



DASTUR

Greening of Coal: Towards Zero Carbon Emission

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Rethinking Clean Energy

Technology | Engineering | Economics | Policy



**NITI Aayog,
Govt. of India**

Carbon capture
policy

Hub and cluster
business model

Financing framework



**US DOE &
Cleveland-Cliffs**

5 mtpa steel plant

2.8 mtpa CO₂
capture

90 ktpa Clean H₂ -
LCoH of US\$ 0.4-
0.5/kg



**US DOE & Air
Liquide**

Merchant SMR

0.9 mtpa CO₂
capture



USTDA & IOCL

Refinery SMR

0.7 mtpa CO₂
capture: EOR & F&B

LCoC: US\$ 40-
45/ton without H₂
valorization



**Abu Dhabi National
Oil Company**

5 mtpa petcoke
gasification

10 mtpa CO₂
capture

200 ktpa Clean H₂ -
LCoH US\$ 1.0-
1.1/kg



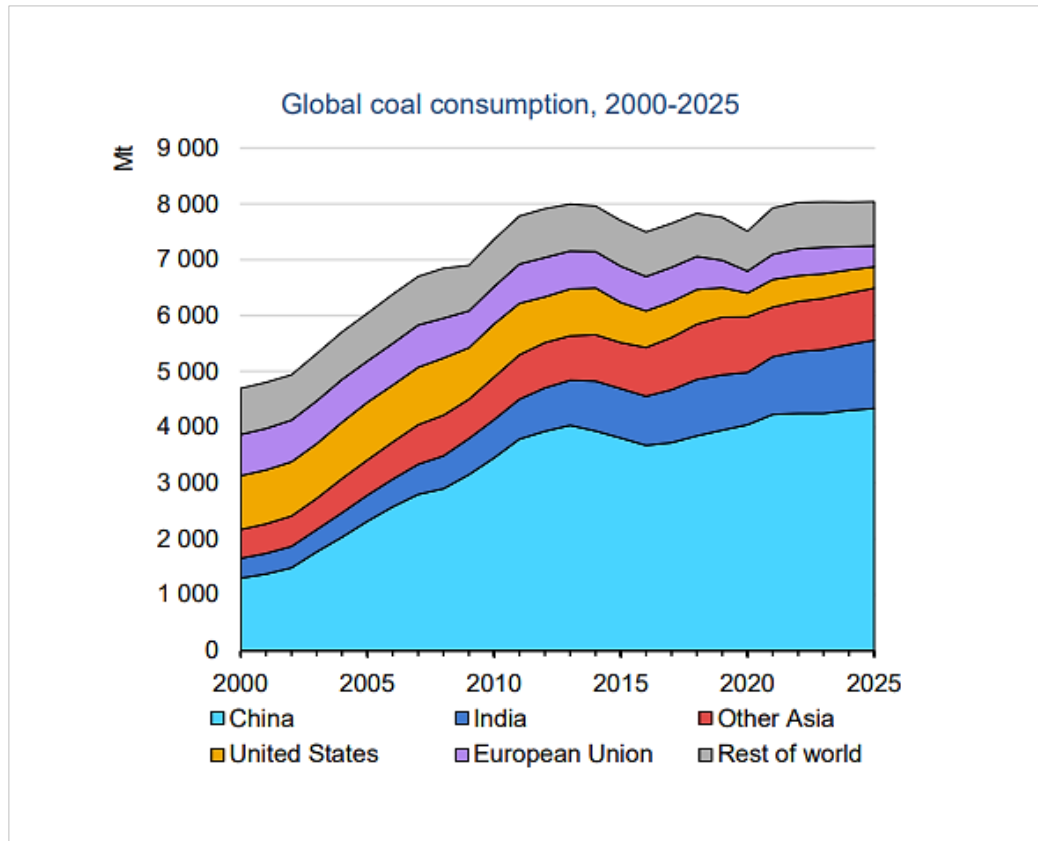
USTDA & BPCL

1.2 mtpa petcoke
gasification

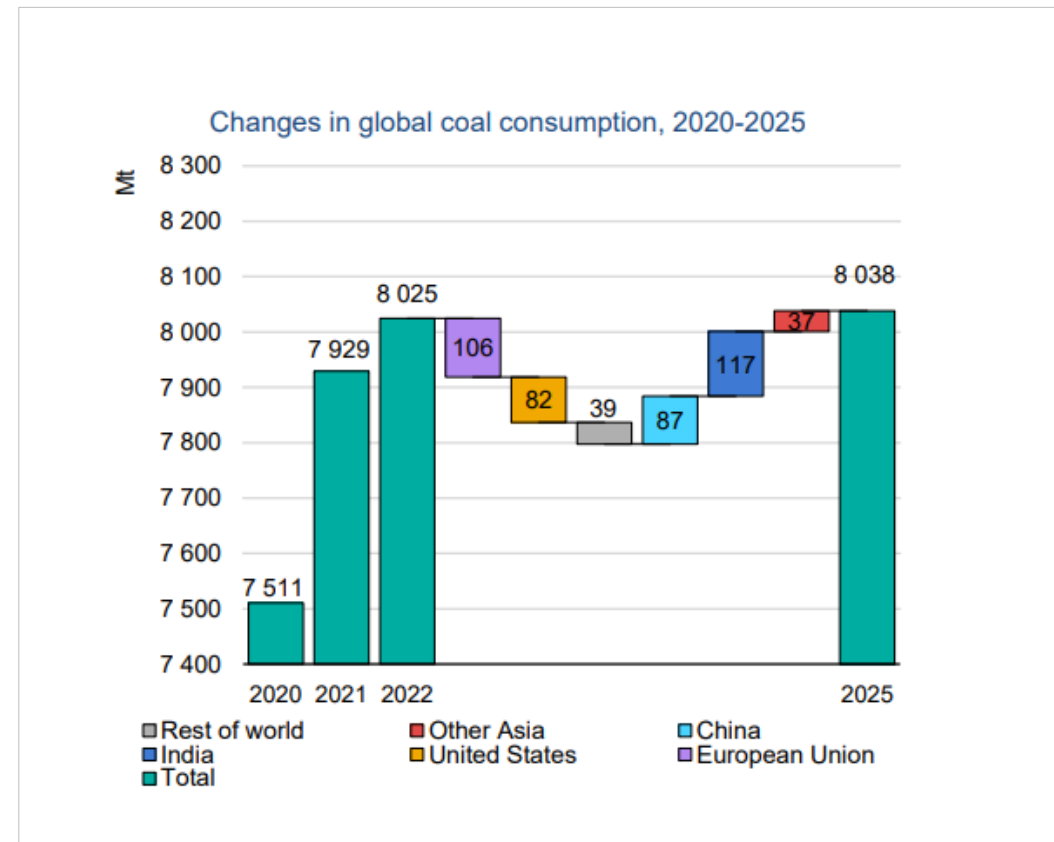
Multi-product
portfolio

90 ktpa H₂ -
LCoH US\$ 0.9-1.2
/kg

Global coal demand has plateaued over past decade, and expected to stay around 8 btpa in near future



80% coal use in EMDE; while Advanced economies (ADE) slow the pace of coal consumption



EMDE: Emerging Markets and Developing Economy
ADE: Advanced and Developed Economy

Coal is the source of 40% of global energy-related CO₂ emissions; Net Zero pathways still unclear

Coal usage in Power sector and Industrial sector

Coal accounts for 36% of global electricity generation

Coal based power plants produce 29% of all energy-related CO₂ emissions

75% of global 2200GW coal power assets are in Emerging and Developing economies

Present operating coal fleet would emit 330 Gt cumulatively from 2022-2100; consuming two-third of the CO₂ budget of 1.5 °C target

175GW coal assets are under construction; likely lifespan of 25-30 years





Industries (steel, cement etc.) account for 30% of global coal consumption

Coal is the dominant energy source for steel (75%) and cement (55%) sectors

Possible pathways to reduce CO₂ emissions

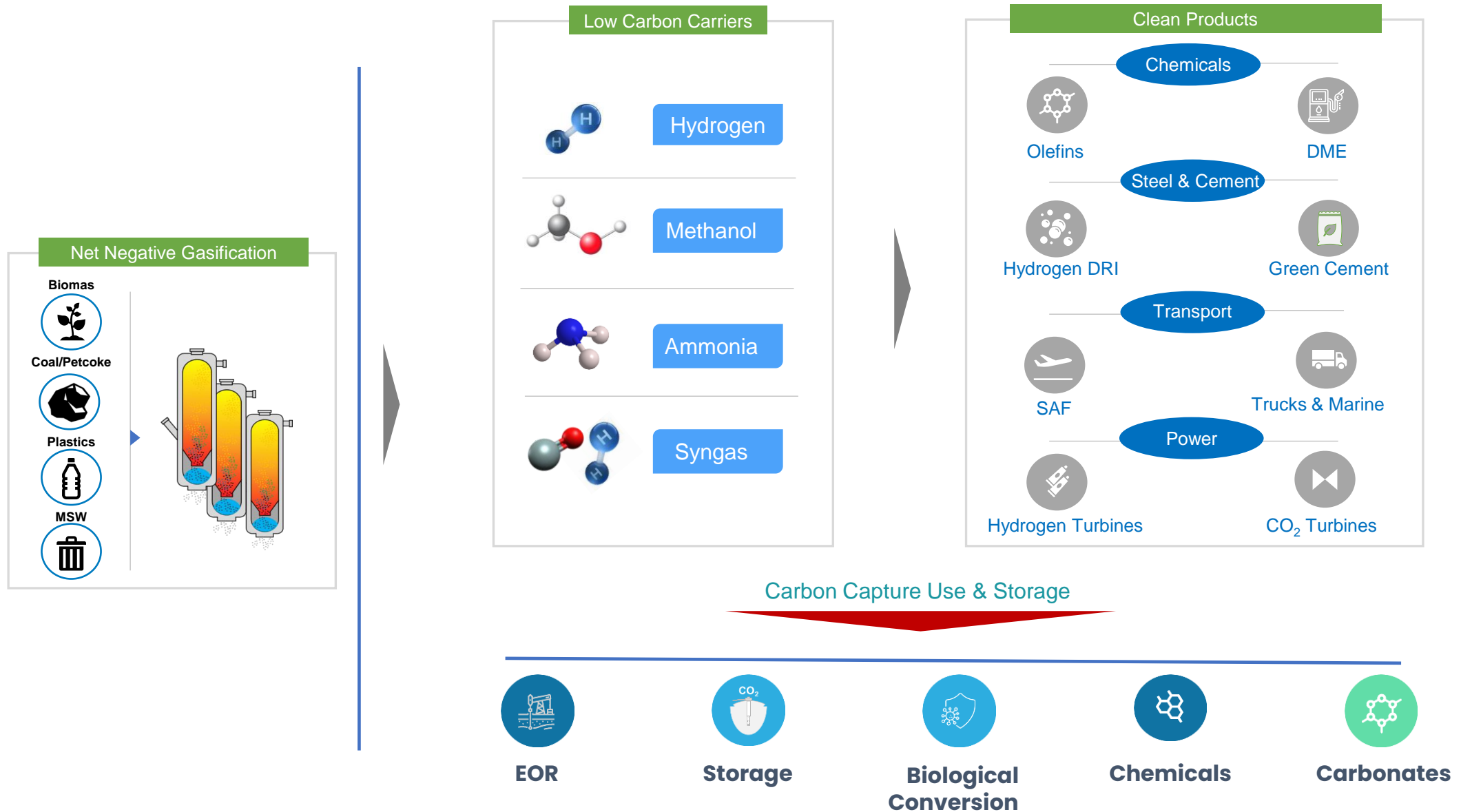
- › Retrofit existing plants
- › Cofire with biomass/ ammonia
- › Coal to NG transition
- › Planned capacity retireals
- › Further growth of RE



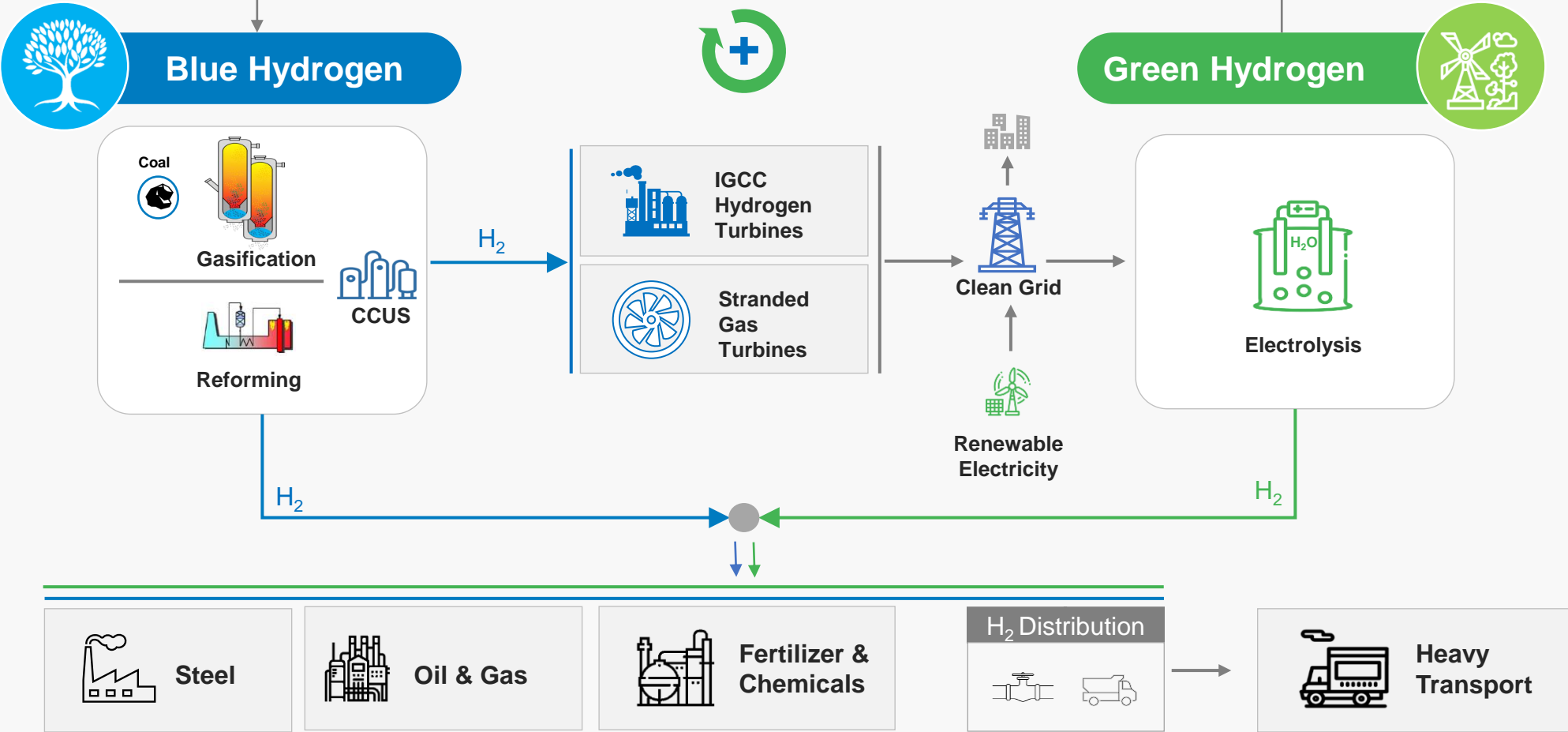
- 01 Recognizing that CO₂ is the Enemy, NOT Coal or Other Fossil Fuels 
- 02 Decarbonizing through Coal Gasification is Key Enabler 
- 03 Hydrogen and Other Low Carbon Carriers Key to Industrial Decarbonization 
- 04 Giga Ton (GT) Scale CO₂ Management Infrastructure Essential for Deep Decarbonization 

A Systems Model Framework for Gasification, New Energy Carriers
and Giga Ton Scale Carbon Capture Management will be the **Building
Blocks of Greening of Coal** towards **Zero Carbon Emission**

Commercial Scale Deep Decarbonization Model for the Industry through Coal Gasification



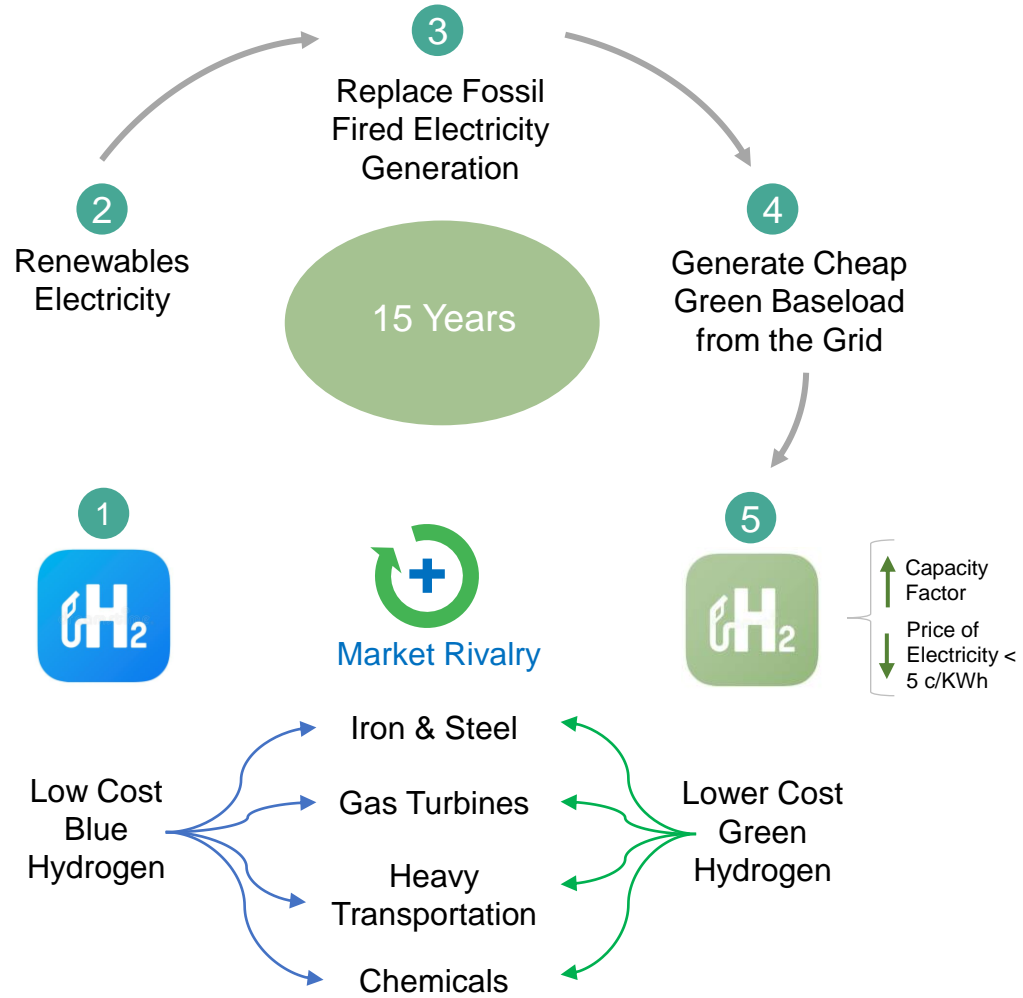
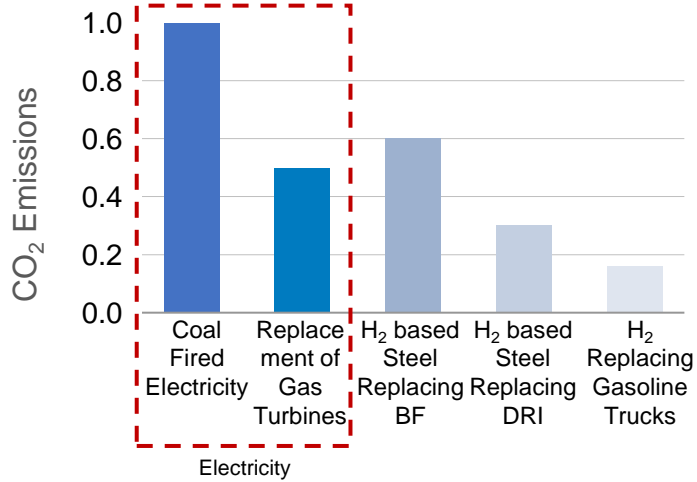
Model for Hydrogen Economy Evolution



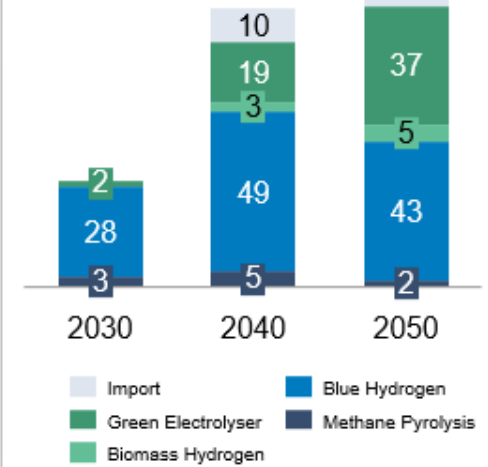
Energy Security, Economic Prosperity

The Market Evolution Model for the Hydrogen Economy

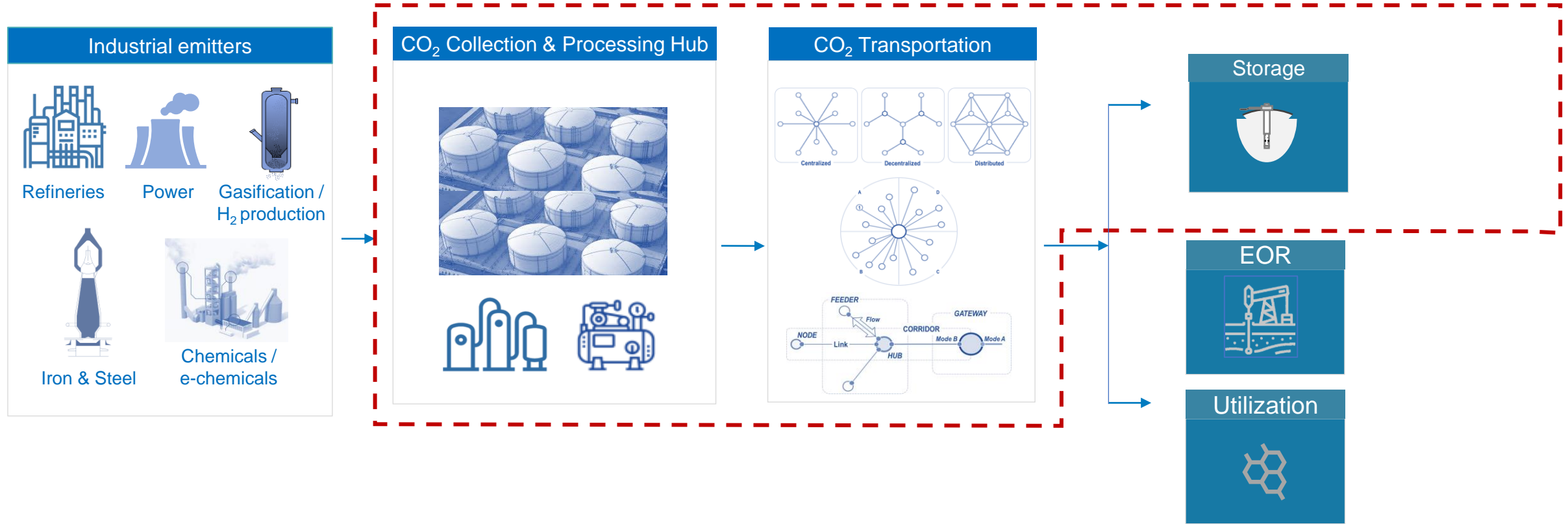
Carbon Replacement Ratio - 1 MWh of Renewables



[Mt H₂]



Model for Large Scale CO₂ Capture and Management – ‘GT Scale CO₂ Grid’



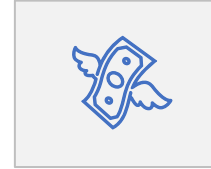
--- CO₂ Grid Operator's Boundary

Large scale CO₂ collection, aggregation, transport and disposition infrastructure that is economically attractive and operationally seamless for emitters



PPP based demonstration plants

- Funding for demonstration plants
- Assist in land acquisition
- Supply chain infrastructure support for gasification projects



Incentivize gasification-based low-C products

- Preferential procurement + PLI
- Capital subsidy for 'Make in India'



Loan guarantee program

- Enables low cost and easy access to capital
- Funding through Government backed Green/Blue bonds
- Bridge loans



Carbon capture policy

- Incentives for CCUS through tax and cash credits

Source:





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