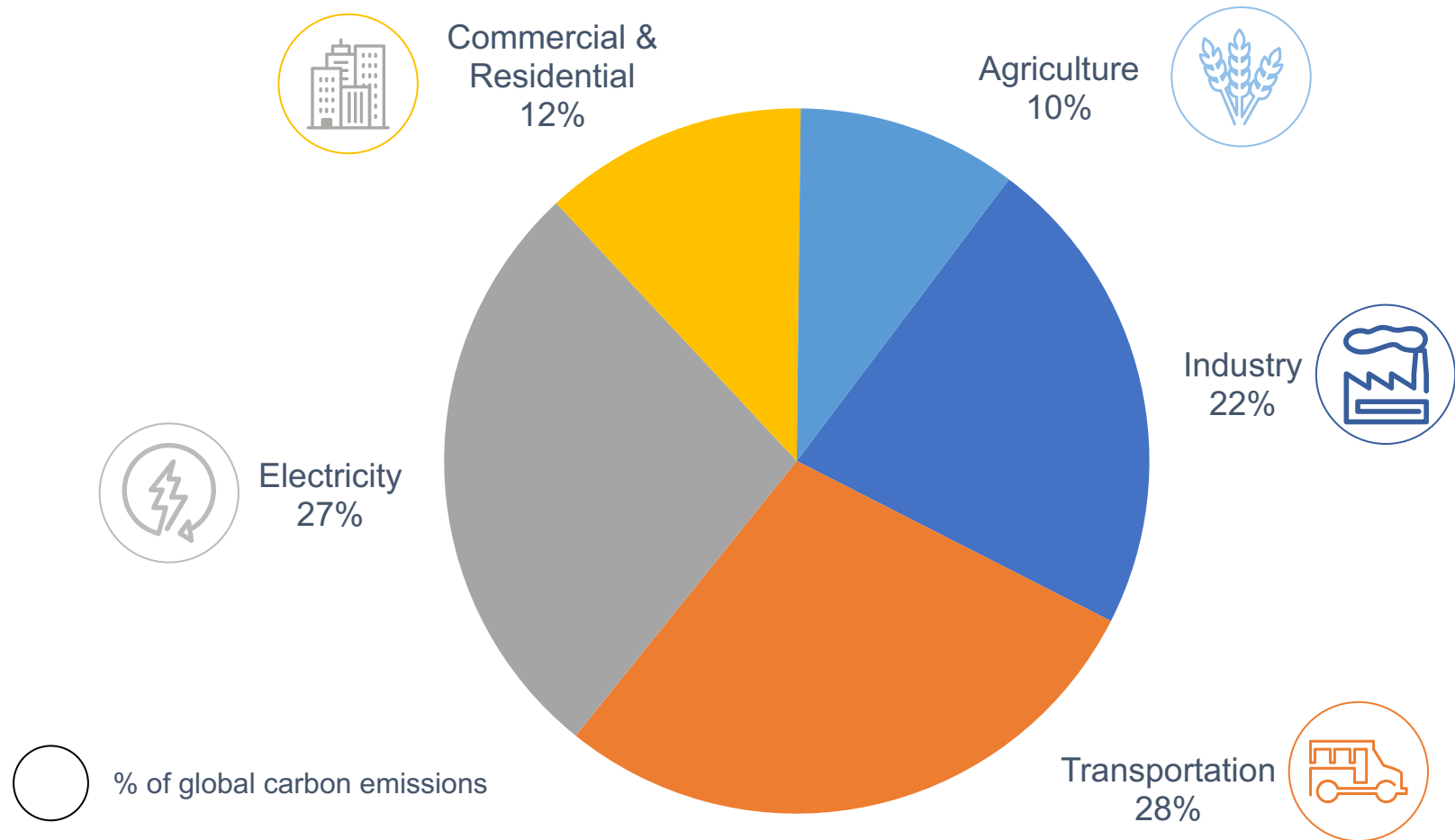




The Hydrogen to Power a Green World.

Need for de-carbonization



Source: EPA

Clean Hydrogen is a key pillar of de-carbonization

Renewable energy



Key markets served:

- Electricity Market

Battery innovation



Key markets served:

- Short Term Electricity Storage
- Med/Light Duty Transportation

Clean hydrogen*



Key markets served:

- Heavy Duty Transportation
- Marine & Air Transportation
- Steel Industries
- Chemical Industries
- Agriculture
- Long Term Electricity Storage

**Clean hydrogen has broadest reach given unique ability to eliminate hard-to-abate CO₂ emissions*

Clean Hydrogen from electricity and natural gas

monolith

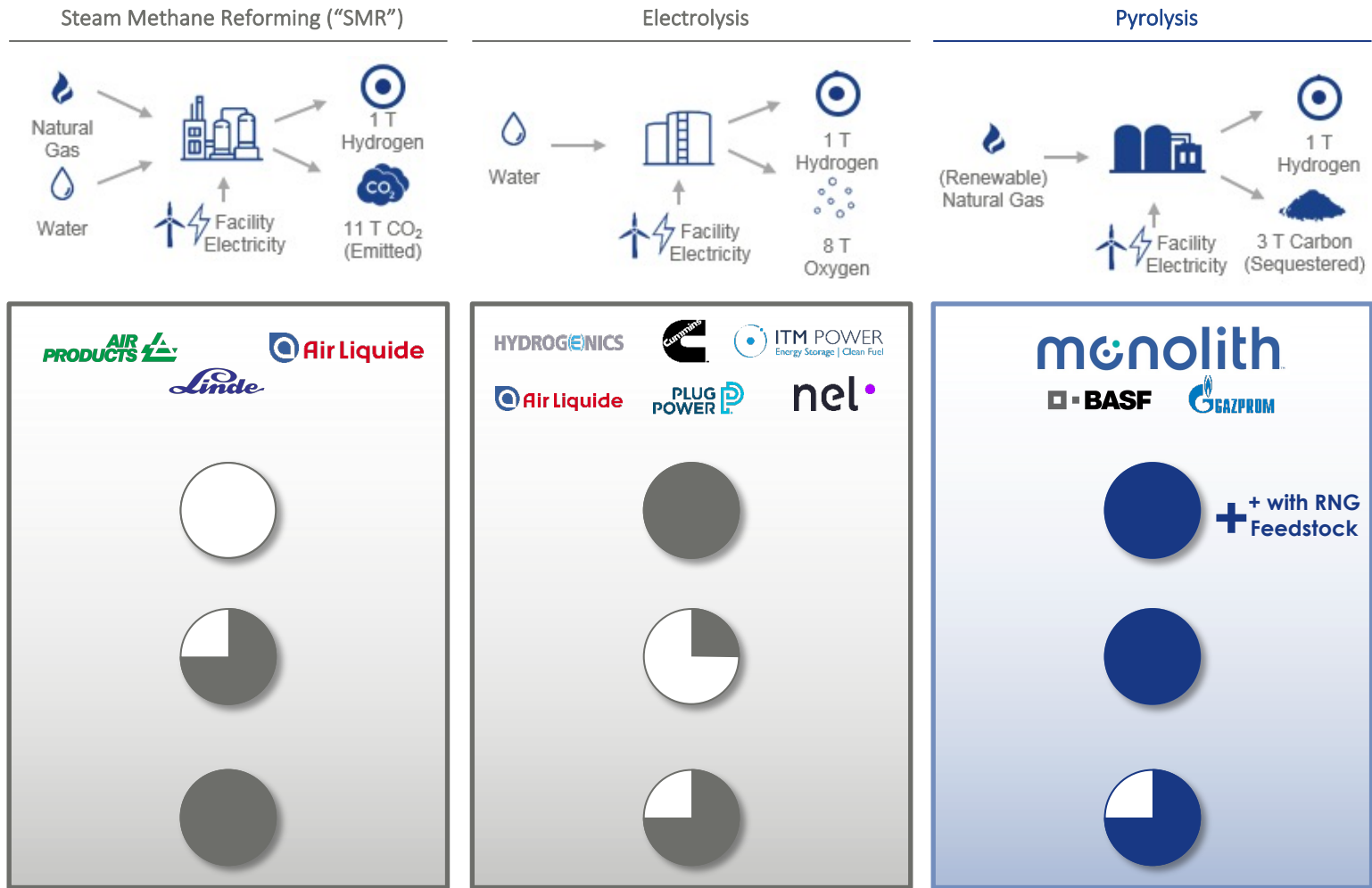
Protected Methane Pyrolysis Technology



Olive Creek 1 (OC1)

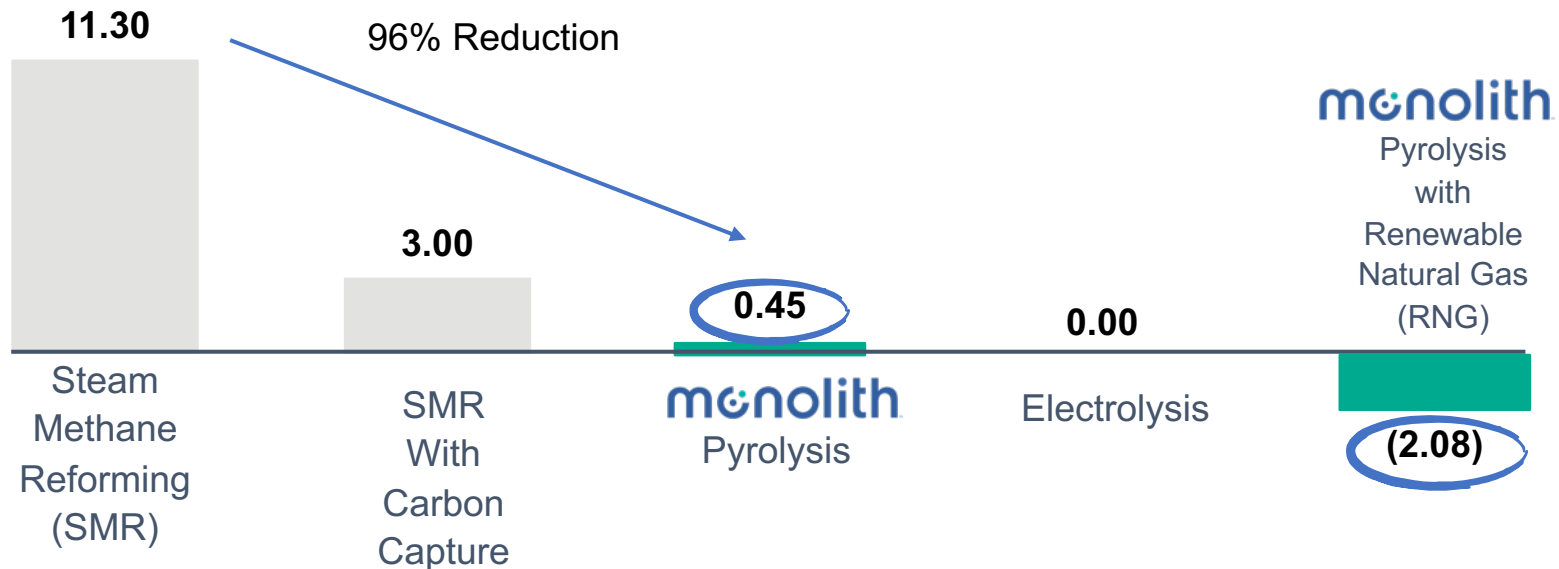
Commercialization of technology complete

Hydrogen production methods



Potential for lowest hydrogen carbon emissions

Carbon Intensity Of Hydrogen Production – Well To Gate (kg CO₂e / kg H₂)

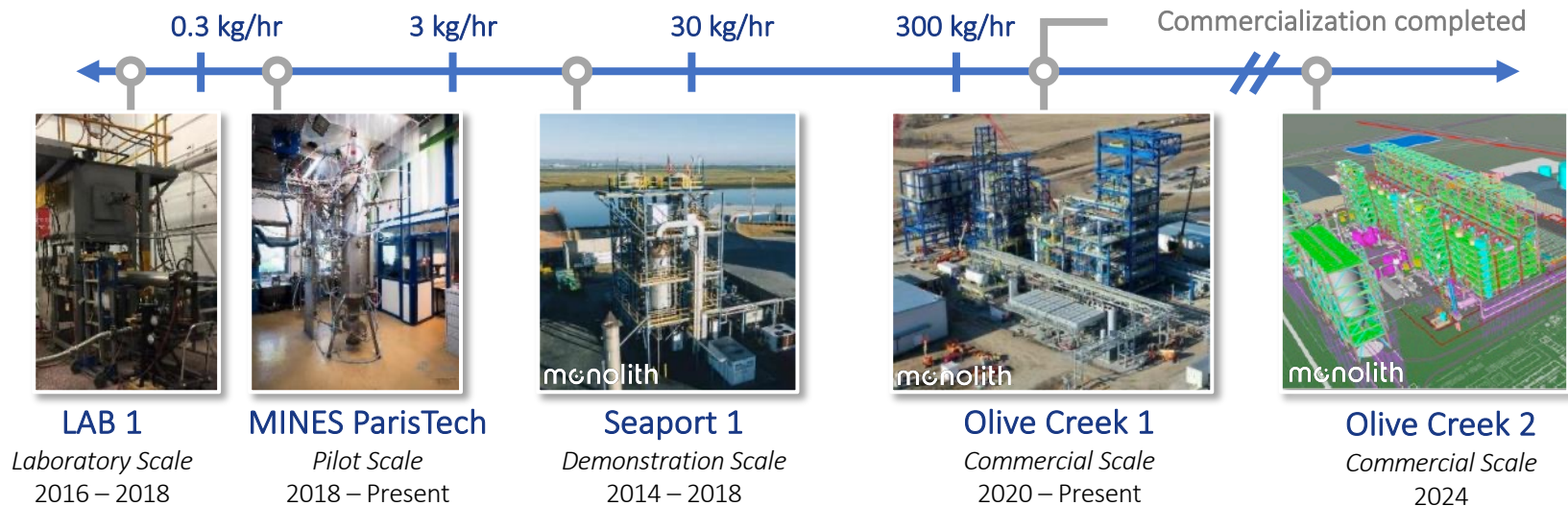


Note: Electrolysis and pyrolysis assume 100% renewable energy

Sources: NREL Hydrogen Analysis (H2A) Production Models, Version 3.2108, Central SMR without CCUS; NREL Hydrogen Analysis (H2A) Production Models, Version 3.2108, Central SMR with CCUS; Based on third party study using GREET1_2020 and AR5 GWP (CO₂, N₂O, CH₄); NREL Hydrogen Analysis (H2A) Production Models, Version 3.2108, Central Electrolysis (Process emissions only); Based on third party study using GREET1_2020 and AR5 GWP (CO₂, N₂O, CH₄)

Our History

CLEAN HYDROGEN PRODUCTION



Replicate Rx 12 Times
No technology scaling required



Demonstrated ability to scale-up patent protected, commercially viable technology

Olive Creek Project

Olive Creek I Facility at Mechanical Completion

Olive Creek I (OC1) Facility

Capacity	Hydrogen Production: ~5 ktpa Carbon Sequestration: ~15 ktpa
Completion	June 2020
Location	Nebraska, United States
Technology	Full commercial scale



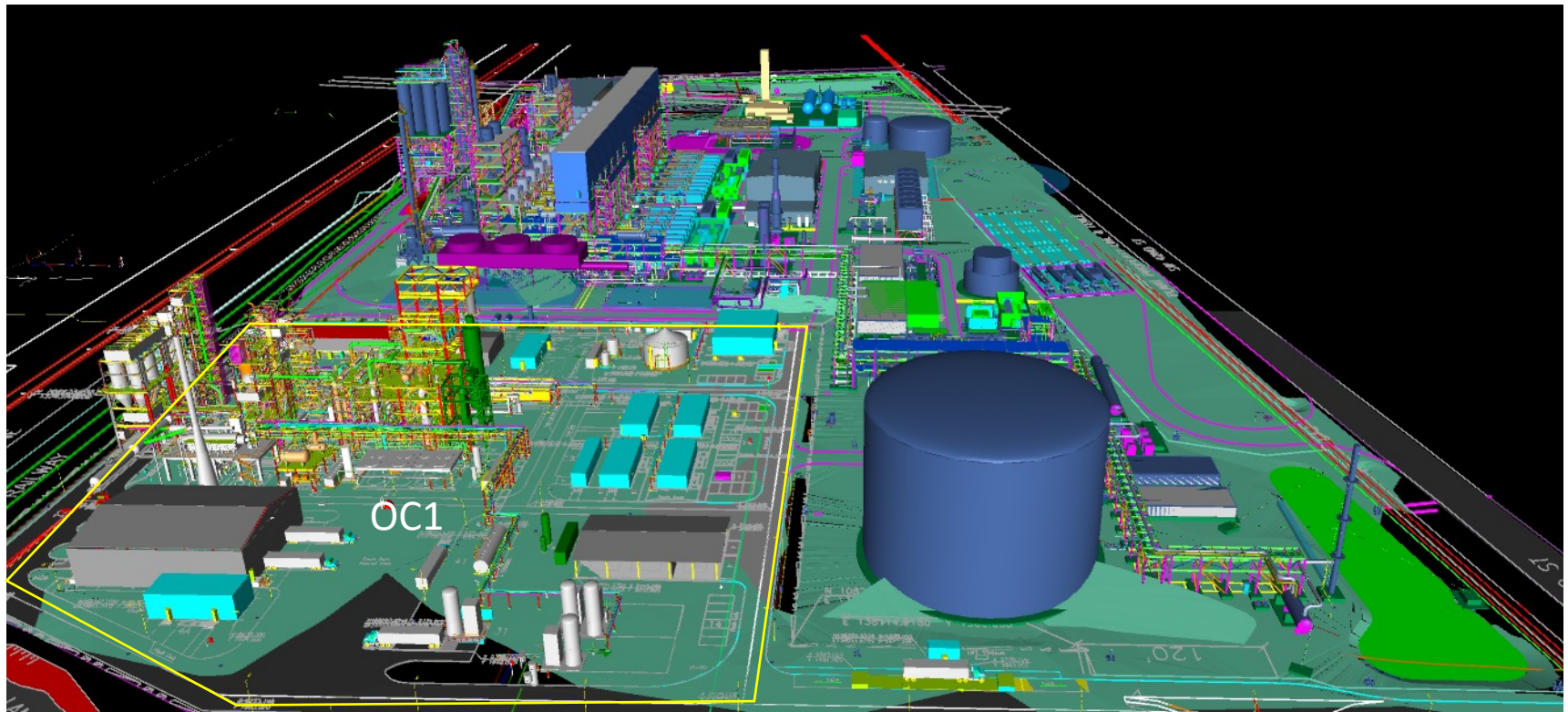
OC1 is the first commercial-scale methane pyrolysis facility built in the U.S.

Olive Creek 2 Largest Clean Hydrogen Plant in the Country

Olive Creek II (OC2) Facility

Capacity	Hydrogen Production: ~60 ktpa Carbon Sequestration: ~180 ktpa
Completion	2024
Location	Nebraska, United States
Technology	Full commercial scale

OC2 Will be the Largest Clean Hydrogen Plant in the Country



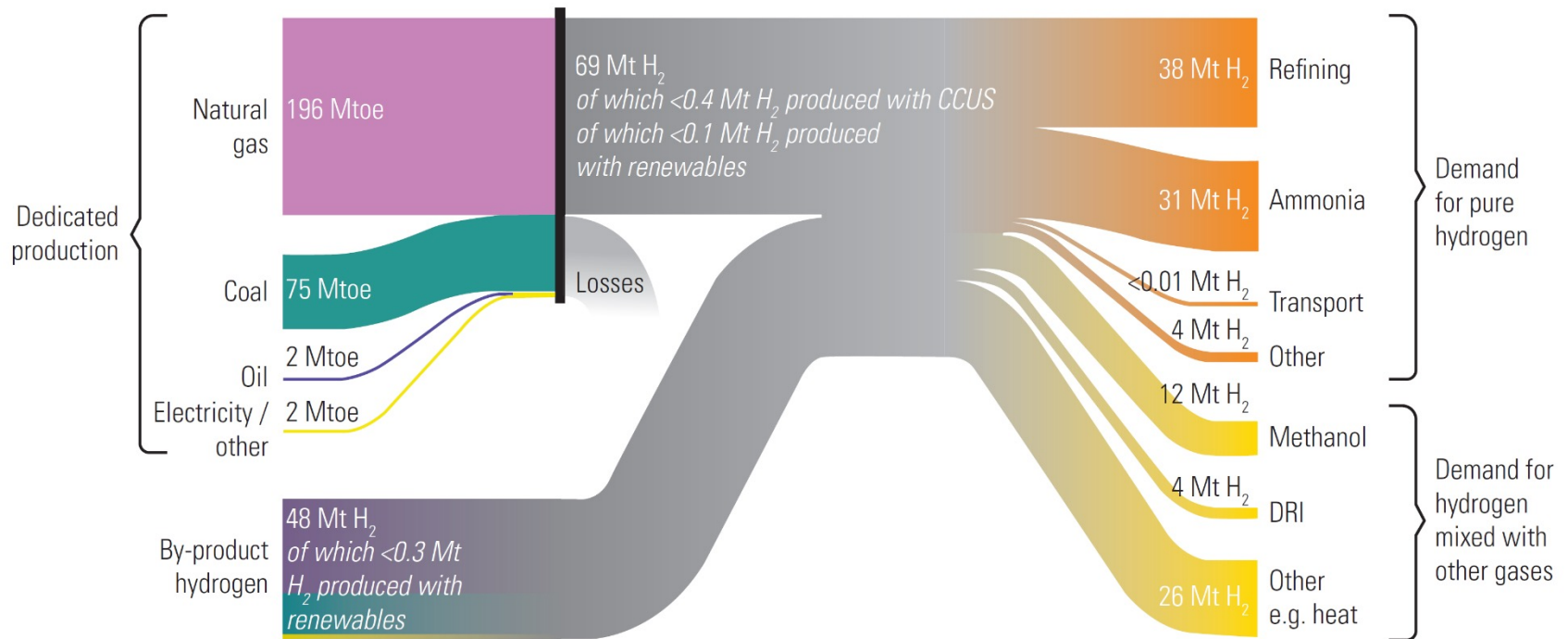


Considerations for future R&D on Clean Hydrogen Technologies

Global Hydrogen Market

Global hydrogen market is nearly **US\$130 billion** and expected to grow 7+% per year ⁽¹⁾

Hydrogen production results in nearly ~830 MtCO₂e (**2% global CO₂ emissions**) ⁽²⁾



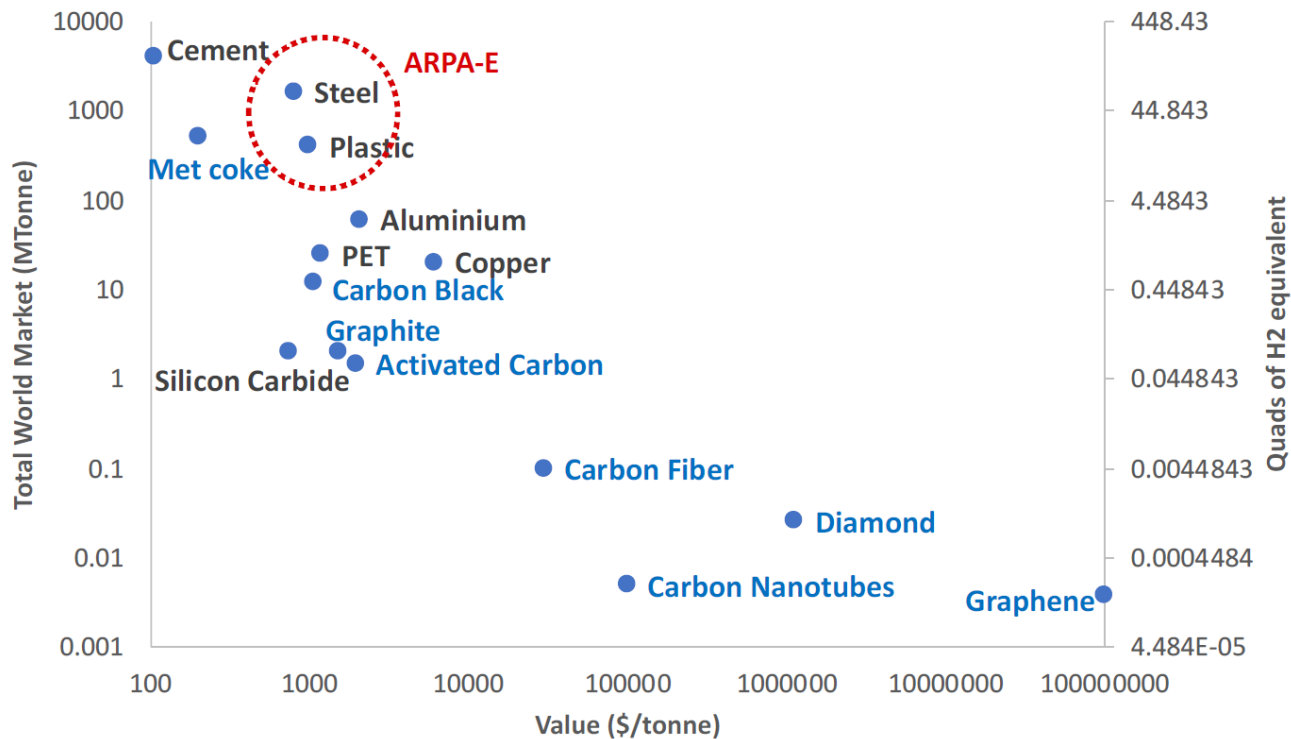
DRI: Direct Reduced Iron

(1)(Figure) United States Department of Energy Office of Fossil Energy. "Hydrogen Strategy Enabling a Low-Carbon Economy," July 2020.

(2) Kearney Energy Transition Institute. "Hydrogen Factbook: Applications and Business Models," June 2020.

Hydrogen Market Requires Large Carbon Market

Which markets can absorb this volume of carbon?



Sept. 21&22, 2017

UPGRADE: Unleashing Plentiful Gas Reserves
to Advance Decarbonized Energy

2

Source: Marc Von Keitz, DOE Program Director, ARPA-E Cohort Presentation 2019,
Day 2 Kickoff Slides, January 12 & 14, 2021

Must Consider Delivered Cost of Hydrogen

Exhibit 10: Emerging hydrogen distribution chains					
H ₂ value chain	Example end user (Europe, 2030)	Example value chain steps			Cost, USD/kg
		Production	Conversion/ transmission	Distribution	
Onsite	Industrial, large scale offtaker	<ul style="list-style-type: none">Renewable/low-carbon production 1.6–2.3 USD/kg	<ul style="list-style-type: none">On-site storage for average of 1 day 0.5 USD/kg		~2–3
Regional	H ₂ refueling stations (HRS)	<ul style="list-style-type: none">Renewable/low-carbon production 1.6–2.3 USD/kg	<ul style="list-style-type: none">Conversion to LH₂ and storage for average of 1 day <i>or</i>Storage as GH₂ for average of 1 day and compression to 700 bar 0.7–1.0 USD/kg	<ul style="list-style-type: none">Trucking as LH₂ for 300km + operating of 1,000kg LH₂ HRS <i>or</i>Piping as GH₂ for 300km and operating of 1,000kg GH₂ HRS¹ 1.0–2.0 USD/kg	~3–5
International	Industrial, large scale offtaker	<ul style="list-style-type: none">Renewable/ low-carbon production 1.0–1.4 USD/kg	<ul style="list-style-type: none">International pipeline for ~9,000km and storage at port for average of 2 weeks <i>or</i>Carrier conversion/ reconversion, shipping for ~9,000km and storage at port for average of 2 weeks 0.6–3.5 USD/kg	<ul style="list-style-type: none">Trucking as LH₂/GH₂ for 300km and onsite storage for average of 1 day <i>or</i>Piping as GH₂ for 300km and onsite storage for average of 1 day 0.1–2.0 USD/kg	~2–7

¹ Refers to usage of existing pipeline to industrial hub

Source: “Hydrogen Insights Report,” February 2021. Production costs adjusted.



Thank You.