

CO₂ Geo-Sequestration

Needs Assessment: Permitting, Data Management, Operations

Presented By:

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Presented at:

Ground Water Protection Council Annual Forum
Salt Lake City, UT
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Purpose

- Presentation of CO₂ Geo-Sequestration Class VI injection well functional program needs to define electronic data tracking and submissions to accomplish management of program.

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Need

- Solicit input from Class VI stakeholders to shape and define data management needs
- Identification of “Areas” of most interest
- Identification of Potential Pilot State Participation
- Comprehensive Data Management and Document Management System
- Provide Information to Develop Survey of Need

Permit Application – Area of Review

| Need: Maps of | Comment | Data | Reg Only |
|--------------------------------|---|------|----------|
| Wells | Is a Map Sufficient? Data List? Submission Format? XML? | | |
| Penetrations | | | |
| Subsurface Cleanup Sites | | | |
| Surface Water | | | |
| Springs | | | |
| Mines (Surface and Subsurface) | | | |
| Structures | | | |
| Roads | | | |
| Faults | | | |

Permit Application – Area of Review

| Need: Size Determination | Comment | Data | Reg Only |
|------------------------------------|---|------|----------|
| Modeling | Size delineation? What Model used? Submission/Storage of Data Files? | | |
| Well Logging | | | |
| Well Testing | | | |
| Seismic | | | |
| Reservoir Conditions | | | |
| Fluid Parameters: Reservoir | | | |
| Fluid Parameters: Injection Stream | Is Supercritical Required? | | |
| Reservoir Structure | | | |



Permit Application – Geology

| Need: Information Submitted | Comment | Data | Reg Only |
|-----------------------------|--|------|----------|
| Hydrogeologic Properties | Data List? Submission Format? | | |
| Structural Geology | | | |
| Injection Zone Geology | Maps? Cross-Sections? | | |
| Confining Zone(s) Geology | | | |
| Seismic History | Seismic Sources | | |
| Faults | Location/Orientation how submitted? How Determined to be non-transmissive? | | |
| Reservoir Parameters | Depth, areal extent, thickness, mineralogy, porosity, permeability, capillary pressure, etc. | | |
| Cores | | | |

Permit Application – Geology

| Need: Information Submitted | Comment | Data | Reg Only |
|--|---------|------|----------|
| Geology/Facies Changes | | | |
| Outcrop Data | | | |
| Well Logs and Tests | | | |
| Geomechanical Information on Fractures | | | |
| Stress | | | |
| Ductility | | | |
| Rock Strength | | | |
| In situ Fluid Pressures | | | |

Permit Application – Well Construction

| Need: Proposed Construction | Comment | Data | Reg Only |
|-----------------------------|--------------------------------|------|----------|
| Well – Location(s) | | | |
| Well Design | Horizontal? Multiple Laterals? | | |
| Casing, Tubing & Packer | Setting Points | | |
| Surface: Wellhead | | | |
| Surface: Facilities | | | |
| Perforations | | | |
| Monitor Wells - Locations | | | |
| Monitor Well Depths | | | |
| Stimulation | | | |

Permit Application – Risk Assessment

| Need: Actions | Comment | Data | Reg Only |
|---------------------------|---------|------|----------|
| Risk to USDW | | | |
| Risk to Health | | | |
| Waste Stream Properties | | | |
| Formation Compatibility | | | |
| Water Compatibility | | | |
| Proposed Testing Schedule | | | |
| | | | |
| | | | |



Permit Application – Beyond SDWA

| Need: Actions | Comment | Data | Reg Only |
|---------------------------|--|------|----------|
| Clean Air Act | | | |
| RCRA | Resource Conservation and Recovery Act | | |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act | | |
| Waste Capture | | | |
| Waste Transport | | | |
| Other Permit Requirements | NPDES, etc. | | |
| 40 CFR 144.31 | | | |
| | | | |



Permit Application – Waiver

| Need: NODA (8/24/2009) | Comment | Data | Reg Only |
|-------------------------------------|---------|------|-------------|
| Injection Above/Between USDWs | | | |
| Public Notice Process | | | |
| Coordination with other Agencies | | | |
| Aquifer Exemptions | | | |
| | | | |



Permit Application – Approval

| Need: Process | Comment | Data | Reg Only |
|------------------------------------|---|------|----------|
| Proposed Monitor Plans | | | |
| Meets Criteria | List of Criteria? | | |
| Proposed Operating Constraints | | | |
| Source of Injectate | | | |
| Corrective Actions on Wells in AoR | | | |
| MIT | | | |
| Permit Issuance | | | |
| Data Migration | Should application data be migrated to production data? CROMEER | | |
| Public Notice | | | |

Financial Assurance

| Need: Revision Process | Comment | Data | Reg Only |
|----------------------------------|---------------------|------|-------------|
| Type of Assurance | | | |
| Level of Assurance | | | |
| Plan over Time | Frequency of Review | | |
| Process of Adjustment | | | |
| Operation | | | |
| Post Injection | | | |
| Closure | | | |
| Emergency & Remedial Response | | | |



Plan Submissions

| Need: Submission | Comment | Data | Reg Only |
|----------------------|----------------------------------|------|----------|
| AoR Plan | Details and Actions following... | | |
| Site Closure Plan | | | |
| Plugging Plan | | | |
| Emergency Plan | | | |
| Remedial Action Plan | | | |
| | | | |
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AoR Plan – Details & Actions

| Need: Revision Process | Comment | Data | Reg Only |
|--------------------------------|------------------------------|------|----------|
| Re-modeling – History Matching | | | |
| Corrective Action(s) | | | |
| Adjustment of Monitoring | | | |
| Adjustment of Plume Migration | | | |
| Frequency of Update | What Triggers a Plan Review? | | |
| Geology Adjustments | | | |
| New Wells/Penetrations | | | |

Facility Management

| Need: Revision Process | Comment | Data | Reg Only |
|---------------------------|---------|------|-------------|
| Ownership | | | |
| Location | | | |
| Surface Facilities | | | |
| Safety Features | | | |
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Permit Management

| Need: Revision Process | Comment | Data | Reg Only |
|------------------------|---------|------|----------|
| Permit Authorizations | | | |
| Modifications | | | |
| Requests | | | |
| History | | | |
| Wells Associated | | | |
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Well Management

| Need: | Comment | Data | Reg Only |
|------------------------------|--|------|----------|
| Injection Wells | | | |
| Monitor Wells | | | |
| Construction | Strings, Cement | | |
| Below Land Surface Locations | Vertical and Horizontal Considerations | | |
| Completions | Location, Stimulation | | |
| Existing Wells | Special Conditions? | | |
| Brine Production Wells | Will withdraw from injection zone be required? | | |
| | | | |



Geology

| Need: | Comment | Data | Reg Only |
|----------------------|----------------------|------|----------|
| Zones | | | |
| Structure | | | |
| Faults | | | |
| Geochemistry | | | |
| Reservoir Parameters | | | |
| Well Logging | Raw Data or Results? | | |
| Well Testing | | | |
| Seismic | | | |



Monitoring

| Need: | Comment | Data | Reg Only |
|---------------------|-------------------------|------|----------|
| Well Activities | Pressures/Volumes/Rates | | |
| Waste Stream | Components/Tracers | | |
| Water Quality | | | |
| Well Integrity | Corrosion, MITs | | |
| Pressure Front | | | |
| Soil | | | |
| Air | | | |
| Supercritical Fluid | | | |
| Changes over Time | Baseline Requirements | | |

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Compliance/Enforcement

| Need: | Comment | Data | Reg Only |
|----------------------|---------|------|----------|
| Operating Conditions | | | |
| Pressures | | | |
| Rates | | | |
| Volumes | | | |
| MITs | | | |
| Enforcement Actions | | | |
| Fines | | | |
| Payments | | | |



Reporting

| Need: | Comment | Data | Reg Only |
|-------------|--|------|----------|
| Submissions | Electronic Submission from Regulated Community | | |
| EPA | Submission to National Oversight | | |
| CO2 Balance | Accounting for Quantity Sequestered | | |
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Post Injection & Closure

| Need: | Comment | Data | Reg Only |
|------------------|---------|------|----------|
| Monitoring Plan | | | |
| Post Injection | | | |
| Requirements | | | |
| Reporting | | | |
| MIT | | | |
| Plume Monitoring | | | |
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Emergency & Remedial Action

| Need: | Comment | Data | Reg Only |
|------------------|---------|------|----------|
| Financial | | | |
| Location of Plan | | | |
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Other Considerations

| Need: | Comment | Data | Reg Only |
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