

McKinsey
& Company

Hydrogen Council

Hydrogen Shot Summit

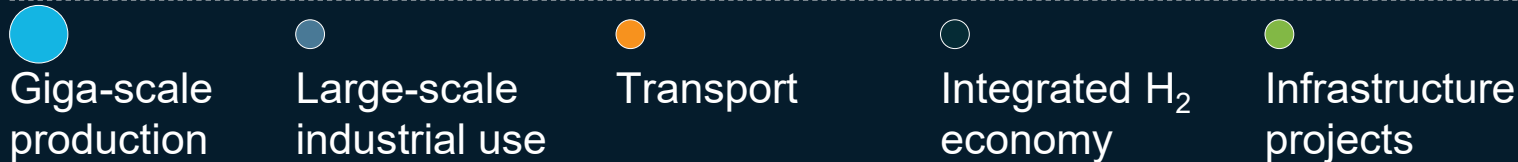
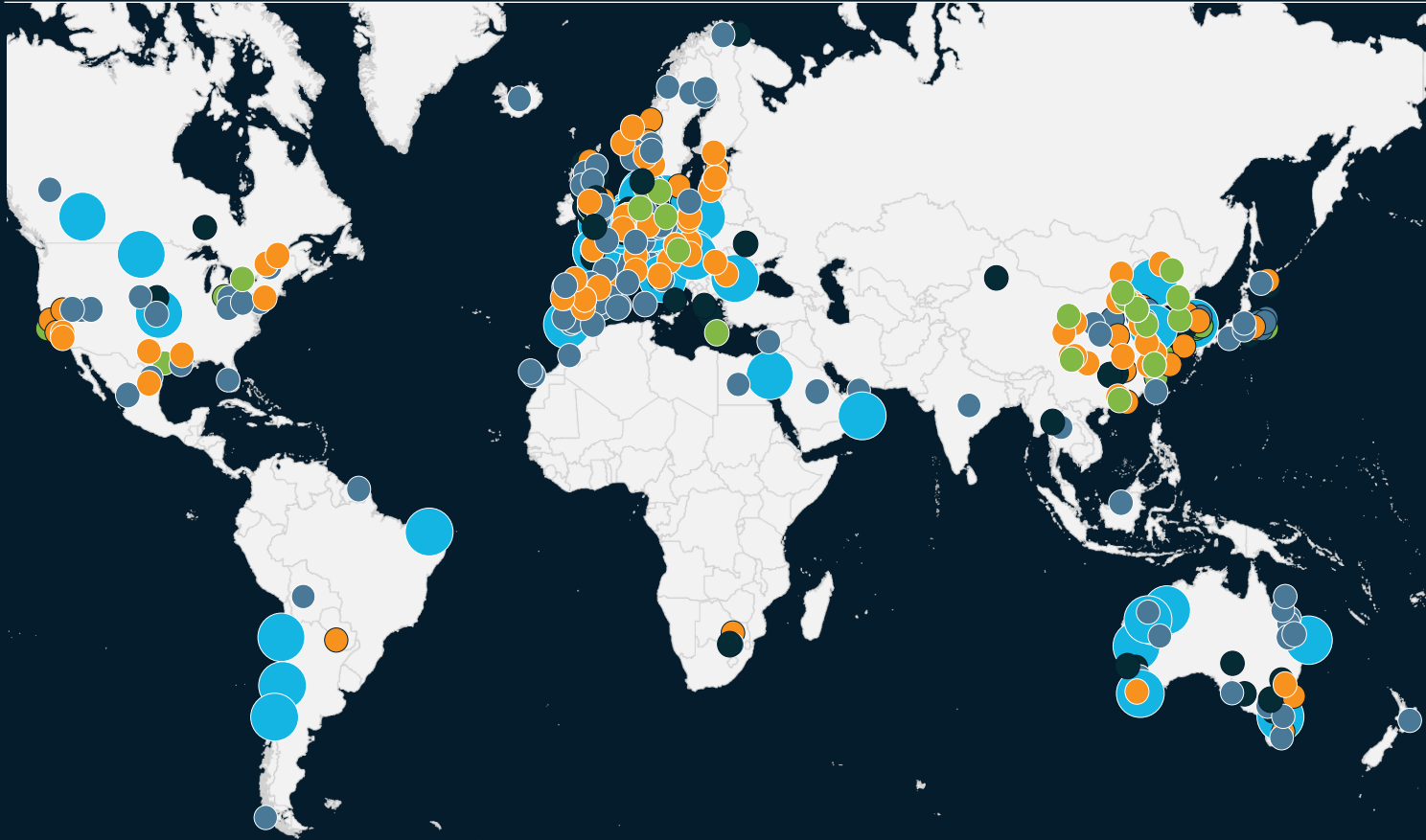
Bernd Heid, Senior Partner

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August 31, 2021



350+ large-scale projects announced globally

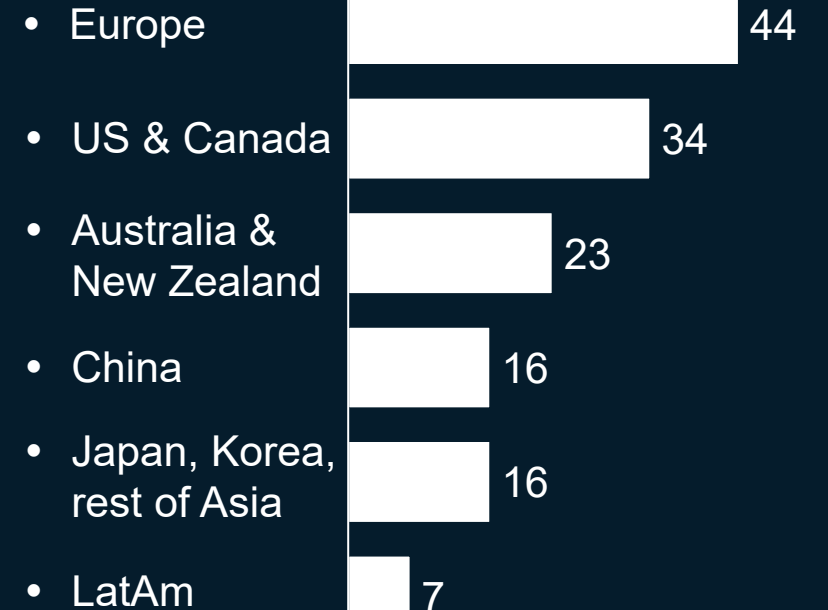


500+ USD bn

announced globally

150+ USD bn

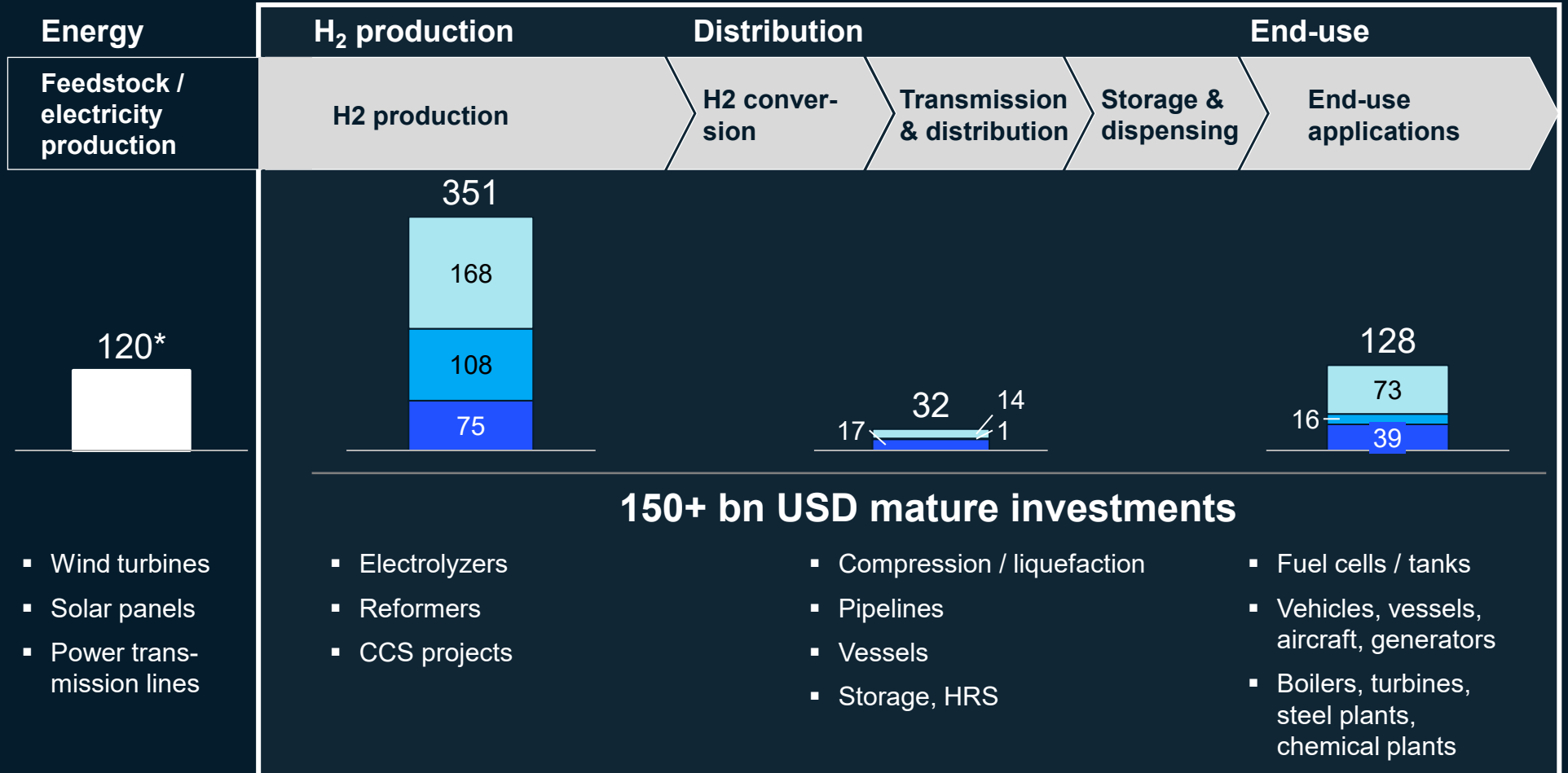
investments considered mature



Investment announced across the value chain until 2030


- Additional indirect investments
- Additional government targets
- Direct private sector investments

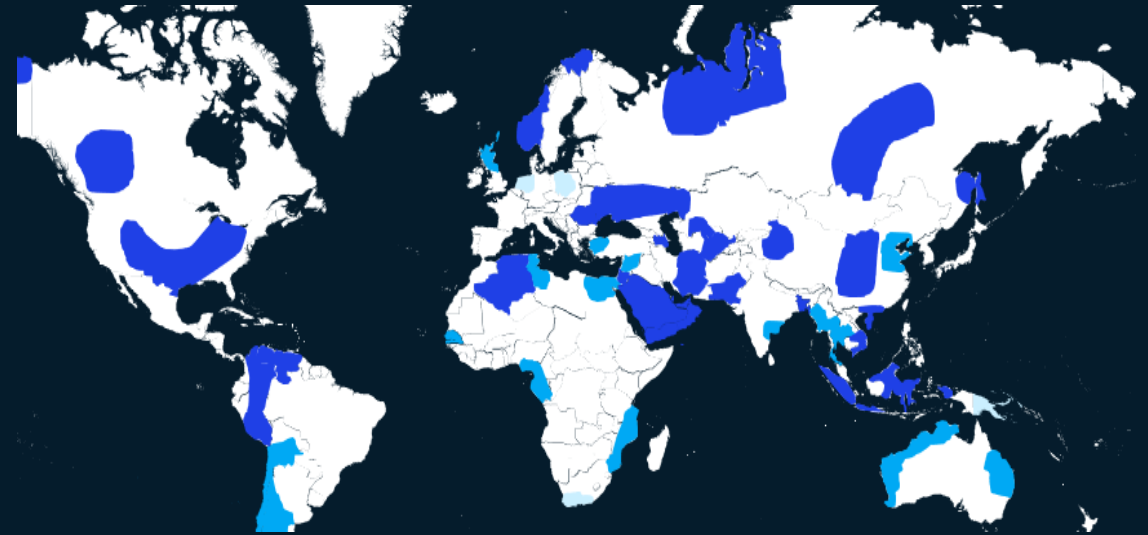
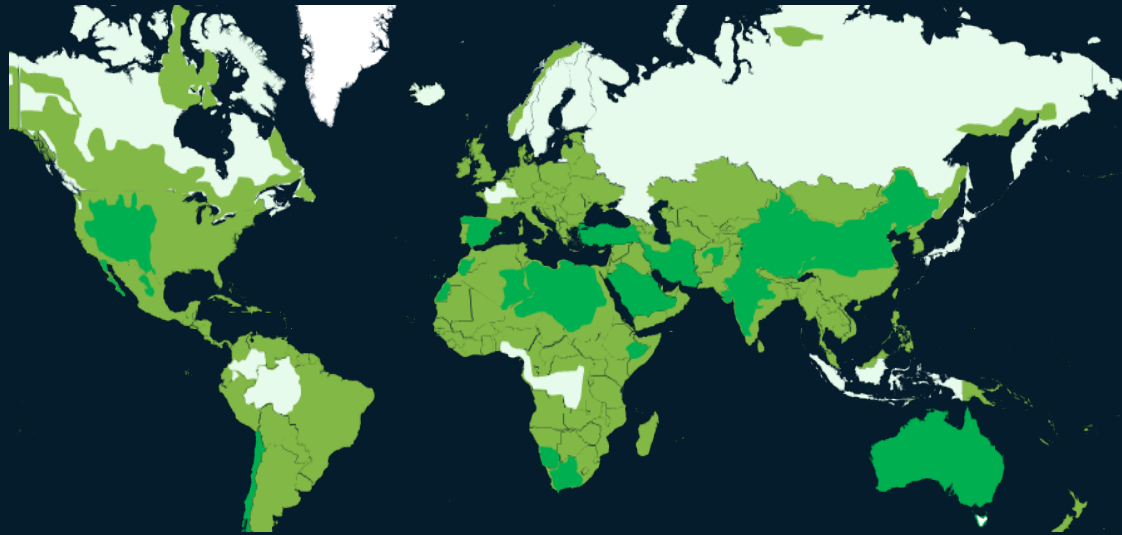
Announced investments until 2030
USD bn



* Required investments into renewables

Global hydrogen production potential

 Potential to produce H₂ below 2 USD/kg

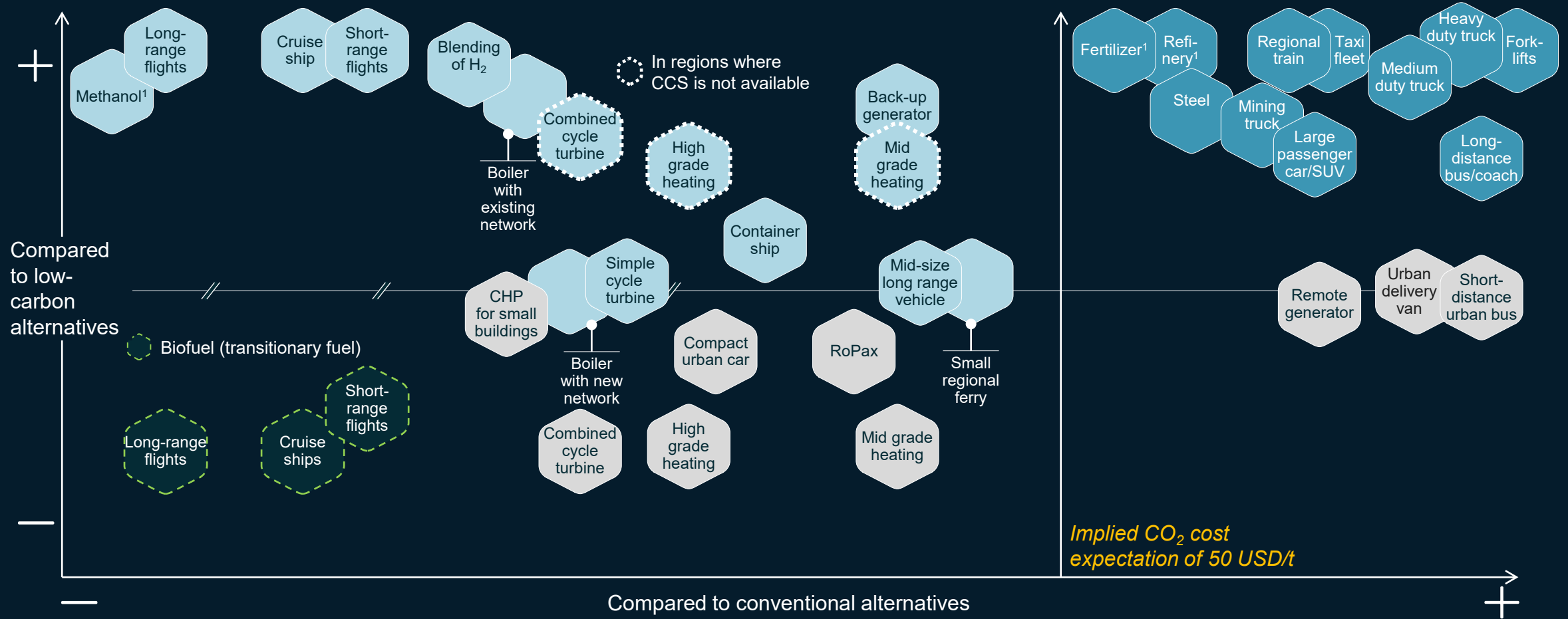


- USA
- Brazil
- Chile
- Spain
- Portugal
- Egypt
- Morocco
- UAE
- Saudi Arabia
- China
- India
- Australia



- USA
- Canada
- Russia
- Norway
- UAE
- Qatar
- Saudi Arabia
- Malaysia
- Indonesia

Hydrogen cost competitiveness by 2030



1. Clean hydrogen is the only alternative

Hydrogen ecosystems will emerge around large-scale off-takers

Hydrogen clusters are formed when **large scale off-takers** co-locate hydrogen production, providing cheap hydrogen access to other **smaller scale applications** in the vicinity

Cluster types include

- **Ports** for fuel bunkering, port logistics and transportation
- **Industrial centers** around refining, fertilizer, steel and power
- **Export hubs** in resource rich countries



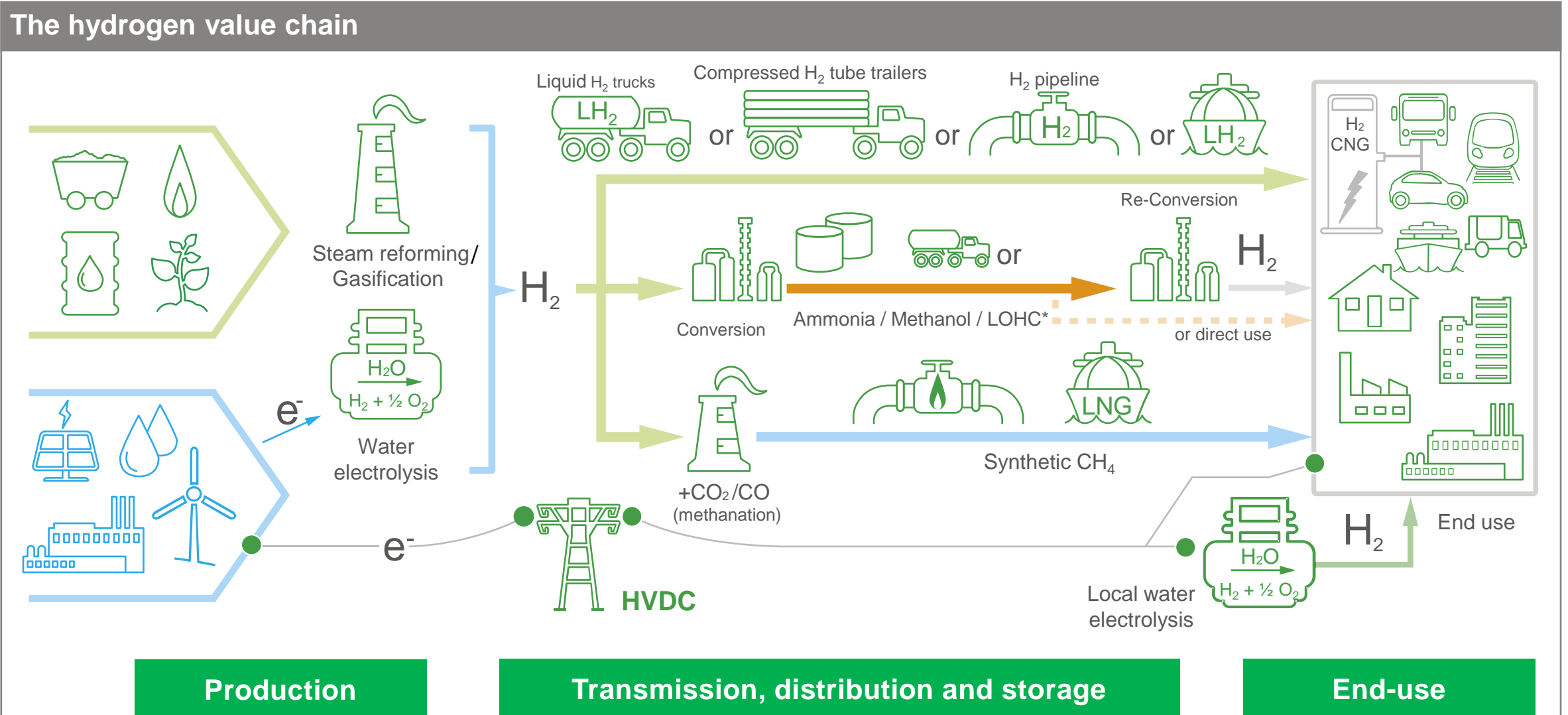
US Department of Energy Hydrogen Shot Summit

August 2021

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Hydrogen's versatility makes it an appealing choice for decarbonization

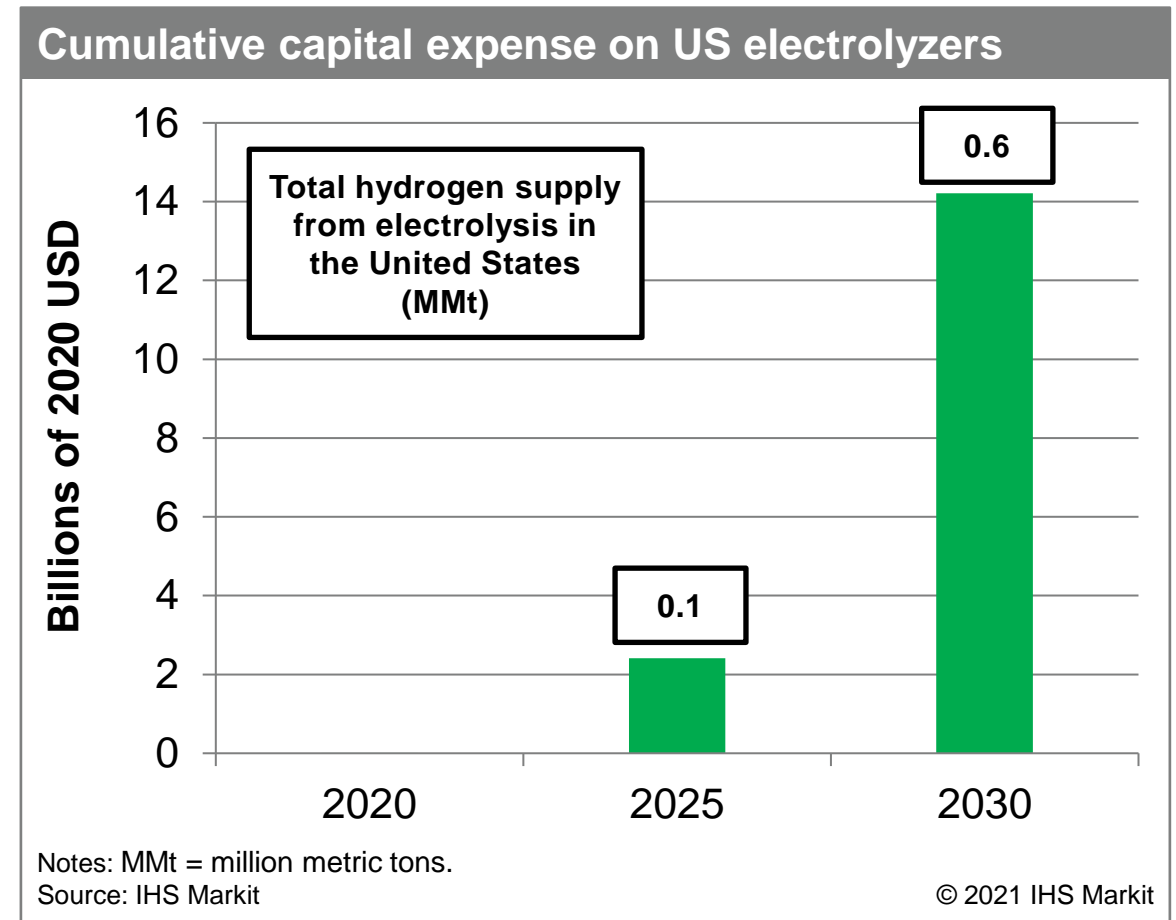
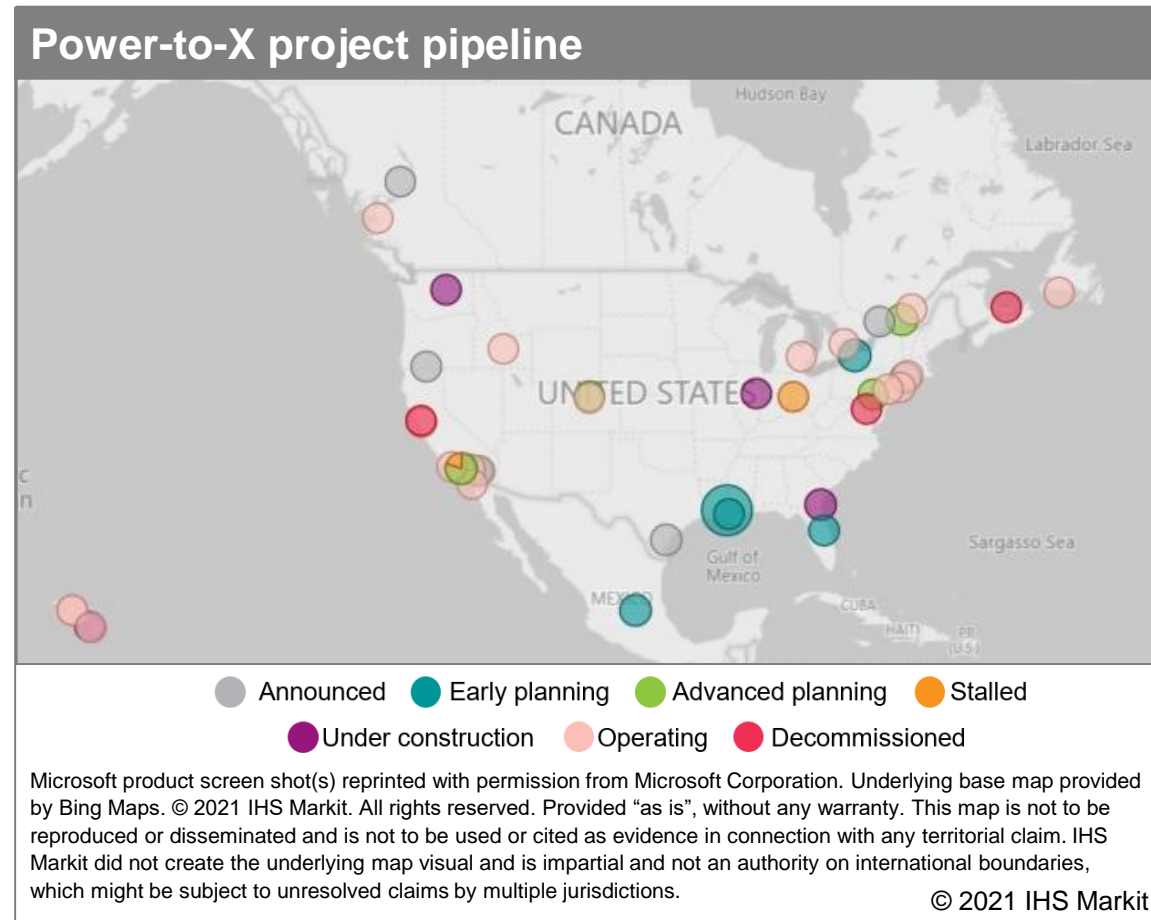


Source: IHS Markit * Liquid organic hydrogen carriers

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Electrolyzers will provide an increasing share of US hydrogen supply

Improving cost and performance will increase the efficiency of capital deployed



US perspective : All pathways to clean hydrogen - NG+CCS, waste, renewables, nuclear