FACTSHEET FOR PARTNERSHIP FIELD VALIDATION TEST

Partnership Name	Plains CO_2 Reduction (PCOR) Partnership – Phase II	
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Principal Investigator	Edward Steadman	
Field Test Information: Field Test Name	Lignite in North Dakota Field Validation Test	
Test Location	Section 36-T159N-R90W in Burke County, North Dakota	
Amount and Source of CO_2	Tons Less than 1000 tons for the project	Source Commercial source – to be determined
Field Test Partners (Primary Sponsors)	Flatland Exploration Company, subsidiary of Fischer Oil and Gas	
	ND State Land Department	
	Eagle Operating, Inc.	
	Schlumberger	

Summary of Field Test Site and Operations:

CO_2 in an Unminable Lignite Seam – CO_2 will be injected into an unminable lignite seam in northwestern North Dakota. Our working hypothesis is that the injected CO_2 will naturally bond to the surfaces of the fractured lignite and be held there by hydrostatic pressure. The injected CO_2 also has the potential to displace methane occupying the coal fractures. This validation test will provide valuable information regarding lignite for both CO_2 sequestration and enhanced coalbed methane (CBM) production.

Research Objectives:

The objectives of this demonstration are to 1) determine the accuracy with which CO_2 storage capacity in lignite coal can be predicted; 2) develop robust data regarding the potential for CBM to be produced from lignite coal as a by-product of CO_2 injection; 3) demonstrate cost-effective monitoring, mitigation, and verification (MMV) technologies and protocols for CO_2 sequestration and enhanced CBM in a lignite coal seam; and 4) provide field validation testing of sequestration technologies and infrastructure approaches that can lead to wide-scale deployment in coal fields throughout the PCOR Partnership region.

Summary of Modeling and MMV Efforts: (Use the table provided for MMV)

Geophysical logs have been used to delineate stratigraphy, structure, and petrophysical properties. Schlumberger's Petrel has been used for geological model creation. Once this model is populated and calibrated, it will be fed into Schlumberger's Eclipse model for CO_2 simulation.

The applicability of various MMV technologies (tiltmeter survey, gravity survey, tracer study, and seismic survey) to the lignite test continues to be researched and evaluated. The selection and application of specific MMV technologies will be conducted in the upcoming months. This analysis will occur after the interpretation of geological characteristics data that were gathered during drilling activities. Additionally, the pump test design for the dewatering phase of this task is under development.

At a minimum, pressure and water quality will be monitored in wells. Pressure measurements will provide an understanding of the pressure front advancement in the reservoir in response to the injection. Water samples will be collected from different horizons.

SUMMARY OF MONITORING METHODS BEING CONSIDERED		
Measurement Technique	Measurement Parameters	Application
Introduced and/or Natural Tracers	Travel time Identification of CO_2 sources	Tracing movement of CO_2 in the storage formation Quantifying solubility trapping Tracing leakage
Water Composition	CO_2, HCO_3^-, CO_3^{2-} Major ions Trace elements Salinity	Quantifying solubility and mineral trapping Quantifying CO_2–water–rock interactions Detecting any leakage into shallow groundwater aquifers
Subsurface Pressure	Formation pressure Annulus pressure Groundwater aquifer pressure	Control of formation pressure below fracture gradient Wellbore and injection tubing condition Leakage out of the storage formation
Well Logs	Brine salinity Sonic velocity CO_2 saturation	Tracking CO_2 movement in and above storage formation Tracking migration of brine into Shallow aquifers Calibrating seismic velocities for 3D seismic surveys
Passive Seismic Monitoring	Location, magnitude and source characteristics of seismic events	Delineation of microfractures in formation or caprock Delineating potential CO_2 migration pathways
Time-Lapse Gravity Techniques	Density changes caused by fluid displacement	Detect CO_2 movement in and above the storage formation Locate CO_2 migration pathways
Tiltmeter	Detect and monitor changes in the surface inclination	Detect CO_2 movement in and above the storage formation Locate CO_2 migration pathways

Accomplishments to Date:

- Well drilling is completed.
- Logging is completed, and logs are being processed in collaboration with Schlumberger.
- Core is collected, and its analysis is in progress.
- Canister tests are under way.
- Drill cuttings have been collected and described.
- All five wells have been perforated, and initial swabbing has occurred.
- Initial geological and numerical models have been created.
- Preliminary simulations have been run which provide guidance for the possible outcome of CO_2 injection activities in the coal seam.

Figure 1. Rig crew from Eagle Operating Incorporated drilling a well at the lignite field site.

Figure 2. Examining core at the field site.

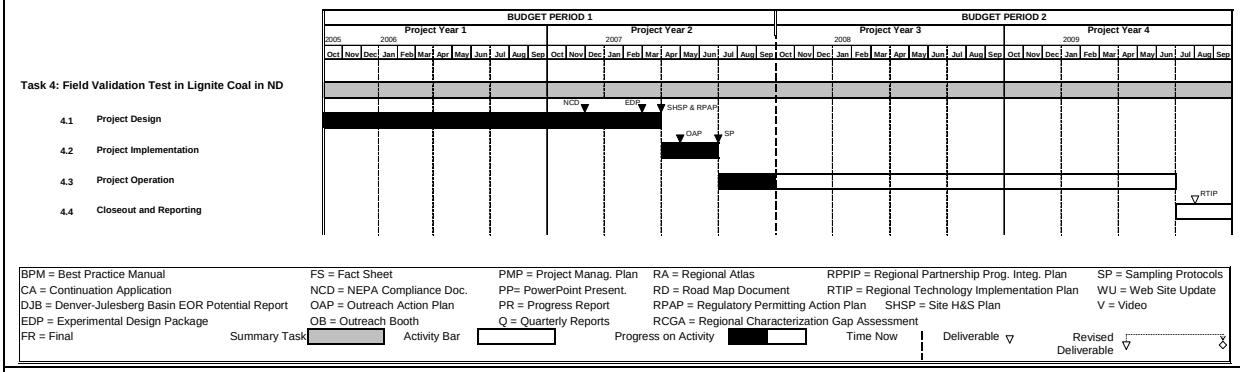
Summarize Target Sink Storage Opportunities and Benefits to the Region:

The results of Phase I reconnaissance-level characterization activities indicated that low-rank coal seams (such as lignite) in the region may have the capacity to store 8360 million tons of CO_2. Phase I results also suggested that there may be over 17 trillion cubic feet of methane that could be produced from low-rank coal seams. To date, no field studies have been conducted on the ability of lignite coal seams to store CO_2. The field-based investigations conducted under this activity will provide previously unavailable insight regarding the sequestration of CO_2 in low-rank coals. This insight can be broadly applicable in the region, as low-rank coal seams are known to occur throughout western North America.

Cost:	**Field Project Key Dates:**
Total Field Project Cost: $4,596,909 **DOE Share: $2,829,208 62%** **Non-Doe Share: $1,767,701 38%**	**Baseline Completed:** Ongoing **Drilling Operations Begin:** August 2007 **Injection Operations Begin:** Summer 2008 **MMV Events:** Summer 2008

Field Test Schedule and Milestones (Gantt Chart):

- National Environmental Policy Act Compliance document due November 30, 2006 – completed on schedule
- Experimental design package due February 28, 2007 – completed on schedule
- Site Health and Safety Plan March 31, 2007 – completed on schedule
- Regulatory Permitting Action Plan March 31, 2007 – completed on schedule
- Outreach Action Plan April 30, 2007 – completed on schedule
- Sampling protocols due June 30, 2007 – completed on schedule
- Regional Technology Implementation Plan due July 31, 2009.



BPM = Best Practice Manual	FS = Fact Sheet	PMP = Project Manag. Plan	RA = Regional Atlas	RPPIP = Regional Partnership Prog. Integ. Plan	SP = Sampling Protocols
CA = Continuation Application	NCD = NEPA Compliance Doc.	PP= PowerPoint Present.	RD = Road Map Document	RTIP = Regional Technology Implementation Plan	WU = Web Site Update
DJB = Denver-Julesberg Basin EOR Potential Report	OAP = Outreach Action Plan	PR = Progress Report	RPAP = Regulatory Permitting Action Plan	SHSP = Site H&S Plan	V = Video
EDP = Experimental Design Package	OB = Outreach Booth	Q = Quarterly Reports	RCGA = Regional Characterization Gap Assessment		
FR = Final	Summary Task	Activity Bar	Progress on Activity	Time Now	Deliverable / Revised Deliverable

Additional Information

In the upcoming months, log processing and laboratory- and field-scale tests will be completed. The anticipated field-scale experiments include, at a minimum, a pump test. Well stimulation will be conducted if necessary. Acquired log data, core analysis, and in situ monitoring data will be used to further refine the simulation model and begin modeling CO_2 fate. CO_2 injection is anticipated for the summer of 2008. At that time, the MMV program will be implemented.