Long, loud and legal: the case for zero-emission UK shipping

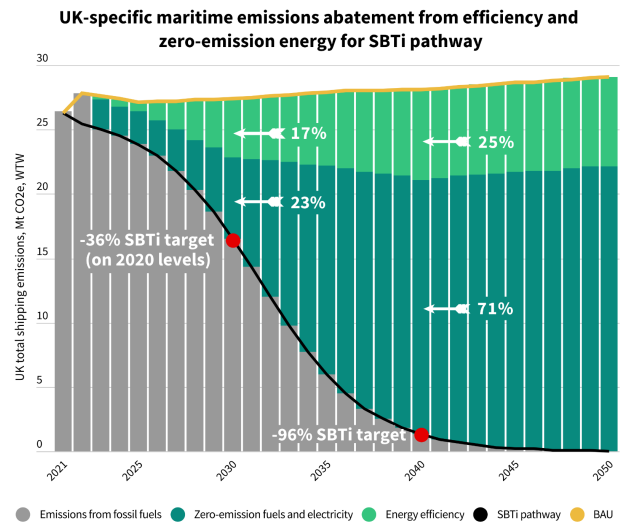
Maritime energy policy recommendations for the UK

January 2024

Executive Summary

In 2021, UK shipping burned through 7 million tonnes of fossil marine fuels, producing 26.3 million tonnes of carbon dioxide equivalent - nearly 20% of total UK transport greenhouse gas emissions. But despite the critical imperative to eliminate these emissions in line with the Paris Agreement and Net Zero, the UK has "no credible policies" for shipping emissions to meet the carbon budgets, according to the Climate Change Committee.

A visionary policy and regulatory framework is needed to achieve emissions reductions of -36% on 2020 levels by 2030, and -96% by 2040, as required by the Science-Based Targets initiative (SBTi) that the UK supports. The bulk of those savings must be achieved through **zero-emission energy** (fuels and electricity).



The UK should therefore introduce the following requirements as conditions of entry on all ships calling at UK ports:

- **A well-to-wake (WTW) energy greenhouse gas intensity (GHGi) standard** measured in grammes of carbon dioxide equivalent per megajoule (gCO_2e/MJ), to progressively increase the use of zero/near-zero-emission energy;
- **A mandate for the use of a percentage of renewable fuels of non-biological origin (RFNBOs)** to guarantee essential investment before 2030 (which could be partly supported by a maritime Contract for Difference funded via a levy on UK marine fuel sales); and
- **A mandate for ship energy efficiency improvement** to ensure the 2030 target can be met, and the most economical use of shipping energy in the long-term. This could be achieved by requiring all ships to demonstrate they meet the uppermost energy efficiency standard (label "A") under the International Maritime Organization (IMO) Carbon Intensity Indicator (CII).

Independent legal analysis undertaken for T&E shows that the UK already has the necessary primary legislative powers to obligate all vessels calling at UK ports to comply with the above measures. T&E recommends that as a first step, **the Government should use the forthcoming refreshed Clean Maritime Plan to announce its intention to consult on the above framework.**

The UK's policy choice to outsource the regulation of its international shipping emissions to the ineffective IMO is a dead-end. While pursuing IMO efforts in parallel, the UK must immediately implement a Paris-aligned, national framework for all UK shipping emissions, based on the above recommendations.

This has been a long time coming. The case for a robust and ambitious legal framework for UK maritime energy that is equal to the challenge of Net Zero is loud and clear. The course forward for the UK is clearly charted. The UK must set sail.

1. Introduction

In 2021, UK shipping used 7 million tonnes of fossil marine fuels and produced 26 megatonnes of carbon dioxide equivalent ($MtCO_2e$), or nearly 20% of total UK transport emissions[1]. Without intervention, T&E projects that these emissions will grow by ~10% by 2050[2].

UK shipping emissions must fall by 36% on their 2020 levels by 2030, and 96% by 2040[3]. Applying the principle of Common but Differentiated Responsibilities (CBDR) increases the 2030 target to -50%, and the 2040 target to zero[4]. Energy efficiency will play a significant role, but alternative fuels and electricity must deliver the bulk of the emissions savings. This must happen without significant use of many biofuels, blue fuels, onboard carbon capture and storage (CCS) or other unabated fossil fuels like liquified natural gas (LNG)[5]. Renewable electricity and renewable fuels of non-biological origin (RFNBOs) produced from it, such as e-hydrogen and e-ammonia, are the only scalable, sustainable options.

The foundations of this monumental technological transition must be firmly in place by 2030, just 6 years away. But at the time of writing, and in spite of industry calls for clarity on fuels policy[6], it has not yet begun: according to the Climate Change Committee, the UK currently has "no credible policies[7]" for shipping to meet the emissions reduction requirements of the 6th Carbon Budget in 2033.

As described at Section 2.1, normal market conditions will not bring about the energy transition required. Unprecedented levels of investment right along the clean shipping value chain are needed, and this will only be achieved through a visionary framework from the Government. The good news is that the UK already has the primary legislative powers it needs, and the forthcoming updated Clean Maritime Plan

(CMP) and Low Carbon Fuels (LCF) Strategy provide the Government with the perfect opportunity to signal how it will implement the changes.

With a focus on fuels and electricity, this briefing proposes a policy and regulatory framework for the transition: what is needed, why, and how.

2. Policy

2.1 The UK's policy problem

Despite the current absence of credible policy solutions, there are some tentative signs that the Government is starting to recognise the colossal scale of both the UK's maritime emissions problem, and the policies required to address it. The UK was one of only a handful of countries to support the Science-Based Targets initiative (SBTi)[8] at the International Maritime Organization (IMO), the United Nations Specialized Agency for the regulation of international shipping emissions. SBTi was the bare minimum emissions reduction pathway that, at the time of proposal (October 2022), was aligned with the 1.5 degree temperature objective of the Paris Agreement (Chart 1).

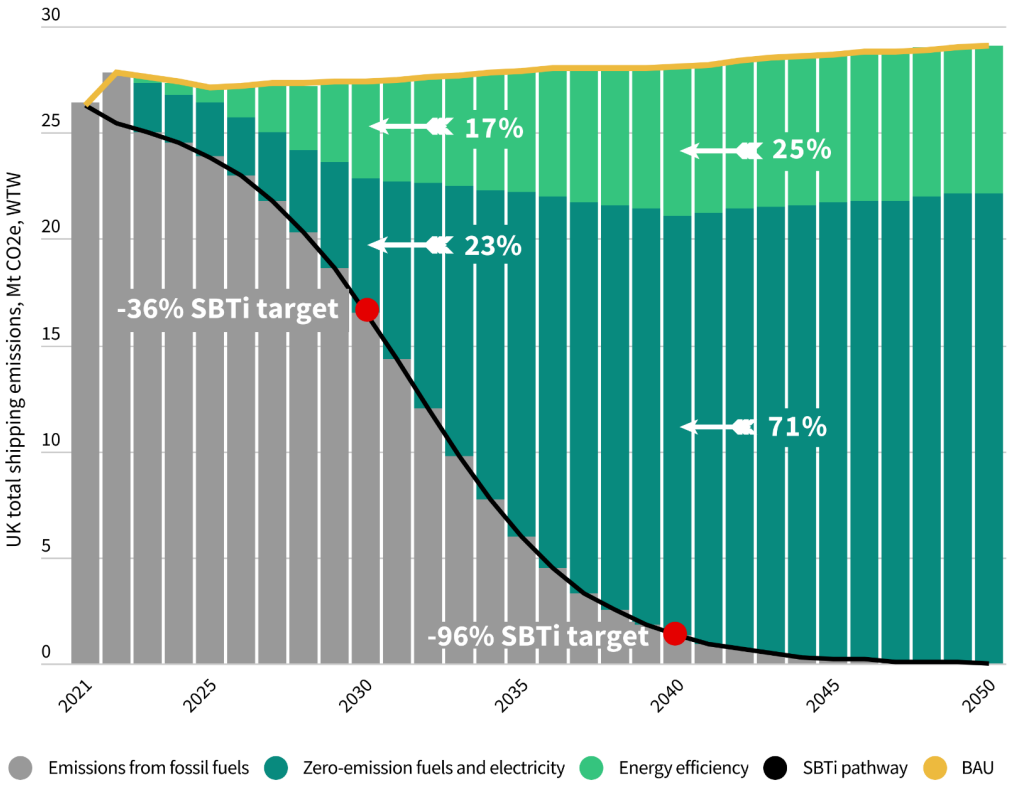
The UK also supports the IMO's target of at least 5% (striving for 10%) of the energy used by international shipping to be met by zero-emission fuel and/or energy sources by 2030[9]. And the UK's Carbon Budget Delivery Plan (CBDP) from March 2023 assumes that over 30% of all UK shipping fuel will be low-carbon[10] in 2035. Whilst inadequate for SBTi[11], the CBDP is at least a step in the right direction.

But where the UK talks the talk, it does not yet walk the walk. SBTi is an appropriate pathway to guide country-level maritime decarbonisation, but the UK has not adopted it (or any pathway) nationally. The Government's own CBDP assumptions are not backed by policy, whilst according to the Global Maritime Forum, the window to achieve even 5% zero-emission fuels in 2030 has nearly passed and rapid action is needed[12].

Chart 1 shows the emissions abatement needed for the SBTi pathway against UK business-as-usual (BAU) maritime emissions. An additional 17% (to BAU) abatement is possible from energy efficiency measures by 2030, increasing to 25% by 2040.[13] This leaves an abatement gap of 23% by 2030, and 71% by 2040. We have assumed these will be bridged with zero-emission energy. But the scale is huge. T&E analysis of the CBDP assumptions[14] shows that to meet just one third of UK shipping's 2021 energy demand with zero-emission fuels and electricity in 2035 would require 44 Terawatt hours (TWh): the output of almost all of the wind turbines that were operating in the UK in 2021. This is more than the electricity consumption of London[15].

But the same analysis also shows the maximum emissions abatement possible from the CBDP assumptions is insufficient for the SBTi targets, achieving 1% abatement in 2030 and 31% in 2035[16].

Chart 1: UK-specific maritime emissions abatement from efficiency and zero-emission energy for SBTi pathway (applied nationally)



Note: BAU pathway uses 2021 AIS-based UK 26.3MtCO2e inventory projected forward from 2023 using demand and efficiency growth assumptions from IMO 4th GHG study. Max additional energy efficiency potential from T&E European decarbonisation roadmap (2021). SBTi curve from T&E e-fuel mandate dashboard (July 2023). Abatement needed from zero-emission energy calculated as the difference between BAU and SBTi minus abatement from additional efficiency. SBTi targets use a 2020 baseline; efficiency and energy percentages based on BAU

This points to the need for a very radical change in government policy, for two reasons:

A. The market will not deliver

Current market conditions (even including the modest government interventions outlined below) will not deliver zero-emission energy. There are no commercial or effective regulatory drivers in the UK. Fossil marine fuels are untaxed and their emissions unpriced[17].

The cheapest sustainable e-fuel is likely to be between four and nine times more expensive than marine fuel oil (MFO) on a total cost of operation (TCO) basis[18]. New analysis of the cost of producing green hydrogen[19] suggests that estimates of €2-3/kg made as recently in 2021 are now some way off; actual costs are likely to be €5-8/kg. The anticipated scarcity of zero-emission marine fuels[20] will do nothing to reduce their costs, and the global shipping sector is likely to need 30-40% of the world's supply of carbon-neutral fuels in 2030 to meet the IMO strategy's goal of 5-10% zero-emission fuel in that year[21].

B. And neither will the Government's plan

The UK government opts for a "twin-track" policy approach to maritime decarbonisation: developing emissions policy only for UK domestic vessels[22] whilst passing responsibility for UK international emissions - 80% of the total in 2021[23] - to the ineffective IMO. This policy choice will fail.

This is because, **firstly**, the IMO's newly-agreed 2050 Strategy on the Reduction of GHG Emissions from Ships[24] is not aligned with the temperature objective of the Paris Agreement: the mid-term targets are too weak and the strategy is non-binding. This means that, even if the targets are met, the UK will still be in breach of its climate treaty obligations. See Annex B for further detail. And **secondly**, the three principal emissions reduction measures either already adopted or proposed by the UK government for domestic shipping emissions amount to no quantifiable reductions (see Info Box).

INFO BOX: the inadequacy of UK shipping emissions policy

Measure	Problem
Proposal to expand the **UK Emissions Trading Scheme** (ETS) to maritime	• Limited to larger, domestic vessels only: 90% of UK shipping emissions excluded • Carbon price too low to drive any abatement[25]
Supporting marine RFNBOs under the **Renewable Transport Fuel Obligation** (RTFO)	• No marine RFNBOs supplied since 2022 amendments to include them. This will not change: - RTFO based on narrow primary powers in Sections 124-132 of the Energy Act 2004 which limit the renewable fuel obligation to fuel suppliers. Maritime sector needs **demand-generating regulations** - No obligation on marine fuel suppliers - No price floor for Renewable Transport Fuel Certificates (RTFCs), meaning the RTFO is less bankable from an investor perspective • RTFO funded by a levy at the petrol pump: inappropriate for UK motorist to pay for zero-emission marine fuels
The **UK Shipping Office for Emissions Reductions (UKSHORE)** for research and development (R&D) into clean maritime technologies	• Budget of £206m is very limited relative to the scale of the maritime decarbonisation challenge • UKSHORE grant-funding not complemented by any policy or regulatory measures to bring technologies developed to commercial scale

Despite so much now riding on the refreshed CMP and LCF Strategy, both due for publication in early 2024, even when combined these measures will not deliver an adequate policy response. The Government has been clear that the CMP will set indicative targets only[26], and also only apply to UK domestic shipping. **The twin-track policy approach will therefore remain in place**. This means that the Government's plan for an "ambitious, but feasible, pathway to net zero emissions"[27] will contain no binding targets for any UK shipping emissions by any date. The twin tracks lead to a dead-end.

2.2 Policy recommendations

The UK needs a demand-generating regulatory framework for zero-emission shipping energy, now, to ensure adequate investment flows to the maritime energy technologies required to meet the UK's SBTi targets. To this end, T&E recommends that the Government require all UK ships to demonstrate compliance with the following requirements:

- An **energy greenhouse gas intensity (GHGi) standard** measured in grammes of carbon dioxide equivalent per megajoule of energy used (gCO_2e/MJ) on a well-to-wake (WTW[28]) basis;
- The use of a **minimum mandated percentage of renewable fuels of non-biological origin (RFNBOs)**; and
- A minimum **energy efficiency standard**.

All measures should increase in stringency over time to align with the SBTi pathway. These requirements should be imposed as conditions of entry to UK ports. **All electricity used should be rated as zero GHG**, and **battery-electric vessels should be exempt from the RFNBO mandate**.

T&E analysis shows that in 2021, around 10% of UK shipping emissions were produced by moored vessels[29]. These emissions must be addressed, and T&E has commented separately on the need for greater provision of shore power in the UK[30]. **T&E recommends that emissions from moored vessels in the UK be addressed through the introduction of a zero-emission berth (ZEB) mandate**. This would drive shore power provision in ports where appropriate and allow zero-emission alternatives elsewhere. For the purposes of this briefing we do not provide separate consideration of a ZEB mandate, and assume instead that the impact of a ZEB mandate is included in the abatement achieved by the use of zero-emission fuels and electricity as set out at Chart 1.

T&E urges the Government to include a commitment in the forthcoming refreshed Clean Maritime Plan to consult as soon as possible on all the policy recommendations set out above.

2.3 Benefits

The UK's Net Zero Growth Plan refers again and again to opportunities associated with net zero and the energy transition[31]. Adopting the SBTi pathway nationally and implementing the above policy recommendations would be a first-rate example of what this means. Far from "turning its back" on the IMO, the UK would be showcasing to the rest of the world how to deliver on, and exceed, the IMO 2050

strategy's goals on emissions and zero-emission fuel uptake at the national level. This would be the action of a climate leader.

Doing so would play to the UK's existing strengths in maritime services and academic, R&D, technological and commercial capabilities. It would drive demand for UK-produced battery-electric maritime technologies (echoing the House of Commons Business and Trade Committee's advice to support UK battery manufacturers)[32]. A demand-side measure for green hydrogen would help correct the UK's "failure to commit to strategic decisions on certain technologies and key use cases[33]" and draw UK-produced green hydrogen into a sector that is near the top of the "hydrogen ladder[34]" merit order for green hydrogen use. Producing and using zero-emission marine energy in UK shipping would mitigate the risks to the shipping sector of global fossil fuel price spikes that result from the UK's dependence on imports of crude oil and other feedstocks[35] for its supply of marine fuel.

The market potential for green, hydrogen-based RFNBOs is enormous: T&E analysis shows that, should the UK's 2040 SBTi target be met with zero-emission energy, ~8.8 million tonnes of RFNBOs could be required (see Section 3.4). Maersk's announcement to invest €10bn in green hydrogen-based marine e-fuel production in Spain[36], with the potential to create up to 85,000 jobs, is the direct result of the EU FuelEU Maritime (FEUM) regulation's combined GHGi standard and RFNBO mandate, and a succinct example of the transformative impact of strong policy signals from government.

2.4 Legal basis: how these requirements can be introduced

Independent legal analysis[37] commissioned by T&E shows that the Government is arguably obliged to act on its international shipping emissions independently of the IMO. The same analysis also shows that the necessary legal powers to implement the recommendations in this briefing (covering all UK shipping emissions) already exist in the Merchant Shipping Act 1995 (the 1995 Act).

GHG emissions are caught by the definition of pollution of the marine environment under Article 1 of the United Nations Convention on the Law of the Sea (UNCLOS), and the definition of marine pollution under the 1995 Act is sufficiently broad to include the GHG emission pollution from ships burning marine fossil fuels. This allows the Government to use the primary power in Section 129 of the 1995 Act to bring forward an Order or Orders:

> "*to impose a variety of regulatory obligations on all ships entering UK ports to prevent, reduce or control pollution from GHG emissions. These could include a fuel emissions standard, a fuel levy or emissions charge, or mandatory efficiency standards[38]".*

Using this jurisdiction (known under UNCLOS as port State control, or PSC) to impose regulations on vessels entering a State's ports to control pollution of the marine environment is neither new, nor means the UK would be acting alone. PSC forms the legal basis of both the UK's and EU's existing Monitoring, Reporting and Verification (MRV) regulations, and the FEUM regulation's requirements on fuel GHGi and use of RFNBOs for ships making EU port calls.

3 Discussion

3.1 A balance of measures

Alongside the critical need for deep emissions cuts this decade, considerable uncertainties exist around costs, production pathways and availability of zero-emission marine energy and associated technologies. The combination of regulatory measures recommended here would permit a spectrum of energy technology options (initially) to progressively reduce shipping emissions, but also target large-scale use of RFNBOs and electricity as soon as possible. This is likely to be more effective than any single measure.

3.2 Why impose these requirements on ships (and not other entities)?

Requiring ships to comply with the regulations creates the necessary signals for both supply and demand, essential to the goal of the demand-generating regulatory framework recommended by T&E[39]. It is also the simplest way to meet the UK's obligation to regulate all its shipping emissions independently of the IMO, and is the approach used by FEUM, so would ensure regulatory harmony.

In practice, ship operating companies[40] would be responsible for compliance with the regulations, and this could be done by providing evidence of GHGs saved and fuels / technologies used to the Maritime and Coastguard Agency (MCA, as the UK's competent authority). Independent verification of evidence could be sought from organisations accredited to the appropriate International Standards (mirroring the approach of the RTFO and minimising the administrative impacts for the MCA).

3.3 Why use an energy GHGi standard?

The energy GHGi standard measures the well-to-wake[41] (WTW) GHG emissions that result from each unit of energy used. Because it is unaffected by efficiency, the standard can only be met by switching to forms of energy that emit less than the baseline value.

The standard does not expressly favour specific technologies over others, so offers a degree of technological neutrality[42]. It also safeguards against the emissions risk associated with using the CII as an efficiency standard as suggested at Section 3.6 (and explained at Annex A). It creates an incentive for the use of electricity (if rated zero GHG) and battery-electric vessels. This would encourage provision of shore power and charging infrastructure in UK ports, complementing the ZEB mandate recommended at Section 2.2. The standard could also create an incentive for wind power and wind-assist technologies, if an appropriate future protocol to measure energy and GHG savings can be developed.

The standard uses the same metric as the fuel GHGi standard under FEUM, and whilst the UK needs to be more stringent for SBTi, the regulatory structure would be the same. Furthermore, the IMO's proposed "candidate" goal-based marine fuel standard (GFS) (regulating the phased reduction of marine fuel GHG intensity) may operate in a similar way (although the UK should not wait for / depend on an IMO GFS - see Info Box). A UK GHGi standard could help guide the IMO in the design of its global GFS (which could be in operation by 2027).

INFO BOX: why the UK must not wait for an IMO GFS

There is no guarantee that the goal-based fuel GHG intensity standard expected to be adopted by the IMO will be adequately designed to promote sustainable and scalable fuels in the near term. An IMO GFS would only capture UK international shipping emissions above 5000 gross tonnage (GT) and exclude UK domestic emissions and international vessels smaller than 5000GT. Furthermore, experience with the CII shows that enforcement remains a key challenge for IMO measures, negatively impacting the GHG emissions associated with the UK's trade.

This point is key. The UK will assume legal responsibility for its international shipping emissions from 2033, when they will be included in Carbon Budget 6. Enforcement of IMO regulations falls to Flag States, and the majority of UK shipping is not registered under the UK flag. This means that other Flag States (Cyprus, Bermuda and the Bahamas in the case of the P&O ferries operating between England and France[43]) would effectively determine whether the majority of UK shipping met the requirements of the GFS and, by extension, the UK carbon budgets.

A UK energy GHGi standard enacted through Port State Control would allow the UK to tailor the standard to its own emissions reduction obligations, and ensure also that the standard is met.

Setting the standard level

The standard should be calibrated to the quantity of abatement possible from energy efficiency (see Section 3.6) to bridge the remaining abatement gap (23% in 2030 and 71% in 2040) (Chart 2).

In this scenario, the energy GHGi standard would need to be set at **65.9gCO$_2$e/MJ** in 2030, decreasing to **5.5gCO$_2$e/MJ** in 2040 and zero in 2050 (Chart 3).

Chart 2: UK emissions abatement needed from zero-emission energy in 2030 and 2040, SBTi-compliant

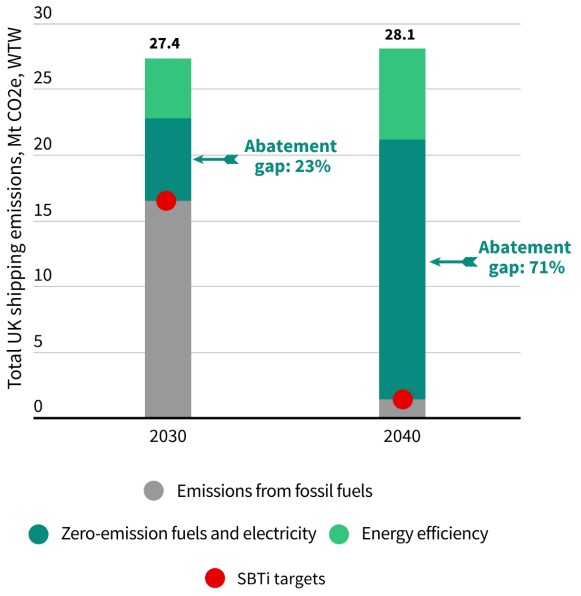
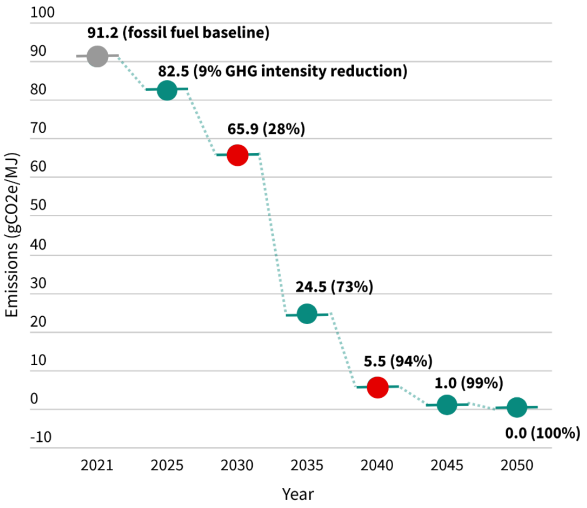


Chart 3: UK vessel energy GHGi standard required for compatibility with SBTi targets



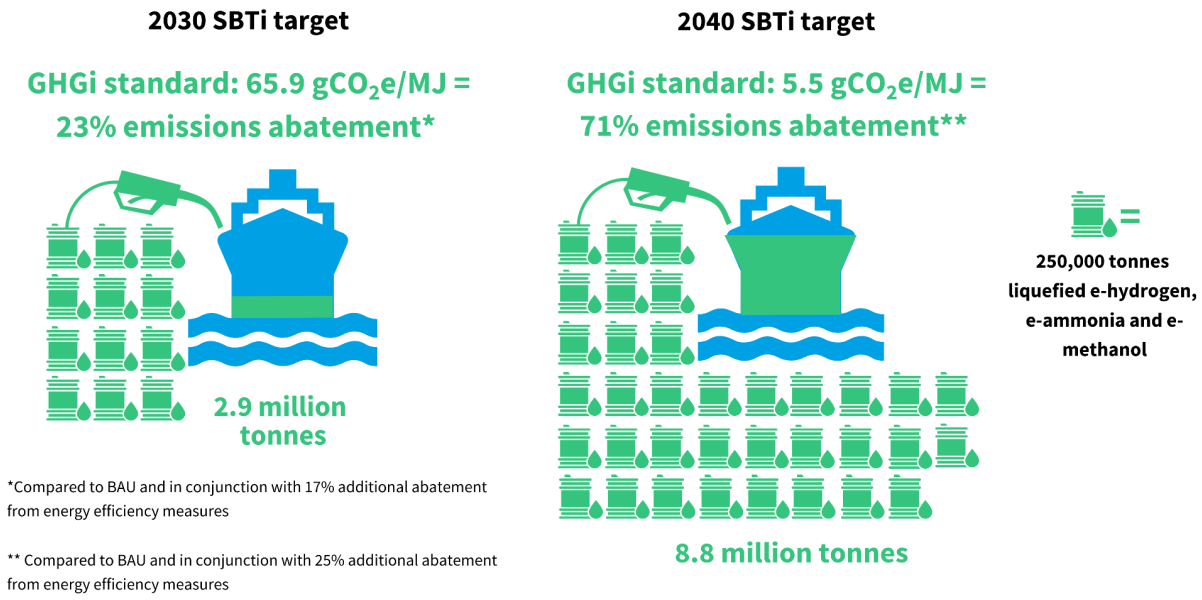
Note: 2021 UK emissions intensity assumed to be equivalent to FuelEUMaritime regulation fossil fuel baseline of 91.16gCO2e/MJ. The dotted lines illustrate an approximate trajectory linking the target years and are not a precise pathway.

3.4 Why mandate RFNBOs?

The energy GHGi standard does not on its own guarantee demand for the use of the zero-emission RFNBOs and electricity required for long-term decarbonisation. Alternatives such as unscalable biofuels and LNG face an increasingly challenging business-case[44], but they are cheaper than RFNBOs and could still be used to meet early-phase energy GHGi targets. This would delay investment in RFNBOs which is needed now to ensure these fuels are available at scale from 2030. A mandate will guarantee that investment.

In its impact assessment of FEUM, the European Commission recognised that, without a regulatory framework for the necessary technological developments, uptake of new fuels would be at best marginal[45]. FEUM therefore includes a mandate for the use of RFNBOs[46].

Current UK uptake of zero-emission shipping fuels is essentially zero,[47] and the highly uncertain trajectory to commercial usage means we do not recommend specific mandate levels at this stage. However, the Government should be under no illusions about the scale of fuel uptake required, and we flag that a UK RFNBO mandate must be more ambitious than the existing requirement under FEUM. Based on existing T&E analysis, we indicate below the fuel quantities[48] required to meet the GHGi standard.



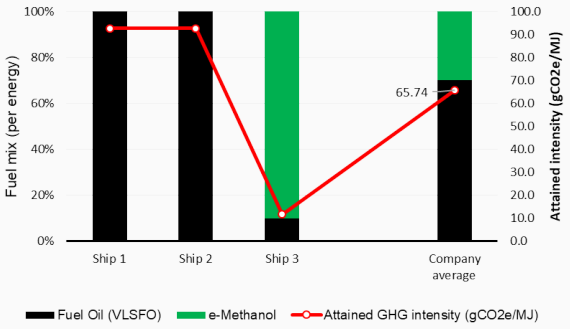
3.5 Compliance with the targets

The compliance requirement for both the GHGi intensity standard and RFNBO mandate should be placed at company fleet level, or even among different companies, rather than at the level of the individual vessel. This "pooling" mechanism forms the basis of the RTFO's tradable certificate mechanism, as well as being used for FEUM.

It means that a small number of zero-emission vessels can generate a compliance surplus which can then be distributed among non-compliant vessels. This incentivises ship operating companies to deploy new or fully-retrofitted vessels using near-zero emission energy, instead of simply improving the performance of old vessels by blending drop-in biofuels. Pooling is appropriate for easing compliance with both the energy GHGi standard and RFNBO mandate.

For example, as shown at Fig 2, a company with three very low sulphur fuel oil (VLSFO[49])-powered vessels[50] needing to meet the 2030 GHGi reduction target of 65.9gCO_2e/MJ necessary for 23% emissions reduction on BAU (as discussed at Section 3.3) could invest in a single VLSFO / methanol dual-fuel vessel and use VLSFO / RFNBO e-methanol[51] at a ratio of 10 / 90. The over-compliance from this single vessel can then be pooled across all three, achieving a compliant, fleet average GHGi of 65.7gCO_2e/MJ and delivering the same GHG savings as each vessel meeting the target individually. The percentage use of zero-emission fuel can be flexed according to availability / the target.

Figure 2: pooled compliance (2030)



Penalties

A disincentive for non-compliance is also needed: it will result in an adequate investor framework and guaranteed GHG savings. EU regulations for Sustainable Aviation Fuel (SAF) contain penalties for non-compliance, as does FEUM for both the GHGi and RFNBO targets[52].

The UK's RTFO contains a buy-out mechanism[53], and also a civil penalty provision for non-compliance[54], which could form the basis of a similar provision for a maritime RFNBO mandate. T&E cautions that, whilst a buy-out does protect fuel suppliers and users from excessive costs, it can also lead to costs for fuel suppliers and users but no fuel, and thus no greenhouse gas savings. An effective balance between buy-out level and civil penalty needs careful consideration.

3.6 Why mandate energy efficiency measures?

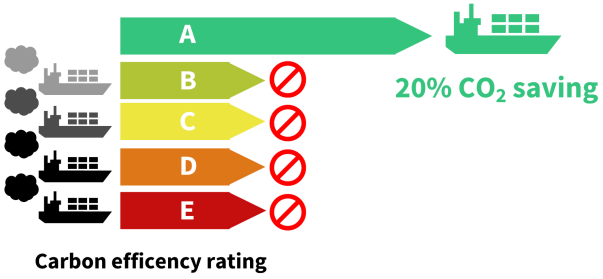
In the long-term, efficiency measures will ensure the use of scarce and expensive renewable fuels[55] is kept to a minimum. Efficiency is also needed in the run-up to 2030, when zero-emission fuels and electricity on their own will not have achieved sufficient market penetration to meet the SBTi -36% target. Regulations driving the most **efficient and economical use of shipping energy** are essential and, as they are integral to shipping energy policy design, we include high-level consideration.

T&E analysis shows that, compared to the BAU scenario, an additional 17% emissions abatement from the maximum use of energy efficiency measures is possible in 2030, increasing to 25% in 2040, as shown at Chart 1. The UK should mandate their use, but not at the expense of regulations requiring

zero-emission RFNBOs in 2030 (essential to guaranteeing adequate long-term supply). In other words, an energy efficiency mandate should be configured to achieve a majority of the required abatement in 2030, and a GHGi standard and RFNBO mandate introduced to deliver the remainder.

Recent analysis by CEDelft[56] of vessels within scope of the 2019 EU Monitoring, Reporting and Verification (MRV) regulations, which included the UK, finds that emissions reductions from energy efficiency measures of ~20%[57] could be achieved if all EU MRV vessels were required to meet the highest energy efficiency standard (label A) under the IMO's existing operational Carbon Intensity Indicator (CII) metric. **Placing a requirement on all ships making UK port calls to demonstrate that they meet the standard required for CII A** is one policy lever the UK could introduce as a way of mandating energy efficiency measures.

All ships entering UK ports meeting the efficiency standard for CII label A



Source: CE Delft. Annual efficiency savings of EEA + UK if only 'A'-rated in the IMO's Carbon Intensity Indicator (CII) are allowed to enter ports

3.7 Funding zero-emission RFNBOs

In a world where marine RFNBOs cost between 4 and 9 times more than conventional marine fossil bunker fuels[58], the need for revenue support may be indicated. Currently, the only incentive for marine RFNBOs in the UK is the RTFO but to date, this has not delivered any fuel.

If designed correctly, a RFNBO mandate would result in some supply of fuel and it is uncertain whether additional support would be needed: early industry moves towards marine RFNBOs[59], required for compliance with the FEUM RFNBO mandate from 2034, have thus far taken place in the absence of a dedicated support mechanism. However, given the very real risk that the costs of zero-emission energy fall disproportionately on the parts of the sector least able to afford them - i.e., UK domestic shipping - consideration of support should be given. The RTFO should not be used for the reasons set out at Section 2.1. The creation of a maritime Contract for Difference (CfD) is a possible solution.

A CfD would guarantee a stable price for all marine RFNBOs produced by a plant for a minimum length of time, de-risking operational costs for first-moving companies. This should ensure that private finance and capital flow to proposed RFNBO plants, thus starting an essential future UK industry[60].

However, the design of the CfD scheme is critical. Should CfDs be adopted, T&E makes the following recommendations:

- **Only UK-produced marine RFNBOs should qualify for the scheme.** This guarantees that UK industry benefits from both domestic and international bunker sales whilst avoiding subsidising fuel produced overseas; and
- **The CfD should be funded by a levy on UK marine fuel suppliers.** This mirrors how the UK's electricity CfD is funded and is also the model used for the RTFO, where RTFCs are funded through a levy at the fuel pump. This ensures that the cost of decarbonisation is borne by industry, adhering to the polluter pays principle.

4. Conclusions & recommendations

The enormity of the UK's shipping energy and emissions problem cannot be overstated, nor the urgency with which the Government must tackle this issue. However, the development of an effective national framework for decarbonisation is being seriously hindered by an outdated policy approach that views UK domestic and international shipping emissions as separate issues, whilst failing to adequately address either. In persisting with this policy choice, the UK is turning away from multiple benefits including international climate leadership, green industrial opportunity and energy security. At the same time, the Government is significantly increasing the risk that the UK's shipping emissions become unmanageable and breach the carbon budgets.

It does not have to be this way. As discussed in this briefing, the UK should use its existing legal powers to implement a binding, Paris-aligned regulatory framework for all UK shipping. Specifically, T&E recommends requiring all ships making UK port calls to demonstrate:

- That they meet a **minimum energy GHGi standard measured in gCO_2e/MJ**;
- Use of a **minimum mandated percentage of RFNBOs**; and
- That they meet a **minimum standard of energy efficiency**, which could be partially met by **demonstrating compliance with the standard required for IMO CII label A.**

These measures would provide much-needed certainty for the shipping sector and set the UK on a clear course for zero-emission shipping by 2050. **We urge the Government to clearly signal this intention by committing to consulting on these measures in the refreshed Clean Maritime Plan.**

Further information

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Annex A: The IMO CII

The IMO Carbon Intensity Indicator (CII) is one of the short-term measures developed as part of the IMO Strategy on the reduction of GHG emissions from ships. The CII applies to bulk carriers, combination carriers, container ships, cruise passenger ships, gas carriers, general cargo ships, LNG carriers, refrigerated cargo carriers, ro-ro cargo ships, vehicle carriers, ro-ro passenger ships and tankers of 5,000 GT and above, that undertake international voyages.

The CII measures the efficiency with which vessels undertake transport work. It uses a specific metric to measure the operational carbon intensity of ships: grammes of CO_2 emitted per tonne of cargo carrying capacity per nautical mile (gCO_2/DWT-nm). Ships must determine their attained CII level on an annual basis and depending on the level attained, the ships receive a label, ranging from label A (best) to label E (worst).

The boundaries of the label categories become stricter over time. This means that ships which receive a specific label in one year may not automatically receive the same label in subsequent years. If the operational carbon intensity of the ship is not improved, it can be expected that the ship will receive worse CII labels over time.[61]

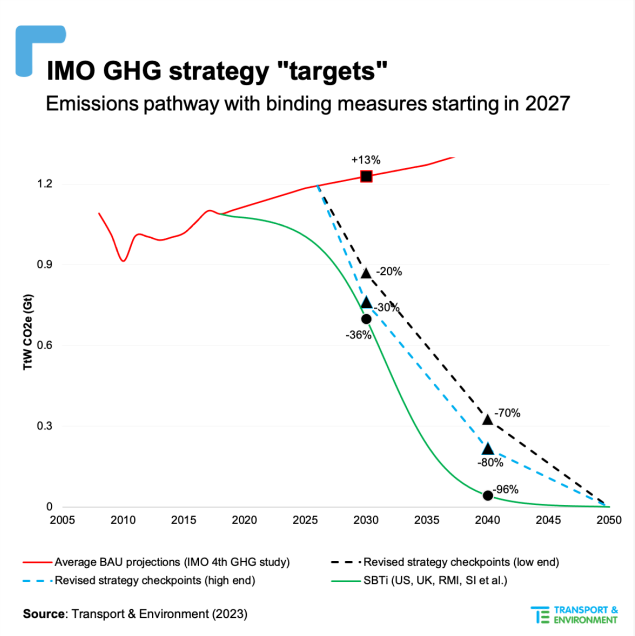
The CII does have a number of shortcomings: the required minimum standard is currently label C, which is too low to drive the efficiency-related emissions savings needed under SBTi; it is based on a tank-to-wake (TTW) assessment of emissions, meaning any emissions occurring (or saved) in the fuel production and supply chains upstream of the vessel's fuel tank are not counted; and it only measures CO_2.

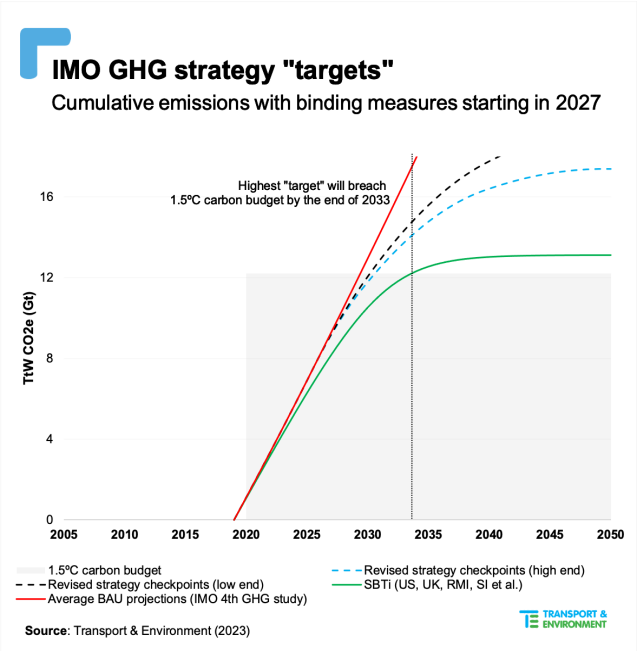
Requiring ships to demonstrate they meet the standard required for CII label A is a simple way to increase the ambition of the CII without needing to duplicate technical IMO CII rules within the national framework.

The IMO proposes to complete a review by 1 January 2026 of the mandatory short-term measures to improve vessel efficiency, which will include the CII. If agreed, these can be expected to positively impact the policy measures recommended in this briefing (through increased abatement from energy efficiency).

Annex B: The IMO 2050 GHG strategy

The IMO's recently-agreed 2050 Strategy on the reduction of GHG emissions from ships is demonstrably not aligned with the 1.5 degree temperature objective of the 2015 Paris Agreement. As shown below, the "indicative checkpoints", even if met, result in an emissions trajectory in excess of what is required for the Paris-aligned SBTi pathway.





Endnotes

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40. Those responsible for a vessel under the international safety management (ISM) code. We propose that if a responsible company is not the entity taking the day-to-day decisions that affect a ship's emissions, that company can claim reimbursement for the costs incurred from the commercial operator, if specified by a contract clause for chartering the vessel
41. Well-to-wake emissions, or life-cycle emissions, are the sum of upstream (well-to-tank) and downstream (tank-to-wake) emissions. This is the approach taken by the FuelEUMaritime regulation
42. An energy GHGi standard is not completely technology neutral in practice. Biofuel production has benefitted from decades of subsidies, lowering production costs. Under the RTFO and FEUM, RFNBOs must meet 65% and 70% GHG reduction on the baseline, respectively, whilst no such criteria are applied to LNG
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46. A 2% RFNBO mandate will apply from 2034 if the share of RFNBOs in total European shipping's energy use is below 1% in 2031
47. See footnote 7
48. Quantities calculated according to the methodology used for T&E's e-fuel mandate dashboard but adjusting the emissions according to the BAU values used at Chart 1. Emissions factors from FEUM annexes: ammonia and hydrogen 0gCO_2e/MJ (does not include potential N_2O factor), methanol 2.76gCO_2e/MJ. Dashboard assumes 100% moored emissions are abated with shore power: here, we assume a ratio of 50/50 shore power/zero-emission fuels, as a possible scenario resulting from a UK ZEB mandate. Quantities will be greater if RFNBO sustainability criteria of the RTFO / FEUM (65% / 70% GHG reduction) are applied
49. VLSFO FEUM emissions intensity = 92.73gCO_2e/MJ WTW
50. We assume all vessels consume the same amount of fuel
51. RFNBO e-methanol emissions factor = 2.76 gCO_2e/MJ, this being the minimum possible emissions under FEUM
52. EUR-Lex (13 September 2023). Regulation (EU) 2023/1805 of the European Parliament and of the Council on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC Accessed at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1805
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57. The analysis concludes that 43Mt CO_2 could be saved if all 2019 EU MRV vessels were labelled CII A. BAU 2019 MRV emissions are calculated as 141.52MtCO_2. 43Mt includes 14.51Mt from the use of renewable fuels by new-build vessels entering the fleet from 2028. As these emissions savings are the result of fuel switching we exclude them as efficiency measures. Emissions are expressed as CO2, TTW only. CEDelft (June 2023). CII and EU maritime decarbonisation. Accessed at: https://cedelft.eu/wp-content/uploads/sites/2/2023/06/CE_Delft_220400_CII_and_EU_maritime_decarbonisation_Def.pdf
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60. It is in the UK's interests - and within its gift - to ensure that at least a proportion of any marine RFNBO mandate is met with domestically-produced fuel. Recent techno-economic assessment of importing low-carbon hydrogen to Europe (https://www.catf.us/resource/techno-economic-realities-long-distance-hydrogen-transport/) indicates importing hydrogen to Europe over long distances will be expensive and energy-inefficient. Further benefits included at Section 2.3.

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