Phase III: Large Pilot Testing of the MTR Membrane Post-Combustion CO₂ Capture Process
(DE-FE0031587; FOA 1788)

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Membrane Technology and Research, Inc.

NETL Project Manager: Sai Gollakota

NETL FY21 Project Review Meeting
August 12, 2021
**Project Overview**

- **DOE-NETL Project Manager:** Sai Gallokota
- **Project Team:** MTR (prime), Sargent & Lundy, WITC, Basin Electric (Host), Trimeric
- **Overall Goal:** Design, build, and operate a 10 MW$_e$ large pilot membrane capture system

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<td>$1.2 million</td>
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The Project Team

DOE NETL
Program Management
Sai Gollakota

MTR
Prime Recipient
Project CO-Principal Investigators
Brice Freeman and Richard W Baker

Wyoming Integrated Test Center
Host
Will Morris

Sargent & Lundy
EPCM
Kevin Lauzze
Dana B Pierik

Trimeric Corporation
Engineering Support
Ray McKaskle

Graycor Industrial Constructors Inc
Site Works
Shawn Anderton
Phase III Roles and Responsibilities

- Phase III project: $64.7 million / October 1, 2021 - August 30, 2026
  - **WITC**: Host site
  - **MTR (prime)**: Fabrication of the membrane unit and operation of the system
  - **Sargent & Lundy**: Management of system detail design, supervision of site works and system installation
  - **Trimeric**: Engineering support
  - **Graycor Industrial**: Site works and installation of the system
The MTR CO$_2$ Capture Design

150 ton/day ~10 MW$_e$
75% CO$_2$ capture
Basin Electric’s Dry Fork Station

- The Wyoming Integrated Test Center at Basin Electric’s Dry Fork Station
- Modern power plant, full controls
- High CO\textsubscript{2} concentration flue gas
- Test center can supply 20 MW\textsubscript{e} of gas
- Power, utilities and flue gas connections in place
- Immediately adjacent to WY CarbonSAFE injection site
- Six miles from an existing CO\textsubscript{2}/EOR pipeline
Outcomes of the Phase III Program

• Demonstration of the total process at a relevant scale (DCC, membrane separation unit, CPU, delivers liquid CO$_2$)

• Technology moves from TRL-6 to TRL-7

• Validation of membrane unit skids, the building blocks of future systems

• Scale-up and cost reduction
  – Module skid cost reduced by 50% in this program
MTR Testing at the National Carbon Capture Center (1 MW<sub>e</sub>)

Spiral modules had large feed-to-residue pressure-drops and a large footprint.

Plate-and-frame modules cut footprint pressure-drops and cost in half.
The Large Pilot will Evaluate Stainless-Steel and Lower-Cost Plastic Housings in a Container-Sized Skid
The TNO Test Unit During Installation
The Phase I Process Flow Diagram
The Phase II Partial Process Flow Diagram (The DCC)
Layout of the Large Pilot System

- Feed blower and DCC (A)
- Controls, operator station (E)
- Cooling water tower (D)
- Flue gas feed
- Electrical substation

- Membrane skids (B)
- CPU, liquid CO₂ discharge (C)
- Permeate compression
Large Pilot at DFS
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