CUSP

The Carbon Utilization and Storage Partnership of the Western US

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U.S. Department of Energy National Energy Technology Laboratory **Carbon Storage Project Review Meeting** September 8-11, 2020

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, Lucid, and Enchant NM.
 Other states will be bringing in
 more interested parties



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Program Overview

- Funding (\$10,million DOE and ~\$2,000,000 Cusp cash and in-kind cost-share)
- Performance Dates: November 2019-October 2024
- The CUSP is following all programmatic goals of the Regional Initiative Program and has evolved its goals in response to the additional funding added in FY20

CUSP Original Scope

- Focus is on collecting, synthesizing, and using existing data sets.
- Data will 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 will assess, update, augment, and verify data used in data analysis and modeling
 - geological storage complexes (saline, stacked storage, ROZs)
 - CO_2 emission sources
 - existing infrastructure
- Strong emphasis on technology transfer

CUSP Expanded Scope

- Working on a modification to the budget to reflect an additional \$5 million DOE funds
- While maintaining original scope and duration (3 years) we will be adding additional funds to each organization to cover tech transfer and education in the subsequent 2 years
- A portion of the new funds are set aside to support the Smart Initiative
- Additional funds will be set aside to jumpstart 45Q ready projects in the Western US
 - Early low hanging fruit is Lucid acid-gas and zero emissions strategy
 - Mid term plan to support some additional studies and work on the NW basalts
 - Other projects as they occur. Already evaluating projects in Kansas,
 Oklahoma, and Montana

Regional Storage is Diverse



Oil and Gas basins

Saline Aquifers

* NatCarb Atlas V

Proven EOR Potential and Extensive Infrastructure



The SWP and Farnsworth Unit

Anthropogenic Supply: 500-600,000 Metric tons CO₂/year supply









arium.com

Progress and Current Status of Project

- a. The project team has done an initial survey of the region for opportunities and issues related to those opportunities
- b. Looking at Sources, Sinks, transportation pathways both existing and potential
- c. Have identified existing regional hubs
- d. Beginning process of refining Atlas style data
- e. Working towards integrating machine learning tools to analyze results.

In the Midst of Down-selecting Sites for 45Q Support

Arizona	Stacked storage in Paleozoic rocks of Colorado Plateau with possible EOR (northeastern AZ								
	Deep saline storage in several basins (south central AZ)								
	Numerous potential opportunities for EOR/stacked storage in Central Valley - possible using CO2								
California	captured from steam generation EOR								
	Seismicity and public perception remain challenging								
	No specific targets yet identified but numerous opportunities on both western and eastern parts of								
Colorado	state								
	Already a significant supplier of natural CO2 so McElmo Dome could potentially take in TCF of CO2 if								
	pipeline were reversed								
Kansas	EOR using CO2 from ethanol plants in southwestern KS								
	Several potential reservoirs (EOR and deep saline) in the area around midstream facilities in central								
	KS								
Montana	Significan point source at Colstrip power plant with good proximity to numerous oilfields								
	Oxy-fuel Combustion-CCUS near Cutbank (northern MT)								
Nevada	Low potential for EOR, some potential for deep saline storage primarily northwestern NV								
	Alternative CO2 storage potential in deep evaporite deposits in southern NV								
New	Stacked storage in Mesozoic rocks of San Juan Basin – Midstream operations already storing CO2 in								
Mexico	the Permian								
	Abundant opportunities for EOR and associated stacked saline aquifers in Permian Basin								
Oklahoma	Conventional CO2 EOR storage in Paleozoic age rocks in oil fields of western OK								
	Sequestration potential in unconventional shale gas systems in central OK (Woodford, Anadarko								
	Basin central OK)								

In the Midst of Down-selecting Sites for 45Q Support

Texas	Too many opportunities to count for conventional EOR in Permian Basin									
	ROZs in San Andres and other formations has excellent potential for CCUS									
Utah	CO2 EOR potential in Paradox and Uinta basins of eastern UT									
	Possible saline storage in Uinta basin									
Washingtor	Columbia River basalts in eastern part of state for geological storage									
	Eocene sandstones and coals in western WA (Bellingham basin, Kummer anticline, Chehalis basin)									
Wyoming	Focused on source ID and economic analysis region-wide									
Indiana	Working on SimCCS part of project									
PNNL	Identification of deep saline reservoirs unique to the Pacific Northwest (basalts)									
	Application the NRAP tools to reservoirs selected by various states									
	SNL will assist with New Mexico microeconomic and state-scale economic impact analysis as a proof									
SNL	of concept and template for other regions									
LANL	Assists with development and application of NRAP tools									
	Leads the SimCCS effort at improving tools, adding data, and technology transfer									

Case Study – Lucid Energy

- a. The team is finalizing a contractual relationship with Lucid Energy Group
- b. The project is to permit and get 45Q credits allowed for a new acid gas disposal well in SE New Mexico
- c. Working with Lucid to develop an MRV plan
- d. Economics analysis for what could be a disruptive technology in waste gas handling in the Permian basin and beyond.

Appendix

These slides will not be discussed during the presentation, but are mandatory.

Organization Chart



Gantt Chart

• Note: this Gantt chart covers years 1-3 which was the original planned performance period

Task Title		2019	2019		2	020		2021				2022			
		Q3	Q	4 Q	1 Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	CUSP of the Western United States		•												
2	Addressing Key Technical Challenges		$\overline{}$								~				
2.1	Expand characterization of stacked 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 CCUS sites			_				-							
3	Facilitating Data Collection, Sharing, and Analysis		$\overline{}$												
3.1	Engaging with national laboratories														
3.1.1	Identify data requirements & needs														
3.1.2	Update geologic data for CCUS Assessment														
3.1.3	Update USDW data from all public sources														
3.1.4	Gather and catalog CO2 emissions (point) source database							-							
3.2	Apply NRAP tools to assess geologic risks														
3.3	Provide synthesized data to DOE's machine learning initiative														
4	Evaluating Regional Infrastructure		•												
4.1	Catalog, map, and evaluate extant and near-term CO2 distribution network														
4.2	Identify and add rights-of-way for new pipelines (main lines and otherwise).														
4.3	Regulatory/policy impact assessment														
4.4	Economic assessment														
4.5	Focused scenario analysis														
4.6	Develop regional readiness indices														
5	Promoting Regional Technology Transfer		$\overline{}$												~
5.1	Development of regional readiness indices maps														
5.2	Technology transfer forums														
5.3	Targeted network development														

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