Working Group #2
Integrity of Underground Natural Gas/ Hydrogen Storage

Working Group Leaders:

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Pipeline Transportation: Hydrogen and Emerging Fuels R&D Public Meeting and Forum
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Top 4 Identified R&D Gaps

Gap #1 – Identify then test to better characterize potential microbial interactions (Output type: Technology Development/Infrastructure type: UGS)

Gap #2 – Pilot studies - explore research consortia to share costs across multiple organizations. (Output type: Technology Development/ Infrastructure type: UGS)

Gap #3 – Site Selection - Suitability for Storage - H2 vs. CO2. (Output type: General Knowledge/ Infrastructure type: UGS)

Gap #4 – Hydrogen loss monitoring. (Output type: Technology Development/Infrastructure type: UGS)

NOTE: RED Text Means Possible Academic Focus

Gap #1 Associated Details

Title: Identify then test to better characterize potential microbial interactions (Output type: Technology Development/Infrastructure type: UGS)
Main Objective: Define microbiological risk in hydrogen geologic storage

New or Improved Technology

a. What operating environment(s) must the technology operate in (inside/outside-pipe, above/under-ground, hazardous liquid or natural gas service, etc.)? Underground
b. Can any functionality and or performance requirements be identified (must produce what data, must have a certain threshold of detection, etc.)? Yes. Type of microbe, percentage hydrogen blend affected by, resulting byproduct
c. Does the gap address any regulatory, congressional, or NTSB drivers (more than one category can be included)? Infrastructure bill H2 component, state requirements
d. Does the gap address any related consensus standards or best practices? pre-cursor to API RPs
e. What technical or regulatory roadblocks or barriers prevent the technology deployment? Technical barrier - could prohibit the ability to store hydrogen in UGS
f. What are anticipated targets or timeframes to complete this research (months)? Less than 24 months
g. What funding level is estimated to support such a topic? RFP needed

Gap #2 Associated Details

Title: Pilot field studies - explore research consortia to share costs across multiple organizations. (Output type: Technology Development/ Infrastructure type: UGS)
Main Objective: Field demonstration of underground hydrogen storage

New or Improved Technology

a. What operating environment(s) must the technology operate in (inside/outside-pipe, above/under-ground, hazardous liquid or natural gas service, etc.)? Underground
b. Can any functionality and or performance requirements be identified (must produce what data, must have a certain threshold of detection, etc.)? Yes, feasibility of hydrogen underground storage
c. Does the gap address any regulatory, congressional, or NTSB drivers (more than one category can be included)? Infrastructure bill H2 component, state requirements
d. Does the gap address any related consensus standards or best practices? pre-cursor to API RPs
e. What technical or regulatory roadblocks or barriers prevent the technology deployment? Principal barrier is finding a location and availability
f. What are anticipated targets or timeframes to complete this research (months)? More than 24 months
g. What funding level is estimated to support such a topic? Greater than $5,000K – emphasize consortium approach

Gap #3 Associated Details

Title: Site Selection - Suitability for Storage - H2 vs. CO2. (Output type: General Knowledge/ Infrastructure type: UGS)
Main Objective: Site Selection - Suitability for Storage - H2 vs. CO2 (techno/economic)

Creation and Dissemination of General Knowledge

a. Does the gap address any regulatory, congressional, or NTSB drivers (more than one category can be included)? Infrastructure bill has CCUS and H2 hub component
b. Does the gap address related consensus standards or best practices? pre-cursor to API RPs
c. What technical details or scope items are necessary and recommended? Technical feasibility screening of storing H2 and CO2
d. What are anticipated targets or timeframes to complete this research (months)? More than 24 months
e. What funding level is estimated to support such a topic? RFP needed

Gap #4 Associated Details

Title: Hydrogen loss monitoring. (Output type: Technology Development/ Infrastructure type: UGS)
Main Objective: Understanding and quantifying potential for h2 losses in UGS

New or Improved Technology

a. What operating environment(s) must the technology operate in (inside/outside-pipe, above/under-ground, hazardous liquid or natural gas service, etc.)? Underground
b. Can any functionality and or performance requirements be identified (must produce what data, must have a certain threshold of detection, etc.)? Yes: leakage rates, dissolution, migration
c. Does the gap address any regulatory, congressional, or NTSB drivers (more than one category can be included)? Infrastructure bill H2 component
d. Does the gap address any related consensus standards or best practices? pre-cursor to API RPs
e. What technical or regulatory roadblocks or barriers prevent the technology deployment? Lack of regulations to enable deployment, tied to Gap #2 Pilot
f. What are anticipated targets or timeframes to complete this research (months)? More than 24 months
g. What funding level is estimated to support such a topic? RFP needed

Additional Identified Gaps

1. Well design to ensure integrity: H2/material compatibility, valve / tubing / wellhead configurations, cement blends, inspection and workover issues.
2. Well inspection and monitoring technology
3. Suitability of caprock(s) - what geology and thickness is required
4. Economic suitability
5. Design and composition of wellbore cements for wells in hydrogen service
6. Establishment of operating best practices
7. Investigation of hydrogen buoyancy stratification
8. Improved understanding of geochemical reactions and how they may impact UGS facilities
9. Advanced modeling of geomechanically multi-phase flow performance of various blends within reservoir formations
10. Suitability assessment for conversion for storage types (cavern, reservoir, etc.)

NOTE: Highlighted RED Means Possible Academic Focus

Thank You!/Questions?