Plains CO_2 Reduction (PCOR) Partnership Monthly Update
March 1–31, 2013

PHASE III ACTIVITIES

Task 1 – Regional Characterization (Wesley D. Peck)

Highlights

- Continued review of updates and corrections to the latest edition of the Plains CO_2 Reduction (PCOR) Partnership Atlas (Deliverable [D] 81, update due August 2013).
- Continued efforts to characterize the third target area (D7, due September 2013), including the following:
  - Collected well ownership information as well as structural information throughout the target area.
  - Reviewed oil field information along the Greencore Pipeline in Nebraska and Wyoming.
  - Downloaded and analyzed field production history graphs from the Wyoming Oil and Gas Conservation Commission.
- Continued efforts to characterize additional saline formations for CO_2 storage, including the following:
  - Built structural models for Minnelusa, Mission Canyon, Inyan Kara, and Qingshankou Formations.
  - Continued work on Petrel structural models for Broom Creek, Keg River – Zama, and Stuttgart Formations.
  - Began petrophysical modeling for both the Minnelusa and Qingshankou Formations.
- Continued efforts to prepare a value-added report on the methodology used for updating the oil fields in the PCOR Partnership region.
- Continued activities to update the Decision Support System (DSS, © 2007–2013 Energy & Environmental Research Center [EERC] Foundation®), including the following:
  - Continued efforts to update the current GIS (geographic information system) well files with new and corrected well information where discrepancies were identified.
  - Continued development of a new monitoring, verification, and accounting (MVA) section for the Bell Creek portion of the demonstration project reporting system. Anticipated completion is March 2013.
  - Updated the oil field information, especially North Dakota wells.
- Current plans for the atlas update are to secure approval and then proceed with a reprinting around May 2013. We currently have only 300 atlases in stock, and the summer teacher seminars usually require approximately 350–500 atlases. Plans are to call this version of the atlas the PCOR Partnership Atlas, Fourth Edition Revised.

Task 2 – Public Outreach and Education (Daniel J. Daly)

Highlights

- Participated in the monthly Regional Carbon Sequestration Partnership (RCSP) Outreach Working Group (OWG) conference call on March 21, 2013. Topics discussed included the following:
  - Outreach session to be held at the 12th Annual Conference on Carbon Capture, Utilization, and Sequestration scheduled for May 13–16, in Pittsburgh, Pennsylvania.
  - Side meeting to be held in conjunction with the U.S. Department of Energy (DOE) project review meeting in August.
  - Time line displayed at the 2012 PCOR Partnership Annual Meeting and the potential use of a time line to showcase the 10-year anniversary of the RCSP program at the meeting in August.
- As part of activities for the Aquistore Outreach Advisory Panel, reviewed the Aquistore Project marketing booklet and provided feedback.
- Continued the update to and revision of the Lignite Field Validation Test fact sheet and brochure (value-added).
- Continued efforts to revise the permanent downhole monitoring (PDM) value-added video short.
- In response to a request from Spectra Energy Transmission (Spectra), provided a PDF file of the Fort Nelson poster (D26) for personnel to print for distribution as part of presentations to select groups in London and Oslo.
- Mailed 25 copies of D26 to Spectra for its distribution at conferences.
- Continued collaborative efforts with Prairie Public Broadcasting (PPB), including the following:
  - Held a meeting at the EERC on March 12, 2013, to review schedules and budgets in relation to the subcontract.
  - Worked on the four segments of the education presentation, including *Energy*, *Energy and Carbon*, *Finding Solutions*, and *CO_2 Storage – One Action Among Many*.
  - Traveled to PPB studios in Fargo, North Dakota, to film the four segments of the education presentation on March 20, 2013, that, when finalized and approved, will be used in teacher activities and made available on the Web site.
  - Provided the PPB editor with updated slide materials for use in the education presentation.
- Reviewed and tested the draft/final outreach-tracking database.
- Continued efforts to review and improve the public Web site, including planned updates to the education section.

Task 3 – Permitting and NEPA (National Environmental Policy Act) Compliance (Lisa S. Botnen)

Highlights

- Provided a brief overview of GS3, a geologic sequestration software suite under development by Pacific Northwest Laboratory, to the National Energy Technology Laboratory (NETL) project manager.
- Continued planning for the 5th Annual Regulatory Roundup, including the following:

  - Drafted and sent an e-mail to regulatory participants soliciting input on date and location preferences.
- Continued activities associated with the Interstate Oil and Gas Compact Commission (IOGCC) Carbon Geologic Storage (CGS) Task Force, including the following:
  - Continued work on the CGS Task Force Report.
  - Participated in a conference call with a subset of task force and subgroup members to discuss Class II to Class VI transition liabilities.
  - Began planning for the next subgroup and full task force meetings.
- Held a conference call to discuss Class VI well permit cost factors.
- Began review of new U.S. Environmental Protection Agency (EPA) geologic sequestration draft and final guidance documents, including the following:
  - Geologic Sequestration of Carbon Dioxide: Draft Underground Injection Control (UIC) Program Class VI Well Recordkeeping, Reporting and Data Management Guidance for Owners and Operators (comments due May 11, 2013).
  - Geologic Sequestration of Carbon Dioxide: Draft Underground Injection Control (UIC) Program Class VI Well Recordkeeping, Reporting and Data Management Guidance for Permitting Authorities (comments due May 11, 2013).
  - Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Testing and Monitoring Guidance (March 2013).
- With regard to the Lignite Field Validation Test site (Phase II) closure:
  - Continued efforts to monitor the site during the reclamation phase, including site visits on March 7 and 21, 2013 (Figure 1).
  - Continued to modify a draft value-added report on closure activities.

Figure 1. Results of reclamation efforts at the Lignite Field Validation Test site (top: September 2011, bottom: March 2013).

Task 4 – Site Characterization and Modeling (James A. Sorensen)

Highlights

- Modeling staff attended Schlumberger Network of Excellence in Training (NExT) software training entitled "Techlog Formation Evaluations" on February 24 – March 1, 2013, in Houston, Texas.
- Fort Nelson test site activities included the following:
  - Continued efforts to compile a report summarizing the activities and lessons learned at the Fort Nelson test site.
  - Continued work with Spectra on proposed scopes of work for 2012–2013 modeling efforts.
  - Sent the Fort Nelson Test Site – Site Characterization Report to Spectra for review and approval in May 2012. Comments were received on February 1, 2013, and review is under way.

  - Sent the Fort Nelson Test Site – Geochemical Report to Spectra for review and approval in September 2012. Comments were received on February 7, 2013, and review is under way.
- Bell Creek test site activities included the following:
  - Held the monthly Bell Creek Project Update Meeting on March 25, 2013.
  - Continued efforts to modify the mineralogy report on 12 Bell Creek sidewall core samples from the 05-06 OW monitoring well. Data sheets were prepared for the additional 35 samples.
  - Continued evaluation and planning of horizontal sidewall core testing.
  - Began cutting samples (for thin-section preparation) from the 23 sidewall cores collected from 56-14R, i.e., Denbury Resources Inc. [Denbury] – 8, and EERC – 15).
  - Photographed, weighed, and measured the 56-14R core plugs and provided the information to Denbury.
  - Recovered 60 feet of full-diameter core from 33-14R and provided technical advice during the collection.
  - Continued fieldwide core analysis (samples from U.S. Geological Survey).
  - Continued revising the fieldwide static model, including creating a 3-D grid.
  - Visited a Muddy Formation outcrop near Hulett, Wyoming.
  - Continued building a depofacies object model using historic and recently acquired core data.
  - Updated the 1-D mechanical earth model (MEM) to Version 3.
  - Continued work on the 3-D MEM of the Phase 1 area.
  - Held a pulsed-neutron-logging review meeting with Schlumberger Carbon Services (Schlumberger), Denbury, and the EERC on March 12, 2013, in Denver, Colorado.
  - Continued work on a poster entitled "Subsurface Core and Analogous Outcrop Characterization for the Muddy/Newcastle Formation of the Bell Creek Oil Field, Power River County, Montana" for the American Association of Petroleum Geologists (AAPG) Annual Convention & Exhibition 2013 (www.aapg.org/pittsburgh2013/).
  - Continued to discuss special core analysis (SCAL) work, including finalizing the revised electrical property test plan with Core Labs.
  - Continued revisions to D32, Geomechanical Report (submitted January 31, 2013), based on Denbury's comments.

Task 5 – Well Drilling and Completion (John A. Hamling)

Highlights

- Staff members participated in a University of North Dakota Environmental Training Institute Occupational Safety and Health Association (OSHA) 10-hour Construction Outreach Training on March 4 and 5, 2013, in Grand Forks, North Dakota.
- Continued efforts on the Fox Hills groundwater monitoring wells, including the following:
  - Installed a larger pump on Well 05-04 on March 26–29, 2013.
  - Completed installation of Well 33-12.
  - Began planning for sampling (anticipated to occur April 1, 2013).
  - Discussed permanent pump options.
- Continued analysis of pressure gauge response from the 05-06 OW well, along with an associated literature review.

- Continued operations planning for the permanent vertical seismic profiling (VSP) geophone array.
- Continued review and modifications to the Bell Creek Baseline MVA value-added report.
- Conducted a literature review for advanced technologies for monitoring CO_2.
- Continued work on a draft of the Bell Creek Test Site – Monitoring Experimental Design Package (D43, due May 2013).
- Prepared abstracts for the upcoming Carbon Management Technology Conference (CMTC) due for upload by April 15, 2013.

Task 6 – Infrastructure Development (Melanie D. Jensen)

Highlights

- Proofread manuscript galley proofs and uploaded corrections to the *Energy & Fuels* Web site. The paper (available online at http://pubs.acs.org/doi/ipdf/10.1021/ef302042p) summarizes the work done to develop and preliminarily test a methodology for estimating a hypothetical phased CO_2 pipeline network.
- Continued research into pipeline sizing for sources that produce variable amounts of CO_2 (as basis for a paper for a trade or peer-reviewed journal).
- Revised and submitted approved version of D84, Report – A Phased Approach to Building Pipeline Network for CO_2 Transportation During CCS, based on recommendations from the NETL project manager.

Task 7 – CO_2 Procurement (John A. Harju)

Highlights

- Participated in ongoing project discussions with Denbury.

Task 8 – Transportation and Injection Operations (Melanie D. Jensen)

Highlights

- Continued investigating potential sources for fugitive CO_2 emissions in the surface facilities at injection sites.
- Attended the Bell Creek project update meeting on March 25, 2013.

Task 9 – Operational Monitoring and Modeling (Charles D. Gorecki)

Highlights

- Continued Bell Creek site activities, including the following:
  - Continued PVT (pressure–volume–temperature) modeling work.
  - Conducted a literature search and review on a PVT modeling and tuning method for compositional simulation to minimize the convergence problem.
  - Continued work on history matching of the simulation model.
  - Worked on history-matching the simulation model.
- Continued Fort Nelson site activities, including the following:
  - Continued working with Spectra on a scope of work for the next stage of dynamic modeling.

- Continued review of Spectra's comments on the Fort Nelson Test Site – Simulation Report (D67, originally submitted September 2011). Comments were received February 4–7, 2013.

Task 10 – Site Closure (to be announced [TBA])

- This task is anticipated to be initiated in Quarter 1 – Budget Period (BP) 5, Year 9 (October 2015).

Task 11 – Postinjection Monitoring and Modeling (TBA)

- This task is anticipated to be initiated in Quarter 1 – BP5, Year 9 (October 2015).

Task 12 – Project Assessment (Katherine K. Anagnost)

Highlights

- Submitted D57, the annual assessment report, on December 28, 2012.

Task 13 – Project Management (Charles D. Gorecki)

Highlights

- Traveled to the International Petroleum Technology Conference (IPTC) in Beijing, China, to present "The Plains CO_2 Reduction Partnership: CO_2 Sequestration Demonstration Projects Adding Value to the Oil and Gas Industry."
- Conducted the monthly task leader meeting on March 12, 2013. Topics discussed included upcoming in-house training opportunities, conferences, deliverables, and updates from each task leader present.
- Participated in a conference call with DOE NETL on March 15, 2013, to discuss upcoming meetings.
- Hosted the 2nd Annual Technical Advisory Board (TAB) meeting in Orlando, Florida.
- Attended the Southeast Regional Carbon Sequestration Partnership (SECARB) 8th Annual Stakeholders' Briefing on March 12 and 13, 2013, in Atlanta, Georgia.
- Continued planning for the upcoming PCOR Partnership Annual Meeting scheduled for September 25–26, 2013, in Minneapolis, Minnesota, including the following:
  - Tested the annual meeting Web site which went "live" on March 28, 2013.
  - Continued preparing a postcard for mailing and an e-mail blast announcing that registration is open.
- Continued work on several abstracts (due April 15, 2013) for CMTC scheduled for October 2013 in Alexandria, Virginia.
- Deliverables and milestones completed in March:
  - February monthly update
  - Task 16: D89 – Geochemical Evaluation of the Basal Cambrian System
  - Task 14: D99 – Water/CCS Nexus-Related Fact Sheet
  - Task 14: M23 – Monthly Water Working Group (WWG) conference call held
  - Task 13: M36: Annual Advisory Board Meeting Scheduled

Task 14 – RCSP WWG Coordination (Ryan J. Klapperich)

Highlights

- Distributed the March meeting agenda on March 5, 2013.
- Submitted the fact sheet entitled "Carbon Capture and Storage: Protecting Freshwater Resources" (D99) on March 22, 2013.
- Distributed the February 28, 2013, conference call notes on March 22, 2013. The eight participants discussed upcoming fact sheets as well as upcoming water-related conferences.
- DOE approved changing the requirement for the annual meeting to be held by June each year to by December each year. This will allow flexibility in scheduling the meeting in coordination with other DOE meetings.
- Distributed supplementary materials on March 28, 2013, for the same-day conference call.
- Held the monthly conference call on March 28, 2013.
- Continued review of upcoming water-related conferences for potential distribution of the fact sheets.
- Began work on the next WWG fact sheet (D99, due October 31, 2013) focused on water-monitoring technologies.

Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project (Dayanand Saini)

Highlights

- Held biweekly project update meetings.
- Smoothed dynamic workflow and ran the test dynamic model again.
- Began compiling relevant data and documentation for inclusion into the Updated Regional Implementation Plan for Zama (D86, due in September). Discussed project at in-house meeting on March 12, 2013.
- Discussed in-house subtask requirements and wrap-up plans.
- Discussed G2G and Muskeg L Pools static and dynamic modeling work, including the following:
  - Reviewed the structure model and worked to resolve a few occurrences of wedge grid cells around the well.
  - Discussed the dynamic simulation model issues (trace component and CO_2 solubility in aqueous phase).
  - Modified dynamic simulation workflow and ran the test model again.

Task 16 – Characterization of the Basal Cambrian System (Wesley D. Peck)

Highlights

- Submitted the geochemical report (D89) on March 28, 2013.
- Continued work on the report describing the wellbore integrity issues (D90, due September 2013).
- Continued modifications to dynamic simulation parameters used to maximize the injectivity at the various large-scale CO_2 sources across the study region.
- Continued modeling and simulation efforts.

- Continued compilation of updated information regarding the emission rates for some of the Canadian CO_2 sources.
- With regard to the Aquistore Project, prepared a core plug sampling and analysis plan.

Travel/Meetings

- February 24 – March 1, 2013: Attended Schlumberger's NExT software training entitled "Techlog Formation Evaluations" in Houston, Texas.
- February 27 – March 1, 2013: Presented at the Rice 2013 Oil & Gas HPC Workshop in Houston, Texas.
- March 2–10, 2013: Provided technical advice during 56-14R core collection in the Bell Creek Field.
- March 4–7, 2013: Hosted the 2nd Annual TAB meeting in Orlando, Florida.
- March 7 and 21, 2013: Traveled to the Lignite Field validation site near Kenmare, North Dakota, to inspect the site.
- March 11–12, 2013: Participated in a logging review meeting with Denbury and Schlumberger in Denver, Colorado.
- March 11–13, 2013: Presented at the SECARB 8th Annual Stakeholders' Briefing in Atlanta, Georgia.
- March 15–22, 2013: Provided technical advice during 33-14R core collection in the Bell Creek Field.
- March 18–22, 2013: Traveled to the Bell Creek Field for sampling activities.
- March 20, 2013: Filmed preliminary version of the education presentation at PPB in Fargo, North Dakota.
- March 20–23, 2013: Presented at the CanGEA 2013 Geothermal Conference in Calgary, Alberta, Canada.
- March 22–29, 2013: Presented at the 6th IPTC in Beijing, China.

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