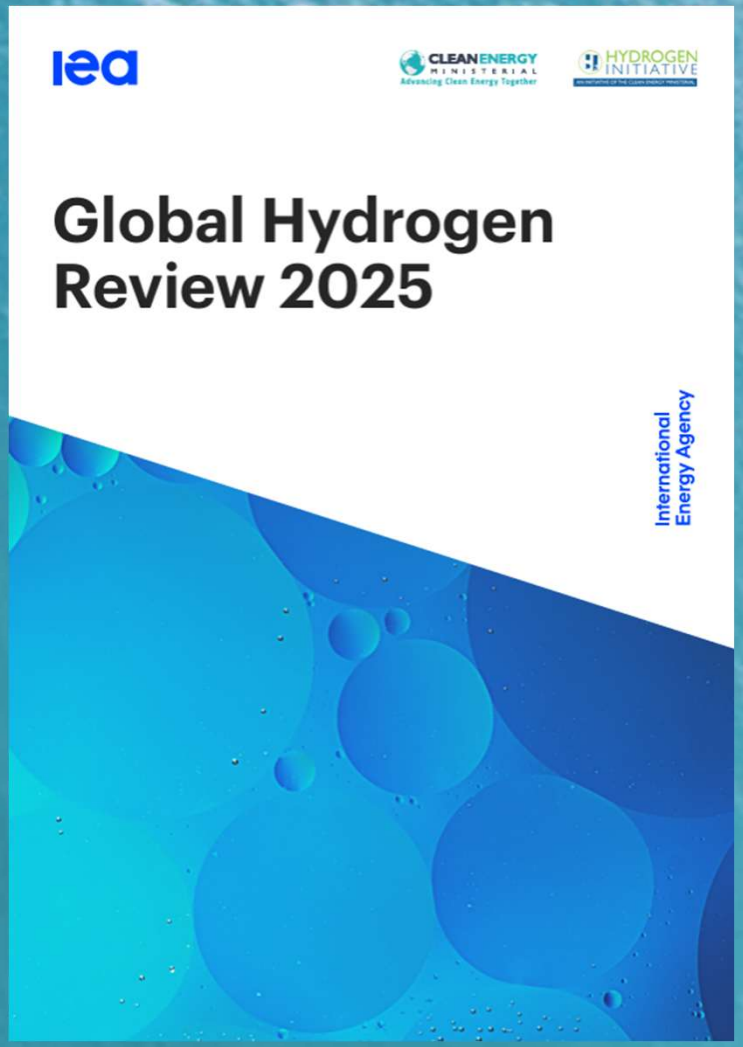
Webinar Publik *Road to* IETD 2025

Menilik Perkembangan Hidrogen Hijau Global dan Indonesia

Hydrogen Today: Global Updates and Emerging Trends

12 September 2025

Dr. Samuel Bartlett, GH2



- Over 200 (500?) committed low-emissions hydrogen production projects worldwide, moving beyond demonstration scale.
- Despite progress, growth is uneven: adoption of hydrogen has not met early-decade expectations, with barriers such as cost, infrastructure readiness, and evolving regulation still significant.
- There is a strong focus on projecting hydrogen's role out to 2030, especially in terms of production capacity, demand, trade, and infrastructure deployment.
- The report includes a special chapter on Southeast Asia, assessing the region's near-term potential for low-emissions hydrogen production and usage.
- Key uncertainties remain: cost competitiveness, regulatory and policy frameworks, and how quickly infrastructure (e.g. transport, storage, trade) can keep up.

Green Hydrogen Organisation

GH2 Global Outlook (September 2025):

Supply

⇧⇧⇧	China
⇧⇧	India
⇧⇔	EU
⇧	Australia
⇔	Latin America
⇔	SE Asia
⇩	Africa
⇩⇩⇩	US

Pricing Carbon !!
State support (CAPEX & Risk)
Hydrogen Hubs
Faster RE Permitting

Demand

⇧⇧⇧	Co-firing in Japan and Korea
⇧⇧	Shipping (EU + IMO Taxes and incentives)
⇧	Fertiliser (Where CO2 is taxed and/or gas expensive)
⇧	Refining (Esp. in EU due to CO2 taxes + mandates)
⇧	Aviation (Esp. in EU due to CO2 taxes + mandates)
⇩	Iron and Steel (Large green premium)
⇩	Transportation (Batteries are cheaper)
⇩⇩⇩	Gas network blending (Inefficient)

Pricing Carbon !!
Green Mandates (Grey to Green Ammonia & Methanol)
Auctions and CFD schemes

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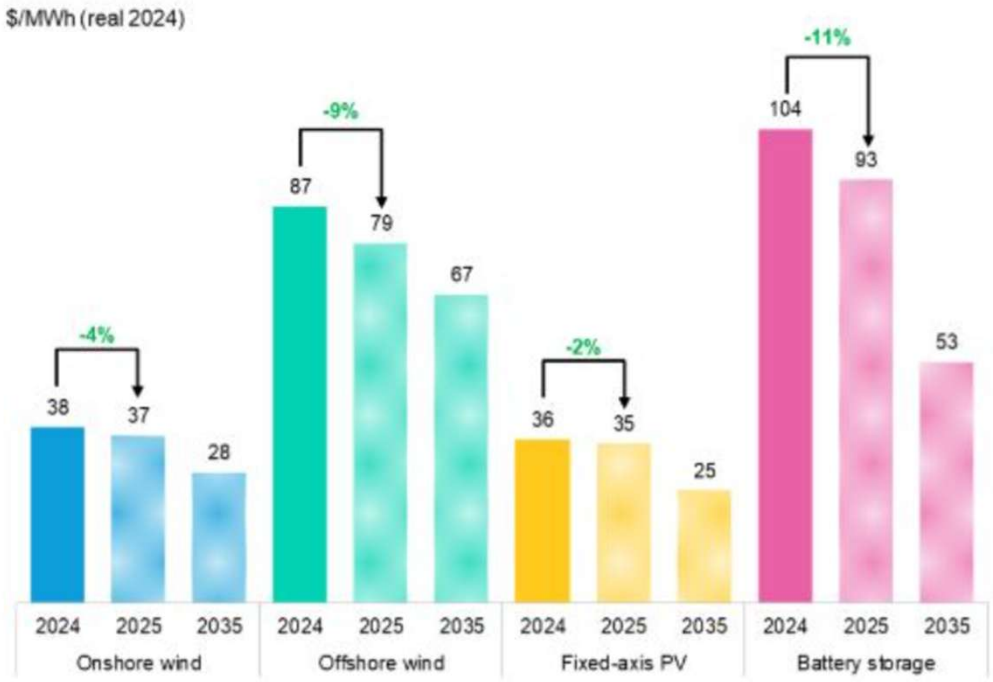
Renewable costs continue to fall

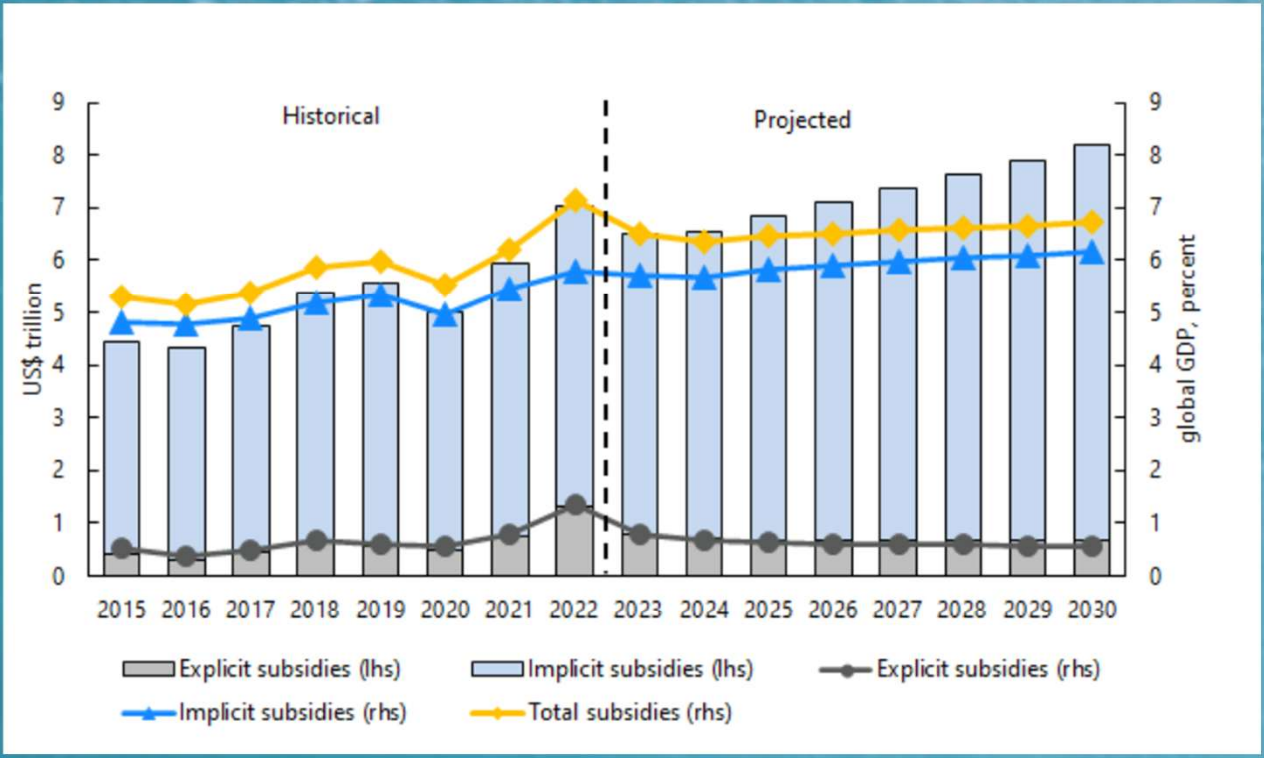
Figure 1: Global benchmark levelized cost of electricity, 2024, 2025 and 2035



Source: BloombergNEF. Note: Global benchmarks are capacity-weighted averages using BNEF capacity forecasts. LCOEs reported without subsidies or tax credits. Offshore wind includes transmission costs. Battery storage reflects four-hour systems.

- IEA: onshore wind and solar PV are the cheapest sources of new electricity generation
- Driven by dramatically falling costs for solar panels and wind turbines, renewables are the most economic option for new power plants in most countries globally.
- In 2023, about 96% of new utility-scale solar PV and onshore wind capacity had lower generation costs than new coal and natural gas plants, and three-quarters were cheaper than existing fossil fuel facilities.

Massive Fossil Fuel Subsidies undermine the energy transition



Source: IMF (2025)

- Intended to protect consumers by keeping prices low
- Lead to higher taxes/borrowing and/or lower spending
- Promote inefficient allocation of an economy's resources & encourage pollution
- Are not well targeted at the poor (mostly benefiting higher income households).
- Remove fossil fuel subsidies! Use the revenue gain for better targeted social spending, reductions in inefficient taxes, and productive investments
- Addresses energy security concerns related to volatile fossil fuel supplies.

Green Hydrogen Organisation

GH2 Global Outlook (September 2025):

Key message: We need to move from generic hydrogen strategy ----> targeted interventions in priority sectors.

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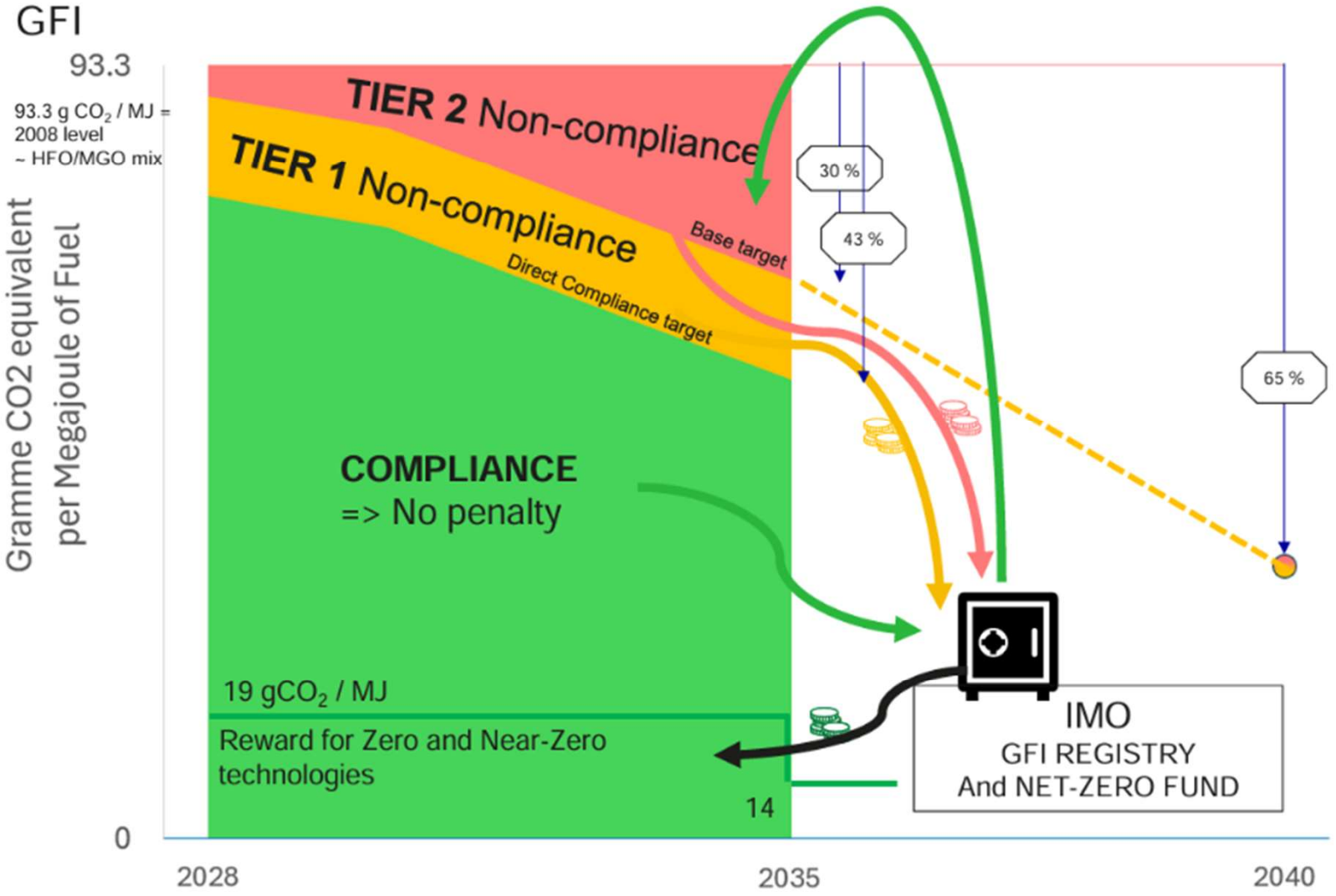
Comparison of hydrogen policy approaches adopted across selected hydrogen markets

	European Union	United States	China	Japan	India
Targets	2030: 40 GW of domestic electrolyser capacity	-	2025: 100-200 kt green hydrogen production	2030: 3 Mtpa of hydrogen consumption	2030: 5 Mtpa green hydrogen production
Supply	European H_2 Bank IPCEI Innovation Fund	Inflation Reduction Act (45V, 45Q, 45Z, 48C)	Provincial subsidies; roll-out through SOEs	CfD scheme	Financial support for electrolysis; ammonia, manufacturing
Infrastructure	H_2 and gas markets decarbonisation IPCEI; AFIR; CEF	support for hydrogen refuelling stations	Support for new hydrogen pipelines	Clusters support scheme; CAPEX subsidy for storage	Hydrogen Valley Innovation Clusters
Demand	RED; ReFuel Aviation; FuelEU Maritime; CISAF; IPCEI	Loan guarantees, tax credits, ZEV mandates	Implementation plan for industry; FCEV tax exemptions/subsidies	Hub support; tax credits for industry; FCEV subsidies	Guaranteed offtake through SECI
Certification	Delegated Acts for renewable and low-carbon hydrogen	Clean Hydrogen Protection Standard (CHPS)	Clean and Low-Carbon Hydrogen Energy Evaluation Standards	Hydrogen Society Promotion Act	Green Hydrogen Standard
R&D	Clean Hydrogen Partnership	Offices of Energy Efficiency, Renewable Energy, FECM	Demo programmes across the entire value chain	Green Innovation Fund	R&D scheme of National Green Hydrogen Mission

AFIR = Alternative Fuels Infrastructure Regulation; CEF = Connecting Europe Facility; CfD = Contract for difference; CISAF = Clean Industrial State Aid Framework; FCEV = Fuel cell electric vehicle; FECM = Fossil Energy and Carbon Management; IPCEI = Important Projects of Common European Interest; RED = Renewable Energy Directive; SECI = Solar Energy Corporation of India; SOE = State-owned enterprise; ZEV = Zero Emission Vehicles.

Source: IEA (2025)

IMO MID-TERM MEASURE



Tier 2 Non-compliance

- **Surplus Units** (SU) from other ships
- Use Banked **Surplus Units**
- **Remedial Units** at Tier 2 price : **380 USD** / t CO2e (2028-2030)
- Price in 2031 to be decided in 2028

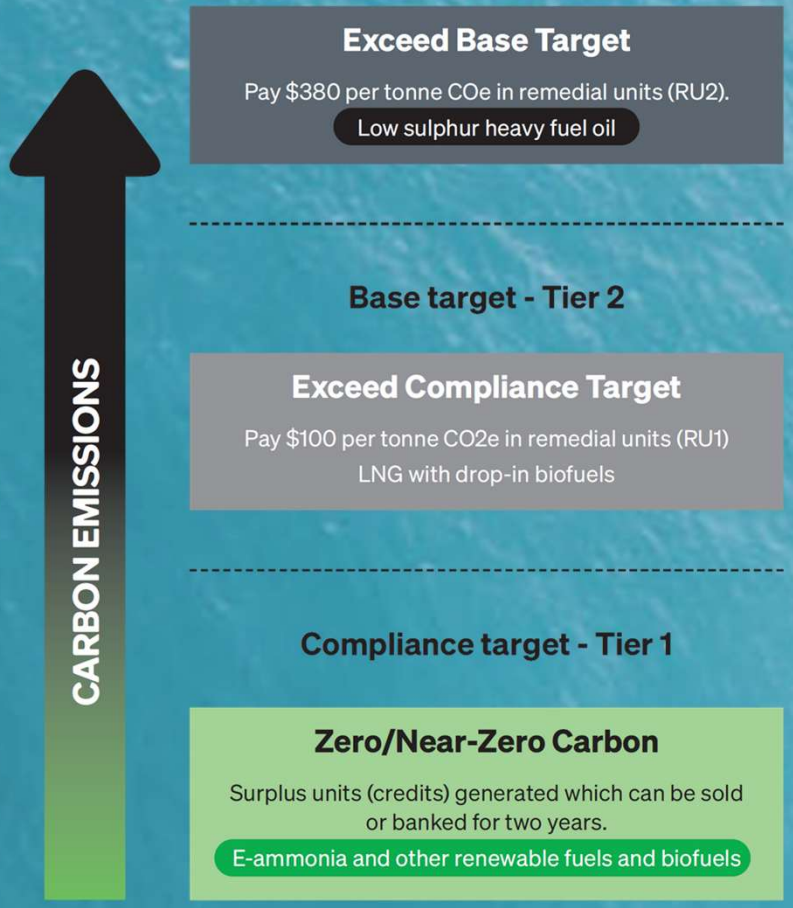
Tier 1 Non-compliance

- **Remedial Units (RU)** at Tier 1 price : **100 USD** / t CO2e (2028-2030)
- Price in 2031 to be decided in 2028

Compliance

- **Surplus Units (SU)**
- Bank or Transfer or Cancel

How the IMO's new rules work



The NZF rests on two pillars: a **global fuel standard** and a **carbon pricing mechanism**. The pricing mechanism has two tiers, which will become more stringent over time. Ships exceeding the **compliance target**, the first tier, will pay a USD 100 per tonne CO2e fee. Ships exceeding the **base target**, the second tier, will pay a USD 380 per tonne fee.

If zero or near zero carbon or biofuels are used, emission will be less than the compliance target, surplus units (credits) will be generated, which can be sold or banked for up to two years. Rewards will also be provided to some of the fuels used, though the eligibility criteria needs to be agreed.

With fuels that fail to meet the compliance target, but meets the base target, the remedial units (RU1) of USD 100 per tonne of CO2e has to be paid. With fuels that fail to meet also the baseline target, remedial units (RU2) of USD 380 per tonne CO2e needs to be paid.

It has been agreed that the monies paid to the IMO for the remedial units should be used **in part to rewards zero carbon fuels** or to **support a just and equitable transition**.

Green ammonia is an alternative today.

Home > Green Marine >

‘World’s first’ digital fuel certificate pilot for ammonia bunkering completed

BUSINESS DEVELOPMENTS & PROJECTS

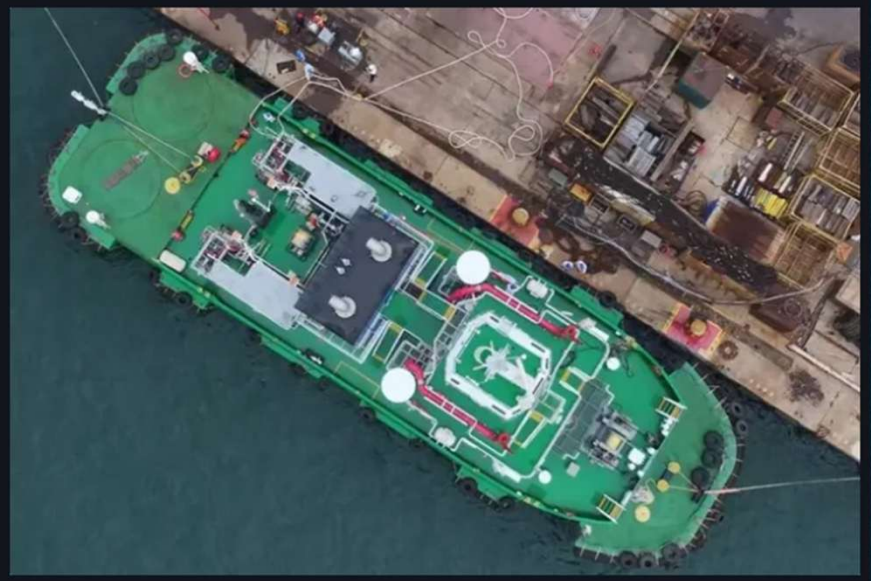
June 26, 2025, by Ajsa Habibic

Australian green technology, energy, and metals company Fortescue has participated in the issuance of the *“world’s first”* digital fuel certification for an ammonia-to-ship transfer.

Courtesy of Fortescue

'World's first' green ammonia ship refuelling completed — using molecules from giant 500MW hydrogen plant

Operation used renewable NH3 from Envision's installation in Chifeng, China



Ship being refuelled with Envision's green hydrogen-derived ammonia **(Photo: Envision)**

GH2 mobilising fuel producers in support of robust IMO rules.

Green Hydrogen Organisation
Weekly Wrap

IMO compromise proposal - a bridge to nowhere?

IMO at the crossroads, for green shipping and green fuels

Are we heading towards shipping leadership on climate or fossil-fuel lock-in?

IMO agrees first globally mandated emissions targets for shipping but more work needed

Thank you!

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