



IMO policy measures: Ensuring certainty for shipping's energy transition

IMO MID-TERM MEASURES

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Executive summary

- **Early adoption of e-fuels is key to avoiding an inefficient energy transition towards zero-emission shipping with costly technology lock-in.** E-fuels will likely be the best bet in the long run due to their high emissions reduction potential and scalability. Because scaling up the use of e-fuels will take a long time, targeted investments should be made now to increase production capacity in time, establish global supply chains, and ensure the availability of e-fuels at key bunkering hubs.
- **Upcoming policy measures from the International Maritime Organization (IMO) should create certainty, ensure e-fuels are cost-competitive, and reduce investment risks.** The transition to e-fuels requires large-scale investments from shipowners, fuel producers, ports, and charterers/cargo owners. These investments can only be securely made if the sector is certain that e-fuels are a competitive way to comply with the upcoming regulations.
- **Only a universal price on greenhouse gas (GHG) emissions with targeted rewards for e-fuels can close the price gap.** A fixed levy on GHG emissions with rewards for e-fuels is the only policy option that can make e-fuels competitive with other fuel pathways. Key industry players, including e-fuel producers and infrastructure developers, suggest that a levy is key to investing in e-fuels early.
- **Ensuring a just and equitable transition requires an equitable revenue disbursement mechanism:** Any revenue generated from economic measures should also be strategically allocated to support lower-income countries in their energy transition. This could include funding for zero-emission fuel production, infrastructure development, workforce training, and targeted broader climate adaptation initiatives to ensure no country is left behind.

Introduction

In 2023, IMO Member States agreed on a new pathway for shipping's decarbonisation. The IMO's revised GHG strategy (['2023 IMO Strategy on Reduction of GHG Emissions from Ships'](#)) calls for ending fossil fuel consumption and reaching net-zero GHG emissions "by or around, i.e., close to, 2050." This cut-off date is supported by indicative checkpoints of reducing emissions by 20%, striving for 30%, by 2030 and 70%, striving for 80%, by 2040. Alongside this, the industry now has a target of at least 5%, striving for 10%, (near-)zero-emission fuel uptake by 2030.

Besides setting these ambition levels, the 2023 Strategy also outlined that "mid-term GHG reduction measures should effectively promote the energy transition of shipping and provide the world fleet with a needed incentive while contributing to a level playing field and a just and equitable transition". This requires:

- **Promoting an energy transition:** Shipping's transition will involve a variety of fuels. However, e-fuels will likely be the best option in the long run due to their scalability and emissions reduction potential. Bringing e-fuels to market requires immediate investments to build the value chain—developing production infrastructure, securing supply networks, and ordering zero-emission vessels. This must happen already this decade to ensure the industry and e-fuel value chains are ready at scale on the required timeline.
- **Ensuring a just and equitable transition:** Climate change impacts and the transition to a zero-emission economy will likely hit poorer countries disproportionately harder. At the same time, some countries will need additional support to comply with more stringent regulations. The IMO's mid-term measures should therefore ensure no country is left behind in the transition and support the countries most impacted.

The policy measures to deliver on the targets set in the 2023 IMO GHG strategy are currently being negotiated and are set to be agreed upon at the 83rd meeting of the IMO's Marine Environment Protection Committee (MEPC 83) in April 2025, adopted in autumn 2025, and enter into force in 2027 at the earliest.

The binding global nature of the regulations will mark a key milestone for shipping and set it apart from essentially every other sector in today's global regulatory landscape. The legal regulation will be part of the International Convention for the Prevention of Pollution from Ships (MARPOL), specifically Annex VI (Prevention of Air Pollution from Ships). MEPC is currently developing a new chapter to MARPOL Annex VI, namely Chapter 5, referred to as the "Net Zero Framework". This chapter will outline the main components of the technical and economic elements. The regulation will be complemented with supporting guidelines—the scope of which still needs to be defined—on revenue disbursement and the emission factors of alternative fuels and technologies.

This insight brief will dive deeper into the policy measures under consideration, highlighting what is currently on the table and what must be achieved to deliver on the IMO's objectives. It builds on stakeholder engagements within the Getting to Zero Coalition and beyond, as well as scenario-based analytical assessments, to outline key takeaways and learnings on the implications of different policy measures for the maritime sector.

What is currently on the table?

Over recent months, IMO Member States have worked together to find commonalities among their positions. But key questions remain, including on the following essential elements of the measures:

- Establishing regulations for the greenhouse gas content of fuels in a global fuel standard (GFS)
- Designing an economic instrument such as a universal levy on emissions
- Designing mechanisms—including those for revenue-sharing—that ensure a just and equitable energy transition.

Within these areas, many more details need to be decided, including penalties for non-compliance with the GFS, alternative compliance (i.e., whether to adopt a flexibility mechanism within a GFS), a definition of zero- and near-zero GHG emission fuels (ZNZ fuels), the emissions factors of different fuels, and the objectives and modalities of revenue disbursement. While the overall design of the measures is expected to be developed as a regulatory text in MARPOL Annex VI, many of the details will likely end up in supporting guidelines, which are set to be developed in the period between the measures' adoption and implementation.

Going into MEPC 83, negotiations have converged on a global fuel standard, with discussions ongoing on the exact levels of the GHG intensity reduction limits. However, areas of divergence remain, particularly regarding the nature of the economic element required to deliver on the IMO strategy. Different combinations under consideration are outlined in Figure 1.

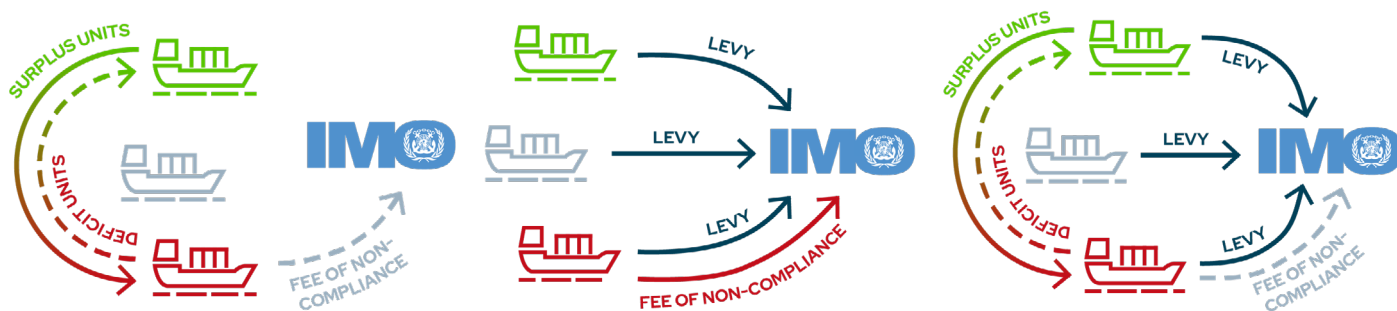


Figure 1a: A flexible compliance mechanism (credit trading) only.

Figure 1b: A universal GHG levy only.

Figure 1c: A flexible compliance mechanism and a universal levy.

Many countries, including both developing and developed economies from across the world, and representing a majority of the global tonnage of signatories to MARPOL Annex VI, have explicitly expressed support for a standalone universal levy. A smaller number have explicitly expressed opposition to a universal levy. At the same time, several countries have put forward proposals aimed at bridging the gaps between supporters and opponents of the levy.

While member states have been siding with one of the three overall designs illustrated above, the last months have seen shifts towards potential compromise solutions, or so-called bridging proposals. These proposals were designed to address concerns about the flexible compliance mechanism and its ability to generate reliable revenue. The proposals are generally based on a banded flexible compliance mechanism (see Figure 2), designed to drive more vessels to pay

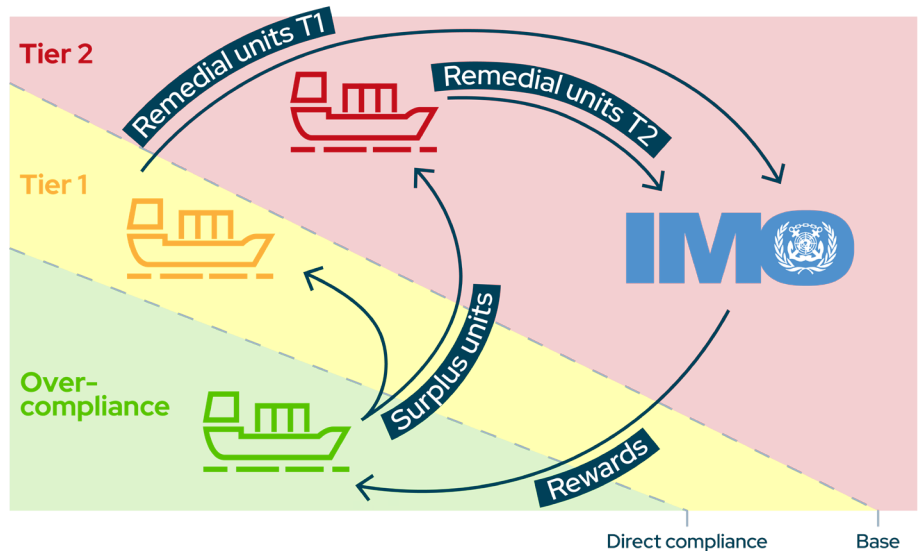


Figure 2: The banded flexible compliance mechanism.

fees to the IMO and generate central revenue rather than trade between vessels. By setting multiple pathways for compliance, this system creates different tiers of (non-) compliance, each associated with its own costs and potential benefits. For example, the lowest tier of non-compliance pays a higher fee than vessels operating in the middle tier. Another proposed option is to add the condition of using ZNZ fuels, where fees are paid when vessels do not use ZNZ fuels, although the production pathways this concept covers remain to be decided.

What does good look like? Enabling an early, just, and equitable energy transition

The shipping industry cannot decarbonise without a full-scale energy transition from fossil fuels to scalable zero-emission fuels. As the GHG intensity limits reduce over time and become more stringent, especially from 2040 onwards, fuels must meet two main criteria to be a viable option: GHG reduction potential and scalability.

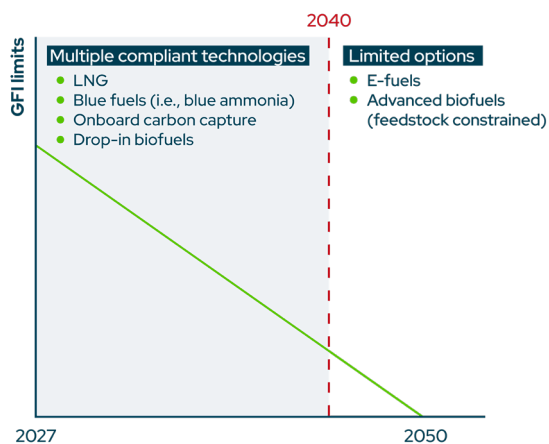


Figure 3a: The effect of the GFS on fuel compliance.

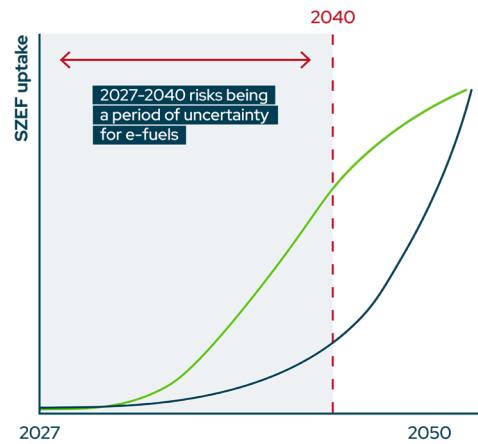


Figure 3b: An incremental vs early transition to e-fuels.

Several technologies exist that can partly reduce ships' emissions, including onboard carbon capture and storage or liquified natural gas (LNG). However, these technologies lack the GHG reduction potential to comply with the IMO ambitions from 2040 onwards and are therefore not viable long-term options. This leaves biofuels and e-fuels as the remaining options. Sustainable feedstocks for biofuels will likely be constrained and this limited scalability makes biofuels unlikely to be a viable long-term option. This leaves e-fuels, such as e-methanol and e-ammonia, as the best bets in the long run.

However, the production of e-fuels is at a nascent stage, and they currently face challenges related to cost, risk, and availability. Operating a vessel on e-methanol or e-ammonia is currently twice as expensive as using conventional fuel. Meanwhile, the lead times for building the new vessels, large-scale production and infrastructure needed to operate on e-fuels are long—taking two years or more in the case of new vessels and five or more years in the case of production projects. An early transition to e-fuels that features a gradual ramp-up in their use is therefore critical as this allows for:

- **Cost reduction through learning and scale:** Early deployment allows producers and technology providers to climb the learning curve, which means technological improvements and economies of scale can reduce production costs over time. If adoption is delayed, these cost reductions also get delayed, prolonging dependence on fossil fuels.
- **Developing skills and workforce:** Building a robust labour force capable of producing, handling, and distributing e-fuels takes time. Early action means that skills and expertise can grow organically, avoiding a future scramble to train workers in a compressed time frame when demand spikes.
- **Building global supply chains:** E-fuels require global value chains—for example, production in areas rich in renewable energy (like wind or solar) and transportation to end-users. Starting the development of these value chains early help controlled growth, reducing possible bottlenecks later.
- **Avoiding technology lock-ins:** Without a clear pathway to e-fuels, industries might invest heavily in transitional technologies (e.g., fossil-based synthetic fuels or hybrid solutions) that risk becoming stranded assets when cleaner alternatives arrive. By signalling and starting the shift to e-fuels now, policymakers and businesses can avoid sinking capital into short-lived, less sustainable pathways.

The transition to maritime decarbonisation must also be done in a just and equitable way, with the global nature of shipping requiring a level playing field that leaves no country behind. This has several implications in practice, from addressing disproportionate increases in trade costs to supporting access to the required infrastructure and technologies and minimising further impacts of climate change on vulnerable states by reducing GHG emissions as quickly as possible. Many countries in the Global South will also need support in seafarer training, wider climate adaptation and mitigation efforts, and unlocking their opportunities to competitively produce e-fuels.

What is needed to get there?

Four sets of investments/commitments, each with its own drivers, are needed to make e-fuel-powered shipping a reality.

Ships	Fuel	Port	Cargo
Investing in new technologies on newbuilds or retrofits	Long-term offtake for e-fuels for 10-15 years, driven by reliable demand	New infrastructure in the short-term requiring significant capital investments	Depending on the segment, cargo owners may have significant control over fuel choice

Shipowners will need to invest in new vessels. This investment decision will be based on an assessment of relative capital and fuel costs as well as residual value across different fuel and technology options. Fuel producers will need to invest in production facilities, which will be based on projected demand for fuel. Ports need to make significant investments in their bunkering and storage infrastructure. Cargo owners will choose which fuels are used on ships in the bulk segment based on the short-term cost and availability of different options.

Cost of the compliant fuels will be a deciding factor. Deep-sea shipping is a highly competitive market with relatively low profit margins. In the context of IMO policy, this means that shipowners and operators will be driven to choose the lowest-cost fuels and technologies to comply with the GFS over the short term.

Allowing this development to take place without further intervention can, however, risk locking long-term investments into fuels and infrastructure that will not be viable options some years later. Targeted subsidies or rewards for e-fuels can mitigate this by supporting fuels that, while essential for the transition, are not yet commercially viable. The goal is not to select a single “winning fuel” or prioritise the option with the highest emissions reductions today but rather ensure that emerging high-potential technologies can compete in the long term to maximise emissions reduction over time. As the GFS naturally encourages the adoption of the most cost-effective compliant fuels, targeted rewards can provide the necessary push for e-fuels, ensuring a broader range of viable solutions for shipping’s transition to low-emission energy.

Business risks will be a critical element in deciding on fuel pathways. When two fuels reach price parity in a competitive market, demand will not be split evenly between them. Instead, demand will shift toward the fuel with a lower commercial risk profile. This dynamic significantly delays the adoption of e-fuels, which face higher financial and operational uncertainties. For instance, securing ammonia as a marine fuel requires long-term (10–15 years) fixed-price offtake contracts, exposing buyers to substantial balance sheet commitments, technology risks in the fuel’s production and use, and the possibility of lower-cost competitors emerging that undercut their investment.

In contrast, biofuels are already proven for use and can be purchased on the spot market without long-term commercial risks, allowing shipowners to remain risk-free after each voyage from a short-term investment perspective. However, when demand increases for a constrained resource like biofuel, prices rise over time. This creates scenarios in which paying to pollute (opting for

emission fees rather than adopting low-emission fuels) becomes an even lower-risk option. For example, if bio-LNG prices rise to match the prices of e-fuels, shipowners will naturally opt for the pathway with the lowest risk—making pay-to-pollute a more common outcome.

Risk can be reduced by increasing investment certainty. Investors and shipowners require clear long-term signals that justify the substantial capital commitments needed for new vessels, fuel infrastructure, and production. Without predictable regulatory frameworks and stable financial incentives, investments in emerging low-emission technologies will stall and short-term compliance solutions will be favoured over long-term decarbonisation. The lifespan of deep-sea vessels (typically 20–30 years) means that uncertainty in fuel pathways or policy effects can delay fleet renewal and create a bias toward using drop-in or transitional fuels rather than investing in more future-proof solutions over a long period. Moreover, fluctuating greenhouse gas pricing, unreliable reward structures, and changing policies can create financial volatility, deterring large-scale commitments to e-fuel production and supply chains.

E-fuels must also be sufficiently available at bunkering hubs to ensure their commercial viability. While e-fuels offer high GHG reduction potential, their adoption is currently constrained by limited production capacity, high energy input requirements, and supply chain immaturity, requiring significant upstream investments in renewable electricity, electrolyzers, and carbon capture systems. The global production capacity for these fuels remains a fraction of projected demand, making early-stage deployment vulnerable to supply bottlenecks. If shipping meets the fuel uptake targets of 5%–10% set out in the IMO’s strategy, shipping demand will equal 0.6 to 1.2 exajoules (or 5–10 million tonnes) of hydrogen in 2030. This will likely need to ramp up to nearly 100 million tonnes of hydrogen by 2050. However, the current total global hydrogen production is only around three million tonnes.

Shipping is not the only sector likely to transition to hydrogen-based fuels, but it can send a major demand signal to further spur production. As fuel producers have repeatedly indicated, if the demand signal is there, fuel production will be able to reach final investment decisions and scale up.

Can the proposals on the table get us there?

Ambitious IMO policy measures will be critical to delivering an energy transition that supports the early uptake of e-fuels. A just and equitable transition. A global fuel standard regulating the greenhouse gas content of fuel from now until 2050 is the measure that provides the clearest pathway for emission reductions. This will need to be combined with an economic measure, rewards for eligible fuels, and revenue disbursement to support lower-income countries in their transitions.

As highlighted above, evidence exists on which proposals are more likely to be most effective in delivering the two transition goals, including their ability to build the business case for e-fuels, particularly in relation to cost, risk, and availability, as well as to enable a just and equitable transition.

A universal levy and rewards can make e-fuels competitive early on

In the first decade of the GFS, the GHG intensity targets will allow multiple fuels to comply with the IMO ambitions. Considering the low targets in the first decade, shipowners have multiple options:

1. Conventional vessels pathway, either in combination with onboard carbon capture and storage (OCCS) or by consuming bio-marine gas oil (MGO) as a drop-in fuel to comply
2. Dual-fuel (DF) methanol vessels that might use bio-methanol first and then switch to e-methanol or use e-methanol from the start.
3. LNG-fuelled vessels that switch to bio-LNG and then e-LNG in the long run or use e-LNG immediately.
4. Dual-fuel ammonia vessels that either start with blue ammonia (synthesised from fossil fuels and using OCCS) and then switch to e-ammonia or run on e-ammonia from the beginning.

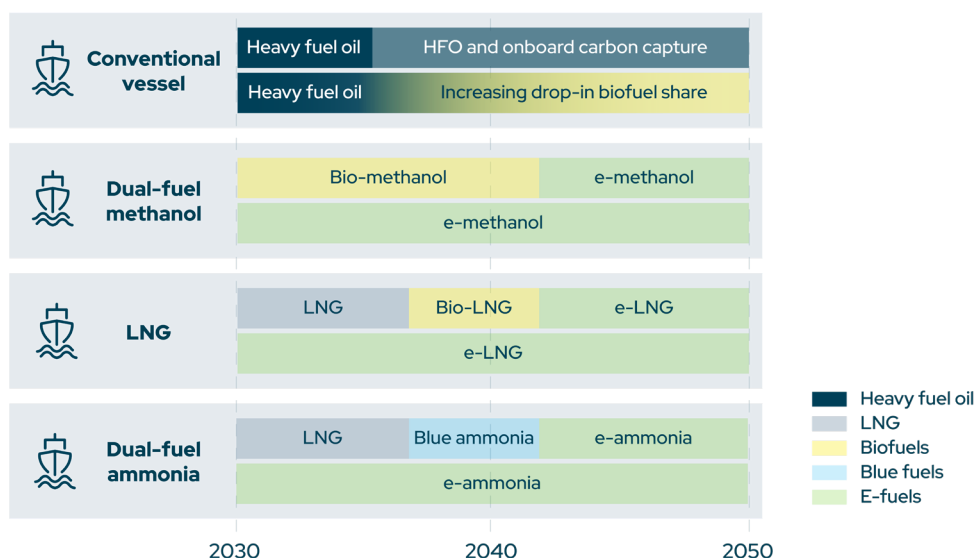


Figure 4: Compliance options for shipowners.

Vessel owners could also take an approach based on retrofitting: for example, opting for an LNG-fuelled vessel to comply in the early years of the GFS and retrofitting this vessel to an ammonia-fuelled one later.

Without the right incentives, shipowners are likely to opt for the cheapest fuels that allow them to comply with the GHG intensity targets. For e-fuels to be able to compete with other lower-cost compliance fuels in the early years, the total cost of ownership (TCO) of operating a vessel on e-fuels should be on par with the others.¹ As shown by various models from UMAS/University College London, DNV, and the Maersk McKinney Møller Center for Zero Carbon Shipping, not all proposals on the table are currently able to achieve this. Figure 4 below shows the different TCOs, covering both the cost of the ship and fuel, for various fuels for a scenario with a credit trading system only, and for a scenario with a lower levy with reward mechanism targeted at e-fuels.²

¹ TCO modelling is based on different assumptions on fuel pricing and availability and credit pricing, and might underestimate factors such as general risk, other e-fuel constraints, or the likelihood of pay to pollute.

² Aymer, D. & Smith, T. (2025). [How the IMO's mid term measures might shape shipping's energy choices and transition to e-fuels.](#)

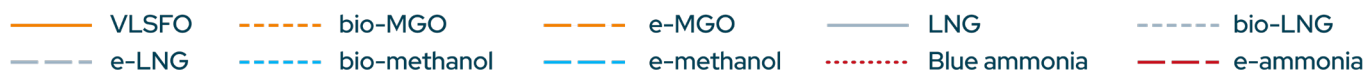
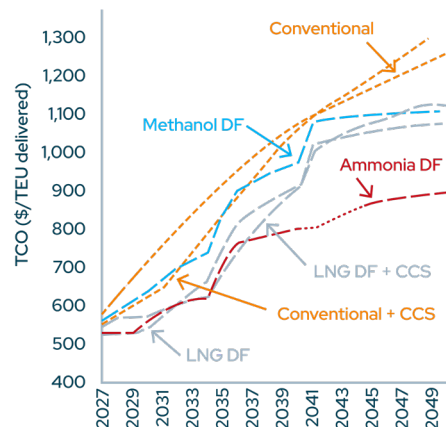
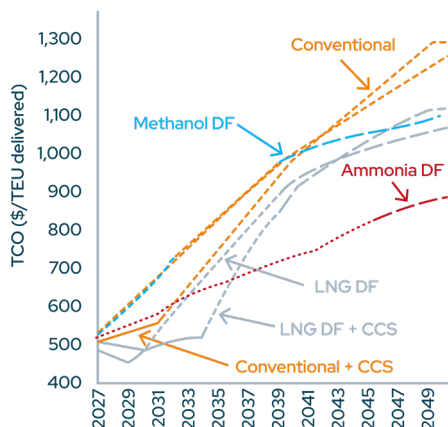


Figure 5a: Total cost of operation in \$ per 20-foot equivalent unit (TEU) delivered, for different fuel and technology options, 2027-2050 in scenario with a credit trading system only.

Figure 5b: Total cost of Operation in \$/TEU delivered, for different fuel and technology options, 2027-2050 in scenario with a levy and reward.

In the first scenario (Figure 4a), e-fuels like e-ammonia only become viable from 2037 onwards, with LNG as the lowest-cost compliance option, potentially combined with onboard carbon capture, until then. When ammonia becomes a viable option, it would first be blue ammonia, with e-ammonia only being adopted at scale from 2043 onwards.

The second scenario (Figure 4b), with a levy and a targeted reward for e-fuels, paints a very different picture. Here, e-ammonia becomes competitive from the beginning of the regulation in 2027, turning into the lowest-cost compliance option from 2037 onwards. This shows that a sufficiently high levy combined with targeted rewards can make e-fuels competitive early on in the transition.

A universal levy and rewards can generate certainty and mitigate investment risk

Certainty is crucial for e-fuel producers making capital investments in infrastructure designed to last over 50 years. A levy and targeted rewards for e-fuels are essential to counteract market risks that come with such long-term investments. A levy discourages reliance on fossil fuels by making emissions financially burdensome, while rewards help mitigate the commercial risk of adopting e-fuels by providing financial support during their early stages of market entry. This combined approach ensures that high-potential e-fuels remain a viable option for long-term decarbonisation, even in a market that would otherwise favour lower-risk alternatives like biofuels or continued fossil fuel use.

Credit trading systems fluctuate with market forces and generate less predictable revenues for green fuels and costs for emitting, which e-fuel producers and other infrastructure developers have highlighted as a major barrier to attracting the investments needed. The main uncertainties from the flexible compliance mechanism through credit trading stem from:

- **Not knowing the price of the units to sell surplus and offset deficit.** As these will be traded between vessels, the prices will be set by the market. Whilst there is a likely range for these credits (between the cost of biofuels and the fee for non-compliance), the uncertainty and fluctuations of prices pose significant challenges for shipowners who need to pass on the costs to customers.
- **Not knowing how much central revenue will be collected and thus available for rewards.** In a credit trading system, the revenue going into a central IMO fund will be driven by shipowners paying fees for non-compliance. However, in this system, it is unclear how many shipowners will opt for paying such fees and how many will manage to buy surplus from overperforming vessels. This creates uncertainty on how much revenue the central fund will have to spend. Given that the rewards for e-fuels will be paid through this fund, this design comes with high uncertainty that the revenues will be sufficient to cover rewards.

Whilst compromise solutions such as a tiered flexible compliance mechanism can generate more revenue, fuel producers and infrastructure developers have indicated that such an approach still creates too much uncertainty for the required investments. The risks of not knowing the costs of the surplus units and unreliable revenue collection are likely to persist in such scenarios, inhibiting the required investments.

A just and equitable transition hinges on sufficient revenues

Shipping’s energy transition will likely have disproportionate negative impacts on lower-income countries. Regardless of the exact design of the measures, they will likely increase the costs of imports and exports, hitting developing countries harder due to their general nature of commodity exporters and importers. Given that both the transition itself and the measures to spur the transition will impact these countries, two questions remain: which options will keep the negative impacts to a minimum and which will be the best to mitigate the negative impacts created?

Firstly, the flexible compliance mechanism will likely reduce the negative impacts on gross domestic product (GDP) in the short run but will result in a significantly higher impact in the long run compared to options that include a levy and a revenue disbursement mechanism.

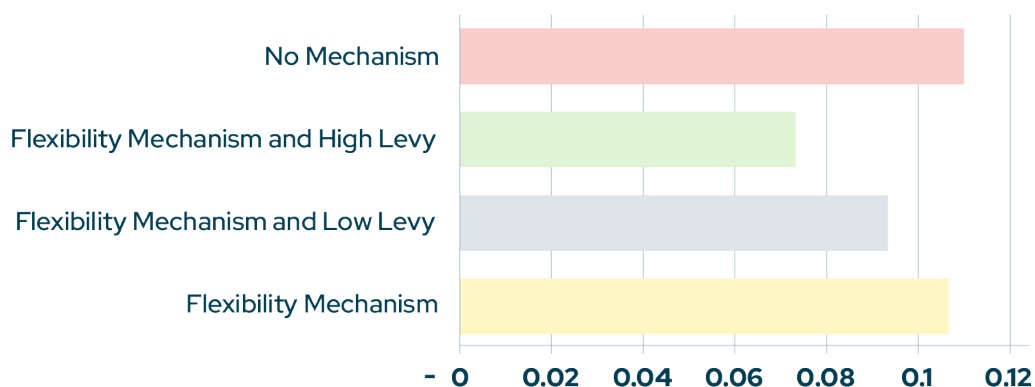


Figure 6: The impact of the various policy combinations on the global GDP between now and 2050. Scenarios that include a levy also include revenue disbursement to all economies.³

3 MEPC 82/INF.8/Add.1, using [UCL’s plotting tool](#).

Secondly, with regard to mitigating any unavoidable negative impacts on developing countries, the only other option left on the table is to use revenue spending. This means that proposals need to be reviewed in light of how much revenue they generate. Paying out rewards for e-fuels will likely be a priority. A just and equitable transition will therefore require the generation of enough revenue to pay out the rewards while having sufficient money left over to support countries in their transition, for example by supporting fuel production, infrastructure development and capacity building, and supporting wider climate adaptation and mitigation efforts.

Figure 6 below compares the total revenue volume required for rewards with the expected revenue generated in different policy scenarios. This highlights that only a scenario with a higher levy will consistently generate enough revenue to support a reward and have sufficient funds to spend on the wider energy transition and support developing countries. Alternatively, this could also be supported through a lower levy in the early years that is ramped up to a higher level as the need for revenues for rewards grows.

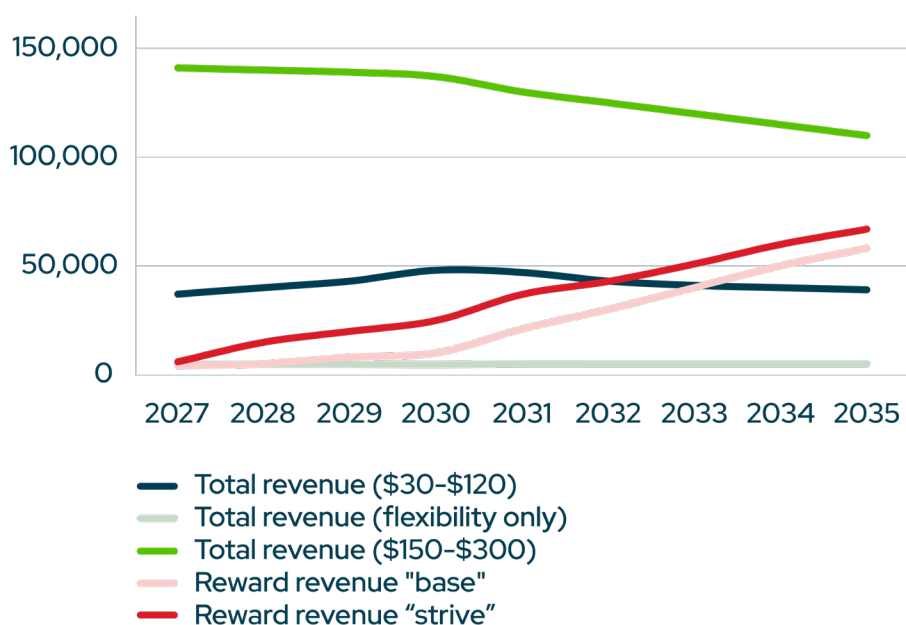


Figure 7: Reward need projections compared to the total revenues in three scenarios: a flexible compliance mechanism only, a lower levy of \$30-\$120/tCO₂e in combination with a flexible compliance mechanism, and a high levy of \$150-\$300/tCO₂e.⁴

The table below highlights the different components that are likely to make up the final package of the IMO’s mid-term measures, diving into their ability to influence the TCO of e-fuels, generate certainty/mitigate risk for investments, and enable a just and equitable transition.

4 MEPC 82/INF.8/Add.1

Elements	TCO of e-fuels	Investment Risk & Certainty	Just & equitable transition	
			Generation of impact	Mitigation of impact
Global Fuel Standard	The GFS alone will incentivise lower-cost transitional fuels and keep the TCO of e-fuels high until 2040	Increases certainty by mandating a pathway but does not in itself create a business case for e-fuels before 2040	Transition to higher cost options will likely negatively impact GDP/trade costs	No ability to mitigate impacts by itself
Flexibility Mechanism (both banded and "classic")	Due to volatility and price uncertainty, unable to close the cost gap of e-fuels	Creates cost uncertainty	Increases disproportionate burden on developing countries as it only targets underperforming vessels	No revenues available to offset any negative impact
Universal Levy	Reduces but does not fully eliminate cost gap between e-fuels and incremental solutions. Can drive sufficient reliable revenue for rewards	Generates a predictable and stable cost, increasing investment certainty	Shares the burden across the fleet, short-term impact higher, long-term impact lower	More likely to generate sufficient revenue to mitigate the impacts
Rewards	Targeting e-fuels can close e-fuel cost gap with other compliant fuels	More investment certainty for fuel producers and bunkering companies, increased bankability for investors, certainty to pass on costs through the value chain	No direct impact	Could support e-fuel production in the Global South
Revenue	Direct effect if a reliable and sufficient stream of revenues is secured	Revenue spent on fuel production and infrastructure development can mature the e-fuel market	No direct impact	Revenues to elements of a just and equitable transition can help ensure no country is left behind



Table 1: *The impacts of the elements of the measures on the business case for e-fuels.*

Conclusion

Achieving the IMO's decarbonisation targets demands urgent and coordinated action across the global shipping industry. A robust international regulatory framework – currently being discussed at the IMO – can create the change needed at the scale and speed required to deliver zero-emission shipping by 2050.

The transition to e-fuels presents the most scalable and effective path to reducing emissions, but its success hinges on creating a viable business case for e-fuels. This requires addressing key factors such as cost competitiveness, investment risk, and fuel availability, enabling shipowners, fuel producers, ports, and cargo owners to commit to long-term investments. Scenarios under consideration centred around a GFS and suggested compromise solutions like a banded flexible compliance mechanism, are unlikely to drive certainty and reduce risk for e-fuel investments. A robust regulatory framework—anchored in a levy-and-reward mechanism—can however provide the necessary financial stability, investment certainty, and sustained revenue streams to drive the adoption of e-fuels over short-term alternatives.

A just and equitable transition must ensure that decarbonisation efforts do not disproportionately impact vulnerable economies. This involves implementing policies that minimise negative short-term effects while ensuring that revenues—generated from a levy—are equitably distributed to support developing nations. Access to financial and technical assistance will be crucial to enabling these countries to build the infrastructure and capabilities needed for their transition.

Ultimately, a clear and predictable policy landscape, supported by strong collaboration between governments, industry leaders, and financial institutions, will be essential to unlocking the full potential of e-fuels and ensuring maritime decarbonisation.