ION
CLEAN ENERGY

BLUE ELECTRONS FOR CLEAN, FIRM DATA CENTER POWER

JULY 9, 2025

EPRI / DOE DATA CENTER WORKSHOP –
CARBON CAPTURE SESSION [PLANNING]

EXECUTIVE SUMMARY

- The growth in demand for data processing and storage is leading to vast data center expansions and increased need for reliable, affordable, base load, clean electricity
- Natural gas power generation with carbon capture and sequestration ("Blue Power" or "Blue Electrons") can address the immediate need for a large amount of continuous, reliable power while minimizing environmental impact and cost; last week's whitepaper by Carbon Direct reports:

> *"NG+CCUS represents a viable path forward in key markets, offering dispatchable, reliable power that aligns with the high-density, high-reliability requirements of data centers. Furthermore, it supports the geographic clustering needs of data centers, while simultaneously lowering emissions. In most regions, it appears to be the only source of power that can meet data centers' requirements."*
>
> *"NG+CCUS can satisfy all the requirements for the rapid growth of data center electricity demand and do so with reliability-adjusted emissions that are equivalent to those of renewables."*

- ION Clean Energy ("ION") has a proven post-combustion carbon capture technology ideal for natural gas combustion applications leveraging its chemical stability in highly oxidative environments, ultra-low emissions (CO_2 and VOCs) and competitive energy consumption.

ION: LEADING CCS PROVIDER FOR BLUE POWER

ION's post-combustion carbon capture technology enables the production of Blue Electrons at an affordable cost by integrating proven and innovative carbon capture technology with established NG-fired power generation

COMPANY INTRODUCTION

- ION is a leading technology provider of novel liquid amine carbon capture that is ideally suited for natural gas combustion applications
- Founded in 2008
- Over 20,000 hours of commercial testing; 24 issued patents in the US, Canada, Europe and countries in the APAC region

KEY INVESTORS

Chevron

Carbon Direct Capital

Williams

Denbury

ION Headquarter in Boulder, CO

KEY CUSTOMERS & PARTNERS

Sargent & Lundy

KOCH ENGINEERED SOLUTIONS

TECO AN EMERA COMPANY

CALPINE

THE ION CCS SOLUTION: A BETTER MOUSETRAP

PROVEN APPLICATION

- Proven ability to handle low CO_2 concentration in highly oxidative environments such as NGCC
- High Oxygen and NOx concentrations can be well-managed

DEEP DECARBONIZATION

- Readily captures 95% as well as over 99% of CO_2, resulting in potential for negative emissions

EXTREMELY LOW EMISSIONS

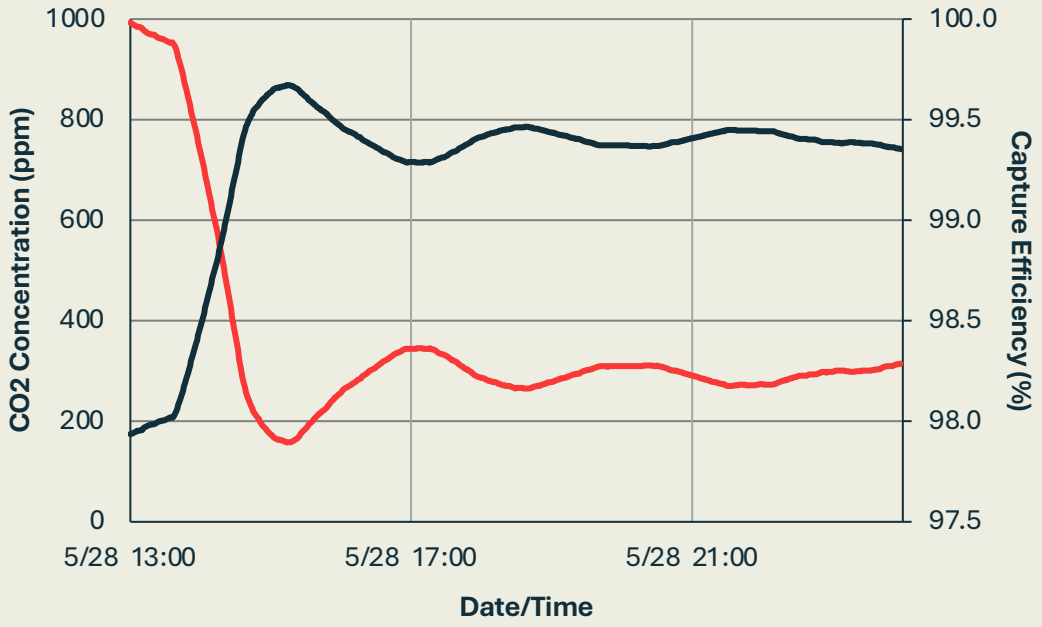
- The total VOC emissions with NGCC type flue gas with ICE-31™ is consistently much below 1 ppm
- Emissions fall below detectable levels of current CEMS, and ION uses cutting-edge CEMS allowing online measurement below ppb detection limit

LOWER COSTS

- ION solvent creates a fast and higher capacity reaction with CO_2, therefore lower OPEX and CAPEX as less solvent and smaller equipment is required
- ION solvent requires less energy for operations at high capture rates; No energy use runaway, even at capture efficiency rates of >95%, saving operating costs from energy consumption
- ION solvent is extremely stable. The stability extends the life of the solvent without losing capture efficiency, therefore reducing solvent replacement, reclamation and disposal OPEX

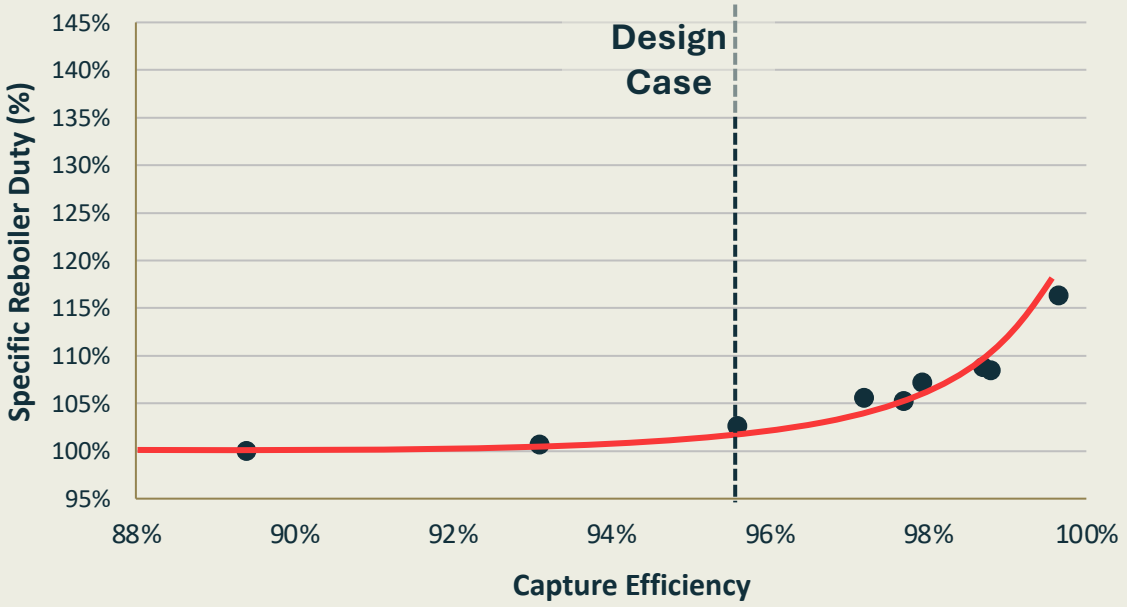
DEEP DECARBONIZATION & LOW ENERGY USE

High Capture Rates Lead to Direct Air Capture[1]



- Approximately 4.8 vol-% CO_2 in inlet flue gas
- Sustained net-negative CO_2 emissions
  - 430 ppm CO_2 in air
  - Approximately 300 ppm CO_2 in outlet flue gas

High Capture Rates with Minimal Energy Penalty[2]



- Typically, you'd see a significant (>50%) increase in energy requirements at capture efficiency rates from 95% to >98%.
- Adding additional packing compared to the design case, drops the additional energy consumption to under 3%

1. Results from Technology Centre Mongstad
2. Results from National Carbon Capture Center

THE PROOF IS IN THE PILOTS

National Carbon Capture Center
Wilsonville, AL

10 TPD CO_2
NCCC Testing

Technology Centre Mongstad
Mongstad, Norway

200 TPD CO_2
Project Slingshot

Koch Headquarters
Wichita, KS

2.8 TPD CO_2
Bedrock Pilot

Los Medanos Energy Center
Pittsburg, CA

10 TPD CO_2
Enterprise Pilot

PEER-REVIEWED RESULTS ON A VARIETY OF FLUE GASES

Safely operated over 20,000 total hours of testing to date with NGCC gas, CHP gas, refinery gases, and coal flue gas[1]

PILOT DATA VALIDATES ION MODELS

Extensive, high-quality pilot data and process modeling allow ION to design plant to handle all (NGCC) flue gas scenarios

[1] *Please refer to link https://www.ioncleanenergy.com/news for the latest progress update and research papers*

ION HAS A PROVEN TRACK RECORD DESIGNING CO_2 CAPTURE FOR NGCC POWER PLANTS

ION has worked collaboratively with each of its customers to optimize design and project-specific needs, considering e.g.: reliability, water consumption, maintenance friendly, and down-turn ratios.

SUTTER ENERGY CENTER

550 MW, 1.75 MTPA CO_2,

Rendering from Sutter Energy Center

- Project selected by DOE's Office of Clean Energy Demonstration ("OCED")
- Customized design of 2x 50% absorber trains plus 1x 100% regeneration to achieve 99% of CO_2 capture
- Hybrid air and evaporative cooling system to adapt to site condition

POLK POWER STATION

1,190 MW, 3.7 MTPA CO_2

Rendering from Polk Power Station

- FEED received DOE CarbonSafe award for demonstrating a large power station with CCS to operate and support a decarbonized electric grid
- Employed mechanical draft cooling towers and steam extraction from before the LP steam turbine to best utilize resources on site

DELTA ENERGY CENTER

835 MW, 2.4 MTPA CO_2

Rendering from Delta Energy Center

- Received $5.8M from DOE/NETL to perform FEED
- Designed a 2x 50% absorber trains system with 95% of CO_2 capture to allow for flexibility
- Worked with steam turbine vendor to optimize extraction at various locations
- Utilized consumptive water available from DDSD and DCC blowdown.

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