

# Sustainable Manning

# Safe Fuel

ISM

MLC

STCW

MARPOL

SOLAS

**UNCLOS**

Hydrogen

Ammonia

Low Sulphur Heavy Fuel Oil

Marine Gas Oil

Biofuel

Liquefied Nature Gas

Liquefied Petroleum Gas

Liquefied Ethylene Gas

Ethanol

Methanol

Lithium-ion Battery

Fusion energy-Thorium Molten Salt reactor

Fuel cell

Scrubbers

EEDI

EEXI

From Well to Propell

## UNCLOS ARTICLE 94 *Duties of the flag State*

Every State shall effectively exercise its jurisdiction and control in **administrative, technical and social matters** over ships flying its flag. In particular, every State shall:

- (a) maintain a register of ships containing the names and particulars of Ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size; and
- (b) assume jurisdiction under its internal law over each ship flying its flag and its **master, officers and crew** in respect of administrative, technical and social matters concerning the ship.

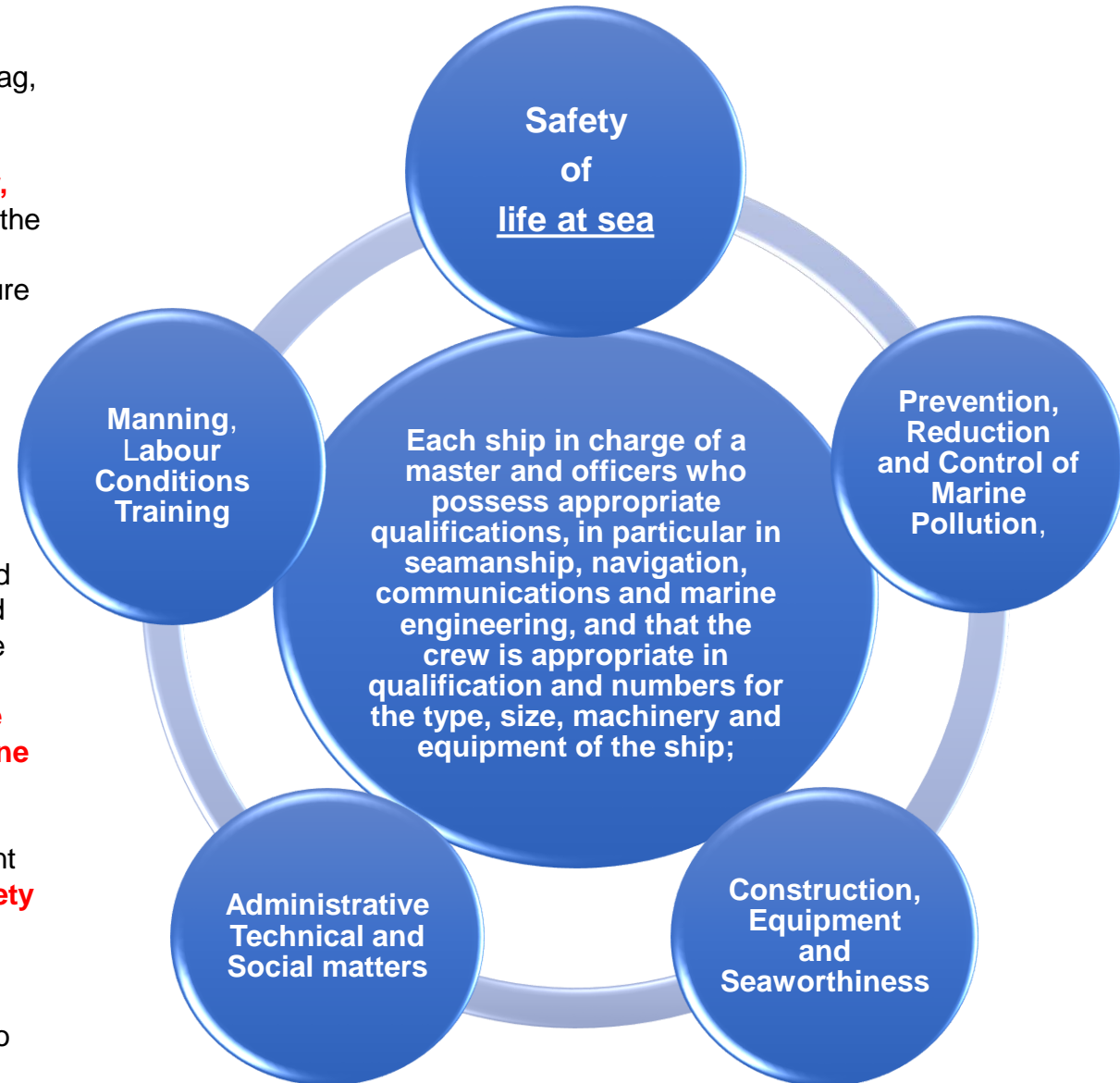
3. Every State shall take such measures for ships flying its flag as are necessary to ensure safety at sea with regards, inter alia, to:

- (a) the **construction, equipment and seaworthiness** of ships;
- (b) the **manning** of ships, **labour conditions and the training of crews**, taking into account the applicable **international instruments**;
- (c) the use of signals, the maintenance of **communications** and the prevention of collisions.

4. Such measures shall include those necessary to ensure:

- (a) that each ship, before registration and thereafter, at appropriate intervals, is surveyed by a qualified surveyor of ships, and has on board such charts, nautical publications and navigational equipment and instruments as are appropriate for the safe navigation of the ship
- (b) that **each ship** is in the **charge of a master and officers** who possess **appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship**;
- (c) that the **master, officers** and, to the extent appropriate, the **crew** are fully conversant with and required to observe the applicable international regulations concerning the **safety of life at sea**, the prevention of collisions, **the prevention, reduction and control of marine pollution**, and the maintenance of communications by radio.

5. In taking the measures called for in paragraphs 3 and 4, each State is required to conform to generally accepted international regulations, procedures and practices and to take any steps which may be necessary to secure their observance.



Tripartite regulations - developed for protect the human environment

## Maritime Labour Convention 2006 (MLC 2006)

### **MLC Standard A2.7 – Manning levels**

Each Member shall require that all ships that fly its flag have a **sufficient number of seafarers on board** to ensure that ships are **operated safely, efficiently** and with due regard to **security**. Every ship shall be manned by a crew that is adequate, in terms of **size and qualifications**, to ensure the safety and security of the ship and its personnel, under all operating conditions, in accordance with the minimum safe manning document or an equivalent issued by the competent authority, and to comply with the standards of this Convention.

### **MLC Standard A2.8 - Career and skill development and opportunities for seafarers' employment**

Each Member shall have national policies that encourage career and skill development and opportunities for seafarers, in or- to provide the maritime sector with a stable and **competent workforce**.

2. The aim of the policies referred to in paragraph 2. 1 of this Standard shall be to help seafarers strengthen their **competencies, qualifications** and employment opportunities. 3. Each Member shall, after consulting the ship owners' and seafarers' organizations conetacerned, establish clear objectives for the vocational guidance, **education and training** of seafarers whose duties on board ship primarily to the safe operation and navigation of. the ship, including **ongoing training**.

### **Guideline B2.8 Guideline B2.8.1 Measures to promote career and skill development and employment opportunities for seafarers.**

Measures to achieve the objectives set out in Standard A2.8 might include: agreements providing for career develop- and skills training with a shipowner or and organization of shipowners promoting employment Through the establishment and maintenance of registers or lists, by categories, of **qualified seafarers**; or promotion of opportunities, both on board and ashore, for further training and education of seafarers to provide for skill develop ferment and portable competencies in order to secure and retain decent work, to improve individual employment prospects and **meet the changing technology** and labour conditions of the maritime industry

# International Standard for the safe Management and operation of ships and for pollution prevention (ISM Code)

## *Implement – Practice – Maintain – Training – Communicate – Development*

The purpose is to provide an international standard for the **safe management and operation of ships and for pollution prevention**.

..take the necessary steps to **safeguard the shipmaster** in the proper discharge of his **responsibilities with regard to maritime safety and the protection of the marine environment**.

..need for appropriate organization of management to enable it to respond to **the need of those on-board ships** in order to **achieve and maintain high standards of safety and environmental protection**.

Recognizing that **no two shipping companies or shipowners are the same**, and that ships operate under a wide range of different conditions, the Code is based on general principles and objectives, which include **assessment of all identified risks to one Company's ships, personnel and the environment and establishment of appropriate safeguards**.

..Clearly, different levels of management, whether shore-based or at sea, **will require varying levels of knowledge and awareness of the items outlined**.

.. In matters of safety and environment protection it is **the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result**.

1.2.3 The safety-management system should ensure:

- .1 compliance with mandatory rules and regulations; and
- .2 that **applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations** are taken into account

## 6. RESOURCES AND PERSONNEL

6.1 The Company should ensure that the master is:

- .1 properly qualified for command;
- .2 fully conversant with the Company's SMS; and
- .3 given the necessary support so that the master's duties can be safely performed.

6.2 The Company should ensure that each ship is:

- .1 **manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements; and**
- .2 **appropriately manned in order to encompass all aspects of maintaining safe operation on board.\***

*\* Refer to the Principles of minimum safe manning, adopted by the Organization by Resolution A.1047(27)*



Anbefaling 050N

Håndtering av Litium-ion batterier



Specific and technical regulation to protect the maritime environment



# International Convention for the Prevention of Pollution from Ships MARPOL

Protocol I - Provisions concerning reports on incidents involving harmful substances (in accordance with Article 8 of the Convention)

Article I Duty to report

1. **The Master** or other person having charge of any ship involved in an incident referred to in Article II of this Protocol shall **report** the particulars of such incident without delay and to the fullest extent possible in accordance with the provisions of this Protocol.

## ROLE OF CHIEF ENGINEER IN IMPLEMENTATION OF MARPOL 73/78

MARPOL 73/78 deals with pollution caused by merchant vessels. The **Chief Engineer** has huge responsibility that vessel is **complying with** all the regulations of MARPOL.

## Certificates

Energy Efficiency Design Index ([EEDI](#)), Energy Efficiency Existing Ship Index ([EEXI](#)), IOPP Certificate (MARPOL I) NLS Certificate (MARPOL II) ISPP Certificate (MARPOL IV) Garbage Certificate of Compliance (MARPOL V) IEE Certificate (MARPOL VI), IAPP Certificate (MARPOL VI) EIAPP Certificate (MARPOL VI and NOx Technical Code) for marine diesel engines

- ✿ RECORD KEEPING
- ✿ SURVEYS
- ✿ CONTROL OF OPERATIONAL POLLUTION
- ✿ BUNKERING
- ✿ RECEPTION FACILITIES
- ✿ EMERGENCY PREPAREDNESS



Mandatory absolute minimum competence

## STCW / STCW – F

*Competence to operate the function of the ship*



## Standard Training - Vessel Specific Training - Familiarization

*Hardware*

*Software*

*Customizations*

Education / Competence like now (STCW)

- with further education :

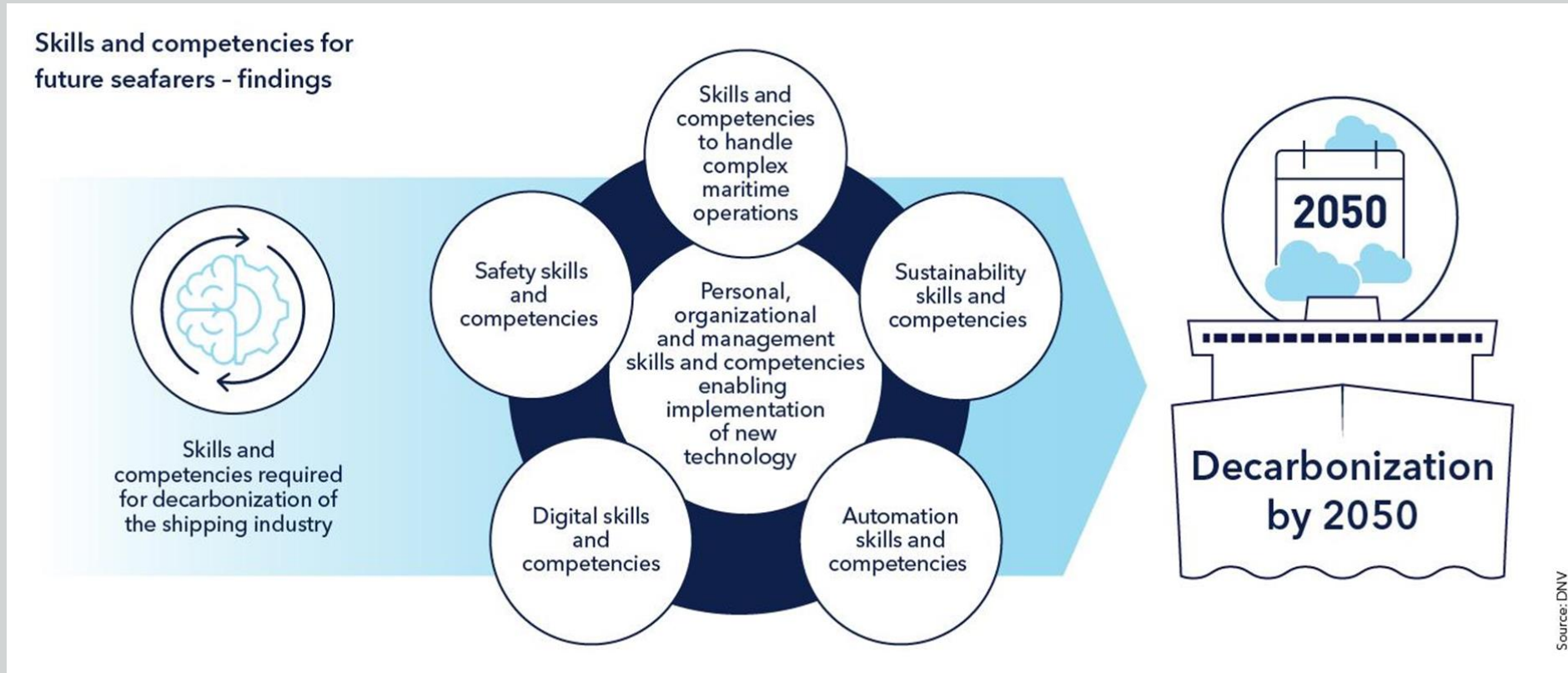
- Energy and environmental competence:
- Characteristics
- Construction & Design
- Environmental Effectiveness
- Fire and Explosion Risks
- Health and Safety issues
- First Aid knowledge
- UNCLOS, SOLAS, MARPOL, Polar Code

- **Communication, Risk & Hazard analysis, operation and emergency situations, major accident risk- Third-Party Risk**
- **Analyze digital information** (instead of human senses)
- **Override the logarithms and operate the ship manually**
- **Simulator operations**
- **Simulator use of Failure Mode and Effects Analysis** (FMEA or System Theoretic Process Analysis)
- **Multidisciplinary communication**
- **Leadership**
- **Cyber security**
- **Condemnation of terrorism** (inc. stowaways)

# Comprehensive Review of the 1978 STCW Convention and Code

## Accepted drafted Aims, Principles and Areas for consideration

### 22 Areas within the Timeline to 2027



#### Reg. I/1.1.15 Definitions and Clarifications Amendments:

*Propulsion power* means the total maximum continuous rated output power for propulsion **and manoeuvring** in kilowatts, of all the ship's **main-propulsion machinery regardless of energy source** which appears on the ship's certificate of registry or other official document;



In relation to regulatory gaps on energy sources for propulsion and manoeuvring, or ships with reduced, zero crew or remotely controlled ships, the ISM Code 1.2.3 and 6.2.2 require the participation of the Chief engineer in the team\* to ensure that technical competence on all operational safety aspects - regarding construction and engineering in order to obtain the necessary certificate for the ship expected operation.

The **Risk and Hazard** analysis must consider UNCLOS 94 and the Chief engineer's responsibility to comply with SOLAS and MARPOL specific emission requirements in relation to the ship specific construction, design, characteristics for all energy sources on board, including environmental efficiency, as well ensure that all equipment and competence to safeguard the ships, the human and the environment is present - under all conditions, to avoid loss of life and criminalisation.

**\* 4 - Design team 4.1** A design **team acceptable to the Administration** should be established by the owner, builder or designer and may include, as the alternative design and arrangements demand, a representative of the owner, builder or designer, and **expert(s) having the necessary knowledge and experience in safety, design and/or operation** as necessary for the specific evaluation at hand. Other members may include marine surveyors, ship operators, safety engineers, equipment manufacturers, **human factors experts**, naval architects and **marine engineers**.

**Why don't we practice this safety regulations?**

Hazard: something that could potentially cause harm. Risk: the degree of likelihood that harm will be caused.

| Regulation          | Failure modes   | Cause of failure modes (Hazards)  | Preventing and mitigating functions (measures) | Functional requirement  | EP | Paragraph |
|---------------------|---|---|--|---|----|-----------|
| 52<br>Safety system | <ul style="list-style-type: none"> <li>- Inability to stop equipment</li> <li>- Significant damage to machineries</li> <li>- Breakdown of engine</li> </ul> | <ul style="list-style-type: none"> <li>- Failure of automatic shutdown systems</li> <li>- Failure of overriding shutdown of main propulsion systems</li> <li>- Automatic shutdown of main propulsion systems</li> </ul> |  | FR52-1: A safety system shall be provided to ensure that serious malfunction in machinery or boiler operations shall initiate an alarm and automatic shutdown of that part of the plant. Shut down of the propulsion system shall not be automatically activated except in cases which could lead to serious damage, complete breakdown or explosion.<br><br>or<br><br>A safety system shall be provided to ensure reliable shutdown of machinery and boiler operations in case of that serious malfunction, taking into account the criticality for continued operation of propulsion. |    |           |
|                     |   |   | SDC 9/ WP.4 01.23                              |   |    |           |





# DAY OF THE SEAFARER

— 25 JUNE —

2023 Seafarers, MARPOL and the marine environment

***In fact, seafarers are already educated, trained and used to cutting-edge technologies – subject to strict international emissions requirements!***



***.. and deals with all of these***



**MARPOL AT 50**  
OUR COMMITMENT GOES ON



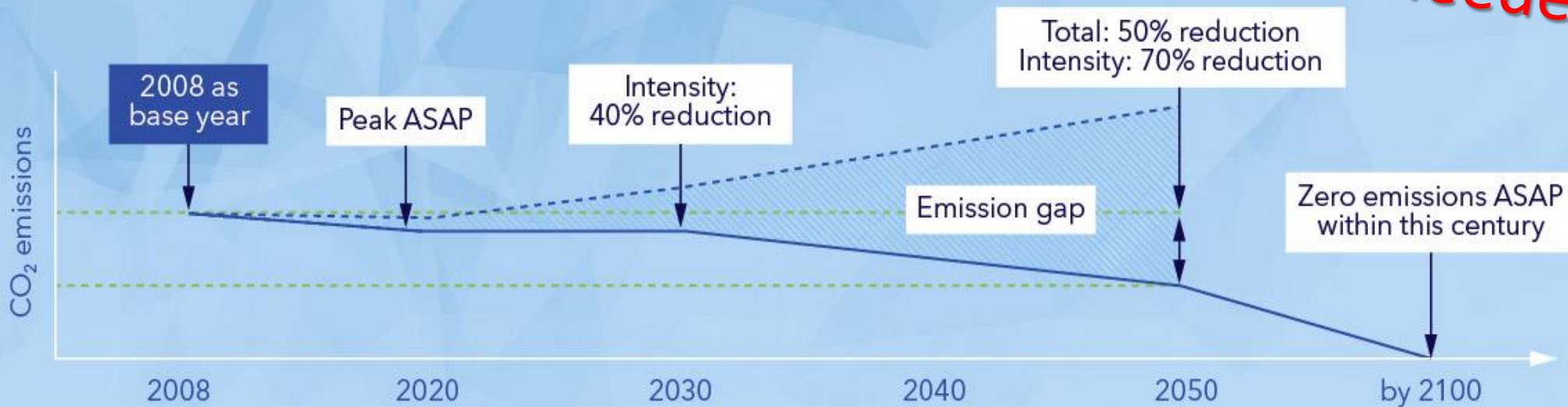
***Sustainable Manning***

The political situations - without impact assessment!

# Roadmap for developing a comprehensive IMO Strategy on reduction of GHG emissions from ships (as amended MEPC 74, 2019)

**Competence before 2030 - needed!**

Initial IMO strategy on reduction of GHG emissions: Vision and ambitions



## Short-term 2018-2023

- Tighter EEDI and SEEMP
- Energy-efficiency indicators

! ■ Speed reduction

- National action plans

## Mid-term 2023-2030

- Energy-efficiency measures for new and existing ships, using new indicators

! ■ Carbon pricing / MBM

- Plan for low-carbon fuels

## Long-term 2030 →

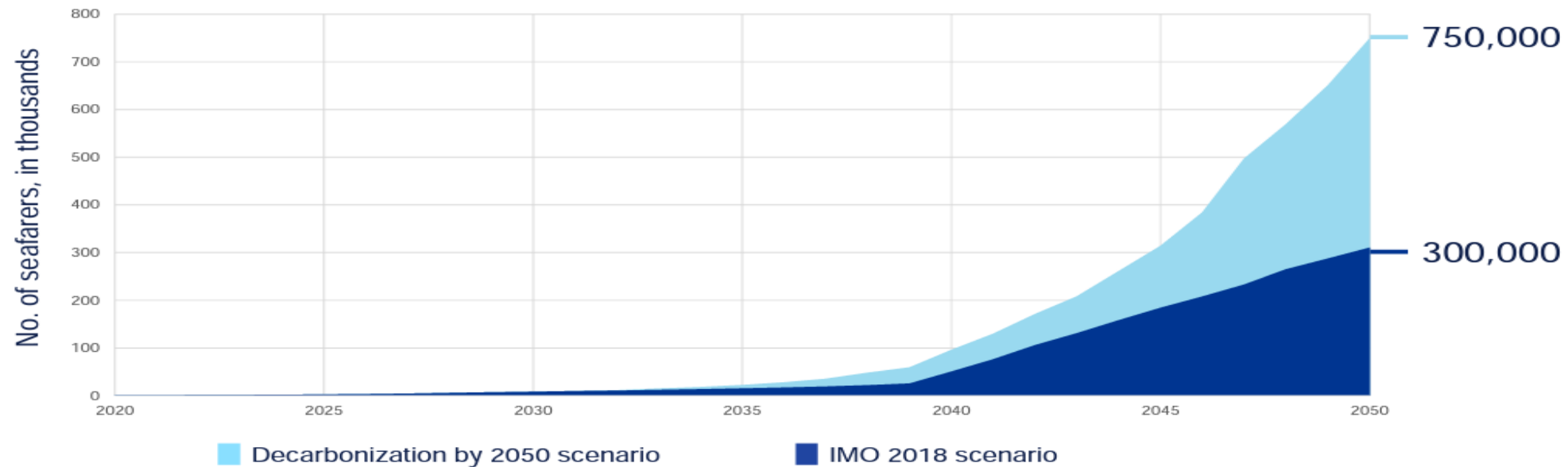
- ! ■ Development of zero-carbon fuels
- New/innovative emission-reduction mechanisms

## The competence needed to reach the Goal

As shipping decarbonizes, training of seafarers must happen in parallel

### Safety hangs in the balance, but there's still time

Estimated number of seafarers working on board ships equipped with alternative fuel technologies



10 DNV ©

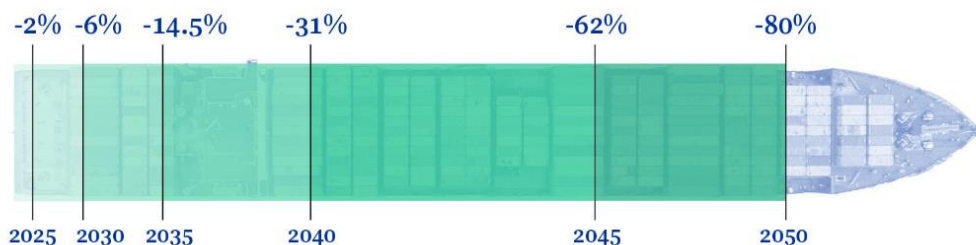


# Fit for 55

EU's target of reducing net greenhouse gas emissions by at least 55% by 2030. The package of proposals aims at providing a coherent and balanced framework for reaching the EU's climate objectives, which:

- ensures a just and socially fair transition

Annual average carbon intensity reduction compared to the average in 2020



## Setting the Scene

$$GHG\ intensity = f_{wind} \times (WtT + TtW)$$

$$\frac{\sum_i^{n\ fuel} M_i \times CO_{2eq\ WtT,i} \times LCV_i + \sum_k^c E_k \times (CO_{2eq\ electricity,k} = 0)}{\sum_i^{n\ fuel} M_i \times LCV_i \times RWD_i + \sum_k^c E_k}$$

$$\frac{\sum_i^{n\ fuel} \sum_j^{m\ engine} M_{i,j} \times \left[ \left(1 - \frac{1}{100} C_{slip\ j}\right) \times (CO_{2eq,TtW,i,j}) + \left(\frac{1}{100} C_{slip\ j} \times CO_{2eq\ TtW,slip,j}\right) \right]}{\sum_i^{n\ fuel} M_i \times LCV_i \times RWD_i + \sum_k^c E_k}$$

Units are  $\frac{gCO_{2eq}}{MJ}$ , basically

**Fuel converted into WtW  $CO_{2eq}$**   
**Total Energy**

**Compliance balance = (GHG target intensity – GHG actual intensity) x Total Energy**

# Challenges

External environment is in focus - internal environment forgotten!

- especially for the engine crew and emergency personnel who will operate and process all types of “green energy”

Safety Culture, Risk & Hazard Understanding

New Energy Sources

GHG

Competence

Certification

Manning

Fatigue, **Mental Health**

Design, Weight, Safe Storage, Stability

Fire & Explosion Barriers

General Operation and Scrubbers

- Internal air and contact contamination
- Extended maintenance
- Pressure & Temperature

High Voltage, Pressure and Temperature

Toxic and Corrosive

Break down

Fire Fighting Systems - Evacuation

Systems

Bunker – Charge

Derating

Criminalisation

Flash Point

Frankenstein Fuel (Chemicals & Plastic)

Ballast water (Chemicals)

# ITF'S SUSTAINABLE SHIPPING POSITION PAPER

A NEW GLOBAL TRAINING SYSTEM THAT CAN MEET THE CHALLENGE

## MARITIME JUST TRANSITION TASK FORCE (2022)

10-point Action Plan to Achieve a Just Transition for Seafarers

## BEYOND THE LIMIT

The ITF is also concerned about the lack of familiarisation procedures taking place for new sign-on crew due to reduced manning, as well as the premature promotion of seafarers to cover certain positions. Both issues have emerged as consequences of the pandemic and governments' willingness to set aside international regulations to keep trade moving at all cost.



# IMO OUTCOME

The 107th session of the IMO's Maritime Safety Committee 31 May to 9 June 2023.

## ISM CODE

No comprehensive review of the ISM Code and related guidelines. Challenge is effective implementation. ISM is designed to be **goal-based**, generic and flexible, and it's a clear link through **human element** between the **ISM Code** and the **STCW Convention**

## Safety of ships relating to the use of fuel oil

SOLAS Chapter II-2, oil fuel shall not jeopardize the safety of ships or adversely affect the performance of the machinery or be **harmful to personnel**.

Develop a **safety regulatory framework** to support the reduction of GHG emissions from ships using **new technologies and alternative fuels**.  
( *ITF MSC Safety dynamics of ship's energy sources presented to the WG 13 October 2023* )

## Maritime autonomous surface ships (MASS)

Goal-based code for MASS, "Remote Operations Centre" (ROC) will be used to designate the place where the remote **master** and remote **operator(s)** are located. **COLREG** would be relevant and applicable regardless of how a ship is operated

## Comprehensive review of the STCW Convention and Code

- ✓ Competency to prevent and respond to bullying and harassment, including sexual assault and sexual harassment (SASH).
- ✓ Address any inconsistencies and to improve the provisions based on experiences and new technologies.
- ✓ Accommodate the use of electronic certificates and documents for seafarers
- ✓ STCW-F Convention containing training, certification and watchkeeping provisions for fishing vessel personnel. (Safety regulations, Certificate, competence more like STCW)

ANNEX 1

RESOLUTION MEPC.377(80)

Adopted on 7 July 2023

2023 IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(e) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) to consider and take appropriate action with respect to any other matters falling within the scope of the Organization which would contribute to the prevention and control of marine pollution from ships,

HAVING CONSIDERED, at its eightieth session, the draft 2023 IMO strategy on reduction of GHG emissions from ships,

3 ALSO ACKNOWLEDGES the importance of addressing the human element, including the impact on seafarers and other maritime professionals, in the safe implementation of the 2023 IMO GHG Strategy;

### MEPC 80 Successes:

- A recognition of the importance of seafarers and maritime workers in achieving the goals of the **GHG Reduction Strategy**.
- Recognizing that the Strategy will have an **impact on seafarers and maritime workforce** and the importance of addressing those impacts.
- The need to regulate and ensure a safe implementation of the strategy
- Promoting a **Just Transition** in the implementation of the strategy

- **highlight Intensity.**
- **Fuel intensity is an energy efficiency measure allowing for a comparison of the technological fuel performance of certain processes, vehicles etc. Fuel intensity can be expressed relying on indicators such as the fuel consumption per specified unit (e.g. unit of production).**

✿ *What amount you burn*

✿ *More efficient utilization*

✿ **Fuel cycle /well-to- propulsion, is the overall greenhouse gas (GHG) impacts of a fuel, including each stage of its production and use.**

✿ **Biofuel which in a Fuel lifecycle can prove an emission reduction (NOx/Co2/Methane) of 65% is the fastest and most affordable solution until 2030**

✿ **Nuclear onshore /barges to produce electricity can be established quickly, as fuel on ships it will take longer.**

✿ **It is important to get an internationally mandatory Fuel regulations as quickly as possible.**

5.3 When developing candidate mid- and long-term GHG reduction measures, due account should be taken to ensure a **just and equitable transition** that leaves no country behind, including supportive measures.

5.5 The Committee recognizes the need for a broad approach to regulating **safety** of ships using zero or near-zero GHG emission **technologies, fuels and/or energy sources**, including addressing the **human element**, to ensure the **safe implementation** of this Strategy.

5.6 Recognizing the **impact this Strategy will have on seafarers and other maritime professionals**, the Organization is further requested to assess its **instruments, guidance and training standards** to help ensure a **just transition for seafarers and other maritime workforce** that leaves no one behind.



# CG on Regulatory Framework for Ships Using New Technologies and Alternative Fuels

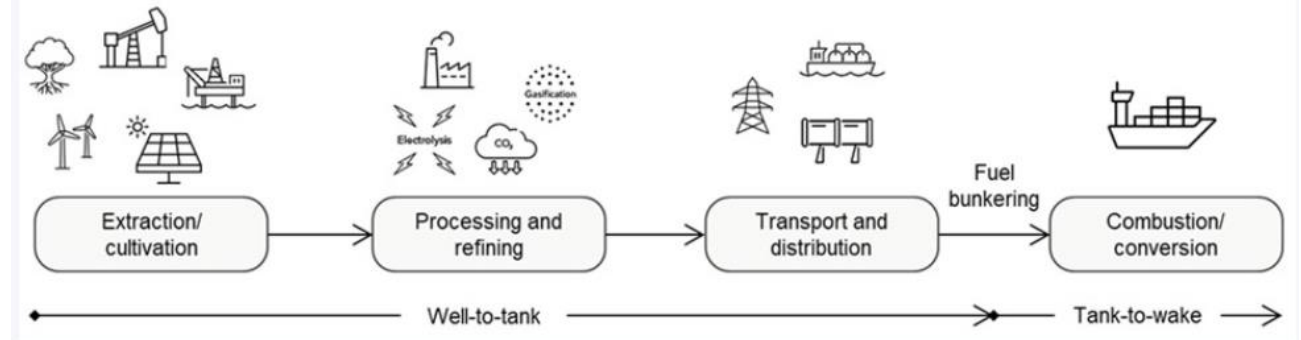
## Terms of Reference (TOR)

- 1. identify and update a list of fuels and technologies which will assist international shipping to support the reduction of GHG emissions from ships using new technologies and alternative fuels;**
- 2. conduct an assessment for each identified fuel and new technologies (e.g. the state of knowledge of risks and the technical considerations of solutions, Hazards and Risks, Risk Control Measures) in sub-paragraph .1 in relation to persons, ships (new built and converted) and applicable operations for these, from e.g. projects applying alternative design and approval process where permitted;**
- 3. based on the outcomes of .1 and .2 above, develop a record for safety obstacles and gaps in the current IMO instruments that may impede the use of the alternative fuel or new technology; and**
- 4. submit a written report to MSC 108.**

## ITF at the IMO mini update

|                           |  |
|---------------------------|--|
| Meeting/ date             | Virtual meeting of the Correspondence Group on development of a safety regulatory framework to support the reduction of GHG emissions from ships using new technologies and alternative fuels<br><b>13 October 2023, 11:00am-13:00pm (GMT)</b>   |
| Submissions by the ITF*   | <ul style="list-style-type: none"> <li>ITF MSC Safety dynamics of ship's energy sources (approved by the Seafarers' Section Committee in May 2023)</li> </ul>  |
| Attention to ITF          | <ul style="list-style-type: none"> <li>Safety measures for persons using the new technologies and alternative fuels</li> <li>Alternative fuels &amp; Energy sources</li> <li>ammonia</li> <li>biofuel</li> <li>hydrogen</li> <li>LPG</li> <li>methanol/ethanol</li> <li>natural gas (LNG/CNG)</li> <li>[MGO]</li> <li>[LSHFO]</li> <li>Relevant new technologies</li> </ul> <p>-batteries</p> <p>- carbon capture system</p> <p>-fuel cells</p> <p>-nuclear power</p> <p>-solar power</p> <p>-wind-assisted propulsion</p> |
| Reminders/ implementation | <p>The 2023 IMO GHG Strategy</p> <ul style="list-style-type: none"> <li>to reduce CO2 emissions per transport work, as an average across international shipping, by at least 40% by 2030, compared to 2008</li> <li>uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5%, striving for 10% of the energy used by international shipping by 2030</li> </ul>  |
| Events                    | <b>Safety dynamics of ship's energy sources- on-the-job operations safety, ITF presentation</b>  |

# lifecycle GHG/carbon intensity - "Well to propell"



The lifecycle refers to the assessment of greenhouse gas emissions from the fuel production to the ship (Well-to-Wake);

from primary production to carriage of the fuel in a ship's tank (Well-to-Tank, also known as upstream emissions)

and from the ship's fuel tank to the exhaust (Tank-to-Propeller or Tank-to-Wake, also known as downstream emissions).

[Guidelines on life cycle GHG intensity of marine fuels \(LCA Guidelines\)](#)

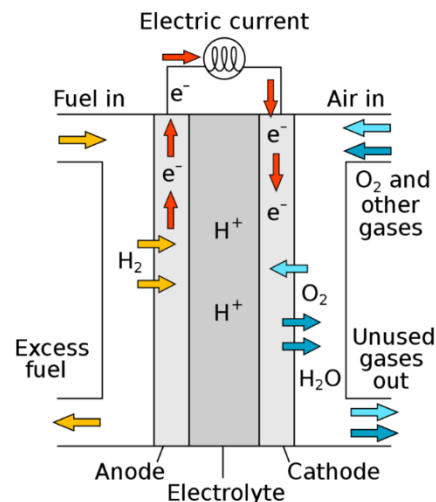
# Safety dynamics of ship's energy sources

The purpose of this document is to highlight the imminent need to put in place measures for those involved in direct on-the-job operations and provide recommendations to close the safety and competency gaps that may exist. When introducing alternative energy sources, the following are **crucial**:

- **A robust training scheme that guarantees the highest level of safety culture;**
- **appropriate training that covers communication, risk analysis, operation and emergency situations;**
- **knowledge about construction and design and relevant regulations;**
- **adequate fire detection and fire-fighting equipment;**
- **availability of proper lifesaving appliances; and**
- **provisions of adequate personal protection equipment for all personnel.**

What information available?

- **Characteristics**
- **Construction & Design**
- **Environmental Effectiveness**
- **Fire and Explosion Risks**
- **Health and Safety issues**
- **Recommendations**



IMO MSC 107 June 2023: SOLAS Chapter II-2, oil fuel shall not jeopardize the safety of ships or adversely affect the performance of the machinery or be **harmful to personnel**.



# Safety dynamics of ship's energy sources Feb.2022

## Energy sources covered

- **Hydrogen**
- **Ammonia**
- Low Sulphur Heavy Fuel Oil (LSHFO)
- Marine Gas Oil (MGO)
- Biofuel
- Liquefied Nature Gas (LNG)
- Liquefied Petroleum Gas (LPG)
- Liquefied Ethylene Gas
- Ethanol
- Methanol
- Lithium-ion Battery
- Fusion energy-Thorium Molten Salt reactor
- Fuel cell
- Scrubbers

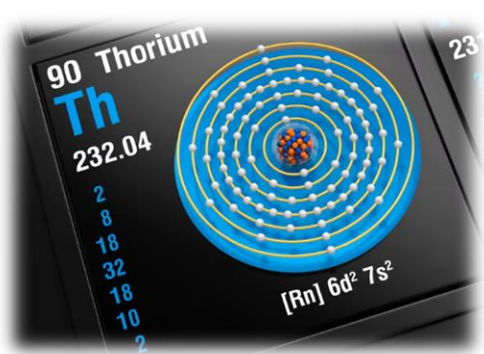
**IMO MSC 107 June 2023** : *Develop a safety regulatory framework to support the reduction of GHG emissions from ships using new technologies and alternative fuels.*

## Part II

### Safety dynamics of ship's energy sources

#### Reading guidance

| Energy          | Characteristics  | Construction & Design  | Environmental Effectiveness  | Fire and explosion risks  | Health and safety issues  | Recommendation  |
|-----------------|--|--|--|---|---|---|
| <b>Hydrogen</b> | <p>Storage <b>temperature</b><br/>-253°C;<br/>Storage <b>pressure</b><br/>700 Bar;<br/>Boiling point<br/>252.8°C;<br/><b>Flash point</b><br/>252.8°C;<br/>Energy density<br/>142.0 MJ/kg</p> | <p>Needs 6 to 10 times more storage space, few bunkering ports available;</p> <p>Storage tank and fuel cell shall be on the highest point on the ship where natural ventilation is possible;</p> <p>Structural fire protection (insulation towards neighbouring spaces);<br/>H<sub>2</sub> detection system;</p> <p>Pressure regulating unit(s) and a relief system;</p> <p>Fire safety system;</p> <p>Emergency shutdown system</p> | <p>Virtually zero exhaust emissions;</p> <p>To produce 1 kg H<sub>2</sub> 48 kWh needed;</p> <p>Transporting of H<sub>2</sub> conducted by carbon-based fuel</p> | <p>High fire and explosion risk due to low flashpoint and extremely high pressure;</p> <p>Explosive/flammability limits 4–75%</p> | <p>Bunkering possess needs high level of caution for safety of all personnel;</p> <p>If inhaled;</p> <ul style="list-style-type: none"> <li>- in small concentrations, it can cause headache, nausea, irritation in skin and eye, convulsions;</li> <li>- high concentration, can cause asphyxiation</li> </ul> | <p><b>Operation</b><br/><b>Knowledge gaps:</b> More testing needed on the safety aspects of handling, storage and bunkering;</p> <p><b>Safety:</b> H<sub>2</sub>'s unique properties make it very different from natural gas;</p> <p><b>Fuel system:</b> Use in its pure form when possible;</p> <p><b>Framework:</b> The Alternative Design process is currently the best approach;</p> <p><b>Implementation:</b> Scaling up H<sub>2</sub> operations will be a challenge;</p> <p><b>International regulations</b><br/>Amendment to IGF Code<br/>Crew safety training /competency requirements;</p> <p>Amendments to STCW, focusing on ships specific trainings and familiarisation, medical treatment and first aid competence;</p> <p>Alignment SOLAS and MARPOL VI for safe operation of H<sub>2</sub> fuelled engines.</p> |



[https://www.imorules.com/SOLAS\\_CHVIII.html](https://www.imorules.com/SOLAS_CHVIII.html)

| Energy   | Characteristics   | Construction & Design   | Environmental Effectiveness | Fire and explosion risks  | Health and safety issues | Recommendation  |
|--|---|---|-----------------------------|---|--------------------------|---|
| <b>Fusion Energy – Thorium Molten salt Reactor</b> | <p>Reactor temperature 700°C;</p> <p>Vapour pressure;<br/>Boiling point 4787°C;</p> <p>Melting point 1750°C;<br/>Density (20°C)11.72g.cm-3;</p> <p><b>Energy density 79,420,000 MJ/kg;</b></p> <p>Energy efficiency 50%</p> | <p>The reactor placed in engine room, with double cooling systems;</p> <p>The reactor is concealed with 1m thick concrete shell;</p> <p>The weight and size of the reactor will mathematically on a 68220dwt tanker release around 6,500 total dwt;</p> <p>No need for HFO storage tanks;</p> <p>Bunkering is not needed, but the “stone” with size of a golf ball to be replaced every 10 year</p> | Zero                        | <p>“Freeze plug” where a reactor drain-plug is actively cooled to keep the fuel in and the reactor running;<br/>If anything goes wrong, the reactor fuel is safely drained, and the reactor stops;<br/>The molten salt intrinsically slows the reaction.<br/>if it becomes overheated because of its negative temperature coefficient of reactivity;<br/>The operational temperature of the reactor is 600-700°C, while the boiling point of the molten salt is up to 1,400°C leaving a very large safety margin which makes the reactor inherently safe against overheating.</p> | Normally none            | <p><b><u>International regulations</u></b><br/>Use existing SOLAS regulations (Ch. VIII);<br/>Amendments may needed with additions;<br/>-Amendments to STCW, focusing on ships specific trainings and familiarisation and first aid competence;</p> |

## Q6. Why is “nuclear (Thorium)” attractive energy source?

In a molten salt reactor (MSR)

Fully controllable by the human

Bunkering roughly once every 10 years only

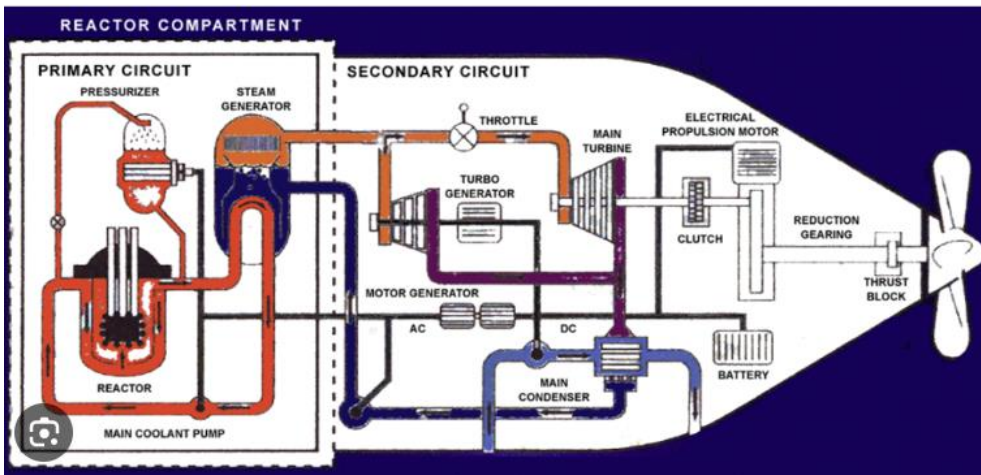
SOLAS regulations already exist (CHAPTER VIII – NUCLEAR SHIPS)

Real zero emission energy - Initial IMO GHG strategy focus area

Technology ready – Power supply from barge to ship, possible soon

Seagoing ships available in 2040

- Let go of the old political reluctance



<https://www.youtube.com/watch?v=IBRVb0-0kAw>  
<https://www.nordnorskrapport.no/2023/09/kjernekraft-og-thorium-ma-handle-ikke-prate/>



# The Norwegian Government's hydrogen strategy

towards a low emission society

17.08.20

## RELEVANT POINTS FROM THE GOVERNMENT'S ACTION PLAN FOR GREEN SHIPPING<sup>40</sup>

### The government will:

- Stimulate further green growth and competitiveness in the Norwegian maritime industry, and facilitate higher exports of low and zero emission technology in the maritime sector.
- Stimulate zero and low emission solutions in all vessel categories.
- In future reviews of the standard spending assessments in the revenue system for the county authorities take into consideration the spending increases arising as a result of the requirements set by the county authorities for low and zero emission systems on ferry and high-speed ferry routes.
- Follow up the resolution to introduce a zero emission requirement for cruise ships and ferries in the world heritage fjords as soon as this is technically feasible, and no later than 2026, and come back to Parliament when the time is right.
- Extend to other Norwegian fjords the environmental requirements stipulated for ships in the world heritage fjords.
- Evaluate an environmental benefit scheme for zero and low emission ships in the NIS and NOR ship registers.
- Ensure that the Norwegian Maritime Authority and Norwegian Coastal Administration have the capacity and skills to handle new systems in green shipping, including the development of regulations for the use of hydrogen in maritime industries.
- Consider stipulating requirements for low and zero emission systems in public ferry and high-speed ferry services, wherever practical.
- Evaluate requirements for the introduction of zero and low emission systems for service vessels in the aquaculture industry.
- Consider introducing requirements for zero and low emission systems for new operations vessels involved in petroleum production.

Box 3-7, Relevant points from the government's action plan for green shipping

**Competence training for maritime workforce?**

## 2.1 Safe use of hydrogen in shipping

It is important for regulations to be capable of handling both new technology and new digital solutions. The development of international regulations for the future is vital if the Norwegian maritime industry is to be able to market new technology internationally, and if the maritime industry is to be able to operate internationally with new, innovative technology developed in Norway. The government wants Norway to continue being a driving force in the development of regulations and standards, in order to be able to adopt new solutions and technologies in the maritime sector.

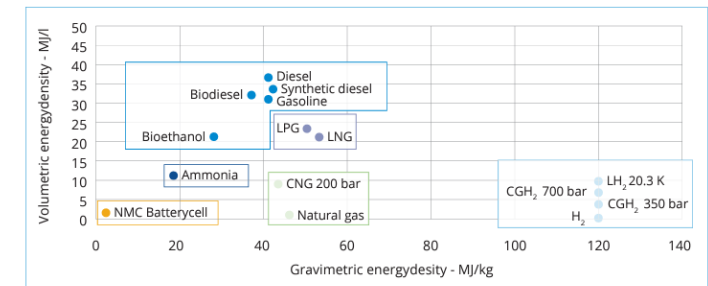


Figure 1-4 Comparison of energy density of hydrogen and other relevant fuels/energy carriers. The Y axis is volumetric energy density – how much energy the various carriers have per unit of volume (litre). The X axis is gravimetric energy density – how much energy the various carriers have per unit of weight (kilogram) Source: Shell (2017), Shell hydrogen study: Energy of the future? Sustainable mobility through fuel cells and hydrogen, figure taken from DNV GL (2019)

Hydrogen has been used as an energy source for over 50 years, but not on ships that have completely different external factors such as salt, vibration, temperature, humidity and an infrastructure together with other energy sources and systems! Hydrogen is the lightest and smallest of the elements, > 700 Bar, - 253°C, leak can be ignited by static discharge from clothing and equipment and by self-ignition!

**Hydrogen has an energy density of 33 kWh per kg, while batteries struggle to reach 0.3 kWh/kg. The disadvantage is of course that very large tanks are needed even to store a few kg of hydrogen. More than 50 percent disappears from electricity via hydrogen to electricity again. In practice, hydrogen is not more energy efficient than fossil fuels in a piston engine.**



# M/F HYDRA

## The LH<sub>2</sub> arrangement

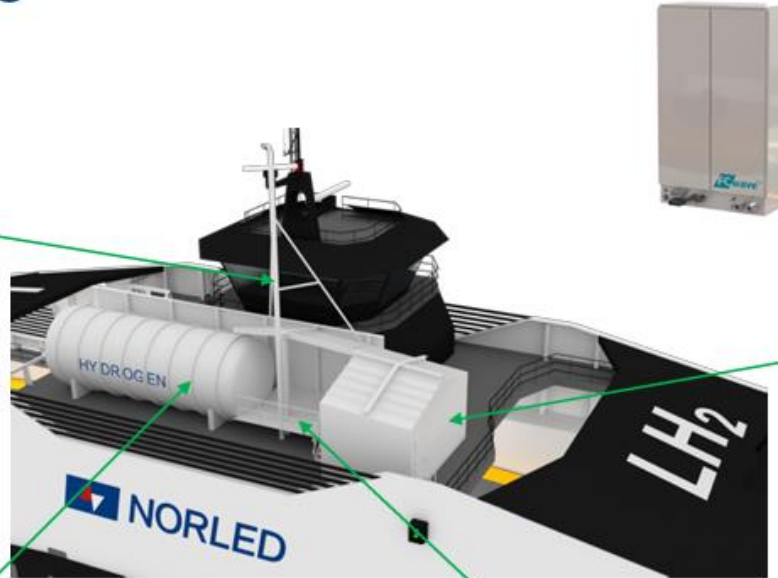


### Vent mast:

- Evacuate emergency releases to safe location
- Inherent safe
- No releases during normal operation

### LH<sub>2</sub> storage:

- Linde LH<sub>2</sub> tank
- 4 ton capacity
- 10m length, 3,5m diameter
- DNV certification
- 2-3 bar operational pressure
- Vacuum insulated



### Fuel cell modules:

- Ballard FC Wave
- 2 pcs. 200 kW
- 30-80% load
- DNV certification

### FC room:

- Accommodate safe FC operation
- Potential FC explosion loads to be catered for

### Processing area:

- Vaporizer
- LH<sub>2</sub> to GH<sub>2</sub> (3-5 bar, 10-30° C)

# Bunkering

## LH<sub>2</sub> supply from Germany



(Picture: Linde Gas)



- Truck transport from Leuna, Germany to Viganeset, Norway from 2022-2025
- 3,2 tons capacity with delivery every 3<sup>rd</sup> week
- Shift to LH<sub>2</sub> supply from Norway when available (2025?)



- Risk-based approach towards authorities, incl. QR
- Safety zones on site (ATEX and access zones)
- Short bunkering time
- No over-filling, venting or LH<sub>2</sub> spillage
- Trailer de-pressurization through tower post-bunke
- Patent pending for bunkering operations

**Forskrift om skip som bruker drivstoff med flammepunkt under 60 °C**

**International Code of Safety for Ship Using Gases or Other Low-flashpoint Fuels (IGF Code)**



**SJØFARTSDIREKTORATET**  
**BEMANNINGSSERTIFIKAT FOR MINSTE SIKKERHETSBE MANNING**

Utstedt etter bestemmelsene ved forskrift om bemanning av norske skip  
og overensstemmende med reglene i STCW konvensjonen.

| Navn<br>HYDRA   |  | Kj. signal:<br>LFWX                  | IMO nr.<br>9887530           | Hjemsted<br>Stavanger                  |                 |
|---|--|--------------------------------------|------------------------------|--|-----------------|
| Type<br>Passasjerskip - Bilferge  | Ant. pass<br>295                             | Fartsområde<br>2 - Beskyttet farvann |                              | Arbeidsordning<br>Skiftordning         |                 |
| Br. tonn<br>2046.00   | Største lengde - bredde<br>82.400 - 17.500 m | Fr. effekt<br>1920 kW                | El. anlegg<br>690 V - 880 kW | Framdr. mask<br>Elektrisk-<br>Hydrogen | Hastighet<br>12 |
| Sikkerhetsbemanning er basert på at følgende tekniske innretninger er installert:<br>Autopilot <input checked="" type="checkbox"/> Intern komm <input checked="" type="checkbox"/> Personellalarm <input checked="" type="checkbox"/> UMS Alarmer <input checked="" type="checkbox"/> |  |                                      |                              |  |                 |
| Sikkerhetsbemanning for drift med periodevis ubemannet maskinrom. Tidsperioden skal ikke overstige 2 timer  |  |                                      |                              |  |                 |
| Stillinger  | Ant.   | Kvalifikasjoner * (STCW)             | Kommentarer                  |  |                 |
| Fører   | 1  | D3 (II/2,3)                          |                              |  |                 |
| Overstyrmann  | 1  | D3 (II/2,3)                          |                              |  |                 |
| Maskinsjef  | 1  | M3 (III/3)                           |                              |  |                 |
| Matros  | 1  | -                                    |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |
|   |  |                                      |                              |  |                 |

Samtlige besetningsmedlemmer skal fylle kravene til passasjer- og krisehåndtering, jf. kvalifikasjonsforskriften § 60.

(\*) Sertifikatkoder refererer til nasjonal kode. STCW referanser i parentes. Andre sertifikater kan aksepteres dersom de gir tilstrekkelige rettigheter for stillingen. Se hvert individuelt sertifikat for mulige begrensninger.

M1 sertifikat krav

Maskinsjef skal være ombord under bunkring

Maskinsjef har ikke ansvar for bunkrings tårnet

Maskinsjef skal ha skipsspesifikk opplæring

Norled oppfyller ikke kravene i ISM koden

Norled oppfyller ikke kravene Forskrift om

arbeidsmiljø, sikkerhet og helse for de som har

sitt arbeid om bord på skip

Norled oppfyller ikke kravene i Skipssikkerhets

loven

Norled oppfyller ikke kravene Forskrift om

bemanning av norske skip

(bemanningsforskriften 2009)

Norled oppfyller ikke kravene Forskrift om

vakthold på passasjer- og lasteskip.

Norled oppfyller ikke kravene Forskrift om

driftsordninger på norske skip

# Møte med NHO SJØ ang. ladetårn 24.04.03

Med bakgrunn i Forskrift om kvalifikasjoner og sertifikater for sjøfolk § 36. Stillingsbetegnelser maskinoffiserer som sier; Maskinsjef er den overordnede maskinoffiseren som har ansvar for skipets mekaniske framdrift og for drift og vedlikehold av mekaniske og elektriske installasjoner om bord og Bemannings forskriften § 7. Fastsettelse av sikkerhetsbemanning Hvor hvert enkelt skip skal ha sikkerhetsbemanning fastsatt av Sjøfartsdirektoratet, med bestemte stillingsbetegnelser og kvalifikasjonskrav mv. som er nødvendig for å ivareta skipets og de ombordværendes sikkerhet og hindre forurensning av det marine miljø.

Følgende må på plass:

Ved innføring av ny teknologi eller energikilder for fremdrift, manøvrering og operasjon med nødvendig landbasert infrastruktur, overvåking eller styring ligger ISM koden spesielt § 1.2.3 og § 6 til grunn, satt opp i en Risk and Hazard analyse mellom de parter som bestemt i [Alternative design and arrangements for SOLAS chapter II-1](#)

Videre;

Det utarbeides en skriftlig oversikt over hvilket arbeid som kan utføres utenfor skipet- og av hvem

Det utarbeides med bakgrunn i kvalifikasjons forskriften og Forskrift om sikkerhet ved arbeid i og drift av elektriske anlegg, en oversikt av kompetanse behovet for å kunne utføre slikt arbeid

Kompetanse behovet avtales dekkes kollektivt og individuelt, det gis skriftlig bevis for deltagelse på slike skipsspesifikke kurs

Det utarbeides en skriftlig avtale med leverandør og eller godkjent elektrofirma som har ansvar for landbasert skipsspesifikk infrastruktur konstruksjon, design, planlagt vedlikehold og reparasjoner

Alle disse forhold, inklusive familiarisering, rutiner, avvik, ansvarsforhold, vaktrutiner, personlig verneutstyr og forsikringsforhold etc. innføres i rederiets og det enkelte skips ISM systemer og i skipets bemannings sertifikat.

## Ang. HYDRA LFWX (38-WESTCON YARD FLORØ AS) - IMO 9887530



Odd Konrad Dale <OKD@sdir.no>

Til Odd Rune Malterud

Kopi Sonja Elisabeth Hillersøy-Ådnesen; Kristian Breidfjord; Jan Reinert Vestvik; Hege-Merethe Bengtsson

Du svarte på meldingen 04.07.2023 09:07.



fre. 26.05.2023 12:46

Hei

Vi takker for henvendelsen som gjelder kvalifikasjoner for Hydra.

Sjøfartsdirektoratet har gjennom hele byggeperioden hatt dialog med rederiet om opplæringskrav. Mannskapet om bord på Hydra skal være kvalifisert ihht. IGF kompetanse (jf. Kvalifikasjonsforskriftens krav §§ 69 og 69a), herunder systemspesifikk opplæring ombord.

Basert på denne bekymringsmeldingen vil Sjøfartsdirektoratet vurdere om det bør gjøres endringer i detaljer i bemannings sertifikatet, slik at mer detaljert informasjon om fartøysspesifikk tilleggskompetanse kommer frem tydeligere.



**Odd Konrad Dale**

Senior Surveyor

**Sendt:** onsdag 15. november 2023 12:33

**Til:** Odd Rune Malterud <ORM@dnmf.no>

**Emne:** Bekymringsmelding - HYDRA LFWX - Bemanning

Hei

Vi viser til deres bekymringsmelding 4. juli 2023 angående bemanningen på Hydra, samt purring 30. august. Videre viser vi til bekymringsmelding 10. mai 2023 og vårt svar 1. juni.

Dere skriver at rederiet kommer med stadig nye påfunn mht. bunkring og vaktssystemer. Dere anser Hydra som en storulykkerisiko og mener vi ikke har oppfylt våre forpliktelser.

I svaret fra oss 1. juni har vi redegjort for kvalifikasjonskravene som gjelder. Vi har også foreslått å presisere dette i bemanningsoppgaven.

Parallelt med dette har vi håndtert en annen bekymringsmelding som går på arbeidsordning på samme fartøy. Dere har fått kopi av vårt vedtak i den saken, datert 27. oktober 2023. Rederiet pålegges å endre arbeidsordning eller søke om ny bemanningsoppgave for tovaaktordning. Fristen for å etterkomme pålegget er utsatt til 31. januar 2024.

I forbindelse med eventuelt ny bemanningsøknad vil vi ta inn en presisering om IGF-kompetanse. Dere vil også få mulighet til å uttale dere i saken, jf. bemanningsforskriften § 4.



**Jan Reinert Vestvik**

senioringeniør

underavdeling passasjerskip



**ITF MSC 11.10 2023 ;**

**The ITF MSC SG encourages the ITF MSC members that seafarer's organizations and maritime unions have an important role to play at the IMO by supporting ITF technical statements and policies and positions to your national administrations.**

**Using resources provided by the ITF and implementing these technical statement and policies in your Unions and organizations you can bring awareness of the health, safety and welfare of your members to your national administrations.**



## Safety

1. Yourself
2. Your College
3. The Ship
4. and the Environment as determined in UN/IMO /ILO /EU



## Security

STCW Medical examination to be medically fit for duty on ships.

STCW Certificate of Proficiency (COP) and Competency (COC)

**Respect** regardless of gender, nationality, sexual orientation, gender identity or religion

**Career** and competence development as well as employment opportunities for maritime positions, 24/7 Ref. MLC 2006, Regulations 2.7 and 2.8



### **Sustainable?**

Political understanding on “green” energy sources with, extreme pressure, temperature, corrosive, toxic and High Voltage for propulsion, manoeuvring and operation of the ship shall be **HUMAN SAFE**.

Emissions calculation from well to propell is crucial to reach the sustainability goal

Use current regulations and technical competence – IMPLEMENT

- don't wait until the IMO has developed the regulations, - influence them!



**SEAFARERS** have deal with automation since 1965, and prevention, reduction and control of marine pollution since 1973 (MARPOL)

Seafarers' competence shall safe and secure the OPERATION OF THE SHIP'S FUNCTIONS

- and ensure ALL safe and healthy return to the port facility and their family.





## ENERGY

- ✓ a robust training scheme that guarantees the highest level of safety culture
- ✓ appropriate training that covers communication, risk analysis, operation and emergency situations
- ✓ knowledge about construction and design and relevant regulations
- ✓ adequate fire detection and fire-fighting equipment
- ✓ availability of proper lifesaving appliances
- ✓ provisions of adequate personal protection equipment for all personnel.



## ENVIROMENT

**Human** Competence, Construction, Design, Equipment, Safe energy Sources and environmental effectiveness is the key to achieve common goals on sustainable manning, greening the economy, fair and inclusive, decent safe work and **leaving no one behind.**

# Reports & Publications



09 Nov 2022  
**Posters - Task Force 10-point Action Plan to Achieve a Just Transition for Seafarers (2022)**  
 Global shipping urgently needs to decarbonise. The world is facing a climate emergency. Urgent action is needed to limit global warming to 1.5C or we will face...

## THE MASS HUMAN ELEMENT – COLLATING SEAFARERS' VOICES: PERSPECTIVES AND EXPECTATIONS



09 Nov 2022  
**Mapping a Maritime Just Transition for Seafarers - Maritime Just Transition Task Force (2022)**  
 Global shipping urgently needs to decarbonise. The world is facing a climate emergency. Urgent action is needed to limit global warming to 1.5C or we will face...

## New fuels and seafarers' competences



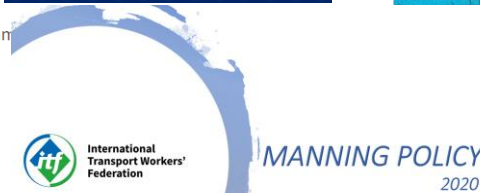
Copyright: Oliver Design



### Safety dynamics of ship's energy sources

- A robust training scheme that guarantees the highest level of safety culture;
  - appropriate training that covers communication, risk analysis, operation and emergency situations;
  - knowledge about construction and design and relevant regulations;
  - adequate fire detection and fire-fighting equipment;
  - availability of proper lifesaving appliances; and
  - provisions of adequate personal protection equipment (PPE) for all personnel
- + career paths for ALL maritime workers**
- The ITF MSC Safety dynamics of ship's energy sources document contains a table which includes the following topic:
- Identify technical characteristics and Environmental Effectiveness of fuels and energy sources
  - Identify hazards related to safety and health and operation, including bunkering and storage;
  - Identify safety and health issues for lives and cargo on board related to construction and design of a ship, and
  - Recommendations to close the safety gap.

**Subjects:**  
 Hydrogen - Ammonia - Low Sulphur Heavy Fuel Oil (LSHFO) - Marine Gas Oil (MGO) - Biofuel - Liquefied Nature Gas (LNG) - Liquefied Petroleum Gas (LPG) - Liquefied Ethylene Gas - Ethanol- Methanol - Lithium-ion Battery - Fusion energy, Thorium Molten Salt reactor, Fuel cell - Scrubbers



- ✓ ITF Manning policy
- ✓ Reference addition
- ✓ Checklist



20 Aug 2019  
**ITF guidelines on the IGF Code**

The IMO has adopted a mandatory safety code for ships using gases or other low-flashpoint fuels. The booklet provides a brief information on the IGF Code and what...



11 Dec 2018  
**Are seafarers indispensable?**

On 3 December 2018, the International Maritime Organization (IMO) convened the 100th session of Maritime Safety Committee (MSC) – first held in 1948. To mark the...



05 Oct 2018  
**Presentation of ITF Seafarers' Section Automation Working Group (SSAWG) Vice Chair at Norwegian Engineer Officers' Conference 2018**



29 Oct 2021  
**ITF's Sustainable Shipping Position Paper**

Widespread and systemic change is needed to speed up the maritime industry's transition to a zero-carbon future. Seafarers are already seeing the dangers of...



20 Sep 2020  
**Beyond the Limit**

How Covid-19 corner-cutting places too much risk in the international shipping system.



21 May 2020  
**Sub-Committee: Human Element, Training and Watchkeeping (HTW) Submission**

Sub-Committee on Human Element, Training and Watchkeeping (HTW): deals with issues regarding human in the maritime, in particular education and training, validation...



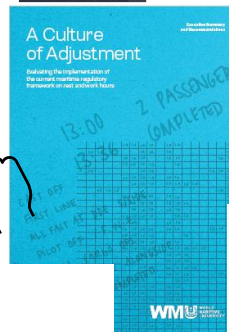
29 Apr 2020  
**SKILLSEA project: Future Skill and Competence Needs**

Technology and digitalisation are transforming the shipping industry. 'Smart' ships are coming into service, creating demand for a new generation of competent,...



23 Aug 2018  
**Autonomous ship 'Yara Birkeland' - how far has the industry reached?**

The world's first seagoing autonomous ship, called Yara Birkeland, was expected to be launched and to set sail in 2018, delivering fertiliser along a 37-mile...



**A 10-Point Action Plan to achieve a Just Transition for Seafarers**

Skills and training to support a decarbonized shipping industry

