



The Carbon Utilization and Storage Partnership of the Western US

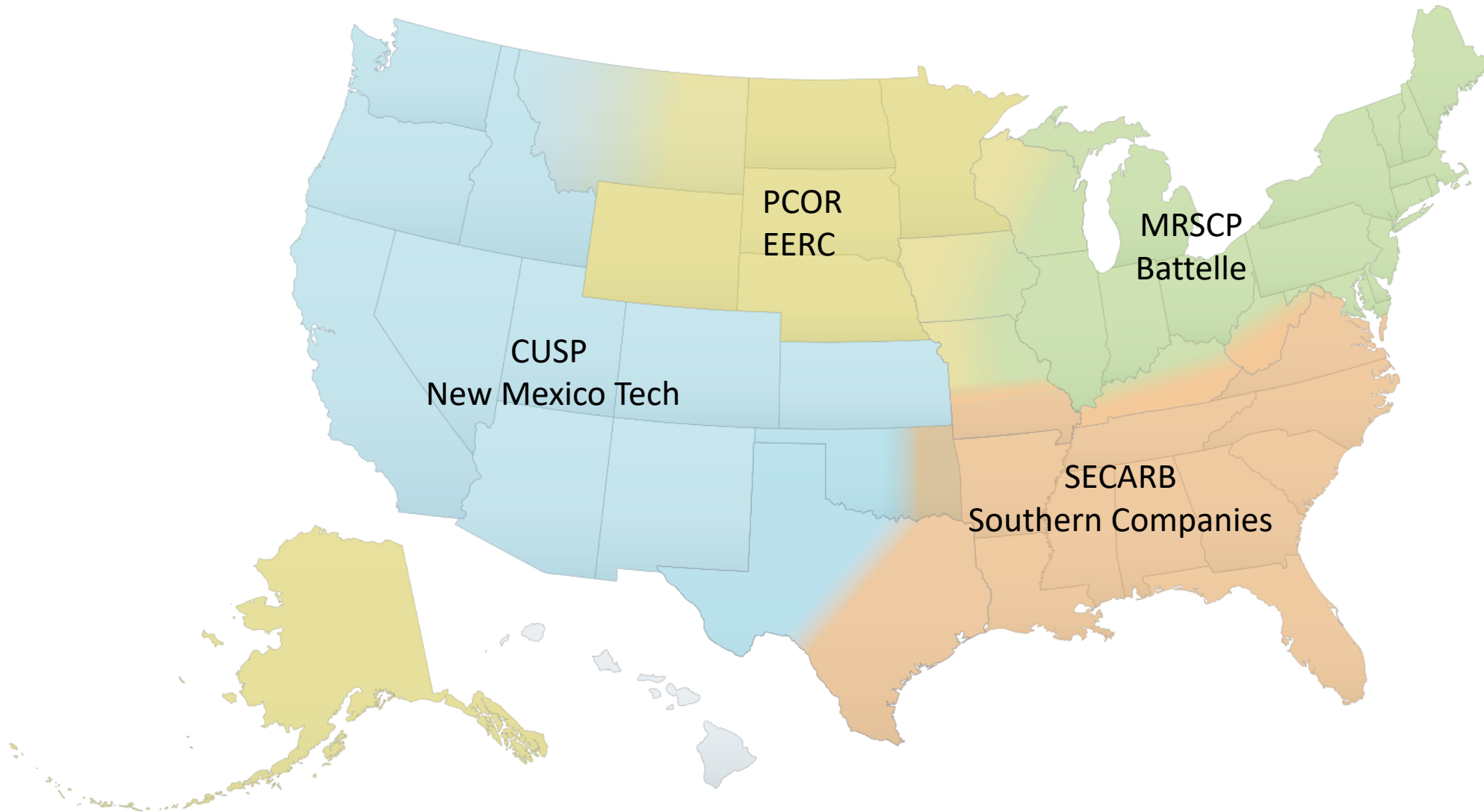
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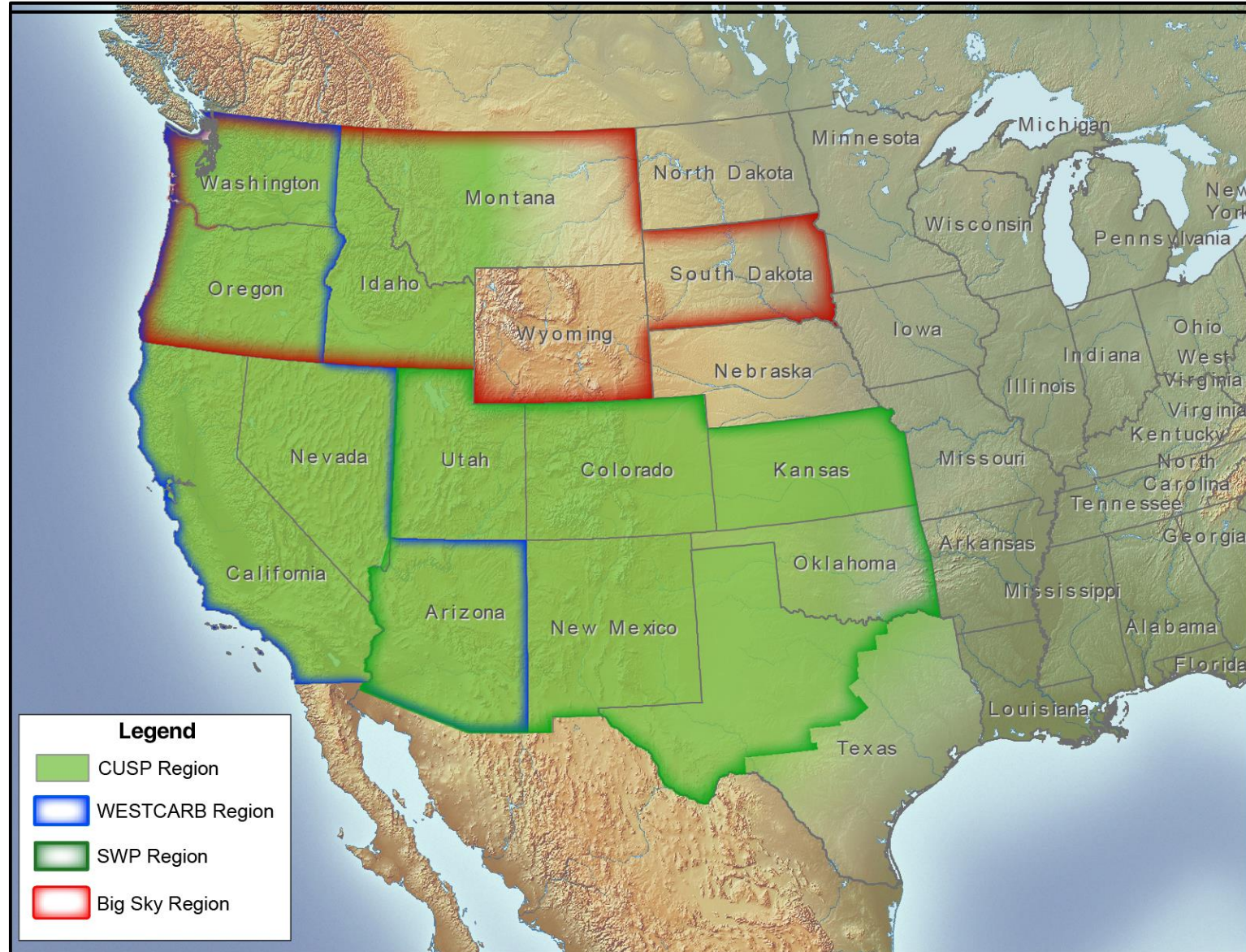
NETL

Regional Initiatives to Accelerate CCUS Deployment (2019-?)



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

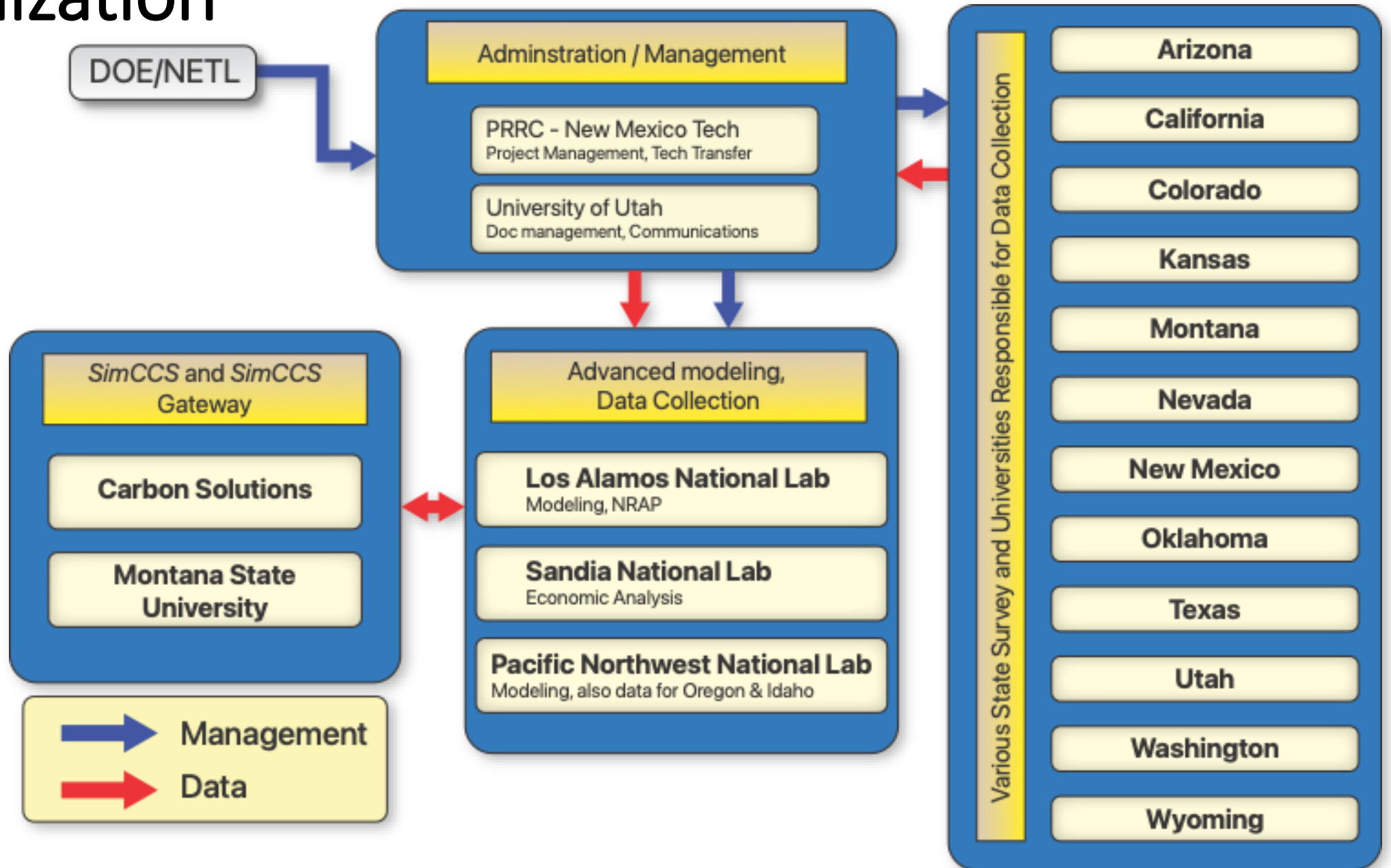


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Organization



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)

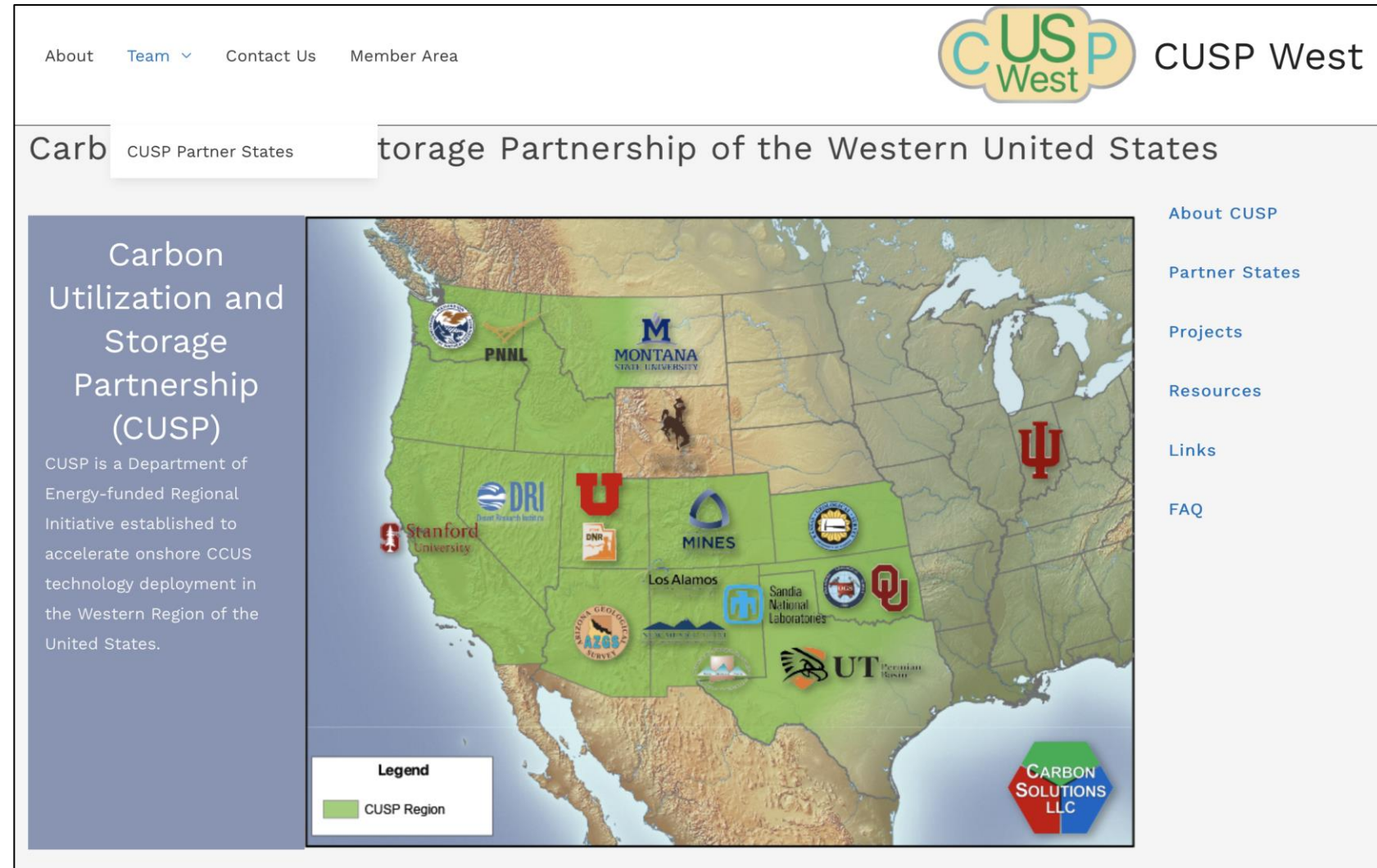
- While maintaining original scope and duration for atlas work (3 years) we added funds to each organization to cover tech transfer and education in the subsequent 2 years
- A portion of the new funds were set aside to support the Smart Initiative
- Funds set aside to jumpstart 45Q ready projects in 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



Industry Advisory Board

- 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
 - CO₂ emitters
 - CO₂ capture and transport companies
 - Oil/Gas operators
 - Policy think tanks



Carbon Utilization and Storage Partnership

What is the Carbon Utilization and Storage Partnership (CUSP)? CUSP is a Department of Energy-funded Regional Initiative established to accelerate onshore CCUS technology deployment in the Western Region of the United States. The CUSP project is a research consortium of all or parts of 13 states, consisting of organizations throughout the western United States including academia, government agencies, national laboratories, and industry.

The Main Objectives of the CUSP Initiative

- Addressing Key Technical Challenges
The project will expand the understanding of storage in stacked and unconventional formations, with emphasis on optimizing storage and reducing uncertainty.
- Facilitating Data Collection, Sharing, and Analysis
The project will consolidate and update the disparate and outdated datasets to improve the understanding of CO₂ injection, containment and economic feasibility.
- Evaluating Regional Infrastructure
The project will evaluate the requirements of a transportation network needed to deliver the captured CO₂ from the sources to the utilization and storage sites.
- Promoting Regional Technology Transfer
The project will engage, inform and educate CCUS stakeholders to facilitate technology transfer and the advancement of CCUS projects in the region.



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



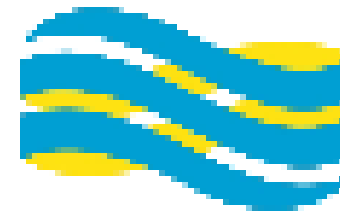
2020 Case Study – Enchant Energy



- 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.

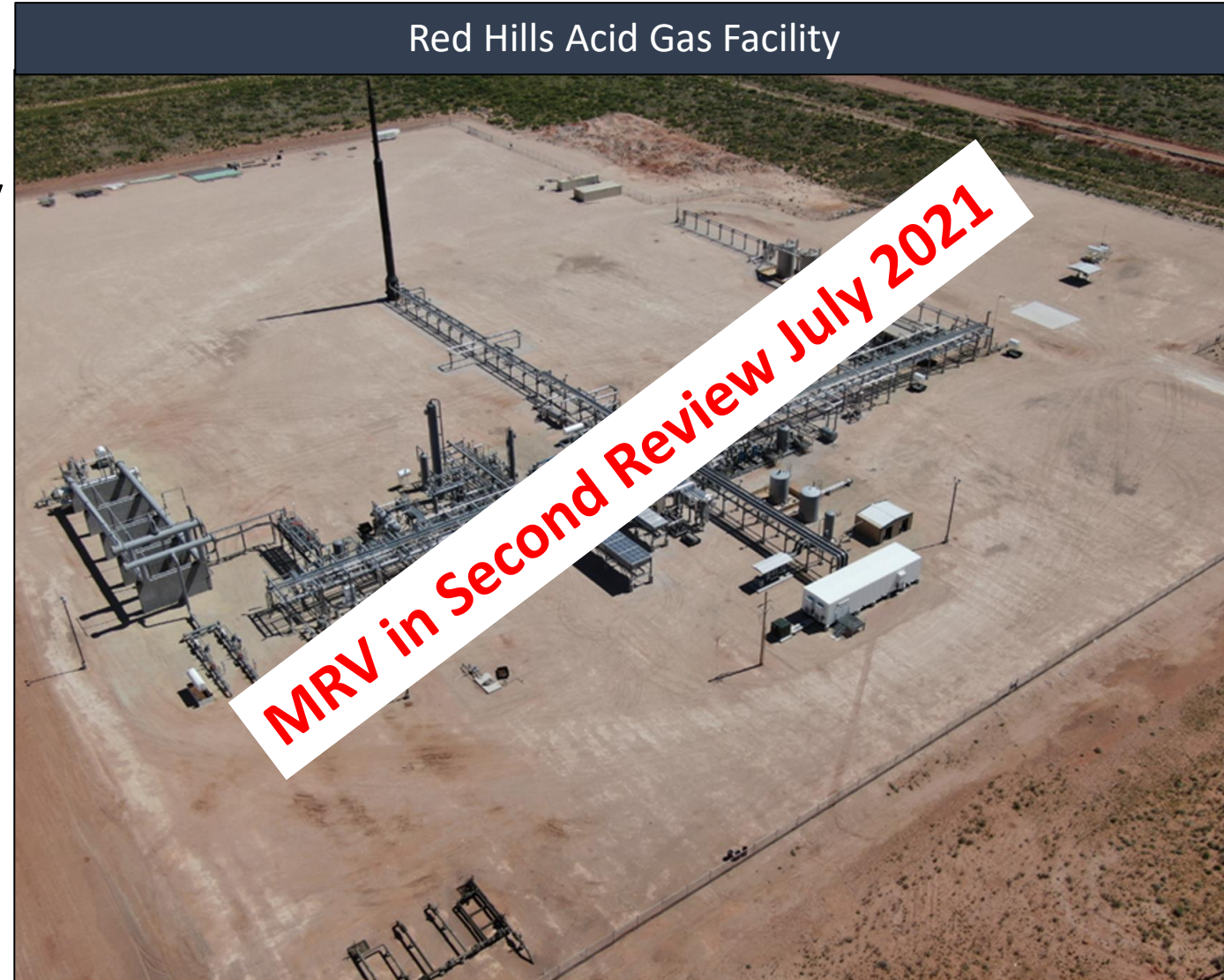


2020 Case Study – Lucid Energy



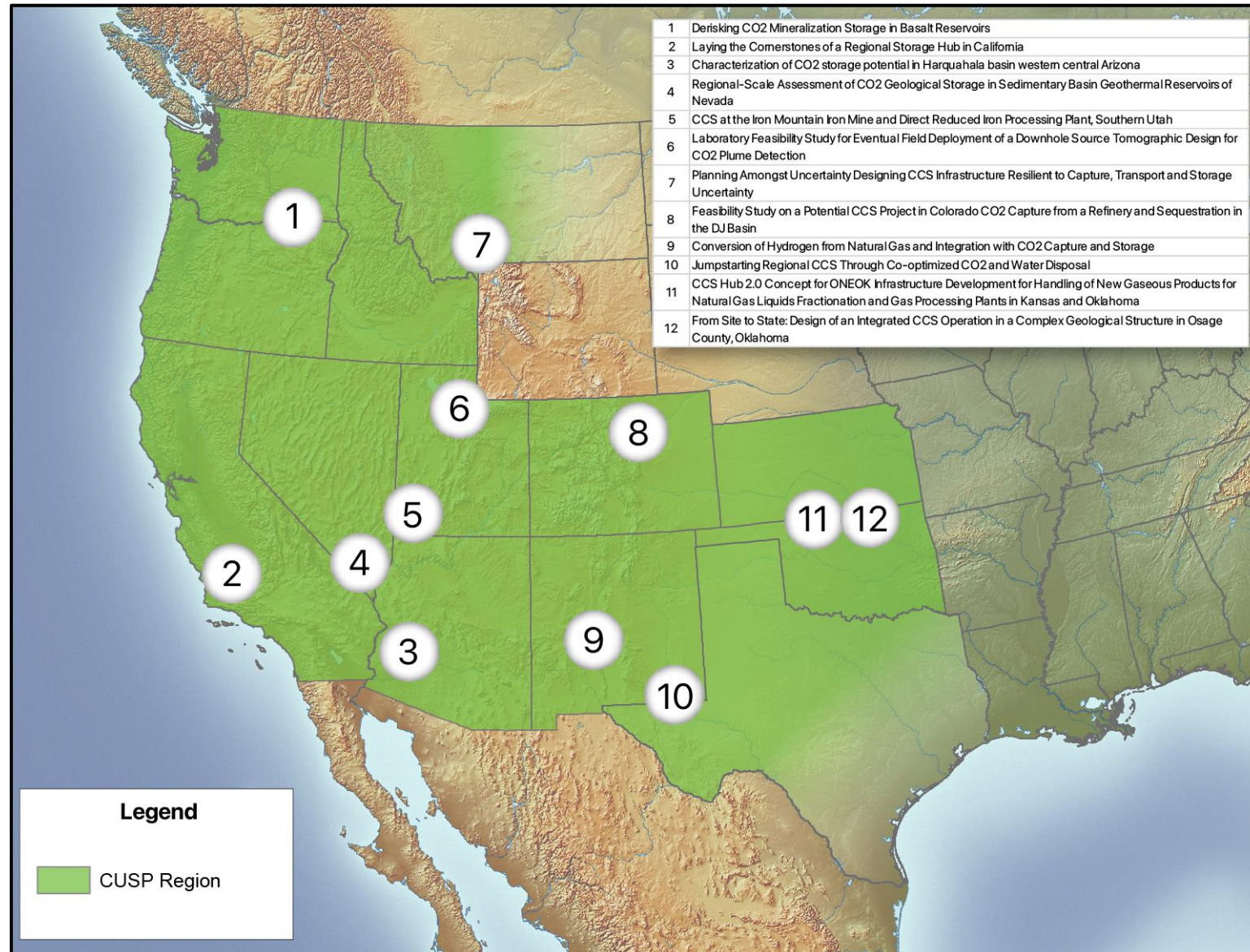
LUCID
energy group

- 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 H_2S and CO_2 concentrations in the raw sour gas it receives into the facility
- Roughly 50% of Lucid's CO_2 emissions are from vented CO_2 resulting from Amine Treating
- Capturing, sequestering and storage of vented CO_2 is the most economic option to capture 45Q tax credits and impact Lucid's carbon footprint
- Additional CO_2 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

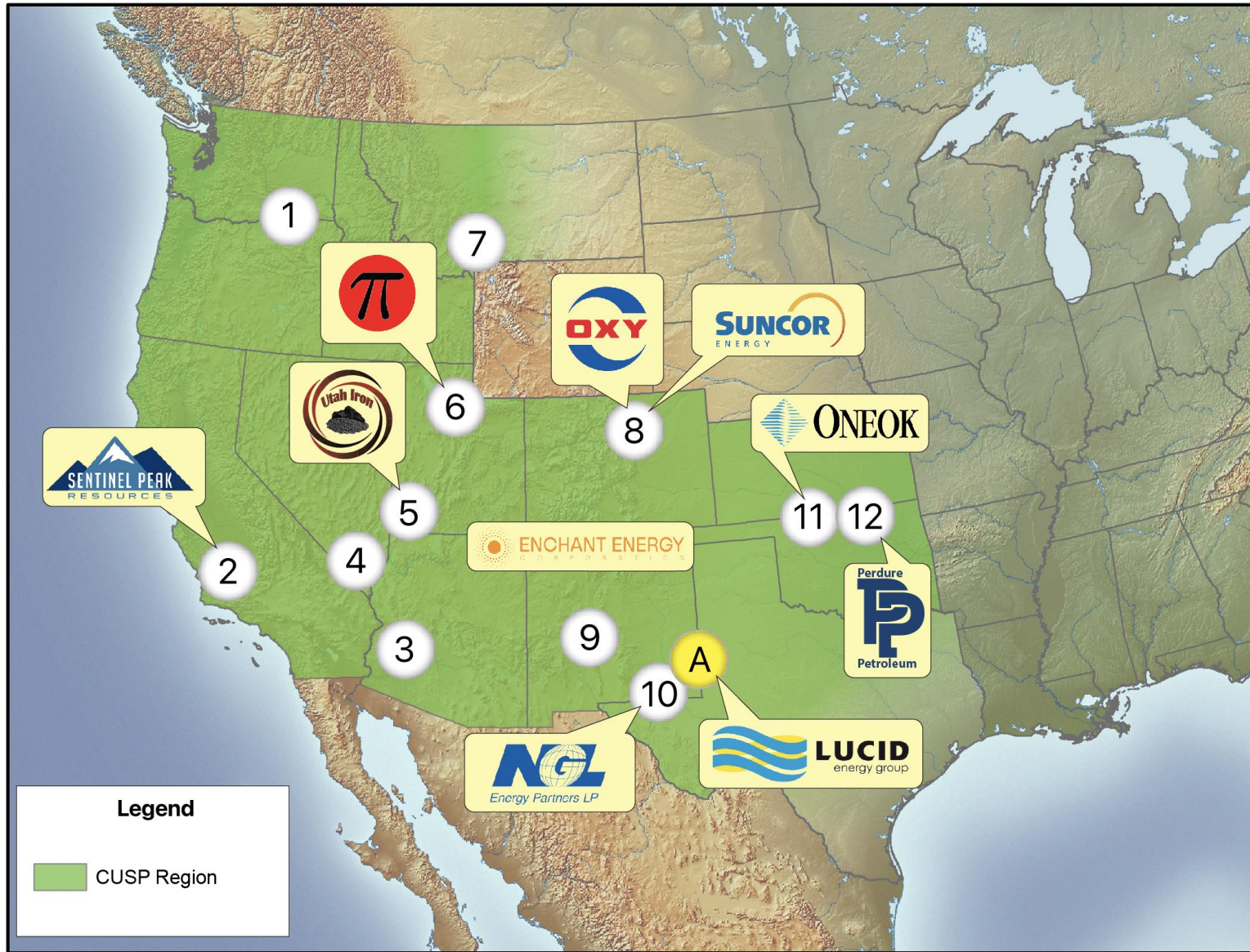


Selected 2021 Portfolio

- 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...

Carbon
America

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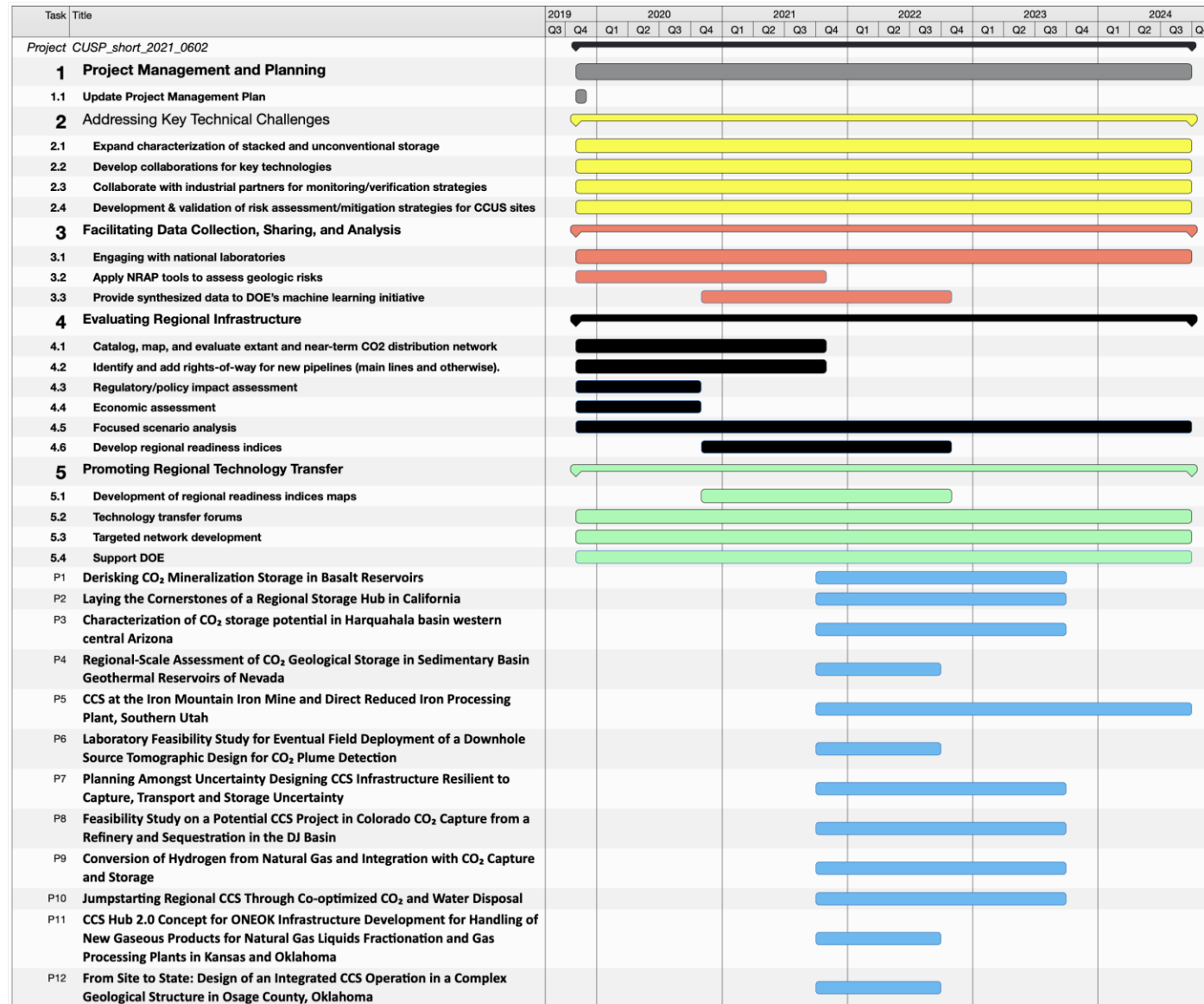


2021 Portfolio - Timeline

- Industry engagement
 - Lucid Energy
 - Enchant Energy
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 - Sentinel Peak Resources
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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

CUSP Members



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