

# A Combined Water and CO<sub>2</sub> Direct Air Capture System

Project Number: DE-FE0031970

Will Kain  
IWVC, LLC



---

U.S. Department of Energy  
National Energy Technology Laboratory  
**Direct Air Capture Kickoff Meeting**  
February 24-25, 2021

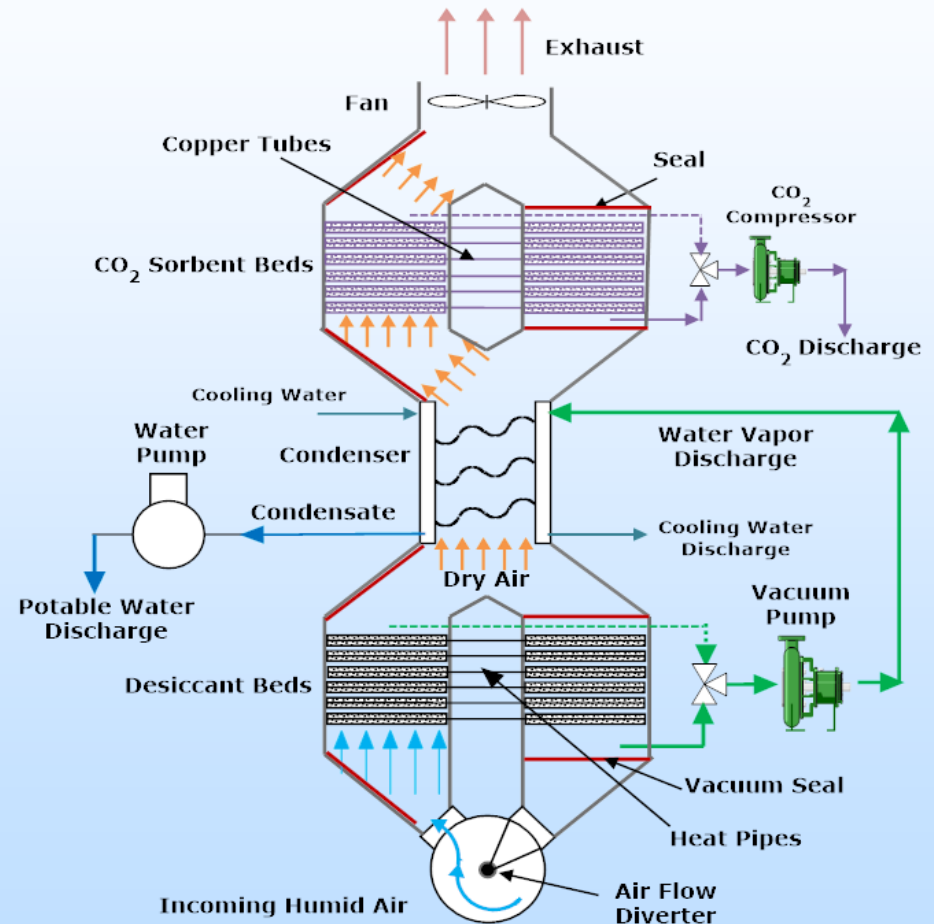
# Program Overview

---

- a. Funding – \$3.17 million
  - a. DOE: \$2.5 million
  - b. Cost Share: \$672,000
- b. Overall Project Performance Dates – 10/1/2020 – 9/30/2023
- c. Project Participants
  - a. Awardee: IWVC, LLC
  - b. Subawardees: PNNL, Barr Engineering
  - c. Partners: SoCalGas, Siemens, U. North TX, RadMax Technologies
- d. Overall Project Objectives – build 30t/y CO<sub>2</sub> capture demonstration system with simultaneous fresh water production, proving superior technical, economic, and environmental performance

# Technology Background

- AWE process integrated with solid sorbent for CO<sub>2</sub> capture
  - Potable water and CO<sub>2</sub> production provide additional revenue and magnifies environmental benefits of DAC
  - Isothermal desiccant regeneration minimizes energy consumption for AWE
- Commercially proven CO<sub>2</sub> sorbent
  - Scaled-up application for DAC
  - Combined thermal and pressure swing regeneration
  - Internal heat recuperation
- Novel contactor design for both sorbents
  - Maximizes heat and mass transfer performance with minimum size, weight, and cost
  - Proven commercial pathway to scale-up



# Technical Approach/Project Scope

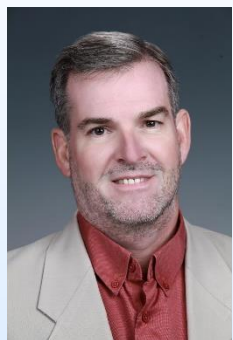
---

- a. Project work plan
  - a. BP 1 – Design demo system (PNNL, Barr, IWVC, Siemens)
  - b. BP 2 – Build demo system (Barr); Contactor assembly and condenser unit (PNNL); Supplemental CO<sub>2</sub> sorbent (UNT); Vacuum pump (RadMax); System TEA (IWVC)
  - c. BP 3 – Operate demo system (IWVC, Barr, SoCalGas); System TEA (IWVC, Siemens)
- b. Key project milestones
  - a. 9/30/2021 – demo system (30t/y CO<sub>2</sub>) design complete
  - b. 12/31/2022 – demo system fabrication and shakedown complete
  - c. 9/30/2023 – 9 months of demo system operations complete; complete TEA for commercial scale system
- c. Project success criteria
  - ✓ Demonstrate attainment of 30t/y CO<sub>2</sub>, 1000L/d H<sub>2</sub>O design capacity
  - ✓ Validate modeled values for energy consumption and cost of CO<sub>2</sub>

# Team and Facilities



Will Kain – IWVC



Pete McGrail, Todd Schaefer – PNNL



Ron Kent – SoCalGas



Dan Palo – Barr



Shenqian Ma – UNT



SoCalGas/SDSU-Brawley Site

# Opportunities for Collaboration

---

- a. Synergies from collaboration
  - Collaborate with DAC project teams on CO<sub>2</sub> compression technologies/systems
  - Heat management and recovery strategies to improve efficiency
- b. Areas of complementary work
  - CO<sub>2</sub> market opportunity analysis – identifying relevant areas for CO<sub>2</sub> utilization other than geologic sequestration
  - Complementary design, engineering, and fabrication for dehumidification application (private investment)
  - Engagement with organizations designing solid-sorbent systems for industrial CO<sub>2</sub> capture