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Alternative Bunkering Market Landscape

1st August 2025

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Overview Legislations

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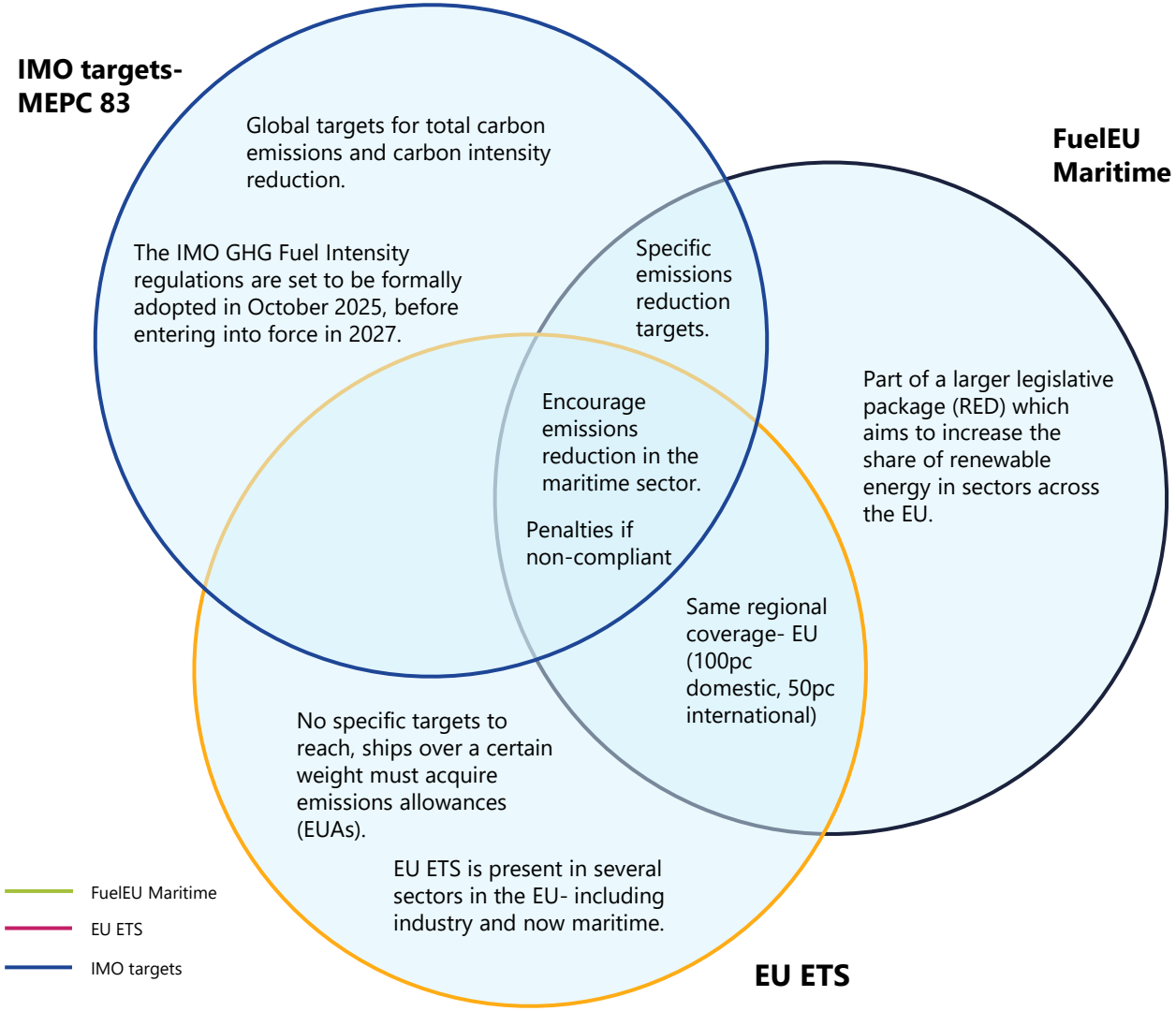
Maritime renewable fuels: Legislation overview

Summary of relevant legislation that affects the maritime sector

Timeline for legislation relevant to the maritime sector

- **2008** – Reference year for decarbonization targets in IMO legislation
- **2009** – RED (Renewable Energy Directive) starts
- **2020** – Reference year for FuelEU Maritime decarbonization targets
- **2021** – FuelEU Maritime proposal introduced
- **2025** – EU ETS comes into effect in the Maritime sector- companies to start sharing emissions
- **2025** – FuelEU Maritime target: 2pc reduction in GHG intensity vs 2020 levels
- **2028** – Implementation of IMO GHG Fuel Intensity (GFI) targets and Remedial Units (RUs)
- **2030** – IMO target: 20-30pc reduction in GHG emissions vs 2008 levels 5pc RFNBO target and 40pc carbon intensity reduction target
- **2035** – IMO GFI target: 30pc reduction (Base Target) & 43pc reduction (Direct Compliance Target) vs 2008 levels
- **2040** – IMO target: 70-80pc reduction in GHG emissions vs 2008 levels
- **2050** – IMO target: 100pc reduction in GHG emissions vs 2008 levels
- **2050** – FuelEU Maritime target: 80pc reduction in GHG intensity vs 2020 levels



Source: IMO, European Commission, Argus Media - Consulting Services

IMO vs FuelEU Maritime Framework

IMO GFI and FuelEU Maritime framework comparison

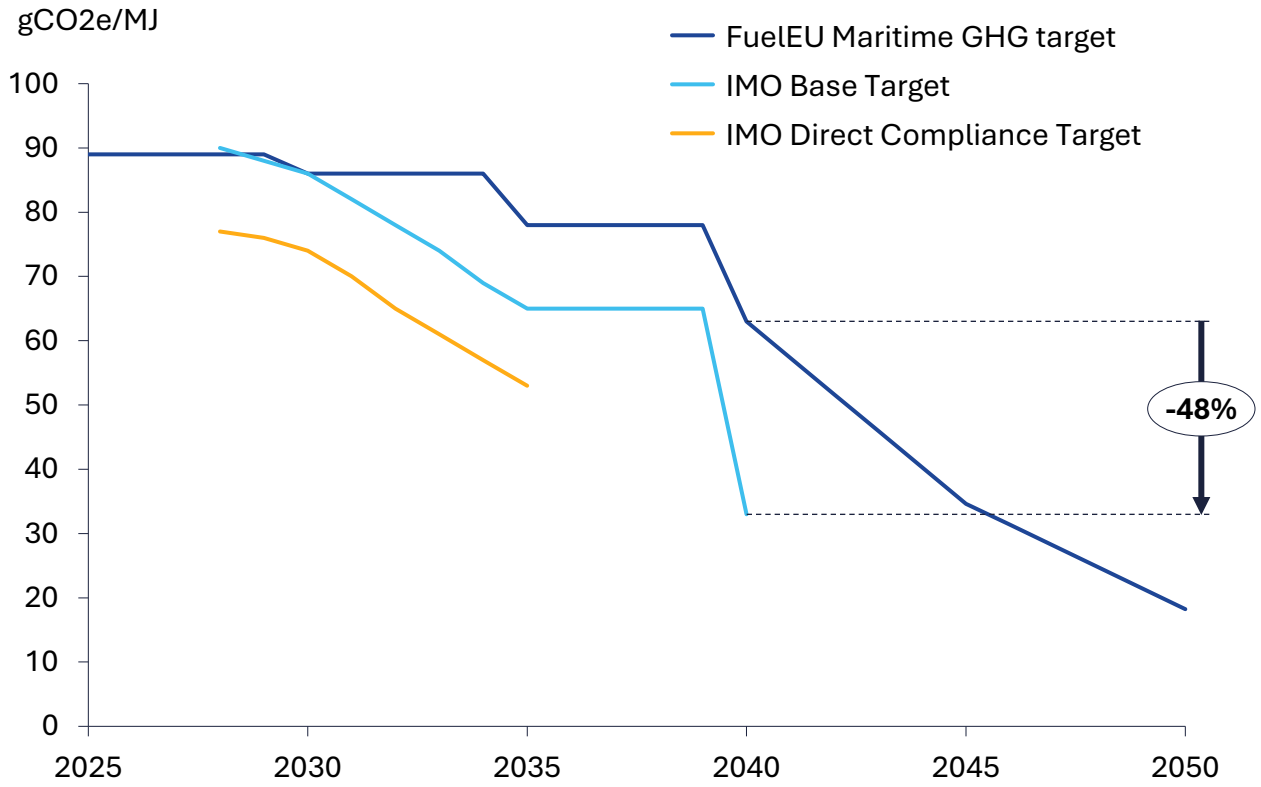
	IMO GFI	FuelEU Maritime
Fossil fuel baseline	93.3 gCO2e/MJ	91.16 gCO2e/MJ
Flexibility mechanism	Surplus Units (SUs) generated from ships exceeding the Direct Compliance GFI targets can be: • Banked for two years • Traded with ships not meeting the Base GFI targets • Pooled with other vessels • Cancelled	Compliance surplus can be: • Banked (does not expire) • Sold • Pooled with other vessels • Cancelled
Biofuel criteria	No limitations on the food and feed crop-based biofuels	Food and feed crop-based biofuels are non-eligible for emissions reduction
Sustainability requirements for ZNZ emission fuels / RFNBO	• The GFI threshold of zero and near-zero (ZNZ) emission fuels must be: - no greater than 19.0 gCO2eq/MJ until 2034 - no greater than 14.0 gCO2eq/MJ from 2035	• RFNBOs/e-fuels must meet the 70pc GHG reduction threshold of the EU REDII (i.e. max 28.2 gCO2e /MJ)
RFNBO targets / incentives	• No sub-target • ZNZs are eligible for financial reward from the IMO Net Zero Fund (will be determined by 1 March 2027, subject to revenue availability)	• Multiplier of 2 for RFNBOs until 2033 • 2pc sub-target for RFNBOs by 2034 (if 1pc uptake not reached by 2031)

Source: IMO, European Commission, Argus Media - Consulting Services

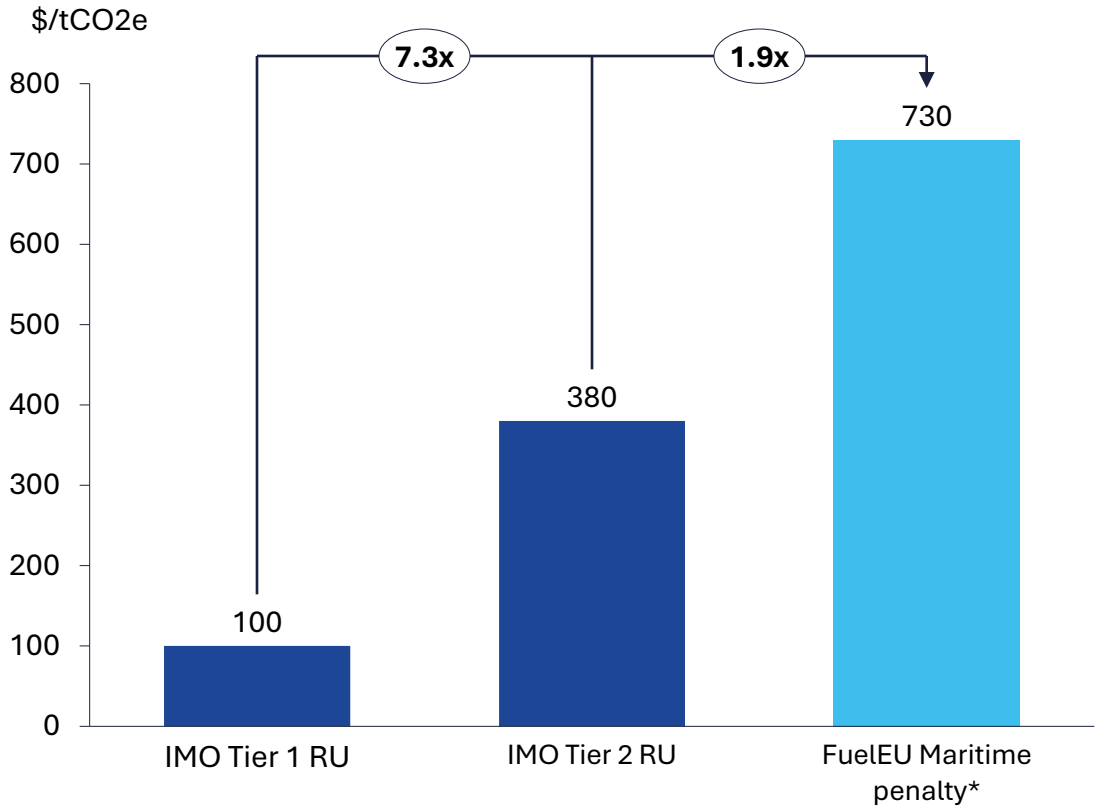
Fuel GHG intensity targets: IMO vs FuelEU Maritime

Despite the IMO's more aggressive targets, FEUM's penalty is significantly higher, leading to higher compliance costs for ship operators

IMO GFI vs FuelEU Maritime GHG reduction target, 2025-2050



IMO GFI Remedial Unit (RU) vs FuelEU Maritime penalty



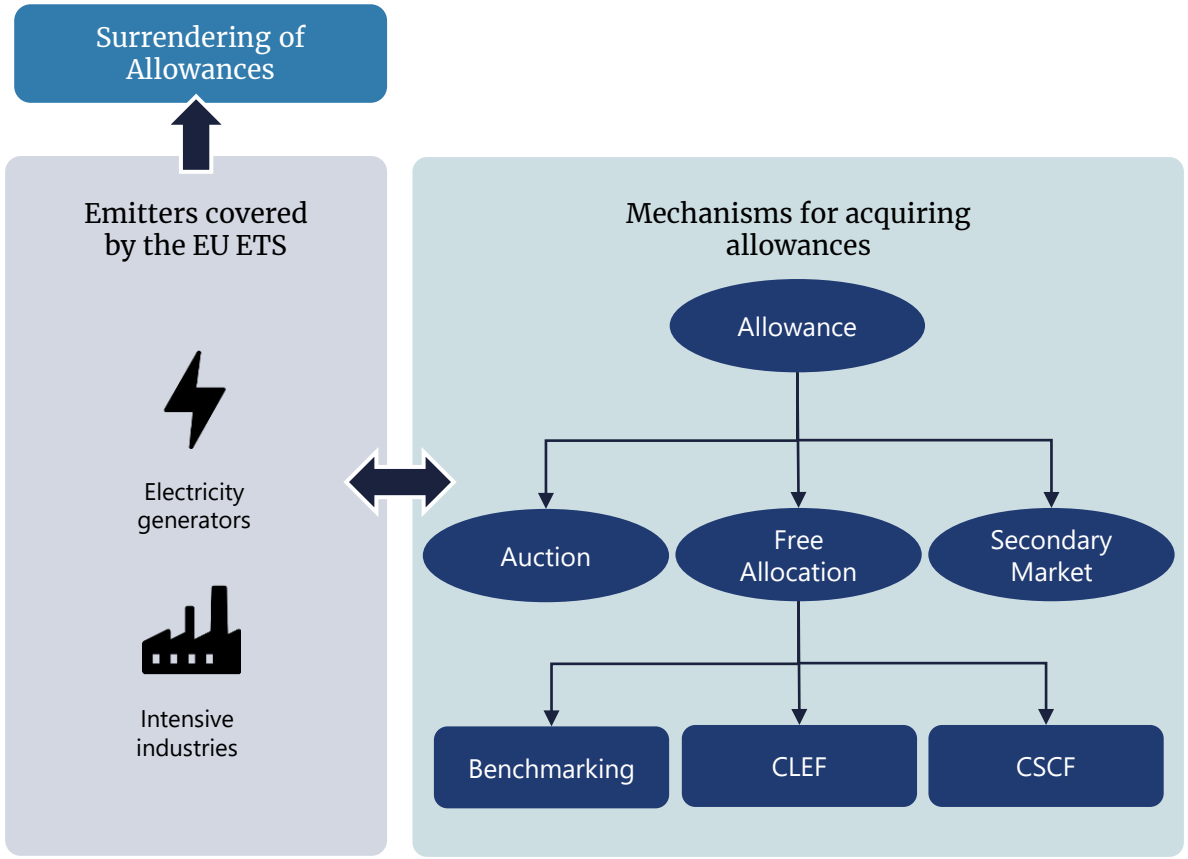
*Based on a VLSFO well-to-wake GHG intensity of 3.7 tCO2e/t fuel and the current USD/EUR exchange rate of 1.14

Source: IMO, European Commission, Argus Media - Consulting Services

EU ETS overview and basic mechanism

The cap-and-trade system requires obligated emitters to surrender allowances for emissions above an applied benchmark

Mechanism of the EU ETS



- **The EU ETS, currently in Phase 4, covers emissions from electricity and heat generation, energy-intensive industries (e.g. iron and steel, cement and lime, chemicals, and refineries), aviation, and since 2024, maritime transport.**
- **It covers all EU member states and approximately 45pc of total EU emissions.**
- **Limited allowances are released in the EU ETS every year, and a linear reduction factor reduces the total availability of allowances to incentivise emission reduction.**
- **Installations covered by EU ETS must surrender allowances each year to cover emissions, with each allowance representing the right to emit one tonne of CO2. Allowances acquired through a mixture of:**
  i. Free allocation
  ii. The auction market
  iii. The secondary market
- **Free allocation of allowances functions to keep EU industries competitive with competition outside the EU, as well as decreasing the risk of carbon leakage (relocation of carbon intensive production outside Europe where climate legislation is less strict).**
- **Free allowance allocation for non-electrical generation industries is determined by the following mix of factors:**
  i. Benchmarking: The top 10pc performing EU installations in terms of efficiency/emissions are used as a benchmark; only emissions above the benchmark must be purchased.
  ii. Carbon leakage exposure factor (CLEF): Industries at high-risk of carbon leakage have allowance allocation amounting to 100pc of the relevant benchmarks, while low-risk industries are allocated a smaller percentage.
  iii. Cross-sectoral correction factor (CSCF): Set at 100pc between 2021-2025, this is subject to change in the second half of the 2020s.

Source: Argus Media - Consulting Services, EU Commission

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IMO Focus

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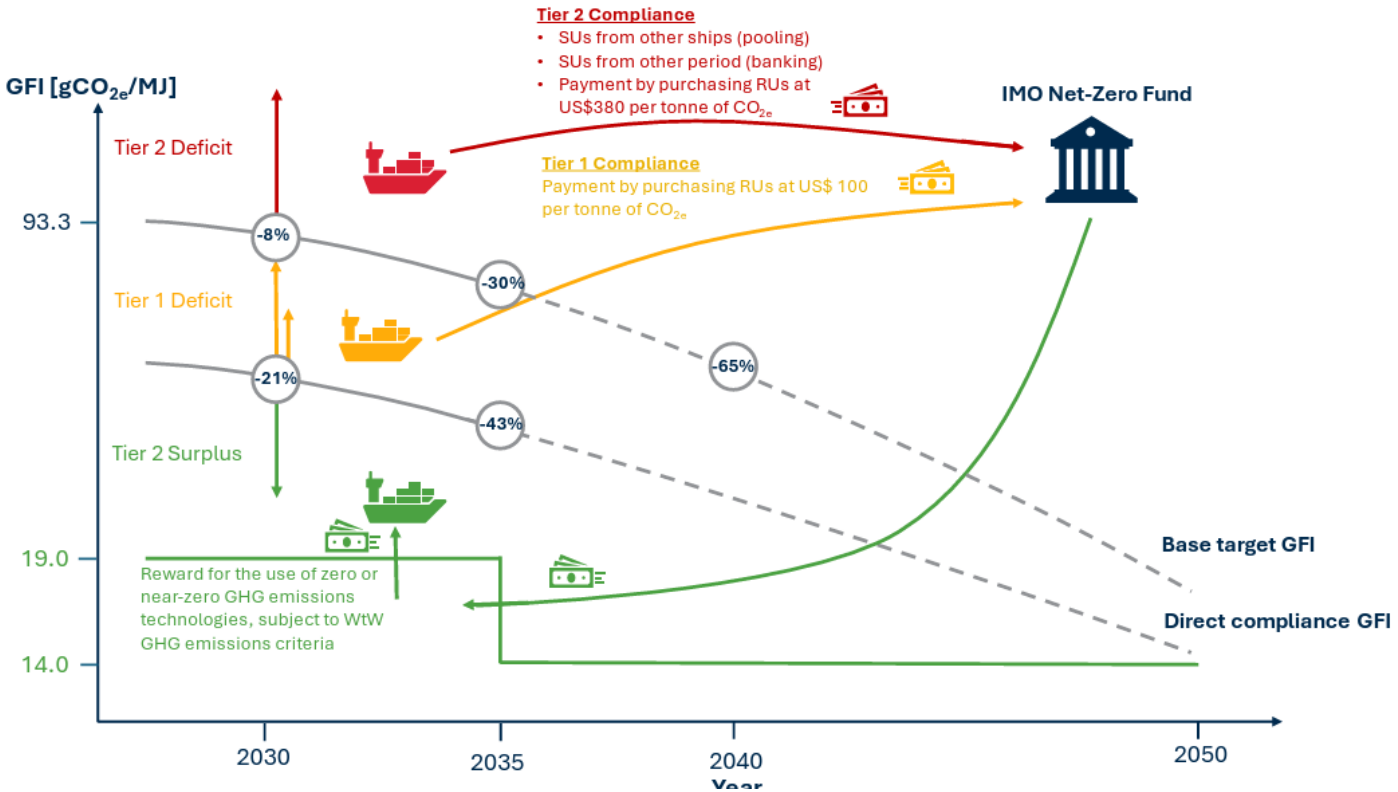
IMO MEPC 83: GHG Fuel Intensity (GFI)

With the GFI mechanism, surplus units generated from vessels using e-fuels can help bridge the price gap between these fuels and low-carbon alternatives

IMO GHG Fuel Intensity (GFI) mechanism



- **At the end of each reporting period, each ship shall determine its GFI compliance balance, as follows:**

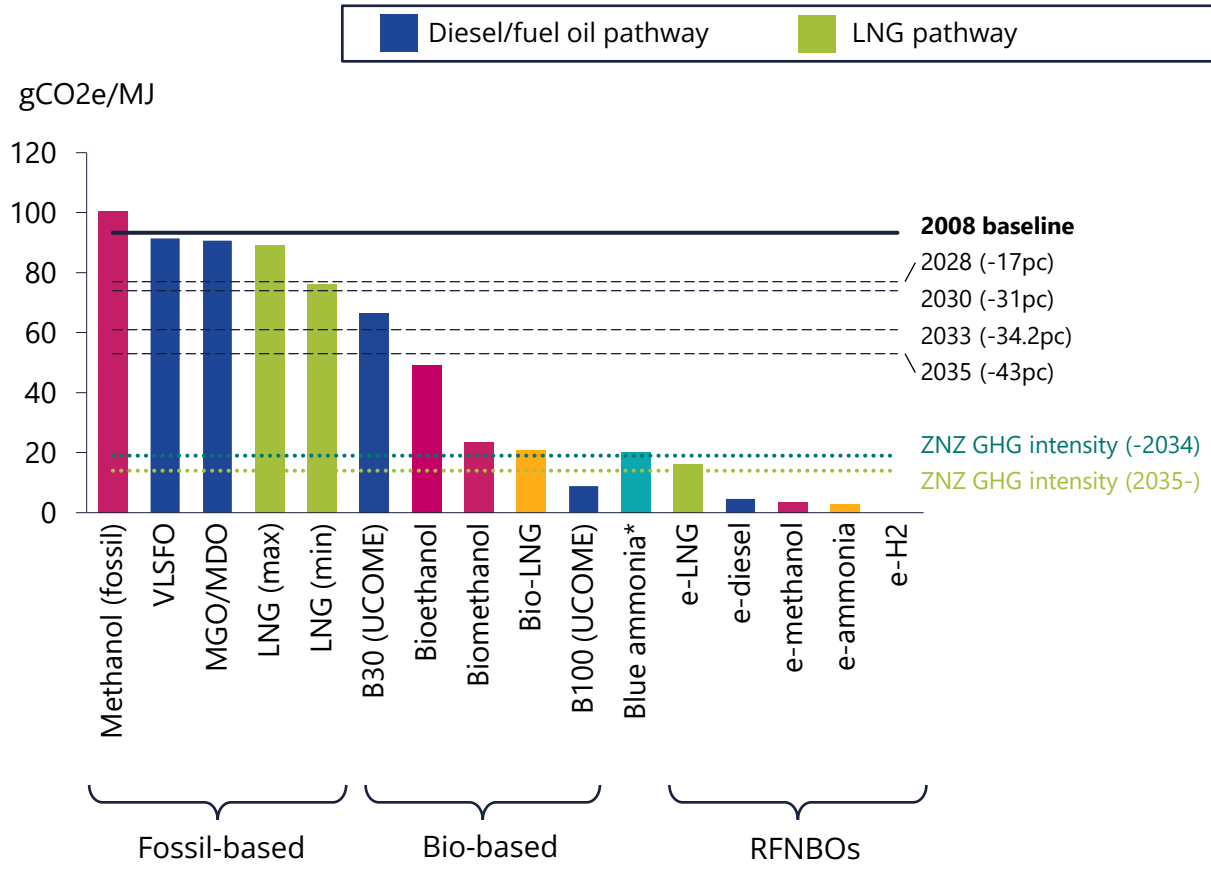
  GFI compliance balance (expressed in tonnes of CO2e) = (Direct compliance target annual GFI – Attained annual GFI) × $Energy_{total}$
- **Surplus Units (SUs) would be provided to ships exceeding the DC GFI targets. These SUs could either be banked for up to two years to be used in the future or sold to undercompliant ships failing to meet Base GFI targets or cancelled voluntarily.**
- **A ship with a GFI compliance balance less than zero is to achieve compliance by balancing its deficit in accordance with the following GFI compliance approaches:**
  - Balance its Tier 1 compliance deficit through Tier 1 remedial units (RUs) acquired, priced at $100/tCO2e
  - Balance its Tier 2 compliance deficit through one or more of the following GFI compliance approaches:
    - Surplus units transferred from other ships
    - Surplus units banked from previous reporting periods
    - Tier 2 RUs acquired, priced at $380/tCO2e
- **By 1 January 2028, the Committee shall determine the mechanism for reviewing and defining the price of a Tier 1 and Tier 2 RU for the reporting periods starting 2031 and onwards**

Source: IMO, American Bureau of Shipping, Argus Media - Consulting Services

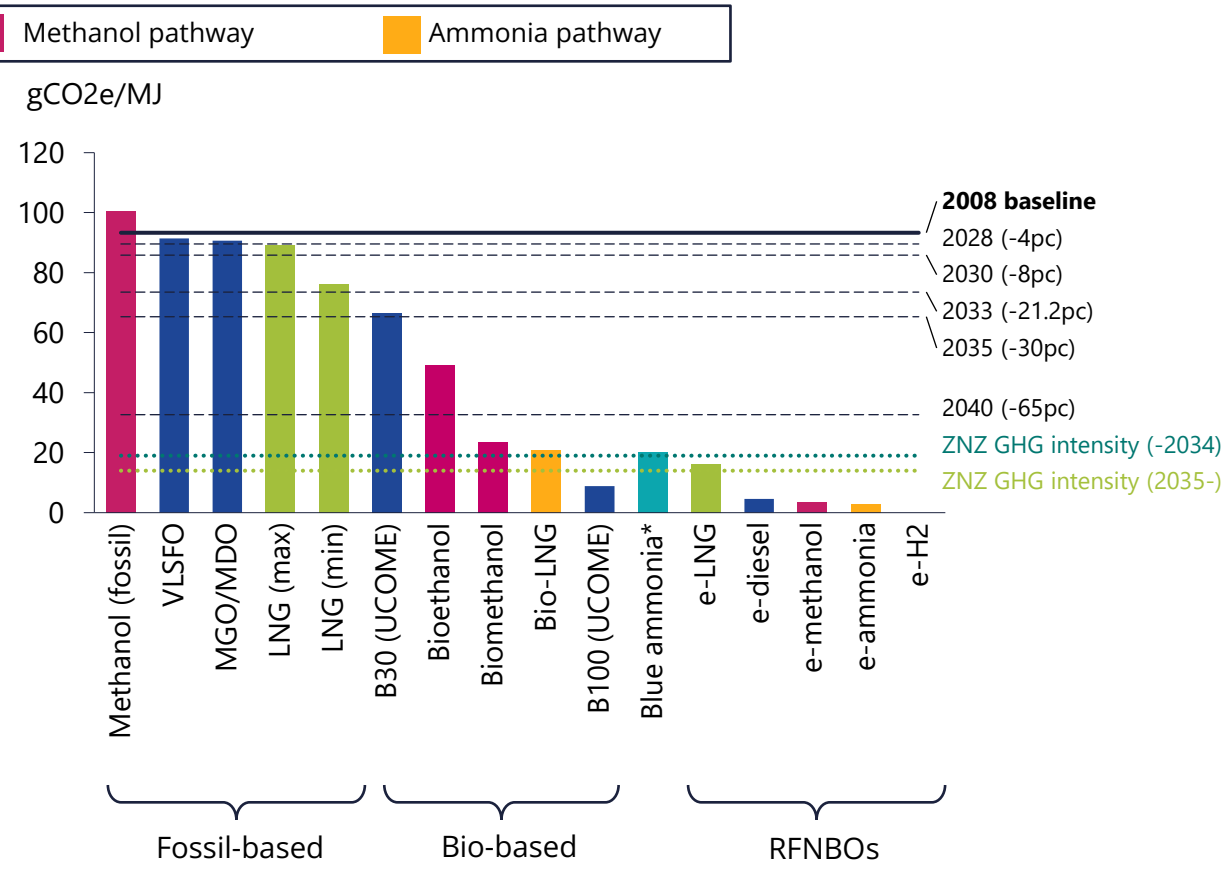
Marine fuel GHG intensity against IMO GFI Targets

Based on the IMO GFI targets, ships burning LNG will have to start acquiring Tier 1 RUs by 2029 and Tier 2 RUs by 2033

Marine fuel GHG intensity against IMO GFI Direct Compliance Targets



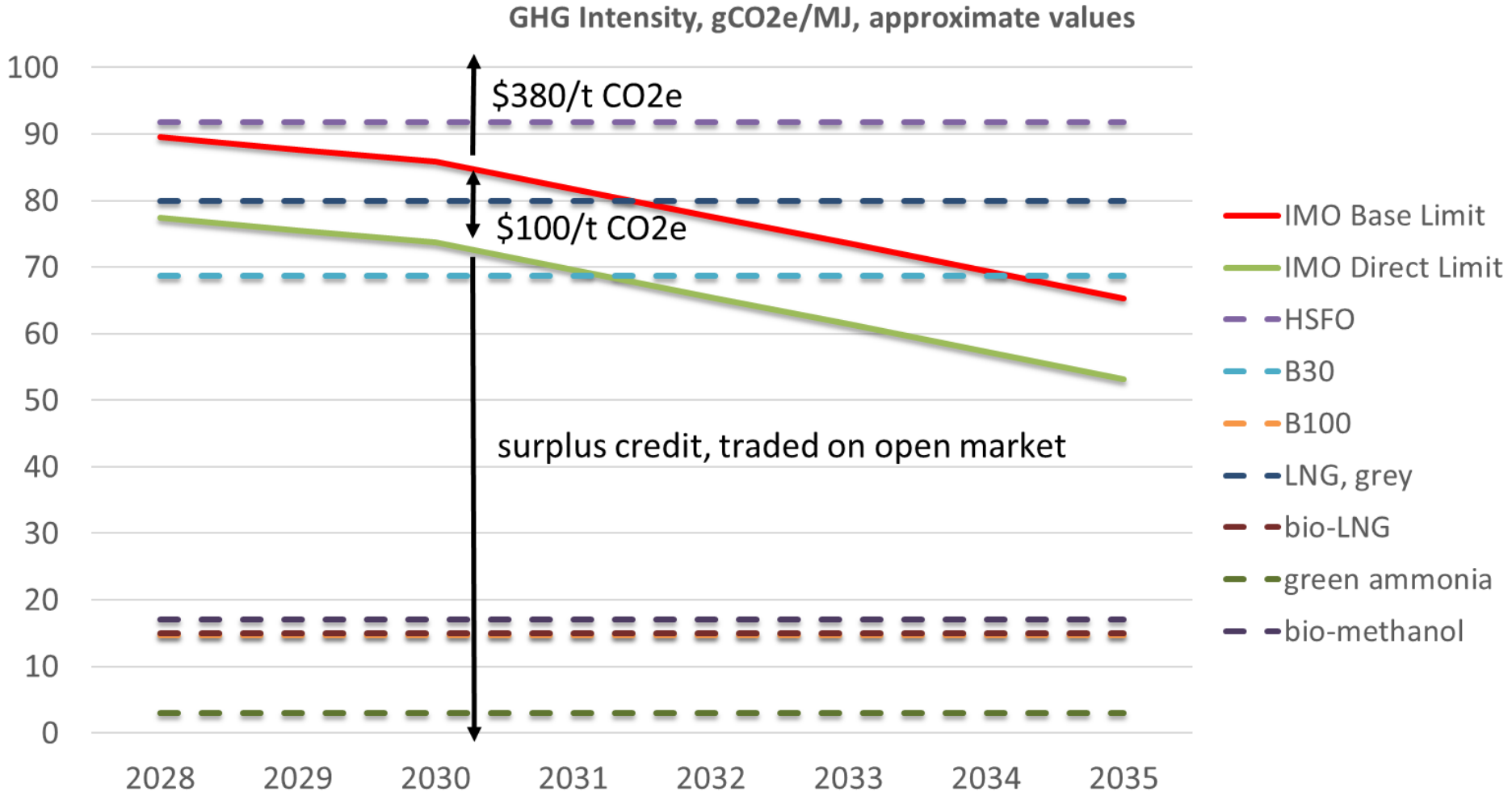
Marine fuel GHG intensity against IMO GFI Base Targets



*depending on upstream emission and carbon capture rate

Source: IMO, Argus Media - Consulting Services

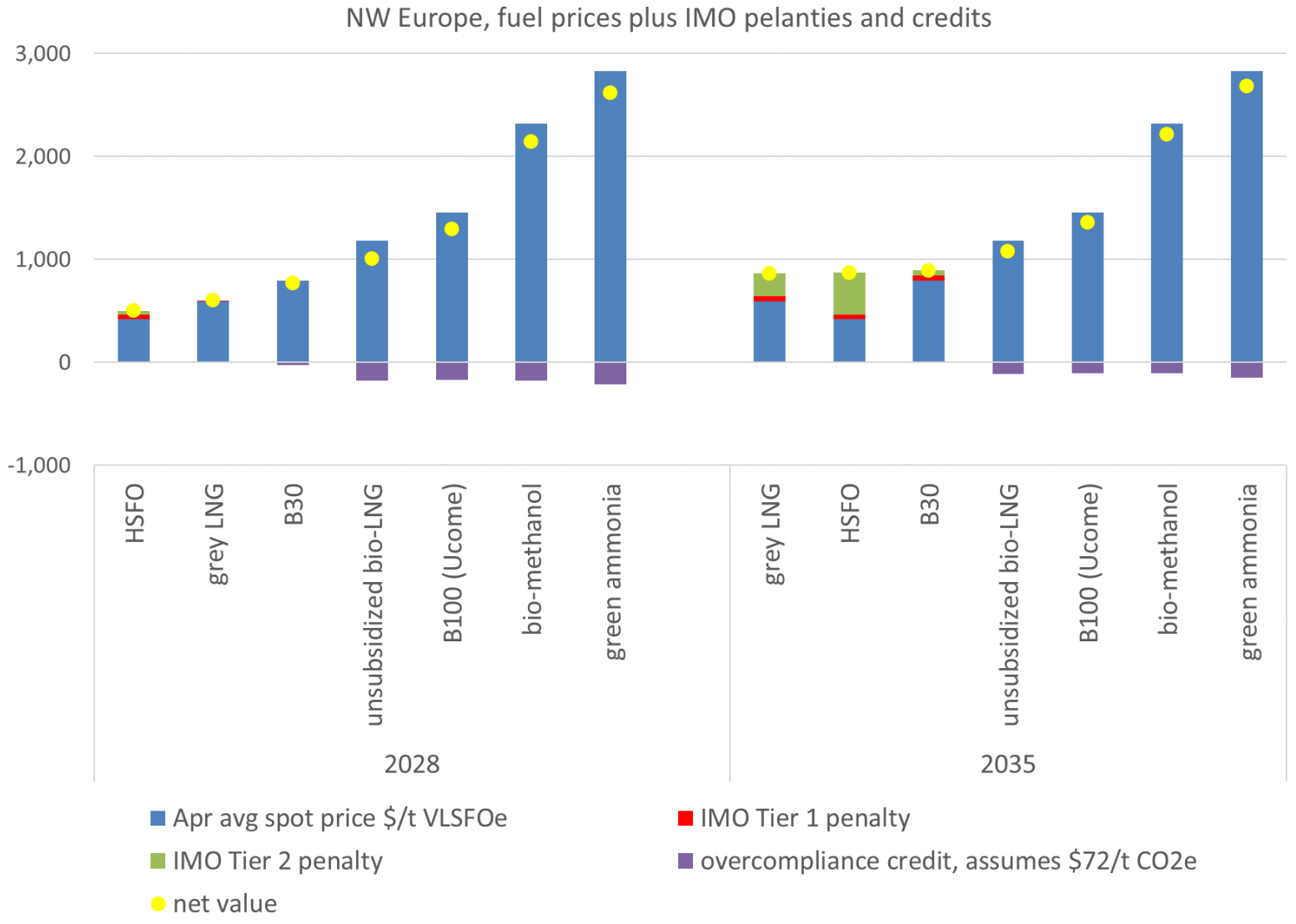
IMO plan for 2028-2035



US's position on IMO GHG:

"President Trump has made it clear that the US will not accept any international environmental agreement that unduly or unfairly burdens the US or the interests of the American people. Should such a blatantly unfair measure go forward, our government will consider reciprocal measures so as to offset any fees charged to US ships and compensate the American people for any other economic harm from any adopted GHG emissions measures"

IMO's GHG carrots and sticks incentives

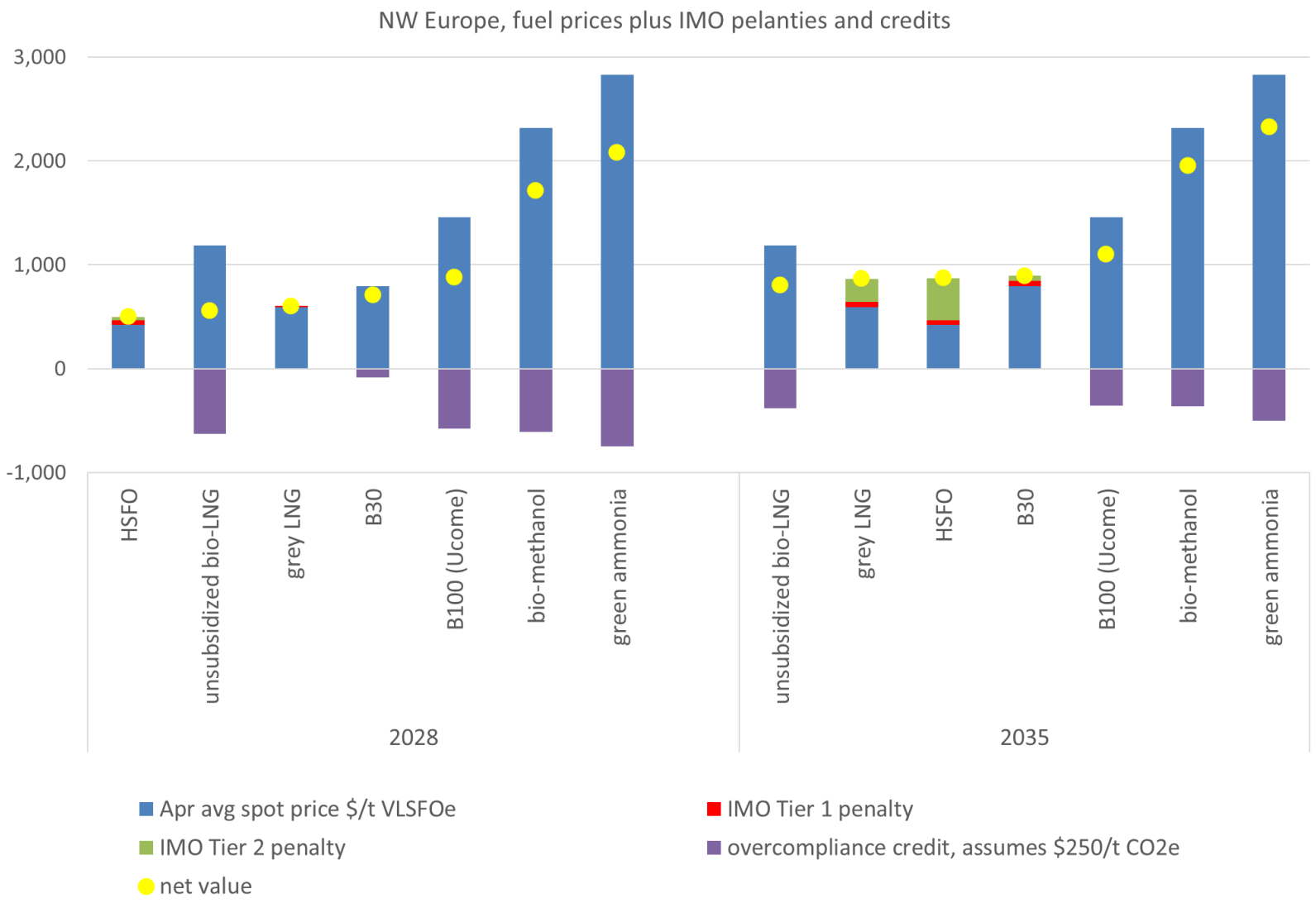


$72/t CO2e surplus credit scenario @ spot April 2025 prices:

- For **non**-LNG burning vessels: HSFO cheapest option in 2028 & 2035
- for LNG-burning vessels: grey LNG cheapest in 2035
- For **non**-LNG burning vessels, looking to stay away from HSFO: B30 is the cheapest option in 2028 & 2035

- Source: Argus Media

IMO overcompliance credits – a wild card



$250/t CO2e surplus credit scenario @ spot April 2025 prices:

- For **non**-LNG burning vessels: HSFO cheapest option in 2028
- for LNG-burning vessels: bio-LNG cheapest in 2035
- For **non**-LNG burning vessels, looking to stay away from HSFO: B30 is the cheapest option in 2028 & 2035

- Source: Argus Media

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Other Initiatives

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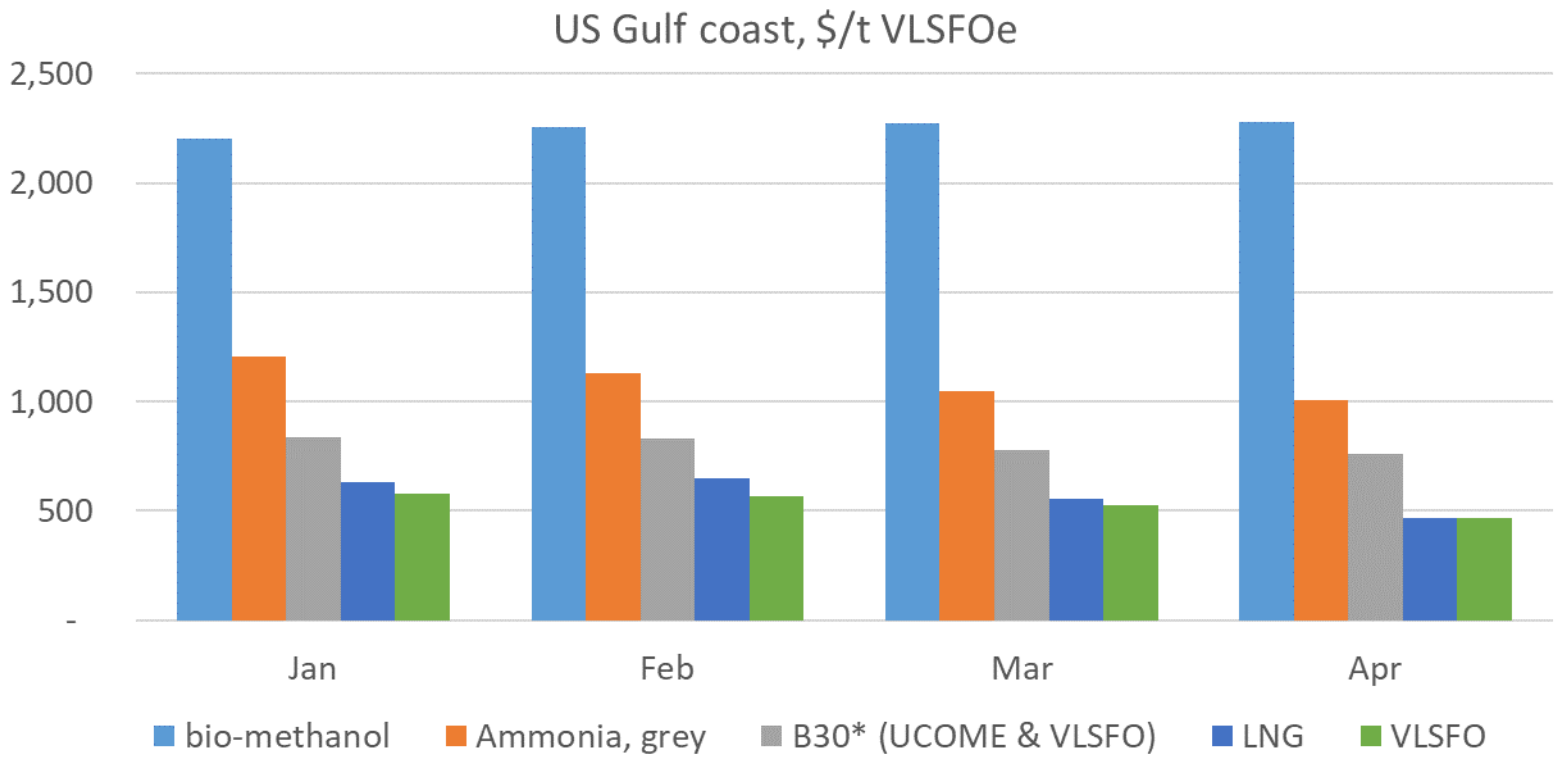
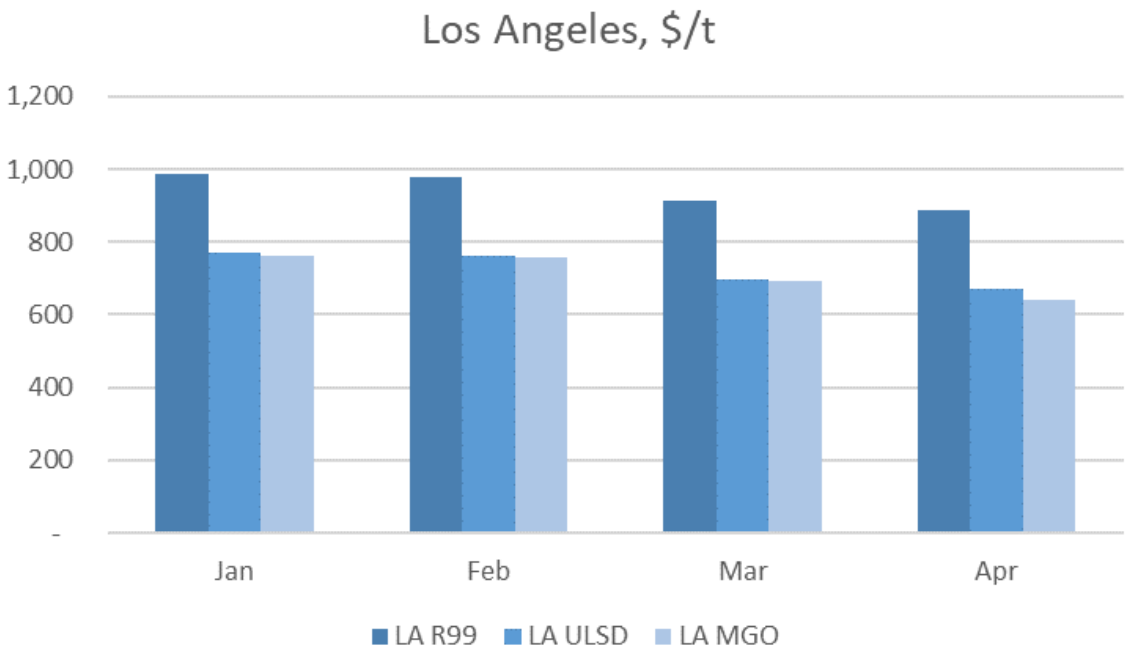
US Gulf coast marine fuels

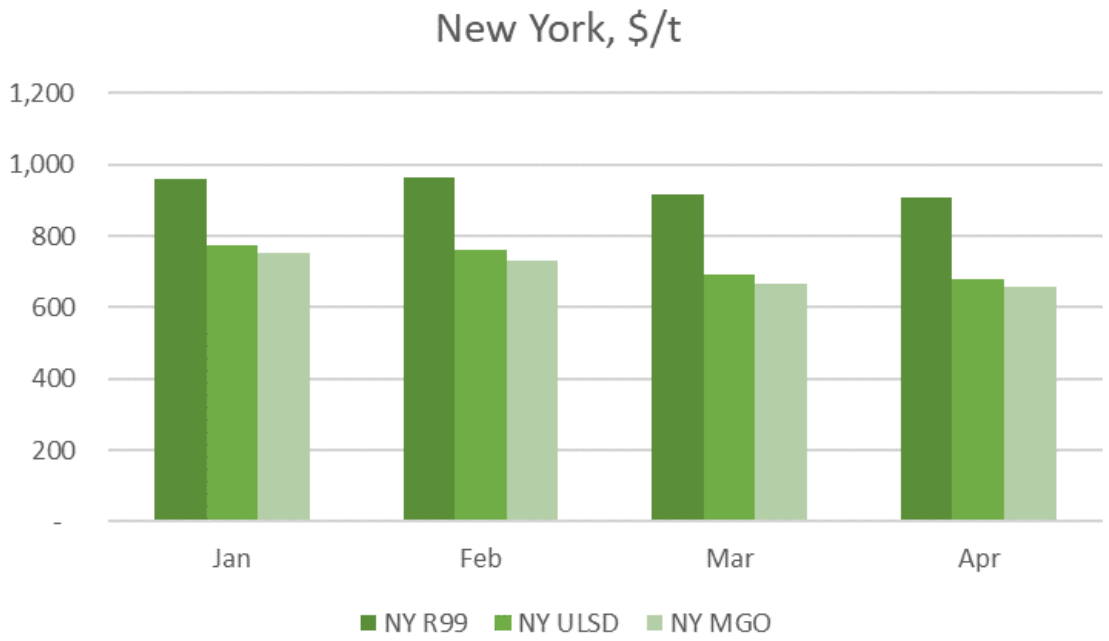


source: *Argus Marine Fuels*
**outright $/t*

- "Renewable Fuel for Ocean-Going Vessels Act" bill – dead in the water
- US having troubles scaling UCOME production and other waste biodiesel.

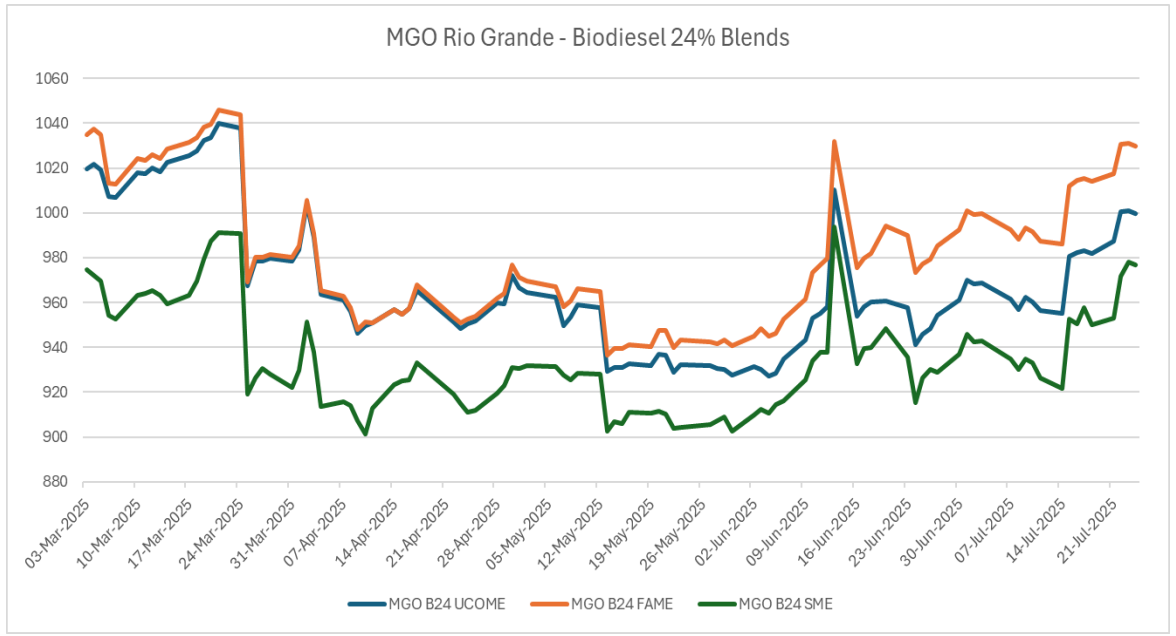
California and New York GHG initiatives

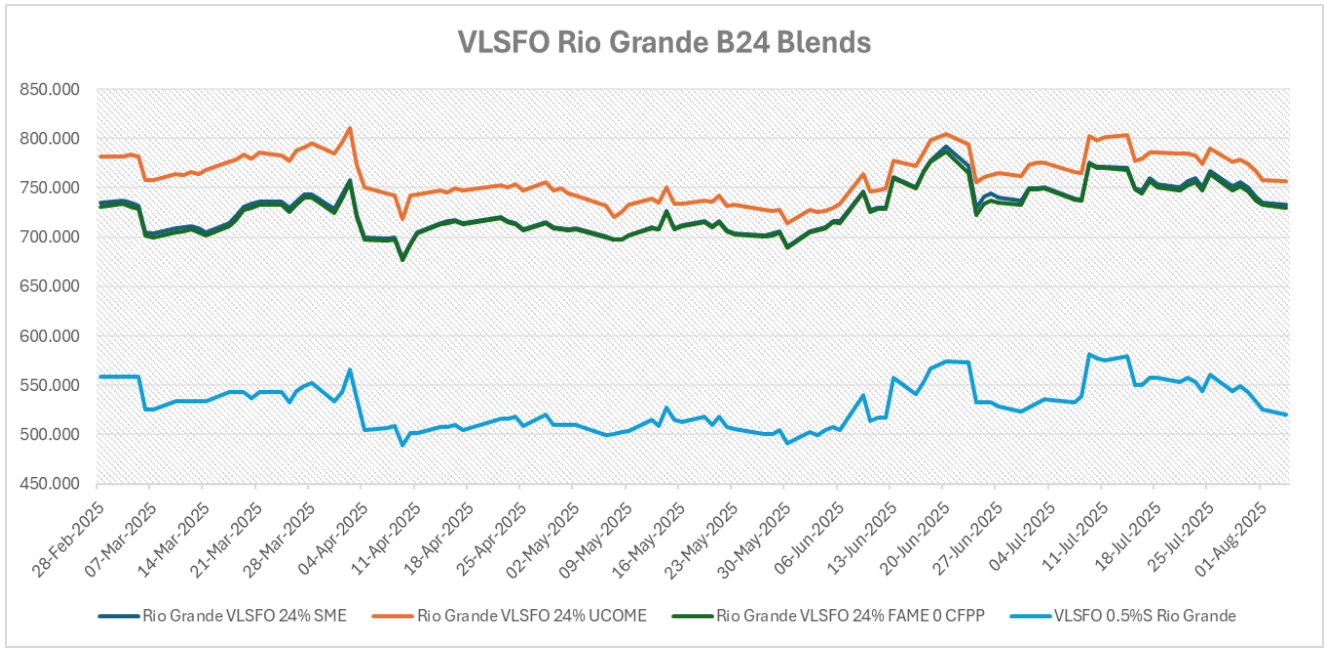




- *Source: Argus Media*

Brazilian Case for Voluntary Biodiesel





- *Source: Argus Media*

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Conclusions

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Key Takeaways

The urgency of national legislation that anticipates global trends and protects Brazilian interests:

Establish a national regulatory framework aligned with the IMO, but adapted to Brazil's specific context.

Encourage the voluntary use of marine biodiesel through incentives (E.g., Fiscal, Logistical).

Develop a maritime carbon credit system compatible with the IMO GFI mechanism.

Invest in port infrastructure to support the supply of alternative fuels.

Source: Argus Media - Consulting Services

Thank you