IMO Net-Zero Framework
Mandate to Markets

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Mærsk Mc-Kinney Møller Center
for Zero Carbon Shipping

Our vision is to sustainably decarbonize the maritime industry by 2050

Our mission is to be an independent and significant driver of a sustainable maritime decarbonization

Not-for-profit

Money earned by or donated to the Center is used entirely to finance Center work,

Independent

We are un-biased, solution agnostic and have no vested interest in any technology. We work collaboratively and bring together key players across the value chain.

Science-based

We commit to climate science and use a data driven approach to explore viable decarbonization pathways.

The year 2025 marks a pivotal moment in maritime decarbonization, shifting focus from ambition to implementation

Pre-2025 | 2025 | Post-2025

Setting the Ambition

- Companies set ambitious targets for decarbonization
- The orderbook saw a shift towards dual-fuel vessels
- Experimentation by front runners with customer support and the promise of regulation

Building a Regulatory Framework

- The IMO agrees upon a Net Zero Framework of incentives
- In the EU, the ETS is in its second year, and FuelEU Maritime takes effect, creating a market for sustainable fuel
- Rising interest in industrial policy for clean energy

Implementation

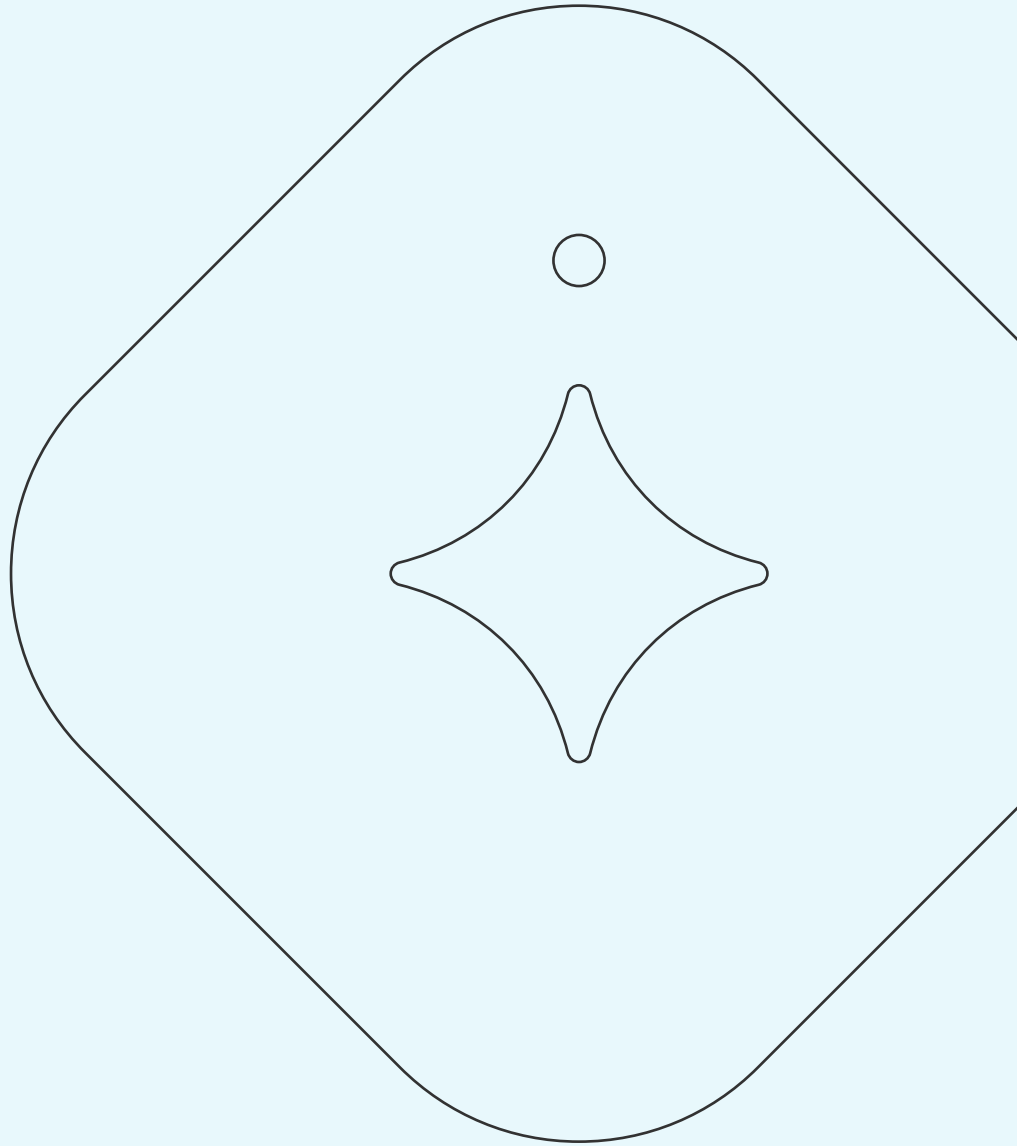
For policymakers:

- Robust NZF guidelines
- National and regional support for onshore infrastructure

For industry:

- Shipping to develop long-term compliance strategies
- Experimentation with advanced technologies

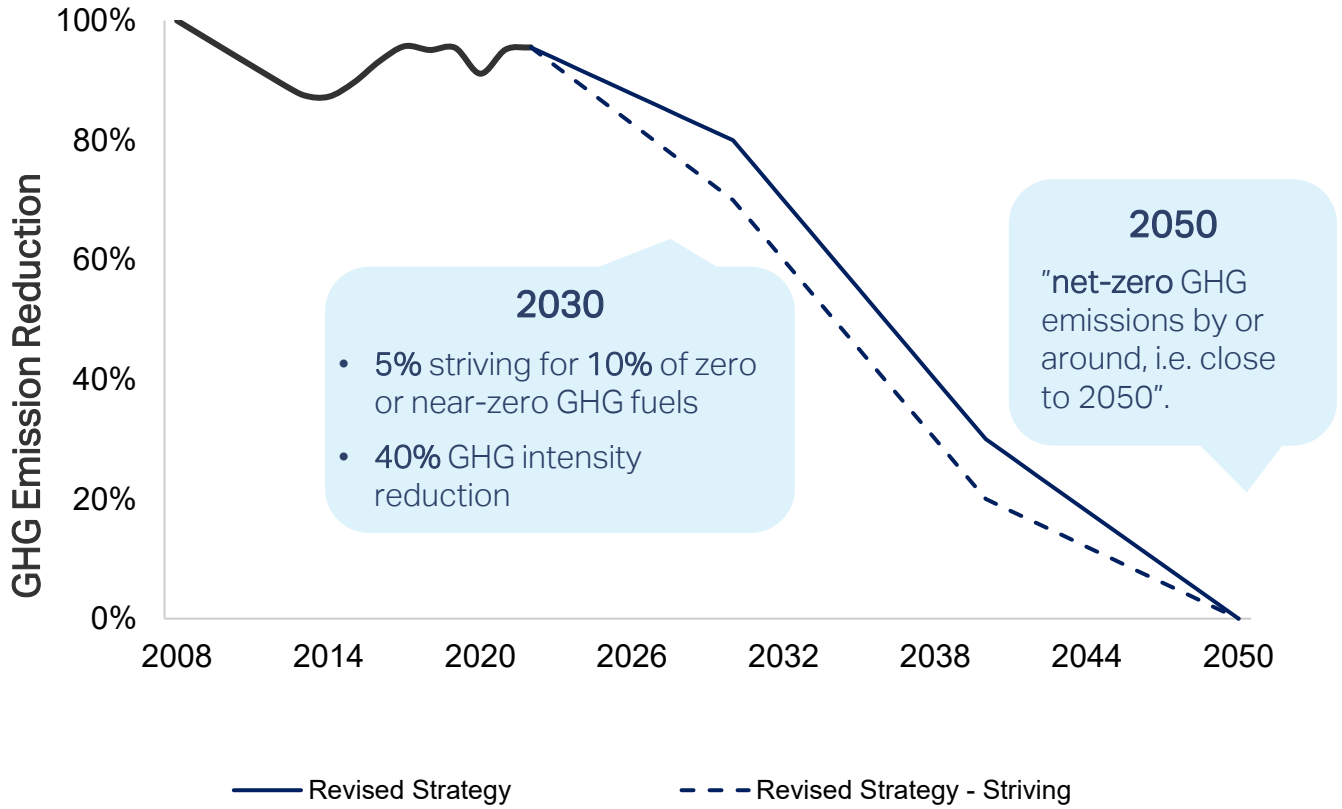
Approval of the IMO Net-Zero Framework



In 2023, the IMO adopted a GHG strategy to achieve net-zero emissions with "mid-term measures" to realize this target

From 50% reduction to net-zero

Mid-term measures to achieve strategy



Technical Measure

Goal-based Fuel Standard

Economic Measure

CO_2 Tax

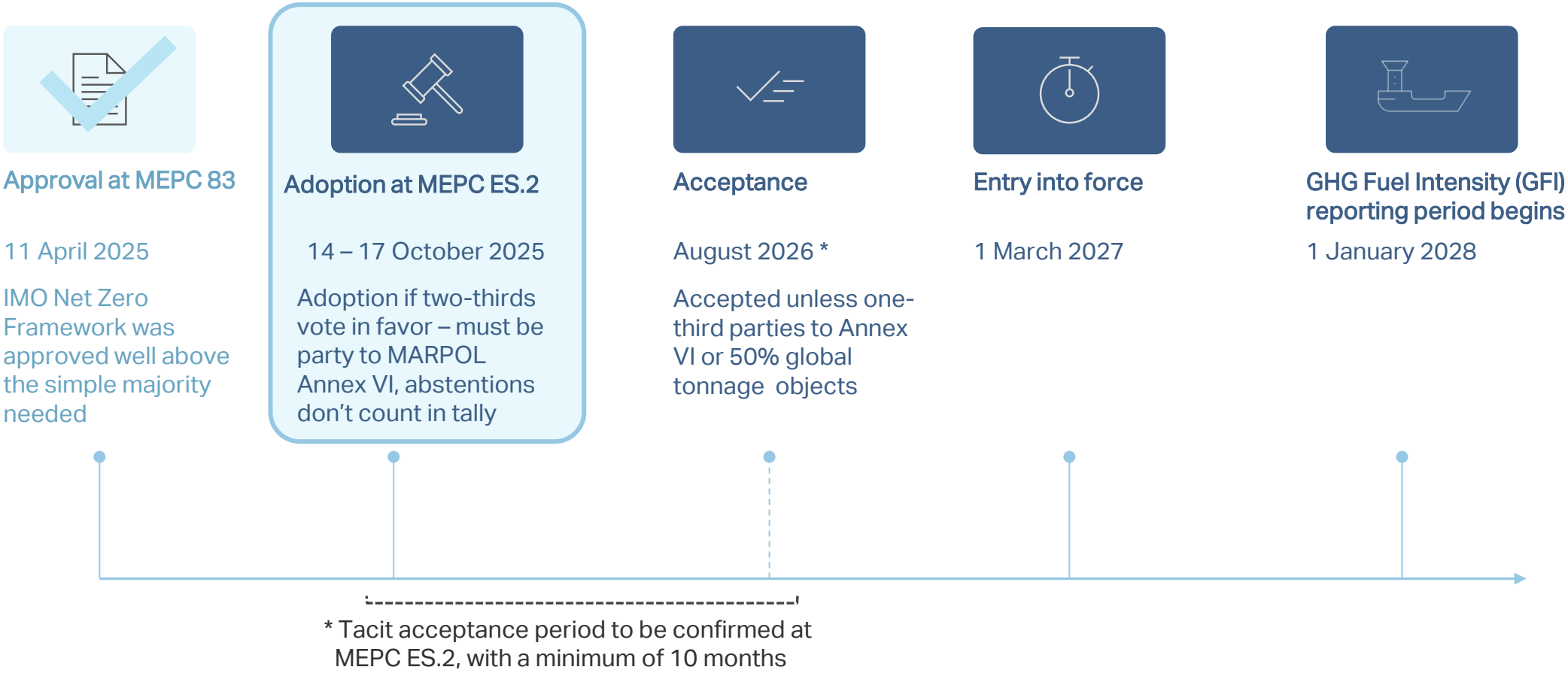
GHG Levy

and/or

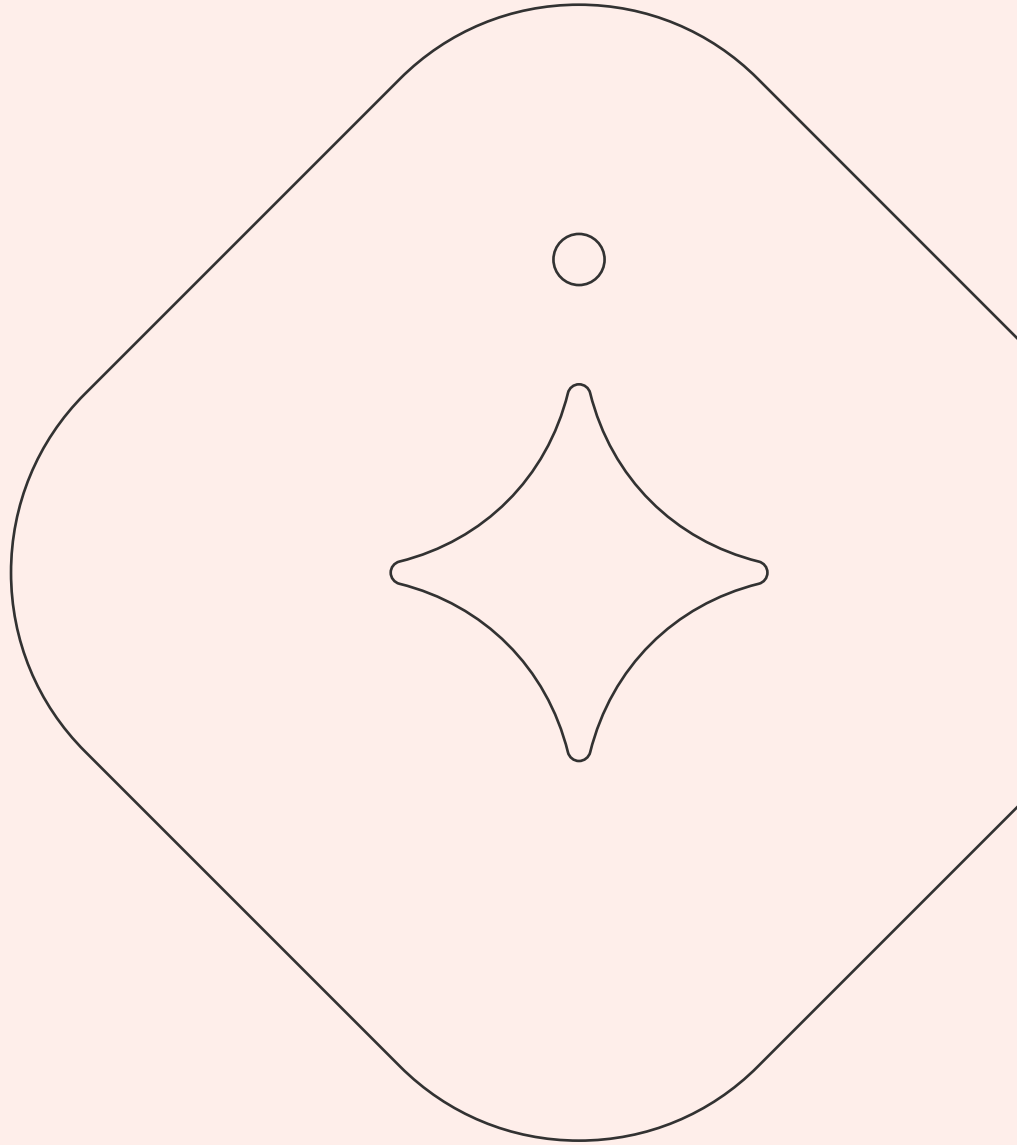
Feebate

Short-term measures including CII and EEXI are also additional measures to achieve the strategy

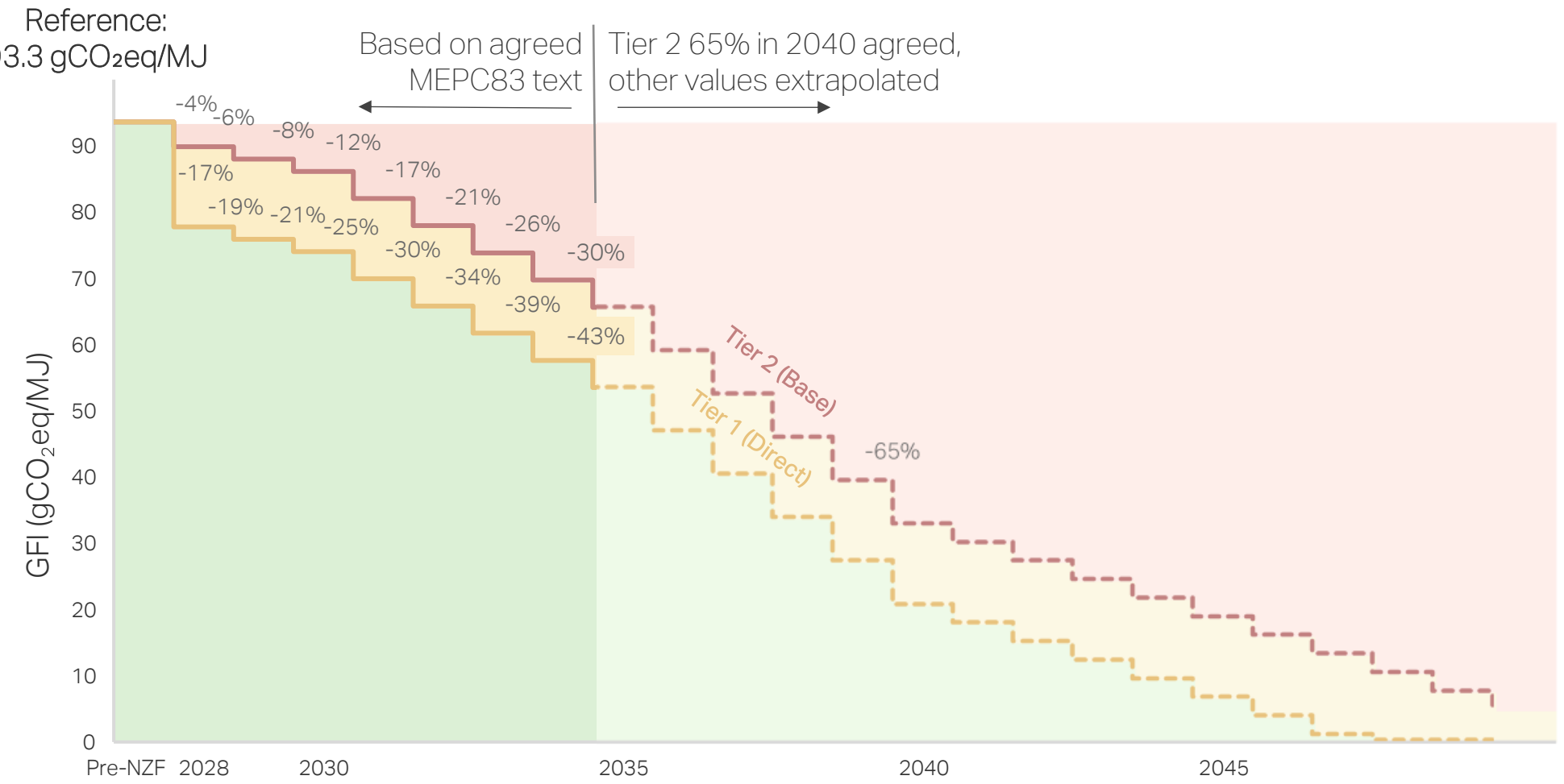
IMO NZF timeline: we are now at the adoption step with first reporting period expected in 2028



Net-Zero Framework



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



Tier 2 Remedial Unit

380 USD per tonne of Tier 2 CO_2eq deficit

Tier 1 Remedial Unit

100 USD per tonne of Tier 1 CO_2eq deficit

Surplus Unit Options

- Sell to ships for Tier 2 compliance
- Bank (max 2 years)
- Cancel

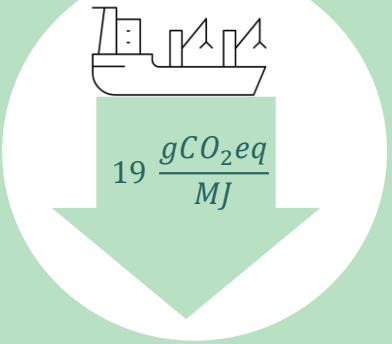
Note: The NZF Text (Draft Amendment to MARPOL Annex VI, Regulation 35) does not include all values to 2050. We extrapolate GFI reduction factors based on the existing factors and the assumption that Tier 2 will reach 95% reduction by 2050. For Tier 1 we assume the 13% gap with Tier 2 remains constant through 2050.

The IMO Net Zero Fund will mobilize revenue for ZNZs and to support a just and equitable transition

Remedial Unit
contributions to address Tier 1 & 2 deficits

IMO Net Zero Fund
collects and distributes revenue

Modelling shows it could raise over **10 billion USD** per year

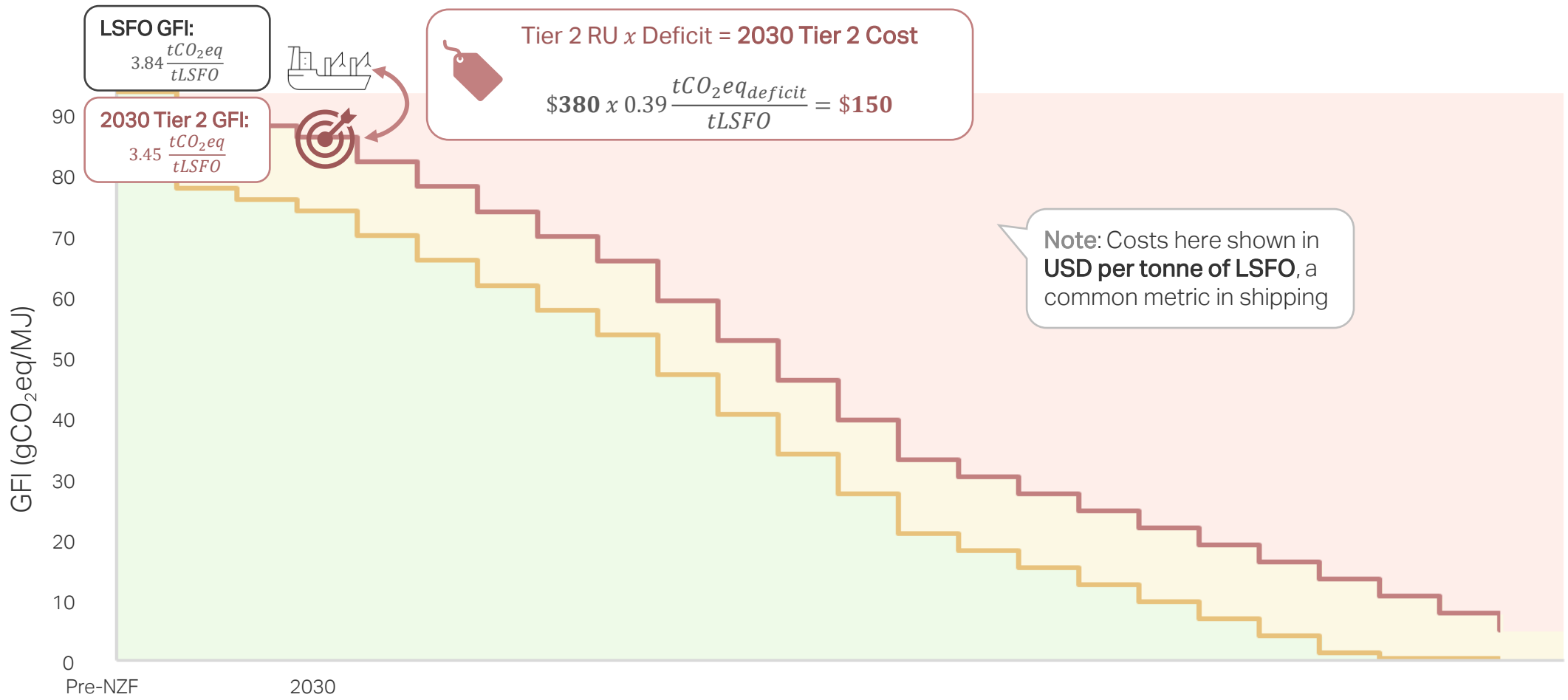


Rewards for the use of zero- and near-zero GHG energy sources

Revenue for developing countries

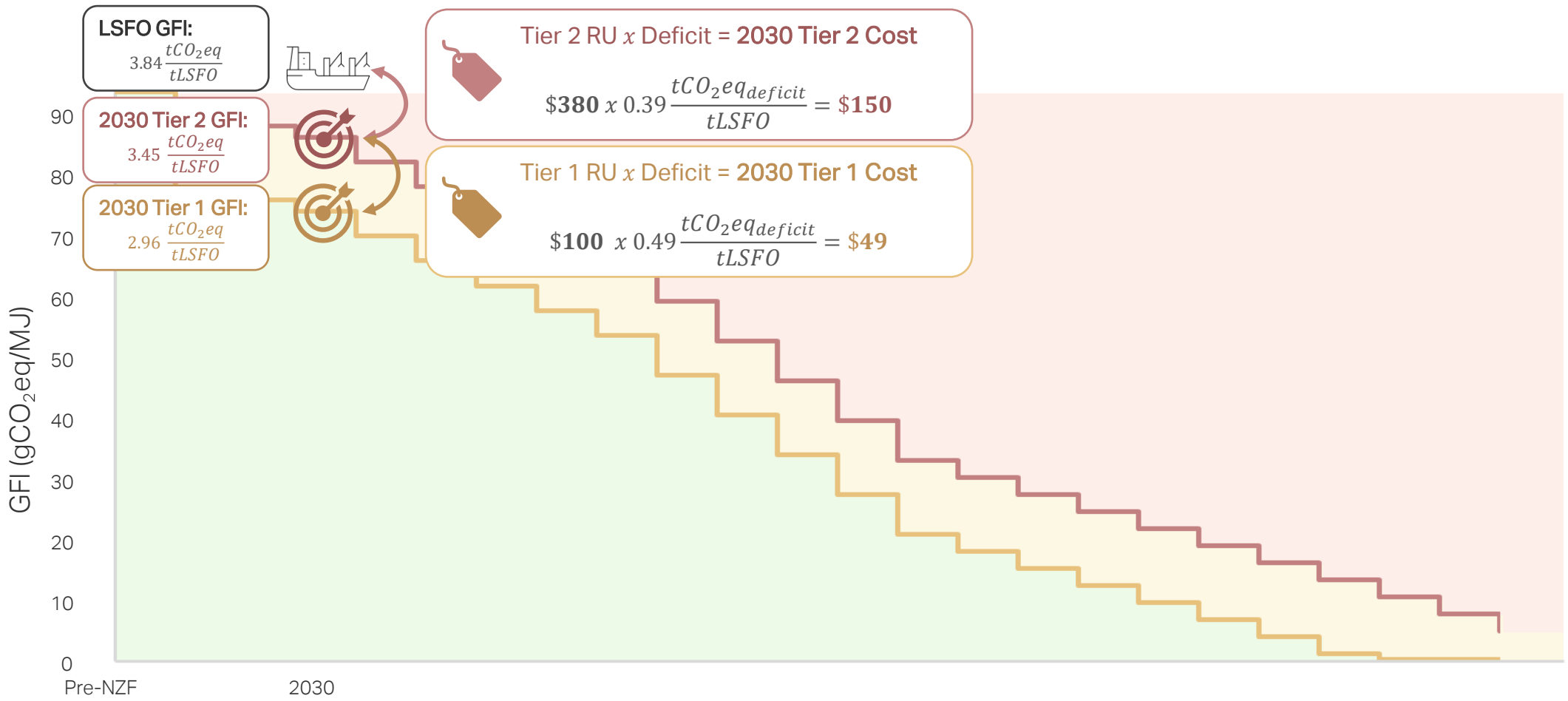
- Development of ZNZ fuels; port infrastructure
- Seafarers
- Technology transfer and capacity building
- National Action Plans
- Food security

In 2030 vessels sailing on conventional fuel oil will face a penalty, known as a Remedial Unit (RU) for Tier 2 non-compliance



Note: This calculation shows the cost per tonne of LSFO using the LCV of 0.0402 as well as the emission factor for Heavy Fuel Oil with sulfur between 0.1 and 0.5% from the 2024 IMO LCA Guidelines. The surplus unit benefit is calculated as the forecasted abatement cost of biodiesel in 2030 from LR & UMAS, 2020. See more detailed calculations in our Compliance Cost Calculator.

In 2030 they will also face an additional penalty, at a lower rate, for Tier 1 non-compliance



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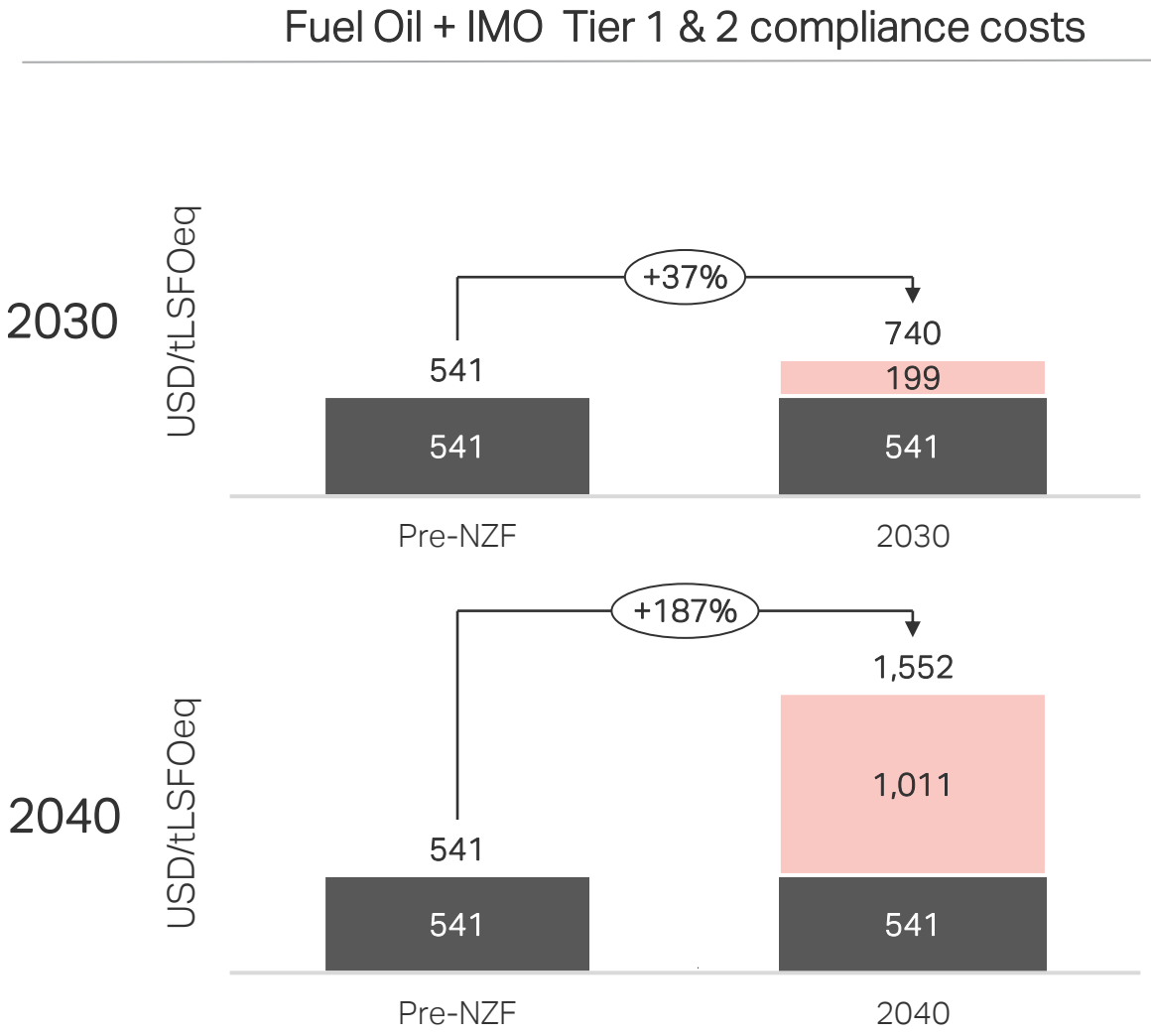
The combined impact of the penalties will raise the cost of sailing on fossil fuels



- Fuel oil faces low but meaningful additional costs in early years
- Fuel oil could nearly triple in cost due to IMO NZF

Assumptions: We assume the cost of compliance is based on purchasing RUs at $380 for Tier 2 and $100 for Tier 1. Fuel costs are from our Fuel Cost Calculator (MMMCZCS, 2024). For the ZNZ range, we use 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 in 2030 and equal to RUs in 2040. Reward is based on NavigaTE modeling (MMMCZCS) that modeled potential rewards based on estimated revenue collection and eligible ZNZs. The emissions factor for the e-fuel is assumed to meet the ZNZ threshold of 19gCO2eq/MJ in 2030 and 14 gCO2eq/MJ in 2040.

For **newbuilds** companies can design ships to lower impact

Lowers GHG Intensity

Dual-fuel ships, with innovative technologies at delivery

Blend “drop-in” **biofuels**

?

Onboard carbon capture and storage?

Lowers total GHGs

Increase **operational efficiency**

energy efficiency technologies, e.g., propeller retrofit, hull coating

Lowers GHG Intensity + total GHGs

Advanced technologies, e.g., wind propulsion, electrification

The **existing single-fuel fleet** will consider similar options plus retrofits

Lowers GHG Intensity

Retrofit vessel with dual **fuel** engines

Blend “drop-in” **biofuels**

?

Retrofit onboard carbon capture and storage?

Lowers total GHGs

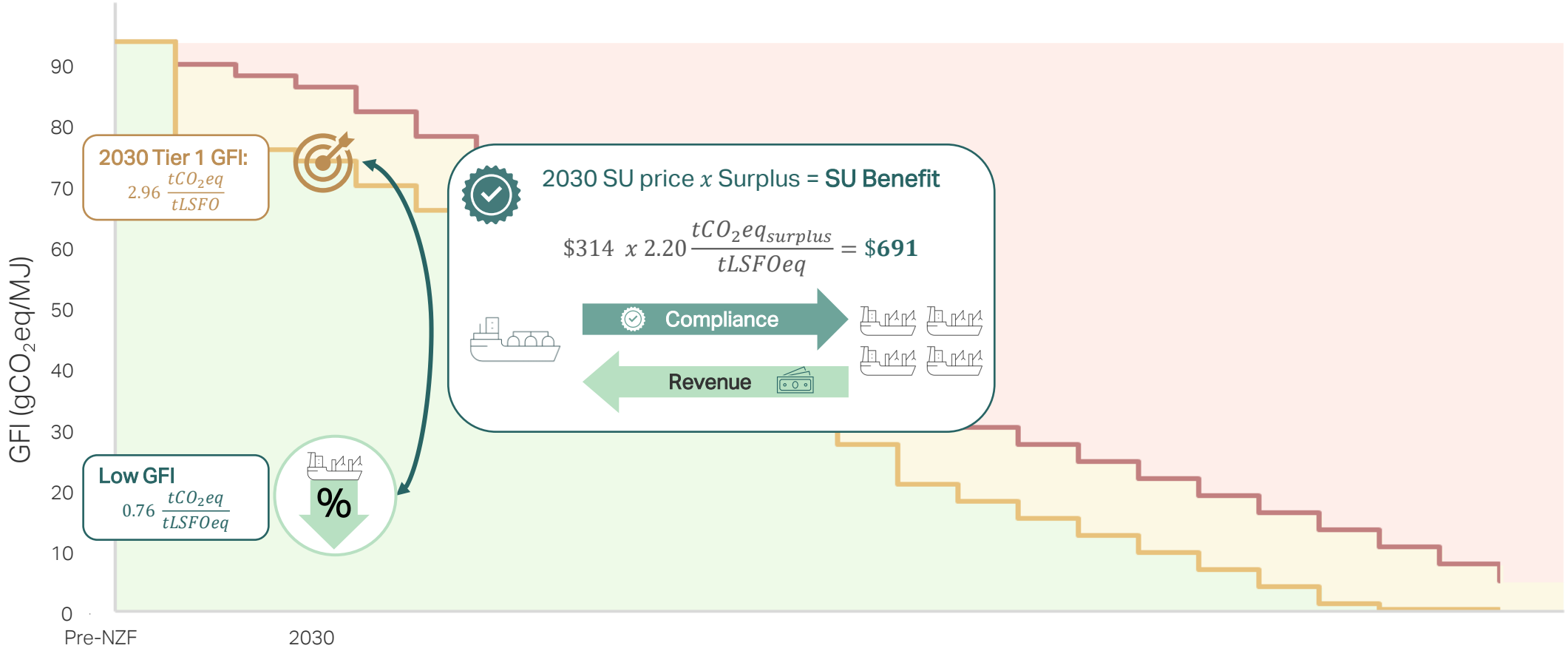
Increase **operational efficiency**

energy efficiency technologies, e.g., propeller retrofit, hull coating

Lowers GHG Intensity + total GHGs

Advanced **technologies, e.g.,** wind propulsion, electrification

Vessels with a low GHG Fuel Intensity (GFI) will earn Surplus Units (SUs) which can be sold for revenue, here shown with assumed 2030 SU price



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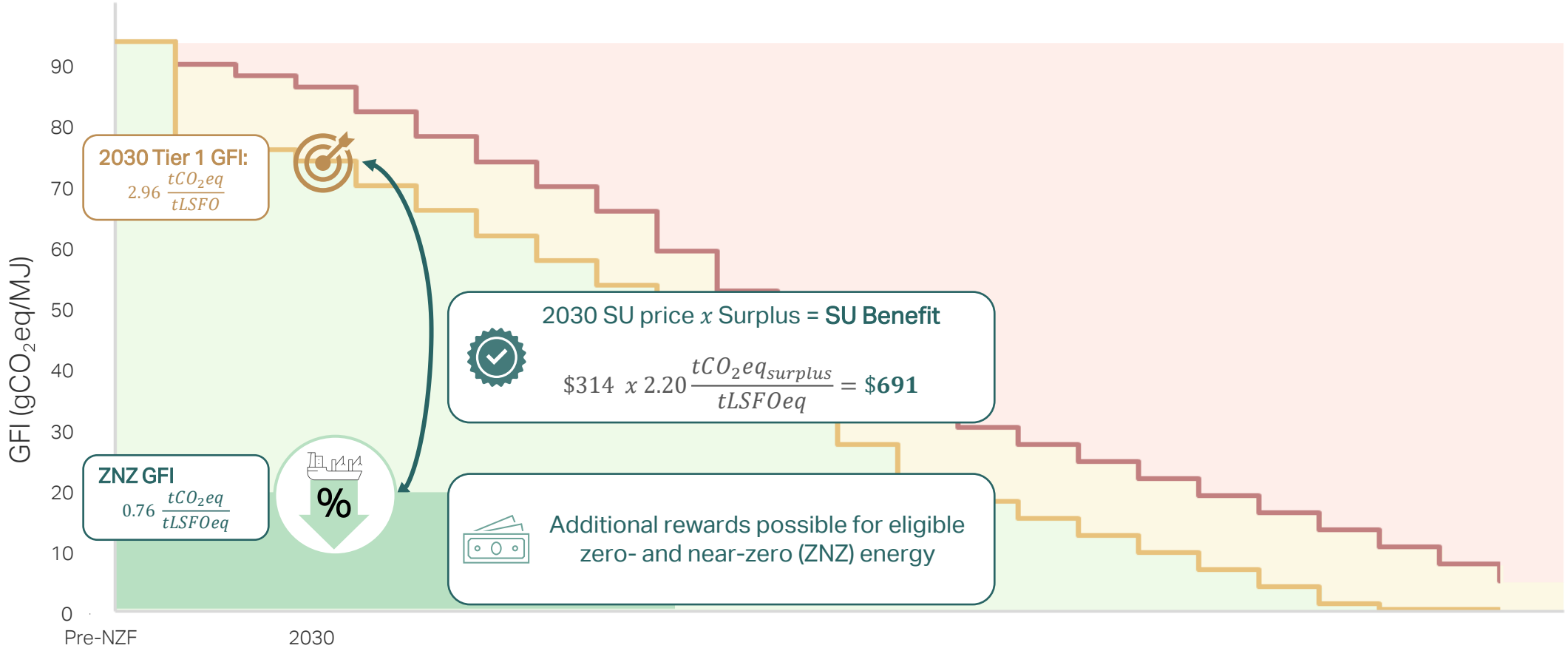
In addition to SU benefits, companies can potentially earn a reward if sailing on zero-or near-zero energy, but details still to be determined



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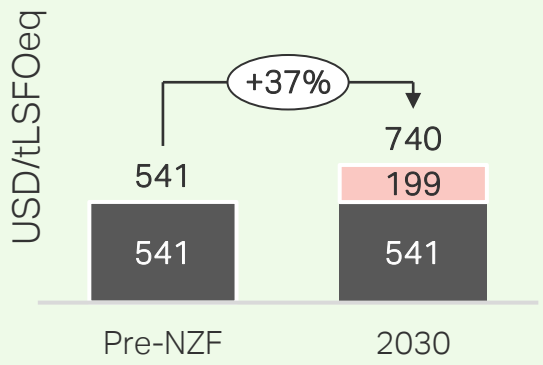
Putting it all together: The IMO NZF will **raise cost for conventional fuel oil**

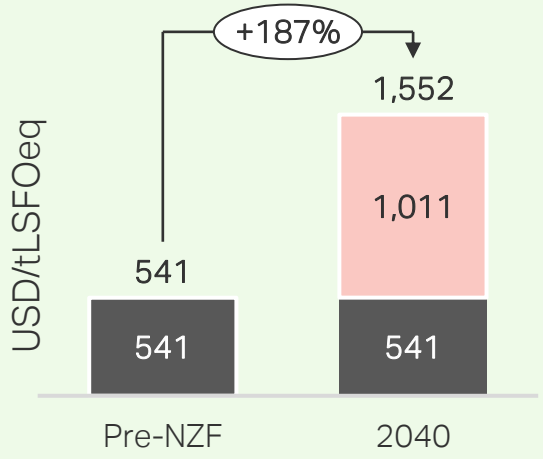
Fuel Oil + IMO compliance costs

2030



- Fuel oil faces low but meaningful additional costs
- Surplus units can provide substantial benefits for sustainable fuels
- Rewards can potentially further reduce, or even close, the cost gap

2040



- Fuel oil could nearly triple in cost due to IMO NZF
- Over time, surplus benefits decrease for sustainable fuels
- We expect production costs could also go down, creating a business case

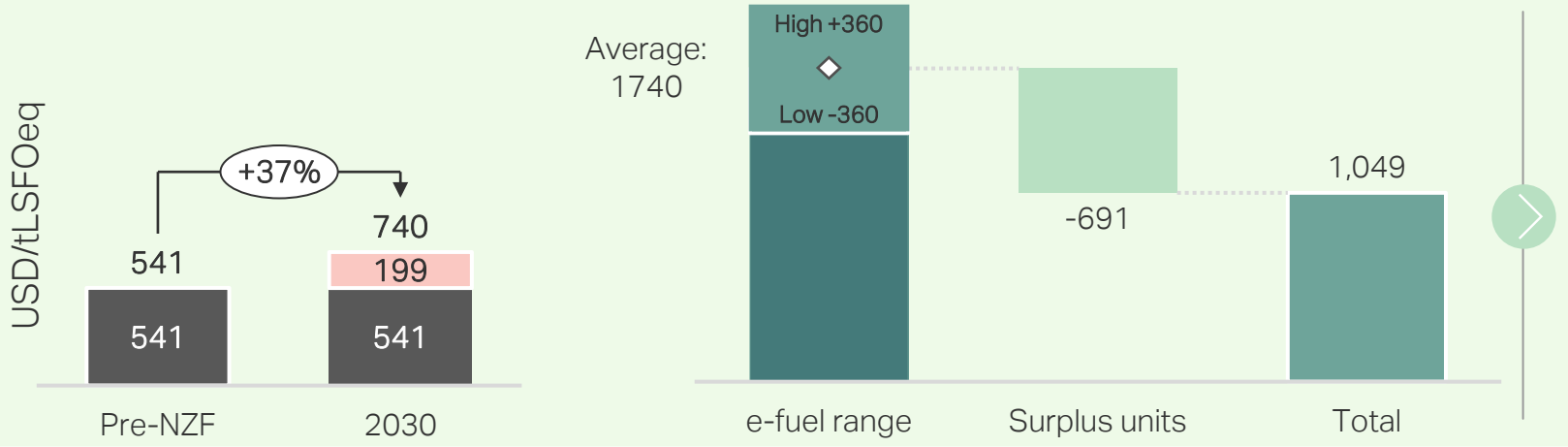
Assumptions: We assume the cost of compliance is based on purchasing RUs at $380 for Tier 2 and $100 for Tier 1. Fuel costs are from our Fuel Cost Calculator (MMMCZCS, 2024). For the ZNZ range, we use e-methanol and e-ammonia (global, high electricity cost). Surplus revenue is based on an assumed market price of surplus equal to the abatement cost of bio-diesel in 2030 and equal to RUs in 2040. Reward is based on NavigaTE modeling (MMMCZCS) that modeled potential rewards based on estimated revenue collection and eligible ZNZs. The emissions factor for the e-fuel is assumed to meet the ZNZ threshold of 19gCO2eq/MJ in 2030 and 14 gCO2eq/MJ in 2040.

Putting it all together: The IMO NZF will raise cost for conventional fuel oil and **provide benefits early on for advanced sustainable fuels**

Fuel Oil + IMO compliance costs

Sustainable fuel + IMO benefits

2030



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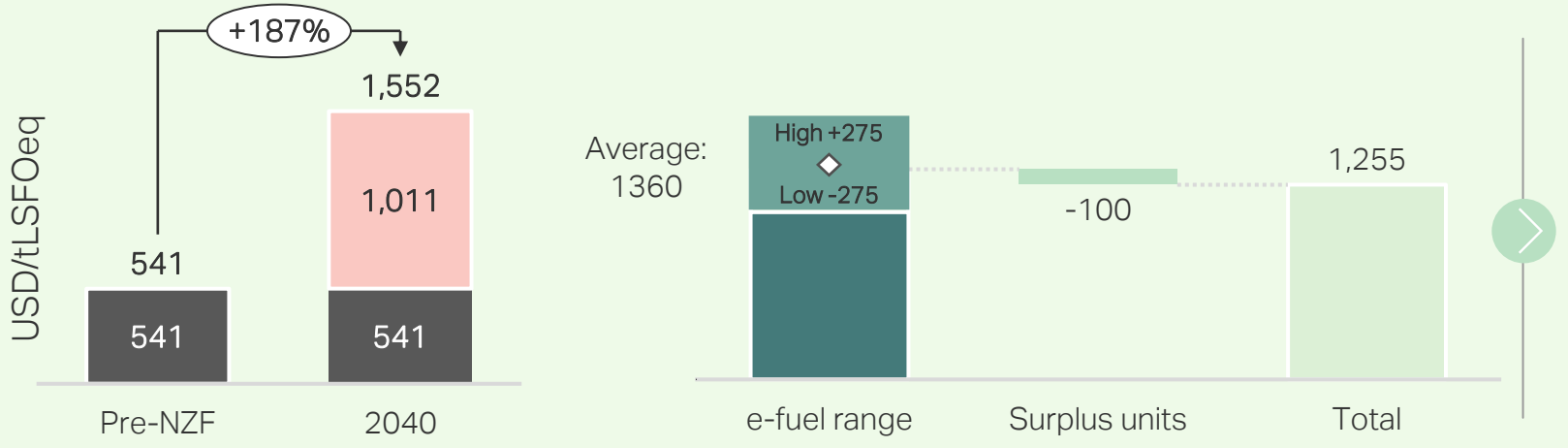

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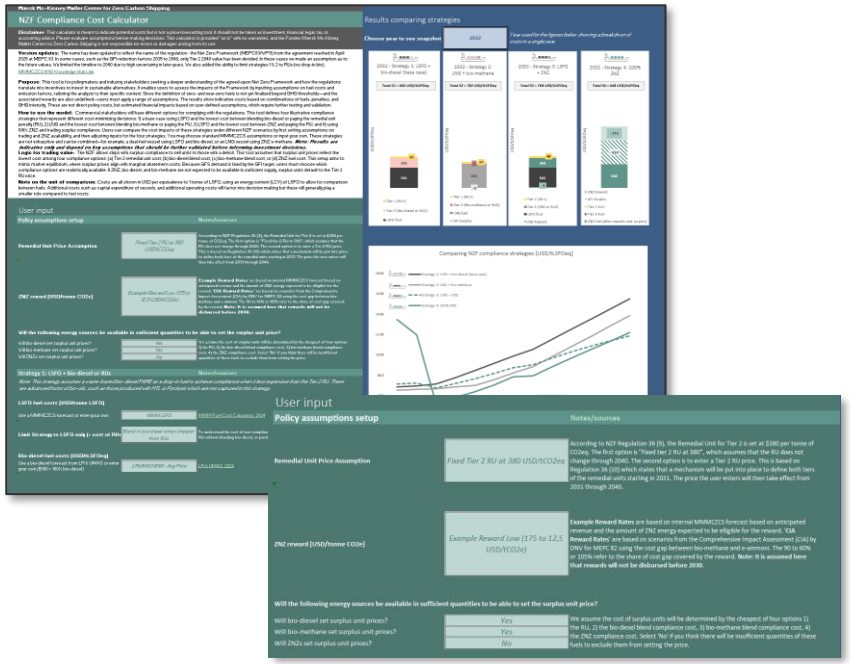
Net-Zero Framework Compliance Cost Calculator: Build your own compliance scenario

NZF3C (Compliance Cost Calculator) is on our website

https://www.zerocarbonshipping.com/nzf-compliance-cost-calculator-nzf3c

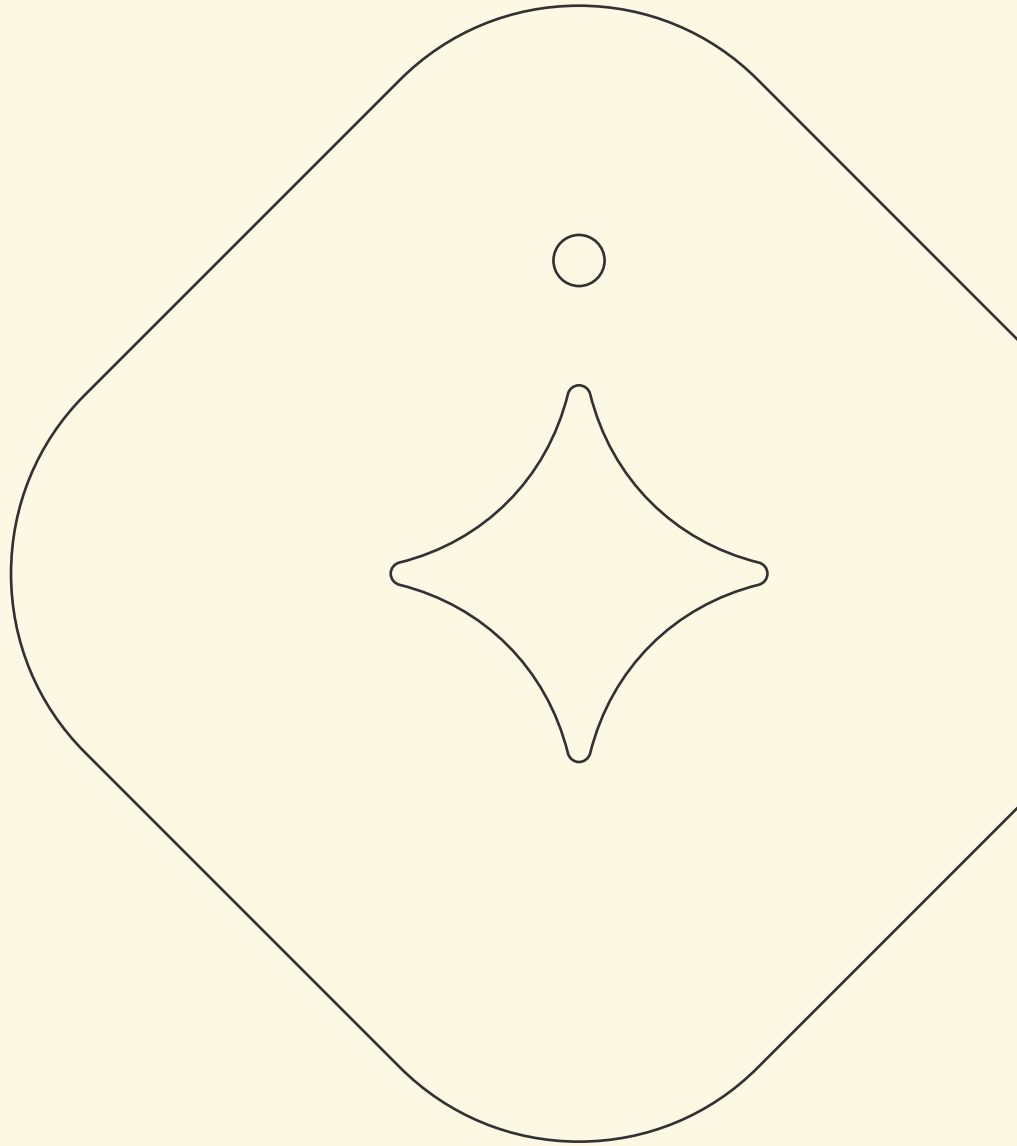
Input assumptions that makes sense for your organization



The NZF3C is a work in progress

- **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.

What is next for the Center on IMO NZF



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

Provide needed e**xpertise 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

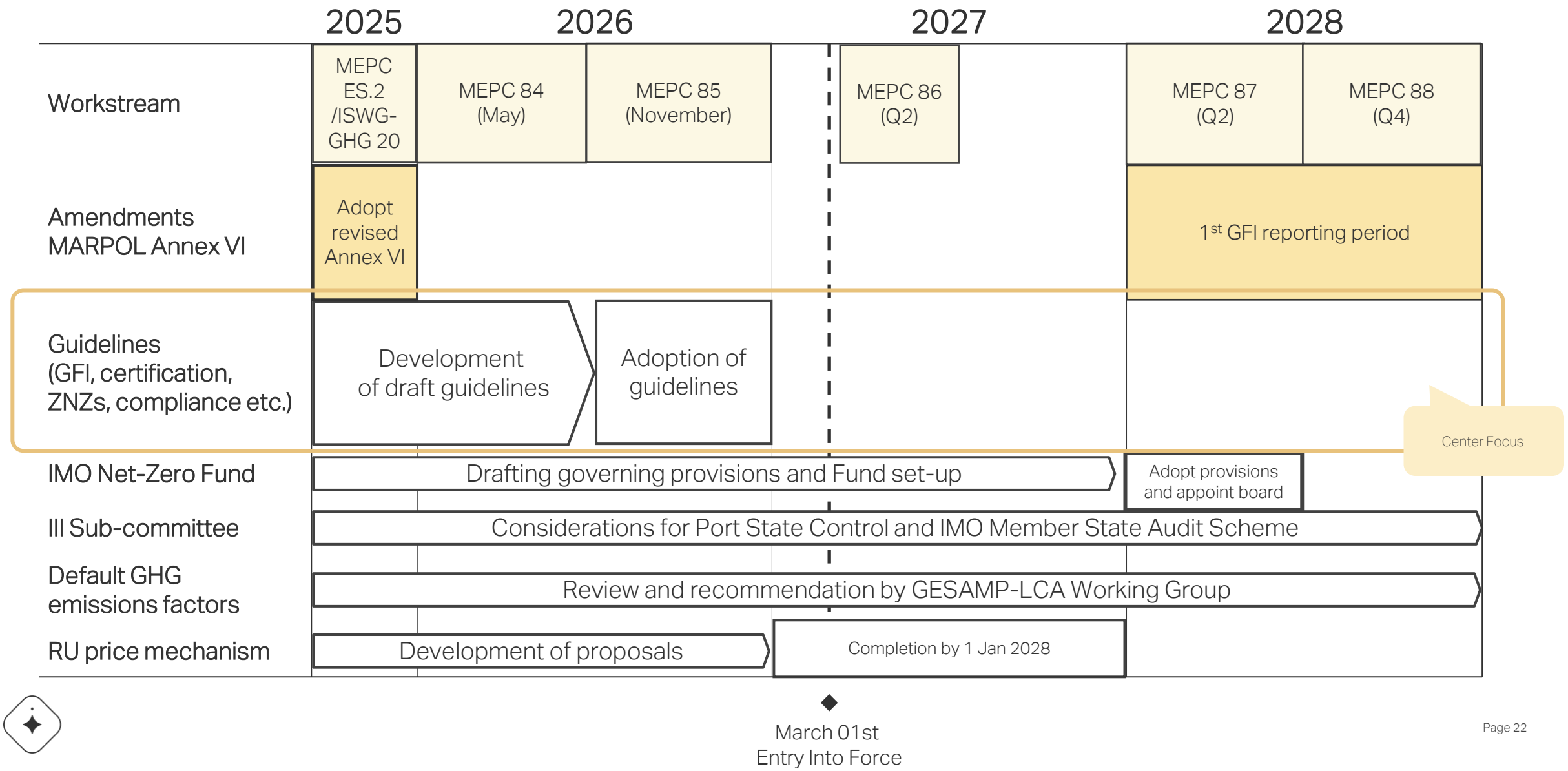
Outcomes we aim for

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

Find the latest in our IMO Net Zero Framework Page

https://www.zerocarbonshipping.com/imo-net-zero-framework

After adoption, several workstreams needed for implementation



Countdown is back!

Our first two newsletter of the new series, ‘Countdown to NZF’ have been published

Subscribe to the newsletter to follow our insights and analysis

How the IMO Process Works for the NZF

3 September 2025
View in browser

In April 2025, IMO Member States approved the Net-Zero Framework. This October, they will meet again to formally adopt the historic regulation.

Countdown is back.

This time, we’re diving deep into the International Maritime Organization Net-Zero Framework (IMO NZF), starting with what it is, how it works, and what it will mean for the industry. This series will unpack elements of the regulation with explanations, analysis, and practical insights.

The big picture

- The IMO NZF will become a new chapter under MARPOL Annex VI if adopted at MEPC/ES.2 in October 2025.
- The regulation must go through a process of adoption and tacit acceptance before entry into force.

Thank you

Reach out

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