



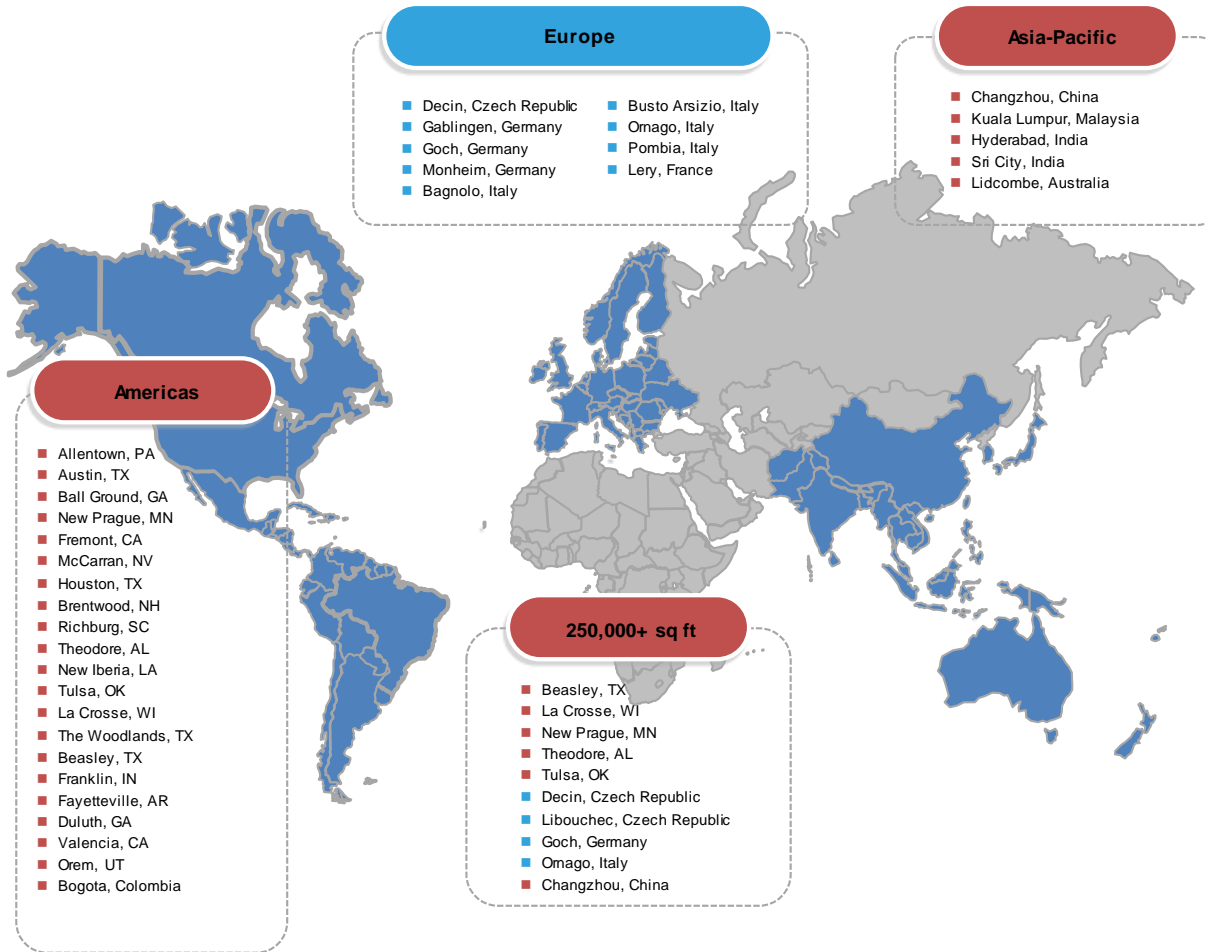
Cryogenic Carbon Capture

Kyler Stitt, VP Engineering, SES a Chart Company



Chart Industries

- NYSE: GTLS
- Market Capitalization: ~\$6.0B
- Net Debt: \$804M
- Enterprise Value: ~\$6.8B
- Shares Outstanding: 35.8M (Basic)
- Revenues (2021A): ~\$1.3B
- Headquarters: Ball Ground, GA
- Team Members: ~4,900 (50-50% U.S./International)
- Global Footprint: >25 Locations Worldwide



Broad Offering of Highly Engineered Cryogenic Equipment

Brazed Aluminum Heat Exchangers



Cold Boxes



Gas Pre-Treatment and Nitrogen Rejection Units



Specialty Pressure & Heat Transfer Equipment



Air Cooled Heat Exchangers



Axial Flow Fans



Integrated Energy Systems



Lifecycle Services



Cryogenic Bulk Storage Tanks



Vaporizers



Cryogenic Storage & Regasification Systems



Packaged Gas Systems



Cryogenic Launch Umbilicals & Storage



Nitrogen Dosing & Food Preservation



Fueling Stations



HLNG Vehicle Tanks



Cryogenic Transport Trailers



LNG Virtual Pipeline Solutions



LNG by Rail



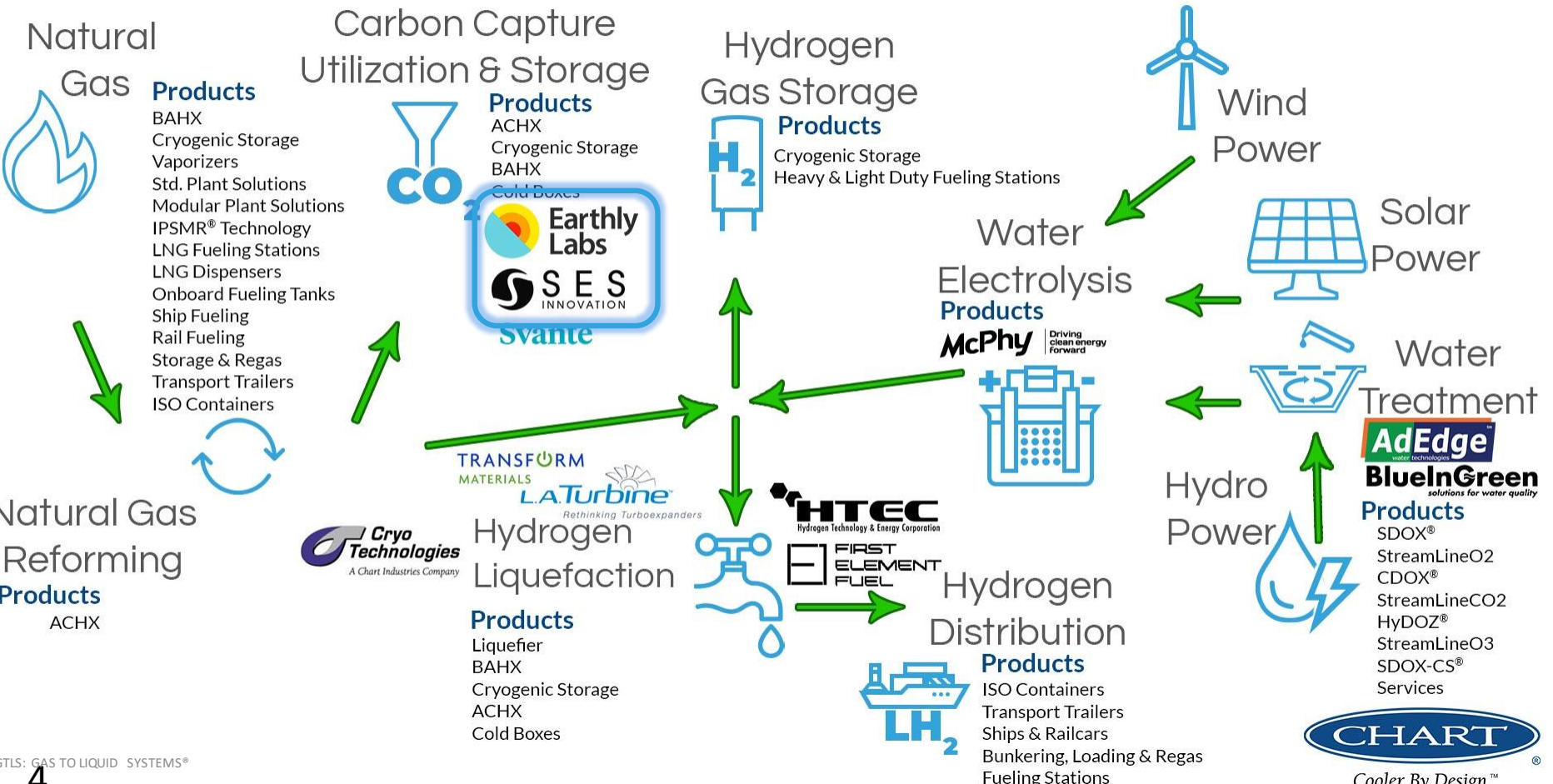
FEMA Valve Portfolio



Servicing & Repairs



CHART PRODUCTS For the Clean Nexus of Power, Water, Food & Industrials



GTLS: GAS TO LIQUID SYSTEMS®



Leader in CO₂ Capture

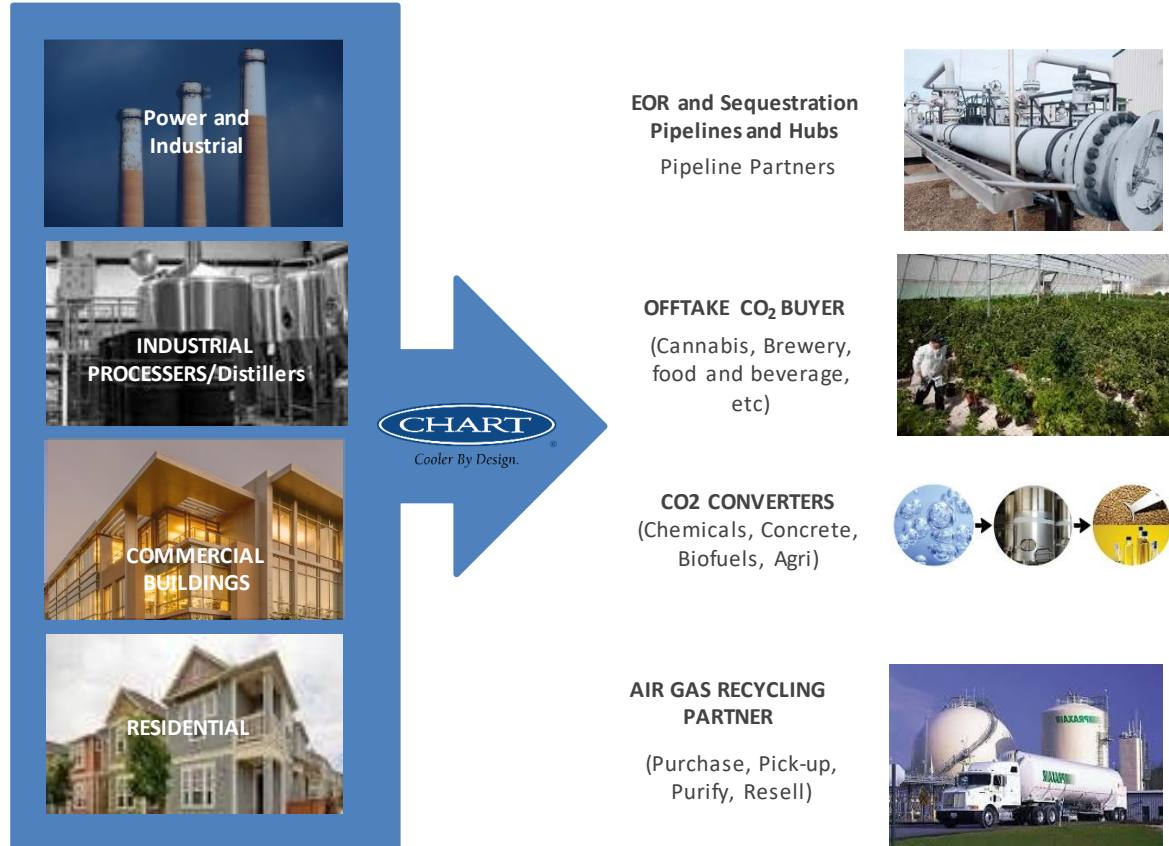
TECHNOLOGY SOLUTION

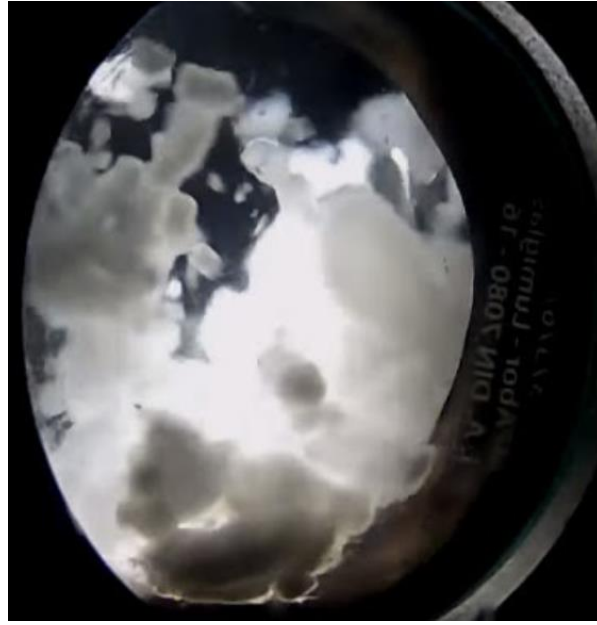
- CO₂ Capture
- CO₂ Purification
- CO₂ Software
- CO₂ Credit / Trade
- CO₂ Recycling / Broker

SERVICES

- Rebates
- Financing
- CO₂ Credits / Trades

Leverage Chart CO₂ Ecosystem to Accelerate Market Capture & Leadership





CO₂ CAPTURE INVENTED FOR A CHANGING WORLD



Sustainable Energy Solutions CO2 Capture Leadership



60+ Patents Issued, Bench and Field Pilots Completed, Recognized as top Post-Combustion Carbon Capture Technology

2010-2021

Powered Carbon Cure (Round 1 & 2) to win the Carbon XPRIZE

2019-2020

Chart acquires SES to Accelerate Carbon Capture Scale-Up and Deployment

2020

First Small-Commercial Project (30-300 TPD CO2) Near Kansas City, MO

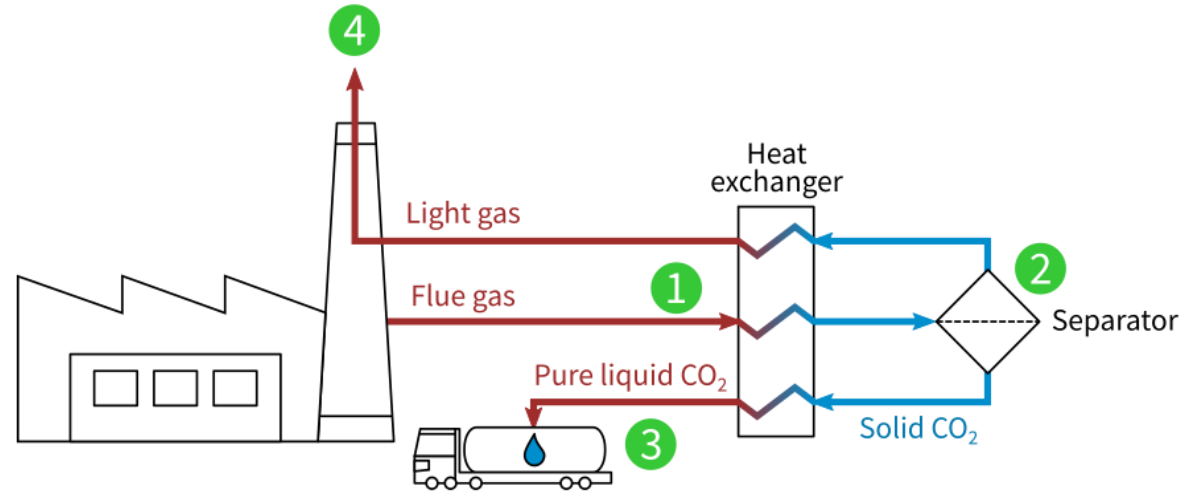
2021

Scale-up to Full-Industrial Carbon Capture

2023-

“Without carbon capture, the worldwide fleet of coal and gas power plants would need to retire about 23 and 17 years earlier than expected lifetimes, respectively in order to limit global warming to 1.5 °C and 2 °C. Blast furnaces and cement factories without CCS,[...] may also be stranded.”

-Feb. 2022, UN IPCC Report



- 1 Flue gas is cooled
- 2 CO₂ is separated as a solid from the light gases
- 3 CO₂ is melted and prepared for transport
- 4 Light gases are reheated and released to atmosphere



Lowest energy and cost retrofit technology

Easiest retrofit carbon capture technology

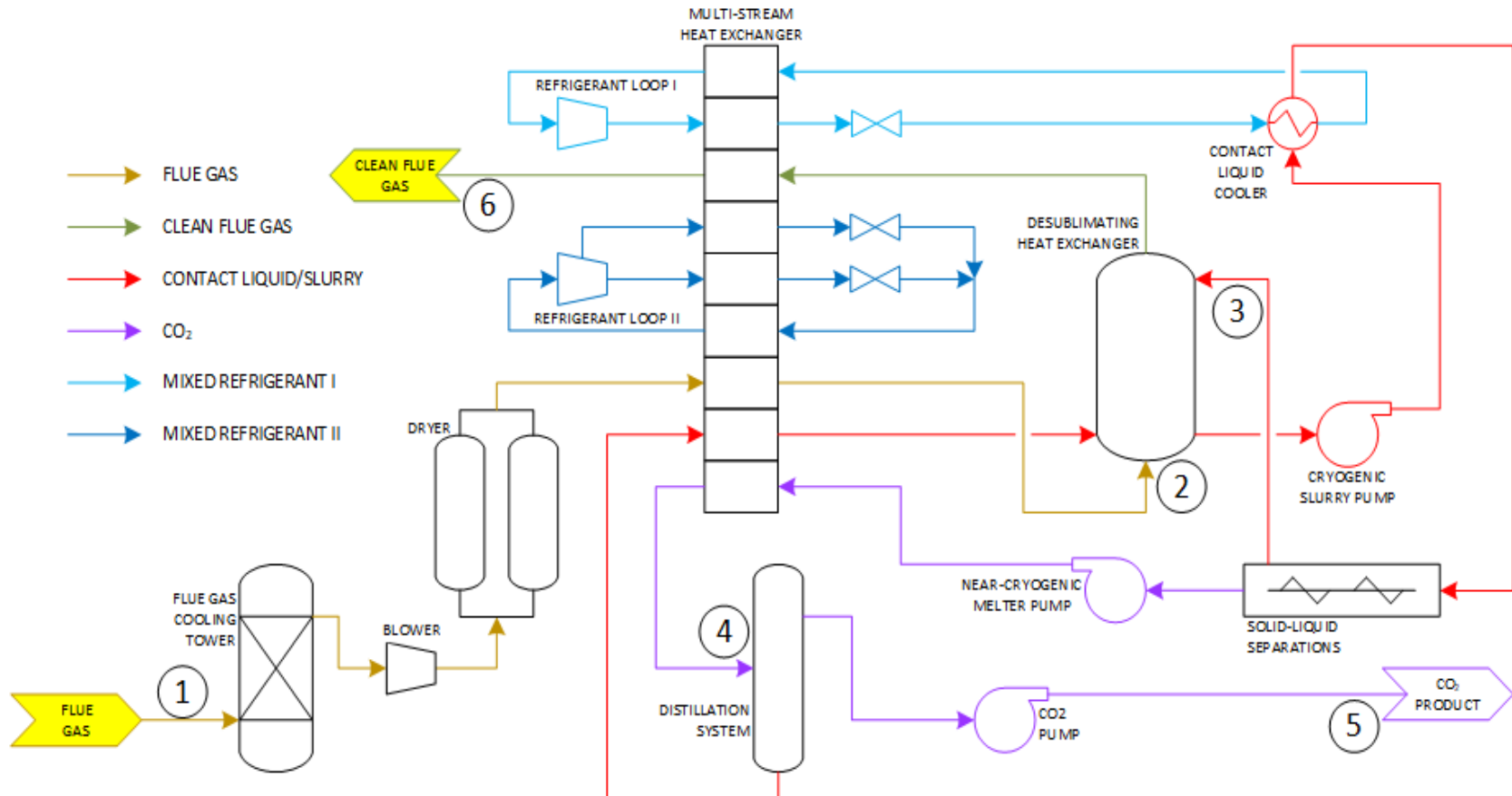
Produces high-purity, liquid CO₂

Very high capture rates, up to negative emissions (99%+)

Handles impurities (SO_x, NO_x, PM) better than amine

Integrated grid-scale energy storage

Simplified PFD



Study in the Journal of Applied Energy co-authored by researchers at MIT Energy Initiative and ExxonMobil (2021)

“In the analysis, it was determined that the cost to produce cement and capture CO₂ using our CCC technology is 24% higher than producing cement with no CO₂ capture (not accounting for any value for the CO₂ being captured). This is compared to other capture technologies that range from a 38% increase to a 134% increase in the cost of producing cement and capturing CO₂”

<https://news.mit.edu/2021/reducing-emissions-decarbonizing-industry-0721>



ExxonMobil



Small-Commercial (100-300 TPD CO₂)

Supply existing and emerging CO₂ consumers



SOLUTION

Capture CO₂ from post-combustion sources and produce it as high-purity liquid ready for sale in existing supply chain

SIZES: 100-300 TPD CO₂

CO₂ Purity: 99.97 – 99.999%

Industrial (500-1500 TPD CO₂)

Capture from small boilers and kilns for sequestration or use (EOR)



SOLUTION

Capture from industrial boilers and kilns and produce CO₂ ready for pipeline transportation and se

SIZE: 500-1500 TPD CO₂

CO₂ Purity: 99.97%

Large-Industrial and Utility (2,000-10,000 TPD CO₂)

Capture from large cement, steel, and power plants for sequestration



SOLUTION

Capture from large-scale cement, steel, and power and produce CO₂ ready for pipeline transportation and sequestration

SIZE: 2,000 – 10,000 TPD CO₂

Purity: 99.97%

Equipment Scaling – Nothing New!



Capture at Cement Plant

Small Pilot Operated by SES



Use in Concrete

CarbonCure Utilization Partner



30
TPD
CCC
Pilot

Design based off field-tested 1 TPD unit

Location at Sugar Creek Cement Plant near
Kansas City, Missouri

Skid-based design that can be built mostly
off-site with limited integration

Project Start: Feb. 1, 2022

Three Phases: Engineering, construction, operation

Partnership with Department of Energy
(NETL), FL Smidth, Eagle Materials



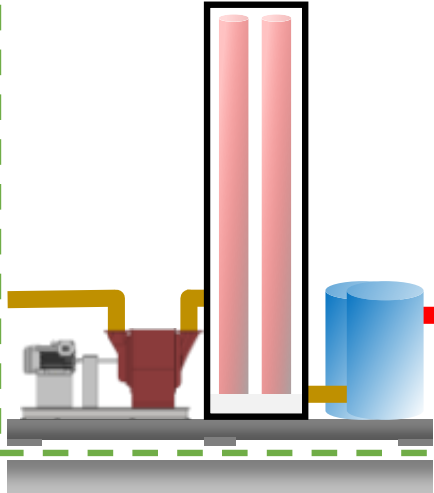
CCC Pilot/Small Commercial-Scale Preliminary Layout



Module Layout

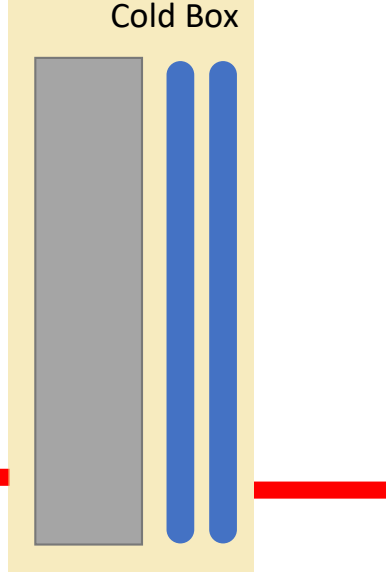


Module M-1
Front-End
Treatment



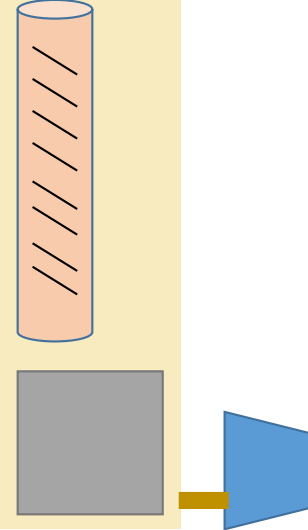
Est. Gross Weight 90,000 lbs

Module M-2
Cold Box



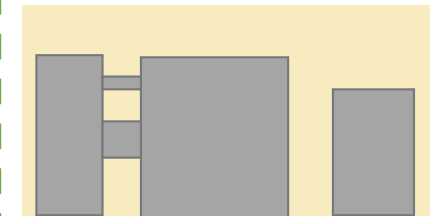
Est. Gross Weight 70,000 lbs

Module M-3
Solid-Liquid Separations



Est. Gross Weight 70,000 lbs

Module M-4
Compressors



Est. Gross Weight 110,000 lbs*

*Compressor weight may be lower depending on final selection

Inflation Reduction Act



Credit	Previous Credit Amount	New Credit Amount*	Project type	Previous Capture Requirement	New Capture Requirement
Geologic Storage of CO ₂	\$50	\$85	Utilization/Conversion Projects	25,000 – 500,000	Tied to Capture Requirement
Utilization/Conversion of CO and CO ₂ to Useful Products	\$35	\$60	Industrial Facilities	100,000+	12,500
Enhanced Oil Recovery	\$35	\$60	Electricity Generation	500,000+	18,750

Other notable items:

- Direct pay: 0-12 years, start date extended to 2033 from 2025
- Ability to transfer, carbon capture owner may transfer credits to another taxable entity
- Clean hydrogen tax credit implications
- *Must meet certain prevailing wage and apprenticeship requirements in order to qualify for the “bonus” credit amount

Cement Plant Example CO₂ Capture 730K Tons/year Geologic Sequestration

- *Before IRA*
 - \$36.5M/yr. Max Value
 - \$438M for life of the project
 - Tax Credit
 - Implement before 2025
- *After IRA*
 - Value of \$62.1M/yr. Max Value
 - \$745M for life of the project
 - Direct pay available for 0-12 yrs.
 - Ability to transfer credits
 - Meet prevailing wage requirements



Collaboration Opportunities



Small-commercial (100-500 TPD liquid CO₂ production) projects

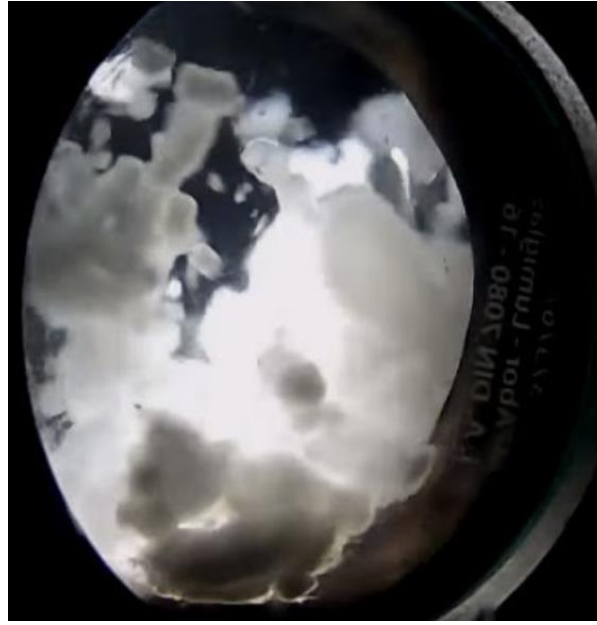
Medium and large-scale industrial and power Projects (1,000+ TPD liquid CO₂ Production)

Engineering and technology partners

Downstream CO₂ transportation, use, and sequestration partners

Contact us for:

- ✓ Full project quotes
- ✓ Feasibility and FEED studies
- ✓ Small-scale demonstrations
- ✓ Webinar, newsletter, and other informational communications



THANK YOU

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