



⁸RH₂ Technology for Blue Ammonia Production with High CO₂ Capture Rates

November 2022

8 RIVERS

8 Rivers' Business

From innovation to commercialization to deployment, we enable the world's largest companies to meet their Net Zero goals.

15+ years

Clean Energy Development

>400

Patents Granted

>70

Patent Families

8 Rivers Holds More Patents on CO₂ as Related to Energy Systems Than Any Other Entity in the World.

TECHNOLOGY DEVELOPMENT

- We have a robust technology portfolio to meet a diverse set of low-carbon energy challenges.

PROJECT DEVELOPMENT

- Our project development engine specializes in marquee deployment of low-carbon projects, leveraging the scale and expertise of Fortune 500 partners.

TECHNOLOGY LICENSING

- 8 Rivers will license out its world-class portfolio to energy companies and projects to accelerate global deployment of clean energy.

8 Rivers' Unique Place in the Clean Fuels and Energy Market

8 Rivers offers the one of the strongest collections of ESG technologies touching multiple power, industrials, and chemicals processes



Zero-Emissions Electricity

64
Patents

CORE INNOVATION
Oxy-Combustion



Zero-Emissions
Hydrogen & Ammonia

7
Patents

CORE INNOVATION
Oxy-Combustion



H₂S Sour Gas to
Sweet Gas

Patents
Pending

CORE INNOVATION
CO₂ Working Medium



Direct Air Capture
of CO₂ (DAC)

Patents
Pending

CORE INNOVATION
CO₂ Working Medium



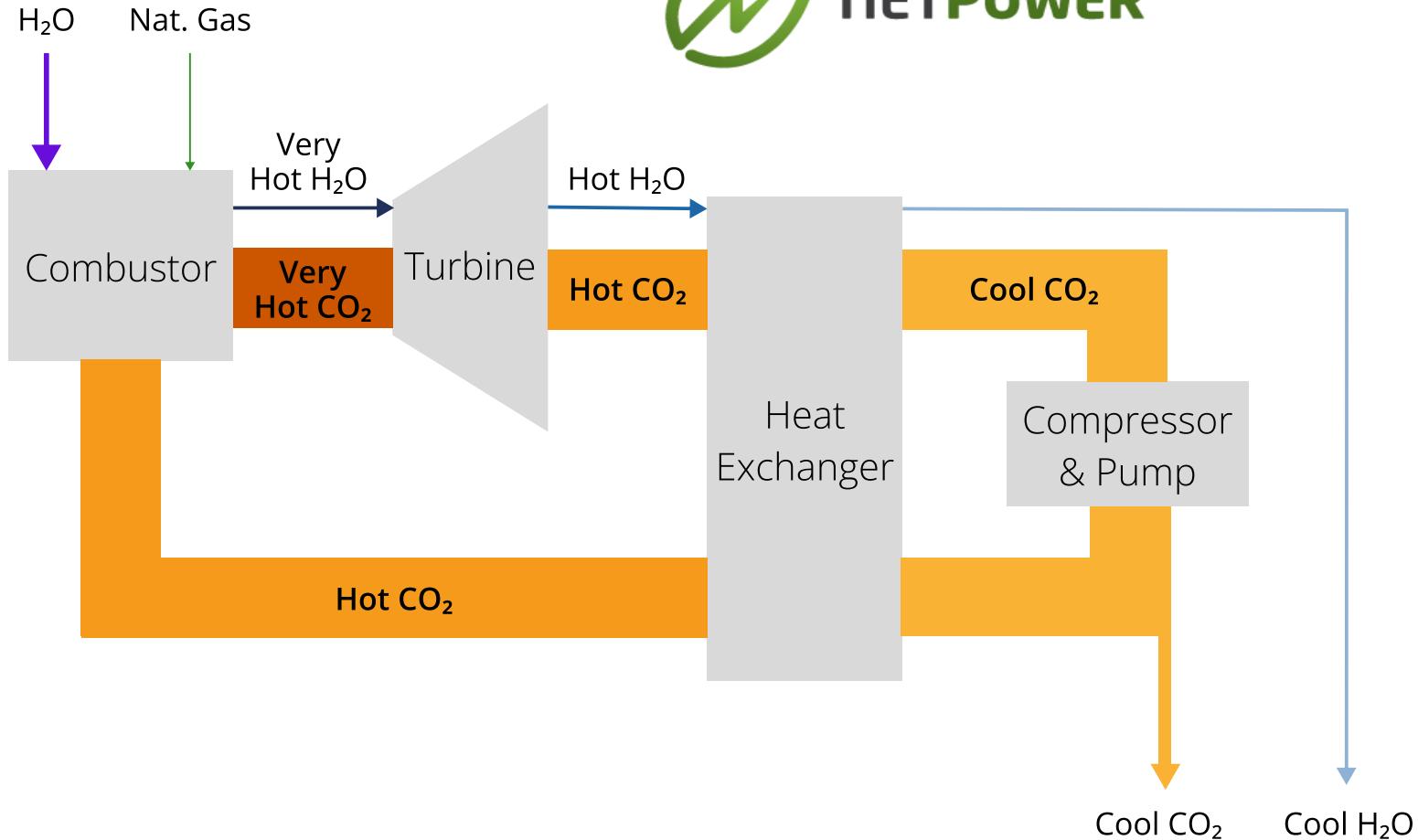
Decarbonizing
Industrial CO₂

Licensed
Technology

8 Rivers has a large pipeline of additional ESG technologies under development and a business model that supports continuous innovation

The Allam-Fetvedt Cycle

Reinventing emissions capture from its source.



8 Rivers Projects – Building the Hydrogen / Net Zero Clean Fuel Economy

8 Rivers has built a deep pipeline of third party-led and zero degrees deployment opportunities, with more available, driving 8 Rivers' current growth-stage expansion.

Global interest and partnerships with strong market expansion potential:
\$39 trillion, or ~50% of world GDP, is generated by nations, cities, or regions with an actual or intended net zero target (1)

Public Projects

- Allam-Fetvedt Cycle Projects
- 8RH₂ Projects
- AFC + 8RH₂ Combined Projects
- DAC Projects
- ★ NET Power Test Plant



1. Project Broadwing

- 284 MW Allam-Fetvedt Cycle plant in Illinois, powering clean ethanol
- Sited next to class VI sequestration well
- Filed a funded interconnect application with grid operator
- Partner with ADM and Warwick

2. Project Coyote

- 284 MW NET Power Allam-Fetvedt Cycle plant in Colorado
- Completed concept development in 2020 – water neutral operations enables use of brownfield site
- Advantaged gas supply and CO₂ transportation infrastructure
- Partner with Southern Ute Tribe

3. Project Whitetail

- 350 MW NET Power Allam-Fetvedt Cycle plant in Teesside Zero Carbon Cluster in UK
- Substantial government support – pre-FEED and DPA
- Completion of pre-FEED in 2020
- Partner with Sembcorp

(1) Source: [https://www.nsenergybusiness.com/features/gdp-netzero-emissions/](https://www.nsenergybusiness.com/features/gdp-net-zero-emissions/) and <https://eciu.net/netzerotracker>.

SK Group Invests \$100M into 8 Rivers Capital

Technology

SK Group, 8 Rivers form zero-emissions joint venture

By Nina Chestney



LONDON, March 8 (Reuters) - U.S. clean technology firm 8 Rivers Capital has secured \$100 million in investment from South Korea's SK Group ([034730.KS](#)) and formed a joint venture to deploy zero-emissions projects in the Asia-Pacific region, the company said on Tuesday.

https://www.koreatimes.co.kr/www/tech/2022/01/419_321862.html
<https://www.weforum.org/organizations/sk-holdings>
<https://cleantechnica.com/2021/07/14/sk-innovation-wants-to-rebrand-from-carbon-to-green/>
<https://koreajoongangdallyjoins.com/2021/06/23/business/industry/SK-Chey-Taewon-carbon-neutral/20210623190807258.html>

Recent SK Announcements

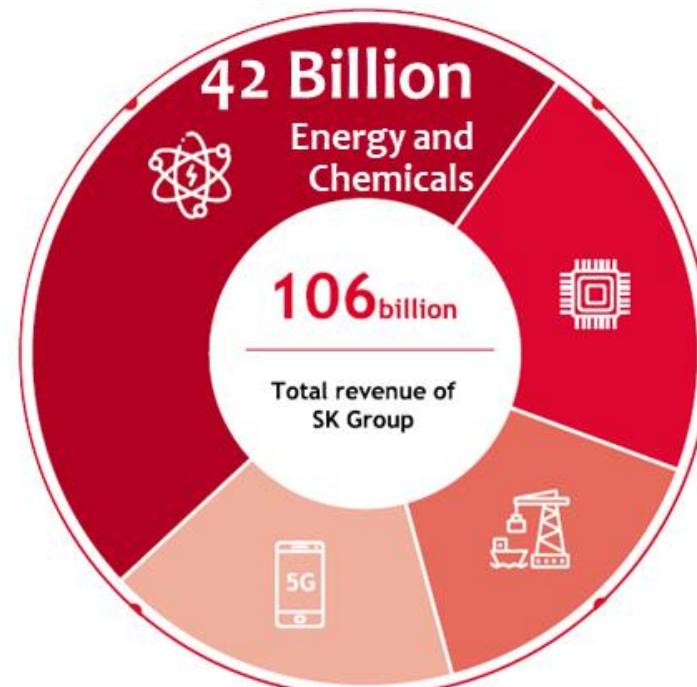
SK has pledged to **cut 200 million tons** of carbon emissions globally **by 2030**.

SK has announced a "complete shift in the central axis of business" and stated that it plans to move from a carbon business to a **green business**.

SK is expanding its global presence and employs over 81,000 people, including 16,000 people in some **260 global affiliates/branches worldwide**.

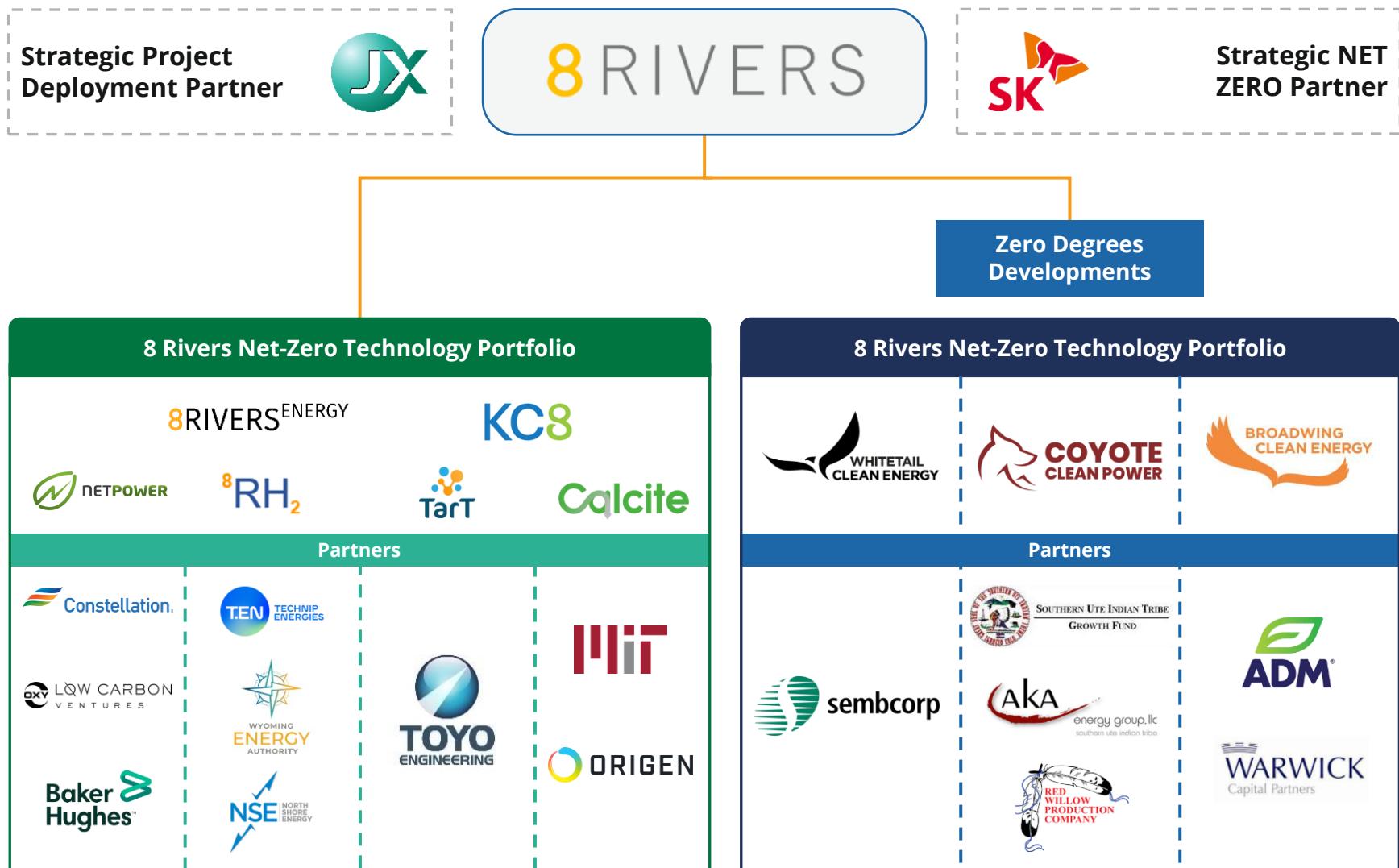
"All SK Group affiliates will achieve net zero carbon emissions **ahead of its 2050 goal**"

- SK inc. Chairman Chey Tae-won



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Map of 8 Rivers Technologies and Project Partners (not exhaustive)

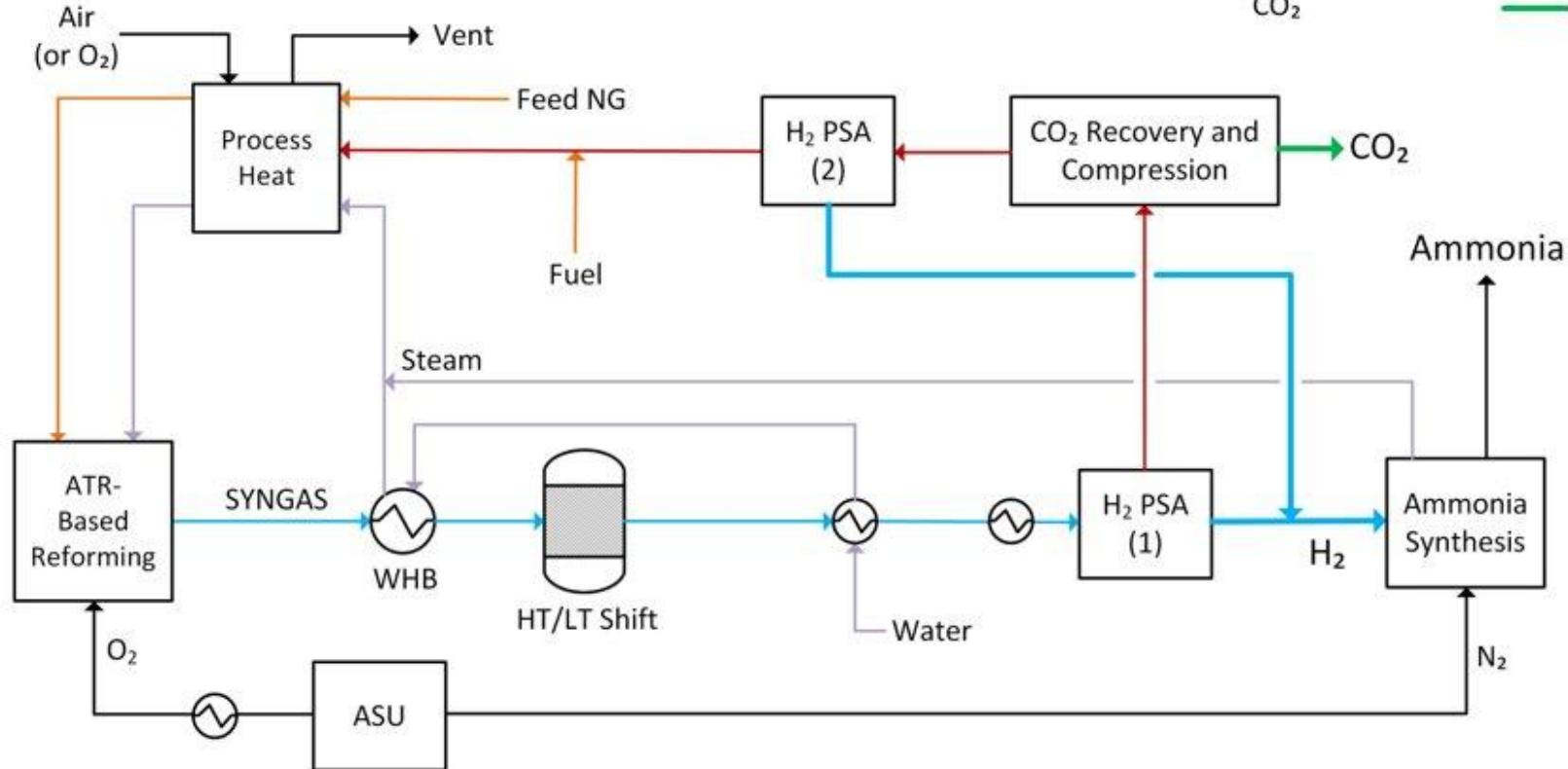


⁸RH₂ Process

High Thermal Efficiency and 99%+ CO₂ Capture rate

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8 RH₂ Ammonia



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Technology Overview: ⁸RH₂ Hydrogen for Ammonia Production

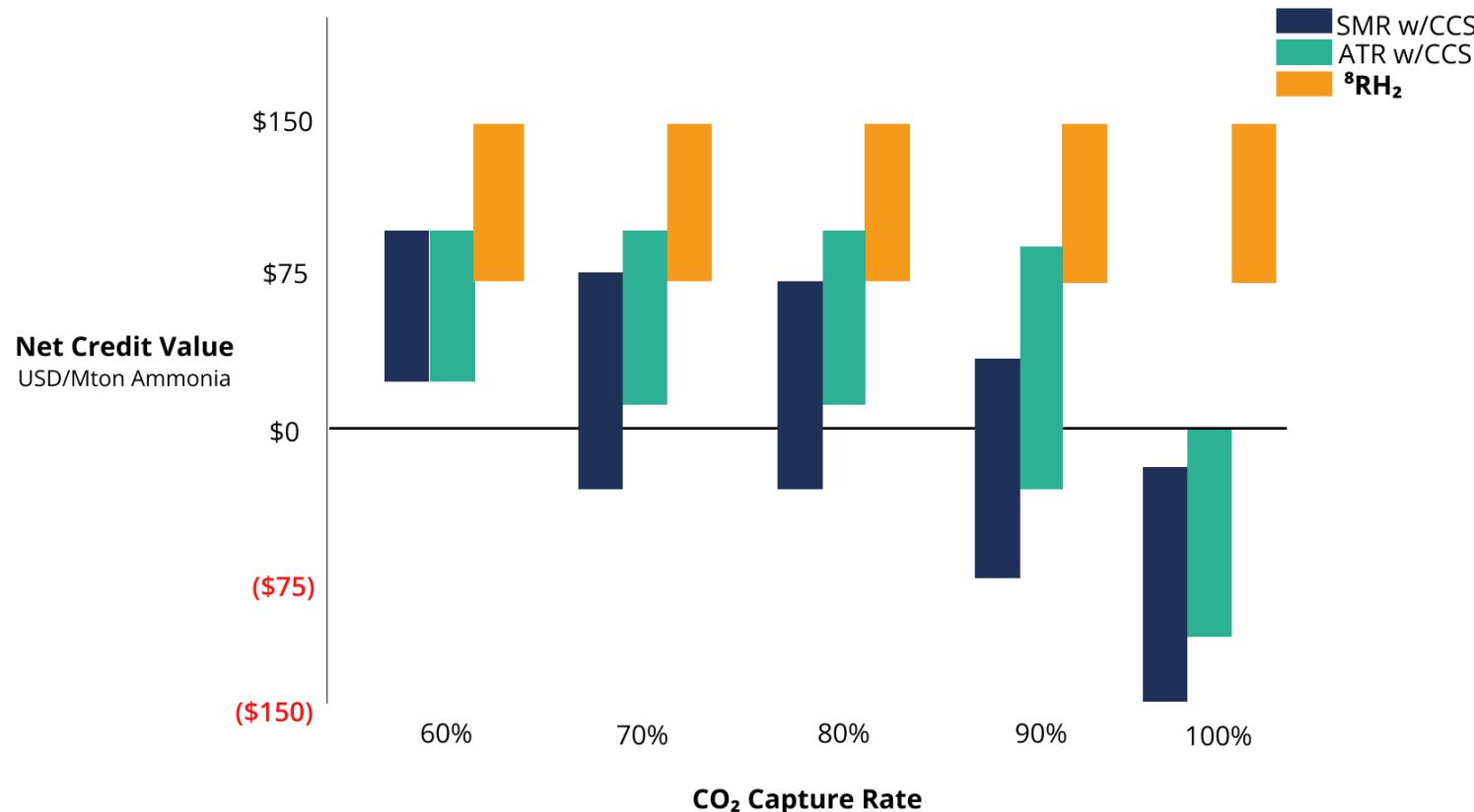
Low-Carbon H₂ and Ammonia

- Low cost and high carbon capture rate.
- Low-temperature CO₂ capture maximizes H₂ recovery
- > 99% CO₂ capture at pipeline pressure.
- Unified CO₂ cleanup and recovery for oxy-heater exhaust and syngas streams.

	⁸ RH ₂	Conventional ATR + CCS	SMR + CCS
Fuel input (MWth, LHV)	406	422	498
H ₂ output (MMSCFD)	100	100	100
Thermal efficiency (LHV)	82.3%	79.4%	67.2%
NG Conversion rate (MMBtu / ton ammonia)	27 - 28	28-30	30 - 35
Net power import (MWe)	17.5	27.2	0
CO ₂ capture rate	>99.0%	95-97%	90.1%
CO ₂ spec (pressure, mole %)	150 bar, 99%	26 bar, 99%	110 bar >96%

Blue Ammonia Technology Comparison and 45Q Tax Credits

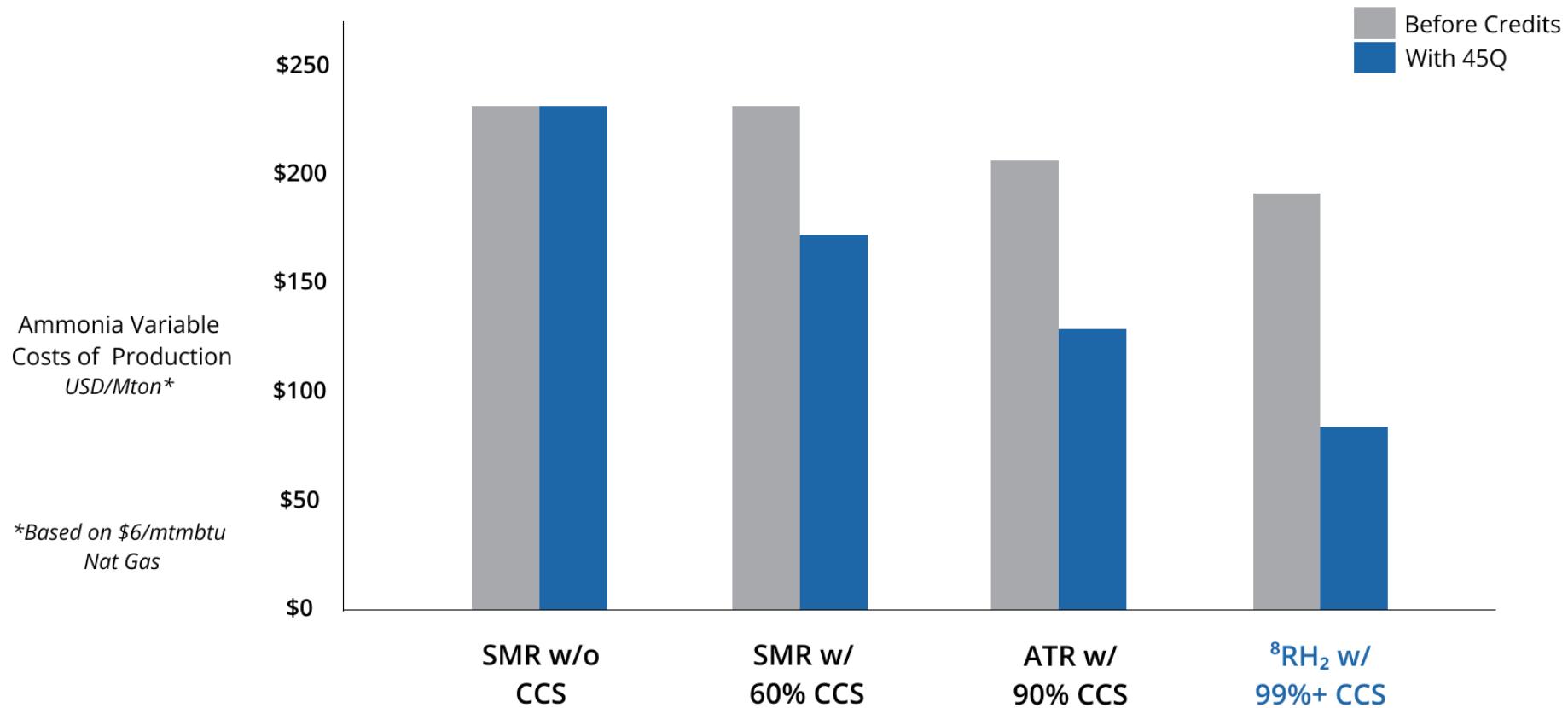
Net Tax Value of 45Q



$$\text{Net Credit Value} = \left[\frac{45Q \text{ Tax Value/ton}}{\text{(net of tax equity)}} \times \frac{\text{Feedstock CO}_2 \text{ Intensity}}{\text{(tons CO}_2 / \text{tons NH}_2)} \right] - \left[\frac{\text{CO}_2 \text{ Capture Costs}}{\text{/ton}} \right] + \left[\frac{\text{CO}_2 \text{ Transportation \& Storage Costs}}{\text{/ton}} \right]$$

Blue Ammonia Technology Cost Comparison

Variable Costs Net of 45Q tax Credits

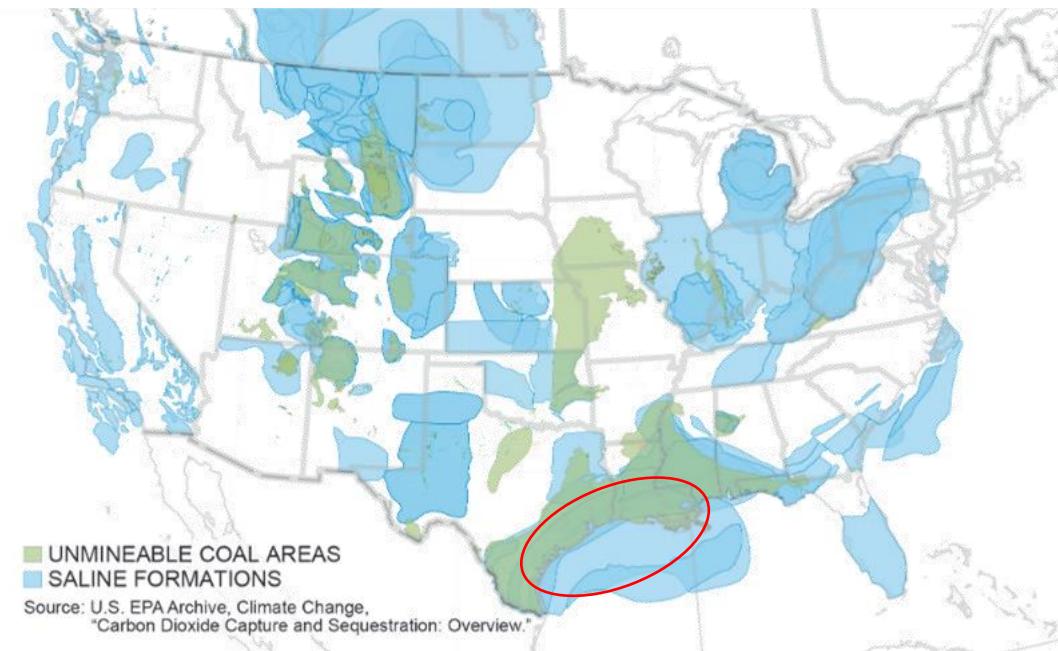


First ⁸RH₂ Deployment

- Gulf Coast, United States

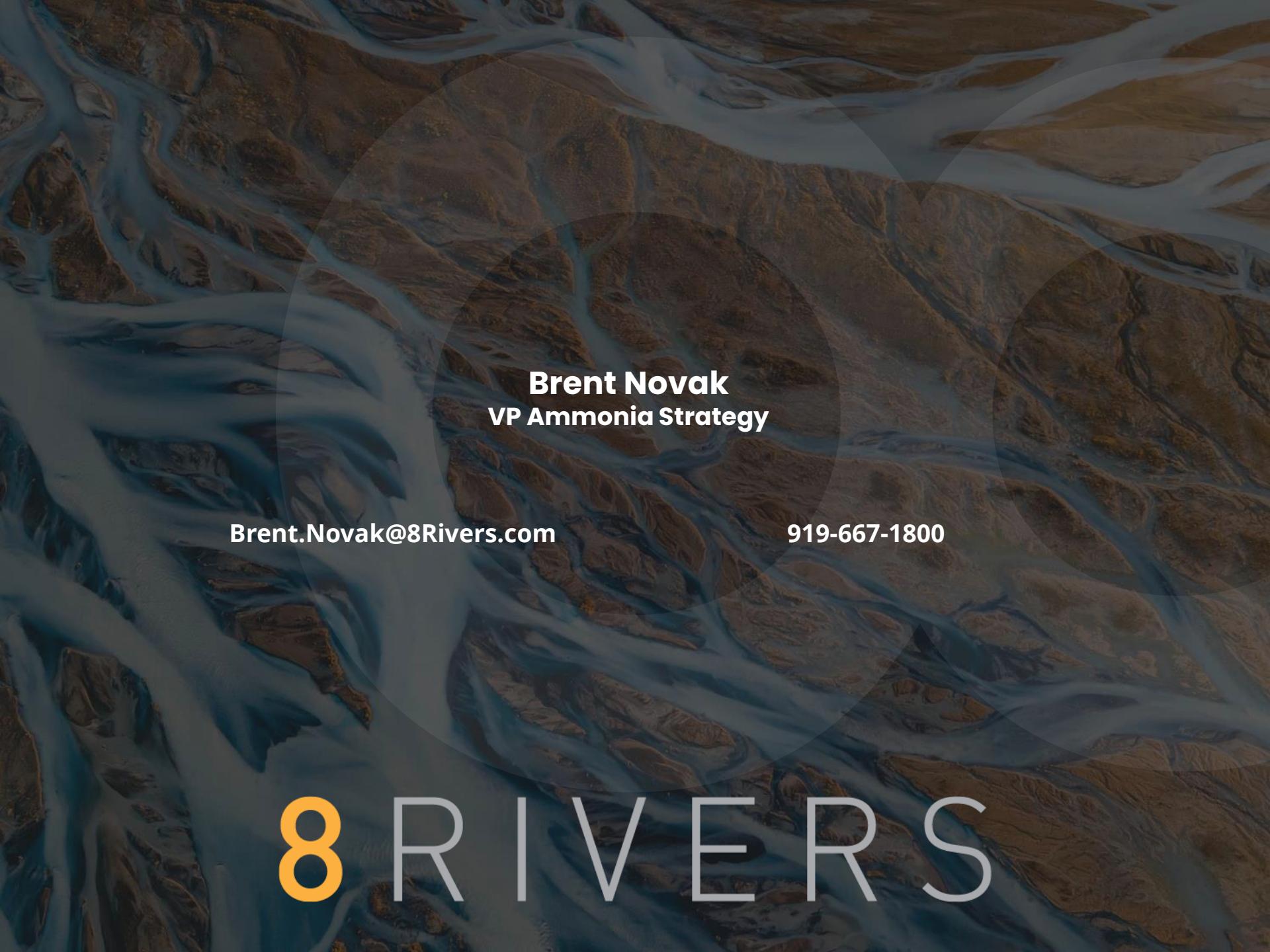
World Scale blue ammonia plant located on the US Gulf Coast

- 200 MMSCFD of clean hydrogen utilizing 8RH2 technology
- Integrated 880k TPA blue ammonia plant



Development Timeline

- FEED Study: 1Q2023 - 1Q2024
- FID: 1Q2024
- Construction: 2024 – 2026



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