

Regional Resource Assessment for CO₂ Storage in New Mexico and Surrounding Areas: Identification, Characterization, and Evaluation of In-Situ Mineralization Site/Complex

(DE-FE0032257)

Sai Wang, PhD

New Mexico Tech - PRRC

U.S. Department of Energy

National Energy Technology Laboratory

2023 FECM / NETL Carbon Management Research Project Review Meeting

August 29, 2023

Presentation Outline

- Project Overview
- Project Objectives
- Technical Approach
- Project Scope
- Synergy Opportunities
- Summary

Project Overview

- Funding Profile
- Project Performance Dates:

09/01/2023 – 08/31/2025



	FY 2024		FY 2025		Total	
	DOE Funds	Cost Share	DOE Funds	Cost Share	DOE Funds	Cost Share
NMT	\$ 535,213	\$ 126,214	\$ 399,831	\$ 124,521	\$ 935,044	\$ 250,735
GE Research	\$ 19,997	\$ -	\$ 19,957	\$ -	\$ 39,954	\$ -
LANL	\$ 10,000	\$ -	\$ 15,000	\$ -	\$ 25,000	\$ -
Total (\$)	\$ 565,210	\$ 141,134	\$ 434,788	\$ 108,873	\$ 999,998	\$ 250,007
Total Cost Share %		20%		20%		20%



Project Objective

Goals and Objectives

The overall objective of this project is to identify and access statewide resources for potential CO₂ storage via mineralization processes, including basalt formations and related stratigraphic units, and mining wastes in the state of New Mexico, as well as identify and characterize potential targeted storage sites/complexes to provide insights on storage capacity.

Task 1.0 Project Management and Planning

Task 2.0 Site Screening and Characterization: Pre-screening and identifying potential CO₂ mineralization storage sites/complexes in the state of New Mexico and managing the dataset to reveal associated geological and hydrogeological properties;

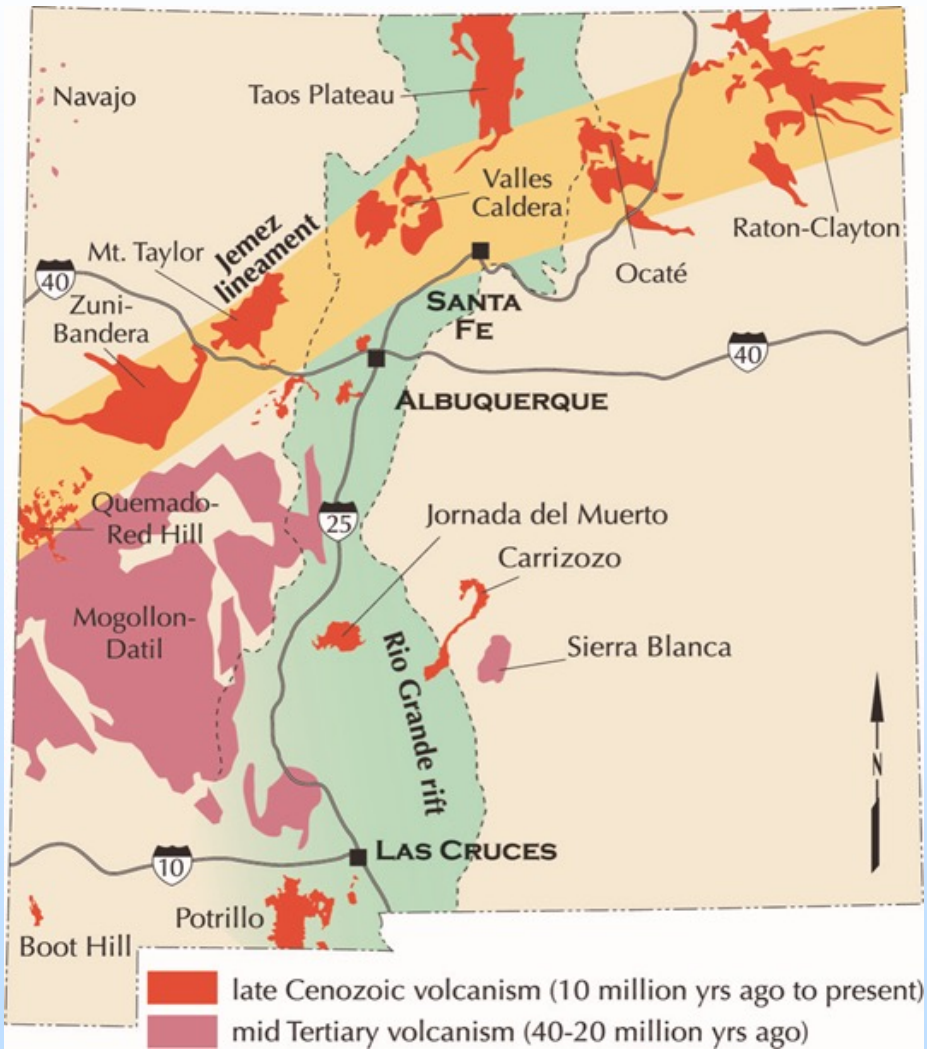
Task 3.0 Resource Rock Sample Characterization: Investigating and diagnosing the petrological, mineralogical, geochemical, geophysical and geomechanical properties of resource rock at the target site(s);

Task 4.0 Reaction Dynamic Study: Studying reaction dynamics of the CO₂ mineralization process on the localized resource rock in order to indicate the optimum scenario for CO₂ storage;

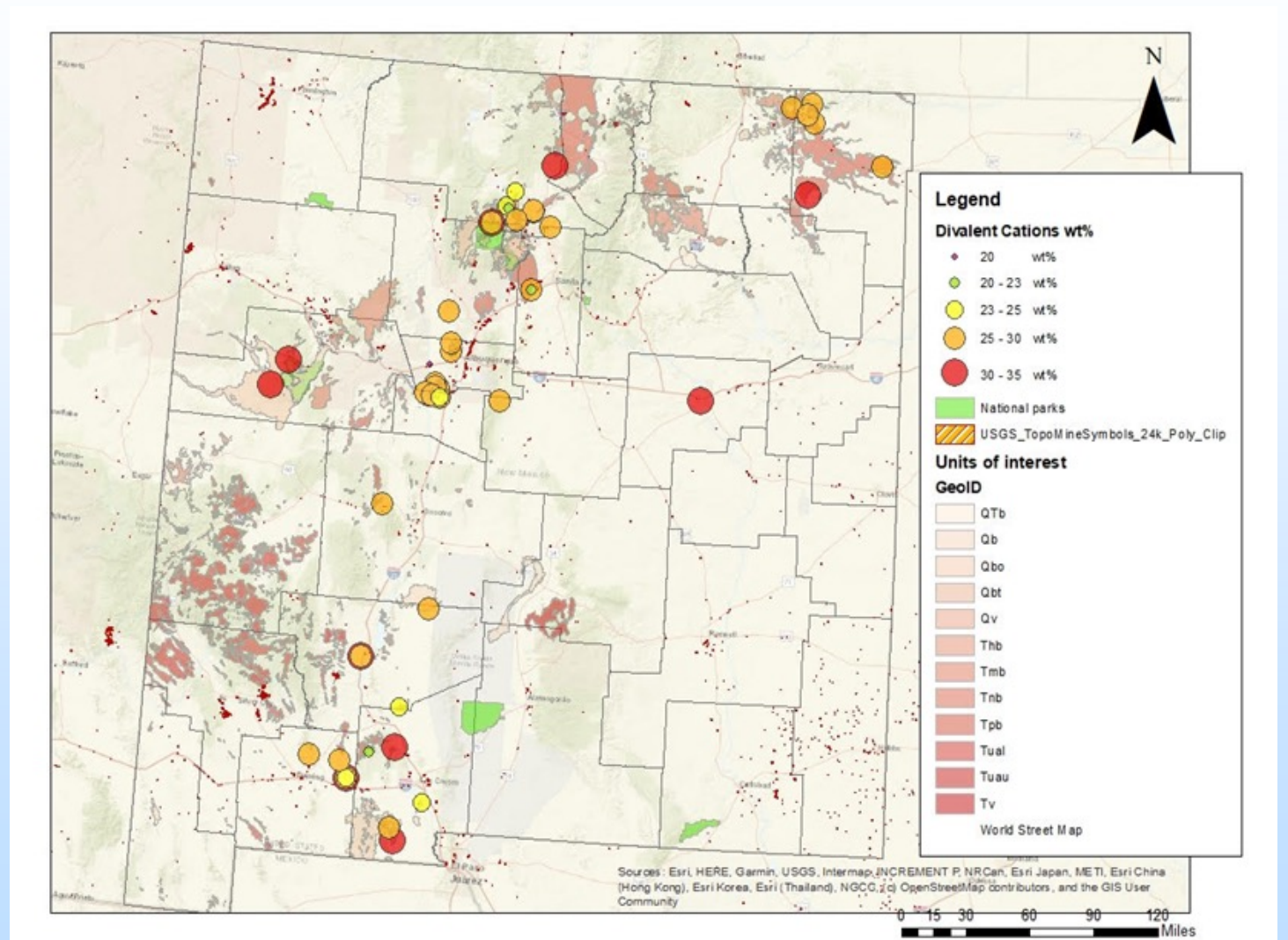
Task 5.0 CO₂ Storage Capacity Estimation: Understanding the CO₂ storage potential through the reservoir-scale simulation and economic analysis on the up-scaling;

Task 6.0 Stakeholder Outreach Activities and Education: Provoking the interest in CO₂ storage to local communities and opening the dialog between researchers and identified stakeholders potentially impacted by the proposed project through the development of a Community Benefits Plan and effective outreach activities.

Technical Approach

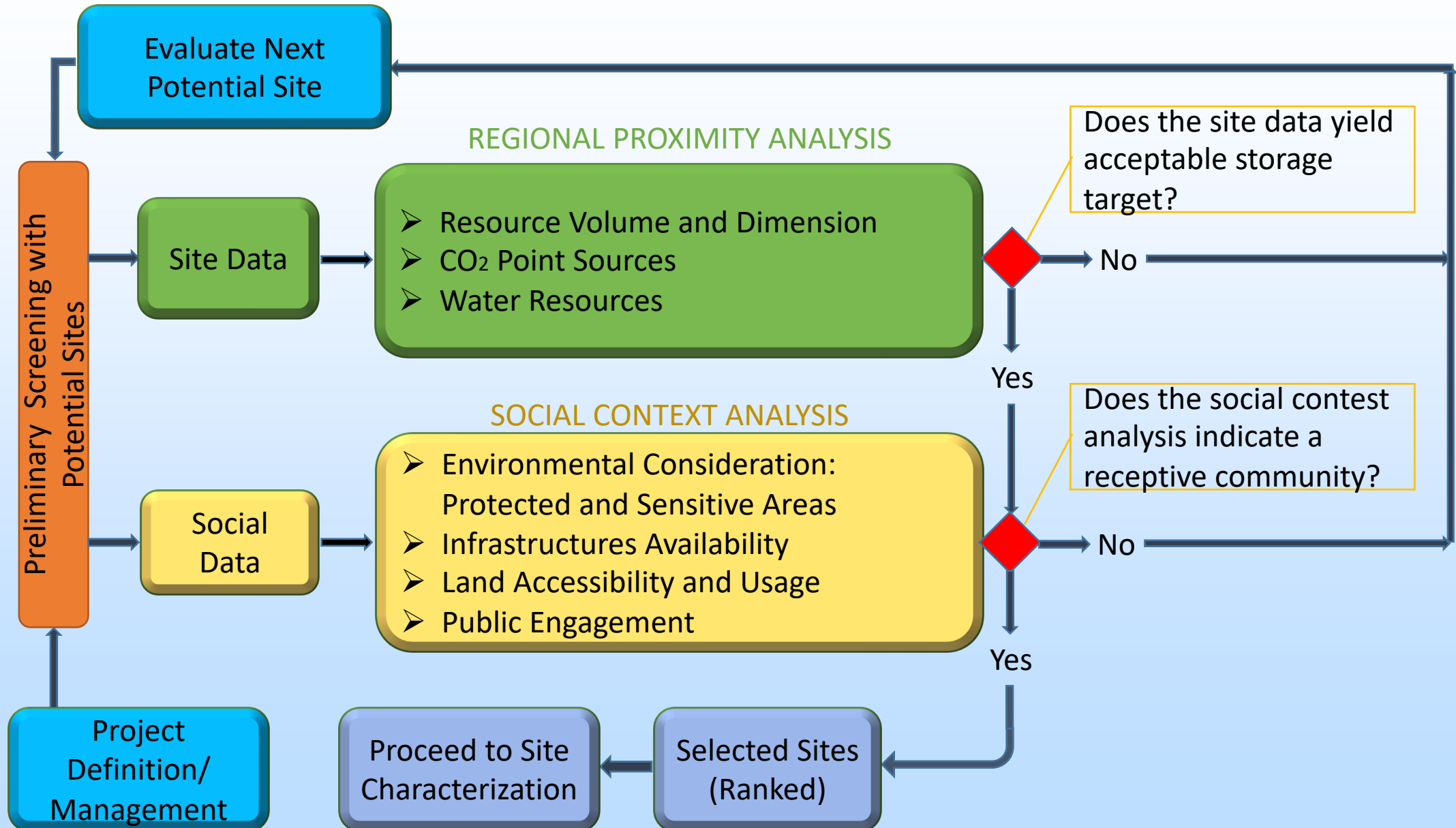


Geographical distribution of the basaltic rock in New Mexico



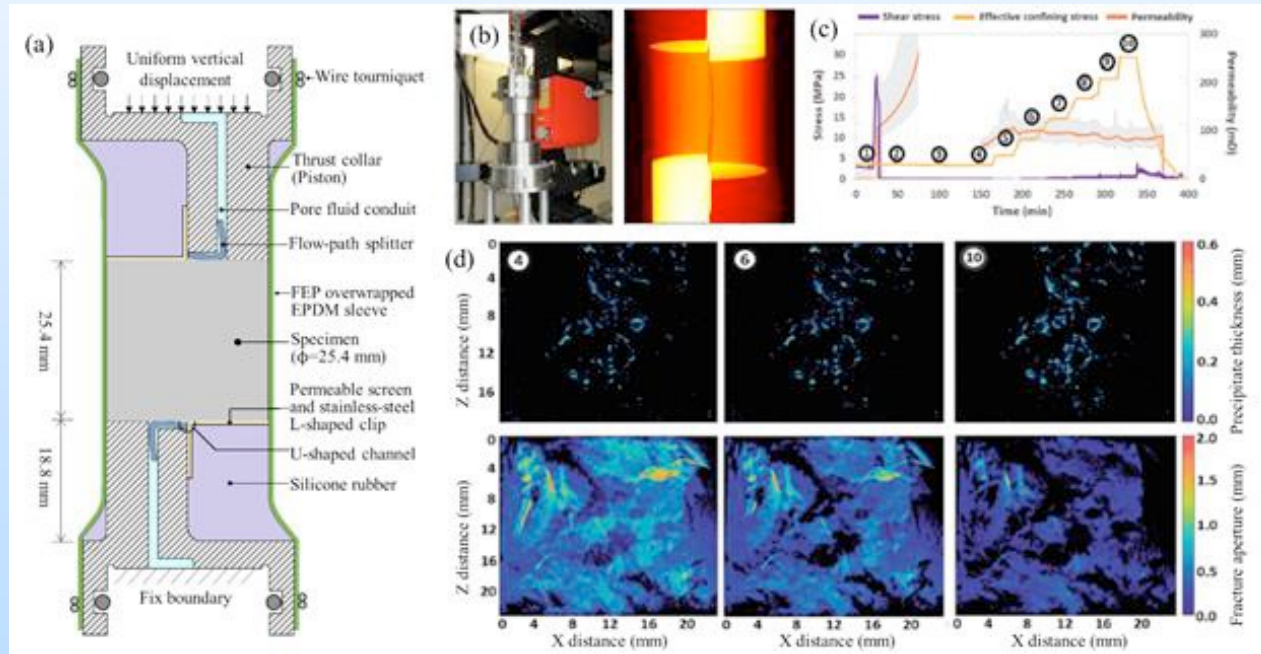
Potential Mafic and Ultramafic Reservoirs and their Chemistries

Technical Approach

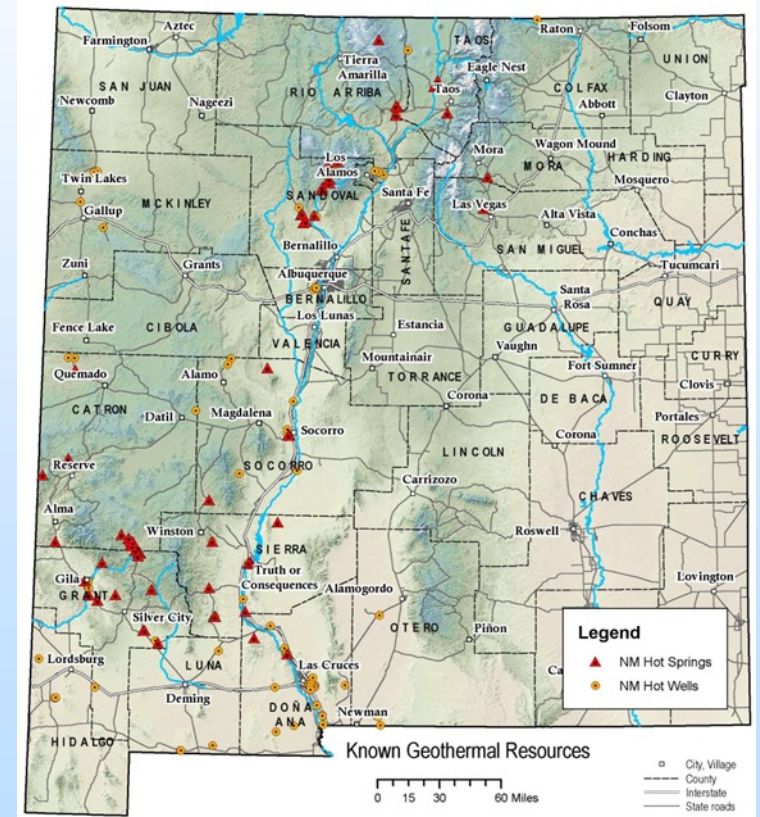


Technical Approach

- Conduct the batch-type experiments to address dissolution and precipitation kinetics. GEM-Selektor code package (Kulik et al. 2013) based on the Gibbs energy minimization method will be used for thermodynamic and kinetic simulations of fluid-rock reactions during CO₂ mineralization.
- Perform the flow-through tests integrated with real-time X-ray microtomography to investigate sustainability of CO₂ injection into the target basalt samples.
- Using Elevated Heat Flow to Enhance Reaction Rates.



Evolution of fracture geometry and precipitate growth based on a triaxial direct-shear (TDS) experiment integrated with fluid flow and real-time X-ray micro tomography



Known geothermal resources in the state of New Mexico (Kelley, unpublished).

Project Scope

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.
2.1	Result of Available Data Gathering for Preliminary State-wide Sites Screening	Within 30 days of completion of Subtask 2.1
2.2	Site Suitability Consideration Results Report	Within 30 days of completion of Subtask 2.1
2.3	Summary Report of the Regional Geology and Hydrology	Within 90 days of completion of Subtask 2.2
2.4	Site Mapping and Rock Sampling Activities Report	Within 90 days of completion of Subtask 2.2
2.5	Summary Report on CO ₂ Injection Zone Description	Within 90 days of completion of Subtask 2.4
3	Resource Rock Sample Characterization Report	Within 9 months of completion of Subtask 2.5
4.2	Report of Reaction Dynamic Modeling	At the end of the Project
5	CO ₂ Storage Capacity Estimation	At the end of the Project
6	Stakeholder Outreach and Education Activities Report	Annually through the end of the Project

	Milestone Title & Description	Planned Completion date
Task 1.0	Kickoff meeting	1st month
Subtask 2.2	Site Suitability Consideration	6th month
Subtask 2.3.2	Regional Hydrology	9th month
Subtask 3	Legacy Resource Rock Sample Characterization	quarterly
Subtask 3.2.3	Critical elements characterization	quarterly
Subtask 3.3.2	Microscopic characterization	quarterly
Subtask 4.1.2	Batch Reactor Experiments for Reaction Rate Measurement	quarterly
Task 6.0	Stakeholder Outreach and Education	12th and 24th month

Synergy opportunities

- The team continuous to collaborate with researchers within Four Corner Regional Initiatives and Carbon Utilization and Storage Partnership (CUSP) West to compliments each projects efforts.
- Continue to share results with scientific community and industrial collaborators for potential technology upscaling.

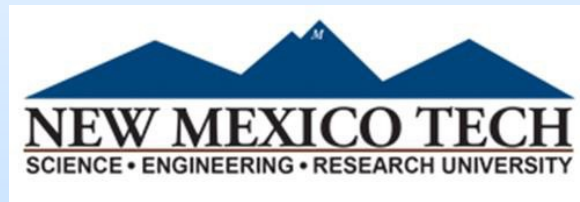
Summary Slide

Future Plans

- Continue to identify the sites for CO₂ mineralization in NM and surrounding areas.
- Continue to study the geological and hydrogeological properties on the selected reservoirs.
- Continue to characterize on the petrological, mineralogical, geochemical, geophysical and geomechanical properties of resource rock.
- Study reaction dynamics of the CO₂ mineralization process on the localized resource rock in order to indicate the optimum scenario for CO₂ storage and upscaling.
- Outreach activities.

Acknowledgements

The project would like to thank DOE for the award opportunity through DE-FE0032257 and our partners.

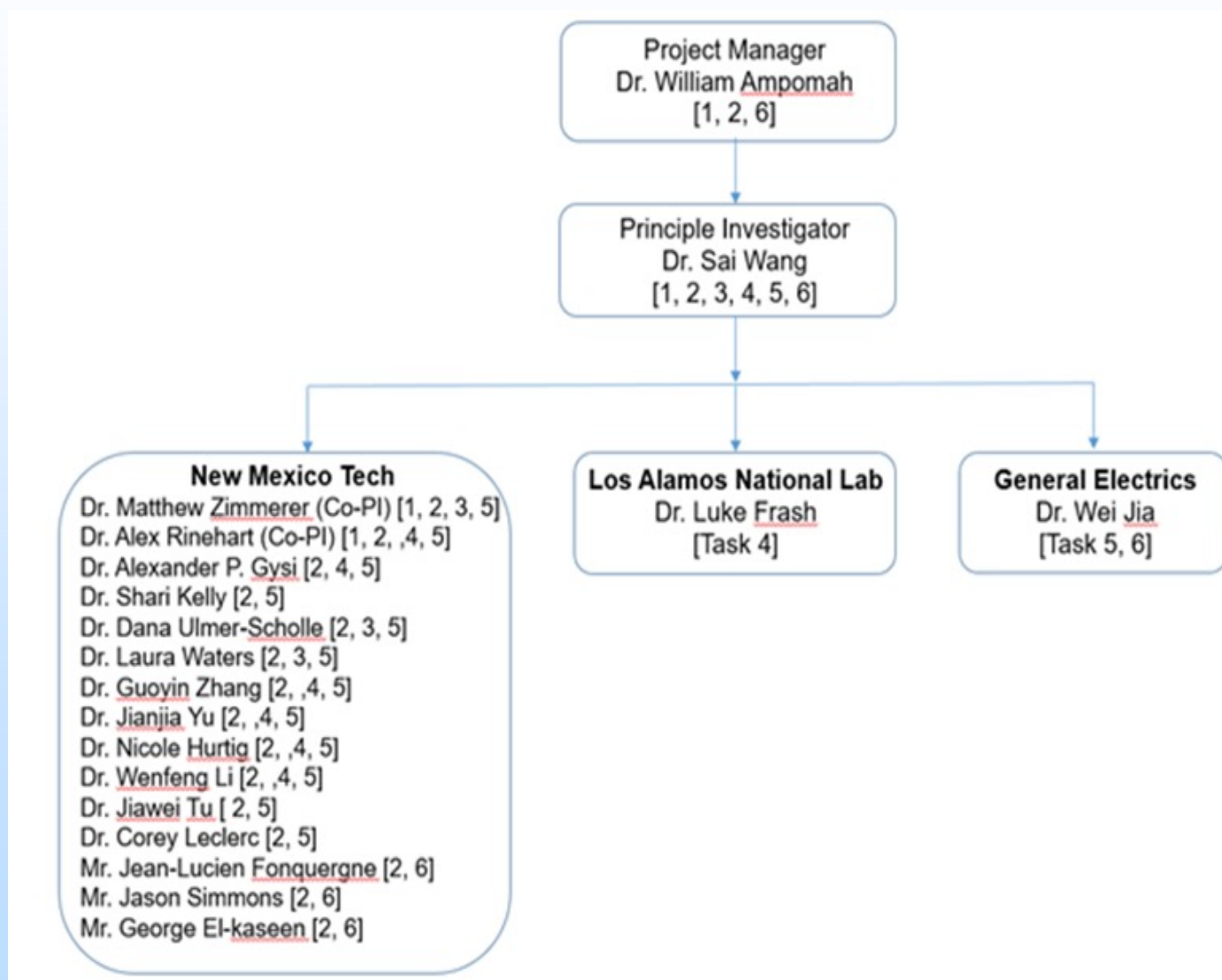


Thank you

Appendix

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

Organization Chart



Gantt Chart

