National Carbon Capture Center
Support of DAC Testing

Prepared for
NETL/FECM Research Proj Review Mtg
DAC Panel

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Southern Company

National Carbon Capture Center

- **Sponsors:** U.S. Department of Energy and its National Energy Technology Laboratory
  - DOE's primary carbon capture research facility since 2009
- **Partners:** Electric Power Research Institute, power/energy industry leaders
- **Managed/operated by:** Southern Company
- **Location:** Wilsonville, Alabama
- **Infrastructure:** Real-world power plant operating conditions – coal and natural gas
- **Expertise:** Technical staff for design, installation, testing support and analysis
- **International collaboration:** Co-founder of International Test Center Network

Test Centers – Evolving Goals

- Cost-effective host site for moving carbon capture development from lab to industrial setting
- Knowledge sharing of public information
- Contribute to partnerships for commercial technology development
- Support Deployment
  - Provide scale-up information
  - Cost-effective testing of novel ideas to improve commercial process
- Support Net Negative Carbon Goals
  - Support transition - fossil fuel use to low or zero carbon options (flexible operation, high capture rate)
  - CO2 utilization and Direct Air Capture at the NCCC

NCCC

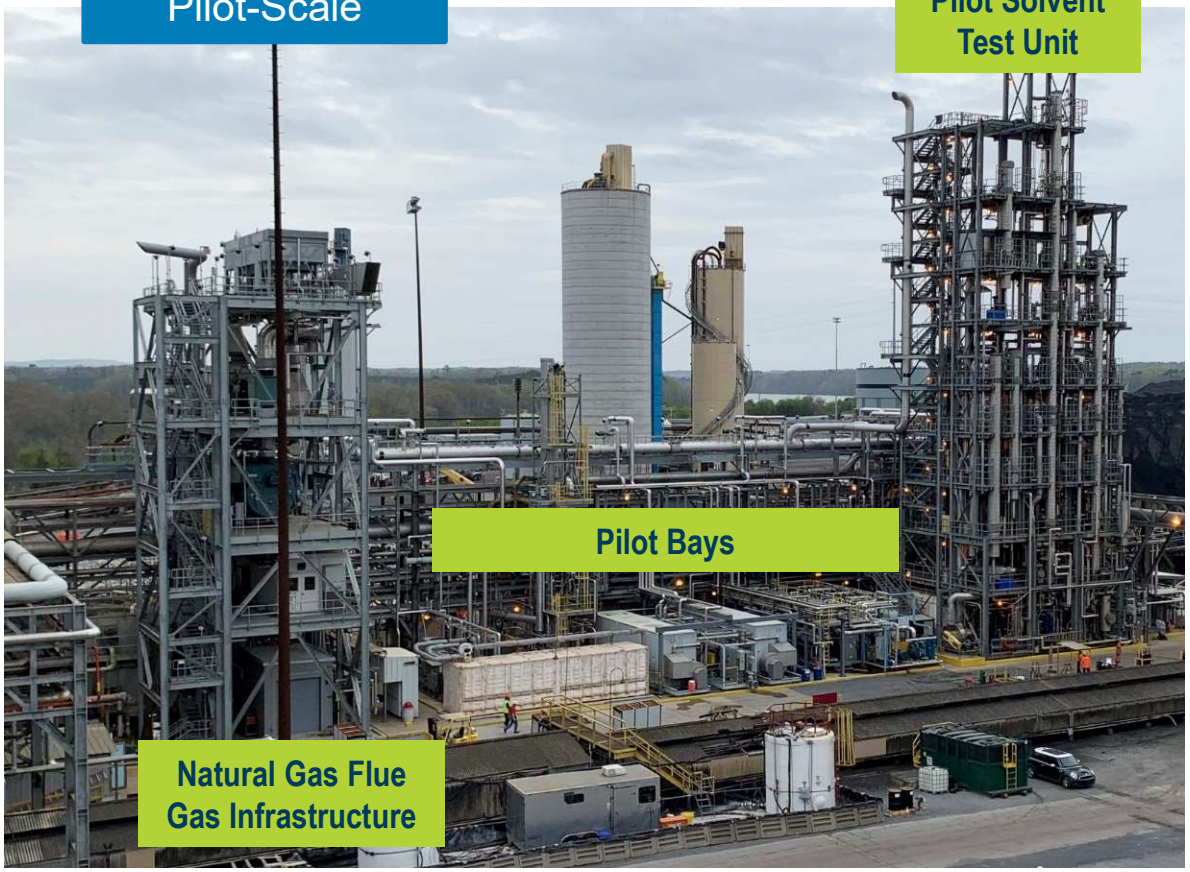
Pilot-Scale

Bench-Scale

Lab-Scale

Test Bays and Equipment

Pilot-Scale



Slipstream Solvent Test Unit

Bench-Scale Area

Lab-Scale Test Unit

Major Accomplishments and Scope

- 135,000+ hours of testing since 2009
- 70+ technologies / developers from 7 countries
- Continuous expansion – alternative regeneration, gas injection, analytical support
- Flexibility for testing at multiple scales & on-site scale-ups
- Accelerated technology development
  - 16+ technologies in queue to test
  - Multiple technologies progressed to FEED studies
  - 8 technologies scaled up (or ready) to 10+ MW
  - CO_2 concrete technology announced commercialization

Provided Test Data to Support Projected Cost Reduction of CO_2 Capture Technologies

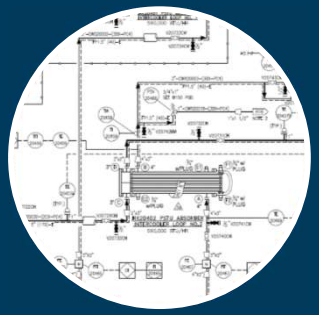
Oct. 1, 2020 – 5-Year Agreement Renewal / $140 Million

Expanding scope to CO_2 capture for natural gas power, CO_2 utilization, direct air capture

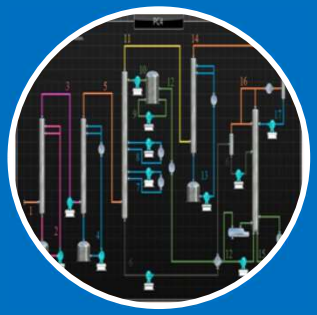
Project Development and Implementation

Safety First

Contract
- Screening
- NDA/TCA
- Onboarding



Project Scope
- Process
- Modification
- Integration



Design
- Mechanical
- Instrument
- Control
- Electrical
- Civil

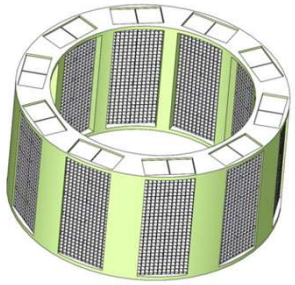
Construction
- Foundation
- Flue Gas
- Utilities
- Installation
- Interconnection

O&M
- Operate
- Test Support
- Analysis
- Troubleshoot
- Repair

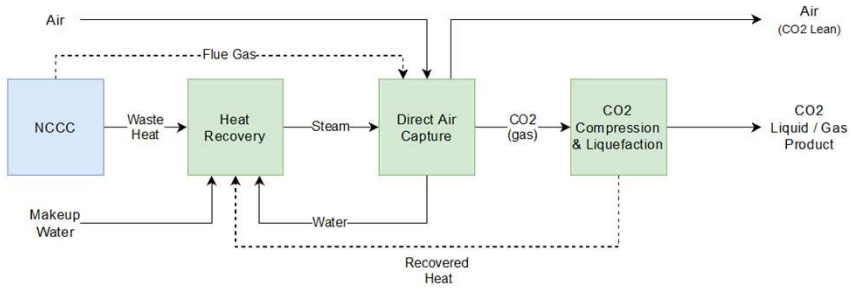
SSEB/AirCapture DAC

- Project (FE0031961)
  - First DAC technology test at NCCC
  - GT's solid-amine sorbent monolithic contactors
  - Advantages
    - Low pressure drop
    - Low thermal mass
    - High geometric surface area
    - Abs/Des: 10:1 (900/90 sec)
- Status
  - Skids delivered in Feb 2023 and commissioned in Apr
  - AirCapture is executing their test plan

100 tonne/yr SSEB/AirCapture Skids Installed at NCCC



2x5 Contactor Arrangement
(100 tonne/yr)



NCCC International Collaboration

Co-founder of International Test Center Network

Share knowledge (safety, CCUS technology emissions, test execution, technology screening, funding, analytical techniques, data analysis, construction, operation) among member facilities

- Support DOE's goal of international cooperation
- Multiple levels of involvement
  - Partners, developers, network members, consulting services, workshops
- Broad effort in Japan, China, India, Middle East, Korea, EU, Australia, Canada, Norway
- Extensive sharing of public information

Developing technologies for an international market will make them more robust and more valuable

Conclusions

- **Collaboration is essential, both domestic and international**
  - **NCCC has extensive experience taking projects from fundamental development into an industrial setting**
  - **NCCC in involved in scale-up of technologies**
- **CCUS R&D goals are evolving**
- **Small test facilities are needed, even after deployment**

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