



## Plains CO<sub>2</sub> Reduction (PCOR) Partnership Energy & Environmental Research Center (EERC)

### Plains CO<sub>2</sub> Reduction (PCOR) Partnership Monthly Update April 1–30, 2014

#### PHASE III ACTIVITIES

##### **Task 1 – Regional Characterization (Wesley D. Peck)**

###### Highlights

- Submitted abstracts entitled “Integrated Modeling and Simulation for Geologic CO<sub>2</sub> Storage in the Basal Saline System of Central North America” and “Integrated Modeling and Simulation for CO<sub>2</sub> EOR (enhanced oil recovery) and CO<sub>2</sub> Storage in the Zama Pinnacle Reefs of Alberta Basin, Canada” on April 4, 2014, for the SEG/SPE/AAPG/SPWLA/EAGE (Society of Exploration Geophysicists/Society of Petroleum Engineers/American Association of Petroleum Geologists/Society of Petrophysicists and Well Log Analysts/European Association of Geoscientists & Engineers) Summer Research Workshop ([www.seg.org/events/upcoming-seg-meetings/sd14](http://www.seg.org/events/upcoming-seg-meetings/sd14)).
- Met in-house to discuss the U.S. Department of Energy’s (DOE’s) shale methodology for CO<sub>2</sub> storage.
- Provided comments on April 10, 2014, to DOE regarding “Progress on the DOE–NETL (National Energy Technology Laboratory) Methodology for Assessing CO<sub>2</sub> Storage Potential in Organic-Rich Shale Formations.”
- Met in-house on April 4, 2014, to discuss the DOE “Atlas V” and the path forward.
- Participated in a conference call on April 9, 2014, with DOE and regional partnership personnel to discuss the upcoming “Atlas V.”
- Continued work on the third target area (Deliverable [D]7, due September 2014), the Minnelusa Formation in Wyoming.
- Continued work on several additional value-added reports, including the following:
  - Met in-house on April 1, 4, 8, and 11, 2014, to discuss value-added report updates.
  - Continued information gathering for a regional characterization report summarizing all past and present efforts.
  - Continued work on the report summarizing methods of original oil in place and CO<sub>2</sub> storage calculations.
- With regard to the **Aquistore** project’s static modeling and dynamic predictive simulations effort:
  - Visited with PTRC (Petroleum Technology Research Centre) personnel at the 13th Annual Carbon Capture, Utilization & Storage (CCUS-13) Conference held April 28 – May 1, 2014.

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

### Highlights

- Presented a quarterly update in-house on April 4, 2014; topics discussed included the upcoming D17, general outreach PowerPoint update, due May 2014; Phase II fact sheets; the Aquistore communications plan update and open house scheduled for June 15, 2014; the North American Education and Outreach Expert Network, including a network development session on April 30, 2014 (in conjunction with CCUS-13); planning and scheduling for the energy and coal 60-minute documentary; and upcoming education seminars planned for this summer.
- Began the process of uploading 55 video items (clips and full-length documentaries) to the Energy & Environmental Research Center's (EERC's) YouTube channel ([www.youtube.com/user/undeerc/videos?sort=dd&shelf\\_id=1&view=0](http://www.youtube.com/user/undeerc/videos?sort=dd&shelf_id=1&view=0)).
- Participated in the Public Outreach/Education Workshop and Discussion on Carbon Capture and Storage (CCS) Education session held April 29, 2014, during CCUS-13.
- Continued work on D17, general outreach PowerPoint update, due May 2014.
- Worked on updating the carbon cycle Web page on the public Web site ([www.undeerc.org/pcor](http://www.undeerc.org/pcor)).
- Began reviewing a Regional Carbon Sequestration Partnership (RCSP) Outreach Working Group (OWG) draft survey about Web-based outreach.
- Held biweekly Task 2 meetings on April 1 and April 23, 2014.
- Continued an in-house review of outreach products using a standard, industry-accepted framework.
- Continued efforts to prepare and update project-related fact sheets, including the following activities:
  - The four-page value-added Lignite Field Validation Test site overview fact sheet is currently undergoing in-house upper management review.
  - Continued value-added updates/revisions to the other Phase II site fact sheets.
- Continued efforts to update the public Web site ([www.undeerc.org/pcor](http://www.undeerc.org/pcor)), including the following:
  - Continued planning for the next update report (D13, due July 2014).
  - Continued repair of broken links as identified on an ongoing basis.
- Continued collaborative efforts with Prairie Public Broadcasting (PPB), including the following:
  - Continued editing the value-added four-part education presentation video in conjunction with PPB.
  - Prepared interview invitation letters in preparation for the tentatively titled “Coal and the Modern Age” documentary.
  - Upon request from the Japan Broadcasting Corporation (via Denbury Resources Inc. [Denbury]) began checking on the available pipeline raw-format footage that PPB shot.

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

### Highlights

- Continued review of DOE's FutureGen 2.0 Project Class VI permit applications.

- Continued planning the 6th Annual Regulatory Roundup meeting scheduled for June 24 and 25, 2014, in Deadwood, South Dakota.
- Reviewed the draft Lignite Field Validation Test fact sheet and provided comments.
- Continued work with the Interstate Oil and Gas Compact Commission (IOGCC) on the development of a fact sheet based on the joint report entitled “Guidance for States and Provinces on Operational and Regulation of Carbon Geologic Storage.”
- Reviewed activities and presentations related to proposed International Organization for Standardization standard for CCS.

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

##### Highlights

- **Bell Creek** test site activities included the following:
  - Continued work on Bell Creek characterization.
  - Continued work on the CO<sub>2</sub>–rock–groundwater exposure report (value-added).
  - Continued work on Milestone (M) 45, First Full Repeat of Pulsed-Neutron Logging (PNL) Campaign Completed, due June 2014.
  - Continued preparing for the 3-D mechanical earth model (MEM) and geomechanical modeling and simulations.
  - Worked on updating the properties in 1-D MEM and 3-D MEM in Techlog and Petrel.
  - With regard to Applied Geology Laboratory activities:
    - ♦ With regard to the 33-14R core (collected April 2013):
      - Met in-house on April 1 and April 15, 2014, to discuss progress.
      - Awaiting return of the requested 46 thin sections from Wagner Petrophysics.
    - ♦ With regard to the 56-14R full-core plugs (collected March 2013):
      - Held a meeting on April 28, 2014, to discuss the progress on the scope of work for core collected.

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

##### Highlights

- Continued review and modification of the value-added baseline surface and near-surface monitoring, verification, and accounting report and appendixes.
- Continued work on D44, Drilling and Completion Activities Report, due June 2014.

#### **Task 6 – Infrastructure Development (Melanie D. Jensen)**

##### Highlights

- Continued work on a journal article (about the attenuation of variable CO<sub>2</sub> sources for use in EOR) for submission to *Energy & Environmental Science* ([www.rsc.org/publishing/journals/ee/about.asp](http://www.rsc.org/publishing/journals/ee/about.asp)).
- Researched additional CO<sub>2</sub> capture technologies for the updated technology overview.
- Provided requested information to a PCOR Partnership partner.

## **Task 7 – CO<sub>2</sub> 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

- Discussed approaches for a report about the surface facilities at Bell Creek.

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

### Highlights

- **Bell Creek** injection-phase site activities included the following:
  - Cumulative CO<sub>2</sub> injection is 641,376 metric tons through March 31, 2014 (Table 1).
  - Modeling staff attended PetroMod training in March 2014 and discussed its use/relevance to the Bell Creek project.
  - Hosted a WebEx meeting on April 2, 2014, with Denbury regarding the 2013 simulation update. Denbury has requested additional simulation runs.
  - Held weekly modeling meetings and discussed Bell Creek Phase 2 history matching.
  - Continued work on the Bell Creek data management system.
  - Installed a data acquisition unit at Bell Creek.
  - Held a conference call on April 9, 2014, with SIGMA<sup>3</sup> to discuss passive seismic monitoring results.
  - Held a WebEx meeting with SIGMA<sup>3</sup> to discuss the repeat 3-D VSP (vertical seismic profile) processing.
  - Worked on M46, 1 Year of Injection Completed, due June 2014.
  - Worked on the additional simulation cases requested by Denbury.
  - Downloaded and processed permanent downhole monitoring (PDM) data through April 4, 2014.
  - Hosted a meeting on April 17, 2014, at the EERC to discuss the PNL processing with Schlumberger and Denbury personnel.

**Table 1. Bell Creek CO<sub>2</sub> Injection Totals for March 2014 (cumulative totals May 2013 to March 2014)**

|   | March 2014 Injection |
|---|----------------------|
| Total, Mscf                                 | 1,906,168            |
| Total, U.S. tons*                           | 109,030              |
| Total, metric tons*                         | 99,006               |
| Cumulative Total, Mscf <sup>+</sup>         | 12,348,407           |
| Cumulative Total, U.S. tons* <sup>+</sup>   | 706,309              |
| Cumulative Total, metric tons* <sup>+</sup> | 641,376              |

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.

<sup>+</sup> Cumulative totals are for the period from May 2013 to the month listed.

- Worked on a summary of the geomechanical modeling work.
- Constructed stratigraphic columns for the observation well and surrounding wells to help with interpretation of upper pressure gauge response in the observation well.
- Continued building the updated facies model for the fieldwide model.
- Worked on the Bell Creek simulation to include CO<sub>2</sub> injection and production data.
- Worked on preparing data for the Phase 2 simulations, including cutting the geomodel.
- Continued work on D66, Simulation Update, due August 2014.
- Continued work on developing a methodology to allocate pressure response from the PDM system to individual production/injection wells.
- Continued injection-phase sampling work, including the following:
  - ◆ Collected and archived the Fox Hills Formation groundwater-monitoring well field parameter data for the April 2014 sampling month.
  - ◆ Completed data input (127 samples) for the April 2014 soil gas results (from handheld meter and Micro Quad gas chromatograph), and began quality assurance/quality control measures.
  - ◆ Collected CO<sub>2</sub> purchase stream gas sample as well as a CO<sub>2</sub> recycle sample for compositional and isotope analyses from the Lost Cabin Gas Plant.
  - ◆ Continued planning of construction of the SQL database to house and access near-surface monitoring data.
  - ◆ Continued evaluation of creating an interactive map product to facilitate improved access and interpretation for team members and stakeholders.
- **Fort Nelson** site activities included the following:
  - Continued work on the Best Practices Manual – Fort Nelson Feasibility Study (D100, due June 2014).
  - Held a meeting April 8, 2014, to discuss progress on D100.
  - Presented a poster at CCUS-13 (Figure 1).



Figure 1. Fort Nelson CCS Feasibility Project poster presented at CCUS-13 (April 2014).

### **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 for Program Year 6 (October 1, 2012, to September 30, 2013), on January 31, 2014.

### **Task 13 – Project Management (Charles D. Gorecki)**

#### Highlights

- Welcomed Sejong University, Seoul, South Korea, as a new partner on April 30, 2014.
- Held the monthly task leader meeting on April 1, 2014. Topics discussed included updates on the Bell Creek, Fort Nelson, Aquistore, and Basal Cambrian projects; a review of upcoming conferences and deliverables; and updates from each task leader present.
- Continued planning the 2014 PCOR Partnership Annual Membership Meeting scheduled for September 16 and 17, 2014, at the Embassy Suites in downtown Denver, Colorado, including the following:
  - Continued drafting the preliminary agenda.
  - Participated in a planning meeting on April 8, 2014.
  - Sent an e-mail blast on April 23, 2014, to partners/invitees announcing that registration for the annual meeting is open.
- Attended and presented a poster at the 4th EAGE CO<sub>2</sub> Storage Workshop in Stavanger, Norway.
- Submitted the quarterly progress report (January–March 2014).
- On April 25, 2014, provided positive feedback to DOE NETL in response to the Technical Readiness Level Assessment and score for the Bell Creek project.
- Continued efforts toward a value-added programmatic risk management plan update (including an updated Bell Creek risk assessment) to be completed by August 2014 including the following:
  - Held an in-house meeting on April 1, 2014, to complete risk registry scores.
  - Held a meeting on April 16, 2014, to discuss the risk assessment.
- Presented information about the PCOR Partnership before the North Dakota Public Service Commission on April 9, 2014.
- Held a call with Spectra Energy management to discuss the status of the Fort Nelson project and current provincial events on April 11, 2014.
- Hosted visitors from PTRC and the Saskatchewan Research Council on April 14, 2014.
- Presented April 29–30, 2014, at CCUS-13, on the following:

- “Carbon Dioxide Storage Potential of the Basal Saline System in the Alberta and Williston Basins of North America”
- “The Plains CO<sub>2</sub> Reduction Partnership’s Adaptive Management Strategy for CO<sub>2</sub> Storage”
- “Development of a Monitoring, Verification, and Accounting Plan for a Potential CCS Project at Fort Nelson, British Columbia, Canada”
- “Modeling of Acid Gas Injection for Enhanced Oil Recovery and Long-Term Storage in Devonian-Aged Pinnacle Reefs”
- Deliverables and milestones completed in April:
  - Task 13: D58/D59 – Quarterly Progress Report Submitted
  - Task 14: M23 – Monthly WWG (Water Working Group) Conference Call Held

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

##### Highlights

- Participated in a WWG conference call to discuss the latest fact sheet (D99, due October 2014) on April 7, 2014.
- Scheduled and held the monthly conference call on April 24, 2014. Agenda items included the following:
  - Discuss progress on fact sheet development.
  - Review proposed WWG Web site content.
  - Discuss potential for collaboration with the OWG.
  - Regional partnership updates.
- Continued working on materials for Web site content and two proposed fact sheet ideas.

#### **Task 15 – Further Characterization of the Zama Acid Gas EOR, CO<sub>2</sub> 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**

- March 31 – April 4, 2014: Traveled to the Bell Creek oil field for a site visit and to download monitoring data.
- April 13–17, 2014: Traveled to the Bell Creek area for monthly sampling activities.
- April 14, 2014: Met with SIGMA<sup>3</sup> in Denver, Colorado.
- April 16, 2014: Met with PPB education services staff in Fargo, North Dakota.
- April 21–25, 2014: Presented and chaired a session at the 4th EAGE CO<sub>2</sub> Workshop in Stavanger, Norway.
- April 28 – May 1, 2014: Presented at the CCUS-13 Conference in Pittsburgh, Pennsylvania.

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