

# CCS Monitoring Plan Development

ARB Technical Discussions in Support of CCS QM Development

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# Drawing on Experience

- WRI CCS Guidelines
- DOE Regional Carbon Sequestration Partnership Initiative and Best Practice Manuals
- Carbon Sequestration Council joint comments on UIC Class VI and GHG Reporting Rules
- Initial work on Elk Hills monitoring plan
- Oxy Denver Unit MRV Plan
- ISO 265 for CO<sub>2</sub> Capture, Transportation, and Geological Storage

# Starting Observations

- This process is in support of ARB development of a CCS Quantification Methodology (QM) not a UIC permitting program
- CCS refers to the full chain of capture, transport, and storage however the focus of the technical discussion is on the storage component
- ARB questions also raise the issue of CCUS in the form of EOR

# Main Points Regarding CCS/CCUS Monitoring Plans

- Base monitoring plans on site conditions
  - Site characteristics
  - Operational history
  - Operational plans / procedures
- Focus on cost-effective approaches
  - Impacts CO2 purchase price
  - Impacts economic drivers for capture projects
- Retain flexibility to adopt/encourage monitoring improvements

# 1. Assess Site Conditions

- Determine site specific potential leakage pathways as well as existing infrastructure and procedures to monitor them.
- Elements of review include:
  - Site Characteristics – Questions
    - How well is the site characterized?
    - Any characteristics of importance (e.g., existing traps, extensive confining layer(s), faults, fractures, history of seismicity, non oil/gas wellbores)?
    - Boundaries?
    - Other reservoir constituents of interest (e.g., H<sub>2</sub>S)?

# Site Conditions(cont.)

- Operational History - Questions
  - Nature of operations?
  - Level of documentation?
  - Potential for unknown wells, induced fractures, or other issues?
- Operational Plans and Procedures - Questions
  - How will reservoir pressure be managed?
  - Procedures for modeling, monitoring and maintenance?

## 2. Develop Tailored Monitoring Program

- Determine the cost-effective suite of monitoring tools and approaches to provide data for quantifying storage and detecting potential leaks
- Site assessment allows focus on site specific concerns rather than generic concerns
- Site assessment may favor or rule out different technologies (e.g., surface flux, 4-d seismic)
- Generally, higher degree of certainty at sites with “good bones” and extensive operational history means more finely tuned monitoring

# 3. Build on Existing Infrastructure and Procedures

- In cases of CCUS, existing infrastructure/procedures may also be utilized to provide monitoring data regarding storage
  - Injection pressures
  - Routine facilities inspection and maintenance
  - HSE monitoring for constituent gases such as H<sub>2</sub>S
- Focus shifts to ensure data collection and storage integrity rather than new monitoring wells



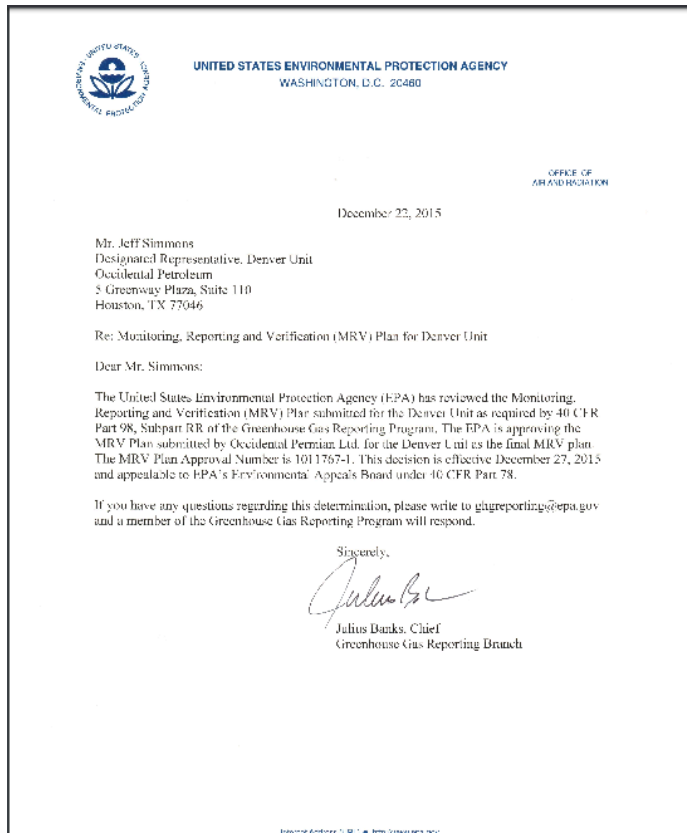
# 4. Anticipate Tech Improvements

- Significant improvements in CCS/CCUS technical knowledge and technology are on the horizon (from CCS/CCUS R&D and other areas of subsurface activity)
- For example:
  - Katherine Romanak's presentation on attribution efforts at Weyburn
  - LDAR programs in oil and gas industry
  - More to come from DOE RCSP and NRAP programs, the oil and gas industry
- Don't stifle innovation by locking in or excluding specific technologies

# EPA GHG Reporting as Example

- Subpart RR monitoring plans include the following elements:
  - Delineation of maximum and active monitoring area
  - Evaluation of potential surface leakage pathways
  - Strategy for detecting and quantifying leaks
  - Strategy for developing baselines
  - Site specific considerations for quantifying stored CO<sub>2</sub>
  - Well identification
  - Commencement date

# Oxy's Denver Unit MRV Plan As Example



- Site assessment showed good bones and strong history
- Ongoing operations provided foundation for monitoring
- Interaction with EPA was invaluable learning experience for EPA and Oxy

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# Questions?

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