#### Webinar

## Net Zero Framework Practical Examples & Insights

Wednesday, May 28 10:00 - 11:00 CET





Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping









### Today's speakers





Nina Porst



Elisabeth Lokshall



Francesco Sandrelli



Joe Bettles

Mads Peter Zacho





Norges Rederiforbund Norwegian Shipowners' Association

Elisabeth Lokshall Advisor, International Cooperation & Climate (Norwegian Shipowners Association)



Policy Director Environment (UK Chamber of Shipping) What does Net-Zero Framework mean fo the shipping industry?



Nina Porst Executive Director for Climate, Environment and Security (Danish Shipping)



# **IMO Net-Zero Framework - Introduction**

28 May 2025

Danish Shipping - Nina Porst

Norwegian Shipowners Associations - Elisabeth Lokshall

UK Chamber of Shipping Francesco Sandrelli

### Why are we here?

- DIGEST IMPACT and UNDERSTAND IMPLICATIONS
- Case Studies

Published - Apr 16 2025

Revision
 Countdown: Historic IMO agreement lays groundwork for maritime decarbonization

On 11 April 2025, IMO Member States reached agreement on a Net-Zero Framework — a set of regulations for the shipping industry to reach net-zero by 2050

In a moment of geopolitical tension, Member States at the IMO have shown that multilateral action on climate is possible. Following years of discussions culminating in two intense weeks of negotiations, Member States agreed last week on mid-term measures (MTMs) known as the IMO Net-Zero Framework – a historic milestone for shipping decarbonization. While our analysis shows that more work is needed to reach netzero GHG emissions by 2050, the Framework establishes a robust foundation that can be further developed to fully decarbonize the maritime sector.

As we turn to the work ahead, it's worth pausing to reflect that this agreement is more than an incremental revision of a treaty. It represents the first legally binding rules that combine mandatory emission intensity limits and GHG pricing globally across an entire sector.



Source: Maersk Mc-Kinney Moller Center for Zero Carbon Shipping, Historic IMO agreement, newsletter 16 April 2025

## New regulation – agreement on a new marine fuel standard (GFS)!

- Ships over 5 000 GT
- First year 2028
- Two-tier targets: Base and Direct Compliance
- Sustainability certification of fuels with a Fuel Lifecycle Label (FLL)
- Reward element for use of ZNZs
- Must be adopted at MEPC-ES.2 in October 2025 with 2/3 majority.

#### Shipping is first industry to agree fines for gas emissions

After ten years of talks, the International Maritime Organization has pulled off a deal giving vessel owners a choice: use cleaner fuels or pay penalties



WORLD ~ U.S. ~ POLITICS ~ SPORTS ~ ENTERTAINMENT ~ BUSINESS ~ SCIENCE ~ FACT CHECK ~ MORE ~

IVE Trump administration Met Gala 2025 Rihanna Pentagon cuts 'Diddy' trial

#### Major nations agree on first-ever global fee on greenhouse gases with plan that targets shipping

OFFSHORE Creen Marine Hydrogen Marine Energy Subsea Fossil Energy Alternati ENERGY

Aftermath of IMO's net-zero framework: 'Historic' agreement or 'total shipwreck'?

#### **REGULATION & POLICY**

Home > Green Marine >

#### April 14, 2025, by Ajsa Habibic

With the global climate regulation agreement adopted by the International Maritime Organization (IMO) at the 83rd session of the Marine Environment Protection Committee (MEPC 83), shipping is on track to become the first industry with internationally mandated targets to reduce emissions. While some industry representatives praise the agreement as "historic", others describe it as a "shipwreck" that missed targets. However, a unified opinion is that more work is needed to steer the shipping industry toward a climateneutral path.





## **IMO Marine Fuel Standard (GFS)**



### Next Steps - what's still to be done

- MEPC/ES.2 (Adoption)
- GHG 20 (Guidelines) such as Annex 2 MEPC.83 / WP.11
  - Definition of ZNZs and framework for ZNZs rewards (not later 1 March 2027)
  - IMO Net-Zero Fund and its Governing Board;
  - How to verify/ report Attained Annual GFI and GFI Compliance balance of ship;
  - How to Open and Manage ship account in the IMO GFI register
  - Further development of LCA Guidelines
  - Further development of SEEMP

### Next Steps - what's still to be done

Still to be defined	When
Default emissions Factors (LCA)	April 2026 clarified
Recognition of Fuels Certification	From April 2027
RU1 & RU 2 price (after 2030)	By 1 January 2028 (review)
Reduction Targets from 2036-2040	By 1 January 2032
ZNZ Technology and Reward	No later 1 March 2027
SEEMP Amendments	March 2027 (assuming)

### **Next Steps - where to focus**

- Do the math how will this affect you?
- Revisit your decarbonization strategy to identify priorities this will allow you to engage in the following:
  - Promote and support the NZF (political focus)
  - Zoom in on the architecture of those elements still to be settled and bring an industry perspective to relevant stakeholders (i.e. National/International Associations, NGOs, Member States etc..).



Joe Bettles Climate Policy & Analysis Manager (MMMCZCS) Net-Zero Framework calculation and its impact

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### 2025 is a turning point, the key question is not if we will decarbonize, it is how



The Net Zero Framework establishes a two-tiered GHG Fuel Intensity (GFI) reduction pathway, driving both fuel switching and revenue raising



Note: 95% in 2050 is not part of the text and an assumption done for the curves. The direct compliance curve is also not defined post 2035 and it is assumed that the 13% gap between direct and base is maintained through 2050

### Mandates to markets





### Business as usual will lead to compliance cost from Tier 1 and 2



I) Tier 2 Compliance Options in 2030 (8% reduction) Pay the Remedial Unit (380 \$/gCO<sub>2</sub>eq)  $380 \frac{USD}{tCO_2eq} \times 0.39 \frac{tCO_2eq_{deficit}}{tLSFO} = 150 \frac{USD}{tLSFOeq}$ Use drop-in biofuel  $314 \frac{USD}{tCO_2eq} \times 0.39 \frac{tCO_2eq_{deficit}}{tLSFO} = 124 \frac{USD}{tLSFOeq}$ Purchase Surplus Unit Credits We assume that the surplus unit is equivalent to drop-in biodiesel Tier 1 Compliance Options in 2030 (13% reduction) Pay the Remedial Unit  $(100 \text{/gCO}_2\text{eg})$  $100\frac{USD}{tCO_2eq} \times 0.49\frac{tCO_2eq_{deficit}}{tLSFO} = 49\frac{USD}{tLSFOeq}$ 

 $( \mathbf{\bullet} )$ 

Assumptions: We use a 95.63 gCO2eq/MJ LSFO as the reference, with the emissions factor from MEPC.391(81). Abatement cost of bio-diesel is based on the difference between the Center assumption for the cost of LSFO in 2030 (541\$/t) and a bio-diesel forecasted price from LR/UMAS 2020. <u>https://www.lr.org/en/knowledge/research-reports/2020/techno-economic-assessment-of-zero-carbon-fuels/</u>

### The NZF creates value through surplus and rewards for ZNZs

#### ZNZ Surplus revenue in 2030



Revenue calculation uses surplus below Tier 1 multiplied by assumed surplus unit price





Assumptions: Surplus revenue is based on an assumed market price of surplus equal to the abatement cost of bio-diesel. We use a bio-diesel price forecast from LR/UMAS 2020. <u>https://www.lr.org/en/knowledge/research-reports/2020/techno-economic-assessment-of-zero-carbon-fuels/</u> The 175 USD/tCO2eq reward is based on NavigaTE modeling (MMMCZCS) that modeled potential rewards based on estimated revenue collection and eligble ZNZs. Both assume a ZNZ that is meets the ZNZ threshold of 19gCO2eq/MJ

### The NZF creates value through surplus and rewards for ZNZs

#### Eligible ZNZs rewarded



Reward calculation is uncertain; here shown as estimated value x abatement below reference





Assumptions: Surplus revenue is based on an assumed market price of surplus equal to the abatement cost of bio-diesel. We use a bio-diesel price forecast from LR/UMAS 2020. <u>https://www.lr.org/en/knowledge/research-reports/2020/techno-economic-assessment-of-zero-carbon-fuels/</u> The 175 USD/tCO2eq reward is based on NavigaTE modeling (MMMCZCS) that modeled potential rewards based on estimated revenue collection and eligble ZNZs. Both assume a ZNZ that is meets the ZNZ threshold of 19gCO2eq/MJ

# We assume reduction in future cost pathways for advanced e-fuels and low-carbon (blue) fuels



- ZNZ fuel production costs are projected to decline through 2050, assuming learning rates and economies of scale
- e-fuels (derived from electrolytic hydrogen) expected to fall from ~2,000–3,500 \$/tLSFOeq in 2028 to ~1,200–1,800 \$/tLSFOeq in 2050
- Blue ammonia starts lower (~1,400 \$/tLSFOeq in 2028) and declines to just above 1,000 \$/tLSFOeq
- Estimates are public in our <u>Fuel Cost</u>
   <u>Calculator</u>



# Early benefits support scaling of higher cost ZNZ fuel

Cost and benefits of compliance for [USD per tonne LSFO-equivalence]



Costs of Using LSFO (Fossil Fuels):

- Additional costs due to blending biodiesel and Remedial Unit (RU) penalties
- Tier 2 compliance becomes more expensive as targets tighten

#### Costs of Using ZNZ Fuels:

- Early benefit from surplus units and ZNZ rewards offset high initial costs
- Low rewards and surplus in 2040 are balanced by falling ZNZ costs
- ZNZ costs are expected to decline ~24% between 2030 and 2040 as production scales

Assumptions: We use a bio-diesel price forecast from LR/UMAS 2020. All other fuel costs are from our Fuel Cost Calculator (MMMCZCS). For the ZNZ, we use the average between e-methanol and e-ammonia (global, high electricity cost). Surplus revenue is based on an assumed market price of surplus equal to the abatement cost of bio-diesel. Reward is based on NavigaTE modeling (MMMCZCS) that modeled potential rewards based on estimated revenue collection and eligible ZNZs. Both assume a ZNZ that is meets the ZNZ threshold of 19gCO2eq/MJ

A mid-range cost of ZNZ could compete with LSFO as early as 2030 with rewards and surplus units, while LNG and bio-methane could be lower





Based on MEPC 83/WP.1 The reduction curves from 2035 to 2040 are not part of the text and an assumption was done using the 65% reduction for Tier 2 in 2040 and reaching 95% by 2050. **Assumptions:** Biofuel = biodiesel price forecast from LR/UMAS 2020; Biomethane costs from NavigaTE; ZNZ = fixed for the first 10 years at 2000 USD/tLSFOeq, roughly equal to NavigaTE 2028 average of emethanol / e-ammonia, from 2038 we use the average cost of fuel between e-methanol and e-ammonia. Download the MTM Compliance Cost Calculator: <u>https://www.zerocarbonshipping.com/news/countdown-historic-imo-agreement-lays-groundwork-for-maritime-decarbonization/</u>

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### This changes if you use the current price of LNG





# MEPC 83 plans to implement a revision of the **Remedial Units**, which raises the cost of fossil strategies



### Build your own compliance scenario

#### NZF3C (Compliance Cost Calculator)



https://www.zerocarbonshipping.com/nzfcompliance-cost-calculator-nzf3c



- **Policy still evolving**: Key NZF elements (e.g. ZNZ definitions, RU pricing, rewards) remain under development.
- High input uncertainty: Results depend on assumptions for future fuel costs/prices and GHG factors, which are uncertain. The user can override Center assumptions with their own input.
- Illustrative only: This tool is not investment advice and should not be used for financial or strategic decision-making without further analysis.

### Walk through a few features in the tool



- Remedial Unit (RU) Price Assumption. Choose whether the Tier 2 penalty stays fixed at \$380/tCO<sub>2</sub>e or enter your own value from 2031.
- ZNZ Reward Rate. Pick a reward level for ZNZ fuels based on either internal forecasts or DNV's CIA scenarios. Assumes no rewards before 2030.

es/sources

• Surplus Unit Pricing Logic. Set whether surplus unit prices are based on the cheapest compliance option: RU, bio-diesel, bio-methane, or ZNZ fuel. Choose 'No' to exclude options you believe will be unavailable at scale.

		Fixed Tier 2 I	RU at 380 USE	)/tCO2eq
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According to NZF Regulation 36 (9), the Remedial Unit for Tier 2 is set at \$380 per tonne of CO2eq. The first option is "Fixed tier 2 RU at 380", which assumes that the RU does not hange through 2040. The second option is to enter a Tier 2 RU price. This is based on egulation 36 (10) which states that a mechanism will be put into place to define both tiers of the remedial units starting in 2031. The price the user enters will then take effect from 2031 through 2040.

USD/tCO2e)

Example Reward Rates are based on internal MMMCZCS forecast based on anticipated revenue and the amount of ZNZ energy expected to be elligible for the reward. 'CIA Example Reward Low (175 to 12,5 Reward Rates' are based on scenarios from the Comprehensive Impact Assessment (CIA) by DNV for MEPC 82 using the cost gap between bio-methane and e-ammoni. The 90 to 60% or 105% refer to the share of cost gap covered by the reward. Note: It is assumed here that rewards will not be disbursed before 2030.

#### Will the following energy sources be available in sufficient quantities to be able to set the surplus unit price?

Will bio-diesel set surplus unit prices? Will bio-methane set surplus unit prices?

162	We assu
Ves	the RU, the ZNZ
	fuels to

me the cost of surplus units will be determined by the cheapest of four options 1) 2) the bio-diesel blend compliance cost, 3) bio-methane blend compliance cost, 4) compliance cost. Select 'No' if you think there will be insufficient quantities of these exclude them from setting the price.



### Walk through a few features in the tool



- **ZNZ Emission Factor**. Choose whether the ZNZ you are analyzing is just meeting minimum thresholds, or enter your own (in gCO2e/MJ)
- ZNZ Fuel Cost. We have taken costs from our Fuel Cost Calculator which you can use, we have high (e-methanol), low (e-ammonia), and an average of the two which include decreasing costs over time due to learning and economies of scale. Alternatively, you can enter your own. Note: this in terms of USD per tonne of LSFO equivalence.

		Notes
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threshold or	Enter my own	The MEPC83/WP11 agreement includes a threshold for rewarding ZNZs of 19 gCO2e/MJ from 2028 - 2034, and 14gCO2e/MJ after 2035
N] ->	10	The 10 gCO_ze/MJ shown is a placeholder, not a recommendation. To earn rewards, fuels must be <19 gCO_ze/MJ (pre-2035) or <14 gCO_ze/MJ (post-2035). Enter actual values from your supplier where available.
enter your own	Enter fixed price	Here the costs are global averages for e-ammonia (low) and e-methanol (high) from our Fuel Cost Calculator assuming high cost of electricity. Note: the costs vary over time assuming learning curves, therefore, this mimics spot prices.
ies of LSFO	2000	A fixed price assumes one price through 2050, reflecting a long-term 23 year offtake agreement. Make sure to convert USD/tonne to USD/tLSFOeq

### What's next?





By addressing lack of clarity and certainty through analysis and engagement the Center aims for an effective framework that drives decarbonization

What is needed?



Provide regulatory clarity to
 enable early investment

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Provide needed expertise and analysis for guidelines and MARPOL amendments

Our approach Build a **resource for industry and policymakers** on the NZF and provide **rigorous analytical briefs** to dive into the unanswered questions

Outcomes we aim for

Build confidence and ensure **adoption in October**, support **robust and effective guidelines**, and aim for an **effective NZF** that creates a clear business case for decarbonization



Nina Porst Executive Director for Climate, Environment and Security (Danish Shipping)

How the industry is starting to plan for the Net-Zero Framework

Mads Peter Zacno Chief Executive Officer (Navigator Gas)

# Thank you

Follow our work https://www.zerocarbonshipping.com/guide-to-the-imo-mid-term-measures-

Reach out <a href="mailto:countdown@zerocarbonshipping.com">countdown@zerocarbonshipping.com</a>