Hydrogen and the New Geopolitics of Energy

Setting the scene

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Head of Hydrogen Analysis, BloombergNEF

October 24, 2022

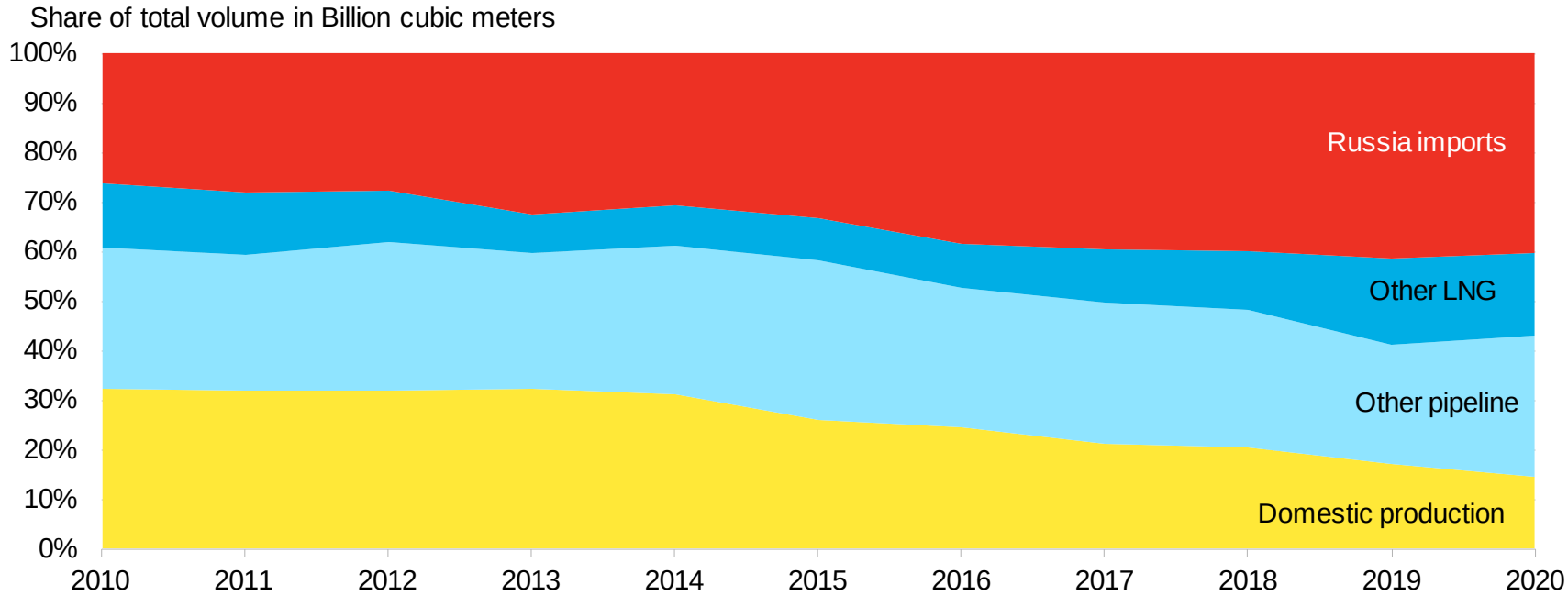
BloombergNEF

Larry the Cat
Source: Bloomberg LP

Source: Bloomberg LP

Russia provides over a third of European gas supplies

Breakdown of EU gas supplies by source



Source: BloombergNEF, Eurostat. Note: Includes liquified natural gas (LNG) and pipeline imports from Russia.

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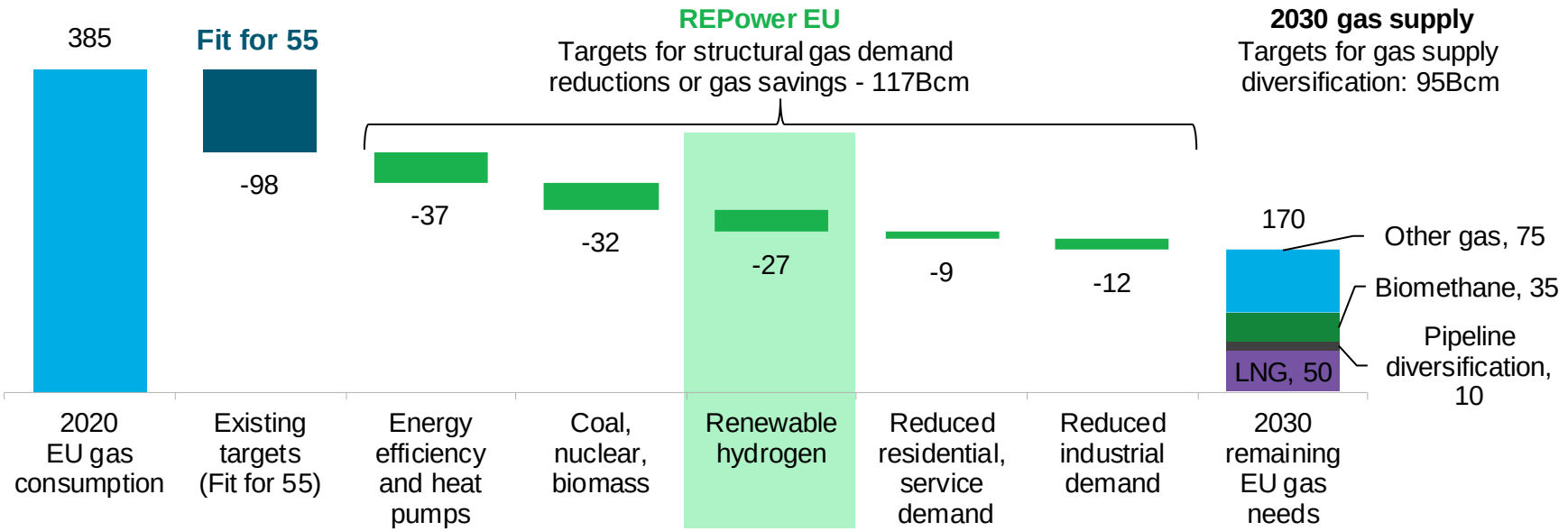
Hydrogen plays a central role in Europe's strategy to reduce natural gas demand

European Commission targets for EU natural gas use by 2030, based on REPowerEU package

Billion cubic meters (Bcm)



Source: BloombergNEF, European Commission, Eurostat. Note: LNG is liquified natural gas. EU's Russian Gas Phase-Out Hinges on Clean Energy (web | terminal).

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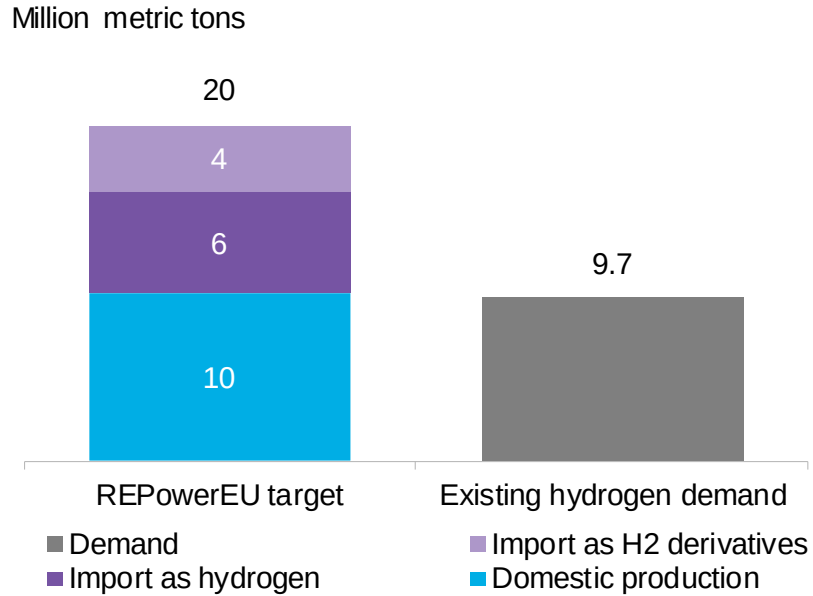
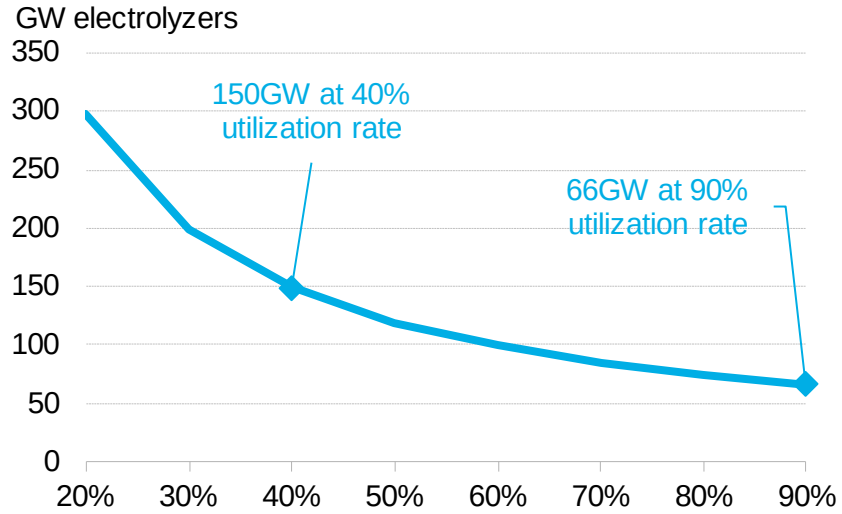
REPowerEU has quadrupled Europe's hydrogen ambitions

REPowerEU hydrogen targets vs existing demand



Source: BloombergNEF, European Commission

Required domestic electrolyzer capacity to meet domestic targets



Source: BloombergNEF

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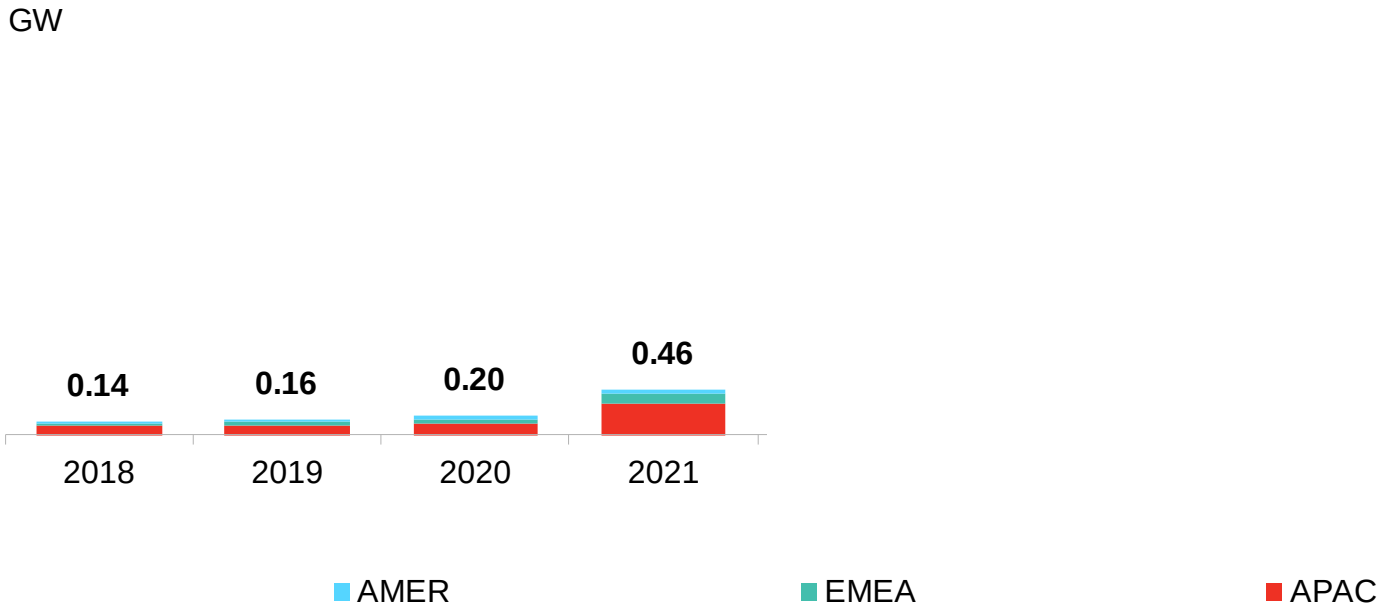
A mere 200 megawatts of electrolyzers were shipped in 2020

Estimate and forecast of annual electrolyzer shipments

Source: BloombergNEF

Electrolyzer sales doubled in 2021

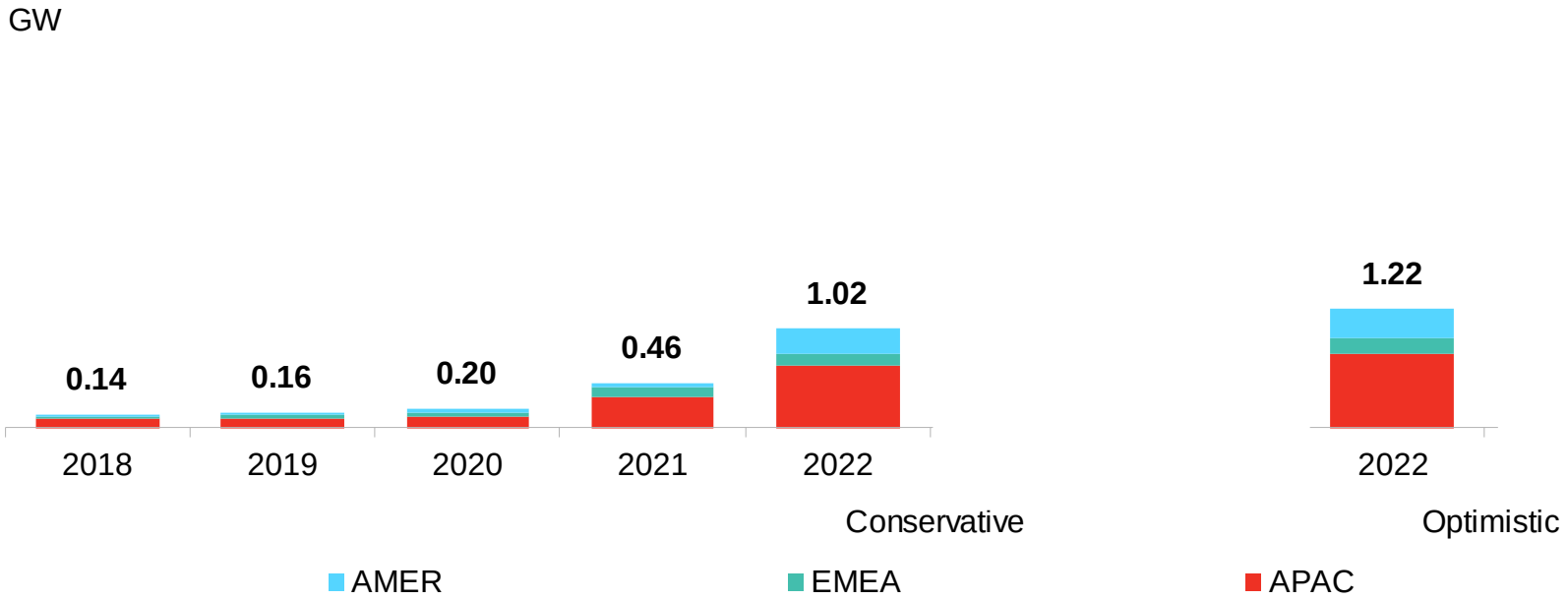
Estimate and forecast of annual electrolyzer shipments



Source: BloombergNEF

Global electrolyzer markets are set to keep doubling

Estimate and forecast of annual electrolyzer shipments



Source: BloombergNEF

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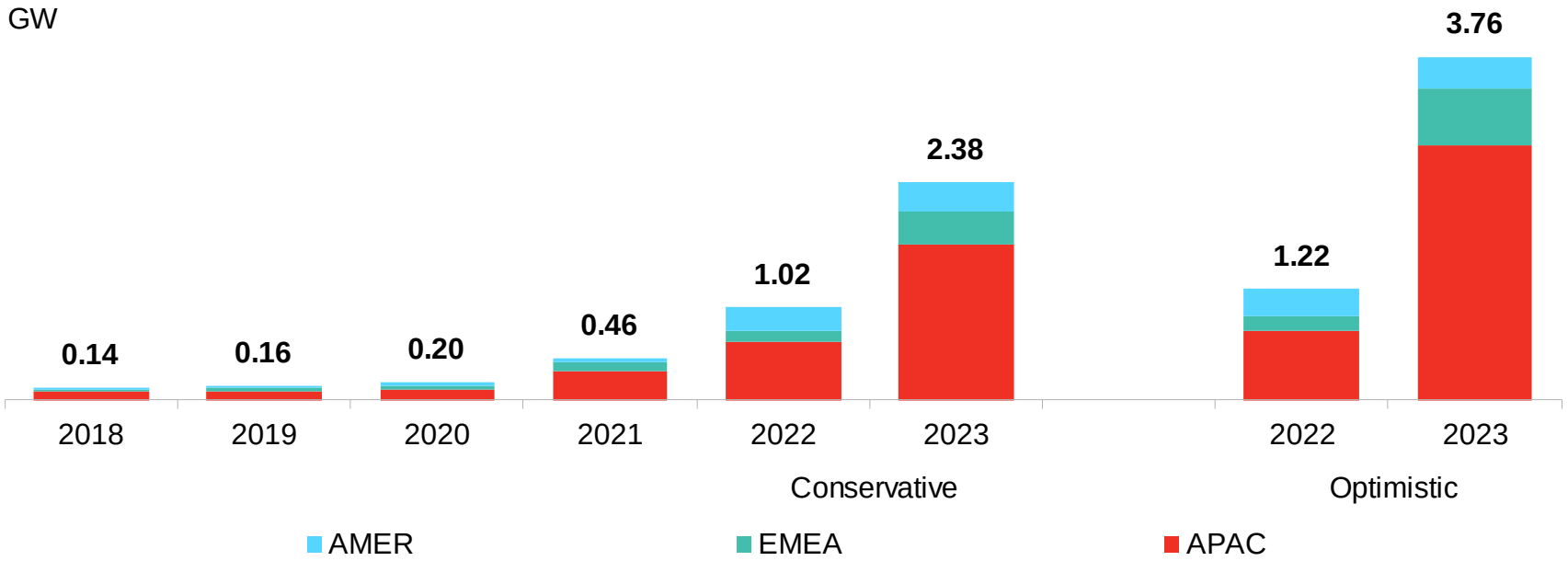

Source: BloombergNEF

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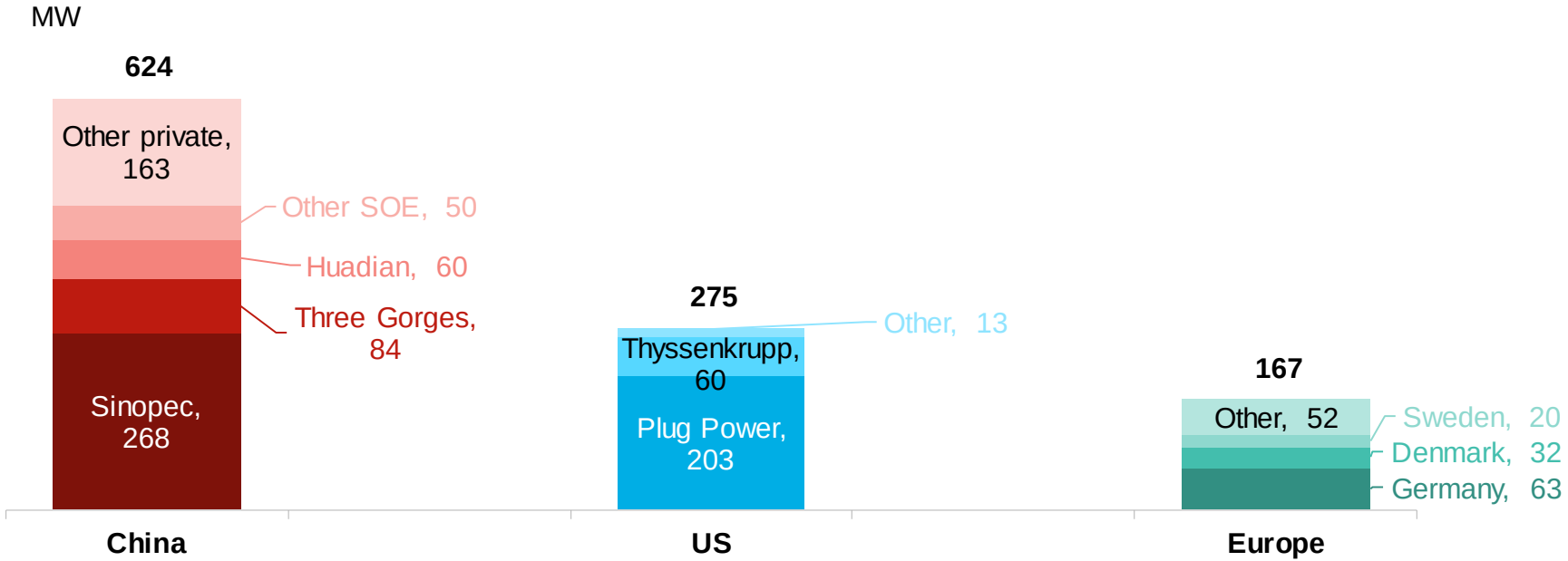
China dominates electrolyzer deployment, followed by US and Europe

Leading markets for green hydrogen development in 2022



Source: BloombergNEF. Note: Follows our optimistic forecast for 2022. Other Europe includes UK. SOE stands for Chinese state-owned enterprises. Sinopec, Three Gorges and Huadian are also SOEs.

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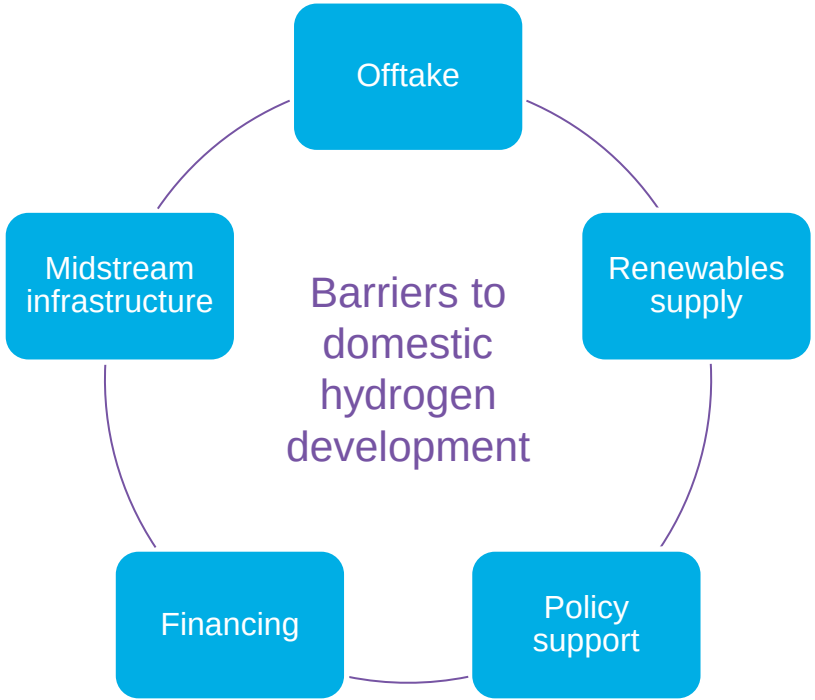
Domestic hydrogen in Europe faces barriers



Source: BloombergNEF

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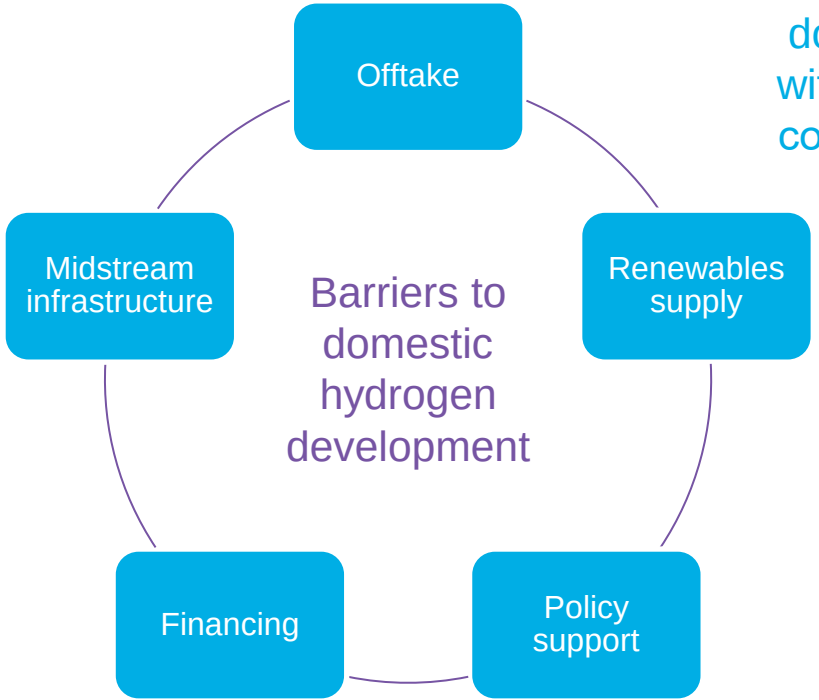
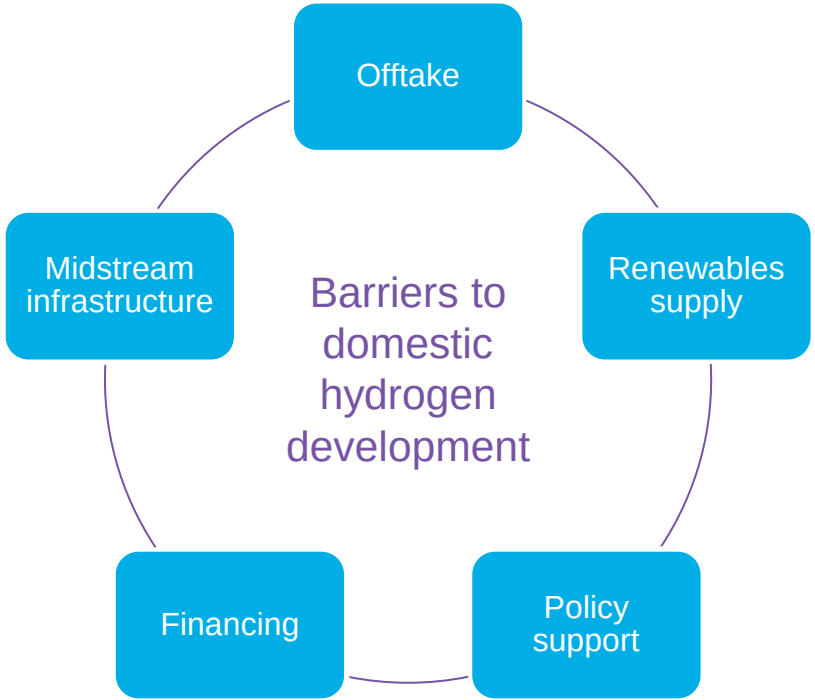


On-site development dominates today, with regional hubs coming our way…

…but space, cost and grid constraints can be a bottleneck

Source: BloombergNEF

Domestic hydrogen in Europe faces barriers

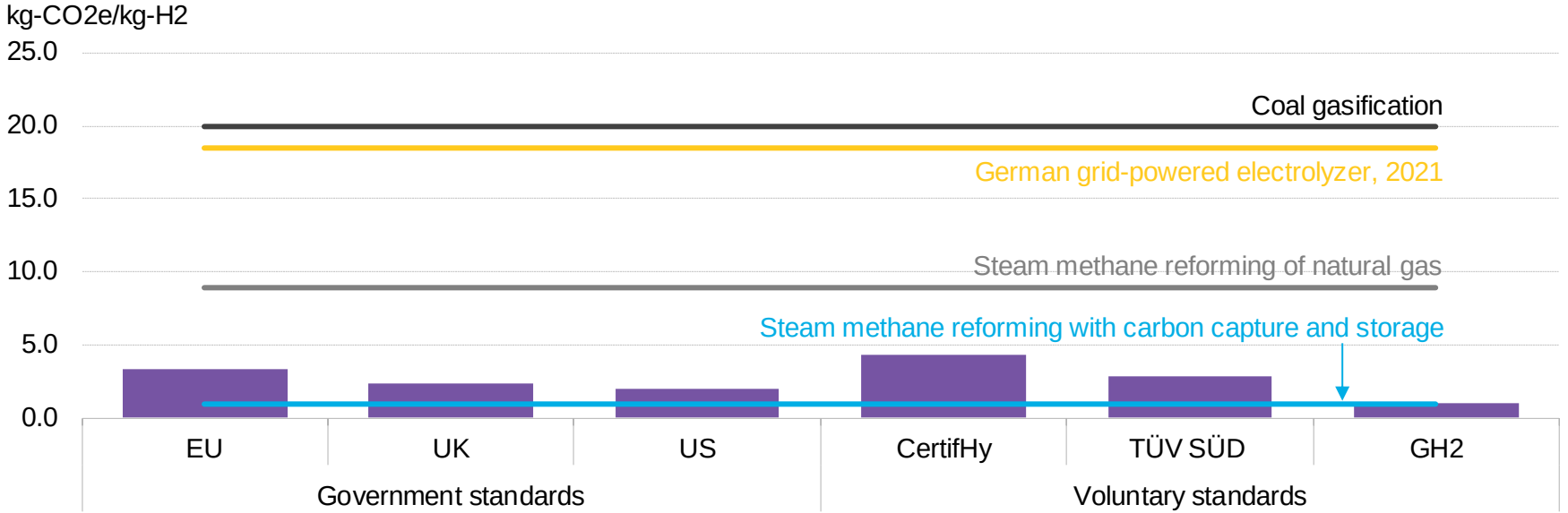


Imports may be a way around these constraints for Europe…

Source: BloombergNEF

Definitions of clean hydrogen need to align

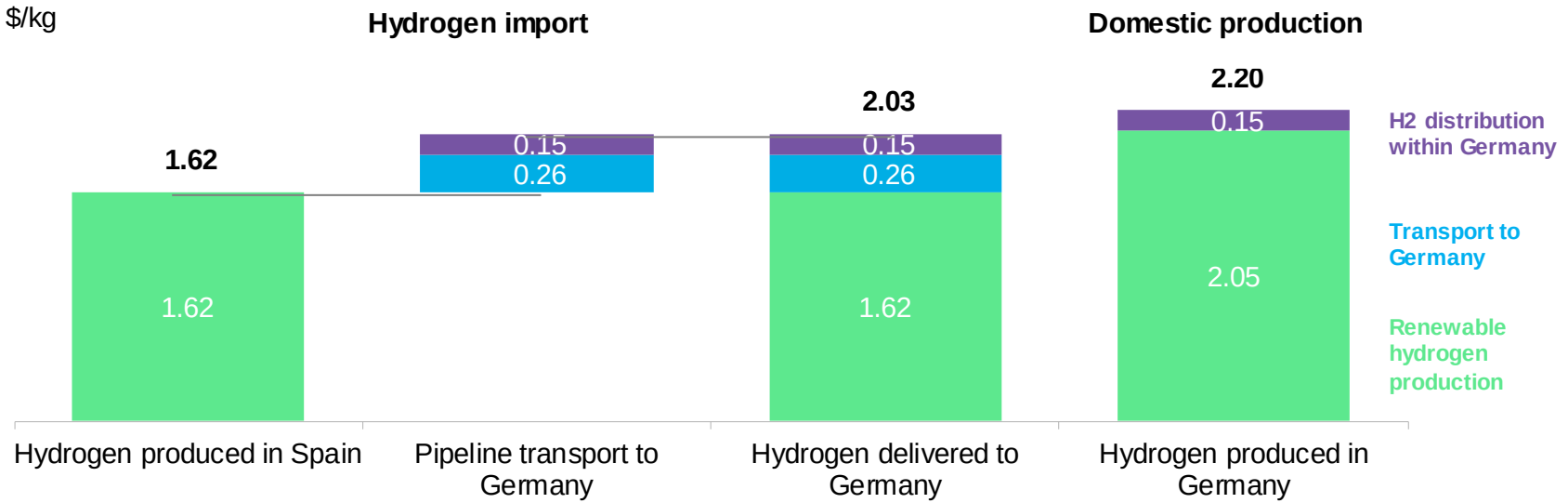
Hydrogen standard emission thresholds against production emissions only



Source: BloombergNEF. Note: CertifHY = A voluntary EU scheme for hydrogen certification. TÜV SÜD is set by a German technical certification company. GH2 = A voluntary standard by the Green Hydrogen Organization. SMR with CCS assumes a 90% capture rate. Emissions intensity of grid electricity in Germany at 349 grams CO2equivalent per kilowatt-hour. Values assume lower heating value (33.3kWh/kg) for hydrogen.

Pipelines from southern Europe or North Africa look competitive by 2030

Landed cost of hydrogen delivered from Spain to Germany, 2030: import versus domestic production



Source: BloombergNEF. Note: Assumes 2,000km pipeline transport form Valencia, Spain to Duisburg, Germany using a repurposed 48-inch pipeline operated between 80-60bar. Compressor stations every 500km along the pipeline. Local distribution distance is 50km using a repurposed 8-inch pipe operated at 7-3bar. Hydrogen is produced using western alkaline electrolyzers in both countries. Electricity from tracking solar PV is used in Spain, onshore wind in Germany.

Timing the conversion of gas pipeline infrastructure is a key challenge

Source: Bloomberg

Many countries have ambitions to ship hydrogen to Europe and Asia

Source: Bloomberg

The easiest way to ship hydrogen (H_2) is in the form of ammonia (NH_3)

Source: Vigor

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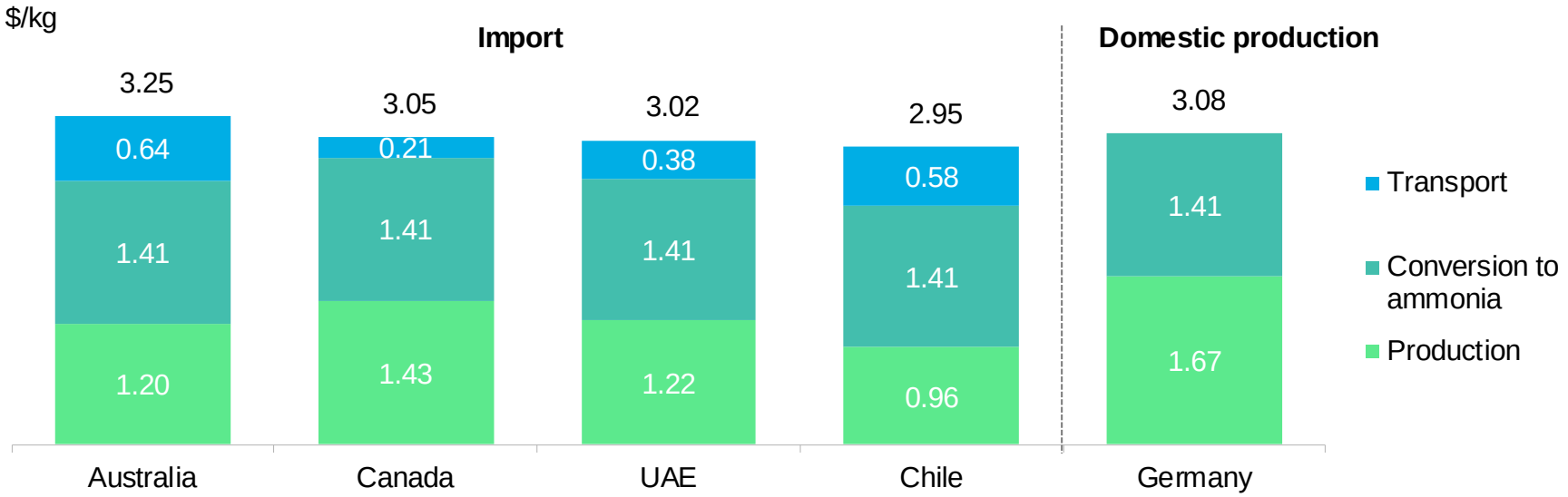
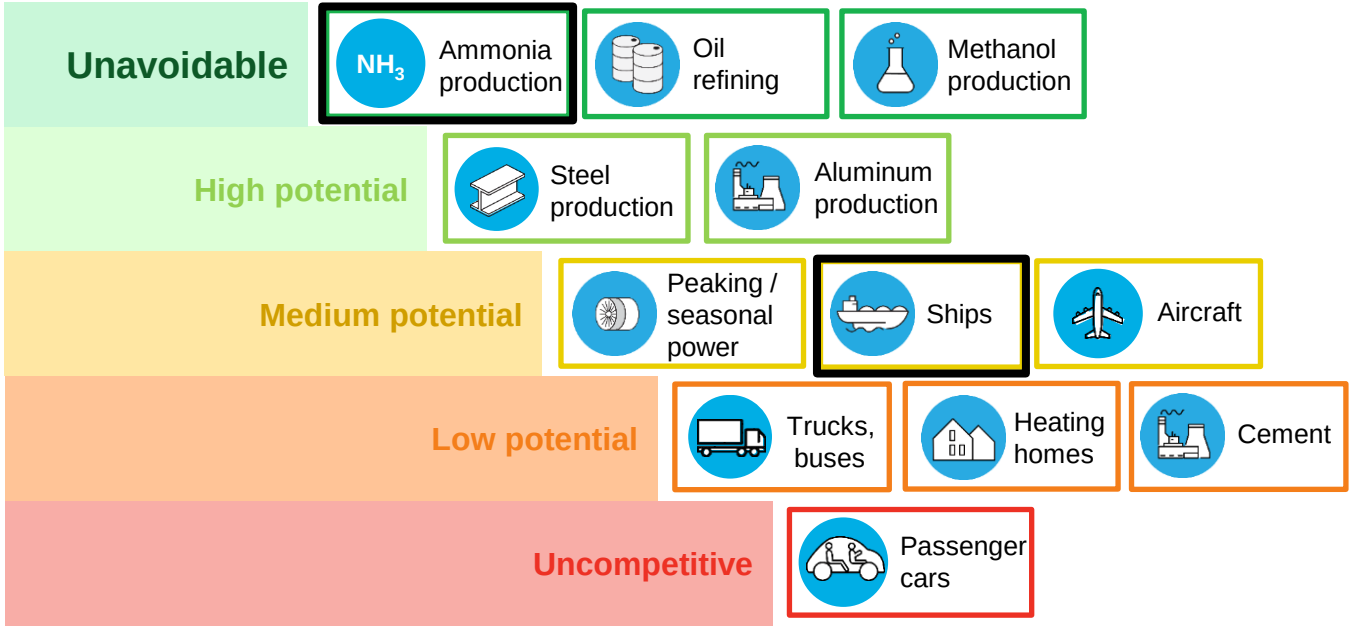


Source: BloombergNEF. Note: Assumes ship transport to Germany over 20,000km from Australia, 6,500km from Canada, 12,000km from UAE and 18,000km from Chile.

Ammonia has only a limited number of direct-use applications

The prospects for widespread adoption of clean H_2 in various sectors



Source: BloombergNEF, concept from Liebreich Associates

See *Hydrogen Economy Outlook* (web) for detail.

Unavoidable sectors cannot decarbonize without using clean hydrogen.

High potential sectors need a low carbon price to adopt H_2, or other methods of CO_2 removal cost more.

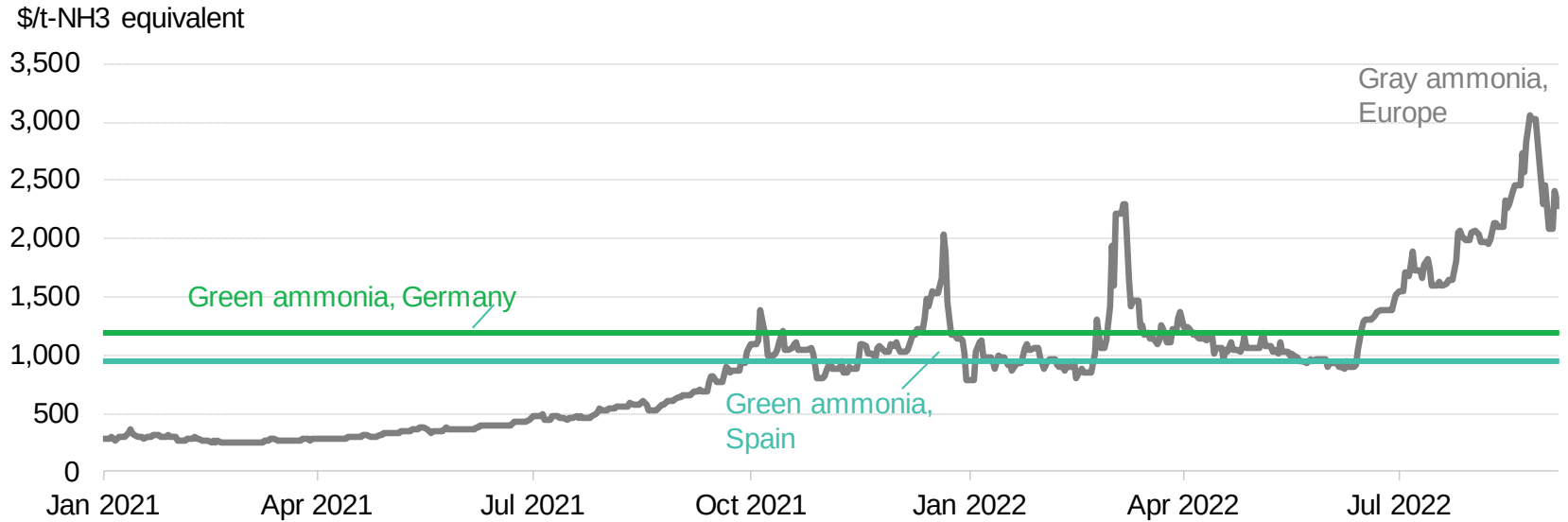
Medium potential sectors may find H_2 competitive in some circumstances.

Low potential sectors could use some H_2 under special circumstances.

Uncompetitive sectors have cheaper alternatives to cut CO_2.

In some situations, green hydrogen can already be cheaper than gray H_2 today

Short-run marginal costs of ammonia production



Source: BloombergNEF. Note: Includes fixed and variable operating costs. Assumes captive H_2 production costs from 1H 2022 Hydrogen Levelized Cost Update (web | terminal) with no transport and storage costs. Ammonia costs in line with our report Hydrogen: Making Green Ammonia and Fertilizers (web | terminal). Excludes carbon prices for gray ammonia.

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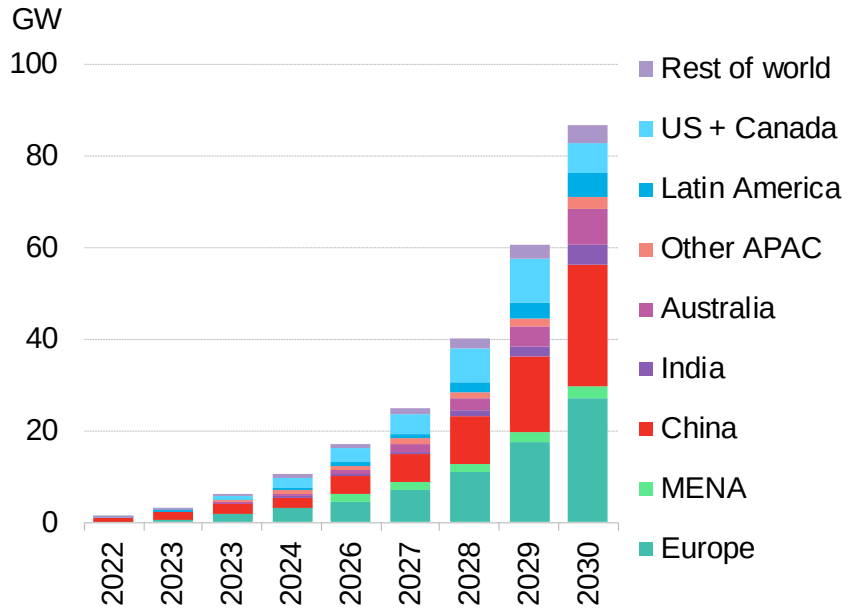
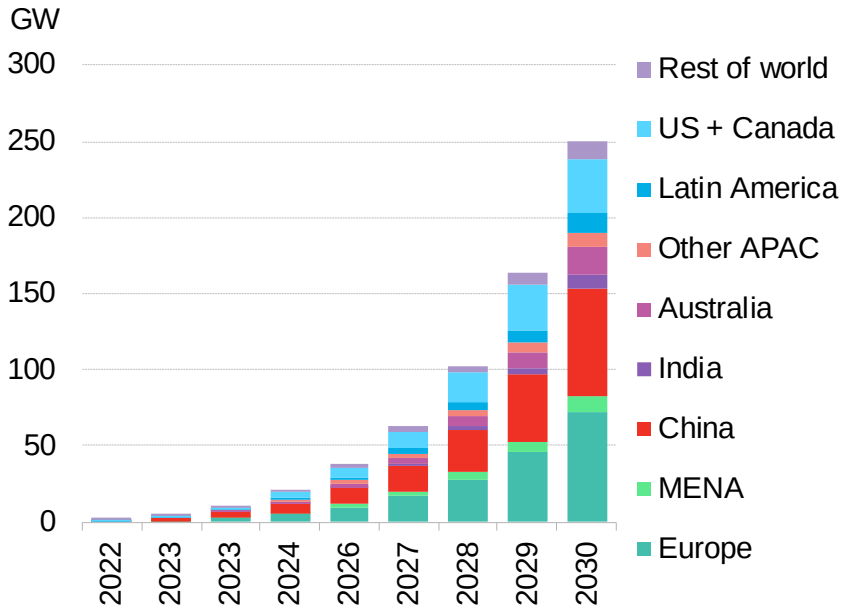
Many regions in the world are vying to supply Europe with hydrogen/ammonia imports

Annual electrolyzer forecast, global



Source: BloombergNEF

Cumulative electrolzyer forecast, global



Source: BloombergNEF

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

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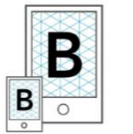

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