



A New Energy Future for Montana, Idaho, South Dakota, Wyoming, the Pacific Northwest and the Nation

**CO₂ Sequestration with Enhanced Oil Recovery:
Lost Soldier Wertz Field**

2006

***REGIONAL CARBON SEQUESTRATION PARTNERSHIPS ANNUAL
REVIEW MEETING***

National Energy Technology Laboratory

Pittsburgh, PA

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Technical Lead and Partners

- **BSCSP Lead: Geoffrey Thyne, James R. Steidtmann Enhance Oil Recover Institute, Univ. of Wyoming**
- **Field Test Partners: Merit Energy**
- **Field Test Information:**
 - **Field Test Name: Reactive Carbonate Reservoir (Madison Formation) Field Validation Test**
 - **Test Location: Lost Soldier and Wertz Fields, South Central Wyoming**
 - **Amount and Source of CO₂: N/A**

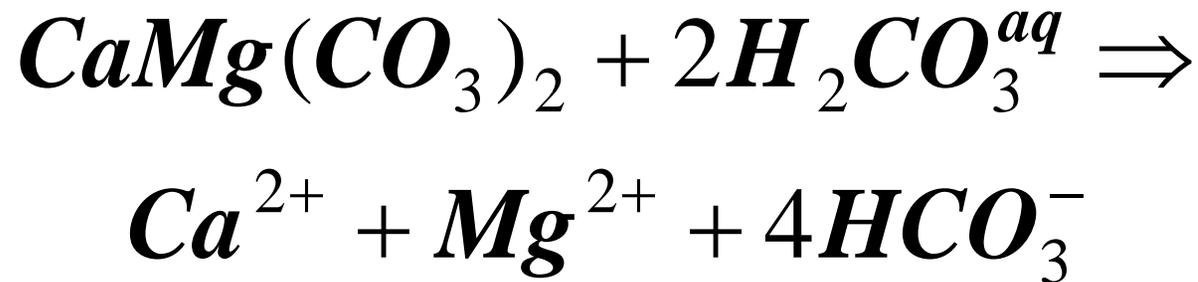
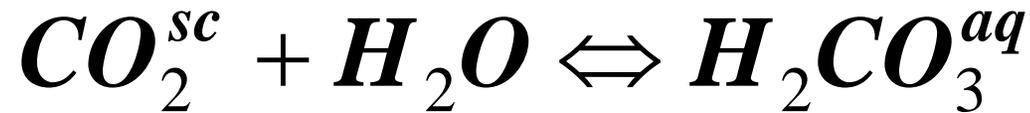
Cost and Key Dates

- **Total Field Project Cost: \$675.6K**
 - **DOE Share: \$500.0K** 74%
 - **Non-DoE Share: \$175.6K*** 26%
 - *Does not include TBD cost share associated with collection of new core.
- **Field Project Key Dates**
 - **Baseline Completed: 9/30/2006**
 - **Drilling Operations Begin: 3/31/2008**
 - **Injection Operations Begin: N/A**
 - **MMV Events: N/A**

BSCSP Geologic Approach

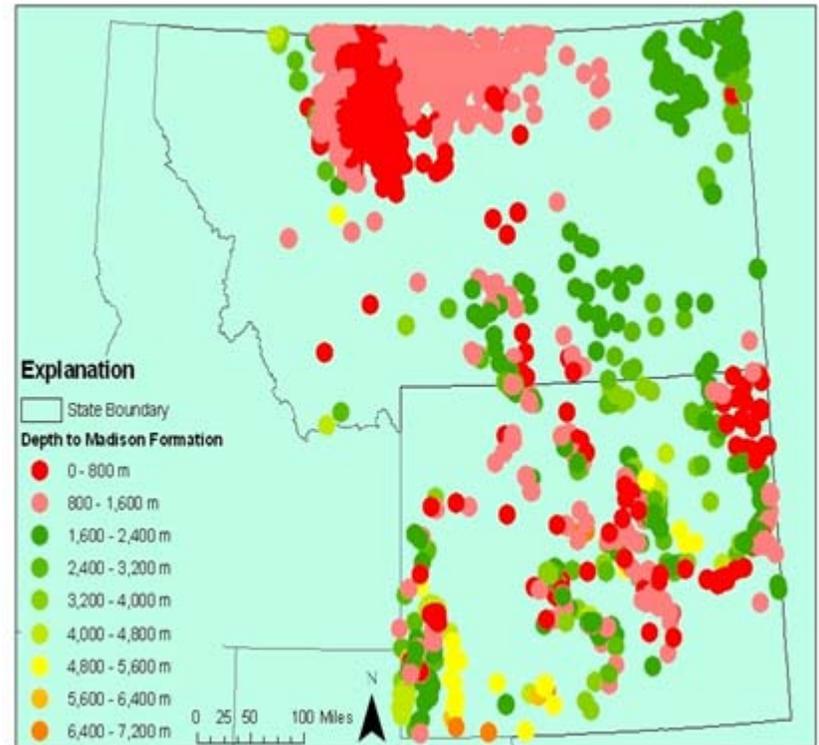
- Take advantage of reactive properties of CO₂
 - Identify sequestration targets with multiple trapping mechanisms
 - Emphasize mineral or other chemical reaction trapping
- Develop robust geologic sequestration options to permanently store CO₂
 - Conversion to alkalinity and carbonate minerals

Reactive Trapping of CO₂



Reactive Carbonate Reservoir (Madison Formation) Field Validation Test

- Regionally abundant carbonate rocks (dolomites and limestones) are highly reactive with CO₂
- Reactions should result in permeability and porosity increases
- Large Capacity
 - 50-200 GtCO₂ storage capacity (GWG methodology)



Depth to top of Madison Formation

Field Test Overview

- Assess long-term CO₂ mineralization rates in the Wertz and Lost Soldier Fields in south central Wyoming (Madison Formation target)
- Collect core from reservoir that has undergone CO₂ EOR
 - long CO₂ exposure history
 - Compare to preinjection core
 - Validate predictive modeling of CO₂ injection

Field Test Approach

- Focus on the consequences of the long-term exposure of carbonate rocks to CO₂-rich fluids
- Conduct modeling studies to match the history of preinjection and post injection conditions
 - Changes in water chemistry
 - Changes in permeability and porosity
 - Quantify changes in carbon storage potential

Accomplishments (1)

- Acquisition of Merit production and geological data for LS-W fields which includes separate
 - Injection and production data for the Madison interval.
 - Preliminary agreement with Merit for deepening existing well into the Madison and collecting core.
- Established contact with ZERT to evaluate appropriate role for EORI and potential collaborations.
- Preliminary agreement with LNLL to use laboratory equipment for appropriate simulations.
- Contract with WRI for joint tracer study in place, initial analytical procedures verified and instrument selected.

Accomplishments (2)

- Selection of the software packages for creation of the geological and multiphase flow model.
- Acquisition of the Petral-Eclipse software and accompanying system is configured specifically for running parallel ECLIPSE simulators (in purchasing phase).
- Initial discussions with Rockware to provide PetraSim software and latest update for new EOS as well as construction of preliminary model of LS-W Fields. Contract in place by end of month.
- Contracting study of naturally-occurring CO₂ reservoirs in the Rocky Mountain region. Contract in place by end of month.

Path Forward

Task 4.0 - Reactive Carbonate Reservoir (Madison Formation) Field Validation Test	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Task 4.1 - Planning															
Initial and detailed project planning				Gm4											
Site selection for Madison Formation core															
Final report preparation															
Task 4.2 - Reservoir Characterization															
Geochemical modeling															
Sample / Analyze Anadarko samples of early CO ₂ flood brine composition															
Lab experiments on Madison Formation									Gm10						
Madison stratigraphic reservoir characterization															
Tracer Study - Madison Reservoir															
Obtain and characterize Madison core										Gm12					
Task 4.3 - Geologic Structural Analysis															
Reservoir mapping															
3D seismic interpretation															
Rock mechanics															

Gm4	9/30/2006	Complete and document detailed reactive carbonate reservoir project planning
Gm10	12/31/2007	Complete initial lab experiments and brine composition changes for reactive carbonate reservoir activities supporting review and realignment of future activities
Gm12	3/31/2008	Collect Madison Formation core in cooperation with industry partner
Gm18	9/30/2009	Complete final Reactive Carbonate Reservoir topical report

Key Issues

- Negotiations with industry partner for timely piggy-back coring opportunity