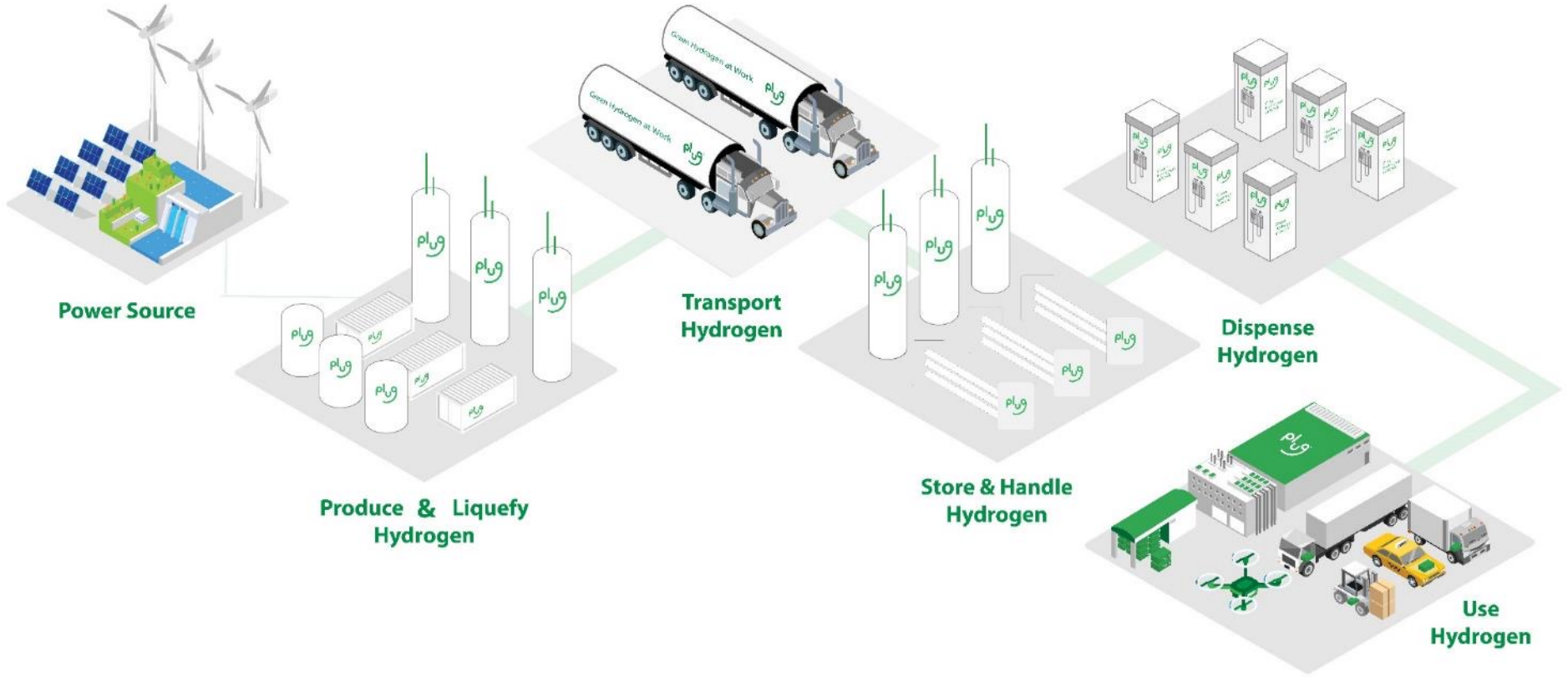
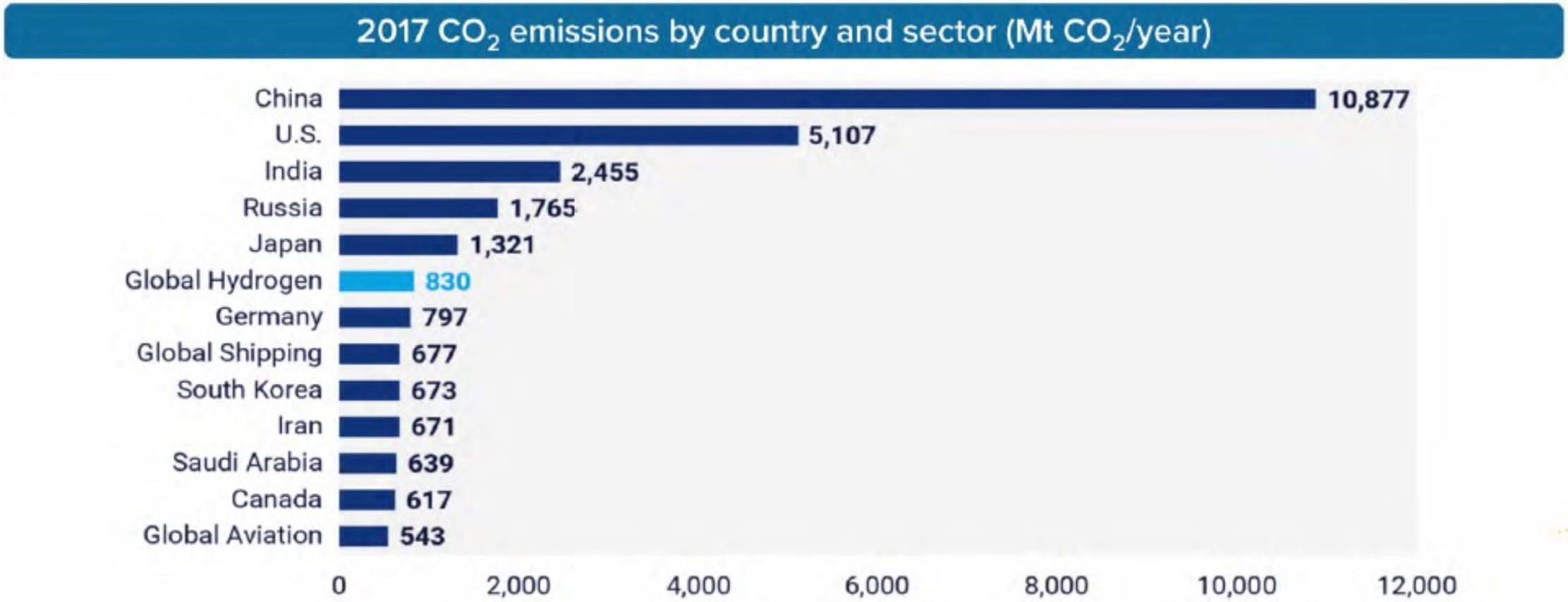
Role of Green Hydrogen as a Global Clean Energy Commodity

03/09/2024

Plug's Green Hydrogen Ecosystem

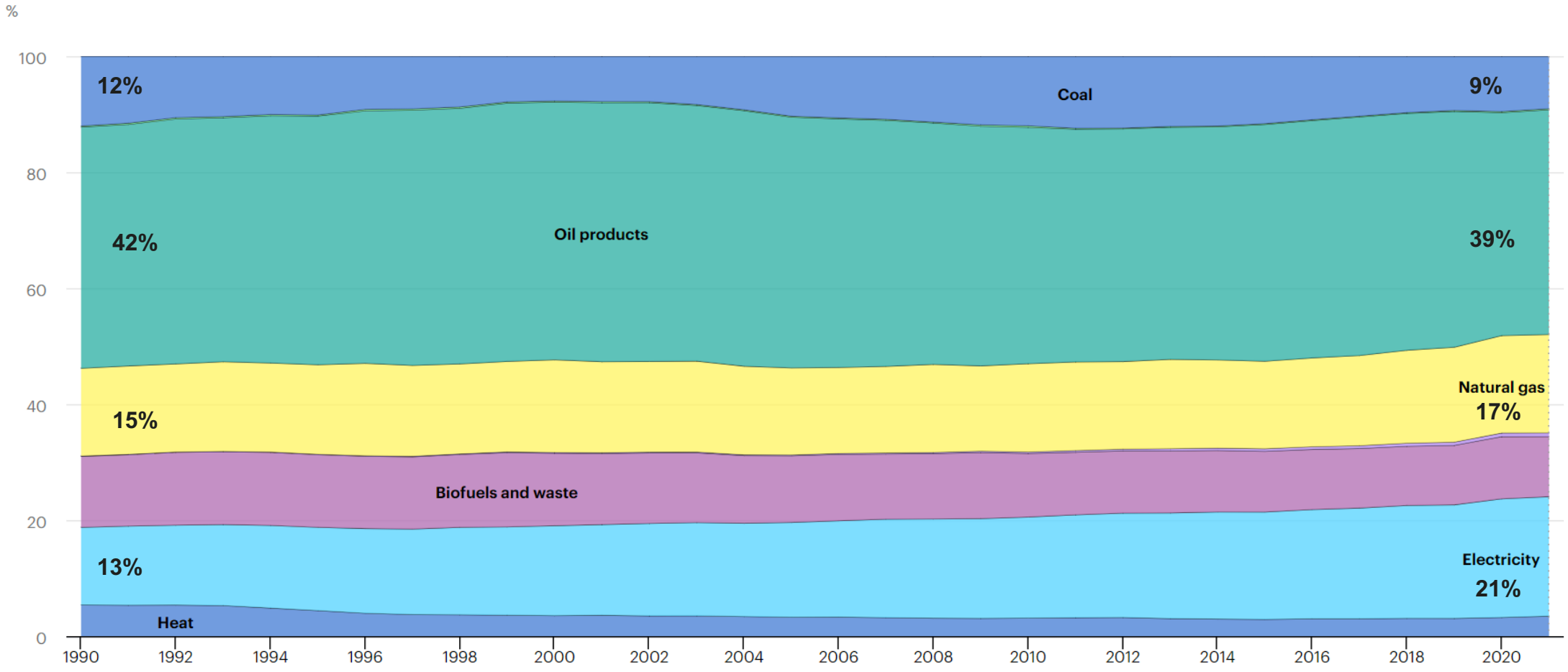


Global hydrogen production accounts for 832 Mt CO2/year...more than the emissions of Germany



Source: Wood Mackenzie, 2019. "CO_2 and other Greenhouse Gas Emissions"

Total Final Energy Consumption (TFEC) by source, World



Source: IEA

Coal Crude oil Oil products Natural gas Wind, solar, etc. Biofuels and waste Electricity Heat

Total final energy consumption1.5ºC Scenario for 2050

Energy transition is driven by:

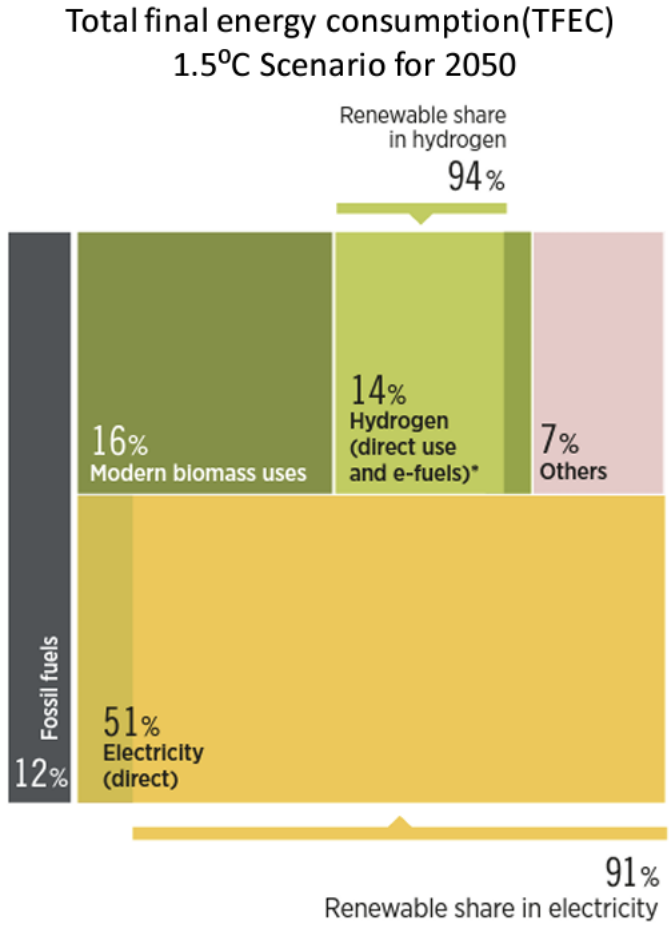
- Low-cost renewable power
- Innovation
- Decarbonisation of energy sectors
- Security of energy supply and affordability

In 2050, 1.5 Scenario sees:

51% of TFEC – Direct electrification

14% of TFEC – Indirect electrification

11 times RE generation compared with 2020



Source: IRENA Innovation Week 2023 edition

As per IEA, Net Zero Emissions by 2050 (NZE) Scenario requires installed electrolysis capacity to reach more than 5500 GW by 2050

Global Priorities

Macro Drivers

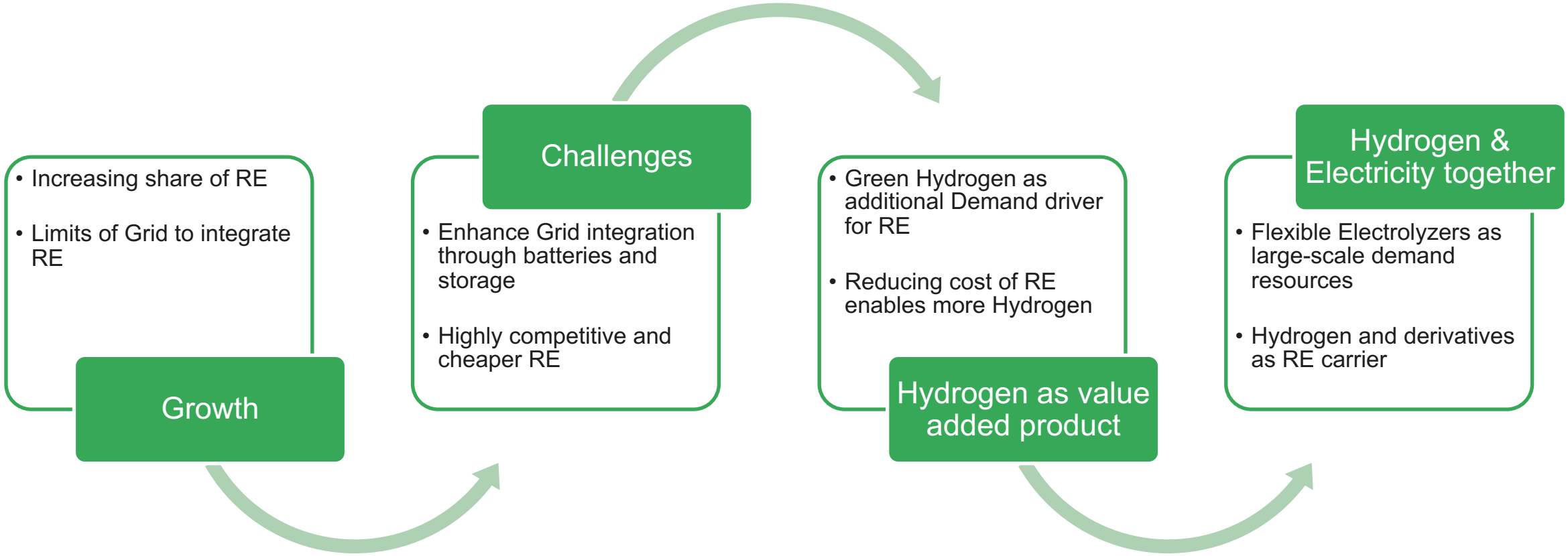
- Decarbonization
- Energy Security
- Energy Independence
- Energy Access and Affordability
- Energy Equity & Environmental Justice

Industry Drivers

- Energy Reliability
- Energy Resilience
- Energy Efficiency
- Direct Electrification of energy
- Biofuels and Synthetic Fuels to decarbonize hard to abate sectors

Sectoral Drivers

- Increasing share of cleaner sources, especially Solar and Wind
- Strong interconnected grid
- Energy Storage to facilitate integration of RE sources - Pumped Hydro, Battery
- Accommodate increasing shares of VRE into the power system
- Transport renewable energy over long distances



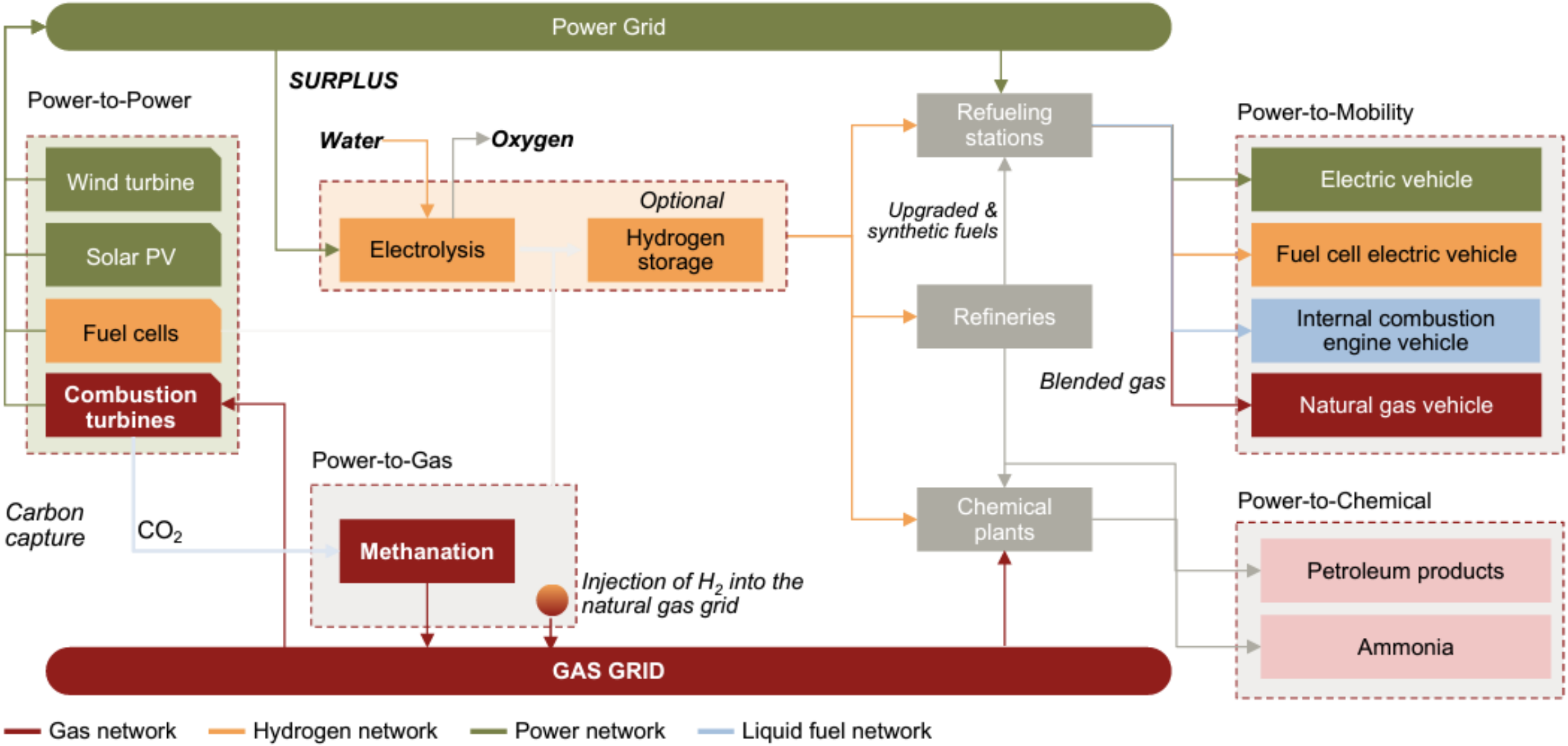
Electrolysis is the most scalable and most mature technology among different Hydrogen pathways. As Hydrogen is adopted as Energy Carrier along with Electricity, other pathways will benefit and complement

Fossil Fuels vs RE and Hydrogen

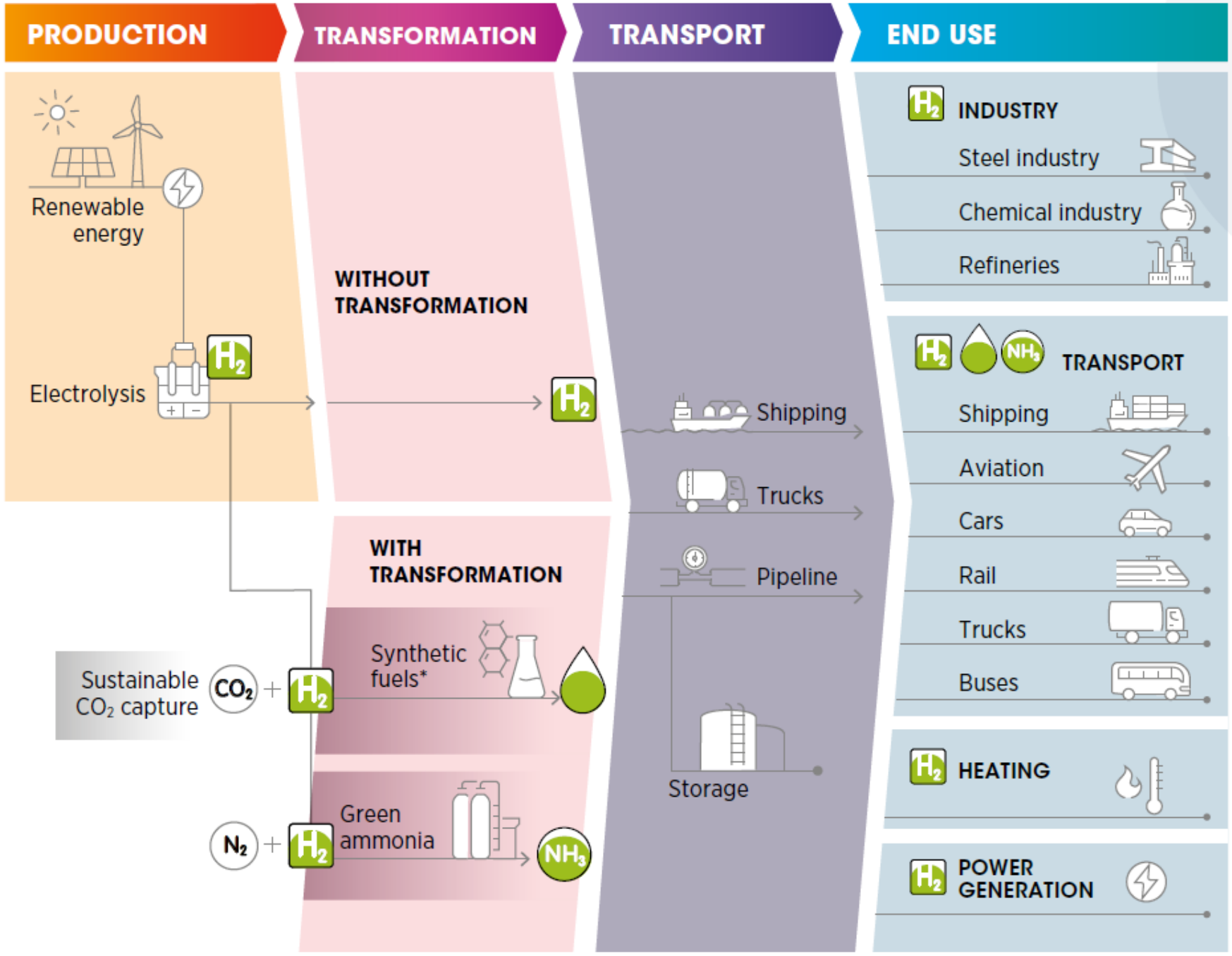
Fossil Fuels

Renewables & Green Hydrogen

Simplified value chain of hydrogen-based energy conversion solutions[1]



1. Simplified value chain. End uses are non-exhaustive. For more information on the technologies mentioned in this diagram, please refer to next chapter or to the Hydrogen FactBook.
Source: A.T. Kearney Energy Transition Institute analysis.



Source: IRENA (2020f).

Green Hydrogen at Work™