

Real economy consequences for Greece from success or failure of the Net Zero Framework

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Executive Summary

Aims and objectives

This report assesses what the success or failure of the IMO Net-Zero Framework (NZF) at MEPC 85 in December 2026 means for Greek shipowners and has the following objectives:

1. To quantify how exposed Greek shipping is to the energy transition risk,
2. To shed light on which IMO NZF outcomes are politically and procedurally achievable,
3. To show how each outcome would affect the commercial position of Greek owners

Key findings

- **The global energy transition is accelerating**, over the coming two decades, shipowners will need to navigate both the transition away from fossil fuel cargos (demand side risk), as well as the transition away from ships being powered by fossil fuels (supply-side risk)
- **Greek shipowners collectively carry the highest climate-risk exposure (demand-side risk).** The Greek owned fleet is estimated at 5,800 ships and more than 458 million dwt, around 19% of the global fleet. Their share is strongest where climate transition risk, especially demand-side risk, is highest. Demand-side stranded asset risks in shipping arise when the global energy transition reduces cargo demand for fossil fuels, that leaves vessels carrying those commodities significantly devalued.
- **Greek owners have twice the total value at risk of the second most exposed owner community, Japan,** and that exposure is concentrated in a small number of Greek companies**.** Particular leadership in the Greek shipowning community relates to the movement of dry bulk (including coal), oil and gas, which are most at risk from the energy transition already underway. Greece's share of the global LNG carrier tonnage is 23%, the sector with the greatest demand-side risk.
- **Supply-side risk is driven by the clarity and predictability of GHG regulation** global IMO regulation adopted as early as possible, can create a more predictable supply-side risk landscape, postponed adoption of IMO regulation accompanied by a regional patchwork adds complexity, uncertainty and administrative burden for shipowners.
- **Of the IMO policy architecture options, the NZF "as is" text is the most likely architecture for convergence, with Brazil's and China's proposals as possible adjustments.** 'Fundamental Redesign' architectures (Liberia et al., Japan, and UAE) are not realistically adoptable at MEPC 85. At MEPC the Liberia et al. architecture had around 22 supporters against more than 50 for the NZF-like proposals. Japan's and the UAE's submissions missed the six-month circulation deadline, and Norway and the EU have challenged both its emissions trajectory and the absence of a fund.
- **Lobbying against NZF increases supply-side risks,** given the political landscape the choice appears to be binary at MEPC 85: between an NZF architecture and delay. Lobbying against NZF is therefore supporting delay.
- **The US has no unilateral veto.** Once adopted, the NZF would enter into force under tacit acceptance unless a third of the 108 MARPOL Annex VI Parties (36) or Parties representing 50% of world tonnage object. Opposition from Panama, Liberia and the Bahamas accounts for around 35% of tonnage, and the Marshall Islands' support for the NZF keeps a blocking coalition well short of 50%.
- **Failure to adopt NZF does not remove supply-side risk** The likeliest result of failure is a delay of two years or more in IMO GHG debates, which hands a clear mandate to regional regulators, in particular the EU. The Commission's commitment to avoid double payment depends on a global market-based measure being adopted, so under a technical-only IMO outcome the EU ETS would likely remain in full force, alongside the IMO fuel standard and any other regional carbon pricing.
- **Supply-side risks persists either way; what changes is clarity.** Depending on the policy details, LNG can remain the most cost-effective compliance option until the mid-to-late 2030s.

The NZF gives owners a timetable for when different ship specifications lose competitiveness, while a regional patchwork with postponed IMO regulation leaves the timing unclear and the compliance burden higher.

- **Smaller owners carry the burden of complexity and uncertainty.** Around 700 companies operate Greek fleets. Only 19 own more than 50 ships, and the average company owns around eight ships. Most lack the management capacity and the spread of ship types to hedge a fragmented regime. Therefore most Greek shipowners would be better positioned to successfully navigate shipping's energy transition if there is clear IMO regulation adopted and a minimum level of sub-global/regional regulation.
- **Supply-side risks and demand-side risks** can combine, producing a significant double risk which Greek shipowners could be particularly badly affected by. Minimising supply-side risk by supporting early adoption of IMO regulation and the NZF, and diversifying from exposure to fossil fuel cargos, are the key means to mitigate the combined risks.

Implications

- **For shipowners:** Transition risk differs from cyclical risk which shipowners have adapted to. In climate transition risks, an asset's underlying competitiveness can change, so waiting for the next cycle may not restore it. A clear IMO framework gives owners a timetable to plan against, more compliance options and alternative technology pathways through the reward mechanism, and a lower risk of stranded assets.
- **For policymakers and industry representatives:** Opposition to the NZF is unlikely to prevent regulation. The evidence points to opposition resulting in a significant delay and a growing regional patchwork rather than a lighter regulatory regime. Constructive engagement on the NZF's design and implementation guidelines gives owners more influence over the final architecture than absolute opposition, which risks a regime designed with minimal input from industry experts.

Method

Exposure was estimated on an ownership basis using Clarksons World Fleet Register data collected on 16 November 2026. Projected fleet supply, from the existing fleet, the orderbook and projected ordering, was set against demand scenarios consistent with a 2-degree temperature goal to estimate capital at risk of stranding in the oil tanker and LNG carrier fleets, aggregated by country and by company obtained from www.shipping-transition.org.

The political analysis is conducted through reviews of the IMO submissions and circular letters through MEPC 83, MEPC.ES2, MEPC 84 and ISWG-GHG 22 and 23, and member state positions recorded during MEPC.ES2 and MEPC 84, as well as inter-sessional meetings, checked against transcripts of interventions. The details of the positions from each of the meetings are available in the Shipping and Ocean Research Group's readouts available at www.shippingandoceans.com. The analysis represents the authors' best understanding of each position and involve a degree of interpretation.

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The UCL Energy Institute hosts a world leading research group which aims to accelerate the transition to an equitable and sustainable energy and trade system within the context of the ocean. The Shipping and Oceans Research Group's multi-disciplinary work on the shipping and ocean system leverages advanced data analytics, cutting-edge modelling, and rigorous research methods, providing crucial insights for decision-makers in both policy and industry. The group focuses on three core areas: analysing big data to understand the drivers of shipping emissions, developing models and frameworks to explore the path toward zero-emission shipping, and conducting social science research to examine the policy and commercial structures that enable the decarbonisation of the shipping sector. For more information visit www.shippingandoceans.com

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1 Energy transition: well underway, just not in shipping, and Greece is particularly exposed

International shipping services a global system, trade. It is a derived demand growing or shrinking in its specific segments in response to wider economic trends - containerisation, oil tanker independence, flag liberalisation and more recently the 'dash to gas'.

Greek shipowners have long been at the forefront of spotting these global trends. 98% of Greek-owned shipping services global trade and is focused on international trends. As a consequence of this foresight Greece has an outsize role and presence in this global industry. In 2026, Greek ownership is as strong as ever, consisting of an estimated 5,800 ships (greater than 1000 gt) and a total carrying capacity exceeding 458 million dwt, estimated by UGS as a share of global fleet of 19%[1].

However, the global energy system is undergoing profound structural change, with shifts in the energy mix, patterns of production and consumption, and the geography of global energy trade. These changes will inevitably affect demand across shipping segments. At the same time, the regulatory framework governing shipping's decarbonisation remains uncertain, particularly in the context of the ongoing IMO GHG policy debate. To be commercially resilient, international shipping should be tracking and responding to these signals. Yet there are signs that significant capital allocation in shipping, including Greek-owned shipping, is not adequately accounting for the fact that the sector is a derived-demand industry.

1.1 Key indicators that demand for shipping is changing

For much of the early 2000s, the dynamics were dominated by a period in which knowledge of what needed to happen was ahead of what was actually happening in the real economy. Renewable energy deployments appeared to be 'additional' rather than displacing fossil fuel use. The scale of the challenge to actually reduce demand for fossil fuels looked insurmountable, even though it was acknowledged as necessary to avoid dangerous climate change. This continued reliance on fossil fuels provided reassurance for those with assets exposed to global fossil fuel dominance and dependence despite the dissonance with the rhetoric about what was needed.

The energy transition, the movement away from the incumbent fossil fuelled energy system towards renewable energy, can be monitored in a variety of ways and reveals that the energy transition is no longer in an era of dissonance. The following indicators provide some insights:

- Clean-to-fossil investment ratio - In 2026, global energy investment totalled $3.4 trillion. Approximately $2.2 trillion flowing to clean energy (renewables, grids, storage, nuclear, EVs and efficiency), approximately 2:1 ratio. Renewables now account for 90% of all new power capacity added worldwide.
- With these renewable additions the retirement and decline of fossil power are now apparent, including in the most populous economies (China and India).
- Particular jumps occurred in electrification infrastructure, with a 46% y-o-y increase in battery storage deployment as costs fell by ~45%.
- Solar PV remains the focus of the largest share of energy investment, proving its cost-effectiveness relative to gas and coal across a swathe of developed and developing economies. This has also evidenced the materiality of the risk of asset stranding for incumbents[2].

[1] https://annualreport2526.ugs.gr/2026
[2] https://www.shippingandoceans.com/post/lessons-from-electricity-sector-transitions-and-shipping-collapses

- Rapid growth in EV's - both cars and now trucks (electric trucks have a 9% market share of sales in 2025, 25% share in China), this has displaced an estimated 1.2 million barrels of oil consumption per day.

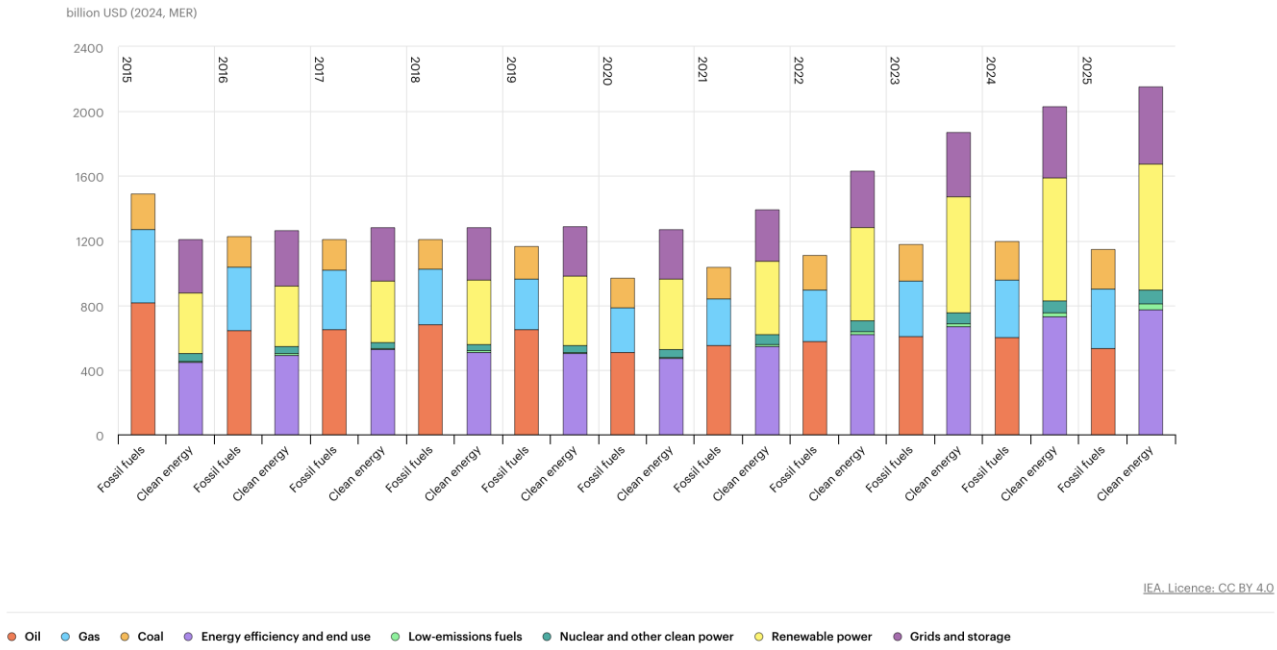


Figure 1:Trends in fossil fuel and clean energy investment[3]

1.2 What is the exposure of Greek shipping to energy transition risks to demand:

Greece's shipowners have built an impressive fleet, with capacity totalling ~5800 ships and ~460 million dwt in 2026. UGS estimates that Greek shipowners have ~19.1% market share. However, the breakdown reveals that Greece's market share is particularly strong exactly where shipping's climate/transition and therefore demand risks are highest - in the movement of fossil commodities around the world (bulk carriers, oil tankers and LNG carriers), see Table 1.

As UGS note in their 2026 report: "...it remains the leading force in strategic ship types worldwide by a large margin, such as in oil tankers and LNG carriers, and ranks second in bulk carriers". For these three ship types, the risks vary because the vessel types have some potential for substitution[4]. For example, bulk carriers carry coal and so are exposed to declines in demand for coal. But they also carry ores and grains, and so some of the risk from demand reduction as countries phase out coal use, is offset by expectations that there will still be growth in ore and grain demand over the same period. However, other ship types have less versatility. This includes the larger oil tankers (moving crude oil in a VLCC is more efficient and economically competitive as long as there remains strong demand for transport between major producer and major consumer countries), and in particular LNG carriers. Unlike oil tankers, and especially chemical tankers, which may still have significant demand to move products, bioenergy liquids or other liquids in large volume, there is no clear substitute for LNG. At the same time, LNG carriers, because they move a specialised cargo in cryogenic conditions, have some of the highest capital costs of all ship types. Furthermore, oil tankers have relatively shorter average lifespans and value, and the fleet is depreciating rapidly, whereas much of the gas tankers

[3] https://www.iea.org/reports/world-energy-investment-2025/executive-summary
[4] https://shipping-transition.org

capacity is new and not expected to retire in the near future, as well as there being less margin for fleet adaptation to alternative commodity's demand, should an oversupply occur.

Table 1: Greece owned share of global tonnage (in DWT)

	Greece owned share of global tonnage (in DWT)	
	2021[5] / %	2026[6] / %
Bulk carriers	20	22
Oil tankers	30	26
Containerships	10	8
Chemical tankers	15	16
LNG carriers	16[7]	23
LPG carriers		11
Vehicle carriers	n/a	8

The exact demand scenarios for each of these fossil commodities (coal, oil/products, and gas), remain highly uncertain as the combination of economic and geopolitical drivers of their production/consumption play out alongside the energy transition. However, a first order analysis of the risk can be obtained by contrasting current projected supply (from existing/order book and projected ordering behaviour), alongside plausible demand forecasts that represent situations where the energy transition occurs in line with the stabilisation of a temperature goal. Figure 2 shows results for both oil tankers and LNG carriers, in terms of capacity (trillion tonne-miles), and the capital at risk of stranding as a result of the contrast between supply and demand projections. The highest risks and the greatest capital at risk occur in the LNG carrier fleet.

The underlying data can be aggregated to show these types of risk across countries, based on vessel ownership, as shown in Table 2. The quantifications show that Greek owners have twice the total value at risk from these climate risks, compared with the second most exposed owner community (Japan). The risk stems from both the average age of their fleet and the very large number of ships owned in Greece that face climate risk. This finding is consistent with the UGS statement that Greece has global leadership in oil tanker and LNG carrier ownership.

Within Greece's national ownership, different companies have different market shares (of the global fleet) in the most high risk assets, as shown in Figure 3. Angelcoussis Group has the largest fleet and the highest value at risk. There are also varying levels of specialisation in the highest risk assets (e.g. some Greek shipowners like GasLog have less diversification in the ship types they own and therefore carry higher exposure to climate related stranded value risks). The consequence of these differences in risks, is that the interests and relative priorities may vary between Greek owners. Overall, the scale of Greek ownership in the most exposed shipping segments means that the energy transition is not a distant or abstract risk for Greek shipping, but a material issue for the value and future deployment of its fleet.

[5] UGS annual report 2021
[6] UGS annual report 2026
[7] Figure for both LNG and LPG carriers

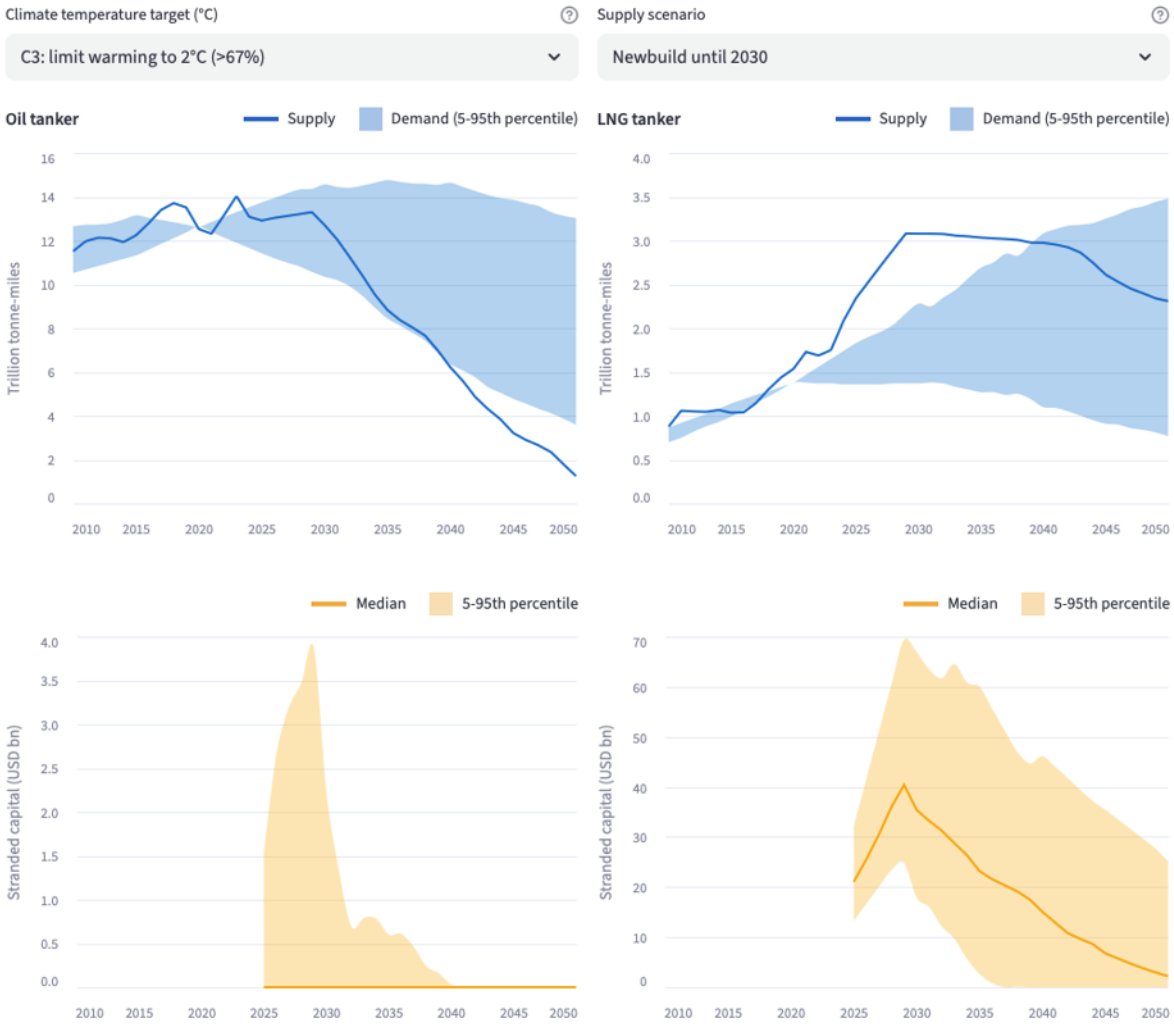


Figure 2: Contrast between supply and demand[8] in both the oil tanker and LNG carrier fleets, under a 2 degree scenario, assuming newbuilding trends continue to 2030

Table 2: National level exposure (calculated on an ownership basis), to assets that are demand-side risk exposed (oil tankers and LNG carriers)

Company Nationality/Region	Value (USD bn)	Mean age	Ships
Greece	77.78	10.84	1517
Japan	37.67	8.85	522
China P.R.	34.08	11.23	890
South Korea	25.12	7.81	312
Norway	19.59	9.51	283
United States	18.11	12.37	296
Singapore	18.08	10.99	387
U.A.E.	10.02	16.6	356
United Kingdom	8.39	8.92	131

[8] https://shipping-transition.org/Supply-demand_balance

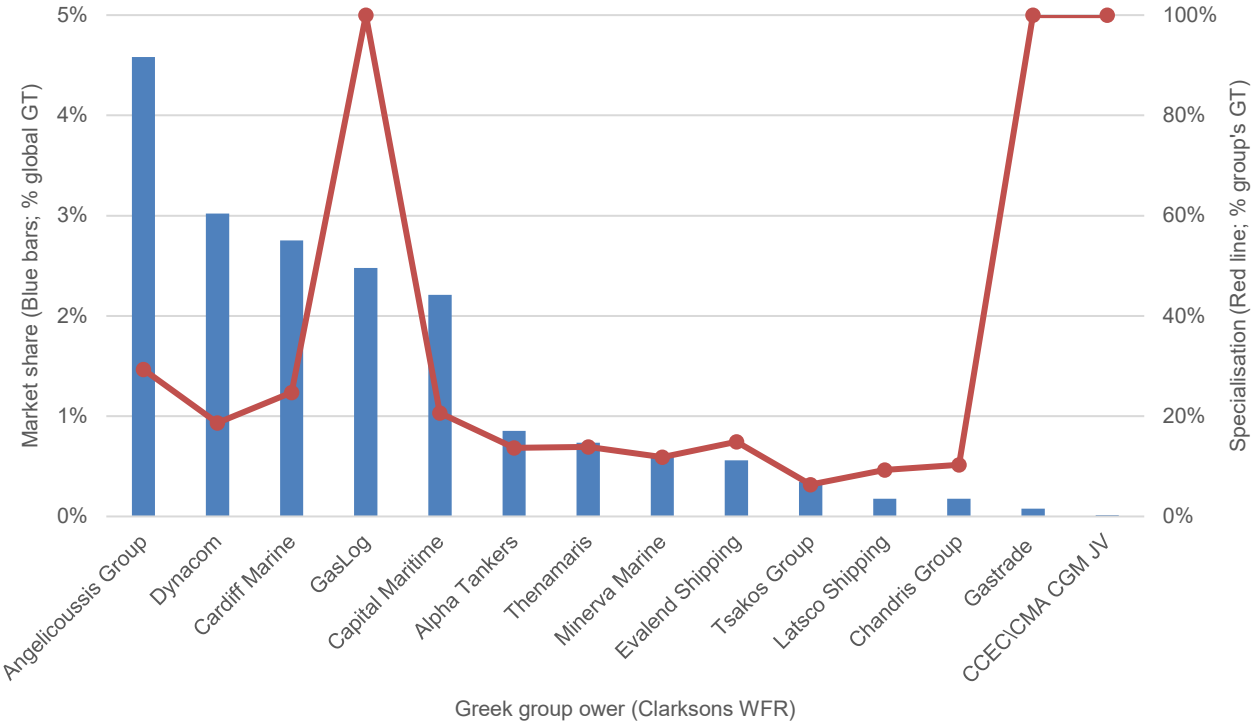


Figure 3: Levels of exposure to risks in the LNG carrier fleet, from across the top 14 shipowners of LNG carriers in Greece (authors' calculations from Clarksons WFR's reported Group Owners. Data collected 16/11/2026)

1.3 What is the exposure of Greek shipping to supply-side risk and does this link to demand-side risks?

In addition to risks related to demand, there are also supply-side climate risks. These relate to how energy transition that occurs within the shipping industry might change the competitiveness and commercial viability of different propulsion and fuel specifications. Unlike the demand side risk, which is driven by the superior performance and economics of renewable energy and is happening 'to' shipping, shipping's supply-side climate risks are likely to be driven by regulation at either the national/regional or global level.

Supply-side risks are less easy to define categorically - as to where greatest exposure exists. Analysis of this type of risk implies that it can relate to age of ships, their energy efficiency as well as their fuel technology/compatibility[9]. But it also relates to the regulatory drivers and how rapidly and strongly they influence the competitiveness of the existing fleet relative to newbuilds.

Assuming adoption of IMO's NZF, Figure 4 shows estimates of how different fuel/technology choices made for a newbuilding in 2028/29 would affect total cost of operation (TCO)[10]. The TCOs start closely grouped together, they start to increase in 2035, and then diverge as stringency of the policy increases around 2038. Two policy scenarios are considered (left hand and right hand plot), representing differences in how details in the NZF might resolve – including both details around a reward mechanism and how SU prices.

[9]https://www.researchgate.net/publication/404868948_Climate_risk_in_shipping_under_the_IMO_Net_Zero_Framework_the_role_of_optionality_and_uncertainty

[10] https://www.shippingandoceans.com/post/imo-net-zero-framework-sends-a-clear-signal-to-shipowners-to-order-ammonia-dual-fuel-ships

Depending on the detail of the policy scenario and how fuel prices evolve, in most cases there is no penalisation for those who have invested in LNG as a dual-fuel technology. LNG can remain the most cost-effective compliance option until the mid-to-late 2030's. It is therefore not a given that the supply-side risks crystallise immediately. Instead, the onset of regulation provides clarity in the timetable for when different specifications can be expected to become less competitive. The inclusion of a reward mechanism for ZNZ options (e.g. ammonia), does not materially change the relative competitiveness of conventionally fuelled vessels (oil and LNG) over the next decade.

Regulation such as the NZF therefore provides shipowners with a time window and can create a range of strategies and options for their own pathways through the transition. Shipowners can choose to be early adopters, and in the event of an effective reward mechanism, will have some of that cost difference subsidised, but will be unlikely to see any competitiveness advantage in operating costs until later in the 2030's. Alternatively, shipowners can choose to transition more slowly, use alternative compliance options (including the SU mechanism), and manage how and when they move to a new technology or fuel.

Although regulation in any one region (e.g. EU) may not produce a strong business case for transition of the global fleet away from the use of fossil fuels, it can still drive some elements of shipping's energy transition[11]. Furthermore, a combination of different regions each applying their own regulation, in combination with a postponed adoption of IMO regulation on energy transition, can still be expected to produce similar shifts in competitiveness between fuel/technology options – the supply-side risk does not go away. However, unlike in the scenario where a single global regulation adopted by IMO drives shipping's energy transition, the complexity of how the different regulations interact and 'stack' to affect business cases under different transition pathways, increases – alongside an increase in the administrative burden of compliance with multiple regulatory regimes. Managing the consequent complexity and administrative burden can be an advantage for companies with the scale, depth of knowledge and capacity to spot opportunities and optimal strategies for compliance. However, for those companies without scale, depth of knowledge or capacity, this scenario both exposes them to supply-side risk and places them at a competitive disadvantage in navigating that risk.

[11] https://www.transportenvironment.org/state-of-european-transport/state-of-transport-2026/shipping

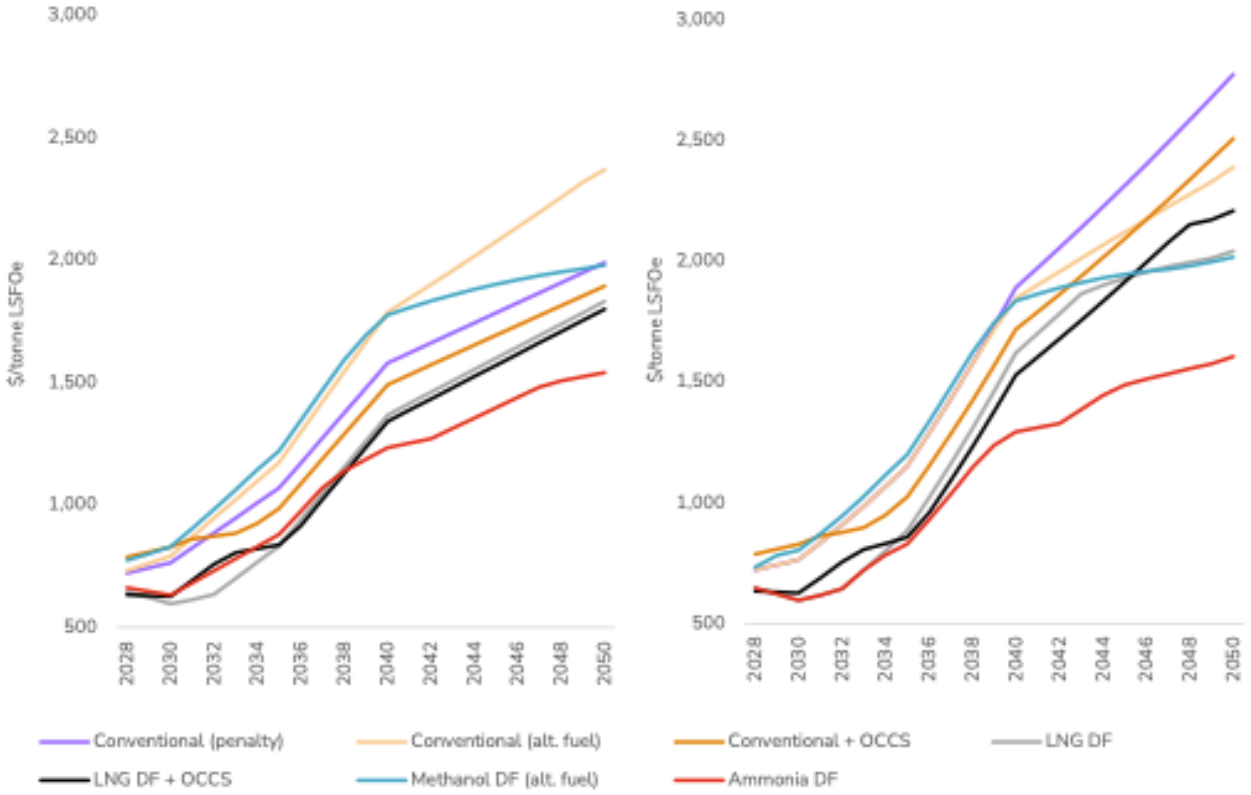


Figure 4: Total cost of operation, assuming no ZNZ reward mechanism and holding RU/SU prices fixed (left), including a ZNZ reward mechanism and increasing RU/SU prices over time (right).

The shipping industry is a significant stakeholder in many of these regulatory forums, including at the IMO and the EU. However it is not always successful. To date, even though the shipping industry has strongly pushed back against regional regulation on its GHG emissions, EU regulations have entered into force and have started, albeit modestly for now (similarly to the scenarios of NZF for initial changes in TCO), to impact the competitiveness of different ship specifications[12].

A failure to adopt NZF at MEPC 85, may postpone when the regulatory driven supply-side risk's timing is clarified for the shipping market. But as long as the IMO remains committed to reaching net-zero emissions, the obligation to transition fleet technology and fuel away from oil/LNG will remain, and consequently the risk for the global fleet still remains.

The difference for shipowners, between adoption of NZF or a postponement accompanied by regional regulations, is not the likelihood of supply-side risk, but the forewarning of the timescale over which the risk materialises, and the complexity and administrative burden created by the regulatory regime that they need to understand in order to manage that risk. Table 3 summarises the characteristics of supply-side risks under two different scenarios for how shipping's energy transition might be regulated.

Table 3: Comparison of regulatory scenarios and their implication

	Impact on competitiveness of oil/LNG fuel choice in the next 10 years	Existence of supply-side risks materialising in current	Complexity in the regulatory signal for determining	Clarity in the timetable for supply-side risks materialising	Ability for more than one fuel/technology pathway to co-

[12] https://www.zerocarbonshipping.com/fueleu

		asset's lifetimes	supply-side risk		exist competitively
Clear IMO leadership in GHG regulation	LNG – Low, Oil – depends on price spreads	High	Low	High	High
Regional patchwork and postponed IMO regulatory clarity	LNG – Low, Oil – depends on price spreads	High	High	Low	Low

The Greek ship owning community has a mix of companies with different scales and capacity to manage supply-side risk. A small number (19) companies own more than 50 ships and therefore are likely to have greater capacity (and resources), as well as broader portfolios of shipping assets which can be used as a physical hedge against the uncertainty in the timing and pathway of shipping's energy transition. However, of the total of around 700 shipping companies in Greece, the average company owns ~8 ships[13], with a tendency to have less capacity and less optionality for hedging of its physical assets. This places many of the Greek companies at a competitive disadvantage, particularly when it comes to managing supply-side risks on an uncertain timescale and with higher complexity e.g. the scenario of a regional patchwork in combination with postponed global regulation.

This is before the interaction between supply-side risk and demand-side risk is taken into account. In practice, the timings of these risks are approximately coincident, and their fundamental drivers are similar (commercial and political pressures on an energy transition away from fossil fuels; some but not all technologies are common: batteries, cheap renewable electricity). The strategies for managing them are different, demand-side risk requires diversification in ship types and/or flexibility in the cargo carried (e.g. LPG/ammonia carriers) and supply-side risk management means managing optionality and competitiveness of different fuel/technology compatibilities. However, both can result in large swings in asset values of the fleet currently held by Greek shipowners – given their leadership in ship types most exposed to demand-side risk.

Based on the analysis in Table 3, adoption of the NZF however, would at least help to reduce the complexity and decrease uncertainty of the timescale at least for supply-side risk. This in turn could help to maximise the chances of smaller companies with less capacity to manage this aspect of their climate risk. Some of these companies may also have negligible demand-side risk (depending on the sectors of shipping they are exposed to). However, other companies may have more concentrated exposure to demand-side risk, and can strategise for that risk with less uncertainty about the timesale of supply-side risks.

To date, this diversity of climate risk exposures and the advantages of clarity and lower complexity from clear IMO leadership on shipping's energy transition has not been reflected in the public positioning at least of the collective of Greek shipowners. UGS has taken a clear position in opposition of the NZF[14], and the Greek shipowning community, and Greece's political leadership, has provided a strong counter narrative against the NZF at public events[15].

[13] https://www.rivieramm.com/news-content-hub/us200bn-greek-fleet-cements-role-as-ultimate-cross-trader-across-shipping-markets-88910
[14] https://ugs.gr/en/press-releases/2026/press-release-20261116/
[15] https://www.qcintel.com/biofuels/article/posidonia-2026-greek-shipping-doubles-down-against-nzf-warns-of-unfeasible-targets-66298.html

The UGS position appears strongly correlated to the public position taken by the top 5 Greek shipowners in terms of market share of LNG carriers (Figure 3), and by association some of the highest climate-related value at risk. All 5 of these companies are signatories of a series of letters, led by Maria Angelicoussis, that strongly criticised and called for abandonment of the IMO's NZF[16] during 2025.

2 What are the political landscape and technical consequences relating to IMO GHG policy scenarios?

The IMO's work to decarbonize international shipping is part of a longer-term process that has evolved over more than a decade. The current discussions around the IMO Net-Zero Framework (NZF) should therefore be understood in the context of the 2023 IMO Strategy on Reduction of GHG Emissions from Ships, adopted at MEPC 80. The 2023 Strategy builds on the Initial IMO GHG Strategy adopted in 2018 and significantly strengthens the ambition to reduce emissions from international shipping.

At the heart of the 2023 Strategy is a clear long-term vision: the IMO aims to phase out greenhouse gas emissions from international shipping as soon as possible, while pursuing a just and equitable transition. To support this ambition, the Strategy sets targets and indicative checkpoints. These include increasing the uptake of zero- and near-zero-emission technologies, fuels and energy sources to at least 5%, striving for 10%, of the energy used by international shipping by 2030; reducing total annual GHG emissions by at least 20%, striving for 30%, by 2030; and by at least 70%, striving for 80%, by 2040, compared with 2008. Ultimately, international shipping is expected to reach net-zero GHG emissions by or around 2050.

Meeting these targets requires measures that drive both emissions reductions and investment in the transition. The 2023 Strategy therefore called for a basket of mid-term measures combining a technical element with an economic element. This policy direction led to the development of the Net-Zero Framework.

At MEPC 83 in April 2025, the IMO finalized and approved the draft legal text for the Net-Zero Framework, intended to introduce a new Chapter 5 of MARPOL Annex VI. The framework combined the two core elements: a global fuel standard to progressively reduce the GHG intensity of marine fuels (technical element) and a global GHG pricing mechanism (economic element). The draft amendments were then circulated to Member States with a view to formal adoption at the second Extraordinary Session of MEPC in October 2025.

However, MEPC.ES2 did not reach a decision on adoption. Following disagreement among Member States, the session was adjourned for one year, with the intention of continuing work towards greater convergence. While this left the agreed-in-principle framework as the starting point, it also reopened discussion around its design, particularly the economic elements and their impacts on different States and stakeholders. Technical work on the implementation guidelines continued in parallel, without prejudging the eventual outcome of the adoption process.

By MEPC 84 in April 2026, several versions of the NZF had emerged, differing in their approach to fuel-intensity requirements, economic incentives, revenue collection and the use of funds. In June 2026, the IMO circulated draft MARPOL amendments for four of these concepts.

[16] https://www.lloydslist.com/LL1154875/Major-shipowners-condemn-Net-Zero-Framework-in-unprecedented-statement

At ISWG-GHG 22 in the first week of August 2026, further discussion was had on the different design concepts, albeit with none of the alternatives to NZF receiving broad support, whilst the majority of member states expressed continued support for NZF and explicit support for the concept of a fund/revenue distribution mechanism.

2.1 What are the NZF and the 5+1 proposals?

At MEPC 83, IMO approved in principle the NZF. Following the failure to adopt this policy at MEPC.ES2, several variants of the concept appeared, formally as submissions to MEPC 84 (April 2026). In June 2026, draft MARPOL amendments of four of the concepts were circulated - the timing of the circulation coincided with the 6-month deadline for a MARPOL amendment circulation prior to adoption at MEPC 85 (December 2026). Subsequently Japan submitted a proposal (including a draft amendment) to MEPC 85, and UAE submitted a concept proposal to ISWG-GHG 23. In total there are 5 'new' proposals in addition to the existing approved option NZF 'as is'.

- NZF as is (+1): this proposal is aligned with the April 2025's agreement in principle. This baseline has two-tier GFI targets. Deficits are balanced with RUs at $100/tCO2eq (RU1) or $380/tCO2eq (RU2). A Net-Zero Fund manages revenues for e-fuel ZNZ rewards and a just and equitable transition.
- NZF as levy (MEPC 84/7/36): single-tier universal levy sets the direct GFI compliance target to zero. Emissions below the base GFI are priced at $300/tCO2eq (RU1) and those exceeding it at $380/tCO2eq (RU2). It retains the Fund and ZNZ rewards.
- NZF softer start, harder finish (ISWG-GHG 22/2/12): this option defers GFI targets by two years, applying only the base GFI target during 2029–2030. It steepens the 2041 GFI base target to a 70% reduction. It keeps the $100/380$ RU pricing and replaces the Fund with an "IMO Facility".
- Fundamental Redesign 1 (MEPC 84/7/38, ISWG-GHG 22/2/9): Co-sponsored by Liberia, Panama, and Argentina, this single-tier option dynamically sets GFI targets based on market availability, affordability, and scalability of viable fuels. It removes the Fund, RU pricing, and ZNZ rewards, relying on transferable Surplus Units (SUs).
- Fundamental Redesign 2 (MEPC 85/7/1): Proposed by Japan, this option lowers GFI target stringency and removes the 2040 target. It removes the Fund and RU pricing, allowing both Tier 1 and Tier 2 deficits to be balanced via SUs or direct financial contributions ($100/380$) to approved projects. It does not fund e-fuel rewards.
- Fundamental Redesign 3 (ISWG-GHG 23/2): Proposed by UAE, this option also removes the fund/RU pricing leaving only a technical standard for compliance. Unlike other technical element proposals, there is no SU trading so no flexibility for under-performance and over-performance, a ship can only trade its compliance in one year with future years – eventually becoming obsolete if it falls too far behind it cannot effectively meet its future obligations. Unlike in the Liberia proposal which has the most support from the US and Saudi, this proposal sets the GFI trajectory from climate science fundamentals, and does not qualify ambition to the affordable/available/scalable fuels.

Table 4: Summary of the architectures on the table

Proposal	Proponent countries	GFI	Compliance Pricing	Fund Architecture	ZNZ Reward
NZF "as is"	UK, Australia, South Africa	Two-tier targets	RU1: $100/tCO2eqRU2 : $380/tCO2eq	IMO Net-Zero Fund	ZNZ rewards
NZF "as levy" (MEPC 84/7/36)	Tuvalu, Fiji, Kiribati	Single-tier (direct GFI is zero)	RU1 (levy): $300/tCO2eq; RU2: $380/tCO2eq	IMO Net-Zero Fund	ZNZ rewards

NZF "softer start harder finish" (ISWG-GHG 22/2/12)	Brazil	Two-tier, deferred 2 years	RU1: $100/tCO2eqRU2: $380/tCO2eq	IMO Facility	Postponed ZNZ rewards
Fundamental Redesign 1 (MEPC 84/7/38, ISWG-GHG 22/2/9)	Liberia, Panama, Argentina	Single-tier, dynamically market-derived	None (SU trading only, uncapped)	None	None
Fundamental Redesign 2 (MEPC 85/7/1)	Japan	Two-tier, targets lowered	None (SUs or voluntary contributions at $100/380$)	None (decentralized direct payments)	None
Fundamental Redesign 3 (ISWG-GHG 22)	UAE	Single-tier, climate-science derived	None	None	None

China's submissions (such as ISWG-GHG 22/2 and ISWG-GHG 22/3/1) are not treated as a separate regulatory architecture because they do not propose a competing framework. Instead, they offer targeted textual adjustments to the Net-Zero Framework (e.g., a more generalized GFI calculation formula and a bracketed Fund/Facility formulation) “to preserve flexibility and facilitate compromise”.

2.2 What is the political landscape for the IMO debate

2.2.1 Timeline/pathway of key decisions

The regulatory process is guided by the mandate set out in the 2023 IMO GHG Strategy, which calls for a “basket” of mid-term measures comprising both a goal-based marine fuel standard and a maritime GHG emissions pricing mechanism. The Strategy originally envisaged adoption in 2025, followed by entry into force in 2027. The current pathway has evolved from this original timeline and is now shaped by the six-month circulation rule: for any MARPOL amendment to be adopted in December 2026, it must have been formally circulated by June 2026. This creates two principal pathways: adoption at MEPC 85 in December 2026, or a deferral of adoption to MEPC 86 in 2027. The key point of divergence between the two scenarios is whether the Committee can secure sufficient support for an eligible text at MEPC 85, and, if not, whether further negotiations can produce a text capable of adoption at the following session.

2.2.2 Potential adoption at MEPC 85

This scenario represents the "timely adoption" pathway advocated by Member States such as the EU, Norway, and Pacific Island nations, which argue that any delay beyond 2026 would fundamentally undermine the IMO's credibility and the ability to achieve the targets set by the 2023 Strategy, including net-zero emissions by or around 2050.

At ISWG-GHG 22 in September 2026, the Working Group discussed the policy concepts included in the four “eligible” amendment options that were circulated within the required timeframe: the NZF “as is” proposal (CL 5216), the “as levy” model (CL 5215), the “Softer Start, Harder Finish” proposal (CL 5214), and the “Fundamental Redesign” proposal (CL 5213). This discussion highlighted where there was some flexibility and where the governments were sticking to their original positions.

A key procedural issue is presented by Japan's updated proposal (MEPC 85/7/1) and UAE's submission (ISWG-GHG 23/2), which were submitted after missing the June 2026 circulation deadline. Under Scenario 1, adopting Japan's text in December 2026 would therefore require Member States to voluntarily override the six-month circulation requirement. While procedurally possible, this would represent a departure from the normal process.

At MEPC 85 and the resumed MEPC.ES.2 session in December 2026, the Committee is expected to reach a final decision on the amendments. The six-month circulation requirement would constrain the drafting group to non-substantive changes (of any of the four circulated amendments), such as typographical or punctuation corrections, that do not alter the meaning of the circulated text. Accordingly, the central question at MEPC 85 will be whether one of the eligible circulated texts can command sufficient support for adoption, or whether the Committee agrees to depart from the normal procedural pathway to accommodate a substantially different proposal from the four circulated.

If adopted in December 2026, the measures would then usually proceed through the tacit acceptance procedure, with entry into force expected approximately 16 months after adoption, in April 2028.

The subsequent implementation period is expected to run from 2029 to 2031. While most draft texts set 1 January 2029 as the entry-into-force date for new-ship definitions and SEEMP updates, Brazil's "Softer Start, Harder Finish" proposal keeps this start date but defers the progression of target stringency by two years across the initial 2029 to 2036 implementation period. Crucially, for the first two years of operation (2029 and 2030), the proposal aligns the direct GFI compliance target with the base GFI target. This alignment temporarily removes the requirement for Tier 1 Remedial Unit payments, postponing significant revenue generation for the proposed IMO Net-Zero Facility until 2031 to allow sufficient time for its administrative and operational setup.

2.2.3 Potential adoption at MEPC 86

This scenario becomes more likely if the Committee determines that none of the four circulated options can secure sufficient support for adoption, or if a proposal such as Japan's or a compound of different policy specifications gains significant support but countries hold firm on the need for a six-month circulation requirement. A further issue could arise if Member States remain divided over the appropriate entry-into-force mechanism, including renewed consideration of an "explicit acceptance" (opt-in) procedure. In either case, MEPC 85 could conclude without adoption, creating a further negotiating period before MEPC 86 or a later meeting.

At MEPC 85 in December 2026, the Committee would debate the four circulated options alongside Japan's proposal, but fail to reach consensus on a final text. One possible source of disagreement could be continued support for Japan's proposal or a substantially new compound proposal, despite its having missed the six-month circulation deadline. If Member States consider an alternative text to have sufficient support, they would need to determine whether and how it could be accommodated within the adoption process, including whether to depart from the normal circulation requirement. A separate issue could also re-emerge around the use of an "explicit acceptance" (opt-in) procedure for the amendments. Rather than allowing the measures to enter into force under the IMO's standard tacit acceptance procedure, this approach would require States to actively accept and ratify the amendments before they could apply to their fleets. The mechanism, originally proposed by the United States at MEPC/ES.2 and supported by several delegations wary of the Net-Zero Framework, would therefore introduce a substantially higher threshold for the measures to achieve broad application. Its potential use could become an additional point of contention at MEPC 85, particularly among Member States concerned that an explicit acceptance requirement could make entry into force less certain and establish a significant precedent for future MARPOL amendments. If agreement on the appropriate entry-into-force mechanism cannot be reached alongside the substantive elements of the

amendments, this could further complicate the path to adoption and require the issue to be resolved as part of a revised proposal for consideration at MEPC 86.

A refined and broadly supported clean proposal would then be circulated either as an output from MEPC 85, or in early 2027, in accordance with the six-month rule. This could take the form of a compromise or hybrid text to build broader support ahead of the next session.

Under this pathway, MEPC 86 in summer 2027 would become the formal point of adoption. Brazil has argued that, in the event that MEPC 85 does not reach a decision on adoption, the Strategic Review of the 2023 IMO GHG Strategy should be postponed until sixteen months after the measures are eventually adopted. This would link the timing of the Review to the eventual adoption and implementation of the measures.

The delay in adoption could also shift the implementation milestones by approximately one year. In particular, the SEEMP updates and “new ship” definitions currently envisaged for 1 January 2029 would likely move to 1 January 2030.

Following adoption in 2027, the measures would enter into force approximately 16 months later, in late 2028 or early 2029, under the tacit acceptance procedure. This timeline assumes that a successful regulatory consensus is eventually reached. The more fundamental risk, however, is that MEPC 85 fails not simply to adopt a text, but to establish a viable basis for further negotiations. If delegations remain unable to reconcile the competing proposals, the Committee could conclude without sufficient common ground to move directly towards a compromise text, requiring the framework to be substantially reworked before adoption could be pursued at MEPC 86 or a later session.

2.2.4 Is “Fundamental Redesign” (Liberia)/Japan architecture adoptable?

Based on submissions and data collected during past IMO sessions, adopting a “Fundamental Redesign”/Japan architecture at MEPC 85 in December 2026 faces significant numerical and procedural hurdles. While the approach is seen as a ”pragmatic” alternative for a number of shipowners and major flag registries, it does not currently appear to have the level of support or the procedural standing required for immediate adoption.

2.2.5 Numerical Readout: The “Two Horse Race”

The most comprehensive (~75 speaking States) estimates of Member State positions can be taken from the MEPC 84 debate. Based on counting States that have ratified MARPOL Annex VI and participated in the discussions, these indicate a clear divide between the competing approaches. At that meeting, the “Fundamental Redesign” position trailed the various NZF-based proposals.

- The dominant bloc: The NZF-like proposals, including the “as is”, “as levy attracted support from more than 50 records. (Figure 5)
- The alternative bloc: The "Fundamental Redesign” concept was supported by approximately 22 records. (Figure 5)
- Unclear and abstaining positions: Even when potential abstentions are taken into account (removing countries that are particularly vulnerable to pressure causing them to abstain), the NZF-like group remains the largest, at approximately 46, compared with 19 for the "Fundamental Redesign” group. At least eight States are currently expected to abstain or remain unclear. (Figure 6)
- The registry factor: Supporters of the “Fundamental Redesign”, Liberia and Panama are the world’s two largest flag registries, but their opposition is not sufficient to constitute a veto.

Under the tacit acceptance procedure, blocking an amendment would require objections from States representing 50% of the relevant gross tonnage (GT). At present, strong opposition from Panama, Liberia and the Bahamas accounts for approximately 35% of GT, while the Marshall Islands' support for the NZF prevents the opposition from approaching the 50% threshold.

The numerical picture therefore suggests that, while the "Fundamental Redesign" position carries significant weight, it is currently a minority position rather than a blocking coalition.

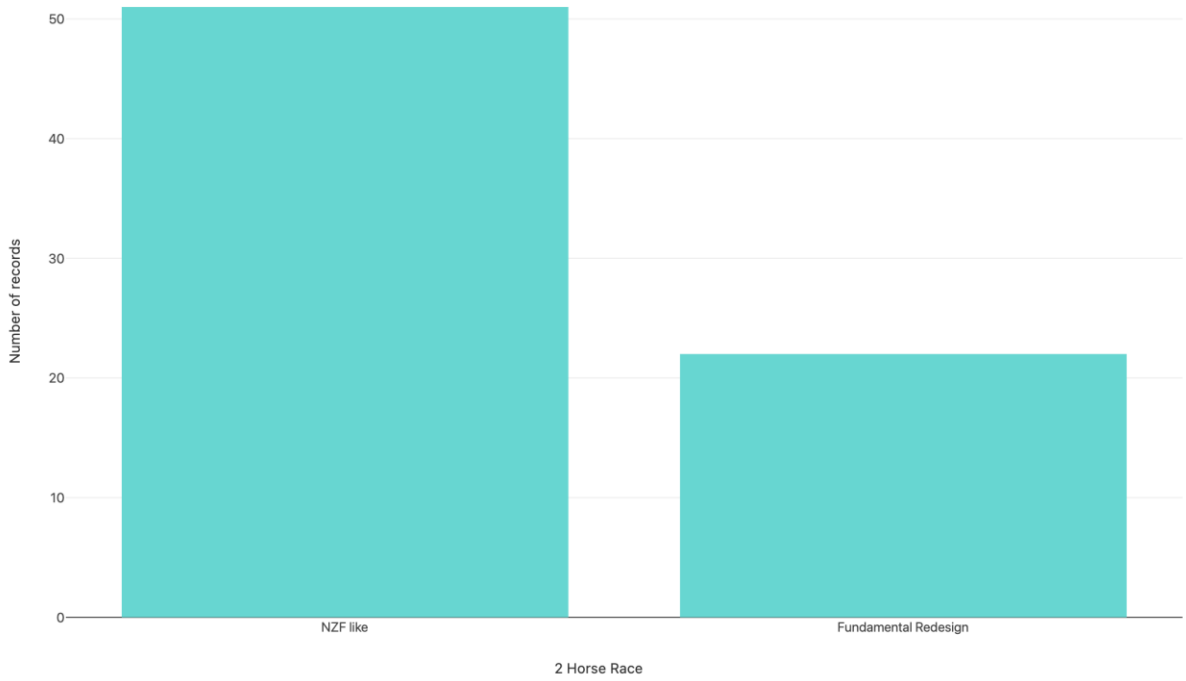


Figure 5:Countries' positions counts with regards to a two-horse race, based on the positions expressed at MEPC 84 and MEPC.ES2 (Countries' positions were recorded live during MEPC.ES2 and MEPC 84, and were checked against transcriptions of interventions available. They represent the authors' best understanding of the position expressed, but classifying positions involves a degree of subjective judgment. Furthermore, they represent countries' positions at those points in time, not the possible evolutions since then.)

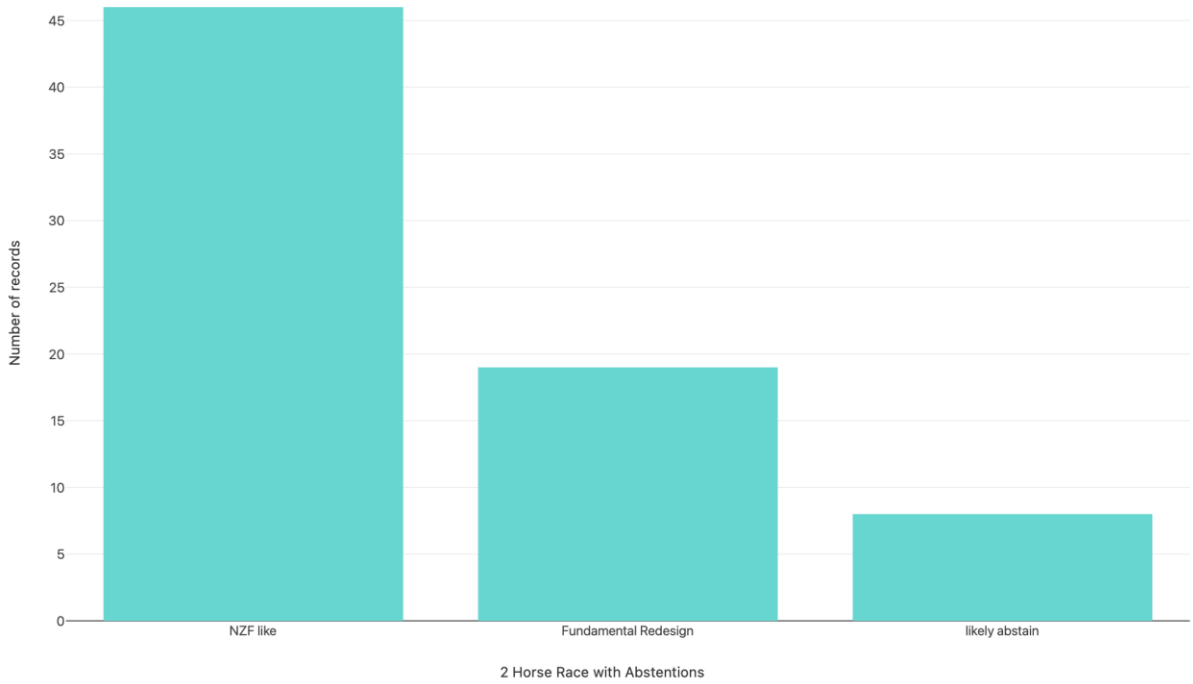


Figure 6:Countries' positions counts with regards to a two-horse race with abstentions, based on the positions expressed at MEPC 84 and MEPC.ES2 (Countries' positions were recorded live during MEPC.ES2 and MEPC 84, and were checked against transcriptions of interventions available. They represent the authors' best understanding of the position expressed, but classifying positions involves a degree of subjective judgment. Furthermore, they represent countries' positions at those points in time, not the possible evolutions since then.)

This finding from MEPC 84 was further validated at ISWG-GHG 22. At that more recent meeting, fewer member states took the floor, so a less representative sample of countries spoke. Furthermore, there were few discussions that could be clearly clarified into a 'support/reject' NZF. The best proxy for understanding the landscape is the level of support for a fund/facility or structure for dispersing revenues as this is something only supported by those who want to see a GHG price and an adoption of an effective economic element. Of the ~50 member states who took an explicit position on that topic, the large majority (~70%) were clearly in support of a strong outcome (Figure 7).

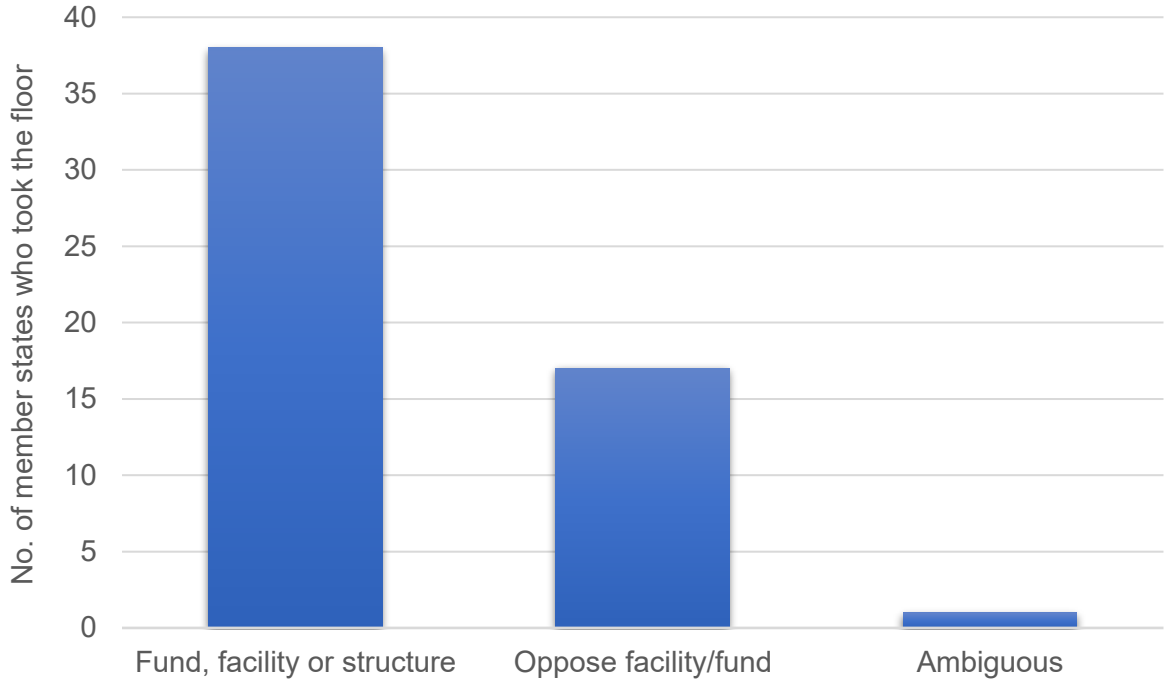


Figure 7:Levels of support for and against the fund/economic element

2.2.6 Procedural Obstacles: The “5+1” Situation

The principal procedural obstacle concerns any architecture incorporating Japan’s latest refinements. Under the six-month circulation rule, a MARPOL amendment must be circulated at least six months before the session at which it is to be adopted. For adoption at MEPC 85 in December 2026, the relevant deadline was therefore June 2026.

The Fundamental Redesign (CL 5213) met this requirement and is consequently among the proposals eligible for consideration. Japan’s updated proposal (MEPC 85/7/1), however, was submitted directly to MEPC 85 and therefore missed the circulation deadline.

This creates a significant procedural constraint for any hybrid “Fundamental Redesign”/Japan architecture. For Japan-specific elements to be incorporated into an amendment adopted in December 2026, Member States would have to agree to proceed despite the normal six-month requirement. While such a step may be procedurally possible, it would represent an unusual departure from standard practice. The alternative would be to defer adoption to MEPC 86 in 2027, allowing a revised text to be formally circulated in advance.

2.2.7 Strategic and Legal Feasibility

The prospects for a "Fundamental Redesign”/Japan architecture are also complicated by substantive disagreements over its compatibility with the 2023 IMO GHG Strategy.

Environmental concerns: Modelling presented by IMarEST and Norway suggests that the "Fundamental Redesign's” “pragmatic approach” may not deliver emissions reductions consistent with the Strategy’s objectives (ISWG-GHG 22/2/2, ISWG-GHG 22/2/3). In particular, linking the trajectory to the availability of “Commercially Viable Fuels” has been criticised by Norway as

potentially resulting in only around a 20% reduction over 30 years, substantially below the Strategy's indicative 70-80% reduction checkpoint for 2040.

JET revenue and the financing mechanism: A central feature of the "Fundamental Redesign"/Japan approach is its rejection of a mandatory global fund. Pacific Island States and the EU have argued that this leaves no clear mechanism for supporting a Just and Equitable Transition (JET) and represents a significant departure from the architecture agreed in the 2023 Strategy (ISWG-GHG 22/2/1, ISWG-GHG 22/2/7).

Japan as a wildcard: Japan's latest proposal introduces a "direct contribution" mechanism, which could provide an alternative to a conventional global carbon price but also adds complexity to the overall architecture. It is questionable whether the mechanism would provide sufficient certainty and transparency, with concerns that it could incentivise short-term investment decisions, including continued reliance on LNG, rather than accelerating the transition towards zero- or near-zero-emission fuels.

2.2.8 Conclusion: Is It Adoptable?

On the current numbers and procedural position, a standalone "Fundamental Redesign"/Japan architecture does not appear realistically adoptable at MEPC 85 in December 2026.

The more plausible role for the "Fundamental Redesign"/Japan proposals is therefore as negotiating leverage rather than as a standalone alternative. Their strongest influence may be in pushing the NZF towards a more politically acceptable compromise, for example, incorporating elements of Brazil's "Softer Start, Harder Finish" approach or China's proposed text "inclusive" text adjustments of the NZF, rather than replacing the NZF architecture altogether.

2.2.9 Does US have veto on acceptance

The US does not have a unilateral veto over the IMO Net-Zero Framework. Once the MARPOL Annex VI amendments have been adopted, they would usually proceed under the tacit acceptance procedure. Under Article 16 of MARPOL, an amendment will be deemed accepted unless, during the specified acceptance period, objections are submitted by at least one-third of the Parties or by Parties representing at least 50% of the gross tonnage of the world's merchant fleet.

This means that the relevant question is not whether the US can block the Framework on its own, but whether the US and other opponents can assemble a sufficiently large coalition of Parties to reach one of the two objection thresholds.

The tonnage threshold is particularly important for the NZF because the largest flag States carry a disproportionate share of the world fleet. Liberia, Panama and the Marshall Islands together represent more than 40% of the relevant tonnage in the figures set out above. However, this does not give any one of these States a veto, nor would the opposition of all three automatically block the Framework. They would still need additional support to reach the 50% threshold.

Liberia, Panama and the Marshall Islands could form the core of a blocking coalition, but they could not block the amendment alone. Additional tonnage would be required from other major flag States such as Hong Kong, Singapore, China, Malta, or others. Conversely, if the Marshall Islands supports the NZF, as currently indicated, the ability of an opposing coalition centered on Liberia and Panama to reach 50% becomes more difficult.

There is also a second potential route to blocking acceptance: objections from one-third of the Parties to MARPOL Annex VI, irrespective of their tonnage. The IMO currently identifies 108 Parties to Annex VI, meaning that this route would require objections from at least 36 Parties.

It is therefore important to distinguish between opposition at adoption and opposition at acceptance. At the adoption stage, the amendment must be approved by a two-thirds majority of the MARPOL Parties present and voting. If adopted, however, the subsequent tacit acceptance procedure does not require another positive vote: the amendment proceeds automatically unless one of the two objection thresholds is reached.

In short, the US has no standalone veto. Its ability to prevent the NZF from entering into force would depend on its ability to build a sufficiently large coalition, either one-third of Annex VI Parties or, more importantly given the concentration of shipping tonnage, Parties representing at least 50% of global merchant fleet tonnage. On the current flag-state numbers, an anti-NZF coalition centred on the US, Liberia and Panama would therefore need to secure substantial additional support to block acceptance.

2.2.10 If not the Liberia or Japan proposals, what are the options that might gain political traction in the period to '85?

If the Liberia and Japan architectures fail to secure sufficient support, political traction is likely to consolidate around the remaining NZF-based amendment options that met the six-month circulation deadline. While the "Softer Start, Harder Finish" proposal offers an important compromise on the timing of implementation, the stronger indication of the base document could be the NZF "as is" text, which already incorporates significant compromises from the earlier negotiations and appears to retain the broadest underlying support (including at ISWG-GHG 22).

2.2.11 The NZF "As Is": The Most Likely Baseline

The NZF "as is" option (Circular Letter 5216) remains the most straightforward route to adoption and may ultimately provide the baseline around which negotiations converge.

- Existing compromise: The text reflects the outcome of the negotiations leading to MEPC 83 and therefore already represents a negotiated balance between environmental ambition, economic considerations and industry readiness. Moving away from it would reopen compromises that have already been reached.
- Procedural advantage: Unlike Japan's latest proposal, the "as is" text was circulated within the required timeframe and is therefore clearly eligible for consideration at MEPC 85.
- Political traction: It remains within the dominant NZF-like bloc, which currently commands substantially greater support than the "Fundamental Redesign" alternative.
- Fallback value: If negotiations around more substantial amendments become too fragmented, the "as is" option provides a comparatively clear route to adoption while preserving the core architecture agreed at MEPC 83.

This makes the "as is" option more than simply a status quo proposal: it may function as the anchor or fallback position for the final negotiations, particularly if Member States prioritise securing adoption in 2026 over reopening the architecture.

2.2.12 Brazil's "Softer Start, Harder Finish": A Potential Compromise, but Not Necessarily the Landing Zone

The "Softer Start, Harder Finish" proposal (Circular Letter 5214) is likely to remain an important source of negotiating leverage. Its main appeal is that it responds directly to concerns about near-term compliance costs by deferring the initial targets while seeking to preserve the overall environmental trajectory through steeper reductions later in the framework.

However, its compromise value does not necessarily mean that it is the most likely basis for final adoption. While Brazil retains the 1 January 2029 start date, its proposal would defer the progression of target stringency and effectively delay the operation of the two-tier compliance architecture by two years, with RU1 payments and therefore significant revenue generation for the proposed IMO Facility then only beginning from 2031. This would require adjustments to implementation milestones and the sequencing of the framework's compliance and revenue-generating mechanisms, which may be difficult for States that view timely implementation and the early operation of the full framework as essential to maintaining the credibility of the 2023 Strategy.

The "Softer Start, Harder Finish" proposal may therefore be more influential as a pressure point within the negotiations, demonstrating the flexibility available on implementation timing, than as the final text itself.

2.2.13 China's "Inclusive" Adjustments: Potential Additions to an NZF-Based Text

China's proposals in ISWG-GHG 22/2 (or ISWG-GHG 22/3/1) could offer a less disruptive way of broadening support for an NZF-based outcome. China proposed, for example, language on GFI calculations that aims to facilitate the recognition of a wider range of technologies, including onboard carbon capture, wind propulsion and solar power, without questioning the entire NZF as is. These adjustments could therefore be incorporated into an NZF-based outcome without requiring a fundamental redesign of the framework.

2.2.14 The "Facility" versus "Fund" Question

The institutional design of the economic element is likely to remain an important area for compromise. The "Softer Start, Harder Finish's" proposal for an "IMO Facility", rather than a fully developed global fund may attract support from states concerned about the administrative burden and governance implications of establishing a large new financial mechanism within the IMO; however, such a proposal may also have other unforeseen implications.

3 What are the implications of these IMO GHG scenarios for Greece and its shipowners?

3.1 Shipping and risks generally - why climate risk is different

Managing commercial risk is a day-to-day part of shipping. Freight rates, asset prices, operating costs and demand conditions can change materially over the course of a vessel's life, and shipowners have developed established ways of managing these risks. Transition risk is different in that it arises from the possibility that the underlying economics of an asset change as the shipping sector moves towards lower greenhouse-gas emissions. For ships, this reflects the interaction between their long operating lives and uncertainty about future regulation, fuel prices and technology costs. The relevant question

is therefore not only how a vessel performs under current conditions, but how its competitiveness may evolve under different future conditions.

Transition risk can materialise through two related channels[17]. Supply-side risk arises if regulation and associated compliance costs make some vessels less competitive or economically viable. Demand-side risk arises if the broader energy transition changes the demand for the cargoes that vessels were built to transport. The latter is particularly relevant for vessels exposed to fossil-fuel trades: a ship may remain technically operable while facing lower utilisation and earnings as the underlying cargo market changes. The two channels can reinforce each other, for example where a vessel faces higher compliance costs at the same time as a weakening freight market.

IMO policy is an important driver of the supply-side component of transition risk. The proposed IMO Net-Zero Framework would introduce a global greenhouse-gas fuel-intensity standard and an emissions-pricing mechanism, with implications for the operating costs and relative competitiveness of ships. At the same time, the regulatory outcome is only one part of the uncertainty facing shipowners. Even once the broad framework is established, its future stringency, the evolution of remedial and surplus unit prices and the design of any fuel reward can affect the resulting economics. These factors interact with uncertainty over the future price and availability of different fuels, as well as the cost and performance of alternative technologies[18].

This makes transition risk structurally different to many other types of commercial risks that Greek shipowners are well accomplished at managing, and which are cyclical or depend on spotting operating niches. A conventional shipping downturn is primarily cyclical: an asset may experience a period of low earnings or value, but its underlying ability to compete can remain broadly unchanged. Transition risk can instead create a directional change in the relative economics of different assets. If future policy, fuel and technology conditions make some vessels persistently more expensive to operate than others, the resulting difference in competitiveness may affect earnings and, potentially, asset values. The extent to which higher fuel and policy costs are absorbed by shipowners or passed through to customers will depend substantially on future freight-rate developments - losses but also large margins of competitive advantage are plausible in the coming decade.

Once the clarification of transition/decarbonisation solution becomes clear in the market, it creates a step-change in competitiveness, which can be expected to flow through to valuations. If a vessel’s earnings capacity or market value were to deteriorate materially, this could affect the owner's equity position and, depending on the financing structure and scale of the change, its ability to meet LTV requirements or refinance the vessel. The analysis of ship finance structures suggests that, at conservative LTVs, senior bank debt is generally better protected from asset devaluation than the equity provided by shipowners[19].

This distinction also affects how the risk can be managed. In a conventional cycle, an owner may decide to acquire an asset at a low point in the market, carry it through a period of weak earnings and wait for market conditions to improve. That approach depends on an expectation that the underlying earning capacity of the asset will recover with the cycle. Where transition risk is concerned, however, the possibility is that the relative economics of the asset itself change. Waiting for the next cycle would not necessarily restore a competitive position if the underlying regulatory, fuel or technology conditions have moved in a different direction.

This suggests that transition risk may need to be incorporated into investment decisions somewhat differently from conventional commercial risk. Under conditions where future regulation, fuel prices

[17] https://www.shippingandoceans.com/post/existing-ships-and-those-on-order-would-produce-twice-the-emissions
[18] https://www.shippingandoceans.com/post/new-climate-resilience-framework-for-shipping
[19] https://www.shippingandoceans.com/post/shipping-banks-remain-exposed-to-latent-systemic-refinancing-risks

and technology costs are volatile but relatively predictable, an investment could be assessed primarily on the basis of its expected lifetime costs and returns. Under greater uncertainty, however, the value of an asset also depends on the flexibility it provides if future conditions differ from expectations. The concept of real options captures this distinction: optionality has economic value because it allows an owner to respond to changes in relative competitiveness rather than committing fully to one future outcome today[20]. For a shipowner, this means that assessing transition risk is not necessarily a question of predicting which fuel or technology will ultimately prevail. It is also a question of considering how an investment performs across a range of plausible future regulatory, market and technology conditions, and what scope it provides to respond as those conditions become clearer.

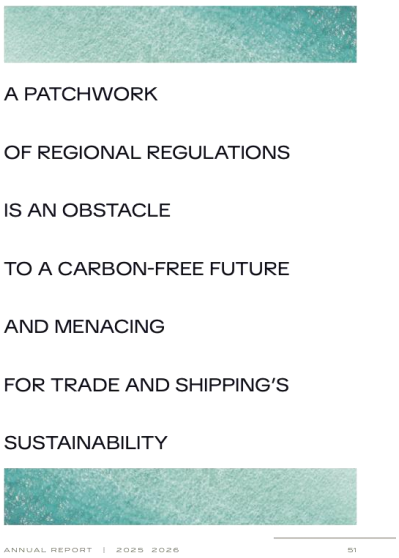
3.2 Beyond climate risk, what are the foreseeable consequences of failure to adopt NZF or resolve IMO's NZF debate?

At MEPC 85 there are a number of potential scenarios surrounding failure to adopt. This could be by a full rejection, re-opening negotiations. Or it could be a long adoption delay > 1 year - which could result from an indication that the modifications to achieve convergence require more finalisation effort and consideration (which may be an alibi for waiting for a new administration in the US). Or it could be Short delay < 1 year - approval in principle of a surgically revised NZF, with the intent to adopt during 2027. Of these scenarios, if there is a failure to adopt, the long delay scenario currently appears the most likely, which would lead to the following:

- **Undermining of the IMO as an organisation** - IMO is a critical organisation for the smooth functioning of global shipping, as proved time and again across safety, wider environment and seafarer matters. But to function smoothly, it needs to retain credibility in its decisiveness and effectiveness at responding to urgent societal needs. With the emergence of a dark fleet, and a large swathe of shipping activity opting out of global 'rules based order', this risk has rarely been more material.

  Against that backdrop, IMO's GHG efforts did enjoy previous success and strengthening of the organisation's credibility - the unanimous adoption of the Revised IMO GHG Strategy in 2023 for example. However since then, NZF has created a pivotal test for that credibility. To have failed to adopt at the first attempt at MEPC.ES2 in October, has already undermined the organisation's standing and credibility. At ISWG-GHG 22, in the middle of a tough year to bring things back together, the report from the meeting expressed positive momentum and set an expectation of decisiveness and adoption at MEPC 85. If at MEPC 85 IMO fails a second-time after all the effort to find other compromise, and momentum build-up approaching MEPC 85, its credibility as shipping's global regulator, particularly in relation to GHG emission reduction, but also more broadly, will be significantly diminished.

[20] https://www.shippingandoceans.com/post/new-climate-resilience-framework-for-shipping



- **Empowerment of regional regulators to create a patchwork of regional regulations, particularly EU** - the IMO is not the only regulator of international shipping - any country/region can and many do regulate international shipping calling at its ports. The EU has already imposed both a carbon price and a fuel standard, in line with its 'Fit for 55' policy. There is an ongoing review of EU's unilateral regulation on shipping GHG emissions, and in an absence of IMO agreeing to the NZF, there will be a clear mandate handed to the EU/EC to strengthen its policy, rather than find ways to reduce its burden on the sector[21]. The UK has begun to implement and explore similar policies to the EU[22]. In Africa, Djibouti and Gabon are already operating a carbon tax on international shipping and now three further African countries are considering joining the scheme[23]. And China has long operated a domestic ETS[24], including already undertaking pilots that include the shipping sector. There is therefore a high certainty that instead of helping to halt the current actions to take control of shipping's GHG emissions at the sub-global level, failure to adopt IMO's NZF will only accelerate and increase sub-global regulation.

- **A sustained hiatus and uncertainty at the IMO on GHG emissions** – in the event that there is a failure to adopt policy at MEPC 85, it is likely this could then result in a significant delay e.g. two years or more, before a similar policy can be tabled for adoption again. A one year delay and significant investment of effort to find a new concept that could achieve broad support has not produced anything more adoptable than a 'surgically' modified NZF. It is likely that a further delay will similarly fail to produce new concepts or a movement in positions. If the decision is taken not to adopt at MEPC 85, then this will be an admission that it is the political context/landscape that is the issue and not the policy or the negotiating process. The next known time the political context significantly changes is under a change of US administration, which is an uncertain future event but one that is most likely more than two years in the future. It is possible that the delay could be even longer, as it will be hard to have a delay of two years and then immediately adopt a package without revisiting its content. The likelihood of a long hiatus, if agreement is not reached at MEPC 85, is also evidenced by the history of previous IMO debates on this subject. When IMO first discussed Market Based Measures (MBM) it agreed in 2009, by majority, that they were necessary. After extensive effort and negotiation and a similar stalemate, in 2013 the IMO formally agreed to suspend MBM negotiations and focus only on technical efficiency standards (which became EEDI). It took until 2021 for a proponent of a new MBM to reopen the debate.

- **Delay to shipping's emission reduction and energy transition** – Shipping's energy transition and efforts to reduce emissions in line with its 2030 goals (at least 20% striving for 30%), and the IMO Strategy objective of 5-10% ZNZ use by 2030, have all been negatively affected by the 1-year delay and loss of confidence in IMO's ability to regulate this transition[25]. Further delay will add both immediate delay to the operation and actions needed to reduce

[21] https://shipandbunker.com/news/world/562210-eu-will-not-require-double-payment-for-both-eu-ets-and-imo-nzf
[22] https://www.gov.uk/government/speeches/maritime-decarbonisation-strategy-and-calls-for-evidence
[23] https://splash247.com/african-nations-join-forces-to-impose-carbon-charges-on-shipping/
[24] https://www.ieta.org/uploads/wp-content/Resources/Busines-briefs/2025/IETA_Business_Brief-China-final-July2025.pdf
[25] https://www.linkedin.com/pulse/japans-proposal-alternative-nzf-tristan-smith-avupe/

emissions in the near term, as well as additional negative sentiment to the investment decisions needed to unlock capital and ensure low and zero-emission solutions are developed and available in the mid-term.

- **Steepening of shipping's decarbonisation pathway** - Every year of delay to adopt policy that can drive emission reduction also reduces the time-scale to the (around) 2050 goal of net-zero emissions, which can then only be reached through steeper rates of emission reduction and higher rates of change (in efficiency, energy technology or demand). Whilst one argument could be made to also postpone the 2050 goal, as climate change affects increase, it can be expected so will the political pressure for the 2050 goal not to slip.

- **Collapse of companies developing/innovating shipping's solutions** - particularly with the adoption of IMO's Revised Strategy, and the positive progress made towards adoption of a mid-term measure in the run-up to MEPC 83, there was growing activity in the development/innovation of solutions that can competitively decarbonise international shipping. In the period since, progress has stalled if not reversed[26], as uncertainty around any clear policy-driven business case increased. Whilst some companies may have managed to put decarbonisation-aligned commercial activity on a slower trajectory, others may only have a short period that they can sustain operations without a return on their decarbonisation investment to date. Failure to adopt NZF, and an entrenched uncertainty will likely result in companies having to crystallise their losses. The consequences to shipping's ability to have affordable and available solutions, and a commercial ecosystem working to scale these up, can be expected to be strongly negatively affected.

- **Increased disinterest by wider energy economy in shipping** - shipping as a sector struggles to secure political attention - a phenomenon sometimes referred to as 'seablindness'[27]. This is to the sector's detriment whenever it has an ask of the political levels or the population. It also affects how the sector is perceived by the wider energy industry. ICS, among others, have put effort into advancing the concept of shipping's expected need for clean energy, including through the Clean Energy Marine (CEM) Hubs initiative[28]. The underlying driver for shipping's relevance to the rapidly growing clean energy economy is that the sector itself will be a plausible off-taker as well as other sectors. A concept that has been primarily enabled by the prospect of global regulation on shipping's emissions at the IMO. If IMO's NZF is not adopted, the plausibility and therefore currency of shipping, will be diminished, increasing the likelihood that it is a sector that is 'left behind' whilst other parts of the economy (including shipping's competitors in land transport modes), receive associated political attention and investment instead.

3.3 What does a patchwork of regional regulation do to shipping / business case?

In our BAU scenario, the EU ETS and FuelEU mechanism are already integrated. The scenario shows that unilateral regional regulation does not lead to any significant uptake of alternative fuels, and simply represents a cost burden for operators (Figure 4). This scenario is likely conservative, as ships are modelled based on segment-size category-average time spent in EU waters, which overlooks the variability within each segment-size category but a minority of ships might spend sufficient time in EU waters for the EU regulation costs to justify any onboard investment, which is ignored by the model.

[26] https://www.shippingandoceans.com/post/shippings-transition-being-hampered-by-policy-uncertainty-yet-industry-progress-continues
[27] https://splash247.com/the-dangers-of-sea-blindness/
[28] https://www.ics-shipping.org/supporting-shipping/clean-energy-marine-hubs/

Furthermore, the modelling excludes vessel types operating predominantly within Europe (e.g. ferries).

Despite those limitations, the impact of the EU regulation solely on the transition is likely to be limited. This is due to the international nature of shipping and the fact that only a minority of shipping voyages are covered; and the fact that revenues are not recycled in the sector. At a carbon price of €100 per tonne, the annual sectoral contribution is estimated at €9 billion, and €7.65 billion under a €85 per tonne scenario[29]. However, a significant portion of this revenue is currently not recycled back into maritime decarbonization, with Member States historically reinvesting only about 5% of general ETS revenues in industrial decarbonization. At a national level, while maritime activities generate an estimated €375 million to €442 million annually in Greece, these revenues are not earmarked for maritime applications[30]. Aside from France and Estonia, Member States have not established dedicated reinvestment programs for shipping. This lack of financial recycling means that early movers investing in zero and near-zero emission (ZNZ) fuels do not receive direct regional subsidies or rewards to offset high capital and fuel costs.

The European Commission has committed to review and potentially revise its legislation to avoid double payment, but this is a conditional commitment that depends on the adoption of global market-based measures at the IMO. If the IMO adopts a technical-only framework with no global carbon price - such as the Fundamental Redesign or the Direct Contributions proposals – there would be no overlapping pricing mechanism to deduct. Consequently, the EU ETS would likely remain fully active without any revision. Shipowners would face a double-charging trap: paying the full capital costs of complying with the IMO's technical fuel standard and the EU ETS carbon tax.

3.4 Why would clarity on NZF be useful for Greece's shipowners?

Establishing regulatory clarity on the NZF is of commercial utility for shipowners for various reasons. Beyond avoiding the regional patchwork and shipping becoming a "cash cow" to national government described in the previous section, there is generally value for shipowners to constructively contributing to its development (guidelines etc.). Despite the shipowner opposition, the NZF has survived (MEPC 84), and may continue to do so[31]. If shipowners maintain a stance of absolute opposition, they risk a scenario where the final technical and economic architecture is fully designed by politicians and lawyers with minimal input from maritime experts, resulting in an impractical and poorly optimized regulatory regime. More concretely, an effective IMO regulation could: provide more compliance and business options to shipowners, and reduce the risk of stranded assets. Those two arguments are detailed below.

3.4.1 Reward mechanism and a fund for creating optionality

A critical technical distinction between the competing regulatory proposals lies in the presence or absence of a centralized fund and an active ZNZ reward mechanism. In a regulatory scenario characterized by a single-tier GFI target and the absence of a centralized fund - such as the Fundamental Redesign or Direct Contributions architectures - shipowners have little commercial choice but to rely exclusively on the least-cost compliance option available at any given point in time. This compliance path is dictated by marginal compliance with the base GFI target, which primarily incentivizes fossil fuels or drop-in bioenergy blends. A viable commercial business case for e-fuels only emerges at the point when the price trajectories of biofuels and e-fuels cross (see Figure 4).

[29] https://ecsa.eu/maritime-eu-ets-shippings-contribution-and-national-revenues/
[30] https://ecsa.eu/maritime-eu-ets-shippings-contribution-and-national-revenues/
[31] https://www.shippingandoceans.com/post/nzf-as-agreed-gets-further-support

By contrast, the reward mechanism creates a wider optionality for shipowners by allowing multiple compliance pathways to co-exist competitively. Under this framework, operators can choose between marginal compliance on the base GFI target using conventional fuels and buying SUs, directly using e-fuels supported by ZNZ rewards, or a combination of both.

Beyond accelerating the broader sector transition, the absence of a functioning reward mechanism introduces significant capital and asset-valuation risk for commercial shipowners. Without a reward mechanism to smooth the transition, shipowners are forced to execute a speculative gamble on the precise timing of the bio-to-e-fuel transition - specifically, guessing the year in which fuel price trajectories will cross. Asset owners must attempt to time the exit from one asset class (such as conventional or LNG-fuelled vessels) and the acquisition of e-fuel-compatible vessels with some precision. By contrast, a functioning reward mechanism allows investment decisions in both fuel pathways to co-exist, providing shipowners with a transitional buffer and a significantly wider margin of error for the acquisition, operation, and eventual disposal of different vessel classes (see Figure 4).

This might be particular an issue for the vast majority of shipowners and commercial operators who do not expect to be early movers in the technology transition. Large shipowner companies possess the dedicated human resource capacity, specialized middle management, and strategic transition teams necessary to analyse, predict, and adapt to volatile fuel and credit markets. Furthermore, these major entities can leverage their large bunkering buying power to secure proprietary fuel supply chains and effectively control the timing of their transition, whereas smaller and medium-sized shipowners face a risk of losing their competitive advantage to highly resourced global operators. A structured, predictable, and transparent reward mechanism under the Net-Zero Framework levels the playing field, ensuring that the timing and economics of the transition are governed by clear regulatory.

4 Conclusions

Shipping is plausibly at an inflection point for two different but interrelated transitions - its transition away from being significantly used to move fossil fuels as cargo, and its transition away from its use of fossil fuel as its energy source.

Both transitions originate in the avoidance of dangerous climate change, but have different delivery mechanisms. The wider energy transition and cargo demand changes are driven by the economic and performance superiority of renewable energy, as well as energy security concerns. Shipping's energy transition will come from regulation - whether IMO or regional regulation.

The speed and nature of both transitions is uncertain, even if their direction is not. The wider energy transition is more advanced and is now accelerating. Shipping's energy transition is in its comparative infancy - but the concept of it being completed within the next 25 years (the IMO's Revised Strategy on GHG emissions), is widely accepted.

Having built a dominant global position as a shipowning nation over many decades, Greek shipowners are uniquely exposed to risks from these transitions, given their particular leadership and strength in owning ship types that are most exposed to the global energy transition (oil tankers and LNG carriers). The exposure or risk is not evenly distributed - a small number of shipowners are particularly exposed with large value at risk particularly linked to LNG carriers.

Because the average Greek shipowner also tends to own a small number of ships compared to some of the larger groups owned elsewhere including in both Europe and Asia, they are also exposed to risks in shipping's own energy transition. Smaller companies lack the large management divisions and technical teams that would be needed to finely time asset ownership decisions in a disruptive and chaotic transition. They are also more likely to lack the capacity to optimise for compliance with a complicated patchwork of regulation, or develop extensive multi-fuel offtake agreements that might

be needed to operate a fleet on the evolving most competitive fuel choice in different parts of the world. Shipowners with smaller fleets typically also have less diversity in ship types and ownership with which to hedge for the different compliance strategies needed to manage a more chaotic and/or sub-gloally regulated energy transition.

4.1 NZF, the most likely basis for concluding uncertainty at MEPC 85, would clarify and stabilise shipping

Given the identified shortcomings in the "Fundamental Redesign"/Japan architecture policy option, the outcome that has the greatest chance of securing a majority of support and convergence between member states is a consolidation around the NZF architecture which has already secured the greatest political traction. The "as is" text is particularly significant because it is already the product of a negotiated compromise.

Reopening its core parameters would carry both political and procedural costs, while the alternative proposals would require Member States to renegotiate elements of a framework that has already been agreed in principle. The "Softer Start, Harder Finish" proposal may nevertheless exert pressure on the negotiations by offering additional flexibility on implementation timing, while China's proposals could provide targeted adjustments to broaden the technology and governance provisions.

Following the path to the most adoptable policy package (NZF 'as is' or a surgically modified variant of this policy) would have the following advantages:

- Creating a clear and predictable framework for shipping's decarbonisation, against which Greek shipowners can plan and strategise to help them manage their transition risks
- Supporting and boosting the IMO as regulator to provide global stability and leadership for international shipping across a range of issues
- Diminishing the role of regional regulators and minimise the risk of significant admin burden from patchwork regulation
- Supporting the existing ecosystem of companies across shipping's value chain who are developing decarbonisation solutions, maximising the likelihood of affordable and available compliance options
- Providing a managed transition away from LNG - LNG will still be compliant under IMO's NZF into the early 2030's, but the policy sets a timetable against which asset owners can manage transition away from their exposure to this commodity.

4.2 Lobbying against NZF is likely to result in failure to adopt policy at MEPC 85, cause an extended delay and disruption

This paper's analysis of the political landscape concludes that supporting alternatives to an NZF-based landing zone will not achieve the IMO's Revised Strategy objectives, and partly for that reason, is unlikely to obtain broad support and convergence. It is therefore the basis for a protracted delay with the inverse outcomes from the previous list:

- Heralds no clarity for the process of shipping's decarbonisation, leading to a late and disruptive transition of uncertain timing, against which Greek shipowners will not be able to plan and strategise to help them manage their transition risks
- Undermining of the IMO as regulator reducing stability and rules-based order for international shipping across a range of issues
- Endorsing the role of regional regulators and increasing the risk of significant admin burden from patchwork regulation

- Crippling and endangering the existing ecosystem of companies across shipping's value chain who are developing decarbonisation solutions, reducing the likelihood of affordable and available compliance options for when (regional) regulation obligates their use
- Creating prolonged uncertainty in the transition from LNG as a fuel, with no clear timetable, values of dual-fuel assets will remain at risk, but with uncertainty for when losses might crystallise.

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