CUSP: Four Corners Regional Initiative

DE-FE0032363

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U.S. Department of Energy

National Energy Technology Laboratory
Annual Review Meeting

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Presentation Outline

- Project Overview
- Overview of Four Corners Carbon Management Hub
- Tasks
- Deliverables and Milestones
- Summary

Project Overview

- Funding Profile
- Project Performance Dates:

04/01/2024– 03/31/2026

	FY 2024		FY 2025		Total	
	DOE Funds	Cost Share	DOE Funds	Cost Share	DOE Funds	Cost Share
New Mexico Institute of Mining and Technology	572,307	105,729	570,547	111,171	1,142,854	216,901
University of New Mexico	100,863	28,373	129,137	29,127	230,000	57,500
University of Arizona	109,000	24,892	92,954	25,887	201,954	50,779
Arizona State University	98,456	24,603	101,544	25,399	200,000	50,002
Los Alamos National Laboratory	237,499	-	237,501	-	475,000	-
Sandia National Laboratories	125,000	-	125,000	-	250,000	-
Schlumberger	-	129,000	-	121,000	-	250,000
Total ($)	1,243,125	312,597	1,256,683	312,584	2,499,808	625,182
Total Cost Share %		20.09%		19.92%		20.01%

All Objectives, Locations, Participants, Approach, Scope, Community Benefits, etc. are merely proposed and are still being negotiated with DOE.

Project Overview: Objectives

- The overall objective of this project is to implement a regional initiative to accelerate deployment of Carbon Capture Utilization and Storage (CCUS) within the Four Corners region, United States.

- This project will provide technical and engagement support for stakeholders within the Four Corners region to develop a framework to accelerate the establishment of Carbon Management Hub.

- The Four Corners Regional Initiative will primarily focus on New Mexico, Arizona and Colorado.

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Project Overview: Objectives

- Specifically, the project aims to

1) Address key technical challenges to accelerate commercial deployment of CCUS within the Four Corners region;

2) Facilitate data collection, sharing and analysis to improve understanding of the impacts of CO2 injection to ensure safe, secure, efficient and affordable injection and containment;

3) Evaluate regional needs and challenges for the development of a safe and environmentally acceptable CO2 transport infrastructure;

4) Promote regional technology transfer, and

5) Engage in community and stakeholder outreach.

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Project Participants

- **New Mexico Tech**
- **Dr. William Ampomah**
- Dr. Robert Balch
- Dr. Sai Wang
- Mr. George El-kaseeh
- Mr. Luke Martin
- Dr. Alex Rinehart
- Dr. Adewale Amosu
- Dr. Tan Nguyen
- Dr. Dana Ulmer-Scholle
- Dr. Robert Czarnota
- Mr. Jean Lucien Fonquergne
- Graduate Students (3)

- **Arizona Geological Survey**
- **Mr. Brian Gootee**
- Ms. Tawnya Wilson
- Ms. Lisa Thompson

- **Arizona State University**
- **Dr. Matthew Green**
- Dr. Klaus Lackner
- Dr. Stephanie Arcusa
- Mr. Robert Page

- **University of New Mexico**
- **Dr. Janie Chermak**

- **LANL**
- **Dr. Bulbul Ahmmed**
- Dr. Bailian Chen
- Dr. Zhiwei Ma

Sandia National Laboratories
- Dr. Shruti Mishra

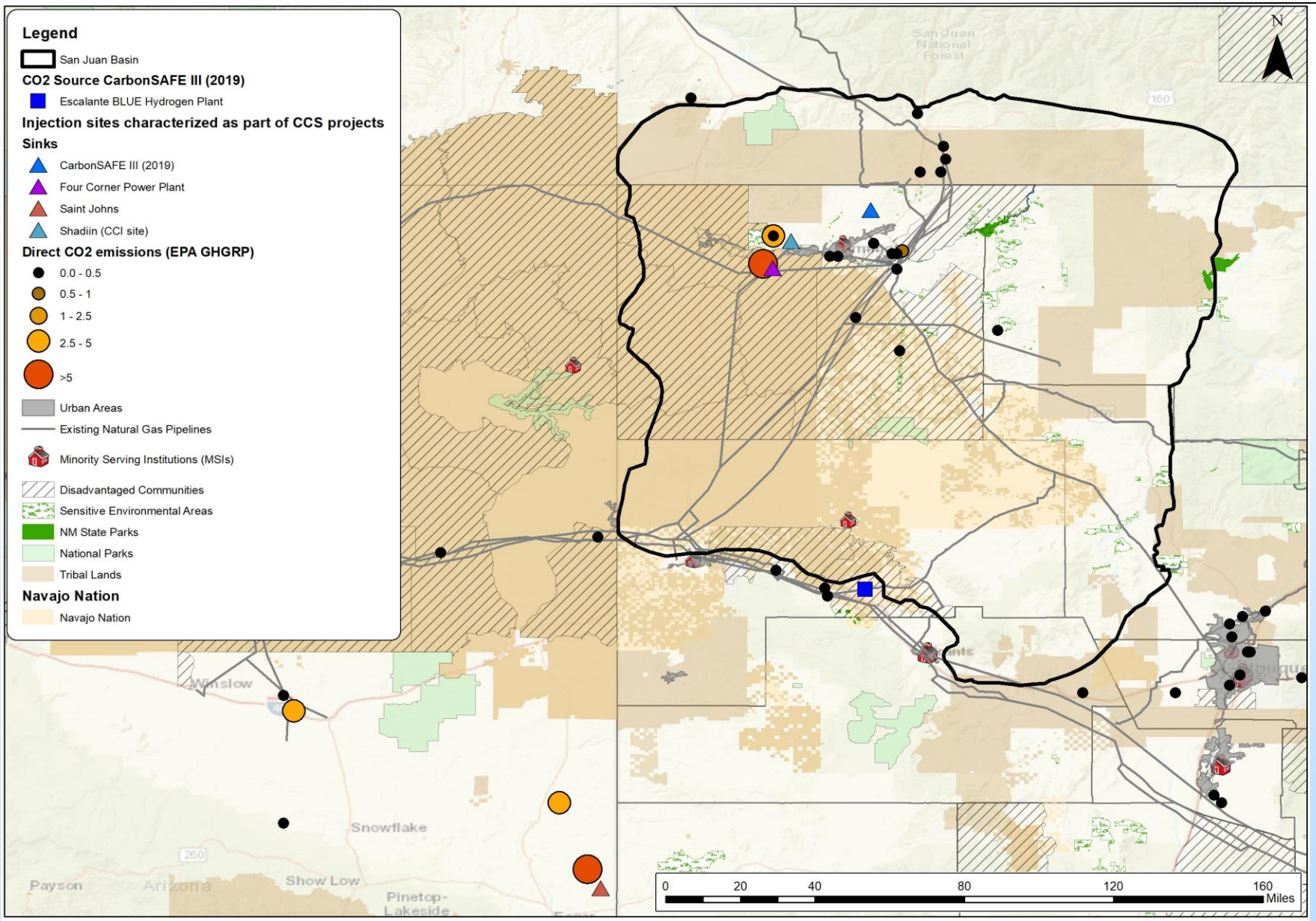
Contractors
- Dr. Tom Bratton
- Mr. Wally Drangmeister
- Mr. Steve Gray

Industry
- Tucson Electric Power Company
- Salt River Project (SRP)
- Navajo Agricultural Products Industry
- Proton Green LLC
- Red Cedar Gathering Company
- Enchant Energy
- Tallgrass Energy

Project partners

All Objectives, Locations, Participants, Approach, Scope, Community Benefits, etc. are merely proposed and are still being negotiated with DOE.

Four Corners Carbon Management Hub (Locations)



- CUSP Four Corners Regional Initiative (this project)
- SJB CarbonSAFE Phase III project (2020)
- Four Corners Carbon Storage Hub (2024)
- Four Corners Power Plant Integrated CCS Project (2024)
- Southwest DAC Hub (2024)

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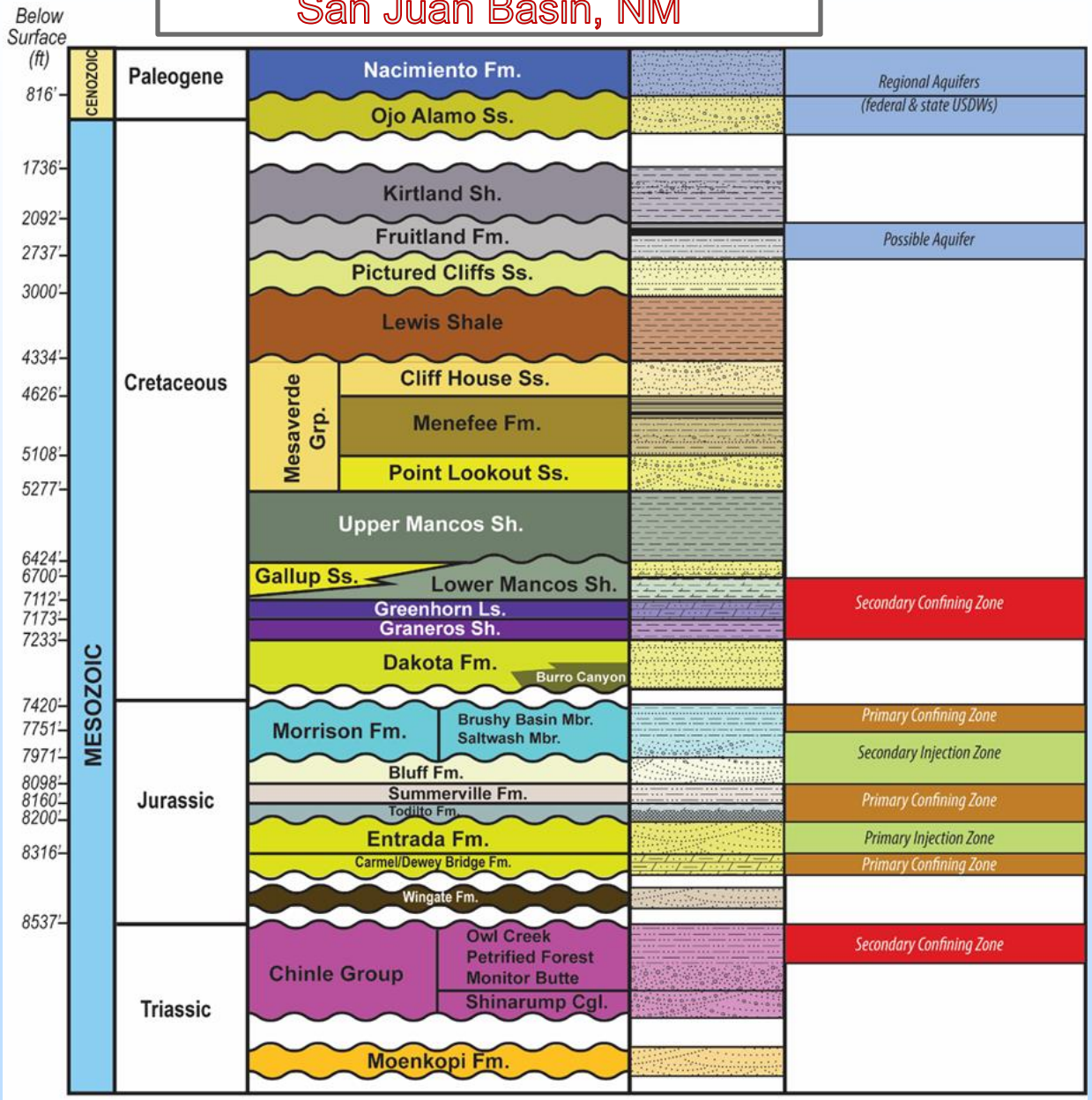
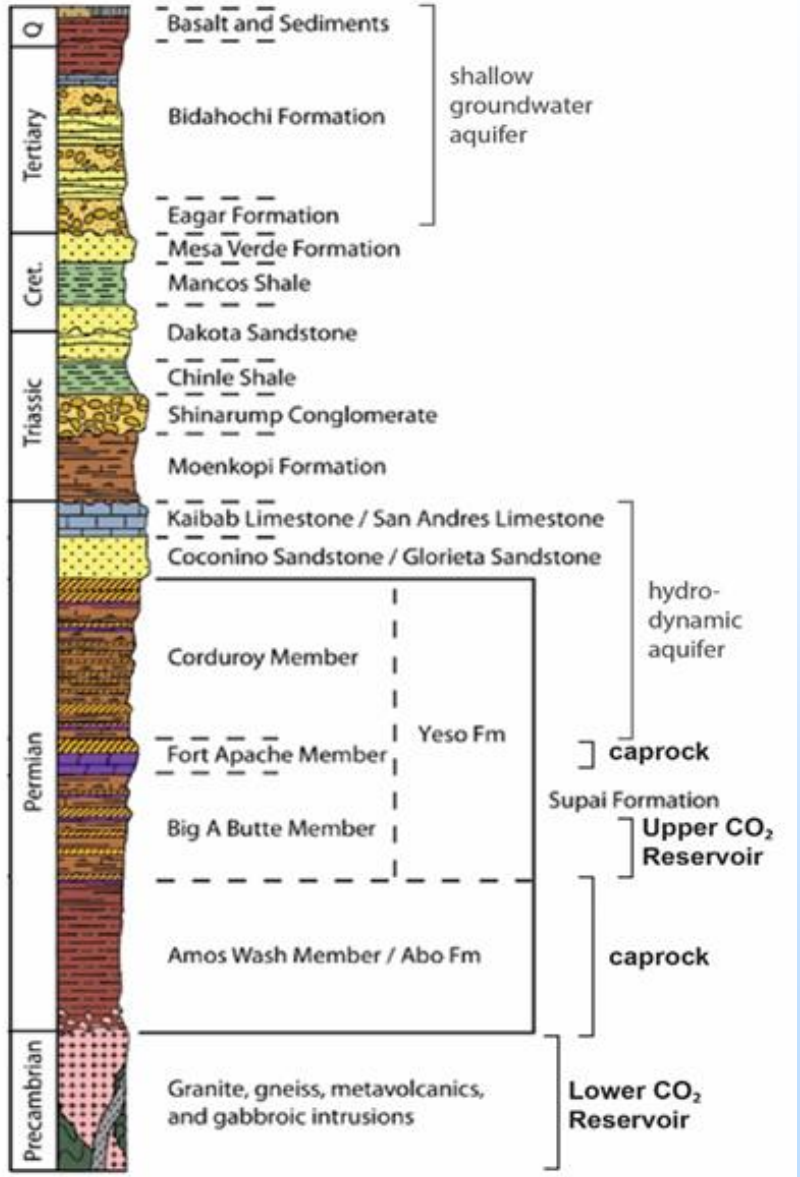
Storage Complex @ FCCMH

San Juan Basin, NM



St. John's CO2 Dome, AZ



SJB CarbonSAFE Project Facts

Key Project Facts

- Perform Site Characterization of storage complex within San Juan Basin
- Source CO2 from Escalante H2 plant, located in Prewitt, NM, USA.
- Initial UIC Class VI permit submitted in 2023
- Community and stakeholder outreach on CCS technology and its benefits

Characterization Plan

- Drilled characterization well, perform injectivity tests
- Recovered ~ 450 ft of Core, sampled drilling cuttings, advanced log suites measurements
- Perform suites of laboratory experiments and numerical models
- Purchased 100 sq.miles 3D seismic, acquire 3D VSP,
- Installed DAS/DTS/DSS Optical fiber behind casing

St. John's Dome Project Facts

Key Project Facts

- Part of the Southwest DAC Hub led by Arizona State University
- St. Johns Dome (SJD) field located in Apache County, Arizona (AZ)
- Proton Green is the project developer
- Perform Site Characterization of storage complex and submit a UIC Class VI permit to EPA
- Community and stakeholder outreach on CCS

Characterization Efforts

- Detailed site characterization data from several wells
- Utilized FMI from 11 wells to map and perform analysis on existing fractures
- Interpreted existing 2D seismic lines
- Existing core samples

Potential CO2 Sources from Power Plants

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Four Corners Storage Hub Project Facts

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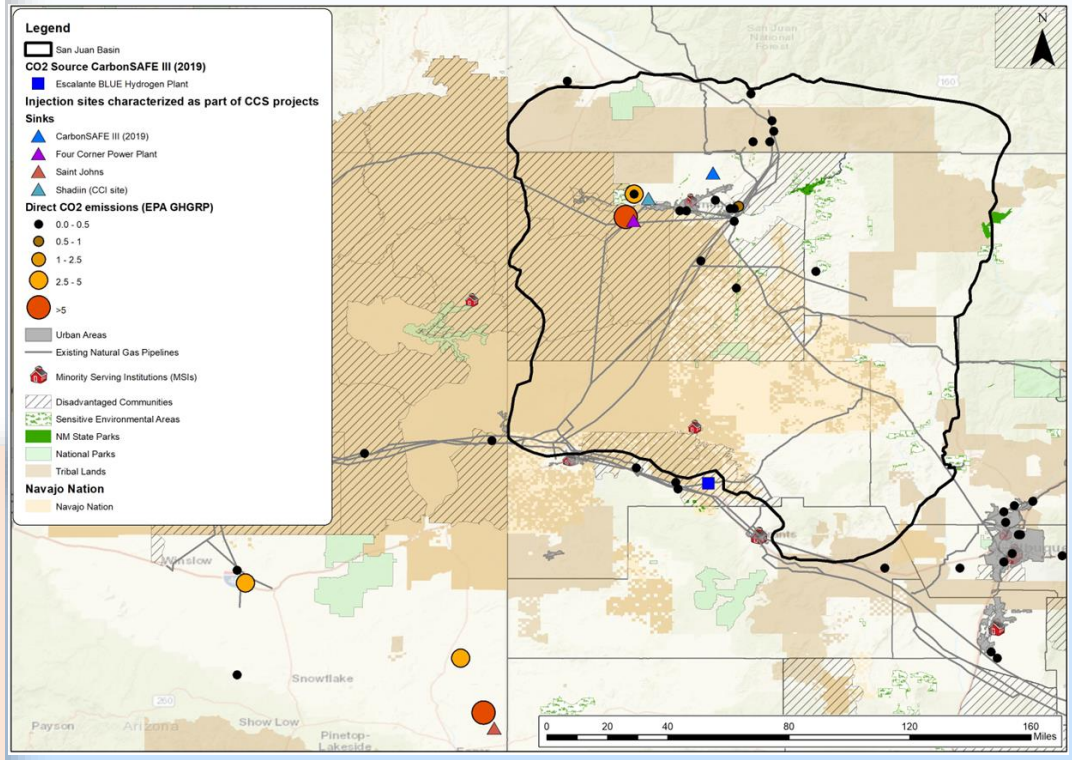
Key Project Facts

- Perform Site Characterization of 3 storage sites within San Juan Basin
- Source CO2 from *Four Corners Power Plant* emits at least 10 million metric tons and others.
- Prepare and submit UIC Class VI applications for 3 sites
- Meet Environmental requirements for characterization work and integrated project
- Prepare Storage Field Development Plan
- Execution of the Community Benefits Outcomes and Objectives (CBOO).



Characterization Plan

- Drill 2 characterization wells, perform mini-frac and step rate test
- Re-enter one additional well to acquire well logs and other information
- Acquire ~ 1000 ft of Core, sampled drilling cuttings, advanced log suites measurements, fluid sampling
- Perform suites of laboratory experiments and numerical models
- Acquire 2 3D seismic, license multiple 2D seismic lines

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Project Scope/ Technical Approach

Task 1.0 - Project Management and Planning

Task 2.0 – Societal Considerations and Impacts (SCI) Assessment and Plans

Task 3.0 – Addressing Key Technical and Non-technical Challenges Within the Region

Task 4.0 – Facilitating Data Collection, Sharing and Analysis

Task 5.0 – Evaluating Regional Infrastructure

Task 6.0 – Promoting Regional Technology Transfer

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Task 1 Project Management

Dr. Robert Balch of the PRRC is Project Manager

Task 1 - **Project Management** is ongoing for the life of the project.

Technical progress will be monitored by each Co-PI or lead for an organization. Tasks will also each be assigned to a leader who will be responsible for ensuring that task is meeting milestones and deliverables

Responsibility for **financial management** rests ultimately with New Mexico Tech; all subcontractors will report to NMT.

Task 2.0 – Societal Considerations and Impacts (SCI) Assessment and Plans

The project will implement the SCI in accordance with the Community benefit plan.

Subtask 2.1 - Community and Labor Engagement: the team will identify communities and stakeholders to be engaged to ensure the project viability and social risk mitigation

Subtask 2.2 Investing in Job Quality and a Skilled Workforce: the team will study the potential of CCUS to create new jobs as well as attract, retain, and train a skilled, local, and diverse workforce

Subtask 2.3 Diversity, Equity, Inclusion, and Accessibility: the team will continue its analysis of prior and ongoing efforts relevant to DEIA in the Four Corners region by members of the project team and beyond

Subtask 2.4 Justice40 Initiative: the project team will carry out a first energy and environmental justice assessment and implementation strategy

CBP Summary

Category	Commitment #No.	Milestone Date
Community and Labor Engagement		
Two community workshops, one in New Mexico and one in Arizona.		6 months after project award for NM. 9 months after project award for AZ.
Public and media engagement. Publish articles that promote the project on: • Web Pages on CUSP west website • LinkedIn Page • Fact sheets • I-WEST website • AZGS Blog and Magazine		4 months after project award.
Inventory of Potentially Impacted Locations and Communities.		4 months after project award.
Baseline Assessment		12 months after project award.
Impact Assessment		18 months after project award.
Investing in Job Quality and a Skilled Workforce		
Not applicable.		

CBP Summary

Diversity, Equity, Inclusion, and Accessibility		
Reduce barriers and improve access to jobs for local and underrepresented workers.	D1.1	Ongoing throughout the project.
Promote DEIA during student researcher recruitment**.**	D1.2	Ongoing throughout the project.
Promote women in STEM.	D1.3	Ongoing throughout the project.
Outreach material in Spanish: 1 webpage and 1 factsheet in Spanish	D1.4	12 months after project award.

Justice40 Initiative		
A decrease in energy burden (energy costs for low-income households).	E1	
A decrease in environmental exposure and burdens.	E2	
An increase in quality job creation, clean energy job pipeline, and job training.	E3	

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Task 3.0 Addressing Key Technical and Non-Technical Challenges Within the Region

Subtask 3.1 Key Technical Challenge: The team will work towards expanding the characterization of potential stacked storage complexes to reduce uncertainties in reservoir and caprock properties within the four corners region.

Subtask 3.1.1 Expanding Characterization of Stacked Storage Within Four Corners

Subtask 3.1.2 Develop Collaborations to Integrate and Validate Key Technologies to Optimize Storage and Reduce Uncertainty in Storage Permanence and Integrity

Subtask 3.1.3 Collaborate with Industrial Partners to Identify and Assist with Monitoring, Verification, and Accounting (MVA) Strategies as Applicable

Subtask 3.1.4 Risk Assessment and Management Validation for Commercial CO2 Storage Sites

Subtask 3.2 - Non-Technical Challenges Within the Region: The team will address non-technical challenges to accelerate CCUS deployment in the region.

Subtask 3.2.1 Cost Effective Drilling Prognosis in Brownfield

Subtask 3.2.2 Competition and Synergies for Subsurface Pore Space

Subtask 3.2.3 Regulation Inventory

Task 4.0 Facilitating Data Collection, Sharing and Analysis

The Project will collaborate with other Department of Energy – Fossil Energy-funded researchers to coordinate and facilitate the collection and analysis of new data, as well as the analysis of existing data in the region to improve the understanding of the impacts of CO_2 injection/storage, as well as to ensure safe, secure, efficient, and affordable CO_2 injection and containment.

Subtask 4.1 Collaborating with National Laboratories

Subtask 4.1.1. Identify Data Requirements and Needs

Subtask 4.1.2. Update Geologic Data for CCUS Assessment

Subtask 4.1.3. Update USDW Data from All Public Sources

Subtask 4.1.4. Gather and Catalog CO2 Emissions (Point) Source Database

Subtask 4.2 Collaborating in DOE's NRAP and SMART Initiatives

Task 5.0 Evaluating Regional Infrastructure

The project team will collect and analyze data on existing infrastructure and its potential to repurpose to advance CCUS within the Four Corners region

Subtask 5.1 Evaluation of CO2 Capture Infrastructure

Subtask 5.1.2 Evaluation of Existing CO2 Capture Units and Future Needs

Subtask 5.2 Evaluation of CO2 Transport Infrastructure

Subtask 5.2.1 Analysis of Existing CO2 Transport Infrastructure

Subtask 5.2.2 Outlook of New CO2 Transport Infrastructure

Subtask 5.2.3 Impact of Disadvantaged Communities and Existing Pipeline Rights-of-way on Pipeline Routing

Subtask 5.3 Evaluation of CO2 Storage Infrastructure

Subtask 5.3.1 Transition of Existing Oil & Gas Infrastructure for CO2 Storage

Subtask 5.3.2 Outlook of New Infrastructure for CO2 Storage

Task 6.0 Promoting Regional Technology Transfer

The project will leverage existing stakeholder relationships and engage and develop new relationships with critical CCUS stakeholders within the CUSP region and globally. The recipient will inform and educate stakeholders about CCUS technologies as well as develop public tools to facilitate regional technology transfer.

Subtask 6.1. Development of Regional Readiness Indices Maps: Key metrics regarding regional readiness will be developed. These metrics include both technical and non-technical factors (e.g., capacity, source proximity, regulatory impact).

Subtask 6.2. Technology Transfer Forums: Project will provide extra efforts to publicize and disseminate this information through specific workshops, forums, or webinars that will be held in strategic locations within the Four Corners region.

Subtask 6.3. DOE Support: Project will provide general support to DOE by developing and delivering communication materials on project activities as needed by DOE

Project Timeline

		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
		Project Year 1												Project Year 2											
Task 1.0	**Project Management and Planning**																								
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2.1	Community, Labor, and Stakeholder Engagement																								
2.1.1	Identification of stakeholders																								
2.1.2	Develop Outreach Material																								
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2.2	Assessment of Economic and Job Creation Impact																								
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2.3	Justice40 Initiative Planning and Implementation																								
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2.3.2	Implementation Strategy Planning																								
2.3.3	Implementation of the J40 Strategy																								
2.4	Diversity, Equity, Inclusion, and Accessibility Plan Implementation																								
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3.1.4	Risk Assessment and Management validation for commercial CO2 storage sites																								D
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5.1.1	CO2 Sources Feasibility Study in the Four Corners Region																								
5.1.2	Evaluation of Existing CO2 Capture Units and Future Needs																								
5.2	Evaluation of CO2 Transport Infrastructure																								
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6.3	DOE Support																								

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Project Milestones

	Milestone Title & Description	Planned Completion Date	Verification method
Task 1.0	Kickoff meeting	March 2024	attend, report
Subtask 2.2.1	Inventory of Potentially Impacted Locations and Communities	Year 1 Q1	Inventory report completed
Subtask 2.3.1	Energy and Environmental Justice Baseline Assessment	Year 1 Q4	progress report quarterly, database
Subtask 3.1.1	Expanding Characterization of Stacked Storage Within Four Corners	Year 2 Q1	report, database
Subtask 4.1.1	Identify Data Requirements and Needs	Year 1 Q1	progress report, database
Subtask 4.1.4	Gather and Catalog CO_2 Emissions (Point) Source Database	Year 1 Q4	progress report quarterly, database
Subtask 5.1	Evaluation of CO_2 Capture Infrastructure	Year 1 Q4	progress report quarterly, database
Task 6.1	Development of Regional Readiness Indices Maps Activities and Education	Year 2 Q2	progress report quarterly

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Project Deliverables

Task/ Subtask Number	Deliverable Title	Due Date
1.0	Project Management Plan	Update due 30 days after award. Revisions to the PMP shall be submitted as requested by the NETL Project Manager.
2.0	SCI Assessment and Efforts	End of project report.
3.1	Catalog of Stacked Storage Options within Four Corners Region	1 month after completing task 3.1.
3.2	Best Practices in Brownfield Drilling	1 month after completing task 3.2,
3.1.4	Summary Report on Risk Assessment	1 month after completing subtask 3.1.4.
4.0	Summary Report on Geological Data Assessment	1 month after completing subtask 4.0.
5.0	Summary Report on Regional Infrastructure Evaluation	1 month after completing subtask 5.2.
6.0	Summary Report of Technology Transfer	End of project report.

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SOPO Goals, Objectives, Success Criteria

Objective/ Decision point	Success Criteria
Conduct community outreach and public engagement of identified stakeholders. Assess of environmental Justice & Justice40 and regional economic impact to DACs **[Task 2]**	Proposed project is well received by the local communities and stakeholders. Positive project environmental and economic impacts to DACs is identified and quantified.
Complete stack storage characterization of the Four Corners region **[Task 3]**	Identification of several storage reservoirs within the region
Gather and catalogue CO_2 emissions (point) source data **[Task 4]**	Consolidate updated CO_2 source and capture data for the Four Corners region into a single database for prioritization of CCUS options.
Catalog and map existing CO_2 transportation (pipelines) in region **[Task 5]**	Consolidate Rights-of-Way and pipeline data for the Four Corners region into a single database with emphasis on cost minimization between major sources and sinks.
Data Assessment and synthesis **[Task 4]**	Technical challenges and risks catalogued and quantified, with relevant datasets being transferred for assessment by NRAP Tools and Department of Energy's Machine Learning initiative.
Technology transfer **[Task 6]**	Development of an interactive Regional Readiness Index as a means of visualizing CCUS potential in specific areas of the Four Corners region

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Project Facts Sheet

CUSP: Four Corners Regional Initiative

Lead/Prime Organization: The Petroleum Recovery Research Center (PRRC) at the New Mexico Institute of Mining and Technology (New Mexico Tech)

Industries: Tucson Electric Power Company, Salt River Project (SRP), Navajo Agricultural Products Industry, Proton Green LLC, Red Cedar Gathering Company, Enchant Energy and Tallgrass Energy

Location of Lead: Socorro, New Mexico

Project Purpose

Our goal is to collect, integrate, and analyze relevant data for the region, developing a framework for carbon management that will increase the readiness of the region to participate in the global transition to a clean energy economy.

Focus Areas

- Improve understanding of geological formations for carbon storage
- Assess risk for effective and safe permanent CO_2 storage
- Collaborate with direct air capture initiatives
- Educate public and stakeholders on carbon management

Research Highlights

- Capture approximately 6 to 7 million metric tons of CO_2 emissions from industrial facilities and power plants
- Improving understanding of regional geological formations for carbon storage, including saline aquifers and stacked storage complexes
- Deploying integrated carbon management projects to capture and store significant CO_2 volumes annually

Project Impacts and Benefits

- Accelerate onshore CCS technology deployment
- Assemble a uniform and accessible database of existing and new CCS data
- Identify technical challenges and develop readiness indices for CCS deployment
- Promote technology transfer and advanced carbon capture solutions

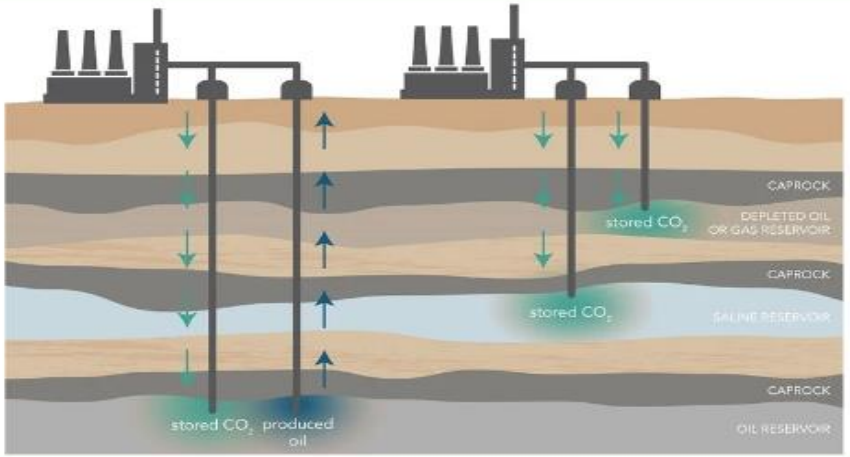

Image provided by Gemini Solutions Inc.

The diagram shows the process of capturing CO_2 from industrial sources, transporting it via pipelines, and injecting it into underground geological formations for storage, thereby preventing its release into the atmosphere.

Factories/Industrial Plants: The buildings at the top of the image represent industrial plants or factories where carbon dioxide (CO_2) is produced.

Pipelines: The vertical lines extending from the factories into the ground represent pipelines used to transport CO_2 from the surface to underground storage sites.

Stored CO_2: The green areas labeled "stored CO_2" indicate the locations where CO_2 is being stored underground. These storage sites can be:

- Depleted Oil or Gas Reservoir: A geological formation that has previously been used for extracting oil or gas and now serves as a storage site for CO_2.
- Saline Reservoir: A deep underground reservoir containing saline water, used for storing CO_2.

Caprock: Layers of impermeable rock that act as a seal to prevent CO_2 from escaping from the storage reservoirs. These layers are crucial for ensuring the long-term containment of stored CO_2.

Oil Reservoir: A geological formation that contains oil, where CO_2 can be injected to enhance oil recovery.

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Acknowledgements

The project would like to thank DOE for the award opportunity through DE-FE0032363 and our partners. We would like to acknowledge additional support from existing projects within the Four Corners Region.

Organization Chart