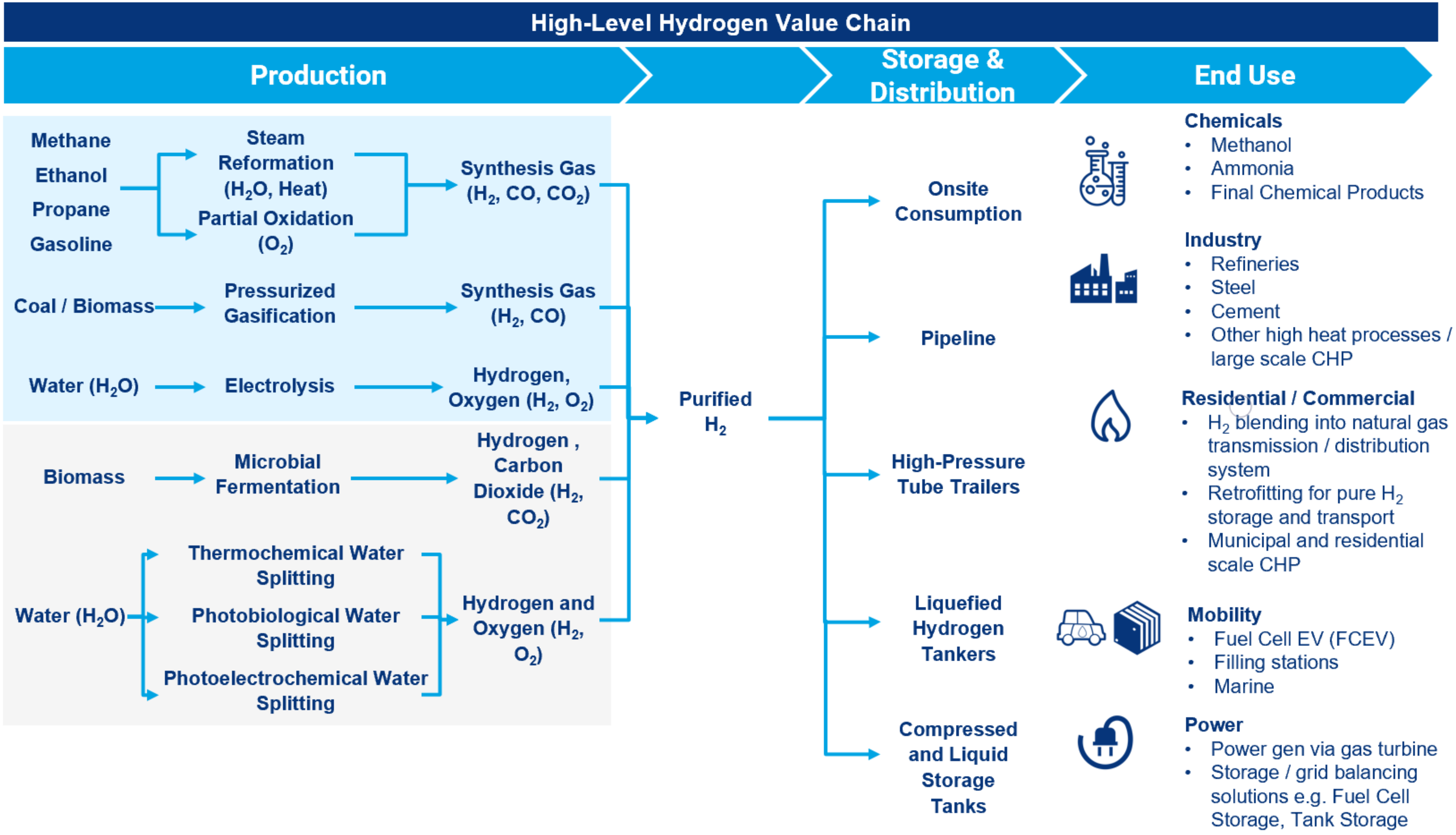
2050: The Hydrogen Possibility

Executive summary and report brochure

1. Executive summary

Why is hydrogen capturing the zeitgeist?

Because it holds the promise to decarbonize so many “hard to abate” sectors



Source: Wood Mackenzie

Policy support is accelerating dramatically

Policy targets are mainly supply-based, either in the form of deployment targets or for project funding

To date the largest policy initiatives for low carbon hydrogen are on the supply and production side of the equation. The four largest targets include:

- European commission’s 40 GW target by 2030
- France 6.5 GW by 2030
- Germany 5 GW by 2030
- United Kingdom 5 GW by 2030

Hydrogen strategies have manifested themselves as targets for electrolyzer deployments or overall green hydrogen production. This is to help scale the small manufacturing base of electrolyzers and de-risk investment in the supply chain. In theory, this should provide the base of support required to reduce manufacturing costs and speed up long-term competitiveness. These strategies, in most instances, also provide grant funding to help make a stronger economic argument for near-term deployments.

More heavy lifting will be required on the demand side However many of the demand sectors that may play a significant role in the hydrogen market are not ready to accept low carbon hydrogen for decarbonization. Either more technical due diligence is required or there is currently not enough targets for commercialization of products.

*Note: While the UK has announced a deployment target for green hydrogen, it has yet to release a standalone “hydrogen strategy”; other nations’ strategies are firmer.

Hydrogen strategies with specific deployment targets*

Hydrogen strategies without specific deployment targets

To be released hydrogen strategies

Source: Wood Mackenzie

Which leads us to forecast ramp-up in demand through to 2050

Growing to 211 MT by 2050; almost doubling current global hydrogen production

While not a panacea for decarbonization, low carbon hydrogen will play a meaningful role in the global energy mix

- In our base case analysis, low carbon hydrogen can constitute approximately 7% of final energy demand by 2050.
- But it will take until post 2040 until end-use markets – currently unfamiliar with hydrogen – begin significant consumption of low carbon hydrogen.

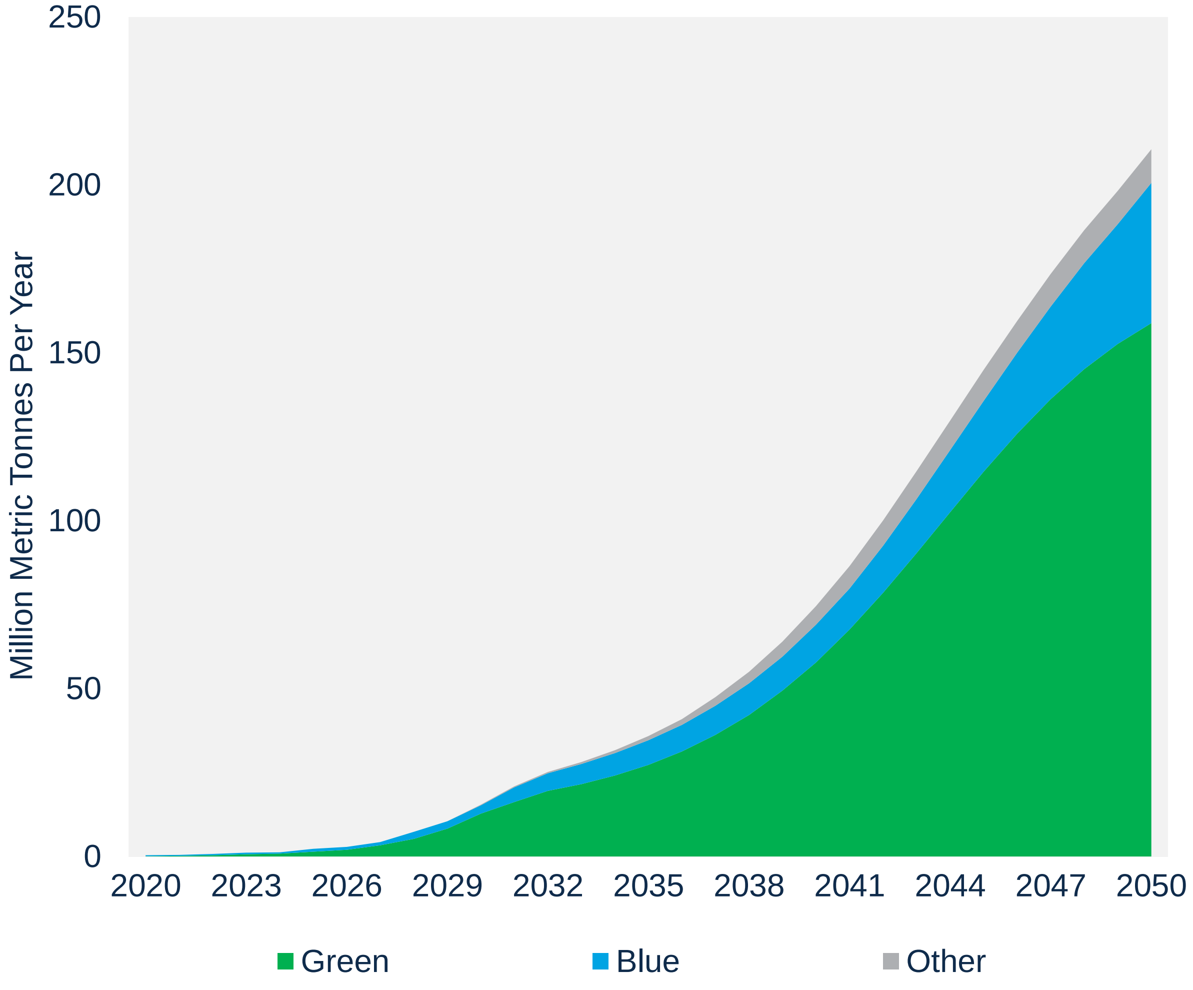
The low carbon hydrogen market will double 9 times by 2050

- From 2020-35 Europe will drive most of the growth in the market. But by the late 2030s China and the United States will become the world's largest hydrogen markets. Even though, as of publication, neither country has an explicit national hydrogen target, nor federal price on carbon, hydrogen will play a critical role in renewable integration and grid flexibility. As these are the markets with the highest consumption of hydrogen, they will push the market into overdrive.

Industrial end users who currently have demand for hydrogen will be the first movers

- From 2020-30, industrial off-takers like the refining, methanol and ammonia sectors will make up 79% of hydrogen demand. They benefit from existing processes and pose the least risk for project development. By 2050 their share shrinks to 31% as hydrogen demand diversifies into new sectors: including steel, heating, ground transportation, etc.

Global low carbon hydrogen production by colour, 2020-50



Source: Wood Mackenzie

2. Report brochure

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Hydrogen research at Wood Mackenzie

We’ve issued eight reports, analyses and proprietary data on the Hydrogen value chain in the last 15 months

Lay foundation for hydrogen research

- *Green hydrogen production: landscape, production and costs*
  October 2019

Buildout additional datasets and coverage

- *Hydrogen mobility market*
  February 2020
- *Green hydrogen project pipeline doubles in five months*
  March 2020
- *Green Steel: is hydrogen met coal’s kryptonite?*
  April 2020

Expand across all colours and long-term drivers

- *2020 Hydrogen Landscape: what the last decade tells us about the future*
  May 2020
- *Hydrogen production costs: is a tipping point on the horizon?*
  Aug 2020
- *Can Russia become a major hydrogen exporter to Europe?*
  Dec 2020

LCOH at-source model
6 countries
2 electrolyzer types
3 electrolyzer sizes
0-100% utilization hours
7 electricity pricing bands
4 hydrogen colours
Adjustable commodity prices
2040 outlooks

End-use demand expansion

- *2050 Hydrogen Outlook*
  Dec 2020

End-use demand markets
Ammonia, Aviation, Ground Transport, Heat, Methanol, Other Chems, Power, Refining, Shipping, Steel, Storage
16 country/region sub-sectors
2050 outlooks

We aim to provide the most complete proprietary datasets, analyses and insights on the hydrogen market as our work on the hydrogen economy accelerates. We will be expanding further in 2021.

Please reach out to us with feedback on what you would like to see across the full hydrogen value-chain.

Source: Wood Mackenzie

Report availability

This report is only available to subscribers of Wood Mackenzie's Energy Transition Service.

The energy market is constantly evolving, and responding to each new development requires a deep understanding of fuel demand, the role of policy in fuel choices, and supply profiles across all fuels in the power and non-power sectors. The Energy Transition Service and Tool leverages our entire commodity analysis platform to deliver integrated energy market research underpinned by extensive expertise, proprietary models and robust market knowledge.

Email contactus@woodmac.com for demo requests and subscription pricing.

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Hydrogen production costs to 2040

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