

Advancing Carbon Management Technologies at the National Carbon Capture Center

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U.S. DEPARTMENT OF
ENERGY



DOE Carbon Capture Research Facility Since 2009

Sponsored by: U.S. government and energy industry leaders

Managed by: Southern Company

Located: Wilsonville, Alabama

Infrastructure: Real-world industrial operating conditions

Expertise: Technical staff for design, installation, testing support and analysis

International collaboration: Co-founded International Test Center Network

An evolving scope – CO₂ capture for fossil-based power generation and industrial sources, CO₂ conversion, direct air capture



CLEARPATH



ExxonMobil



Major Accomplishments

Completed

150K+
Hours of Testing

Pilot-tested

80+
Technologies

Developers from

7+
Countries

- ▶ Continuous expansion – alternative regeneration, gas injection, emissions measurement & advanced analytical support
- ▶ Flexibility for testing at multiple scales & on-site scale-ups
- ▶ Accelerated technology development
 - 18+ technologies in queue to test
 - Multiple technologies progressed to FEED studies
 - 12+ technologies propelled to 10+ MW & engineering-scale
 - CO₂ concrete technology commercialized; returning to expand product development
 - CO₂ conversion/DAC technologies actively testing
 - Groundbreaking cryogenic CO₂ capture

Reduced cost of CO₂ capture from fossil generation by +40%

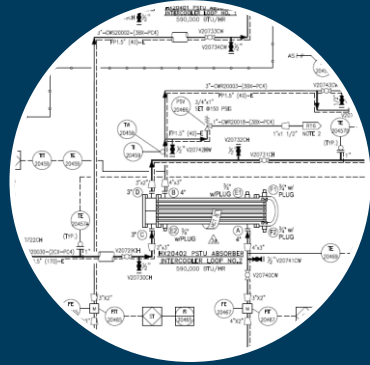


Project Development and Implementation

Safety First

Contract

- ▶ Screening
- ▶ NDA/TCA
- ▶ Onboarding



Project Scope

- ▶ Process
- ▶ Modification
- ▶ Integration



Design

- ▶ Mechanical
- ▶ Instrument
- ▶ Control
- ▶ Electrical
- ▶ Civil



Construction

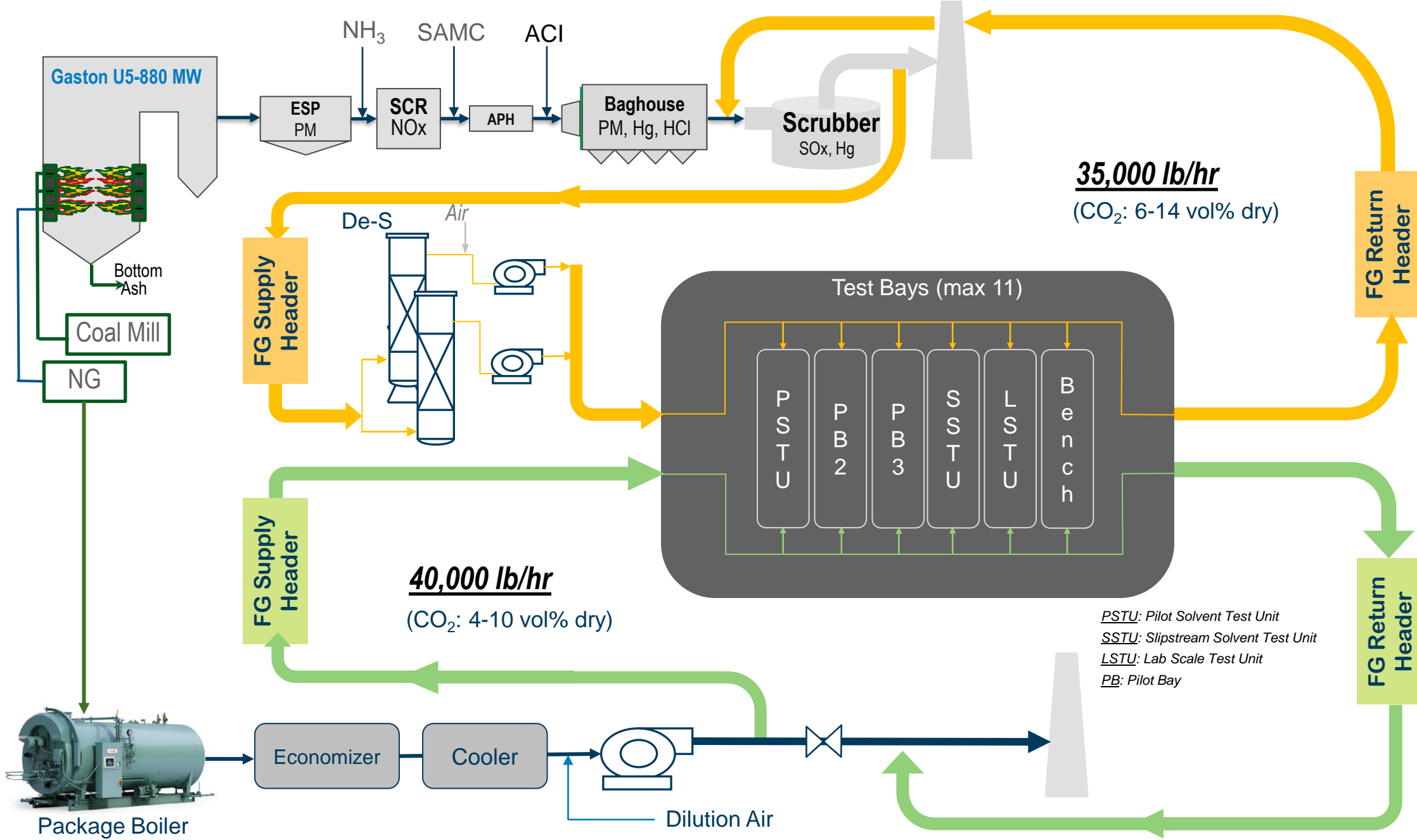
- ▶ Foundation
- ▶ Flue Gas
- ▶ Utilities
- ▶ Installation
- ▶ Interconnection



O&M

- ▶ Operate
- ▶ Test Support
- ▶ Analysis
- ▶ Troubleshooting
- ▶ Repair



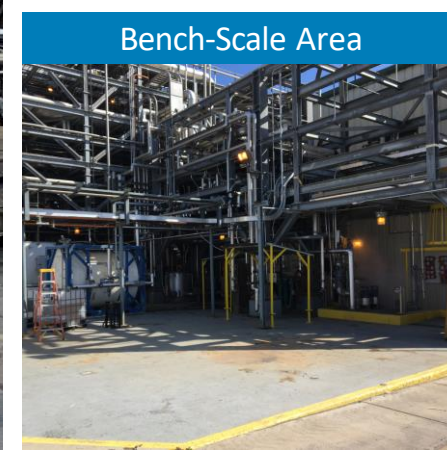


Coal FG Config

NG FG Config

PSTU: Pilot Solvent Test Unit
SSTU: Slipstream Solvent Test Unit
LSTU: Lab Scale Test Unit
PB: Pilot Bay

Test Bays and Equipment



DOE Technology Development Through NCCC

OCED Carbon Capture Demonstrations Program



Baytown CCS
(TX)



Sutter Decarbonization Project
(CA)



Project Tundra
(ND)

OCED FEED Studies



Duke Energy EFFICIENT
(IN)



SSEB – Foreman Cement
(AR)



Dry Fork
(WY)



Tampa Electric –
Polk Power Station (FL)



Springfield CWLP
(IL)



Energy Lake Charles (LA);
NTEC (Navajo)

NETL Carbon Management Program



ROTA-CAP US Steel
(PA) / GO2 NCCC



Argos USA (SC);
Dry Fork (WY)



Holcim (SC);
Dry Fork (WY)



CEMEX FEED
(TX)



Pastoria Energy Facility FEED
(CA)



NCCC



Air Liquide SMR FEED
(CA)



Voestalpine FEED
(TX)



Vitro Flat Glass
(PA)



LG&E-KU FEED
(KY)



Covanta
(IL)

International Collaboration



Co-founder of International Test Center Network

Share knowledge (construction, operation, safety, funding, analytical techniques) among test facilities

- ▶ Support DOE's goal of international cooperation
- ▶ Broad effort in China, India, Middle East, Korea, Japan, EU, Australia, Canada, Norway
- ▶ Multiple levels of involvement
 - Partners, developers, network members, consulting services, workshops
- ▶ Ease of collaboration as IP is not shared
- ▶ Commercial opportunities for some technologies will potentially develop internationally first



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