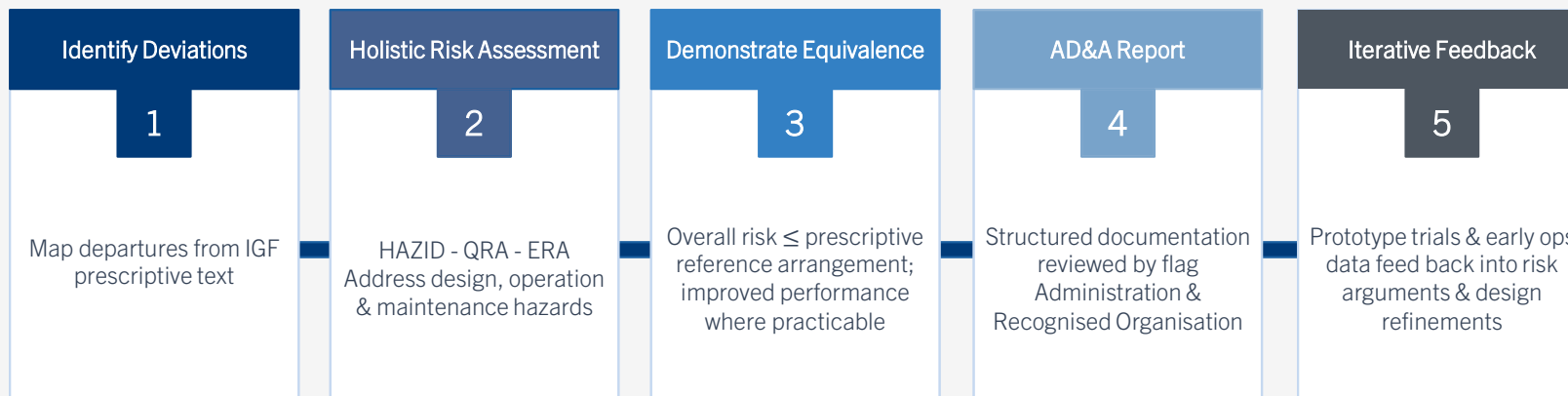




Alternative Design & Arrangements (AD&A) Process

When is AD&A required?

- Whenever a design departs from existing prescriptive IGF Code provisions
- H₂ is not comprehensively covered by IGF prescriptive text → AD&A is the standard pathway
- Examples: novel LH₂ tank positions, H₂ prep rooms, shared LNG/LH₂ units





Risk Assessment: Demonstrating Regulatory Equivalence

QRA as the Technical Foundation for AD&A Submissions

TRACEABILITY

Each design requirement (ventilation rates, detector configs, enclosure dimensions) must be clearly linked to hazard scenarios and supporting quantitative risk assessment results.

SENSITIVITY

Uncertainties in H₂ data (leak frequencies, ignition probabilities) must be examined. Equivalence claims must remain robust under reasonable parameter variations.

COMPARABILITY

Risk estimates compared to LNG or conventional fuel baselines using consistent acceptance criteria. EMSA HSAFE provides a generic hydrogen risk model for this purpose.

EMSA HSAFE Generic H₂ Risk Model

Explicitly supports IGF Code compliance & AD&A justification

- Bunkering operations
- Storage systems
- Fuel preparation rooms
- Tank connection spaces
- Machinery spaces

QRA outputs must support both internal design optimisation and formal evidence submitted to flag Administration/Recognised Organisation



IMO Draft Interim Guidelines for Hydrogen-Fuelled Ships

Regulatory Framework & EMSA Technical Evidence Base

DRIVER 1 Deep Decarbonisation

IMO GHG reduction targets require zero-carbon fuels. Hydrogen is a priority alongside ammonia and fuel cells.

DRIVER 2 Distinct H₂ Safety Challenges

EMSA studies confirm hydrogen hazards differ qualitatively from LNG, wider flammability, cryogenic effects, vacuum loss, invisible flames.

Structure of IMO Draft Interim Guidelines

PART 1

General Provisions, Goals & Functional Requirements

Definitions, overarching safety objectives and high-level performance expectations for all H₂ ships, independent of specific configuration.

PART 2

H₂-Specific Technical Chapters

Compressed & liquefied H₂ storage - fuel preparation & conditioning - secondary containment piping - machinery space concepts - bunkering - emergency systems.

PART 3

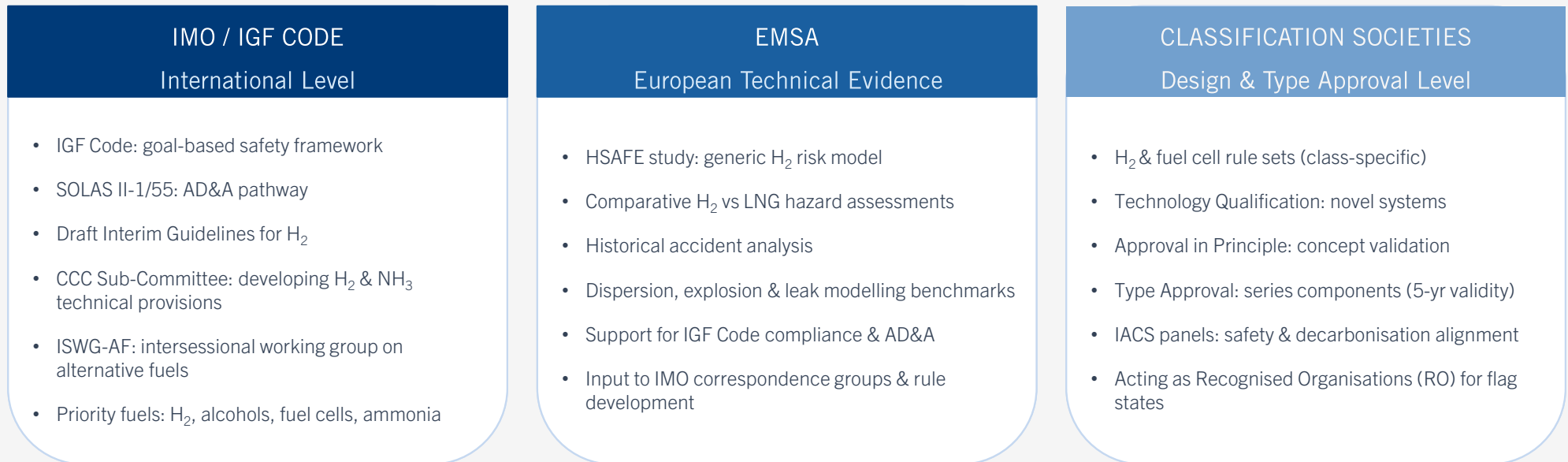
Cross-Cutting Annexes

Guidance on HAZID, QRA, explosion risk analysis and approaches for demonstrating equivalence through the AD&A framework.



Regulatory Landscape: IMO, EMSA & Classification Societies

Tiered Framework for Hydrogen Ship Approval





RINA Classification Rules & Approval Processes

AiP Approval in Principle

When: Concept / preliminary design stage

- High-level confirmation of concept feasibility
- AiP report includes conditions & recommendations
- Signals early alignment between designer, class & flag Administration
- Reduces risk of fundamental concept changes late in design

Typically sought before detailed specs & equipment selections are finalised

TQ Technology Qualification

When: Novel / partially regulated technologies

- Define functional requirements & performance envelope
- Identify failure modes, hazards & degradation mechanisms
- Plan & conduct tests, simulations & analytical studies
- Produce TQ Plan → TQ Report
- Supports AiP assessment and full class approval

Applies to: combined LNG/LH₂ units, novel fuel cell modules, metal hydride / LOHC storage

TA Type Approval

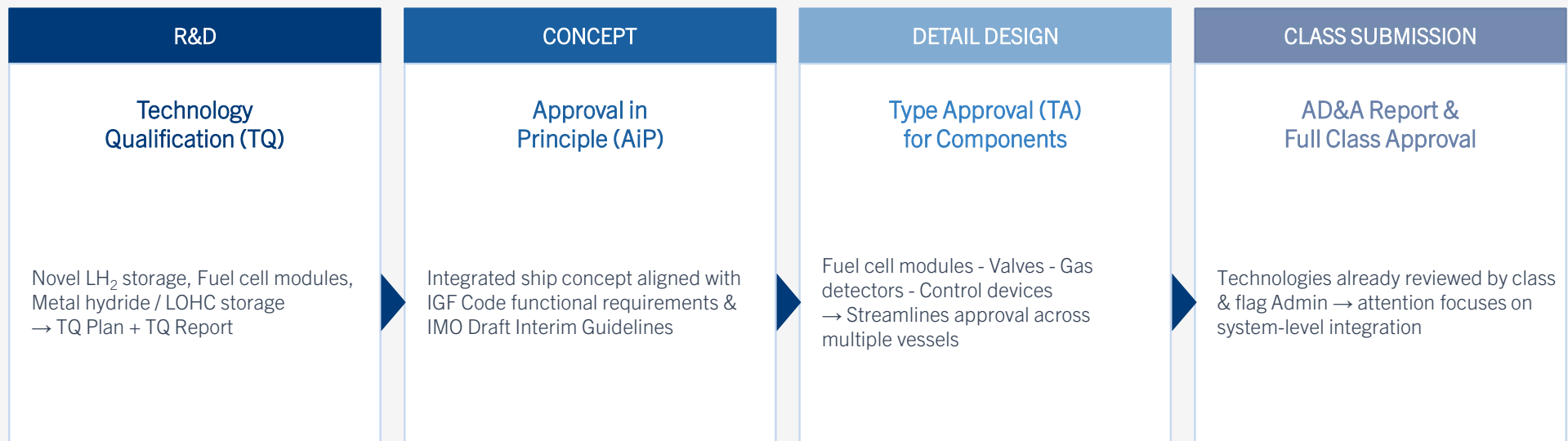
When: Series-produced components

- Certifies product complies with applicable rules & standards
- Based on design docs, material certs, test reports, factory audits
- Validity typically 5 years
- Applies to all RINA-classed vessels using the approved product
- Draws on IGF Code + ISO/IEC hydrogen & fuel cell norms

Simplifies project-specific class approval, review focuses on system-level integration only



Structured Approval Pathway from R&D to Ship Class Approval



Key benefit: before the AD&A submission is prepared, underlying technologies and components have already been subject to structured review, reducing uncertainty and focusing regulatory attention on system-level integration rather than component feasibility.



CCC Sub-Committee: Technical Provisions for H₂

FUEL PREPARATION ROOMS & TANK CONNECTION SPACES

- On open deck preferred, natural ventilation & unobstructed dispersion
- Enclosed Tank Connection Spaces (TCS): gas-tight, mechanically ventilated, secondary containment on piping
- Materials to accommodate lowest credible temperatures
- Bolted hatches: TCS classified as hazardous space, adjacent non-hazardous spaces protected

H₂ STORAGE & FUEL CONTAINMENT

- LH₂ on open deck preferred under AD&A; enclosed only under stringent conditions
- Clear linkage: storage goals ↔ IGF functional requirements (containment, segregation, integrity)
- Collision / grounding damage to LH₂ tanks: severe, often unsurvivable, minimise exposure to collision boundaries

SHARED FRAMEWORK

- Common goal/FR structures reused across H₂, methanol & ammonia
- Avoids fragmented IGF Code - coherent goal-based framework retained
- Cross-fertilisation of QRA methods between fuel types

FORWARD WORK PLAN

- Progressive development: goals → FRs → prescriptive text
- Covers: storage, fuel supply, bunkering ops, emergency systems
- Parallel methanol/ethyl alcohol track → future IGF Code amendments

3. Wave 2 the Future






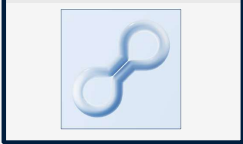



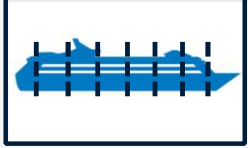
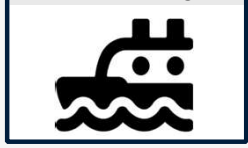
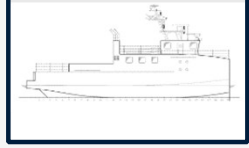

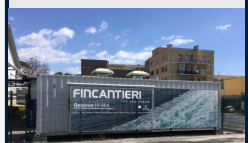

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H₂ Projects

<p>U-212A PEM 270kW Naval application</p> 	<p>FC SWATH PEM MY Concept</p> 	<p>Zero-emission Study for an experimental ship</p> 	<p>MarHySafe Pre normative research</p> <p>HANDBOOK FOR HYDROGEN-FUELLED VESSELS</p> 	<p>ZEUS Lab ship</p> 	<p>Wave 2 the Future IPCEI</p> 	
<p>FC-SHIP LifeCycle</p> 	<p>MC-WAP MCFC 500kW onshore</p> 	<p>TESEO PEM 260 kW onshore</p> 	<p>Leadership Tecn. Generazione Elettrica Innovativa</p> 	<p>GreenCruise Integration of new technologies</p> 	<p>TECBIA PEM 24 m boat</p> 	<p>STASHH Standard for modular fuel cells</p> 
<p>HiSEA Test area</p> 		<p>Area SciencePark Test area</p> 				



Hydrogen as an innovation vector

ZEUS (Zero Emission Ultimate Ship)



First RINA Classed ship capable to be propelled by hydrogen, with a nominal power of 120 kW guarantee by PEM fuel cells + BESS

STATUS: launched in 2022

Viking Neptune



First real onboard implementation of PEM fuel cells, with nominal power of 100 kW, with hydrogen produced and stored aboard a cruise vessel

STATUS: delivered in November 2022

IPCEI Hy2Tech Project



Funded by the European Union
NextGenerationEU



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Validation of Fuel Cell technologies (PEM, SOFC) & liquid hydrogen storage system on board two cruise ships with a nominal power of several MW.

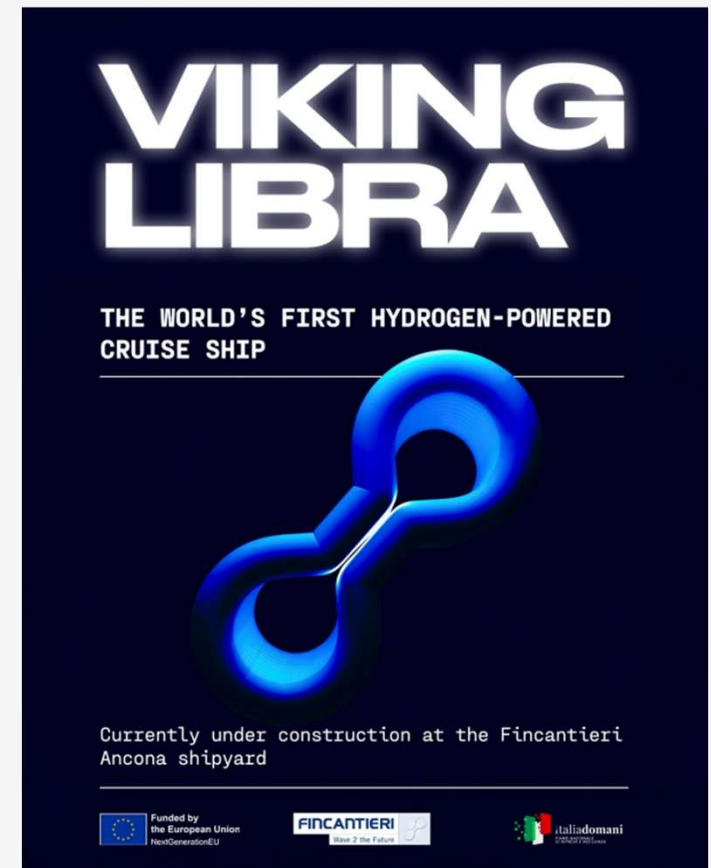
STATUS: started in 2023, will end in 2029



Viking Libra

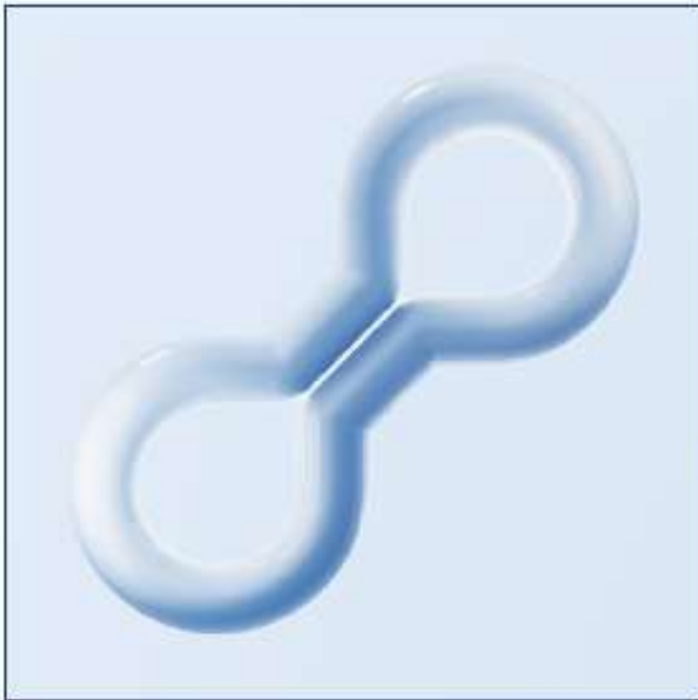
The vessel will feature first-of-a-kind solutions to load and store hydrogen directly onboard the ship thanks to a containerized system to overcome supply chain constraints. Hydrogen will power PEM fuel cells system specifically optimized for Cruise operations.

- Gross tonnage: 54,300 tons
- Length: 239 meters
- Fuel Cells: 6MW
- Viking Libra: delivery end of 2026

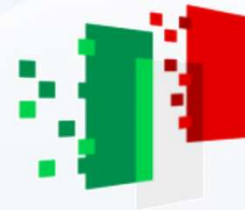


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A IPCEI Hy2Tech Project



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Participants:

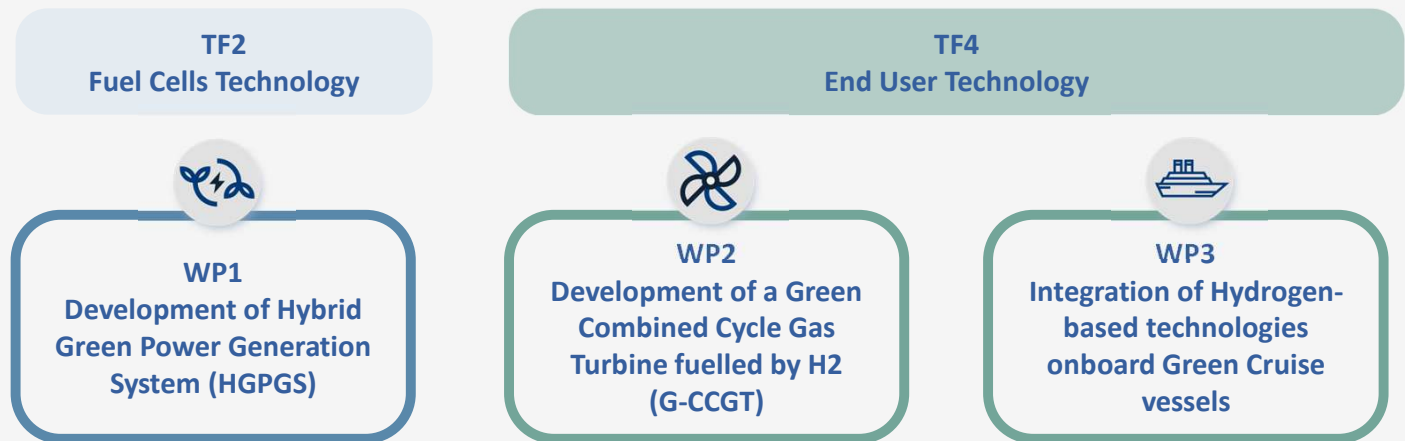
- Fincantieri S.p.A.
- Isotta Fraschini Motori S.p.A.

The project will study a ship hybrid architecture aiming at developing a Hybrid Green Power Generation System integrating on-board H2 Fuel Cell stacks and relevant controlling systems.

The project will also develop a new generation Internal Combustion Engines fuelled by hydrogen applicable to maritime.

A Green Combined Cycle Gas Turbine will be designed with particular reference to the overview of the system and the identification of key components. This will result in a marine-ready G-CCGT package, including the control system.

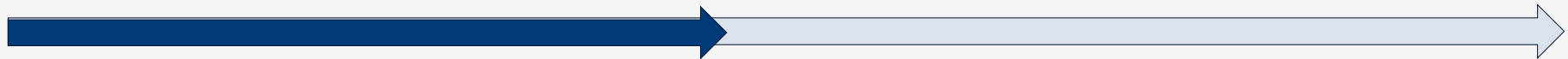
The overall system will be tested together with the H2 handling system under representative conditions.





Results achieved in the third year of the project

2023



2029



In the 3 years of the project, thanks to the support of IPCEI, it was possible to achieve the following **important results**:

- The Viking Libra hydrogen-supported **cruise ship** is already under **advanced construction** while the second targeted H₂-ready cruise ship started as well.
- Acquisition of cutting-edge **skills in hydrogen technologies**, positioning Fincantieri at the forefront of innovation in the maritime sector. Patent registered for LH₂ evaporator.
- **Multiple strategic collaborations with IPCEI direct partners are ongoing** and others are under discussion.
- Advanced development of the **containerized PEM fuel-cell system**, now ready for onboarding.
- **Major technological achievements**, including completion of the hydrogen ICE detailed design, LH₂ and GH₂ system functional design and the GH₂ experimental campaign.

← Metrics as of 31/12/2025 →

	3	Companies/BUs involved
	6	Operational sites involved
	>350k	Hours dedicated to the project
	>700	Innovators involved



WP1 - Development of Hybrid Green Power Generation Systems (HGPGS)



TF2 Fuel Cells Technology

Objective

Development of Hybrid Green Power Generation Systems (HGPGS), designed by our subsidiary, Isotta Fraschini Motori in Bari, which requires the development of the following technologies:

- Fuel Cell stack (PEM) and relevant controlling system.
- Internal Combustion Engine fuelled by H₂.

Technological Advancement (today)

Advanced EMS development, completed H₂-engine functional design, progressed containerized PEM fuel-cell system concept and initiated procurement activities supporting integration and validation of the Hybrid Green Power Generation System.





WP2 – Development of a Green Combined Cycle Gas Turbine fuelled by Hydrogen (G-CCGT)



TF4 End User Technology

Objective

Development of a Green Combined Cycle Gas Turbine (G-CCGT) fuelled by H₂, consisting of design and implementation of a high efficiency combined cycle plant.

The G-CCGT provides the highest Energy Density, it assures needed flexibility, and represents the most advanced technology using H₂, responding to the total power requirement of any ship from 20MW above.

Technological Advancement (today)

Completed functional design of small-scale handling systems and completed GH₂ handling system test campaign, while detailed design activities for LH₂ are underway. Package design advanced, main component selections for maritime Steam-plant completed.





WP3 – Integration of Hydrogen-based technologies onboard of Green Cruise vessels



TF4 End User Technology

Objective

- Integration of Hydrogen-based technologies including Hydrogen fuel storage onboard of Green Cruise vessels.
- Design, build and demonstrate two green cruise vessel prototypes.
- The two sister cruise vessels will be integrated with hydrogen-based technologies and consequently Fincantieri will ask only for the marginal hydrogen-related costs.

Technological Advancement (today)

Study on Risk Assessment aiming to obtain navigability certification are at advanced stage.
Purchase orders for main items completed, construction activities in progress for both vessels.



Thank you for your attention



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