The Future of Hydrogen

Uwe Remme, Energy Policy Division

Nordic Views on New Energy Storage Technologies, Copenhagen, 19 September 2019

International Energy Agency

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

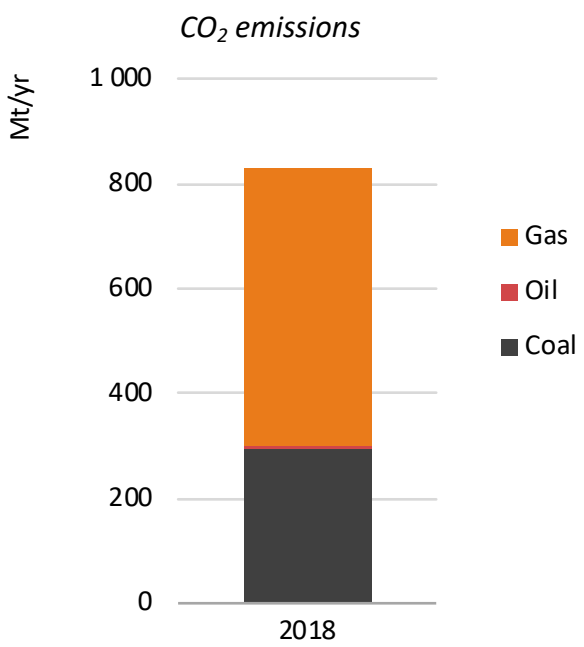
  - ***Integrate more renewables***, including by enhancing storage options & tapping their full potential

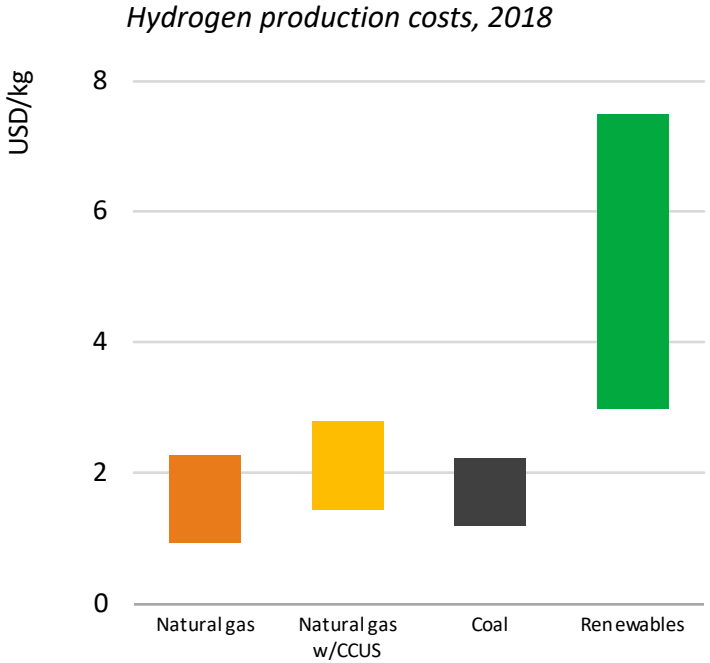
  - ***Decarbonise hard-to-abate sectors*** – steel, chemicals, trucks, ships & planes

  - ***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

The current state of hydrogen production

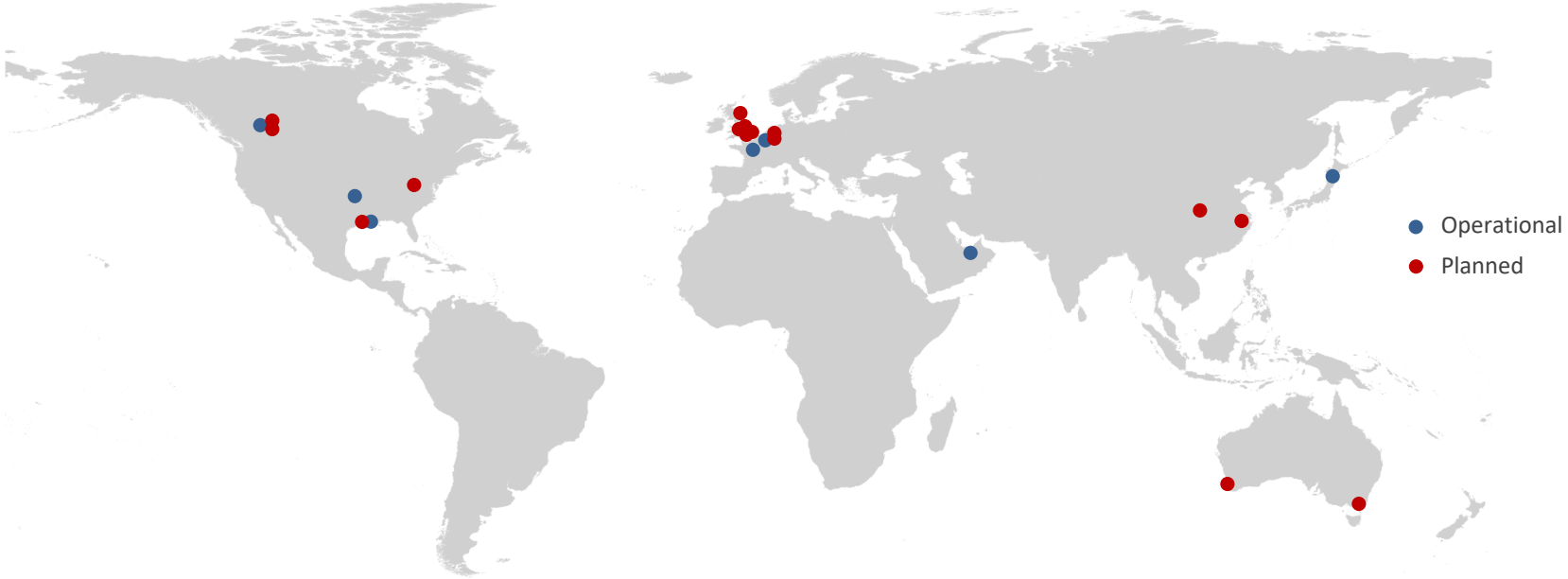




Virtually all hydrogen today is produced using fossil fuels, as a result of favourable economics.

Hydrogen production with CO_2 capture is coming online

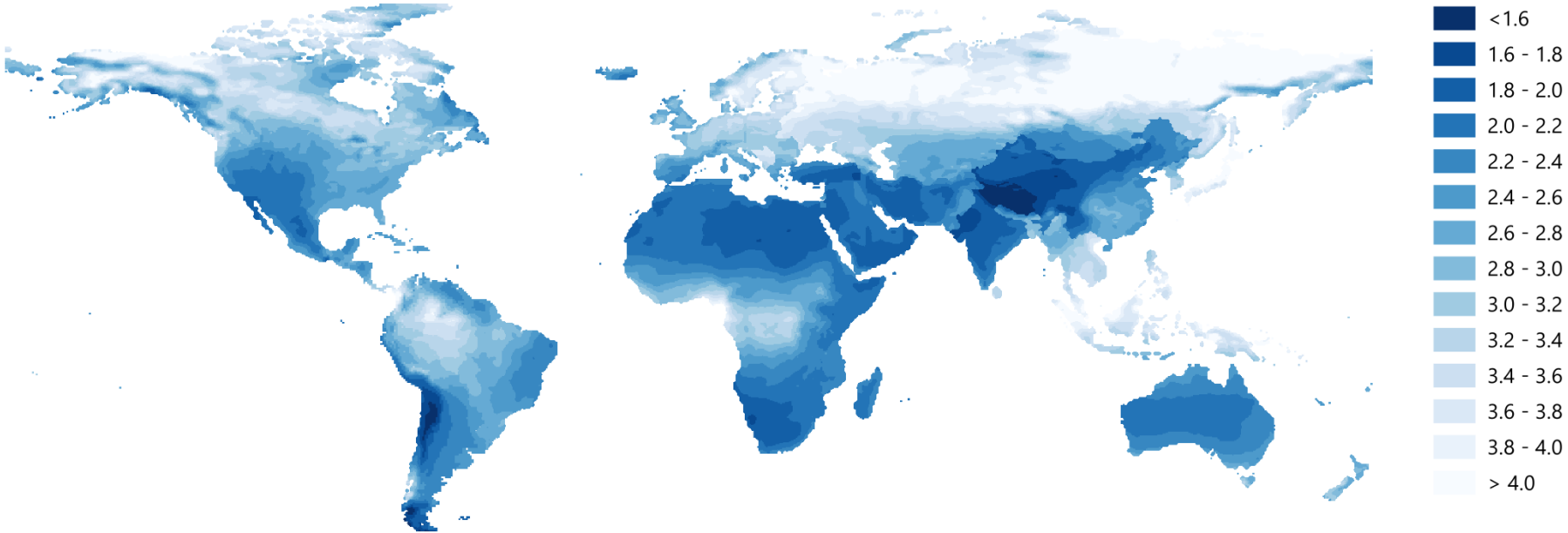
Facilities with hydrogen production and CCUS



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

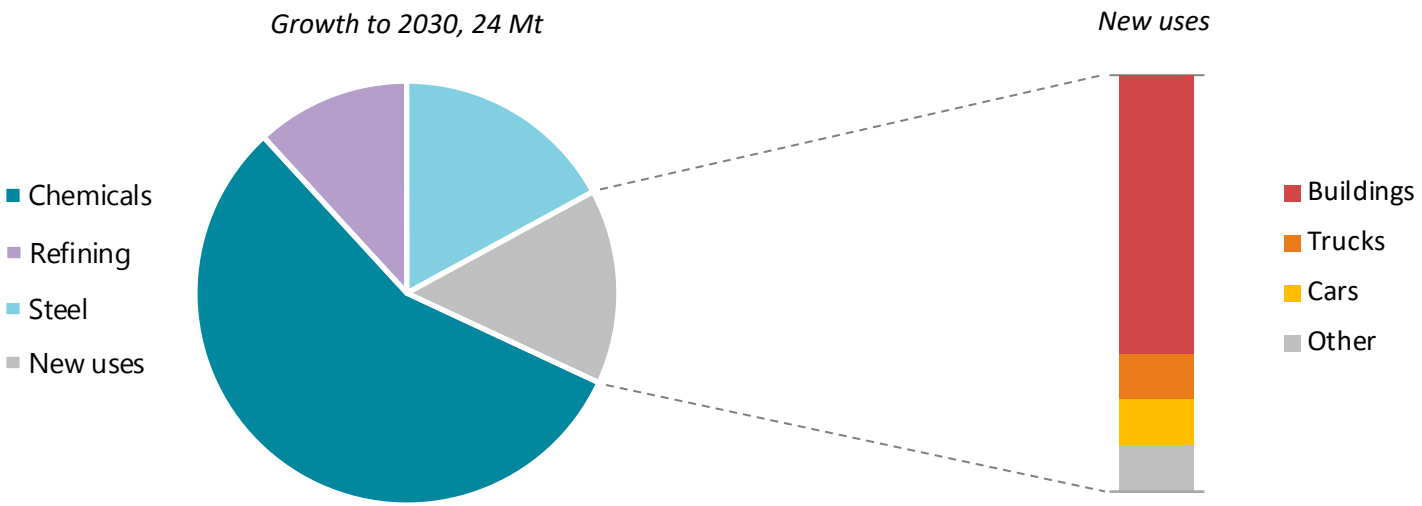
Long-term hydrogen production costs from solar & wind systems



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

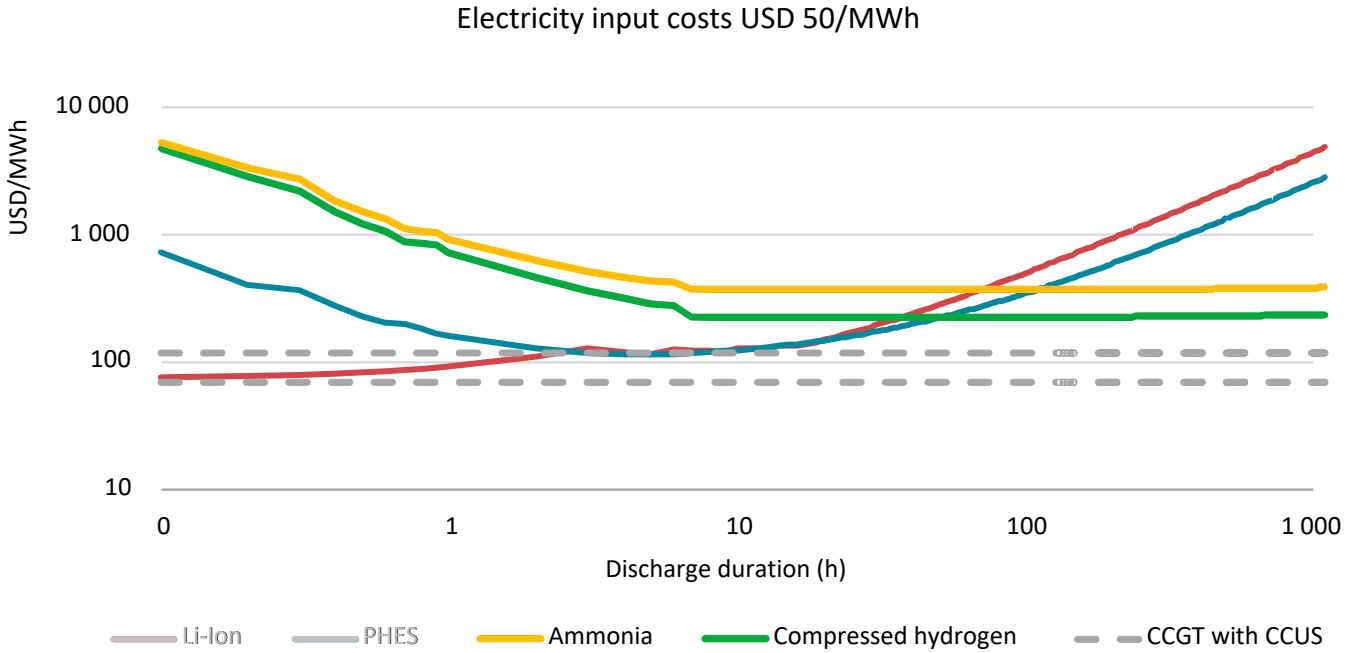
The challenge to 2030: expand hydrogen beyond existing applications

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



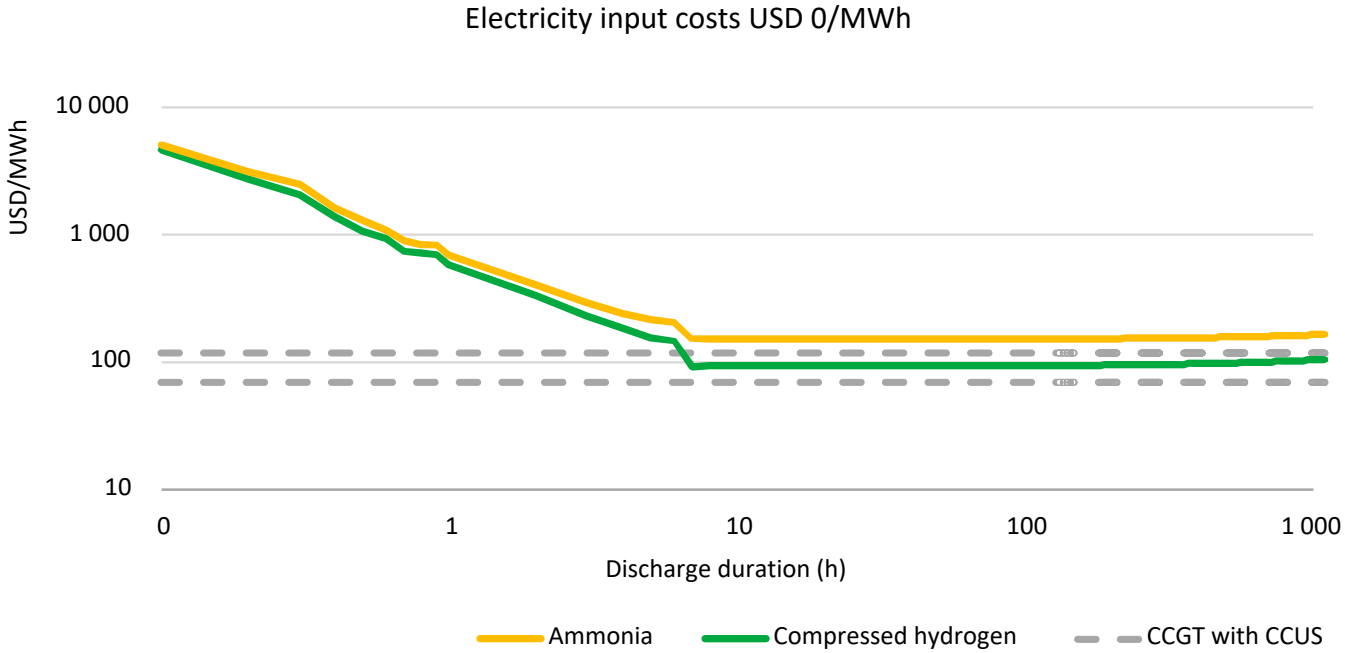
Dependable demand from current industrial applications can boost clean hydrogen production; policies & industry targets suggest increasing use in other sectors, but ambition needs to increase.

How costly is hydrogen storage and when does it make sense?



Depending on the costs of the stored electricity, compressed hydrogen storage becomes the most economic storage option at discharge durations longer than 20–45 hours.

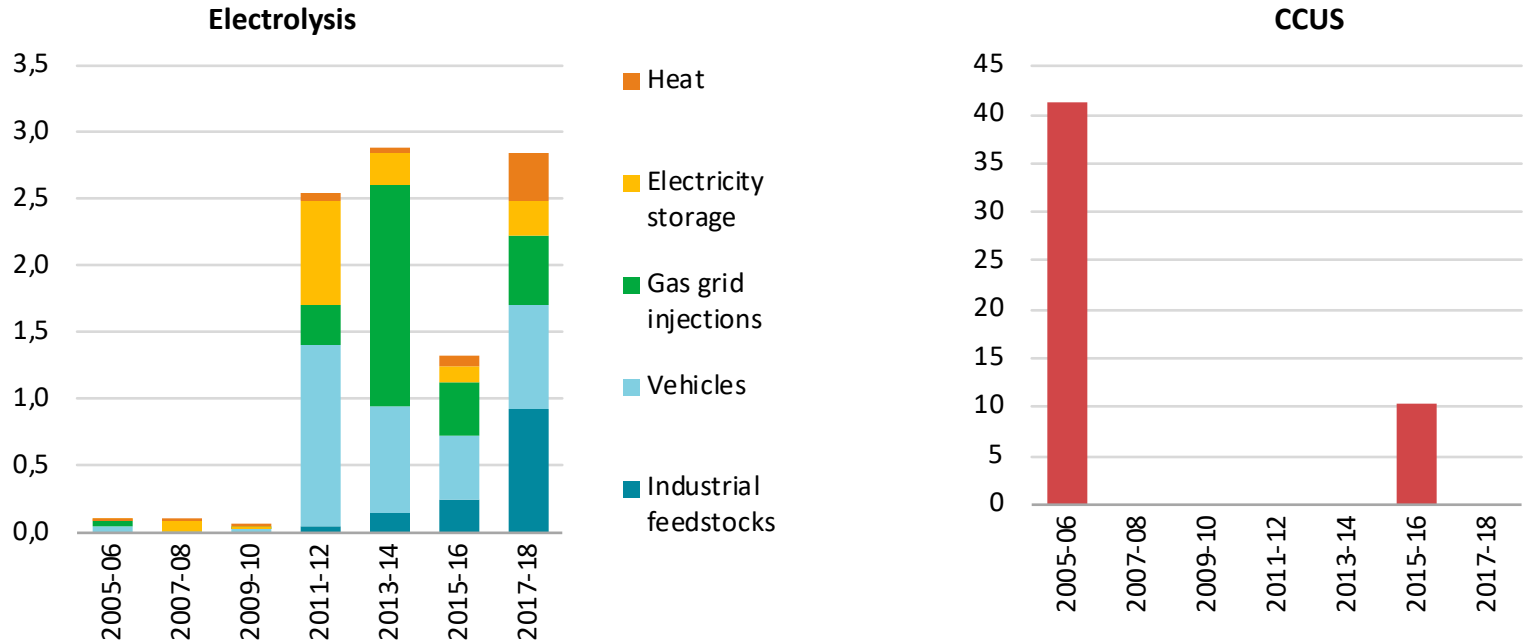
How costly is hydrogen storage and when does it make sense?



Depending on the costs of the stored electricity, compressed hydrogen storage becomes the most economic storage option at discharge durations longer than 20–45 hours.

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.

Four key opportunities for scaling up hydrogen to 2030