Plains CO_2 Reduction (PCOR) Partnership Monthly Update
February 1–28, 2015

PHASE III ACTIVITIES

Task 1 – Regional Characterization (Wesley D. Peck)

Highlights

- Continued compiling information for the Plains CO_2 Reduction (PCOR) Partnership Atlas (5th edition) due August 2015, including updating the oilfield and source information.
- With regard to the upcoming U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) Atlas V:
  - Reviewed the second draft, made comments, and suggested changes to the excerpt provided.
- With regard to the partners-only decision support system (DSS) Web site:
  - Began work on reformatting the Bell Creek-related information.
  - Continued collecting images from the last version of the PCOR Partnership Atlas to put in the image gallery.
  - Worked on maintenance issues.
  - Continued to assemble a presentation on the DSS online mapping services to showcase the capabilities for viewing results in a comprehensive and interactive framework.
  - Updated North Dakota and Montana Petra projects with the latest general well information from each state's online resource as follows: 55 new North Dakota wells and three new Montana wells and updated the Saskatchewan and South Dakota data.
- Continued work on several value-added reports, including the following:
  - Continued work on the Inyan Kara Formation report, and requested geologic modeling data, located the salt water disposal well injection data for the Dakota aquifer, and began writing text.
  - Continued work on the report summarizing methods of original oil in place and carbon dioxide (CO_2) storage calculations.
  - Continued efforts on the Cedar Creek Anticline white paper, including modifying the CO_2 enhanced oil recovery (EOR) section.
- With regard to the **Aquistore** project's static modeling and dynamic predictive simulations effort:
  - Continued working with PTRC Science and Engineering Research Committee (SERC) regarding the Aquistore simulation model.
  - Received notification of acceptance of the abstract submitted to the 14th Annual CCUS (Carbon Capture, Utilization, and Storage) Conference (CCUS-14) (April 28 – May 1, 2015) entitled "Geologic Modeling and Simulation at the Aquistore Site: A Guide to MVA (monitoring, verification, and accounting) Deployment."

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

Highlights

- Continued efforts to expand the type and presentation of statistics for overall past outreach activities and for planning.
- Continued to gather information on audience feedback systems for use with public presentations and focus groups.
- Made plans to participate in the 10th Annual Southeast Regional Carbon Sequestration Partnership (SECARB) Stakeholders' Meeting March 11–12, 2015, in Atlanta, Georgia.
- Continued to revise the draft Phase II project fact sheets, including meetings with project personnel to discuss content, with a focus on terrestrial and Zama projects.
- On February 5, 2015, submitted the update to the Bell Creek project poster (Deliverable [D] 25, due March 31, 2015).
- The monthly Aquistore Outreach and Advisory Working Group call scheduled for February 23, 2015, was canceled, but a summary of upcoming activities was provided.
- Participated in the monthly Regional Carbon Sequestration Partnership (RCSP) Outreach Working Group conference call on February 19, 2015, and discussed comments on the NETL Outreach Best Practices Manual (BPM) and path forward, and accepted assignment of preparing a draft table of projects and related outreach activities for the BPM.
- Continued efforts with regard to the public Web site (www.undeerc.org/pcor), including the following:
  - Continued ongoing identification and repair of broken links.
  - Continued efforts to revise and update the carbon cycle page on the public Web site, focusing on graphic and interactive elements.
- Continued collaborative efforts with Prairie Public Broadcasting (PPB), including the following:
  - Sent interview invitations, and updated the travel schedule for continued work on the Coal in the Modern Age (working title) 60-minute documentary.
  - Prepared a response to China University of Mining and Technology to request help with interviews and filming locations.
  - Continued efforts to schedule Dr. Friedmann for an interview for the 60-minute energy and coal documentary (D22).
  - Completed transcription of filmed interviews and description of field footage associated with the Aquistore project upon request for footage by PTRC.
  - PPB staff will be attending the North Dakota Science Teachers Association Spring Meeting on March 20 and 21 in Bismarck, and this is expected to result in requests for outreach materials.
  - Continued editing Parts 3 and 4 of the four-part education video, and sent action items to PPB.
  - Continued to review historical sources for the coal documentary, including *Energy and the English Industrial Revolution* by E.A. Wrigley, *Power to the People* by Kandar and others, and *Getting the Coal Out* by Diana Tittle.

Task 3 – Permitting and NEPA (National Environmental Policy Act) Compliance (Charles D. Gorecki)

Highlights

- Continued planning the 2015 Regulatory Roundup, tentatively scheduled for July in Deadwood, South Dakota.
- Attended the 2015 Underground Injection Control Conference held in Austin, Texas, February 9–11, 2015.
- Continued review of the U.S. Environmental Protection Agency (EPA)-proposed rule for carbon emissions from existing stationary sources.
- Continued planning for D8, Permitting Review – Update 2, due September 30, 2015, including checking the status of North Dakota primary application and changes to the Canadian and U.S. EPA regulations.

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

Highlights

- **Bell Creek** test site activities included the following:
  - With regard to geomechanical activities:
    - Continued geomechanical characterization of the Bell Creek Field, including updating the properties of the 3-D mechanical earth model.
    - Continued preparing for the geomechanical simulations, including conducting literature review, preparing data, and setting up practice simulations in CMG (Computer Modelling Group).
  - Continued drafting an outline for the site characterization BPM, due August 31, 2015.
  - Worked on incorporating production data from the field into the Petra database.
  - Worked on developing a workflow for evaluating rock mineral volumes and effective porosity above the reservoir zone using pulsed-neutron logs (PNLs).
  - Worked on comparing history-matched fluid volumes from the simulations with the fluid volumes seen on the PNLs.
  - Created a subset of the fieldwide static geologic model that contains Phases 1 and 2; this model is being set up with parameters (e.g., rock compressibility) to prepare for predictive simulation and history matching.
  - Held weekly modeling/simulation meetings to discuss PNL processing.
  - Continued investigating options regarding microseismic data-processing services and 3-D vertical seismic profiling (VSP) data processing.
  - Continued developing ideas for a Bell Creek journal article related to facies modeling to be prepared in collaboration with Denbury.
  - Reviewed the Techlog project to verify contents and plan the path forward for the petrophysical modeling.
  - Continued working on Version 3 of the geologic model, including constructing facies logs for each of the wells that have core and lab data. This work is indicating that a revised facies interpretation may be needed to accurately understand the geology of the Bell Creek Field. Considering a trip to view core to gather additional evidence for the revised facies interpretation.
  - Applied Geology Laboratory activities included the following:

- ♦ With regard to the 33-14R core (collected April 2013):
  - Continued fine-tuning the thin-section descriptions and XRD data.
  - Continued work on the permeability-to-air report.
- ♦ With regard to the 56-14R full-core plugs (collected March 2013):
  - Worked with lab personnel to share facies interpretations for the USGS cored wells.
  - Permeability to water analysis continued, with two samples remaining.

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

This task ended in Quarter 3 – Budget Period (BP) 4, Year 7 (June 2014).

Task 6 – Infrastructure Development (Melanie D. Jensen)

Highlights

- Continued work on the update to D85 "Opportunities and Challenges Associated with CO_2 Compression and Transport During CCS (carbon capture and storage) Activities" (due March 31, 2015), including summarizing the energy requirements and economics of compression and liquefaction and the basis for each method.
- A value-added report entitled "Assessing Temporary Storage Options to Manage Variable-Rate CO_2 Emissions for Use During Enhanced Oil Recovery" continued undergoing internal PCOR Partnership management review. Following DOE review, the authors plan to submit the manuscript for possible publication in *Energy & Environmental Science*.
- Continued to update technologies for the CO_2 capture technologies update overview.

Task 7 – CO_2 Procurement (John A. Harju)

This task ended in Quarter 4 – BP4, Year 6 (September 2013).

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

Highlights

- Nothing to note at this time.

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

Highlights

- Worked on renewing software licenses with CMG.
- **Bell Creek** injection-phase site activities included the following:
  - Began work on a simulation model that includes both Phases 1 and 2. This work included determining parameters and constraints (e.g., perforation intervals, barrier locations etc.) that will be used in the simulations.
  - Compiled Bell Creek Field site safety and operations manual, Denbury training course materials, training certificates for all field operators, and summary of HSE (Health and Safety Executive) requirements for an in-house safety meeting.

- Continued to work with Denbury personnel to collect periodic oil and gas samples from select wells in the Phase 1 area.
- Held a Bell Creek project update meeting in-house on February 11, 2015.
- Worked on building a single well model with refined grids to better capture the near-wellbore phenomena during simulation.
- Continued review of processed permanent downhole monitoring data.
- Continued work processing and differencing the 3-D VSP monitoring survey for 04-03 OW.
- Continued database entry for tracking data drives for the borehole array and recording system.
- Worked on structural modeling of the top of the Fox Hills–Hell Creek aquifer.
- Gathered historical injection and production data to prepare for simulations.
- Reviewed distribution of active wells across the Bell Creek Field for use in simulations.
- Continued injection-phase sampling work, including the following:
  - Completed processing of over 210 soil gas samples collected from Phases 1 and 2 for the December 2014 quarterly sampling event.
  - Completed the gas chromatography analyses for three production wells:
    - 32-02 (sampled in November 2014)
    - 56-14 and 05-06 (sampled in December 2014)
  - Continued development of the Bell Creek water-sampling and analysis prioritization protocol document.
- Based on the most recent publicly available data, cumulative CO_2 injection is 1,660,570 metric tons through November 30, 2014 (Table 1).
- Finished processing the recently completed 3-D surface seismic survey at Bell Creek (Global Geophysical is doing the processing). Received preliminary results from Denbury.
- Continued work on the MVA BPM.
- Continued the literature review for CO_2 EOR simulation strategies.

Table 1. Bell Creek CO_2 Injection Totals for November 2014 (cumulative totals May 2013 to November 2014)

	November 2014 Injection
Total, Mscf	3,046,040
Total, U.S. tons*	174,229
Total, metric tons*	158,211
Cumulative Total, Mscf [+]	31,970,963
Cumulative Total, U.S. tons*[+]	1,828,689
Cumulative Total, metric tons*[+]	1,660,570

Source: Montana Board of Oil and Gas [MBOG] database.

* There is an approximately 2–3-month lag in posting of injection/production volumes to the MBOG database. This was calculated utilizing a conversion of 17.483 Mscf/U.S. ton and 19.253 Mscf/metric ton.

[+] Cumulative totals are for the period from May 2013 to the month listed.

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

- This task is anticipated to be initiated in Quarter 1 – BP5, 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 the annual assessment (D57) on December 30, 2014.

Task 13 – Project Management (Charles D. Gorecki)

Highlights

- Continued preliminary efforts for the Adaptive Management Approach BPM (D102, due June 2015).
- Continued planning for the 2015 annual meeting to be held in Chicago, Illinois, in September, including:
  - On February 12, 2015, sent out an e-mail soliciting partner input on speaker topics as well as a potential associated workshop for the upcoming annual meeting (week of September 14, 2015, in Chicago).
  - Event staff traveled to Chicago, Illinois, February 12–14, 2015, for a site inspection and contract negotiations for the upcoming PCOR Partnership Annual Membership Meeting.
- Began planning for a visit from DOE NETL personnel on April 8–9, 2015.
- Received notification of acceptance of the abstract submitted to CCUS-14 (April 28 – May 1, 2015) entitled "Implementing Carbon Capture and Storage: An Overview of the Plains CO_2 Reduction Partnership."
- Held a task leader meeting February 18, 2015. Topics discussed included brief updates on Bell Creek and Aquistore and focused discussion on the next edition of the PCOR Partnership regional atlas.
- Continued planning for the winter Technical Advisory Board (TAB) meeting, including finalizing the presentation and meeting organization.
- Upon request, held a conference call on February 27, 2015, with Southwest Partnership about technical advisory boards.
- Began work on the oral presentation for the International Forum on Recent Developments of CCS Implementation (http://co2quest.eu/ccsforum15.htm) in Athens, Greece, scheduled for March 26–27, 2015.
- Deliverables and milestones completed in February:
  - January monthly update
  - Task 2: D25 – Bell Creek Test Site Poster (Update) (due March 31, 2015)
  - Task 14: M23 – Monthly Water Working Group (WWG) Call Held

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

Highlights

- Held the monthly conference call on February 26, 2015. Discussed development of the WWG BPM and ideas and timing of the annual meeting. It appears that holding the meeting during DOE's partnership review meeting in August is preferred.
- Began work on a WWG presentation for a DOE-sponsored workshop to be held at Lawrence Livermore National Library on March 16, 2015.
- Distributed a WebEx presentation (and a related funding opportunity announcement) presented by DOE's Crosscutting group to the members of the WWG.
  - Continued working with the consultant on the BPM (D80, due November 30, 2016) and made additional revisions.

Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project (Charles D. Gorecki)

This task ended in Quarter 2 – BP4, Year 7 (February 2014).

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

This task ended in Quarter 2 – BP4, Year 7 (March 2014).

Travel/Meetings

- February 8–12, 2015: traveled to Austin, Texas, to attend the 2015 Underground Injection Control Conference.
- February 9–14, 2015: traveled to Gillette, Wyoming, for site work at the Bell Creek oil fields.
- February 12–15, 2015: traveled to Chicago, Illinois, for a site inspection and contract negotiations for the 2015 PCOR Partnership Annual Membership Meeting.
- February 27 – March 5, 2015: traveled to Phoenix, Arizona, to attend the PCOR Partnership TAB meeting, and other partner meetings.

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