FACT SHEET FOR PARTNERSHIP DEMONSTRATION TEST

Partnership Name	Plains CO_2 Reduction (PCOR) Partnership – Phase III	
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Principal Investigator	Edward Steadman	
Field Test Information: Field Test Name	Fort Nelson Demonstration Test	
Test Location	British Columbia, Canada	
Amount and Source of CO_2	Tons Approximately 1.2 million tons of CO_2 per year	Source Fort Nelson natural gas-processing plant
Field Test Partners (Primary Sponsors)	Spectra Energy	
	Natural Resources Canada	
	British Columbia Ministry of Energy, Mines, and Petroleum Resources	

Summary of Field Test Site and Operations:

This demonstration will utilize CO_2 from the Fort Nelson natural gas-processing plant in northeastern British Columbia, Canada (Figures 1 and 2). The CO_2 will be compressed and transported from the Fort Nelson plant in a supercritical state via pipeline to the target injection location. Previously, a specific brine formation and injection location was chosen, however, subsequent investigations have indicated that the cap rock at the site may be fractured. We are presently supporting Spectra's efforts to choose a new site. We anticipate that the target zone will be a Devonian-age carbonate rock formation located in relatively close proximity to the Fort Nelson gas plant (<50 miles).

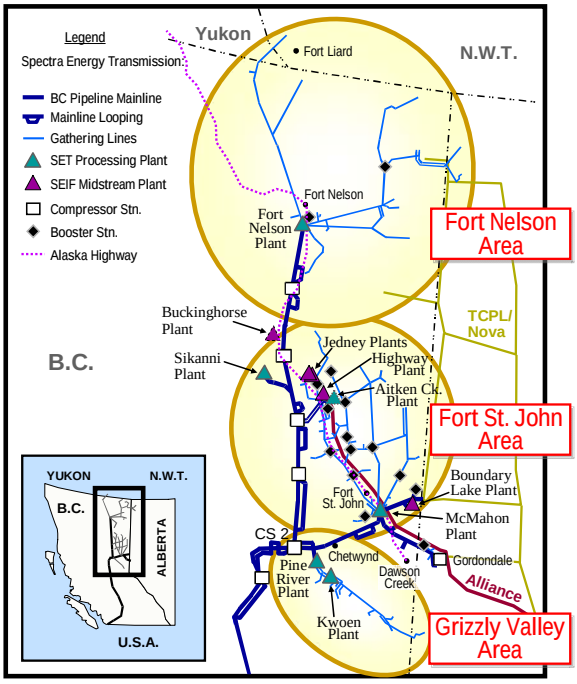


Figure 1. Major gas-producing areas of northeastern British Columbia, including the Fort Nelson area.

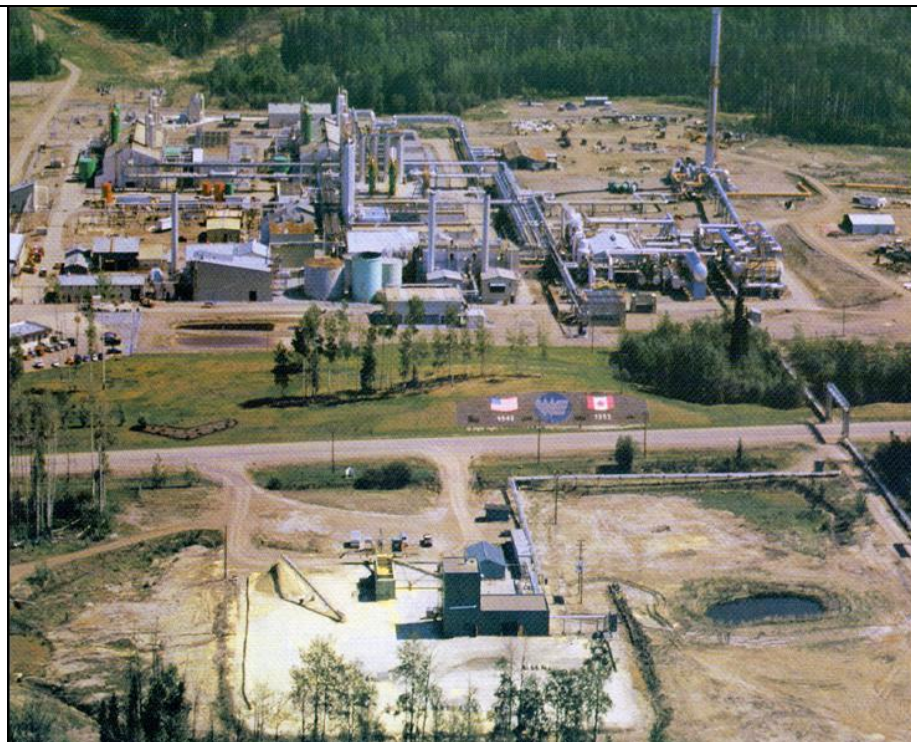


Figure 2. Fort Nelson gas plant, British Columbia, Canada.

The results of Phases I and II of the PCOR Partnership show that many areas of the western Canada sedimentary basin, which includes the Fort Nelson area in northeastern British Columbia, have CO_2 storage capacities exceeding several million tons per square mile and, as such, represent a very significant long-term sink. The target injection formation will likely be at a depth of between 6500 and 7500 feet. Formations in this depth range will be at the temperature and pressure that ensure the injected CO_2 remains in a supercritical state. The thickest, most comprehensive seal for the Devonian carbonate rock formations under consideration will be provided by the massive and extensive shales of the Fort Simpson Formation. The Fort Simpson Formation in northeastern British Columbia and northwestern Alberta is characterized by low permeability and high geomechanical strength. Based on the very low permeability and high mechanical strength of the shale, this cap provides a very competent seal for underlying brine formation reservoirs. The cumulative average thickness of the Fort Simpson Formation is approximately 500 m, and in some areas, the thickness can be in excess of 1000 m. The Fort Simpson Formation is laterally extensive, covering thousands of square miles. Secondary seals also exist above the Fort Simpson Formation in the areas being considered. The most competent and massive of these secondary seals is the Banff Formation, which is predominantly shale and not less than 100 feet thick in the Fort Nelson area.

The PCOR Partnership will conduct a modeling and monitoring, mitigation, and verification (MMV) program associated with a project that will inject approximately 1.2 million tons of CO_2 per year. Spectra Energy will be working closely with the British Columbia Ministry of Energy, Mines, and Petroleum Resources (BCMEMPR) to obtain the necessary permits and regulatory approval to conduct large-scale CO_2 injection activities in the area.

It is likely that a minimum of two injection wells will be employed to provide redundancy in the event that one of the injectors experiences problems. Site development may include conducting a small-

scale pilot test if feasible. It is anticipated that new wells will have to be drilled for use as injectors and monitoring wells. It is anticipated that new pipeline and infrastructure will have to be constructed for the Fort Nelson CO_2 injection project. Site design may include compression and pumps for CO_2 injection and equipment for monitoring (e.g., pressure, temperature and strain gauges, and fluid sampling equipment). It is expected that both borehole and surface monitoring tools will be used along with the application of wireline logging techniques during the drilling of injection and monitoring wells. The use of tracers, fluid sampling, pressure, and deformation monitoring along with numerical modeling will be applied to definitively determine the subsurface area that will be affected by the injection.

As mentioned above, Spectra Energy has not finalized the selection of either the surface location of the injection site or the specific vertical zone of the brine formation into which the acid gas will be injected, which makes estimates of injectivity and capacity purely speculative at this time.

Research Objectives:

The PCOR Partnership Phase III Fort Nelson CO_2 test program will develop detailed and previously unavailable insight regarding a wide variety of issues associated with the geological sequestration of CO_2. The primary research and development targets are summarized below:

- Cost-effective MMV approaches for large-scale CO_2 sequestration in brine formations will be suggested for deployment and evaluation.
- Modeling simulation approaches to predict and estimate CO_2 injectivity, plume areal extent, mobility, and fate within the target formation will be recommended for field testing. Site characterization and MMV activities will be recommended to support these efforts.
- Approaches to predict the effects of CO_2 on the integrity of overlying sealing formations will be suggested for verification and validation with field- and laboratory-based data. Testing and modeling of the key geomechanical and geochemical parameters of sealing formations that might be affected by large-scale CO_2 injection will support these efforts.

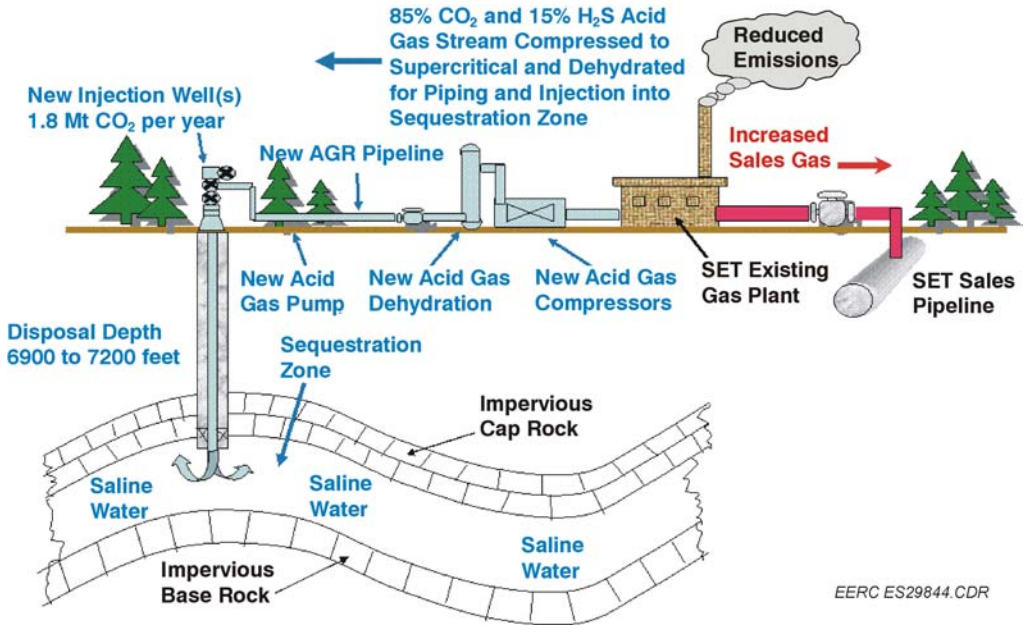


Figure 3. Diagram summarizing key elements of the Fort Nelson test.

Summary of Anticipated Modeling and MMV Efforts:

Measurement Technique	Measurement Parameters	Application
Introduced and Natural Tracers	Travel time Partitioning of CO_2 and H_2S into brine Identification sources of CO_2	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 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 3-D seismic surveys

Accomplishments to Date:

The PCOR Partnership was awarded the third phase of the Regional Carbon Sequestration Partnership program in October 2007. The activities for the Fort Nelson demonstration are progressing. A Site Geological Characterization Experimental Design Package and a Geomechanical Experimental Design Package have been prepared. Baseline characterization activities have been initiated, and potential specific drilling locations have been identified. The Energy & Environmental Research Center is working closely with Spectra, Schlumberger, and RPS Engineering to develop and implement a comprehensive MMV plan. Final injection well locations will be determined by the first quarter of 2009, with drilling being tentatively scheduled to begin in the second quarter of 2009.

Summarize Target Sink Storage Opportunities and Benefits to the Region:

- Satisfies DOE desire to participate in a demonstration of carbon capture and storage (CCS) of 1 Mt/year in a saline formation.
- The project will result in the establishment of relevant, cost-effective MMV protocols for saline formation CCS that can be applied throughout the world.
- DOE will benefit from the international nature of the project.
- The efficient and streamlined nature of the key elements may well lead to one of the most rapid commercial deployments of a saline formation CCS project in North America.
- Transform British Columbia's largest emission point source into one of the world's largest CO_2 sequestration projects.
- Permanent sequestration of approximately 1.2 Mt of CO_2/year.

Cost:

Total Field Project Cost: $12,497,462

DOE Share: $10,020,000 80%

Non-Doe Share: $2,477,462 20%

Field Project Key Dates: Anticipated to be on schedule with Gantt Chart – see below:

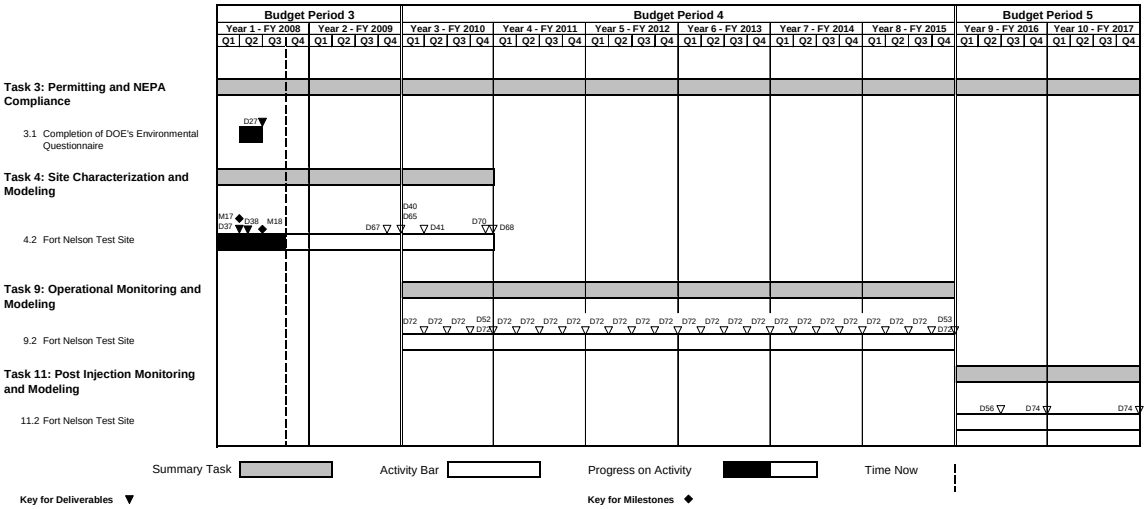
Baseline Completed: Q4 FY 2010

Drilling Operations Begin: Q2 FY 2010

Injection Operations Begin: Q4 FY 2010

MMV Events:
Site Characterization Modeling and Monitoring Plan to Be Completed – Q4 FY 2010

Field Test Schedule and Milestones (Gantt Chart):



Key for Deliverables
- D27 Environmental Questionnaire – Fort Nelson Test Site
- D37 Fort Nelson Test Site – Site Geological Characterization Experimental Design Package
- D38 Fort Nelson Test Site – Geotechnical Experimental Design Package
- D40 Fort Nelson Test Site – Geomechanical Final Report
- D41 Fort Nelson Test Site – Geochemical Final Report
- D52 Fort Nelson Test Site – Site Characterization, Modeling, and Monitoring Plan
- D53 Fort Nelson Test Site – Monitoring for CO_2 Sequestration in a Brine Formation Best Practices Manual
- D56 Report on Cost-Effective Long-Term Monitoring Strategies for the Fort Nelson Test Site
- D65 Fort Nelson Test Site – Site Characterization Report
- D67 Fort Nelson Test Site – Simulation Report
- D68 Fort Nelson Test Site – Best Practices Manual – Site Characterization
- D70 Fort Nelson Test Site – Best Practices Manual – Simulation Report
- D72 Fort Nelson Test Site – Quarterly Summary of Operations
- D74 Fort Nelson Test Site – Progress Report on Monitoring and Modeling Fate of CO_2

Key for Milestones
- M17 Fort Nelson Test Site Selected
- M18 Fort Nelson Test Site Geochemical Work Initiated

Additional Information

NA