Offshore Wind and Renewable Hydrogen: Unlocking Potential

Dynamo Energy Hub

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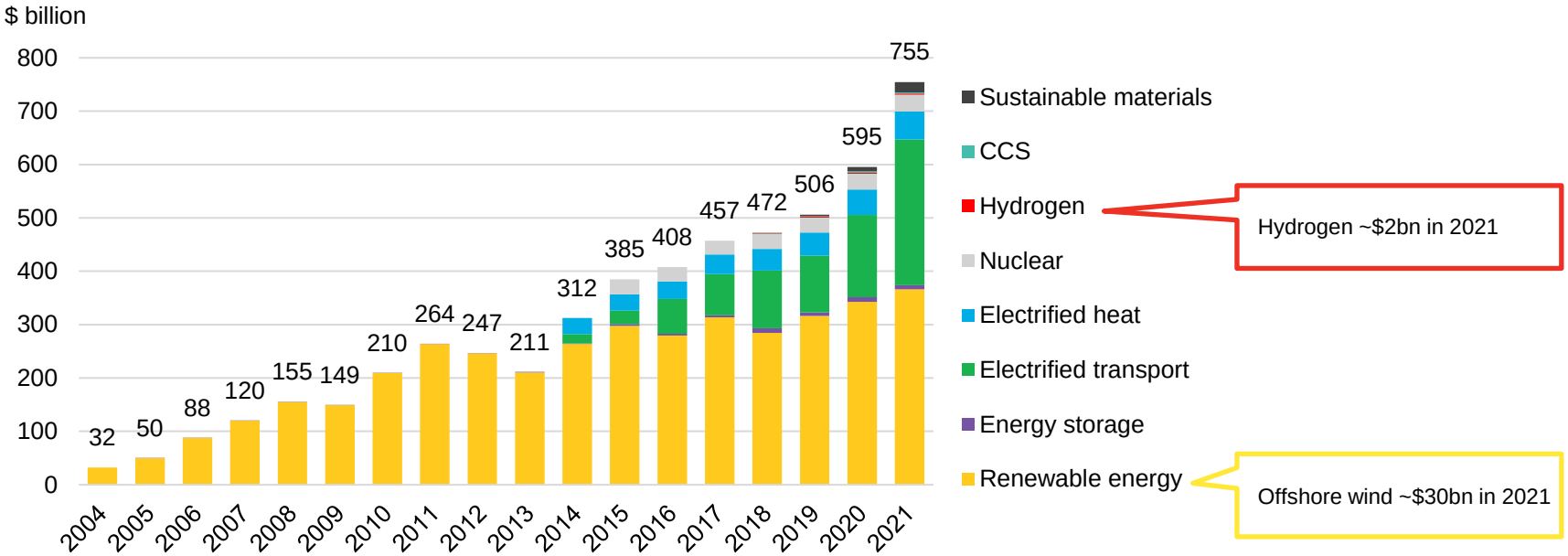
BloombergNEF

Offshore wind and hydrogen are still a small fraction of energy transition spending

Historical investment in energy transition technologies



Source: BloombergNEF.

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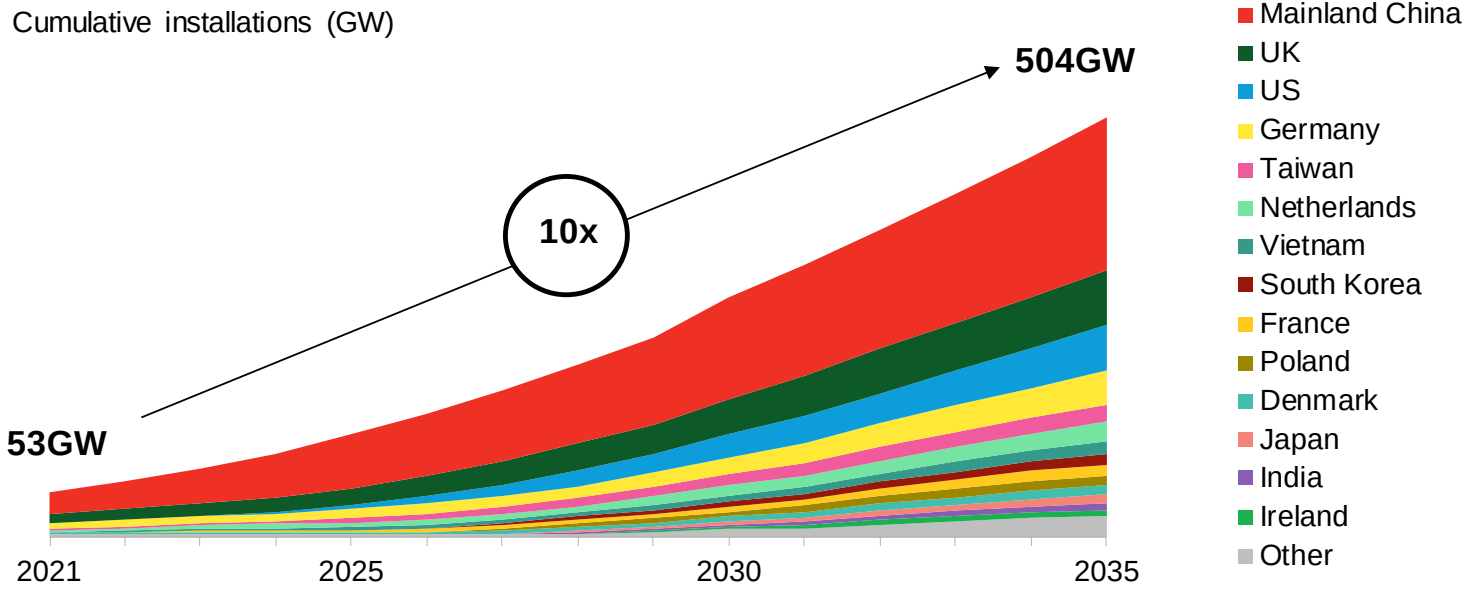
Offshore wind is poised for 10x growth to 2035

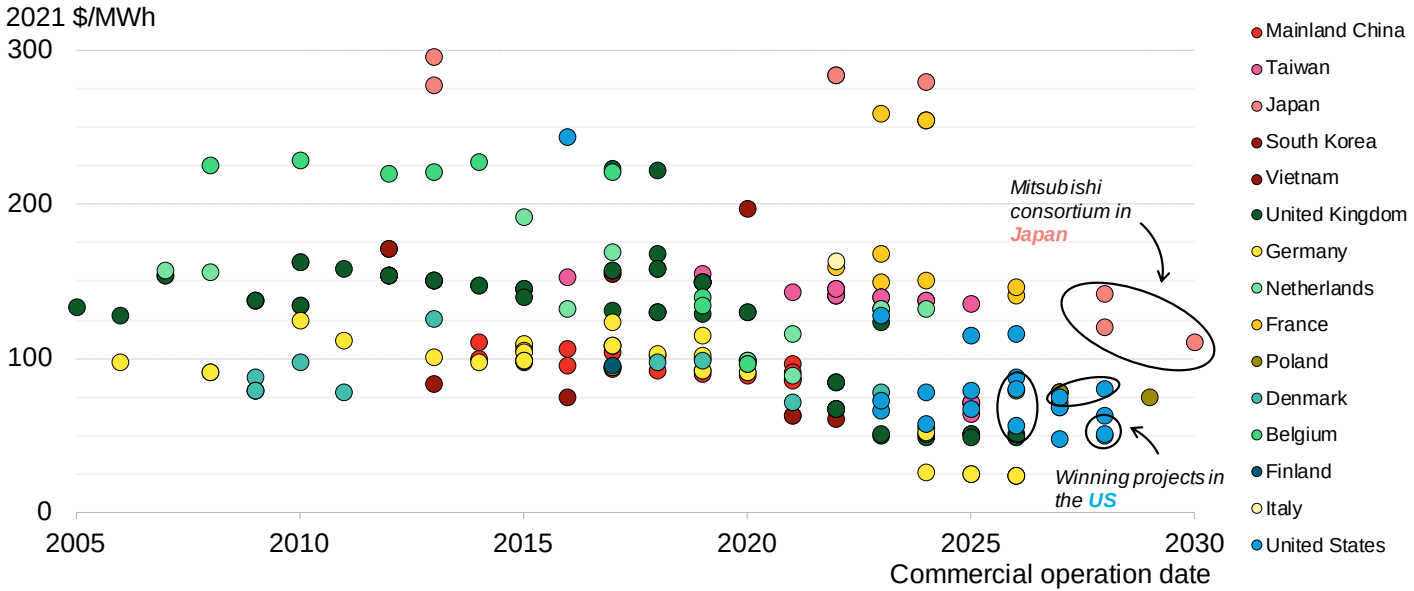
Global cumulative offshore wind installations



Source: BloombergNEF. Note: Other = Portugal, Italy, Finland, Lithuania, Latvia, Estonia, Greece, Norway, Sweden, Spain, Brazil, Belgium, Colombia. Cumulative 2030 installations are 287GW.

Cost reductions achieved in Europe are translating to bids in other markets

Levelized offshore wind prices



Source: BloombergNEF. Notes: Levelized price takes into account tariff price and length, inflation, a merchant tail assumption and a 25-year project lifetime. It is the average inflation-linked tariff over the full life of the project. For a merchant tail or zero-subsidy project, we assume that the previous three-year average power price stays flat in real terms.

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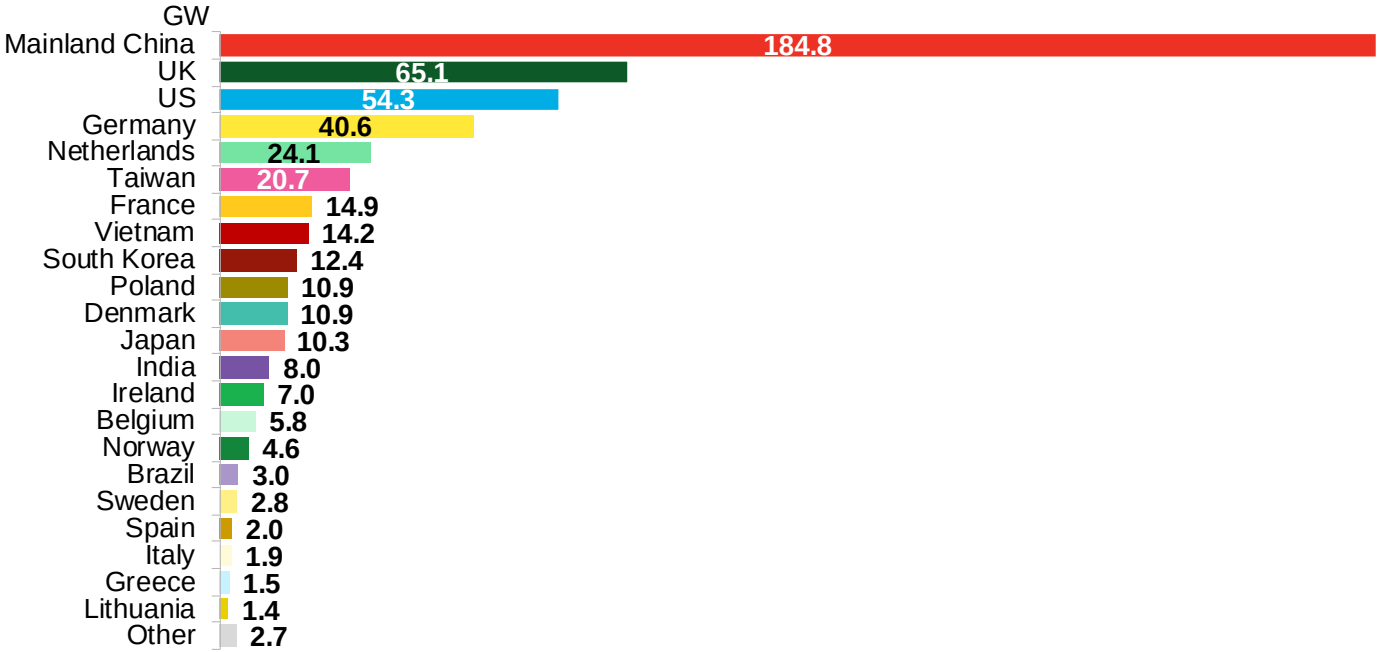
The US will take its place among leading markets in the next decade

Offshore wind market ranking in 2035 (cumulative installations)



Source: BloombergNEF. Note: Shows countries reaching more than 1GW by 2035. Other = Colombia, Estonia, Finland, Latvia, Portugal.

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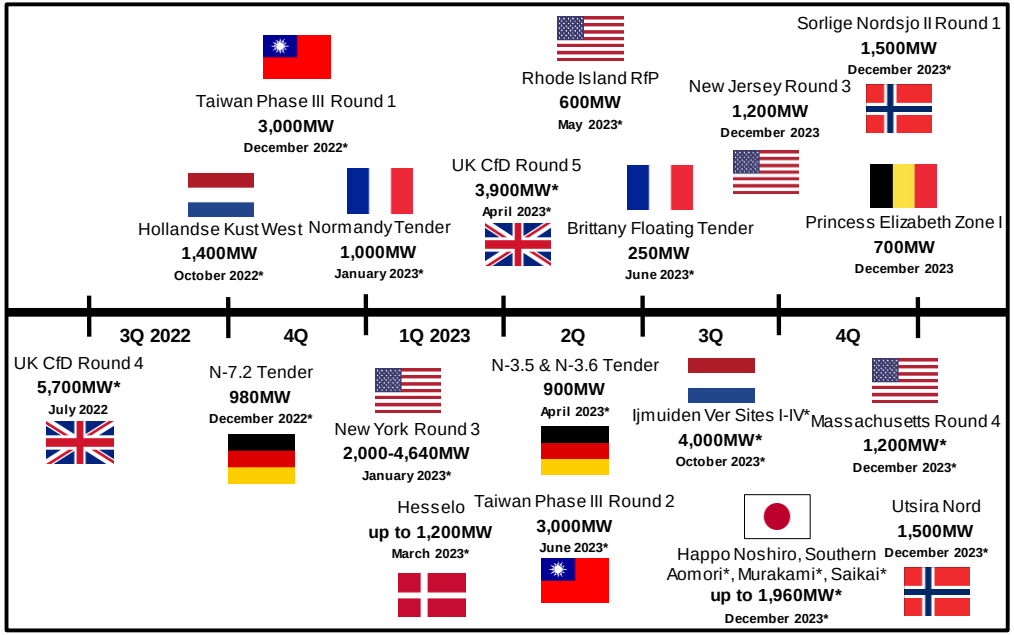
2022 and 2023 will be busy years for offshore wind auctions

Auctions scheduled for the next 18 months



*Source: BloombergNEF. Note: * = BNEF estimate on awarded sites, capacity or date.*

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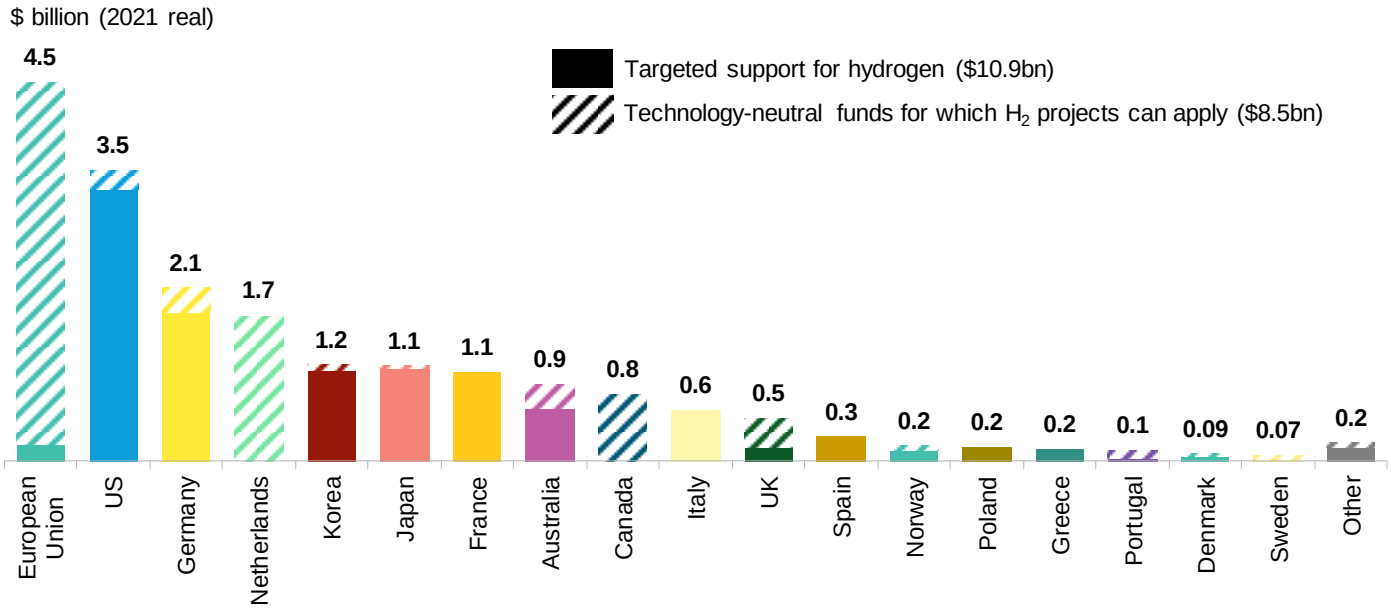
Countries are starting to open the taps for hydrogen funding

Annual budgets for national subsidies open to low-carbon H_2 projects, 2022-30



Source: BloombergNEF. Note: Includes subsidies announced and in force until 2030. Excludes sub-national funds and tax credits. Includes fuel cell funds. We annualize funding amounts. H2 is assumed to access 15% of technology-neutral funds(such as the Netherlands' SDE++ scheme)and 40% of funds focused on industry decarbonization. We assume 37% of EU funding from key programs is for clean energy projects, and that H2 is eligible for 15% of those funds.

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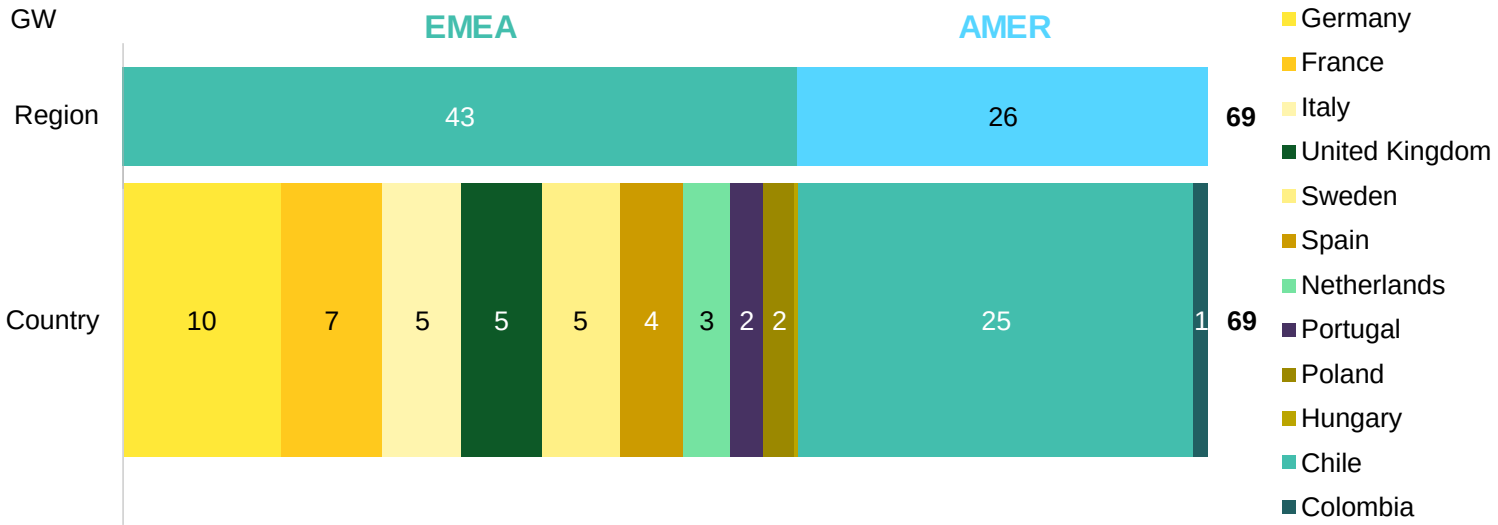
Roughly 70GW of electrolyzer targets are in place, with Chile and Germany leading

2030 electrolyzer targets by countries with hydrogen strategies



Source: BloombergNEF. Note: as of February 22, 2022. Where countries release a range, we used the lower end of the range.

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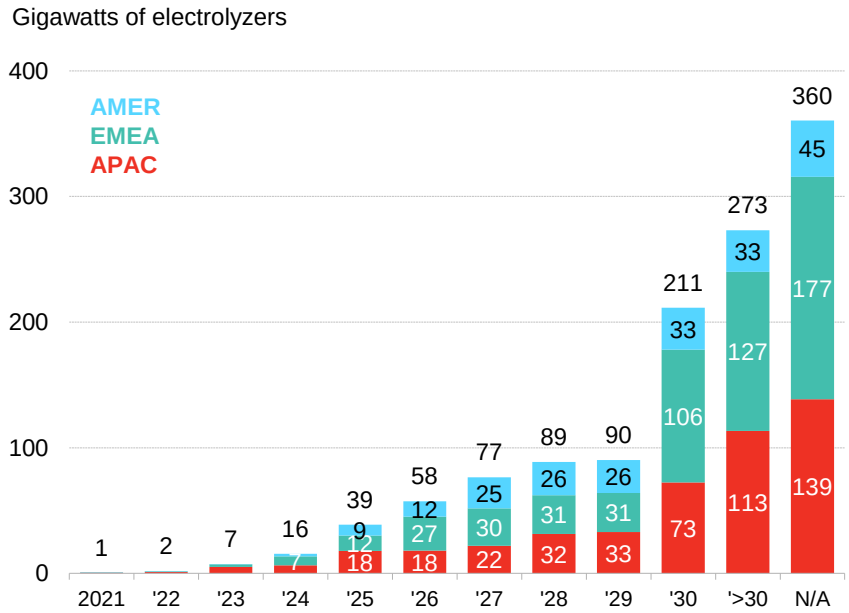
And the development pipeline is even bigger

Cumulative electrolyzer pipeline



Source: BloombergNEF. Estimated using the methodology in BNEF Hydrogen Supply-Demand Model: Supply (web | terminal).

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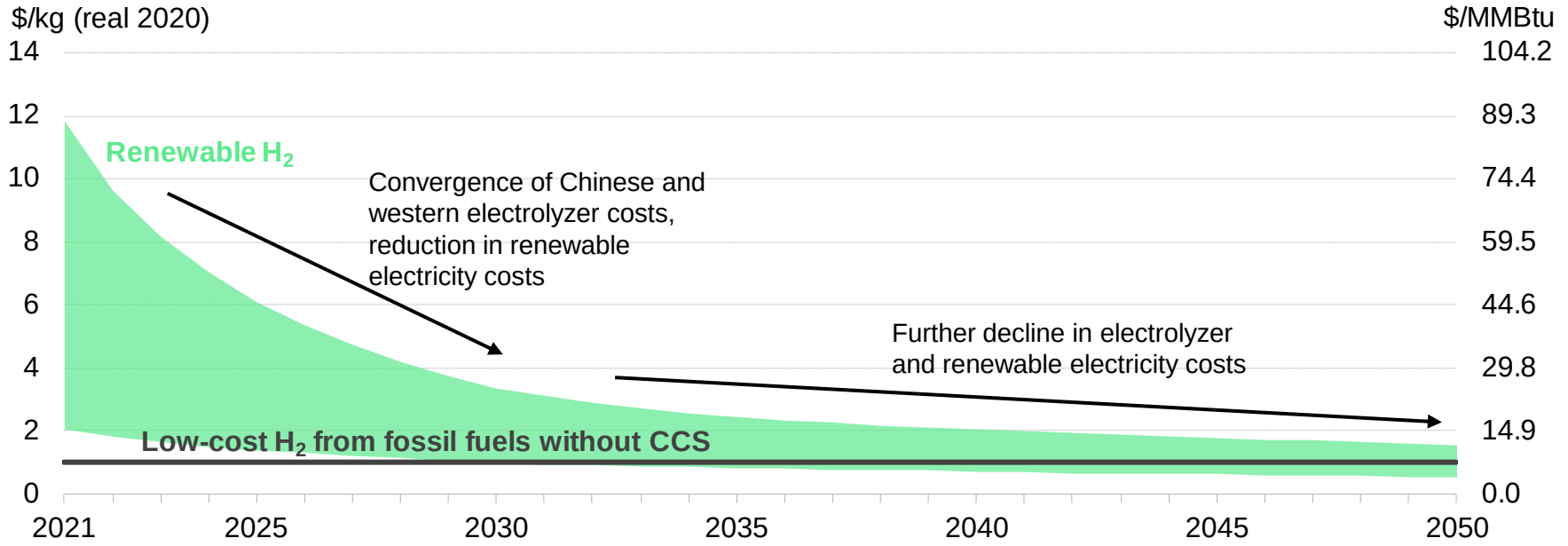
Levelized costs of renewable hydrogen will fall rapidly with scale

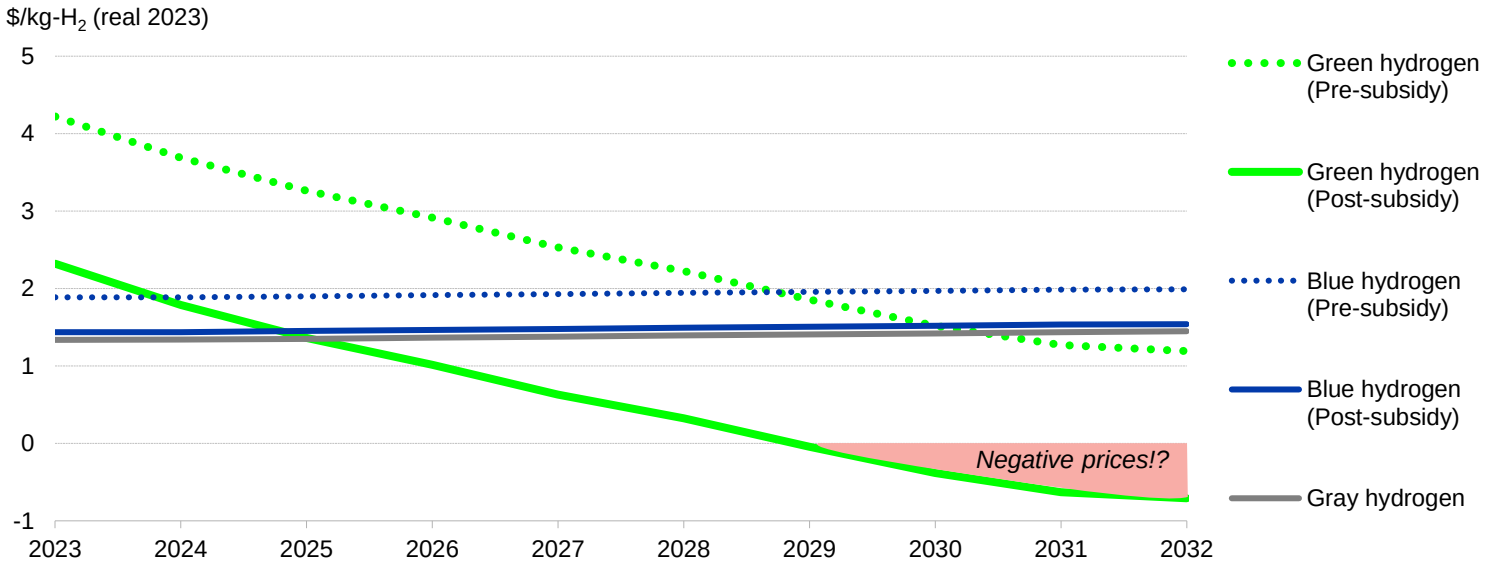
$LCOH_2$ from cheapest available renewable power in 29 countries



Source: BloombergNEF. Note: Assumes 2022 Chinese alkaline electrolyzer costs of $0.25/W, Western alkaline electrolyzer costs of $0.93/W and PEM electrolyzer costs of $1.11/W. By 2030, costs are assumed to converge to those listed in Hydrogen: The Economics of Production From Renewables (web | terminal). Electricity costs derived from BNEF's 2H 2021 LCOE Update (web | terminal), mid scenario.

The IRA tax credit will further accelerate cost reductions… or will it?

Effect of production tax credits on US levelized cost of hydrogen



BloombergNEF. Note: This modeling uses project level assumptions available in BloombergNEF's H2val. Green hydrogen calculation assumes production tax credit of $3/kg taken over equal production in each year. Blue hydrogen calculations assume projects choose 45Q credit.

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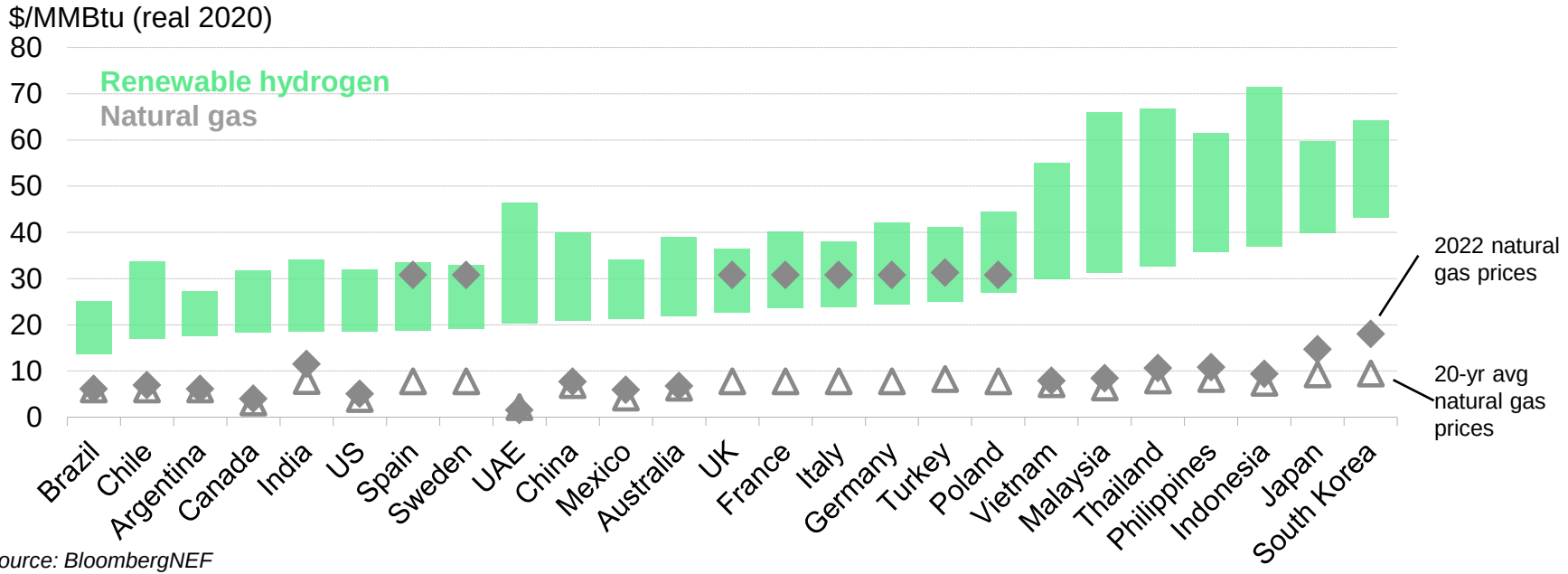
The energy crisis has made green hydrogen temporarily competitive in some markets

Levelized cost of hydrogen range, versus natural gas prices in 25 countries, 2022



Source: BloombergNEF

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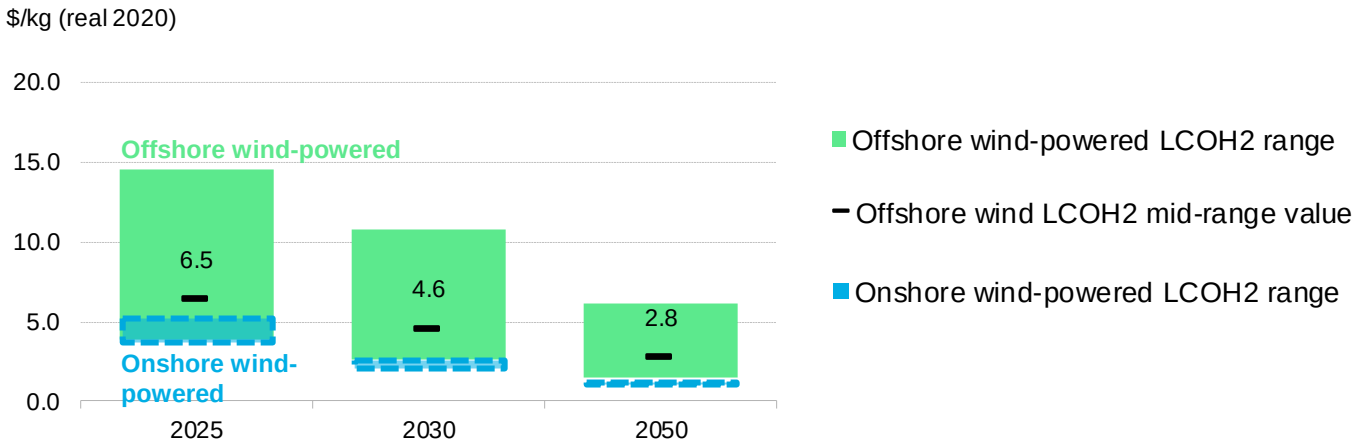
Offshore wind-to-hydrogen may not be cheapest, but can play a role

Levelized cost of hydrogen range for electrolyzers powered by offshore or onshore wind
(assuming an onshore electrolyzer)



Source: BloombergNEF. Note: All hydrogen cost estimates are calculated based on western proton exchange membrane (PEM) electrolyzer costs. The green range represents the calculated $LCOH_2$ from offshore wind based on a wide range of assumptions: transport distance ranging between 10km and 300km, offshore wind capacity factor ranging between 35% and 60%, electrolyzer/wind farm size ranging between 100MW and 3GW. The blue range represents the $LCOH_2$ for onshore wind-powered systems, also using PEM electrolyzers. They represent the typical onshore wind $LCOH_2$ range for the U.K., Germany, and the Netherlands assuming wind capacity ranging between 30% and 50%.

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Our expert coverage assesses pathways for the power, transport, industry, buildings and agriculture sectors to adapt to the energy transition.

We help commodity trading, corporate strategy, finance and policy professionals navigate change and generate opportunities.

Thank you!

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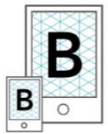

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