



Princeton ACEE/Effiliates Annual Meeting

Decarbonization of Natural Gas via Hydrogen

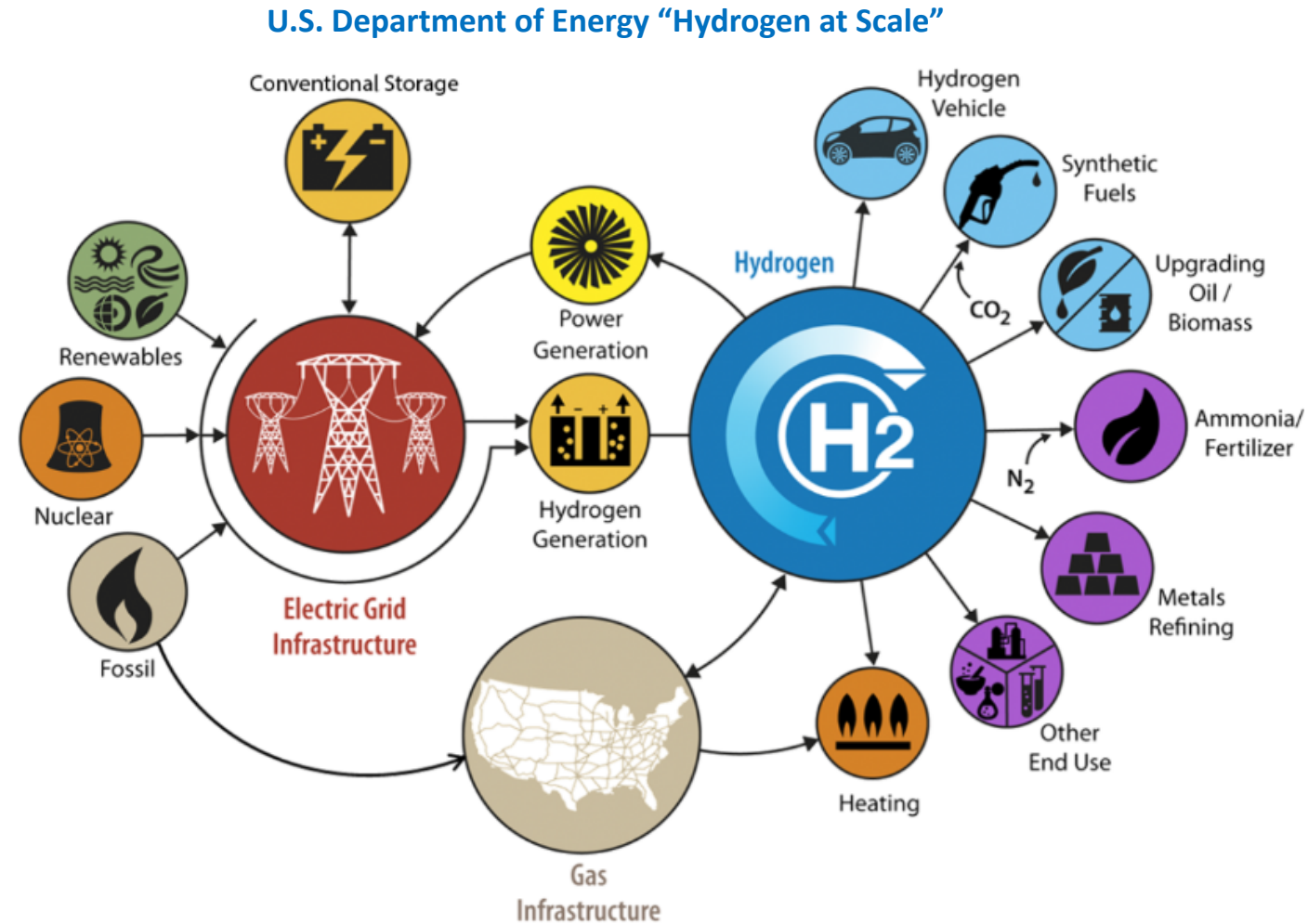
Energy lives here™

David C Dankworth

This presentation includes forward-looking statements. Actual future conditions (including economic conditions, energy demand, and energy supply) could differ materially due to changes in technology, the development of new supply sources, political events, demographic changes, and other factors discussed herein (and in Item 1A of ExxonMobil's latest report on Form 10-K or information set forth under "factors affecting future results" on the "investors" page of our website at www.exxonmobil.com). This material is not to be reproduced without the permission of Exxon Mobil Corporation.

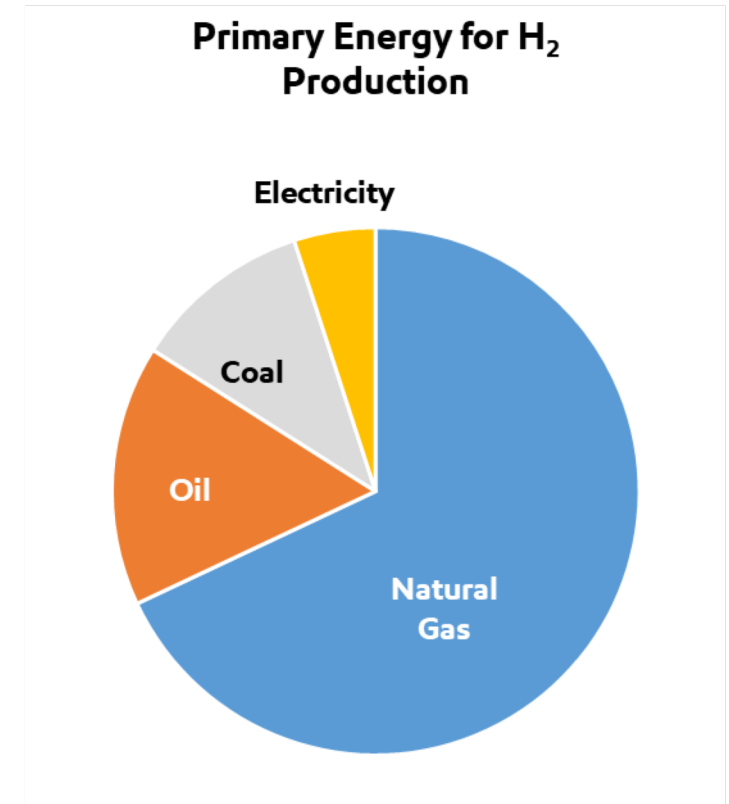
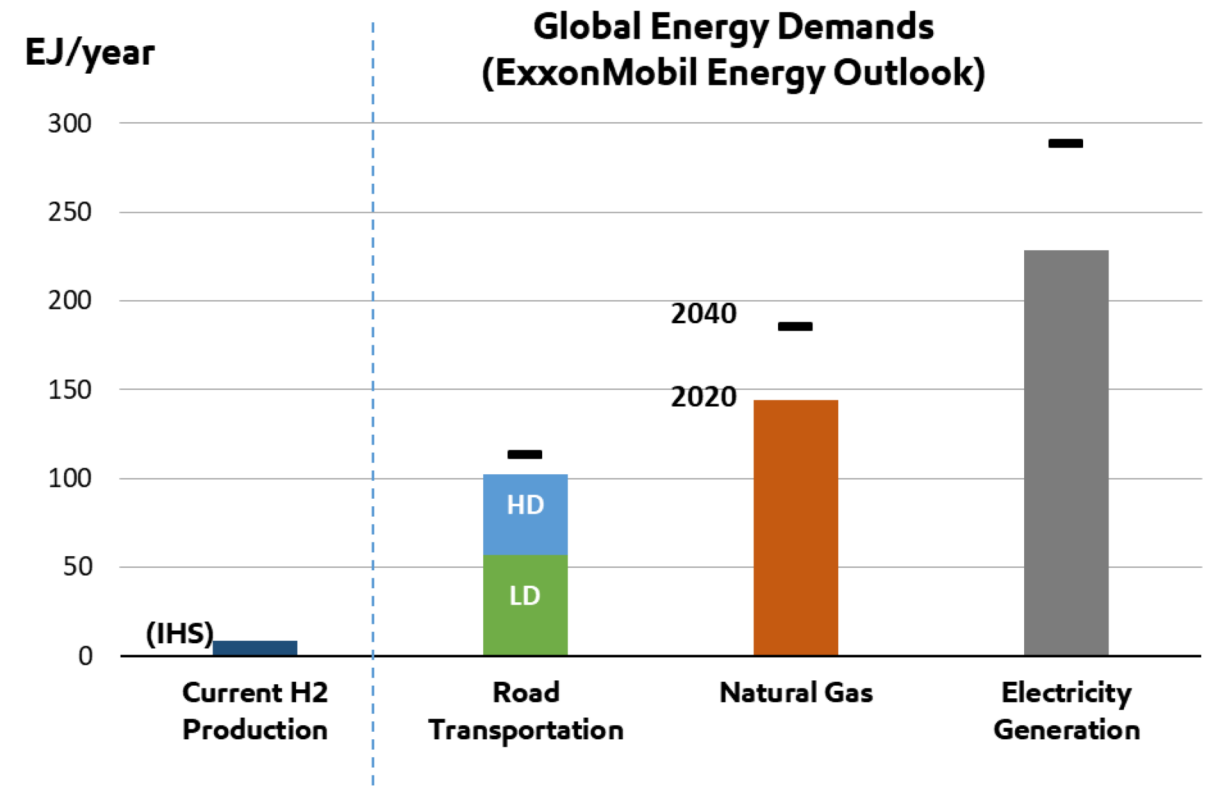
Natural Gas – Carbon => Hydrogen

- Hydrogen has the potential to be a key low-carbon energy carrier.
- Enables zero emissions at end use.
- It's possible to achieve very low CO₂ impact during Hydrogen production.

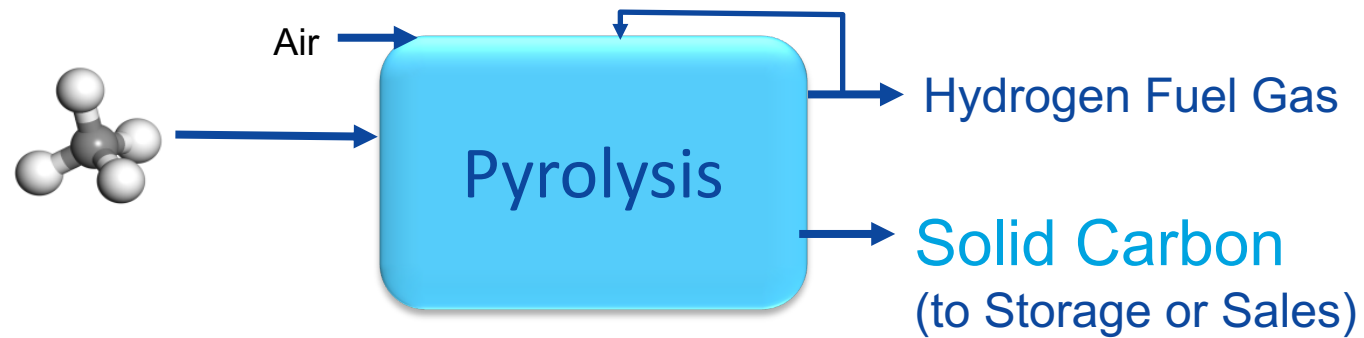
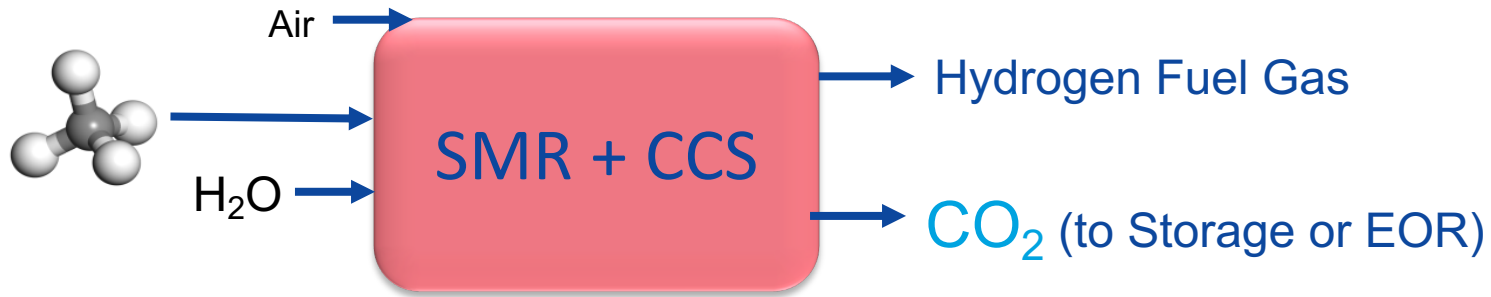


Hydrogen Production and Use

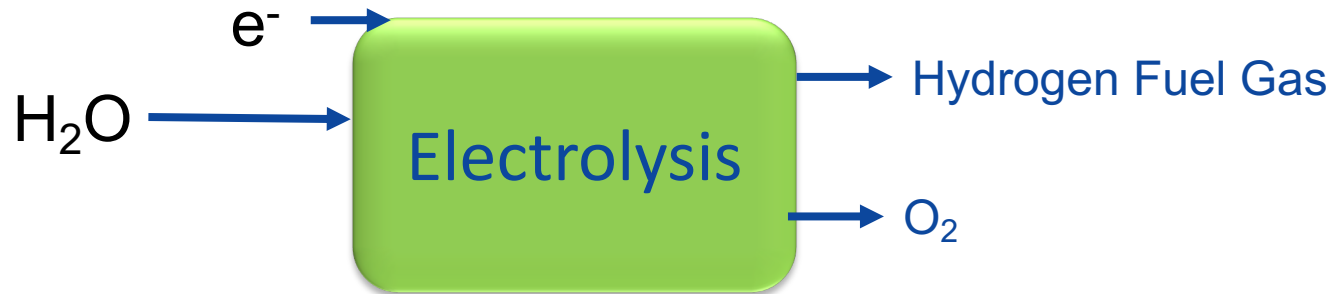
Current global H₂ production: ~70 million metric tons per year



Options for Low CO₂ Hydrogen



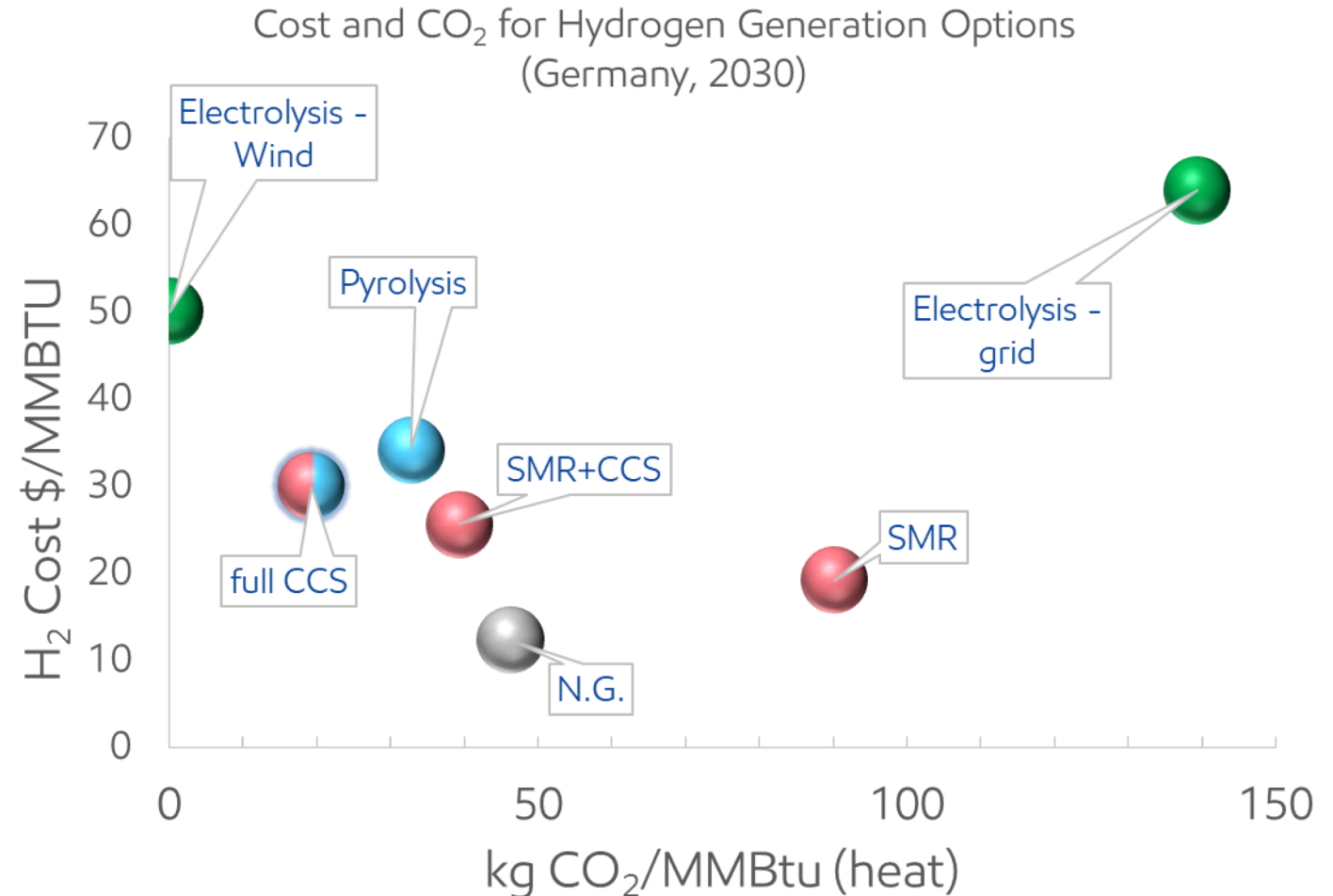
"Blue" Hydrogen
Fossil + Carbon Sequestration



"Green" Hydrogen
Water Splitting
(renewable electric power)

Low Carbon Hydrogen – Comparing the Options

- Electrolysis is highest cost option
- Hydrogen from NG carries GHG load from gas production and transport, will be location and source dependent.
- Improvements in Hydrogen Generation technology required for >50% impact vs direct firing.

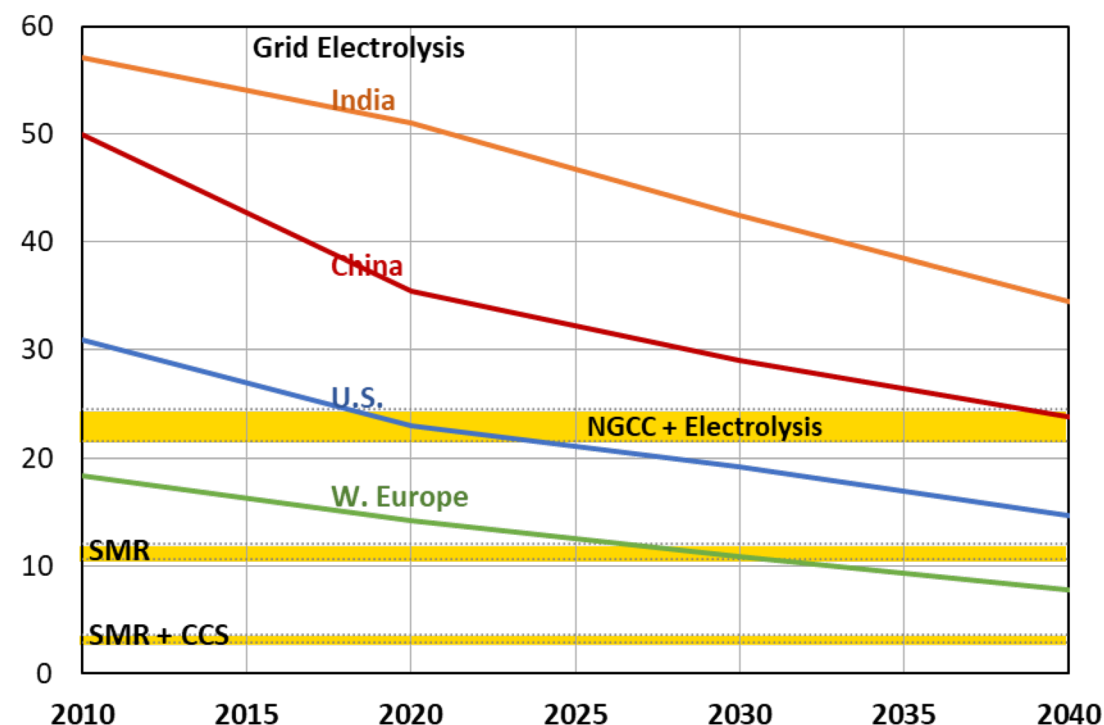


Based on 2030 Europe Outlook (Germany) for raw matl CO₂ footprint
Natural Gas Cost 12\$/MMBTU, 0.46 t_{CO2}/t_{CH4} processing and transport

Hydrogen from Power?

- The source of power for P2G is critical to understanding the Life Cycle impacts of electrolysis with respect to GHG emissions.
- Steam reforming of methane combined with CCS is being investigated as a cost-competitive source of hydrogen compared to electrolysis using renewable energy

GHG Emissions from Hydrogen Production (kg CO₂ / kg H₂)



Source: ExxonMobil Energy Outlook and EMRE Analysis

ExxonMobil