

# SHASTA

**Subsurface Hydrogen Assessment, Storage,  
and Technology Acceleration**

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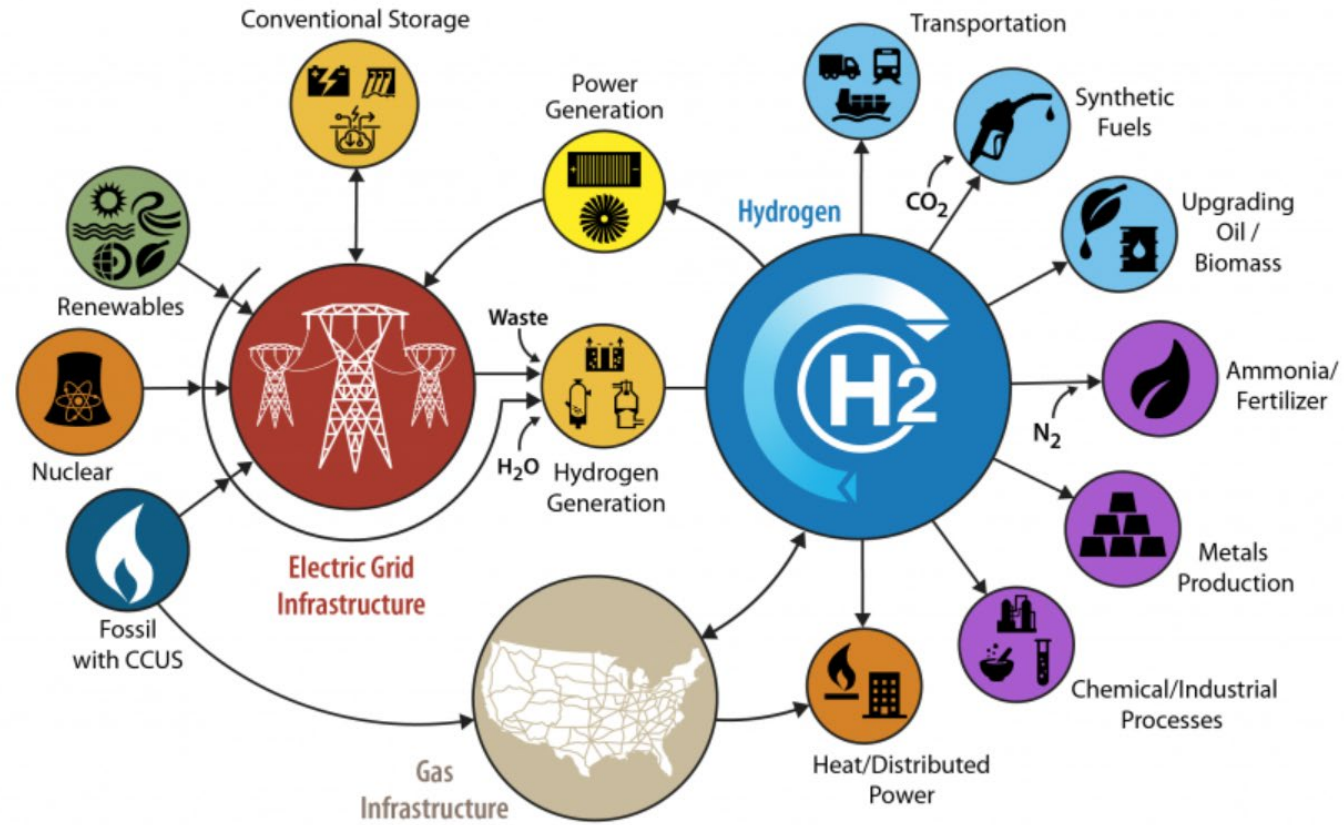
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<https://edx.netl.doe.gov/shasta/>



# DOE's Hydrogen Program Plan



CCUS: Carbon Capture, Utilization, and Storage

Image: <https://www.energy.gov/eere/fuelcells/h2scale>

# SHASTA — Project Objective

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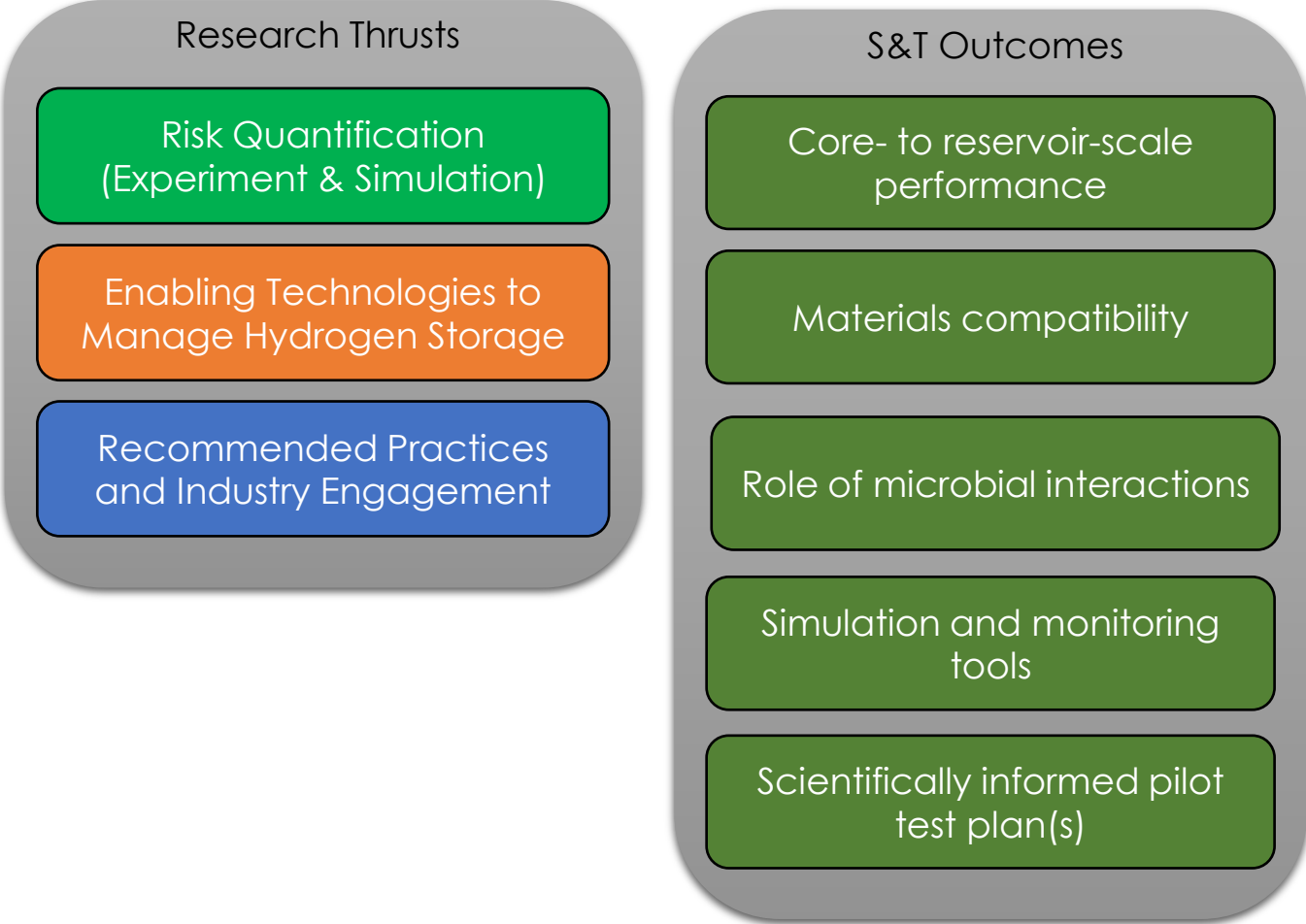
**Address technological hurdles and develop technologies to enable public acceptance of subsurface storage of pure hydrogen and hydrogen/natural gas mixtures.**

## **Specific Goals:**

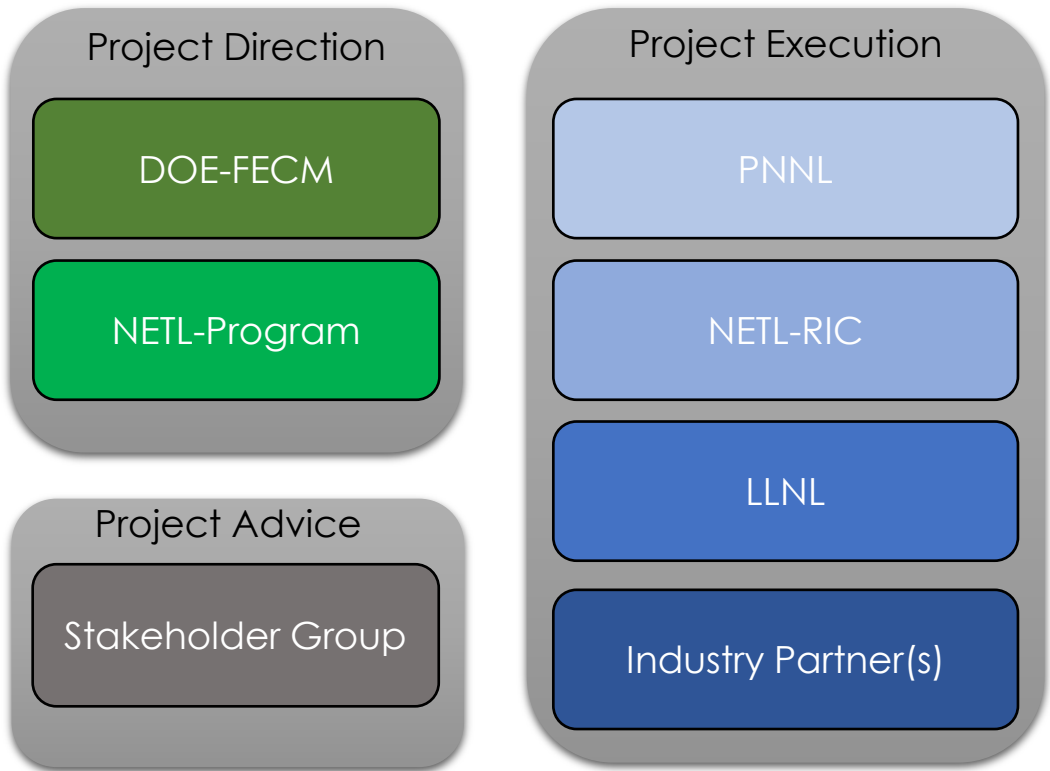
- Quantify operational risks
- Quantify potential for resource losses
- Develop enabling tools, technologies, and recommended practices
- Develop a collaborative field-scale test plan in partnership with relevant stakeholders

# Project organization

## Research Focus



## Structure



# Work Breakdown

## 1 Risk Quantification

- **State-of-Knowledge Report**
- **Research Capabilities**
  - Laboratory Upgrades
  - Simulation Upgrades
- **Fundamental Science**
  - Rock-Gas Interactions
  - Flow Characterization & Dynamics
  - Microbial Interactions
  - Well Materials & Components
- **Risk Assessments**
  - Operational and Safety Risks
  - Social License to Operate

## 2

### Enabling Technologies

- **Software Development**
  - Open-Source Reservoir Simulator
  - Site-Screening Tool
- **Fiber-Optic Sensors**

## 3

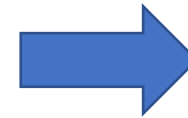
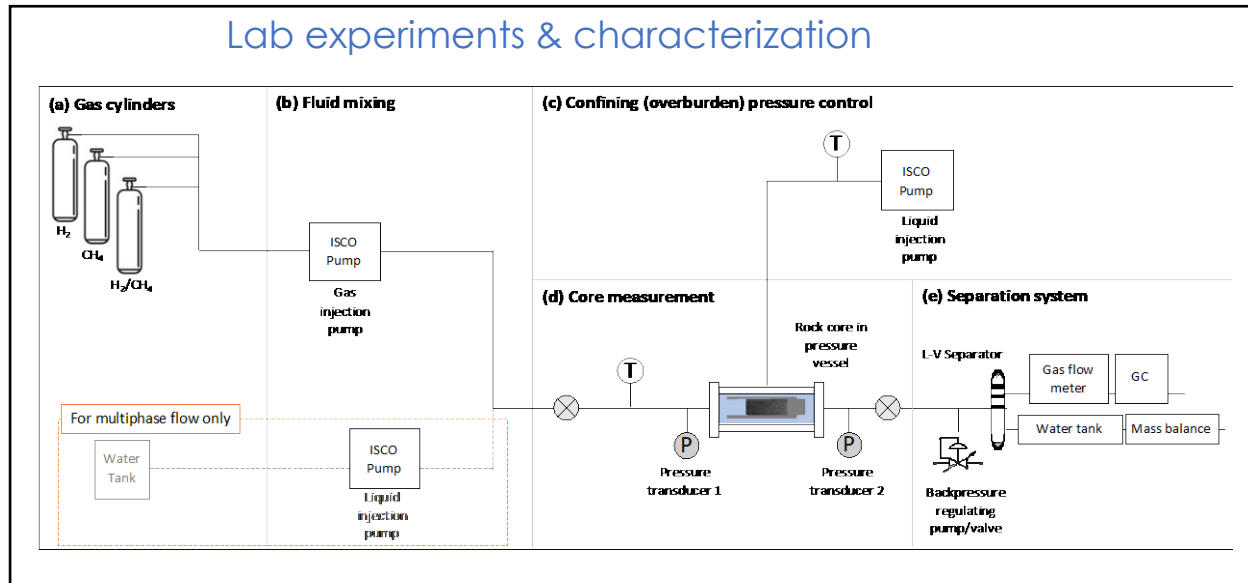
### Stakeholder Engagement

- **Recommended Practices Document(s)**
- **Techno-Economics and the Business Case**
- **Industry / Stakeholder Interactions**
- **Pilot Study Preparation**

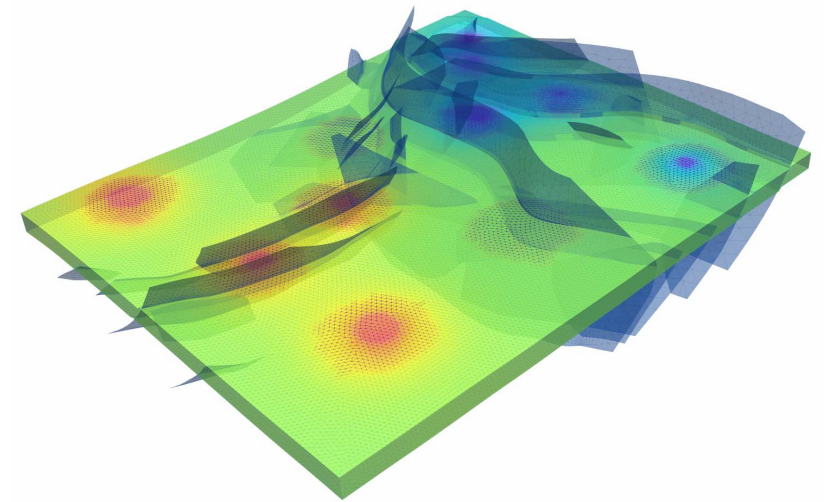
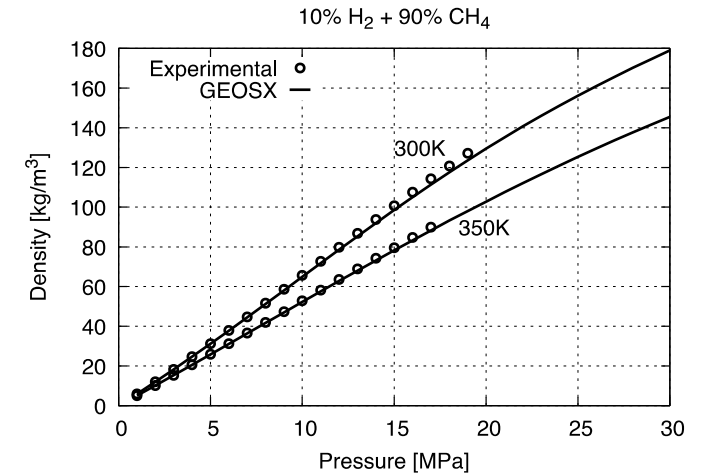
# Guiding Questions: Reservoir Performance

- What is the impact of rock and fluid properties on storage efficiency and energy availability?
- How can H<sub>2</sub>/NG/brine flow dynamics be managed?
- What mechanisms could lead to resource losses?

## Lab experiments & characterization

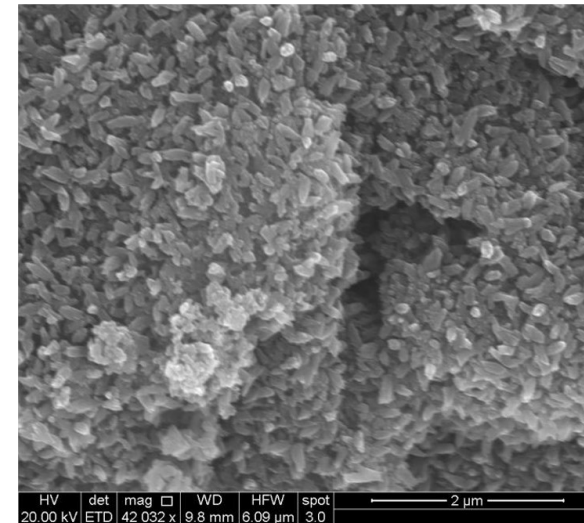
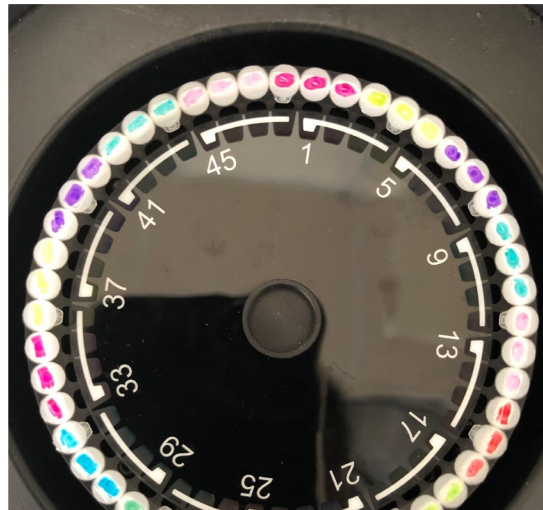
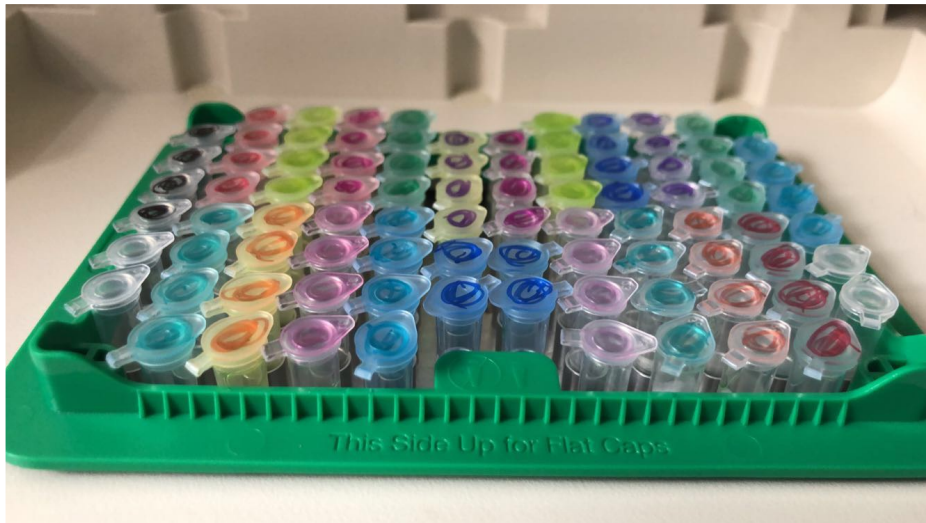


## Numerical studies



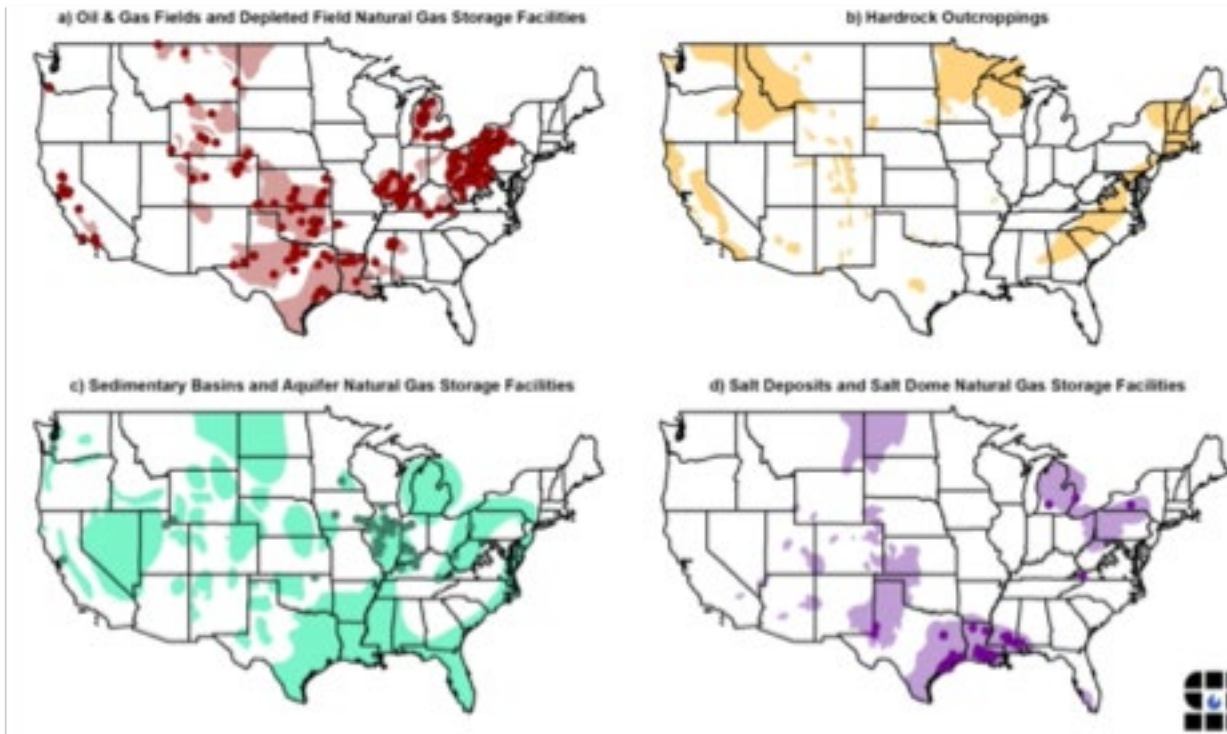
# Guiding Questions: Microbial Interactions

- What are possible impacts of biogeochemical processes?
- What microbial populations and reservoir conditions could be problematic?
- Over what time scales are impacts likely to be realized?

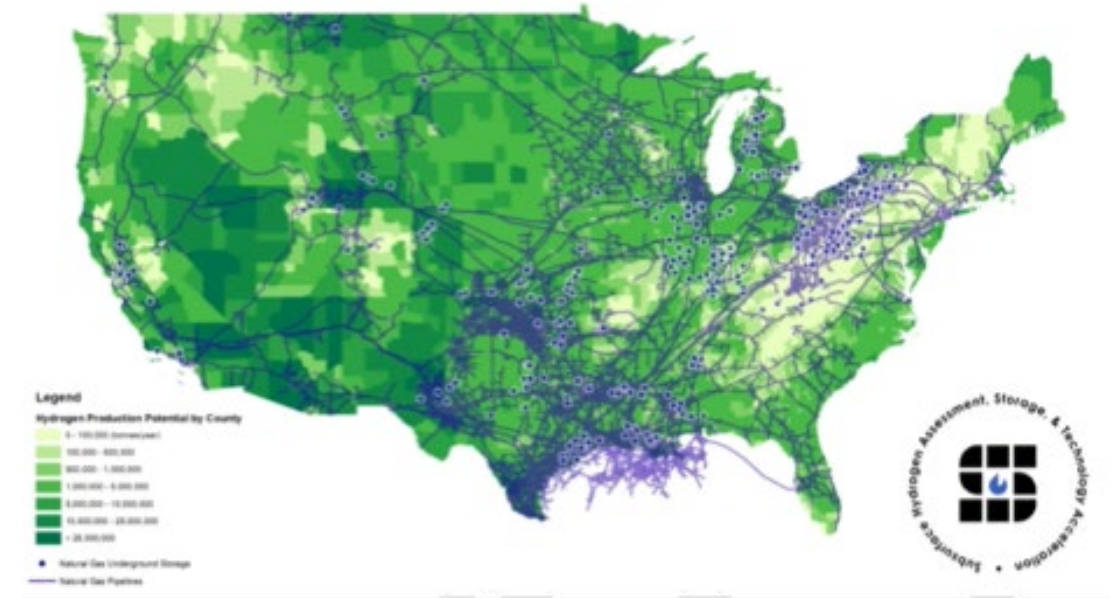


# Guiding Questions: Site Screening & Capacity Estimation

- What is the capacity for hydrogen storage in existing natural gas storage sites?
- What is regional capacity and delivery potential given different energy demand scenarios?
- How can operators assess the feasibility of their subsurface systems for hydrogen storage?



**Figure:** Geographic distribution of different storage formation types (Lord et al 2014) and existing storage facilities (EIA data).



**Figure:** Existing natural gas infrastructure overlain on green hydrogen production potential estimate (EIA data).



# Guiding Questions: Stakeholder Engagement

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- Is current research (SHASTA and others) addressing key concerns that operators, regulators, and the public may have about geologic hydrogen storage (GHS)?
- What is the workflow an operator will go through to deploy GHS, from site-selection, through operational planning and risk assessment, to regulatory approval, and finally field management?
- What complimentary efforts are out there that we can leverage to accelerate this technology?

**This meeting is an ideal forum to tackle many of these questions!**

# Acknowledgements

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**Thank You!**

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