The Carbon Utilization and Storage Partnership of the Western US

Robert Balch
New Mexico Institute of Mining and Technology

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NETL
Regional Initiatives to Accelerate CCUS Deployment (2019-?)

CUSP
New Mexico Tech

PCOR
EERC

SECARB
Southern Companies

MRSCP
Battelle
Who is the CUSP?

- Parts of three of the original RCSPs: SWP, WESTCARB, and Big Sky

- States represented - through a survey, a university, or a research institute: AZ, CA, CO, ID, KS, NM, NV, MT, OK, OR, TX, UT, WA

- National Laboratories - Los Alamos, Pacific Northwest, and Sandia

- Additional collaboration with Indiana University for technical support (SIMCCS)

- Industry engagement: Schlumberger, Bright Energy, EDP, and Enchant NM. Other states will be bringing in more interested parties
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CUSP – Original Scope of Work (2019)

• Focus on collecting, synthesizing, and using existing data sets.
• Data to be incorporated into analytical and optimization models to evaluate CCUS potential and readiness. Goals include:
  • Identifying best prospects for commercial CCUS
  • Quantifying potential economic impacts
  • Developing Readiness Indices (w/ SimCCS) to identify best areas for short-term, mid-term, and long-term CCUS projects
• State organizations assessing, updating, augmenting, and verifying data used in data analysis and modeling
  • Geological storage complexes (saline, stacked storage, ROZs)
  • CO₂ emission sources
  • Existing infrastructure
• Strong emphasis on technology transfer and outreach
CUSP – Expanded Scope of Work (2020)

• While maintaining original scope and duration for atlas work (3 years) we added funds to each organization to cover tech transfer and education in the subsequent 2 years

• A portion of the new funds were set aside to support the Smart Initiative

• Funds set aside to jumpstart 45Q ready projects in the region
  • Farnsworth EOR project conversion to storage focus – Perdure Petroleum – Ion Conjunction with SWP team
  • Provide support for MRV planning at CarbonSAFE III San Juan Project – Enchant Energy – In conjunction with CarbonSafe San Juan team
  • Red Hills and Metropolis separation facilities, Permian basin – Lucid Energy
Progress and Current Status of Project

• Looking at Sources, Sinks, transportation pathways both existing and potential
• Have identified existing and several potential regional hubs
• Beginning process of refining Atlas style data and converting older static databases into self updating data sources
• Working towards integrating machine learning tools such as SimCCS to analyze results
• The project team has done an initial survey of the region for opportunities and issues related to those opportunities
• **Funding has been regular:**
  • ~$6million (including cost-share) in 2019, 2020, and now in 2021
  • With the second round of funding we selected three companies to assist with MRV planning
Outreach

- The CUSP project has developed a website for dissemination of CCS/CCUS materials to the general public and more detailed geologic storage and economic data/analysis information to industry and stakeholders.

- Educational videos are being developed to expand upon the information contained on the website; these will cover the many technical aspects and states within the CUSP region.
The CUSP project has called on a select group of energy sector representatives to advise the team on how best to engage and communicate with industry and other stakeholders, for the purpose of advancing CCS in the western USA.

The CUSP Industry Advisory Group has been formed and consists of members from:

- State regulatory agencies
- CO$_2$ emitters
- CO$_2$ capture and transport companies
- Oil/Gas operators
- Policy think tanks
2020 Case Study – Perdure Petroleum

• Perdure Petroleum operates the Farnsworth Unit, a CO₂ Enhanced Oil Recovery field in Ochiltree County, Texas

• The Farnsworth Unit has been injecting anthropogenic CO₂ from the Agrium fertilizer plant at Borger, Texas and the Arkalon ethanol plant at Liberal, Kansas

• Perdure plans to continue CO₂ EOR operations in the western half of the Farnsworth Unit, with likely expansion to EOR and storage in the eastern half of the unit

• The Perdure MRV plan for the Farnsworth Unit relies heavily on the work conducted by the Southwest Carbon Partnership, one of the NETL Regional Carbon Sequestration Partnerships
2020 Case Study – Enchant Energy

• Enchant Energy is part of the NETL CarbonSAFE initiative that will demonstrate that the storage complex in San Juan County, New Mexico can accelerate the deployment of CCS technology at the San Juan Generating Station (SJGS)

• Enchant Energy plans to retrofit the San Juan Generating Station, San Juan County, New Mexico with 6-7 MMT/yr CO₂ capture technology and locally store more than 2 MMT/yr CO₂

• Project is currently in the Characterization phase, with an upcoming stratigraphic test well; an EPA UIC Class VI permit application is being developed in parallel to the geologic characterization.
2020 Case Study – Lucid Energy

• Lucid operates acid gas treating and disposal facilities at its Red Hills gas processing plant complex and Dagger Draw processing plants in Lea and Eddy County, New Mexico, respectively.

• The Red Hills facility compresses and injects H₂S and CO₂ concentrations in the raw sour gas it receives into the facility.

• Roughly 50% of Lucid’s CO₂ emissions are from vented CO₂ resulting from Amine Treating.

• Capturing, sequestering and storage of vented CO₂ is the most economic option to capture 45Q tax credits and impact Lucid’s carbon footprint.

• Additional CO₂ capture likely with proven economics.
Selected 2021 Portfolio

- Internally selected by management team, the advisory board will assist if future funding is given
- Most projects have industry partners and target injection in 1-3 years
- Includes a unique study for injection into basalts
- Includes bench scale work on the use of CO2 as Geothermal working fluid
- Includes development of regional Storage Hubs
Selected 2021 Portfolio

- Industry engagement
  - Lucid Energy
  - Enchant Energy
  - Oxy Low Carbon Ventures
  - Sentinel Peak Resources
  - Perdure Petroleum
  - Suncor Energy
  - ONEOK
  - Utah Iron LLC
  - NGL Energy Partners
  - Paulsson Inc
  - And other interests...
2021 Portfolio - Timeline

- Industry engagement
- Lucid Energy
- Enchant Energy
- Oxy Low Carbon Ventures
- Sentinel Peak Resources
- Perdure Petroleum
- Suncor Energy
- ONEOK
- Utah Iron LLC
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- And other interests...

Task | Title | 2019 Q3 | 2019 Q4 | 2020 Q1 | 2020 Q2 | 2020 Q3 | 2020 Q4 | 2021 Q1 | 2021 Q2 | 2021 Q3 | 2021 Q4 | 2022 Q1 | 2022 Q2 | 2022 Q3 | 2022 Q4 | 2023 Q1 | 2023 Q2 | 2023 Q3 | 2023 Q4 | 2024 Q1 |
1 | Project Management and Planning | | | | | | | | | | | | | | | | | | | | | |
   1.1 | Update Project Management Plan | | | | | | | | | | | | | | | | | | | | | |
2 | Addressing Key Technical Challenges | | | | | | | | | | | | | | | | | | | | | |
   2.1 | Expanding characterization of depleted and unconventional storage | | | | | | | | | | | | | | | | | | | | | |
   2.2 | Develop collaborations for key technologies | | | | | | | | | | | | | | | | | | | | | |
   2.3 | Collaborate with industrial partners for monitoring/verification strategies | | | | | | | | | | | | | | | | | | | | | |
   2.4 | Development & validation of risk assessment/mitigation strategies for OORV sites | | | | | | | | | | | | | | | | | | | | | |
3 | Facilitating Data Collection, Sharing, and Analysis | | | | | | | | | | | | | | | | | | | | | |
   3.1 | Engaging with national laboratories | | | | | | | | | | | | | | | | | | | | | |
   3.2 | Apply NMAP tools to assess geologic data | | | | | | | | | | | | | | | | | | | | | |
   3.3 | Provide synthesized data to DOE’s machine learning initiative | | | | | | | | | | | | | | | | | | | | | |
4 | Evaluating Regional Infrastructure | | | | | | | | | | | | | | | | | | | | | |
   4.1 | Catalog, map, and evaluate extent and near-term CO2 distribution network | | | | | | | | | | | | | | | | | | | | | |
   4.2 | Identify and add rights-of-way for new pipelines (train lines and otherwise) | | | | | | | | | | | | | | | | | | | | | |
   4.3 | Regulatory/permit impact assessment | | | | | | | | | | | | | | | | | | | | | |
   4.4 | Economic assessment | | | | | | | | | | | | | | | | | | | | | |
   4.5 | Focused scenario analysis | | | | | | | | | | | | | | | | | | | | | |
   4.6 | Develop regional readiness indices | | | | | | | | | | | | | | | | | | | | | |
5 | Promoting Regional Technology Transfer | | | | | | | | | | | | | | | | | | | | | |
   5.1 | Development of regional readiness indices maps | | | | | | | | | | | | | | | | | | | | | |
   5.2 | Technology transfer forums | | | | | | | | | | | | | | | | | | | | | |
   5.3 | Targeted network development | | | | | | | | | | | | | | | | | | | | | |
   5.4 | Support OORV | | | | | | | | | | | | | | | | | | | | | |
   P1 | Derisking CO2 Minimization Storage in Basalt Reservoirs | | | | | | | | | | | | | | | | | | | | | |
   P2 | Laying the Cornerstones of a Regional Storage Hub in California | | | | | | | | | | | | | | | | | | | | | |
   P3 | Characterization of CO2 storage potential in Hanford site western central Hanford site | | | | | | | | | | | | | | | | | | | | | |
   P4 | Regional-Scale Assessment of CO2 Geological Storage in Sedimentary Basin | | | | | | | | | | | | | | | | | | | | | |
   P5 | Geothermal Reservoirs of Nevada | | | | | | | | | | | | | | | | | | | | | |
   P6 | CCS at the Iron Mountain Iron Mine and Direct Reduced Iron Processing Plant, Southern Utah | | | | | | | | | | | | | | | | | | | | | |
   P7 | Laboratory feasibility study for potential field deployment of a downhole source tomographic design for CO2 plume detection | | | | | | | | | | | | | | | | | | | | | |
   P8 | Planning amongst uncertainty designing CCS infrastructure resilient to capture, transport and storage uncertainty | | | | | | | | | | | | | | | | | | | | | |
   P9 | Feasibility study on potential CCS projects in Colorado CO2 capture from a refinery and sequestration in the oil basin | | | | | | | | | | | | | | | | | | | | | |
   P10 | Conversion of hydrogen from natural gas and integration with CO2 capture and storage | | | | | | | | | | | | | | | | | | | | | |
   P11 | Jumpstarting Regional CCS through co-optimized CO2 and water disposal | | | | | | | | | | | | | | | | | | | | | |
   P12 | CCS hub 2.0 concept for ONEOK infrastructure development for handling of new gaseous products for natural gas liquids, fractionation and gas processing plants in Kansas and Oklahoma | | | | | | | | | | | | | | | | | | | | | |
   P13 | From site to state: design of an integrated CCS operation in a complex geological structure in Osage County, OK, Ohio | | | | | | | | | | | | | | | | | | | | | |
Take Aways

- The CUSP is actively seeking opportunities to help companies access 45Q
- Has experience in generating CO2 storage models, MRV applications, and in engaging with stakeholders
- Has databases of useful information necessary to create robust geologic models, flow models, and economics
- Has access to Intelligent computer applications and National Lab products which can optimize connecting sources and syncs, and long range development and economic analyses of projects

**Funding has been regular…**
- ~$6million in 2019, 2020, and now in 2021
- Full allotment of DOE funds used for 2021 selected project
- If additional funds given in Future will select an additional 5-10 projects in the region