



The Future of Hydrogen

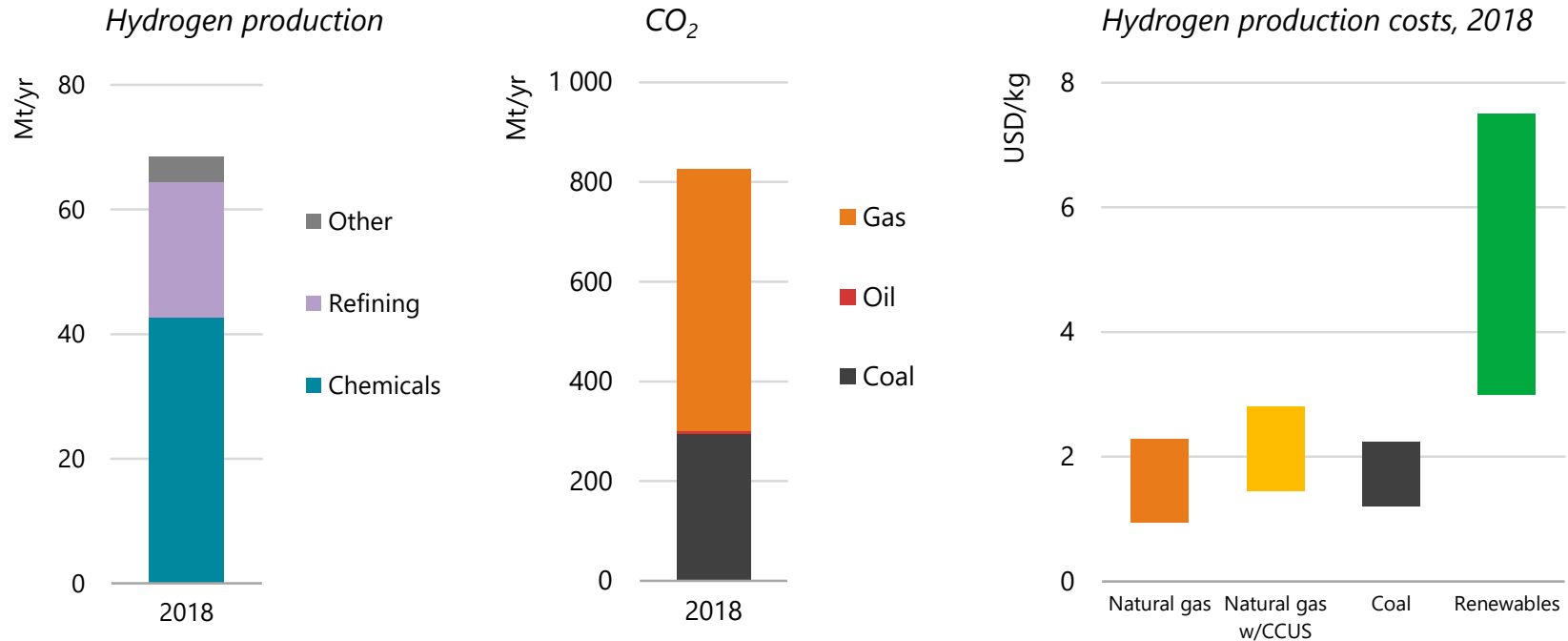
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EPRG & MIT-CEEPR International Energy Policy Conference, London, September 2-3, 2019

Hydrogen – A common *element* of our energy future?

- Momentum currently behind hydrogen is unprecedented, with more and more policies, projects and plans by governments & companies in all parts of the world
- Hydrogen can help overcome many difficult energy challenges
 - **Integrate more renewables**, including by enhancing storage options & tapping their full potential
 - **Decarbonise hard-to-abate sectors** – steel, chemicals, trucks, ships & planes
 - **Enhance energy security** by diversifying the fuel mix & providing flexibility to balance grids
- But there are challenges: **costs** need to fall; **infrastructure** needs to be developed; **cleaner hydrogen** is needed; and **regulatory barriers** persist

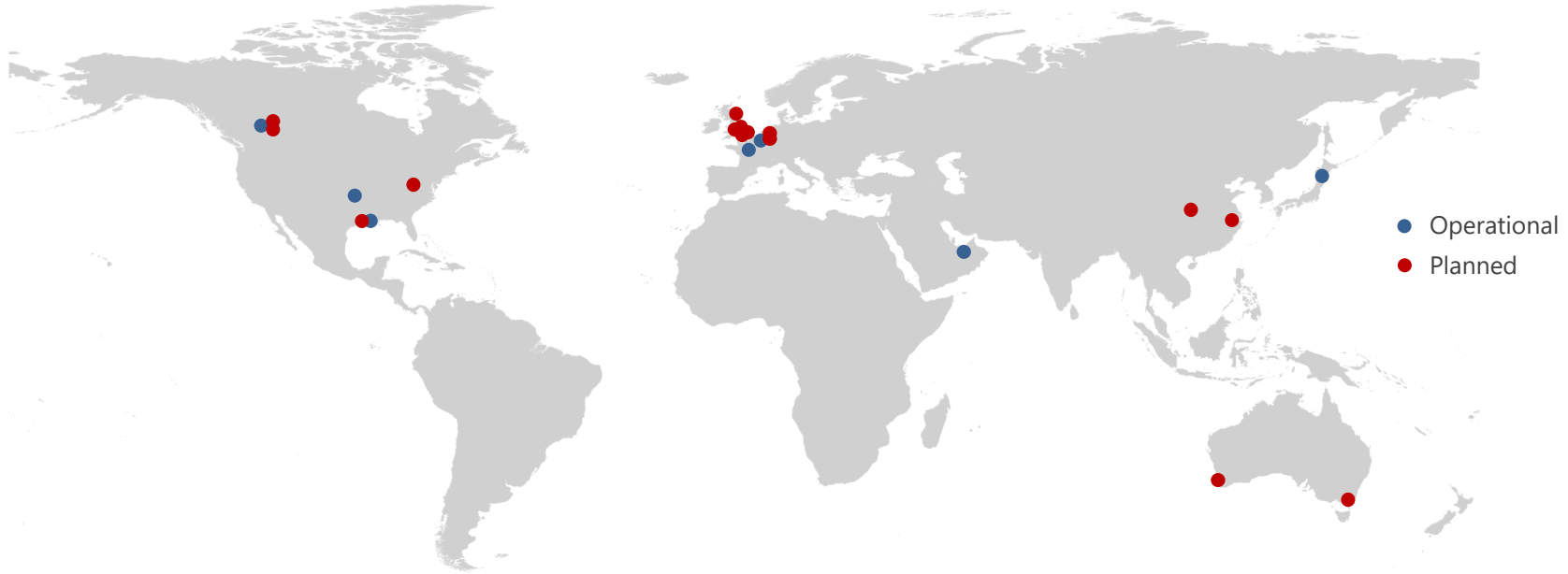
Hydrogen is already part of the energy mix



Dedicated hydrogen production is concentrated in very few sectors today, and virtually all of it is produced using fossil fuels, as a result of favourable economics.

Hydrogen production with CO₂ capture is coming online

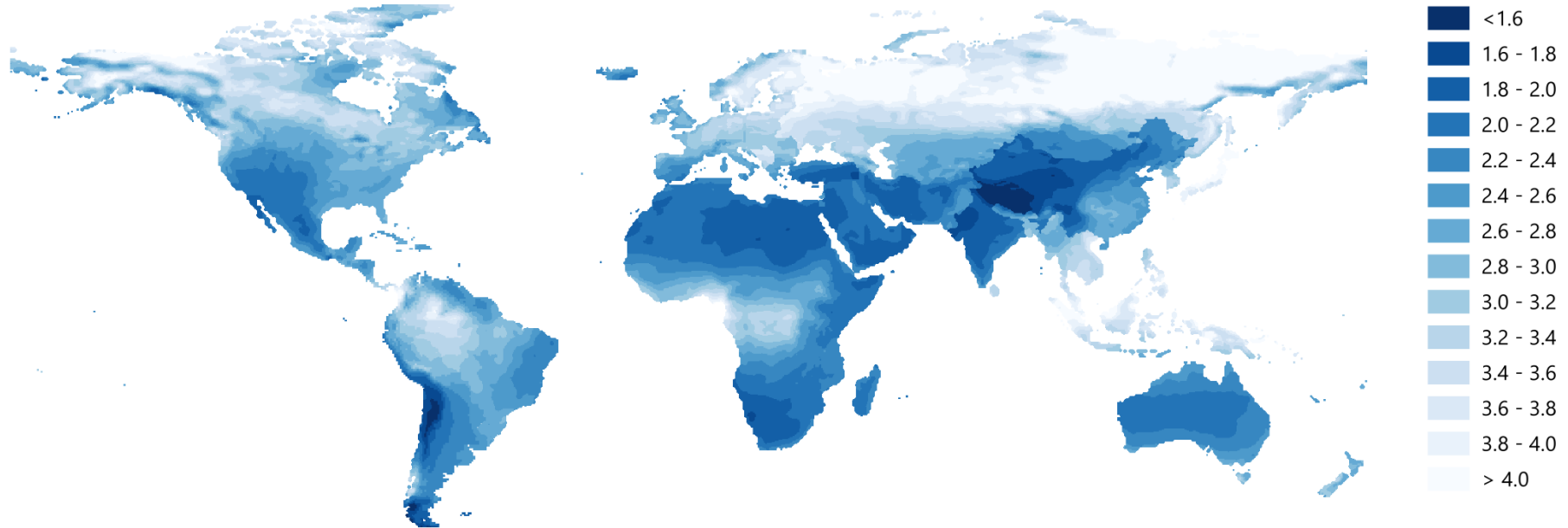
Facilities with hydrogen production and CCUS



Low-carbon hydrogen from fossil fuels is produced at commercial scale today, with more plants planned. It is an opportunity to reduce emissions from refining and industry.

Renewables hydrogen costs are set to decline

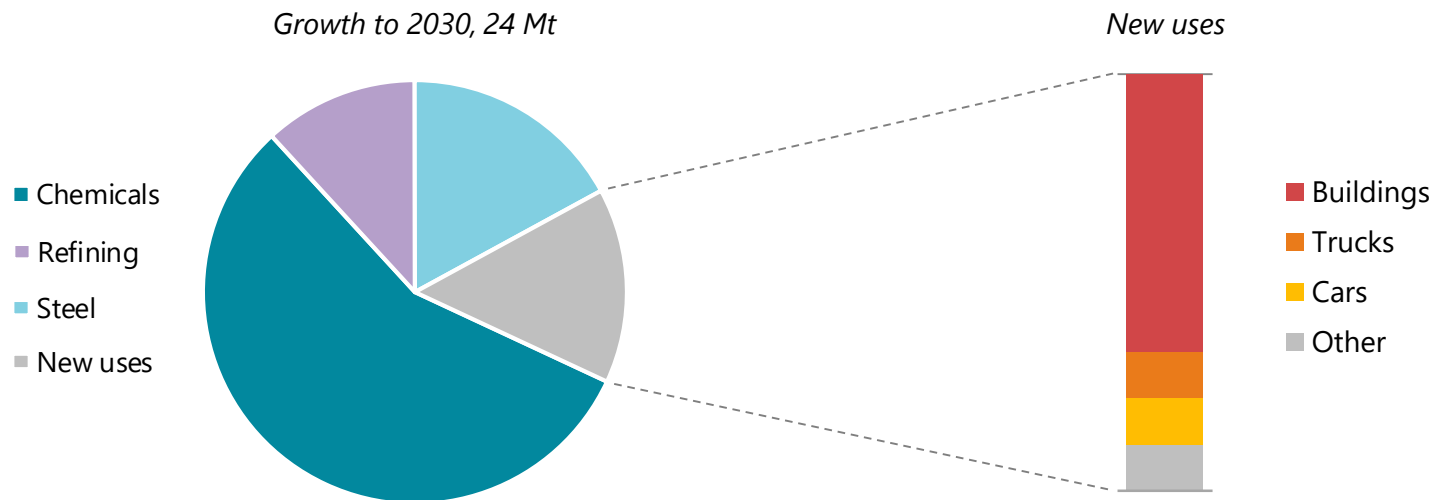
Long-term hydrogen production costs from solar & wind systems



The declining costs of solar PV and wind could make them a low-cost source for hydrogen production in regions with favourable resource conditions.

The challenge to 2030: expand hydrogen beyond existing applications

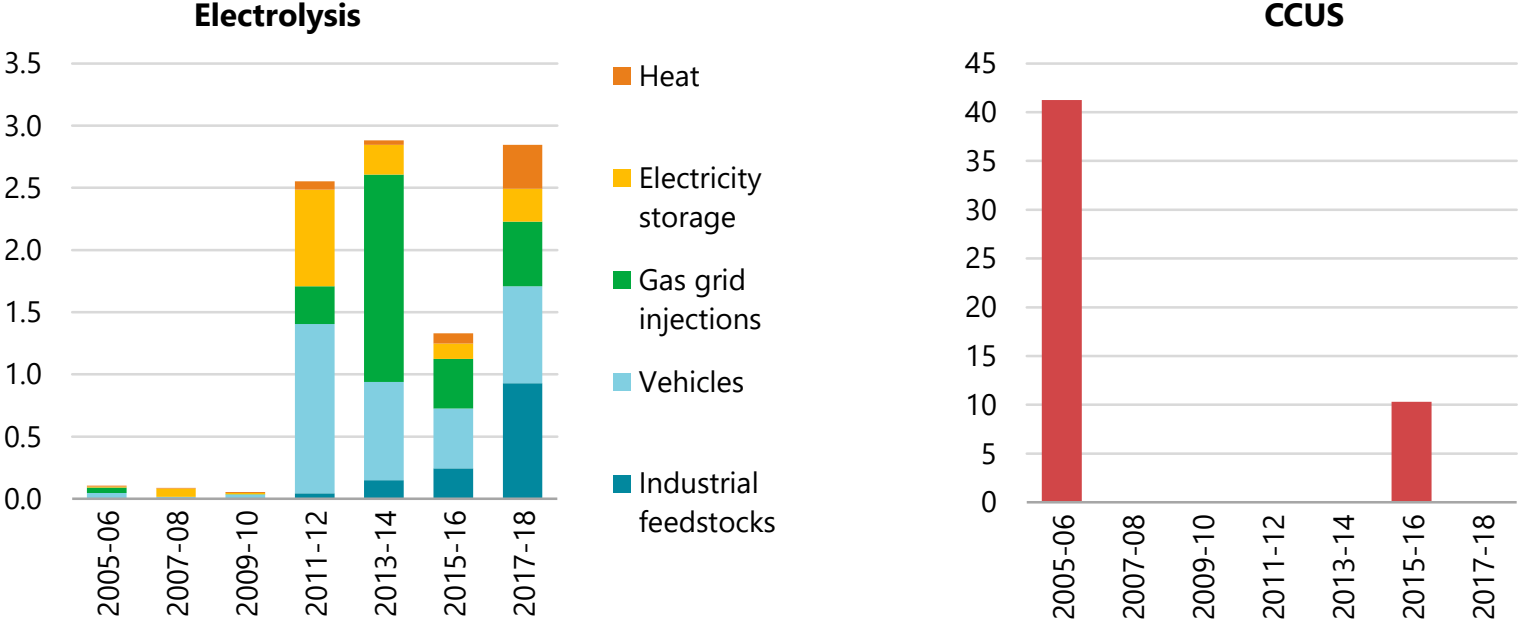
Global growth in hydrogen use based on announced policies, 2018-2030



Dependable demand from current industrial applications can boost clean hydrogen production; policies & industry targets suggest increasing use in other sectors, but ambition needs to increase.

Europe is a global pioneer for clean hydrogen projects

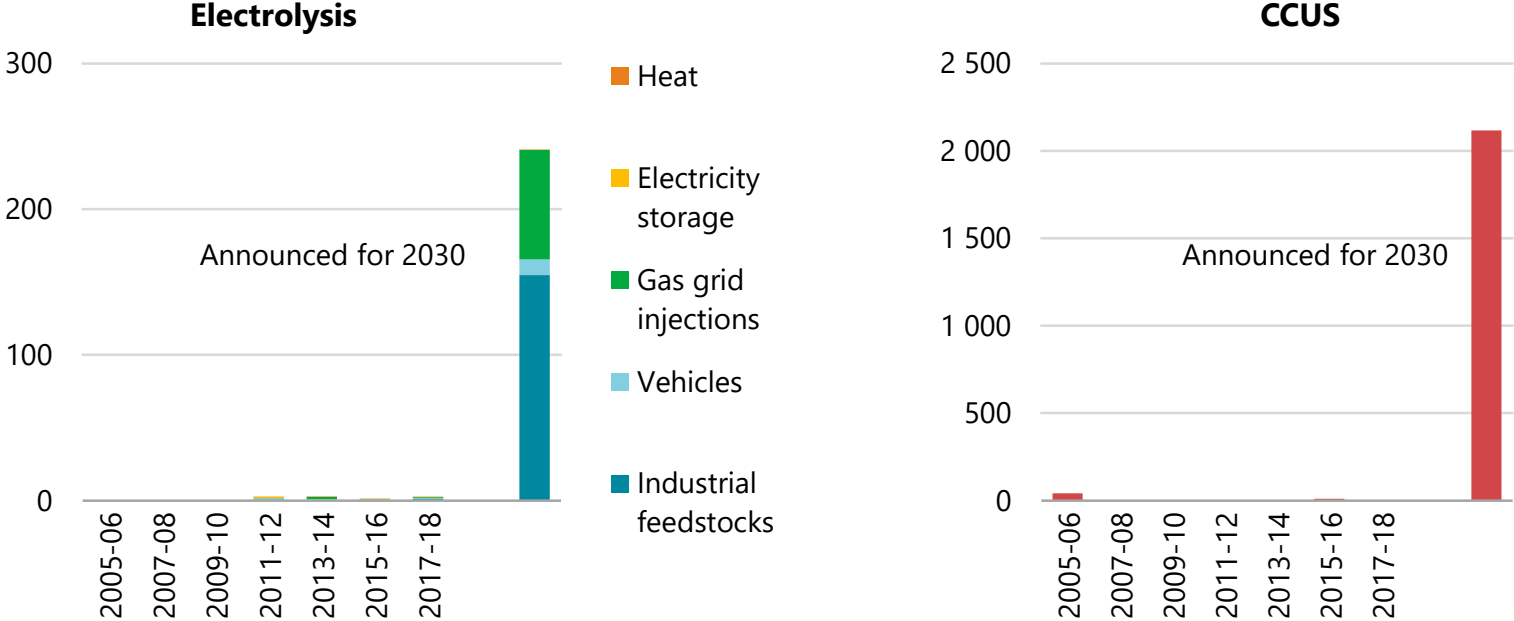
Clean hydrogen production capacity additions in Europe (thousand tonnes/year)



Electrolysis projects have expanded in Europe, but have much less potential to produce clean hydrogen than two CCUS projects.

But policy, not just funding, is needed to realise planned projects

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Four key opportunities for scaling up hydrogen to 2030



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