The new 2023 IMO Strategy and Fuel Transition Pathways

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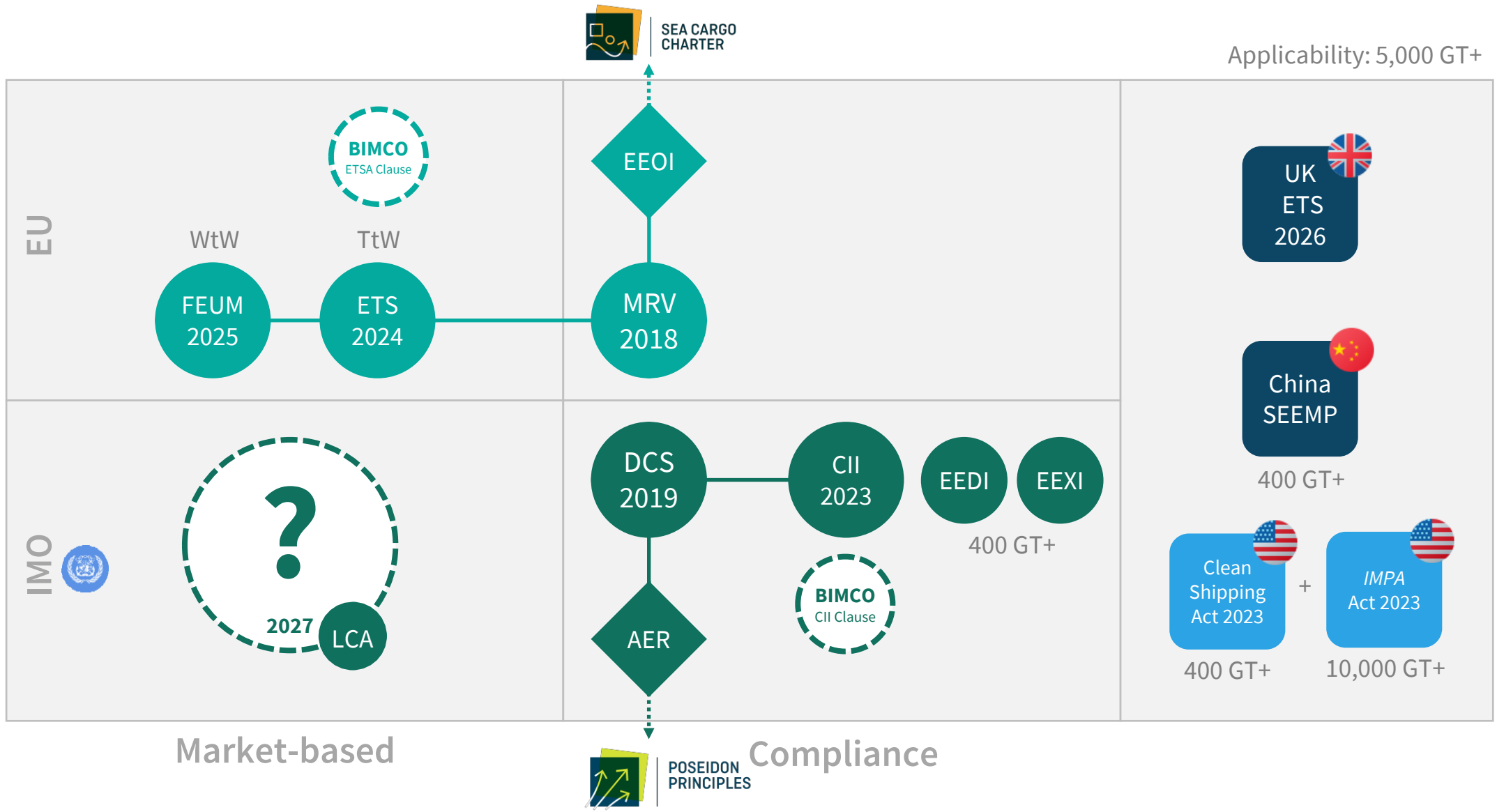
Future GHG regulations overview

Upcoming GHG Regulations at a Glance



IMO 2023 Revised GHG Strategy

The Strategy:

Address and limit GHG Emissions

from international Shipping

The Vision:

Phase out GHG emissions

as soon as possible while promoting

a just and equitable transition

The Mechanisms:

Short Term Measures

Mid-Term Measures

Long-Term Measures

The way there:

Net Zero GHG emissions by around 2050

Uptake of Alternative Fuels

Indicative Checkpoints for 2030 and 2040

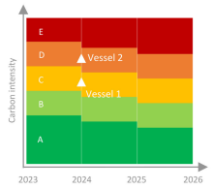
Key Stages

Impact Assessment of new measures

Finalization of Basket of Measures

Approval, Adoption, Entry into Force

IMO 2023 Revised GHG Strategy – Levels of Ambition



Reduce CO2 emissions per transport work,

at least 40% by 2030

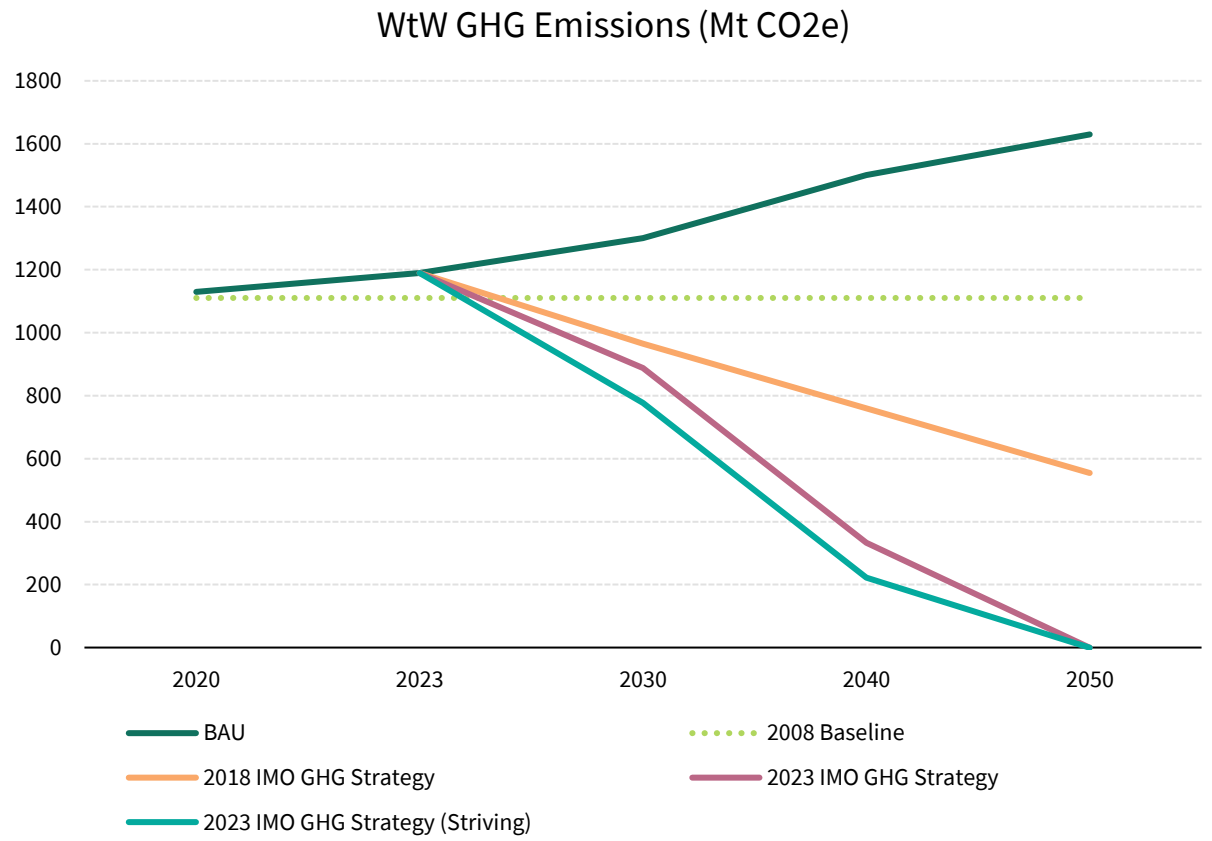
Uptake of zero or near-zero GHG emission

technologies/fuels to represent at least 5%

(striving for 10%) of the energy used onboard vessels by 2030

Reach net-zero GHG emissions (on WtW basis) by around

(close to) 2050 considering different national circumstances

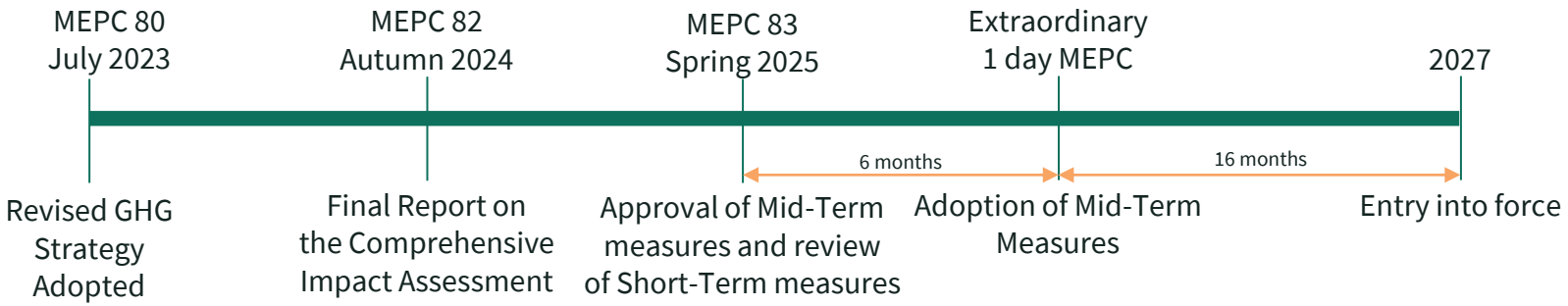


Well-to-wake GHG emissions pathways implied by the revised (2023) strategy compared to the initial (2018) strategy, the emissions in 2008, and business-as-usual (BAU) emissions

→ Synergies with Existing Measures (such as CII) will be considered

Reducing GHG Emissions from Ships : Mid Term Measures

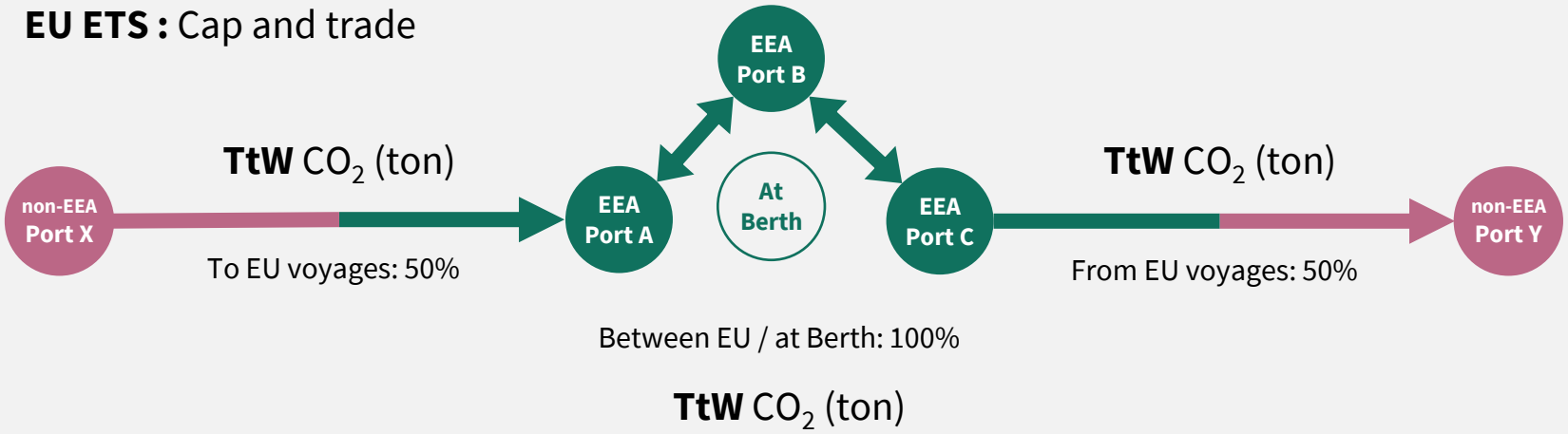
- Adoption from 2025
- On top of compliance measures (CII)
- A basket of measures comprising of:
    - Technical Element (Goal Based Marine Fuel Standard)
    - GHG emissions Pricing Mechanism
- The candidate economic elements will be considered via a comprehensive impact assessment



EU Fit for 55

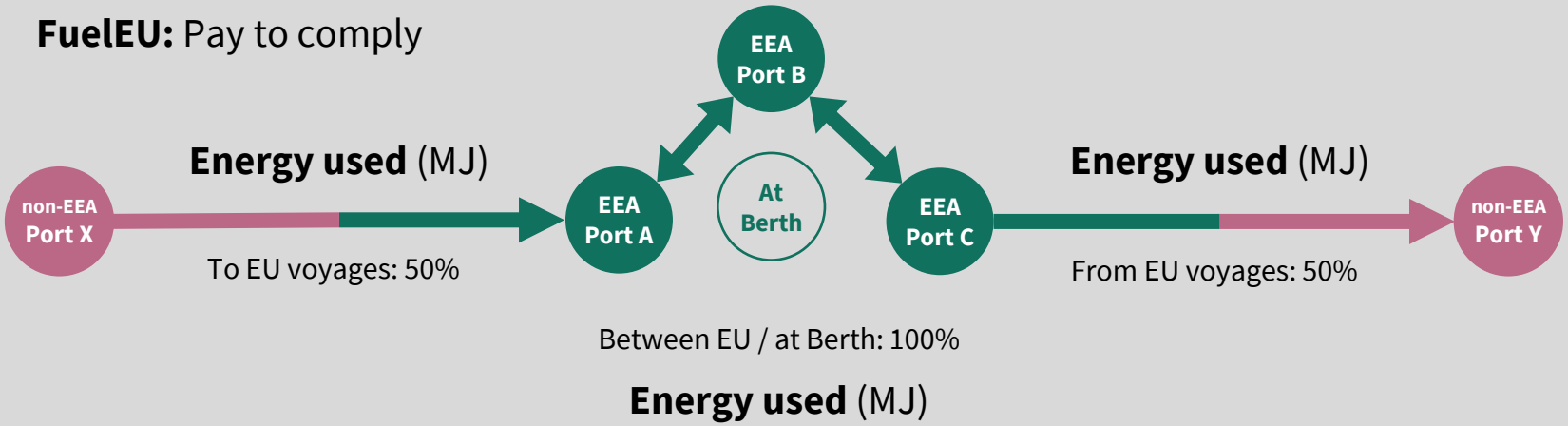
Short and long term measures to make EU carbon neutral by 2050

EU ETS : Cap and trade



- **Pay for operational emissions**
- Expected from 2024
- Three years phased approach
- 5000+GT (400+ from 2026)
- Tank to Wake
- Charterer pays

FuelEU: Pay to comply

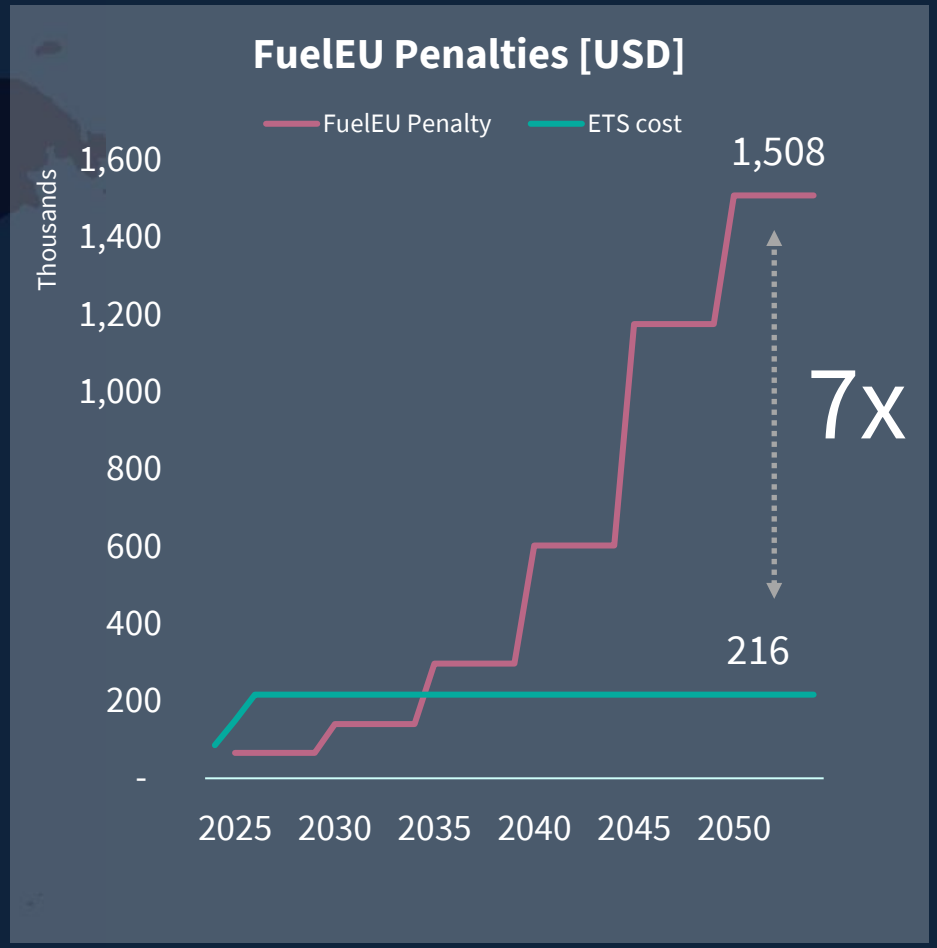


- **Incentivise use of low and zero emission fuels**
- Agreed, Expected from 2025
- -2% (2025) to -80% (2050) red. factor
- 5000+GT
- Well to Wake
- Charterer pays

In 2050, FuelEU Maritime Penalties cost 6 to 8 times more than ETS

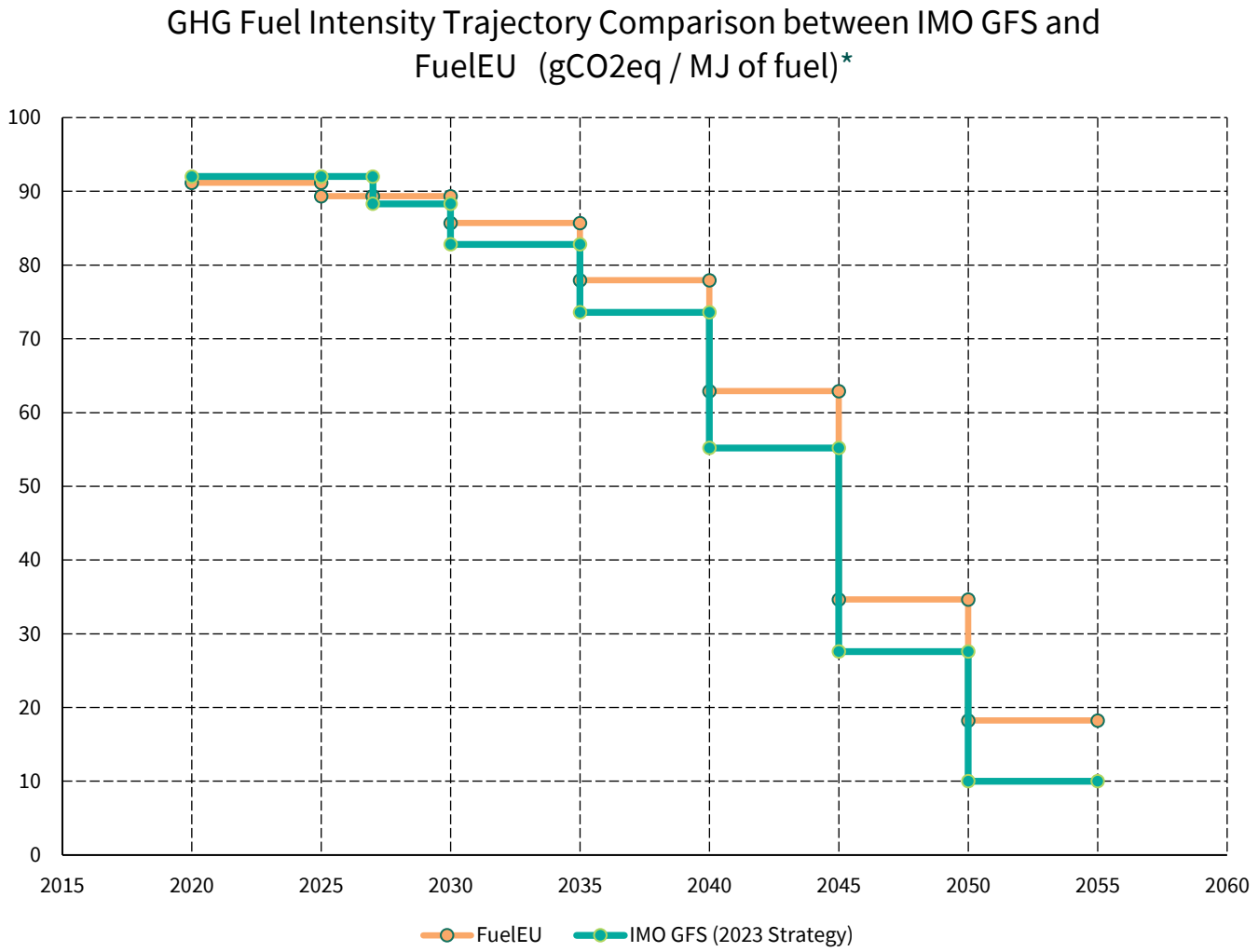
For instance

A single trip to Europe of a Panamax vessel burning VLSFO…



How would a technical element (GFS) would look like?

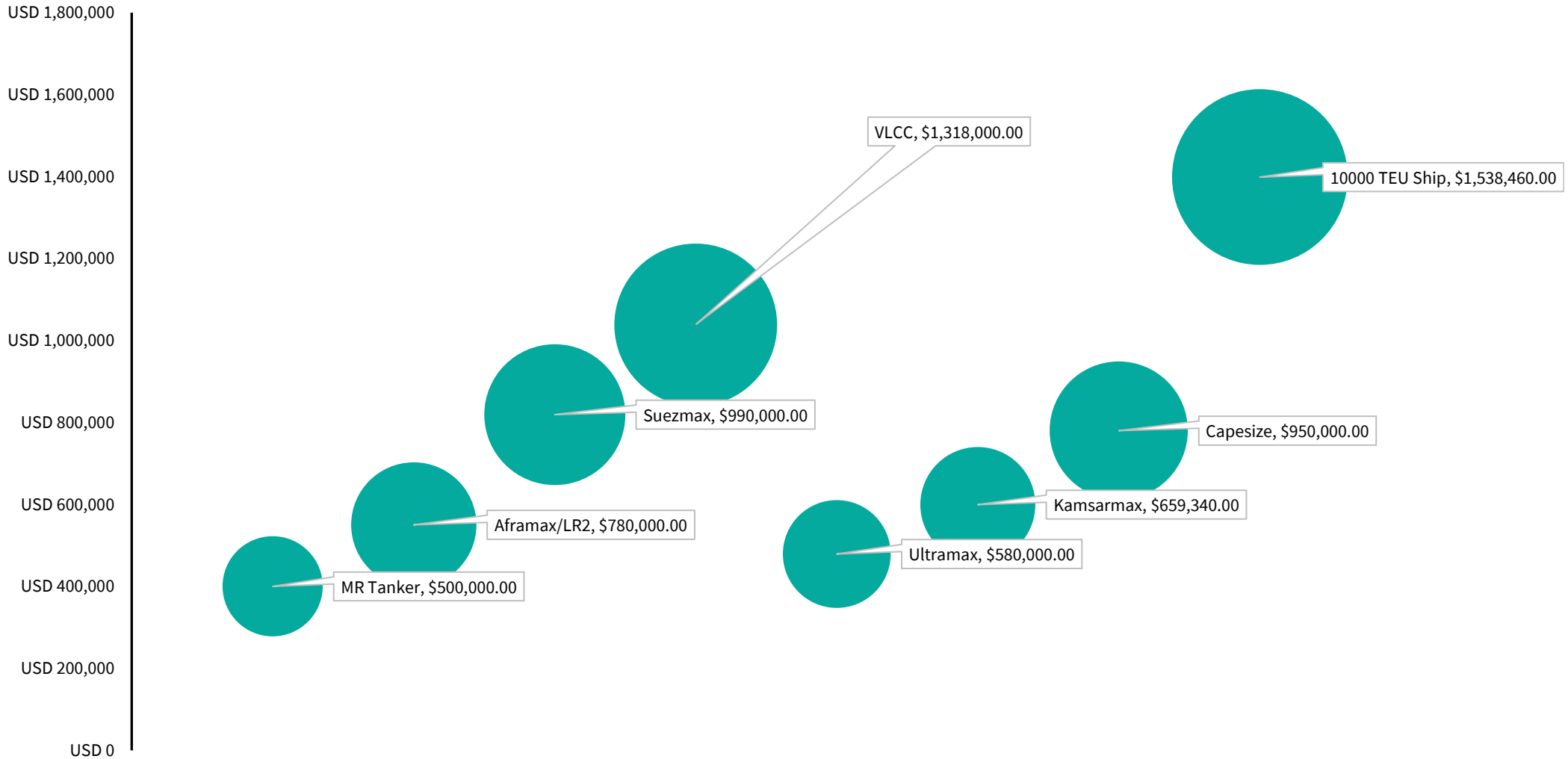
- WtW approach based on GHG Fuel Intensity
- Ramped or linear reduction?
- Final form would be furthered during ISWG GHG 16 (ref to ISWG-GHG 16-2-7/8/9) by EU 27
- How the technical element would be tied to the GHG pricing mechanism?



*projection based on current submissions and data final form still to be determined

Estimated Penalty Projections for Global Fuel Standard

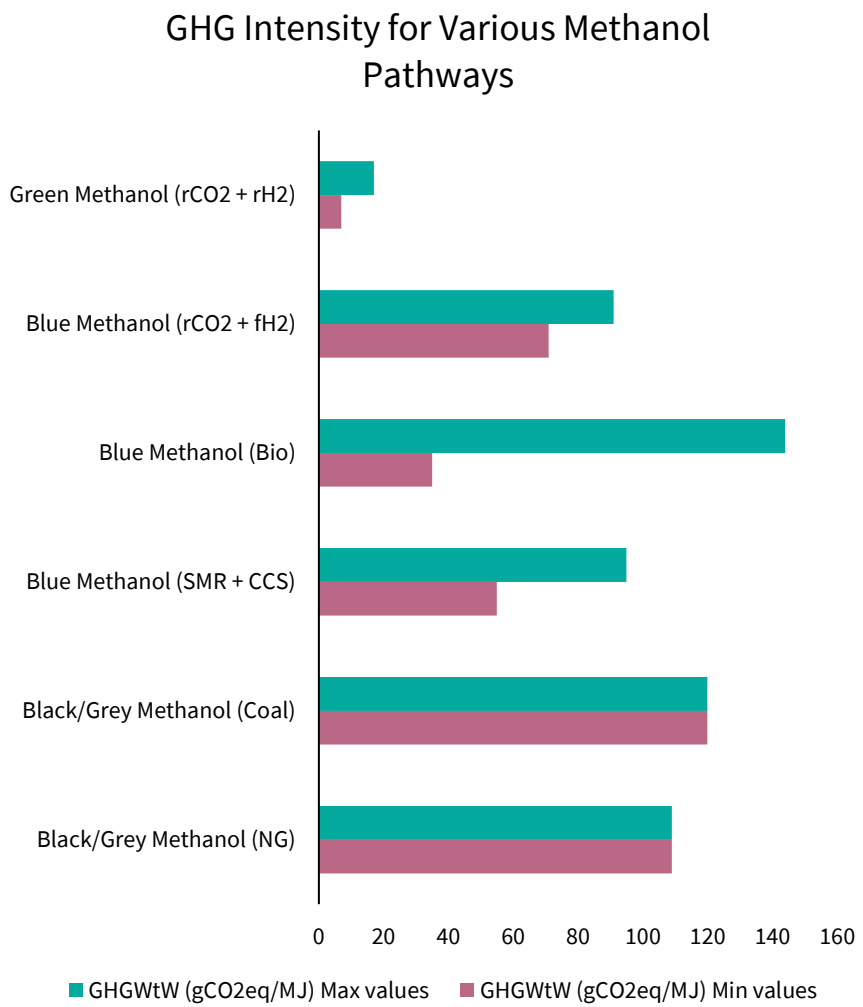
Global Fuel Standard - Annual Penalties per vessel type for the 2027-2030 period



Future Fuel Pathways

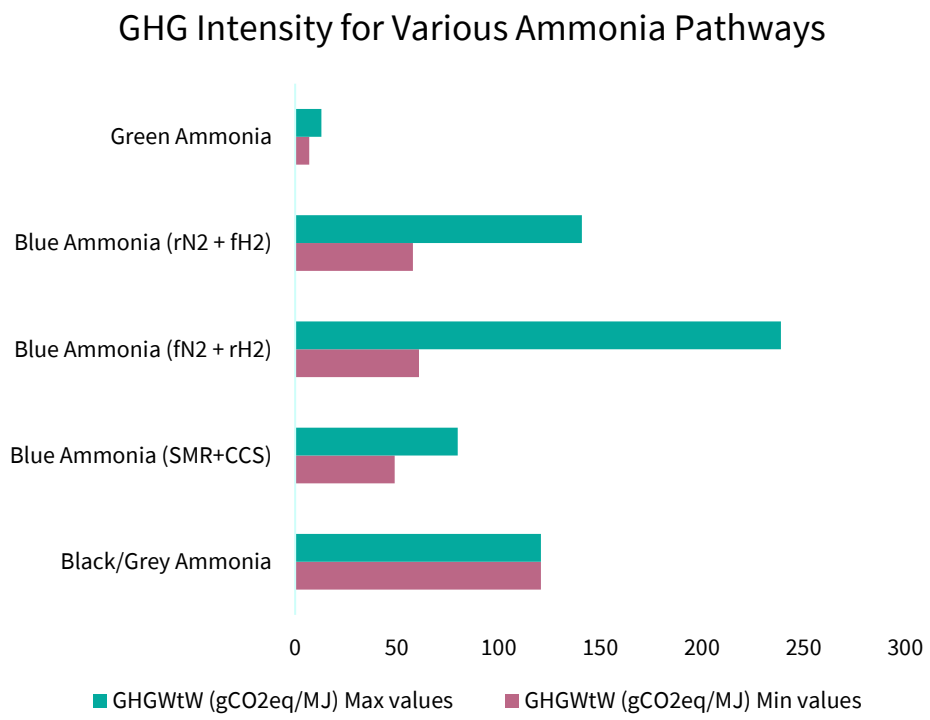
Methanol as Fuel – Pathways to Zero

Fuel Type	Feedstock type	Nature/Source	Process type	Energy used in the process
Black/Grey Methanol (NG)	Natural Gas	Fossil	Steam Methane Reformation of Natural Gas and Methanol Synthesis	Grid Electricity
Black/Grey Methanol (Coal)	Coal	Fossil	Gasification of Coal and Methanol Synthesis	Grid Electricity
Blue Methanol (SMR + CCS)	Natural Gas	Fossil	Steam Methane Reformation of Natural Gas with Carbon Capture & Storage and Methanol Synthesis	Grid Electricity
Blue Methanol (Bio)	Mixed 1st, 2nd and 3rd Gen. feedstock	Biogenic	Reforming of Renewable Natural Gas (biomethane from Anaerobic Digestion) and Methanol Synthesis	Grid Electricity
Blue Methanol (rCO2 + fH2)	CO2 + H2	CO2: Direct Air Capture H2: Fossil Steam Methane Reformation	Methanol Synthesis	Grid Electricity
Green Methanol (rCO2 + rH2)	CO2 + H2	CO2: Direct Air Capture H2: Renewable	Methanol Synthesis	Renewables/Nuclear



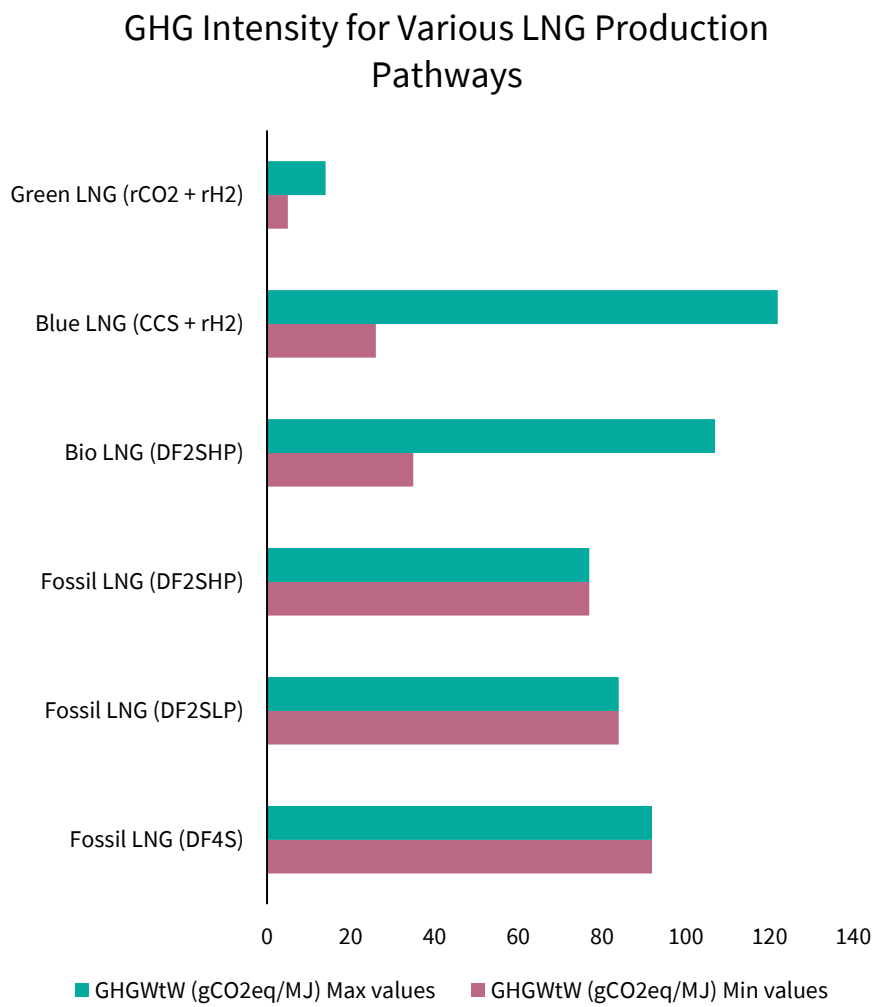
Ammonia as Fuel – Pathways to Zero

Fuel Type	Feedstock type	Nature/Source	Process type	Energy used in the process
Black/Grey Ammonia	Natural Gas	Fossil	Steam Methane Reforming	Grid Electricity
Blue Ammonia (SMR+CCS)	Natural Gas	Fossil	Steam Methane Reforming with CCS	Grid Electricity
Blue Ammonia (fN2 + rH2)	N2+H2	H2 Renewable	Haber-Bosch process	Grid Electricity
Blue Ammonia (rN2 + fH2)	N2+H2	N2: separated with renewable electricity H2: Fossil Steam Methane Reformation	Haber-Bosch process	Grid Electricity
Green Ammonia	N2+H3	Renewable	Haber-Bosch process	Grid Electricity/Renewables/Nuclear



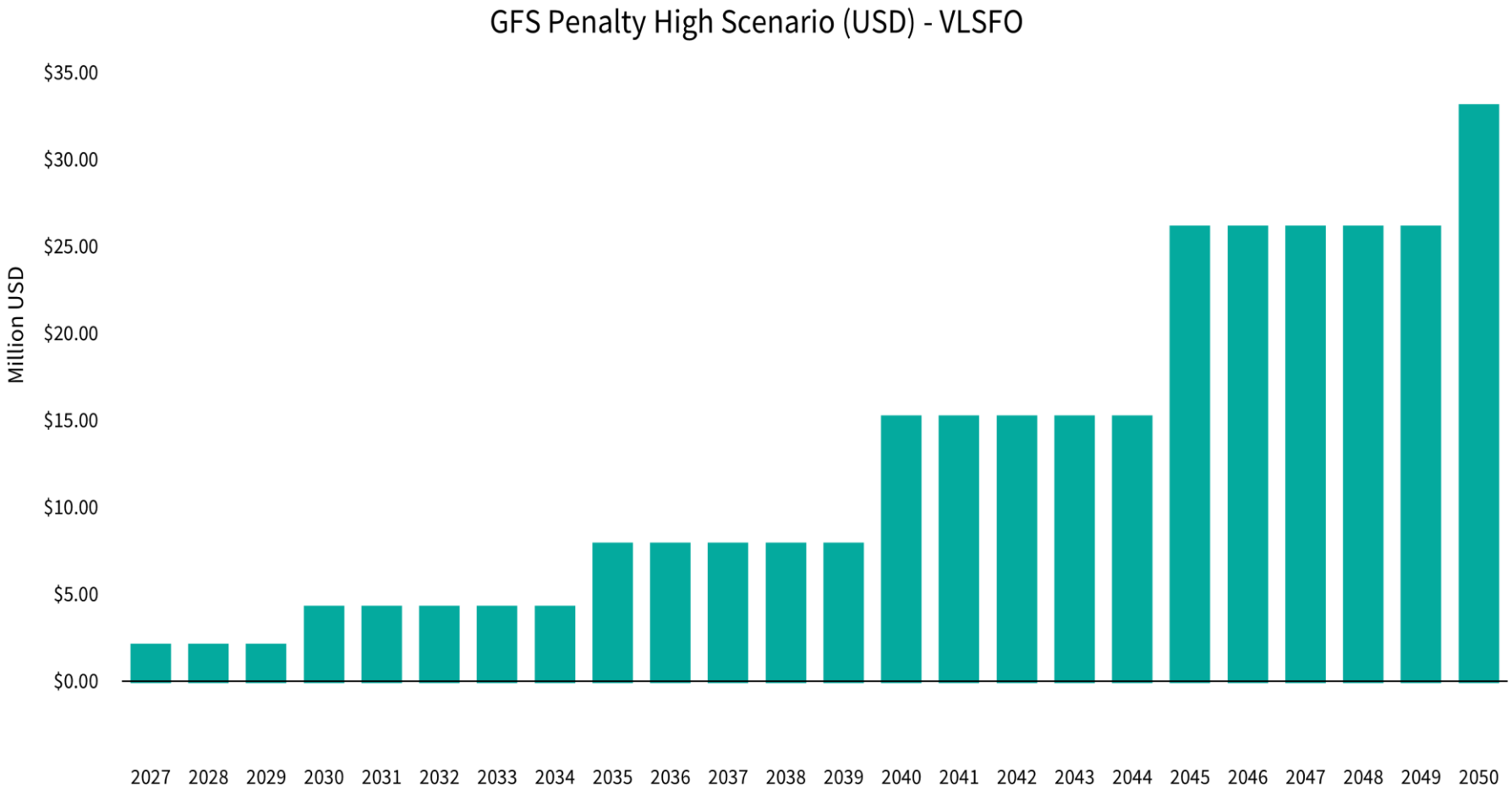
LNG as Fuel – Pathways to Zero

Fuel Type	Feedstock type	Nature/Source	Process type	Energy used in the process
Fossil LNG (DF4S)	Natural Gas	Fossil	Standard LNG production including liquefaction	Grid Electricity
Fossil LNG (DF2SLP)	Natural Gas	Fossil	Standard LNG production including liquefaction	Grid Electricity
Fossil LNG (DF2SHP)	Natural Gas	Fossil	Standard LNG production including liquefaction	Grid Electricity
Bio LNG (DF2SHP)	Mixed 1st, 2nd and 3rd Gen. feedstock	Biogenic	Thermochemical gasification followed by methanation and liquefaction	Grid Electricity
Blue LNG (CCS + rH2)	CO2 + H2	CO2: Fossil Point Source Carbon Capture H2: from Renewable electricity	methanation and liquefaction	Grid Electricity
Green LNG (rCO2 + rH2)	CO2 + H3	CO2: Direct Air Capture H2: from Renewable electricity	methanation and liquefaction	Grid Electricity/Renewables/Nuclear



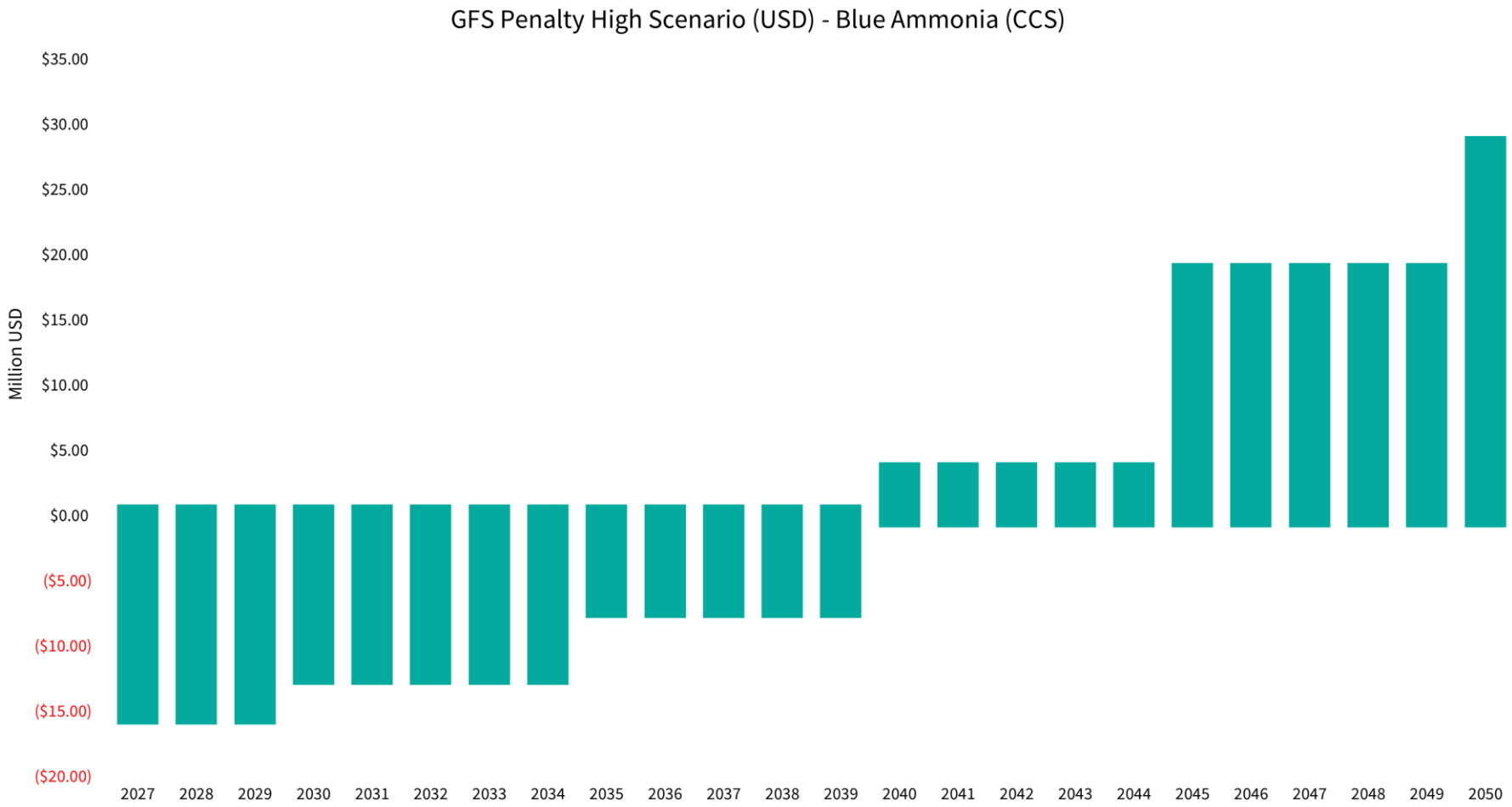
How Global Fuel Standard would look like – VLSFO

- GHG reduction targets as per 2023 Revised IMO Strategy
- No adaptation – BAU with VLSFO until 2050
- Penalties based on the assumption of 75t/day FOC for 270 days sailing



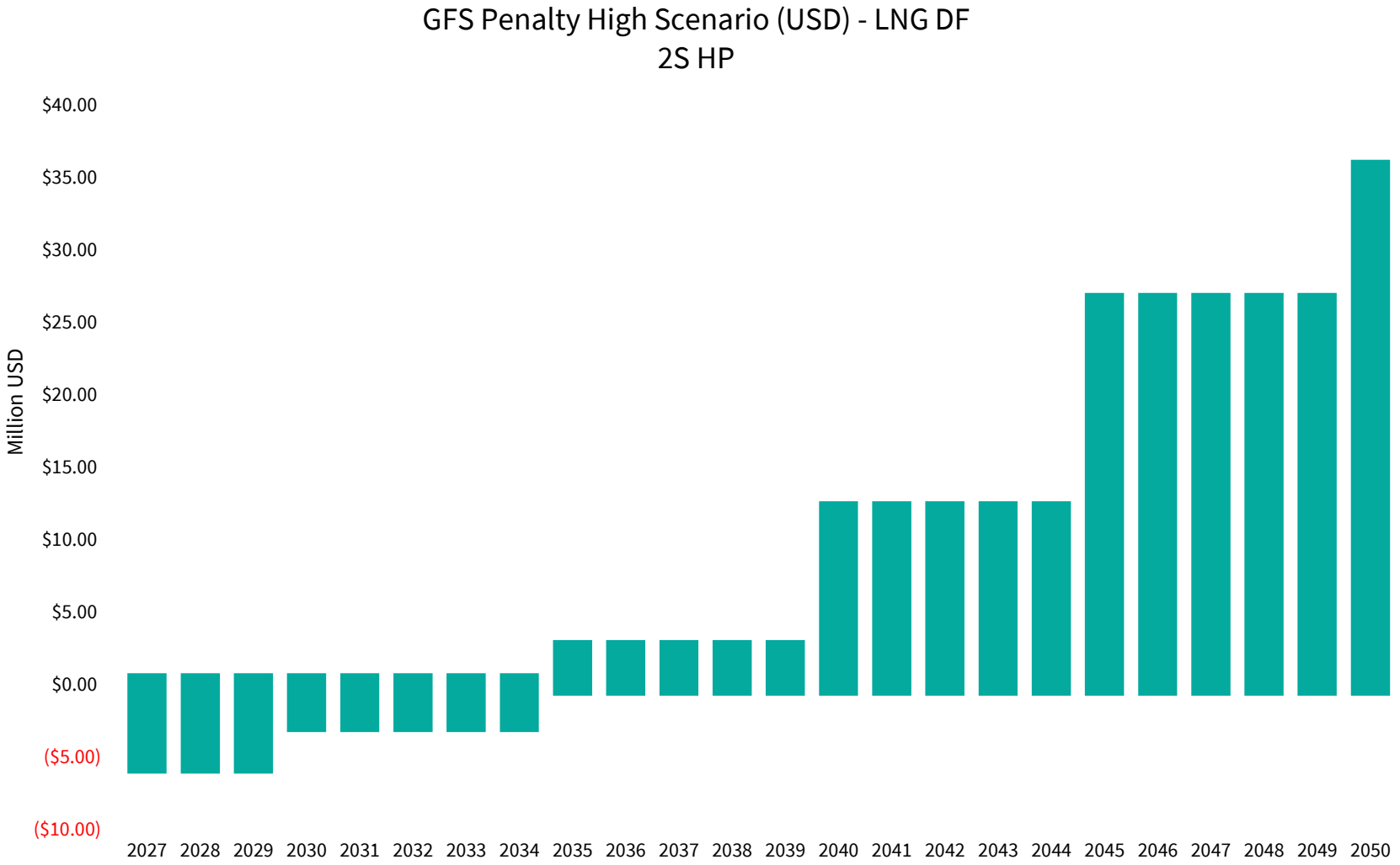
How Global Fuel Standard would look like – Blue Ammonia

- GHG reduction targets as per 2023 Revised IMO Strategy
- Use Blue Ammonia until 2050
- Penalties based on the assumption of 150t/day plus 15ton/day MGO Pilot for 270 days sailing
- Mean GHG intensity for Ammonia i.e. 61 gCO2/MJ
- Aggregate Penalty of 3.8m$ from 2027-2050

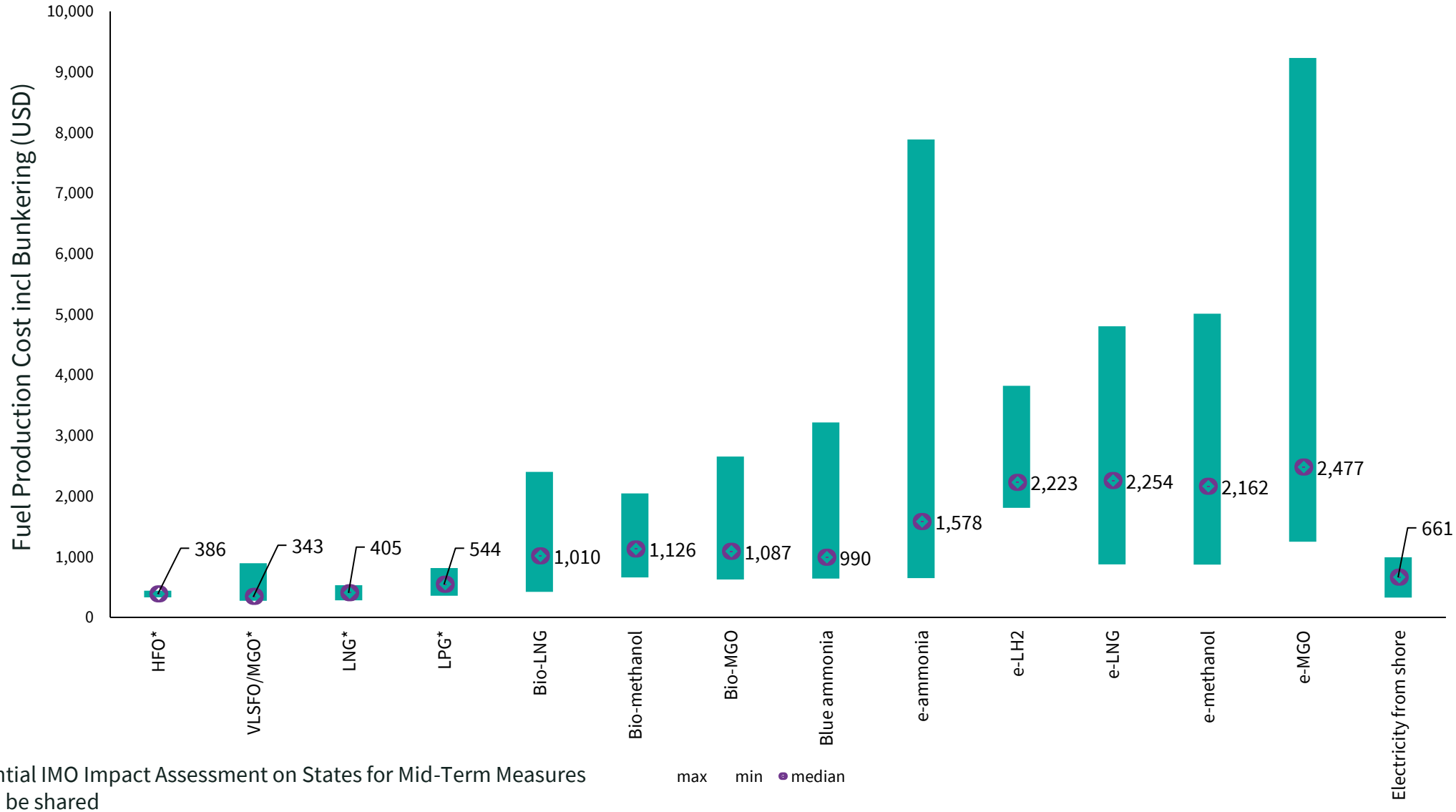


How Global Fuel Standard would look like – LNG DF (High Pressure)

- GHG reduction targets as per 2023 Revised IMO Strategy
- Use LNG DF High Pressure until 2050
- Penalties based on the assumption of 70t/day plus Pilot for 270 days sailing
- Fossil LNG GHG intensity i.e. 78 gCO2/MJ
- Aggregate Penalty of around 200m$ from 2027-2050



An assessment should be made based on future fuel prices*



*Source: Confidential IMO Impact Assessment on States for Mid-Term Measures
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Thank you

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