NETL

# Carbon Sequestration Newsletter

July 2009


## What's Inside?



# Introduction

This Newsletter is created by the National Energy Technology Laboratory and represents a summary of carbon sequestration news covering the past month. Readers are referred to the actual article(s) for complete information. It is produced by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon sequestration. It covers domestic, international, public sector, and private sector news.

# Highlights

***Fossil Energy Techline*, "Small-Scale Carbon Sequestration Field Test Yields Significant Lessons Learned."**

A preliminary geologic characterization and sequestration field test has been completed by the Midwest Regional Carbon Sequestration Partnership (MRCSP) at FirstEnergy's R.E. Burger Plant near Shadyside, Ohio. The targets for the geologic storage of carbon dioxide ($CO_2$) at the site were the Oriskany and Clinton Sandstones at depths in the range of 5,500 feet to 8,000 feet in the Appalachian Basin. The data compiled from the project evaluation indicated that the porosity, void space, and permeability of the target formations were lower than expected, and that the pressure in the formations increased with low injection rates. These results confirm the complex nature of the formations and demonstrate the importance of extensive drilling, formation evaluation, and testing to characterize and identify appropriate formations for $CO_2$ storage within the Appalachian Basin prior to injection. In addition to providing a significant geologic understanding of the formation, the project also provided several "lessons learned," ranging from practices regarding site selection; design of robust formation imaging, evaluation, and testing programs; formation simulation(s); well completion; and communication with stakeholders. MRCSP is one of seven Regional Carbon Sequestration Partnerships (RCSPs) managed by the National Energy Technology Laboratory (NETL) for the U.S. Department of Energy (DOE) to advance carbon capture and storage (CCS) techniques. For more information about DOE's RCSP Program, visit: http://www.netl.doe.gov/technologies/carbon_seq/partnerships/partnerships.html, or click: www.mrcsp.org for details about MRCSP. May 20, 2009, http://www.fossil.energy.gov/news/techlines/2009/09031-CCS_Test_Yields_Valuable_Informati.html.

***Fossil Energy Techline*, "DOE Regional Partnership Begins Core Sampling for Large-Volume Sequestration Test."**

The Plains $CO_2$ Reduction Partnership (PCOR) has begun collecting core samples from a new characterization well near Spectra Energy's Fort Nelson natural gas processing plant in British Columbia, Canada. The coring of the Elk Point rock formations at Fort Nelson will provide characterization data of the carbonate formations and impermeable shale layers that will serve as a caprock to store $CO_2$; in addition, numerous geochemical and geomechanical tests will be preformed to evaluate the performance of the reservoir and containment seals. PCOR will then implement a comprehensive monitoring, verification, and accounting (MVA) protocol that will aid in the development of a set of cost-effective MVA protocols that can be utilized at other locations. The Fort Nelson project, which will inject more than 2 million tons of $CO_2$ per year, is on track to become one of the first commercial-scale CCS projects in a saline aquifer in North America and will also be one of the largest carbon sequestration projects in the world. PCOR is undertaking two large-volume tests in the RCSP Program's Development Phase – the Fort Nelson project and a test planned for the Williston Basin in North Dakota. PCOR's initiatives will result in more than 400 jobs through 2017. To learn more about PCOR, go to: http://www.undeerc.org/pcor/. May 22, 2009, http://www.fossil.energy.gov/news/techlines/2009/09033-CCS_Core_Sampling_Begins.html.

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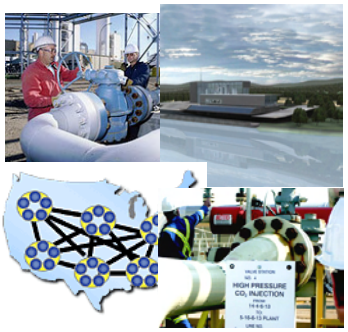
# Sequestration in the News

***Fossil Energy Techline*, "Implementation of the American Recovery and Reinvestment Act of 2009."**

On behalf of DOE's Office of Fossil Energy (FE), NETL issued four Funding Opportunity Announcements (FOAs) as part of the American Recovery and Reinvestment Act of 2009. Two FOAs will provide grants to develop geologic sequestration training centers and support site characterization of promising geologic formations for $CO_2$ storage; two other FOAs will provide funding for CCS from industrial sources and innovative concepts for beneficial $CO_2$ use, and for Round III of the Clean Coal Power Initiative. FE received $3.4 billion from the American Recovery and Reinvestment Act of 2009 for initiatives that focus on the research, development, and deployment of technologies that use coal more cleanly and efficiently, such as gasification and techniques that clean or capture and store greenhouse gas (GHG) emissions from coal-fired power plants. More information regarding the FOA for industrial CCS projects can be found at: http://www.fossil.energy.gov/news/techlines/2009/09038-DOE_to_Fund_Industrial_CCS.html. June 9, 2009, http://www.fossil.energy.gov/aboutus/budget/stimulus.html.

***Fossil Energy Techline*, "DOE Establishes National Carbon Capture Center to Speed Deployment of $CO_2$ Capture Processes."**



DOE announced the creation of the National Carbon Capture Center (NCCC) to aid in the development and testing of technologies to capture $CO_2$ from coal-based power plants. NCCC will serve as a test center for emerging carbon capture technologies at a scale large enough to provide meaningful data under real operating conditions. The center will be operated and managed by Southern Company Services, Inc. at the Power Systems Development Facility (PSDF) in Wilsonville, Alabama. PSDF offers multiple slipstream capabilities for testing processes and the ability to investigate different ranks of coal, biomass, and other fuels. The facility will test multiple pre- and post-combustion $CO_2$ capture technologies. To learn more about DOE's Carbon Sequestration Program, visit: http://www.fossil.energy.gov/programs/sequestration/index.html. May 27, 2009, http://www.fossil.energy.gov/news/techlines/2009/09034-National_Carbon_Capture_Center_Est.html.

***Southern Company News Release*, "Southern Company to Demonstrate Technology to Reduce Greenhouse Gas Emissions from Electric Generating Plant."**

Southern Company announced plans to demonstrate CCS on a coal-fired power plant to support the development of technologies for reducing GHG emissions. In collaboration with DOE and other partners, a demonstration facility will be built by Southern Company

# Sequestration in the News (Continued)

to capture $CO_2$ emissions from an existing unit of Alabama Power's Plant Barry, which is located near Mobile, Alabama. Beginning in 2011, the facility will capture approximately 100,000 to 150,000 tons of $CO_2$ per year and supply it to the Southeast Regional Carbon Sequestration Partnership (SECARB), which will then transport it by pipeline to a site within the area of the Citronelle Oil Field for underground storage. The $CO_2$ capture technology planned for the project uses an advanced, amine-based solvent that reacts with $CO_2$ in flue gas before being separated and compressed for pipeline transport. For more information about SECARB, visit: http://www.secarbon.org/. May 21, 2009, http://southerncompany.mediaroom.com/index.php?s=43&item=1904.

***Casper Star-Tribune*, "Wyo Models $CO_2$ Pipeline Grid."**

Wyoming state energy officials released a work-in-progress database that details potential pipeline investment and collaboration opportunities for $CO_2$ stakeholders. The database, which maps out where planned and speculative $CO_2$ sources could connect through the phased development of pipelines throughout Wyoming, was refined by the state's Pipeline Authority and the University of Wyoming's Enhanced Oil Recovery Institute (EORI). Wyoming's current $CO_2$ pipeline network stems from ExxonMobile's Shute Creek gas plant in southwest Wyoming to the Lost Solider oilfield near Bairoil, Wyoming, and to the Salt Creek field 42 miles north of Casper, Wyoming. According to Wyoming officials, the next phases of the pipeline development will continue to connect $CO_2$ from natural gas processing plants to oilfields within the state. The database is available at: http://eori.gg.uwyo.edu/database.asp. May 19, 2009, http://casperstartribune.net/articles/2009/05/19/news/wyoming/e33d1ffac9b38b9c872575bb00828117.txt.

## Announcements

**NETL Releases Annual Accomplishments Report.**
NETL released its annual accomplishment report, which highlights breakthroughs in research and technology development during the past fiscal year. The report showcases the successes of NETL and its research partners in advancing environmentally sound technologies to meet the Nation's energy challenges. To read the report, click: http://www.netl.doe.gov/publications/others/accomp_rpt/accomp08.pdf.

**Climate Change Teacher's Training.**
The Big Sky Carbon Sequestration Partnership and the Keystone Center will host a professional training seminar on global climate change for middle and high school teachers on August 19-20, 2009, in Billings, Montana. The two-day course, entitled, "CSI: Climate Status Investigations," will provide a better understanding of the science and policy behind climate change by examining topics such as energy use, sources of GHGs, and the role of carbon sequestration in climate change mitigation. To download a brochure, go to: http://www.bigskyco2.org/files/pdfs/MT_Brochure.pdf.

**$CO_2$ Geological Storage: Latest Progress.**
The European Science Foundation (ESF) will hold a conference on November 22-27, 2009, at Obergurgl University Centre in Obergurgl, Austria, aimed at outlining future challenges facing the industrial implementation of geological $CO_2$ storage. The conference will examine modeling techniques; risk assessment; site monitoring; and site design, injection, and closure practices. To learn more, visit the conference website at: http://www.esf.org/activities/esf-conferences/details/2009/confdetail293.html#c28304.

**SEG $CO_2$ Sequestration Geophysics Workshop.**
This Society of Exploration Geophysicists- (SEG) hosted workshop, scheduled for August 23-27, 2009, will focus on the geophysical aspects of CCS, such as rock and fluid physics, flow-to-seismic simulations, site characterization, $CO_2$ plume imaging and monitoring, quantitative $CO_2$ estimation and inversion, risk assessment, and novel case studies. For detailed information, visit: http://www.seg.org/SEGportalWEBproject/portals/SEG_Online.portal?_nfpb=true&_pageLabel=pg_gen_content&Doc_Url=prod/SEG-Meetings/Mtgs-Upcoming-Mtgs/SRW2009Alberta/index.htm.

**CCS Policy Brief Released.**
Indiana University researchers released a policy brief that states CCS can help the United States meet future energy needs and control GHG emissions. The authors recommend: (1) CCS should be deployed only if it is a cost-effective solution; (2) Congress must be cautious when designing incentives for CCS; (3) states need to be involved in developing CCS regulations, particularly with regard to property rights, safety, and liability; and (4) policymakers must consider the interests of geographic regions and business sectors. To view the policy brief, go to: http://www.iu.edu/~speaweb/faculty/pdfs/SPEA_insights_May09.pdf.

# Science

***Science Daily*, "Climate Change Threatens Endangered Honeycreeper Birds of Hawaii."**

United States Geological Survey (USGS) researchers claim that deadly, non-native bird diseases will become more prevalent and invade most of the disease-free sanctuaries of Hawaii's native bird, the honeycreeper, as temperatures increase in Hawaii's mountains due to climate change. The researchers examined the present altitudinal range of avian malaria and pox, honeycreeper distribution, and the future, projected range of diseases and honeycreeper habitat with potential climate change to arrive at their conclusion. Prior to the late 1880s, the Hawaiian Islands did not have any mosquitoes or mosquito-born diseases; shortly thereafter, mosquitoes made their way to the islands, bringing with them diseases that are dependent on seasonal changes in temperature, such as avian malaria and pox. Having no natural resistance against these diseases, honeycreepers significantly declined in numbers and geographic range. Honeycreepers refuge in high-elevation mountains (above 4,000 feet) provided a habitat in which mosquitoes could not thrive. However, climate change could allow mosquitoes to survive in this habitat, which researchers believe could be catastrophic for the honeycreeper population. The journal article, titled, "Introduced Avian Diseases, Climate Change, and the Future of Hawaiian Honeycreepers," is available at: http://www.bioone.org/doi/abs/10.1647/2008-059.1. May 27, 2009, http://www.sciencedaily.com/releases/2009/05/090526140840.htm.

***Science Daily*, "Global Warming Increasing The Dispersal Of Flora In Northern Forests."**

Researchers from the University of Helsinki have found that stronger winds caused by climate change, combined with a slight increase in temperature, could potentially increase the dispersal of plants in Northern forests by spreading plant species into forest clearings. According to the researchers, seeds and pollen are being carried over longer distances due to an increase in wind strength. This dispersal is believed to significantly affect the dynamics and the genetic variation of plant populations. When spread throughout more favorable areas, seeds and pollen have a greater likelihood of surviving in the potentially warming climate. Researchers also discovered that the dispersal of seeds, and the speed at which populations spread throughout the growth season, increased after a rise in temperature of 5.4 degrees Fahrenheit. Based on these results, researchers concluded that warmer temperatures may accelerate the spread of plants, but will not be solely sufficient to aid plant populations in relocating to new vegetation zones. The journal article, titled, "Increases in air temperature can promote wind-driven dispersal and spread of plants," is available at: http://rspb.royalsocietypublishing.org/content/early/2009/06/05/rspb.2009.0693. June 12, 2009, http://www.sciencedaily.com/releases/2009/06/090611065853.htm.

# Policy

***Natural Resources Canada News Release*, "Harper Government Launches $1-Billion Clean Energy Fund, Invests in New Technology, Creates Jobs,"** and ***Reuters*, "Canada Details Fund for Carbon Capture, Clean Energy."**

On June 19, 2009, the Canadian Government announced the launch of an $885 million Clean Energy Fund that will be used to develop and advance clean energy technologies. According to officials, the majority of the fund will be used to support the development of large-scale CCS demonstration projects. The remaining funds will be used to research clean energy technologies, as well as pay for small-scale renewable and alternative energy projects. Investment in the Clean Energy Fund will also support Canada's work with the United States in building a cleaner energy economy for North America through the Canada-United States Clean Energy Dialogue. The Clean Energy Fund is part of the Government of Canada's Economic Action Plan (2009), which includes nearly $2.1 billion for the support of a cleaner and more sustainable environment. May 19, 2009, http://www.nrcan-rncan.gc.ca/media/newcom/2009/200943-eng.php, May 19, 2009, http://www.reuters.com/article/GCA-GreenBusiness/idUSTRE54I5K420090520.

**"The consequences of failure should be considered in siting geologic carbon sequestration projects."**

The following is the Abstract of this article: "Geologic carbon sequestration is the injection of anthropogenic $CO_2$ into deep geologic formations where the $CO_2$ is intended to remain indefinitely. If successfully implemented, geologic carbon sequestration will have little or no impact on terrestrial ecosystems aside from the mitigation of climate change. However, failure of a geologic carbon sequestration site, such as large-scale leakage of $CO_2$ into a potable groundwater aquifer, could cause impacts that would require costly remediation measures. Governments are attempting to develop regulations for permitting geologic carbon sequestration sites to ensure their safety and effectiveness. At present, these regulations focus largely on decreasing the probability of failure. In this paper [the authors] propose that regulations for the siting of early geologic carbon sequestration projects should emphasize limiting the consequences of failure because consequences are easier to quantify than failure probability." **Phillip N. Price and Curtis M. Oldenburg**, *International Journal of Greenhouse Gas Control*, Available online May 21, 2009, doi:10.1016/j.ijggc.2009.03.002, http://www.sciencedirect.com/science/article/B83WP-4WBH5HS-1/2/48f43bac03adcee48d45e2cfbf2eeeab. (Subscription may be required.)

# Geology

**"Analytical solution to evaluate salt precipitation during $CO_2$ injection in saline aquifers."**

The following is the Abstract of this article: "Carbon dioxide sequestration in deep saline aquifers is a means of reducing anthropogenic atmospheric emissions of $CO_2$. Among various mechanisms, $CO_2$ can be trapped in saline aquifers by dissolution in the formation water. Vaporization of water occurs along with the dissolution of $CO_2$. Vaporization can

# Geology (Continued)

cause salt precipitation, which reduces porosity and impairs permeability of the reservoir in the vicinity of the wellbore, and can lead to reduction in injectivity. The amount of salt precipitation and the region in which it occurs may be important in $CO_2$ storage operations if salt precipitation significantly reduces injectivity. Here [the authors] develop an analytical model, as a simple and efficient tool to predict the amount of salt precipitation over time and space. This model is particularly useful at high injection velocities, when viscous forces dominate. First, [the authors] develop a model which treats the vaporization of water and dissolution of $CO_2$ in radial geometry. Next, the model is used to predict salt precipitation. The combined model is then extended to evaluate the effect of salt precipitation on permeability in terms of a time-dependent skin factor. Finally, the analytical model is corroborated by application to a specific problem with an available numerical solution, where a close agreement between the solutions is observed. [The authors] use the results to examine the effect of assumptions and approximations made in the development of the analytical solution. For cases studied, salt saturation was a few percent. The loss in injectivity depends on the degree of reduction of formation permeability with increased salt saturation. For permeability-reduction models considered in this work, the loss in injectivity was not severe. However, one limitation of the model is that it neglects capillary and gravity forces, and these forces might increase salt precipitation at the bottom of formation particularly when injection rate is low." **Mehdi Zeidouni, Mehran Pooladi-Darvish, and David Keith**, *International Journal of Greenhouse Gas Control*, Available online May 22, 2009, doi:10.1016/j.ijggc.2009.04.004, http://www.sciencedirect.com/science/article/B83WP-4WBR6R2-1/2/5cde03c04b69c08a23db98a0764195fa. (Subscription may be required.)

**"The Footprint of the $CO_2$ Plume during Carbon Dioxide Storage in Saline Aquifers: Storage Efficiency for Capillary Trapping at the Basin Scale."**

The following is the Abstract of this article: "[The authors studied] a sharp-interface mathematical model of $CO_2$ migration in deep saline aquifers, which accounts for gravity override, capillary trapping, natural groundwater flow, and the shape of the plume during the injection period. The model leads to a nonlinear advection-diffusion equation, where the diffusive term is due to buoyancy forces, not physical diffusion. For the case of interest in geological $CO_2$ storage, in which the mobility ratio is very unfavorable, the mathematical model can be simplified to a hyperbolic equation. [The authors] present a complete analytical solution to the hyperbolic model. The main outcome is a closed-form expression that predicts the ultimate footprint on the $CO_2$ plume, and the time scale required for complete trapping. The capillary trapping coefficient and the mobility ratio between $CO_2$ and brine emerge as the key parameters in the assessment of $CO_2$ storage in saline aquifers. Despite the many approximations, the model captures the essence of the flow dynamics and therefore reflects proper dependencies on the mobility ratio and the capillary trapping coefficient, which are basin-specific. The expressions derived here have applicability to capacity estimates by capillary trapping at the basin scale." **Ruben Juanes, Christopher W. MacMinn, and Michael L. Szulczewski**, *Transport in Porous Media*, Available online June 9, 2009, doi:10.1007/s11242-009-9420-3, http://www.springerlink.com/content/x572tx728pnh2t88/?p=60372d7184a94345a11c658b8be90809&pi=6. (Subscription may be required.)

# Technology

**"Numerical investigation concerning the impact of $CO_2$ geologic storage on regional groundwater flow."**

The following is the Abstract of this article: "Large-scale storage of [$CO_2$] in saline aquifers may cause considerable pressure perturbation and brine migration in deep rock formations, which may have a significant influence on the regional groundwater system. With the help of parallel computing techniques, [the authors] conducted a comprehensive, large-scale numerical simulation of $CO_2$ geologic storage that predicts not only $CO_2$ migration, but also its impact on regional groundwater flow. As a case study, a hypothetical industrial-scale $CO_2$ injection in Tokyo Bay, which is surrounded by the most heavily industrialized area in Japan, was considered, and the impact of $CO_2$ injection on near-surface aquifers was investigated, assuming relatively high seal-layer permeability (higher than 10 microdarcy). A regional hydrogeological model with an area of about 60 km×70 km around Tokyo Bay was discretized into about 10 million gridblocks. To solve the high-resolution model efficiently, [the authors] used a parallelized multiphase flow simulator TOUGH2-MP/ECO2N on a world-class high performance supercomputer in Japan, the Earth Simulator. In this simulation, $CO_2$ was injected into a storage aquifer at about 1 km depth under Tokyo Bay from 10 wells, at a total rate of 10 million tons/year for 100 years. Through the model, [the authors] can examine regional groundwater pressure buildup and groundwater migration to the land surface. The results suggest that even if containment of $CO_2$ plume is ensured, pressure buildup on the order of a few bars can occur in the shallow confined aquifers over extensive regions, including urban inlands." **Hajime Yamamoto, Keni Zhang, Kenzi Karasaki, Atsunao Marui, Hitoshi Uehara, and Noriaki Nishikawa**, *International Journal of Greenhouse Gas Control*, Available online May 29, 2009, doi:10.1016/j.ijggc.2009.04.007, http://www.sciencedirect.com/science/article/B83WP-4WD6Y39-2/2/09ce1d619736522944aef2cf57f51309. (Subscription may be required.)

**"Coal and energy security for India: Role of carbon dioxide ($CO_2$) capture and storage (CCS)."**

The following is from the Abstract of this article: "Coal is the abundant domestic energy resource in India and is projected to remain so in future under a business-as-usual scenario. Using domestic coal mitigates national energy security risks. However coal use exacerbates global climate change. Under a strict climate change regime, coal use is projected to decline in future. However this would increase imports of energy sources like natural gas (NG) and nuclear and consequent energy security risks for India. The paper shows that CCS can mitigate $CO_2$ emissions from coal-based large point source (LPS) clusters and therefore would play a key role in mitigating both energy security risks for India and global climate change risks. This paper estimates future $CO_2$ emission projections from LPS in India, identifies the potential $CO_2$ storage types at aggregate level and matches the two into the future using Asia-Pacific Integrated Model (AIM/Local model) with a Geographical Information System (GIS) interface. The paper argues that clustering LPS that are close to potential storage sites could provide reasonable economic opportunities for CCS in future if storage sites of different types are further explored and found to

# Technology (Continued)

have adequate capacity. The paper also indicates possible LPS locations to utilize CCS opportunities economically in future, especially since India is projected to add over 220,000 MW of thermal power generation capacity by 2030." **Amit Garg and P.R. Shukla**, *Energy*, Available online May 2, 2009, doi: 10.1016/j.energy.2009.01.005, http://www.sciencedirect.com/science/article/B6V2S-4W6N2PS-1/2/7c4caeeccd9cf56d7527ce41de8d95c8. (Subscription may be required.)

# Terrestrial

**"Soil carbon dioxide flux, carbon sequestration and crop productivity in a tropical dryland agroecosystem: Influence of organic inputs of varying resource quality."**

The following is the Abstract of this article: "In view of the significance of agricultural soils in affecting global [carbon] balance, the impact of manipulation of the quality of exogenous inputs on soil $CO_2$–[carbon] flux was studied in rice-barley annual rotation tropical dryland agroecosystem. Chemical fertilizer, Sesbania shoot (high quality resources), wheat straw (low quality resource) and Sesbania + wheat straw (high + low quality), all carrying equivalent recommended dose of [nitrogen], were added to soil. A distinct seasonal variation in $CO_2$–[carbon] flux was recorded in all treatments, flux being higher during rice period, and much reduced during barley and summer fallow periods. During rice period the mean $CO_2$–[carbon] flux was greater in wheat straw (161 [percent] increase over control) and Sesbania + wheat straw (+129 [percent]) treatments; however, during barley and summer fallow periods differences among treatments were small. $CO_2$–[carbon] flux was more influenced by seasonal variations in water-filled pore space compared to soil temperature. In contrast, the role of microbial biomass and live crop roots in regulating soil $CO_2$–[carbon] flux was highly limited. Wheat straw input showed smaller microbial biomass with a tendency of rapid turnover rate resulting in highest cumulative $CO_2$–[carbon] flux. The Sesbania input exhibited larger microbial biomass with slower turnover rate, leading to lower cumulative $CO_2$–[carbon] flux. Addition of Sesbania to wheat straw showed higher cumulative $CO_2$–[carbon] flux yet supported highest microbial biomass with lowest turnover rate indicating stabilization of microbial biomass. Although single application of wheat straw or Sesbania showed comparable net change in soil [carbon] (18 [percent] and 15 [percent] relative to control, respectively) and crop productivity (32 [percent] and 38 [percent]), yet they differed significantly in soil [carbon] balance (374 and −3 g [carbon] $m^{-2}$ $y^{-1}$ respectively), a response influenced by the recalcitrant and labile nature of the inputs. Combining the two inputs resulted in significant increment in net change in soil [carbon] (33 [percent] over control) and crop yield (49 [percent]) in addition to high [carbon] balance (152 g [carbon] $m^{-2}$ $y^{-1}$). It is suggested that appropriate mixing of high and low quality inputs may contribute to improved crop productivity and soil fertility in terms of soil [carbon] sequestration." **K.P. Singh, Nandita Ghoshal, and Sonu Singh**, *Applied Soil Ecology*, Available online May 23, 2009, doi:10.1016/j.apsoil.2009.04.005, http://www.sciencedirect.com/science/article/B6T4B-4WBY51S-1/2/d19265c76cc03e77bf8898553d42a5a9. (Subscription may be required.)

| Carbon Market Update, June 11, 2009 | |
|---|---|
| CCX-CFI 2009 ($/tCO$_2$) $1.15 (Vintage 2009) | EU ETS-EUA DEC 2009 ($/tCO$_2$) $18.75 (Converted from € to US$) |

# Trading

***KansasCity.com*, "Midwest Governors Group Sets Goals to Reduce Greenhouse Gases,"** and ***ClimateWire*, "Midwestern Governors Release Cap-and-Trade Recommendations."**

The Midwestern Greenhouse Gas Reduction Accord Advisory Group released a plan that calls for a 20 percent reduction in GHG emissions from 2005 levels by 2020 and an 80 percent reduction by 2050 – the first such plan for a regional cap-and-trade program in the Midwest. The sectors covered in the recommendations include electricity generation and imports; residential, commercial, and industrial fuels; transportation fuels; and industrial processes. While the recommendations provide governors in the Midwest with a possible cap-and-trade framework, the group emphasized that the consortium would act only if a Federal cap-and-trade system does not reach fruition. The group recommends a different method than Congress for achieving GHG emission reduction goals in that most of the emissions allowances would initially be sold for a fee to help alleviate the cost to both industry and consumers. A portion of this income would be invested in new technology that could help meet the reduction goals. The consortium's members include Illinois, Iowa, Kansas, Michigan, Minnesota, Wisconsin, and the province of Manitoba; Indiana, Ohio, South Dakota, and Ontario participate as observers. For more information about the Midwestern Greenhouse Gas Reduction Accord, visit: http://www.midwesternaccord.org/, or click: http://www.midwesternaccord.org/Accord_Draft_Final.pdf to view the Advisory Group's recommendations. June 8, 2009, http://www.kansascity.com/news/politics/story/1240419.html, and June 9, 2009, http://www.eenews.net/climatewire/2009/06/09/6/.

***Environment Canada News Release*, "Offset System A Step Towards A Carbon Market In Canada."**

The Canadian Government announced that it is working to finalize a domestic regulatory framework for a Canadian carbon market by moving forward with its Offset System for GHGs. Two draft guides

# Trading (Continued)

were released on June 12, 2009, (available at: http://www.ec.gc.ca/creditscompensatoires-offsets/44B33F4A-34E2-49CE-9D3E-0775600A2AE6/Offsets_Projects%20June%2011_%20pdf.pdf and http://www.ec.gc.ca/creditscompensatoires-offsets/F86DD35D-2561-427D-9FA1-9A292A437FC2/Offsets_Verification%20June%209_e.pdf) that propose rules and guidance on the requirements and processes used to generate offset credits and establish methods that verify GHG reductions achieved from a registered project, respectively. The Offset System will establish tradable credits and encourage cost-effective, domestic GHG reductions in areas that will not be covered by planned Federal GHG regulations, like the forestry and agricultural sectors. Companies will be able to purchase offset credits on the carbon market and use them for compliance with their regulated targets. Interested parties will have 60 days to comment and the final versions of the Offset System guides are expected to be completed in Fall 2009. The release of these two draft guides follows the publication of the first draft guide in August 2008 (available at: http://www.ec.gc.ca/creditscompensatoires-offsets/default.asp?lang=En&n=7CAD67C6-1), which proposed the rules and guidance to quantify GHG reductions. To learn more about Canada's Offset System, visit: www.ec.gc.ca/creditscompensatoires-offsets. June 10, 2009, http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=23C6502E-4307-4647-A5C7-38B3B7EDDDF0.

# Recent Publications

**"Framework for Geological Carbon Sequestration on Public Land."**

The following is from the Executive Summary of this document: "Geological carbon sequestration has been discussed as one potential approach to reducing [GHGs] in [the] atmosphere. Sequestration of carbon in geological formations on public lands presents many challenges, and it is essential that those challenges be recognized in developing a regulatory framework. First, a proposed regulatory framework must recognize $CO_2$ as a commodity, resource, contaminant, waste, or pollutant. Unlike most other resources that are managed, $CO_2$ is a material that is either being stored for disposal or is extracted for use. $CO_2$ is currently leased under the Mineral Leasing Act (MLA) for uses such as refrigeration (in its solid form as dry ice), fire extinguishers, and carbonation of water and soft drinks. $CO_2$ also is used to enhance oil recovery which to some extent results in its sequestration. It is also important to recognize that any discussion addressing the geologic sequestration of $CO_2$ must distinguish between pure $CO_2$ and $CO_2$ mixed with other gases such as hydrogen sulfide, carbon monoxide, methane, and oxides of nitrogen and sulfur. These impurities have the potential to impact the economics, technical feasibility, location preferences, land use planning requirements, environmental impact mitigation, multiple-resource conflict potential, and regulatory oversight of geologic $CO_2$ sequestration. Impurities in $CO_2$ impact its value as a commodity, as well as its behavior in storage." To read the complete U.S. Department of Interior (DOI) document, go to: http://www.doi.gov/news/09_News_Releases/EISA_Sec._714_Report_to_Congress_V12_Final.pdf.

**"Geological Carbon Sequestration Opportunities in Pennsylvania."**

The following is from the Executive Summary of this document: "The Pennsylvania Department of Conservation and Natural Resources (DCNR) Bureau of Topographic and Geologic Survey has concluded an initial study of suitable geologic formations for the location of a state $CO_2$ sequestration network in accordance with Section 2815 of Act 129 of 2008. By enacting this legislation, Pennsylvania acknowledges what is generally regarded by many in the carbon sequestration research community – that the use of subsurface geologic reservoirs offers the most promising means of permanently sequestering large volumes of $CO_2$. Based on this preliminary assessment and the geographic coverage afforded by these potential reservoirs, the geology of Pennsylvania (subject to the adequacy of storage rights and detailed characterization work to be performed at each prospective sequestration site) can support the development of a state geologic sequestration network. Further, the Commonwealth has potential for value-added enhanced oil recovery (EOR) with permanent geologic sequestration of $CO_2$." To view the DCNR News Release, go to: http://www.dcnr.state.pa.us/news/newsreleases/2009/0509-carbonreport.htm. The document is available at: http://www.dcnr.state.pa.us/info/carbon/mastercstareport.pdf.

**"Fortifying the Foundation: State of the Voluntary Carbon Markets 2009."**

The following is from the Executive Summary of this document: "This report was created to answer fundamental questions about the voluntary carbon markets such as transaction volumes, credit prices, project types, locations, and the motivations of buyers in this market. Over the past several years, these markets have not only become an opportunity for citizen consumer action, but also an alternative source of carbon finance and an incubator for carbon market innovation. As the voluntary carbon markets have rapidly gained traction, the answers, to these questions have become increasingly important to investors, policymakers, and environmentalists alike. For example, since the last edition of this report, various U.S. climate bills [have made] reference to voluntary carbon offset standards, the Japanese government [launched] a voluntary carbon-offsetting scheme, and the U.K. government [issued] an official definition of 'carbon neutral.' Last year saw further establishment and greater functionality of voluntary offset standards; the emergence of new registries; the forging of new partnerships between infrastructure providers; the formation of coalitions to encourage self-regulation; and increased market transparency." To view the Ecosystem Marketplace and New Carbon Finance report, visit: http://ecosystemmarketplace.com/documents/cms_documents/StateOfTheVoluntaryCarbonMarkets_2009.pdf.

# Legislative Activity

***Power Engineering International*, "Texas Lawmakers Pass Clean Coal Bills."**

During a recent legislative session, Texas legislators passed several bills aimed at promoting clean coal technology projects. H.B. 469 establishes a sales tax exemption on certain equipment for projects that capture at least half of their $CO_2$ emissions, with local taxing authorities retaining the right to grant further tax breaks during a project's initial development phase. In addition, the bill authorizes $100 million franchise tax credits to the first three in-state projects that achieve a carbon capture rate of 70 percent. Another provision in this piece of legislation grants a new tax exemption for EOR using $CO_2$ captured from an anthropogenic emission source. Moreover, H.B. 1387 addresses the regulatory oversight of captured $CO_2$, and H.B. 1796 creates an offshore carbon storage program and a grant program for GHG emissions reducing technologies, such as CCS. Finally, H.B. 3676 and H.B. 3896 deal with attracting energy and other economic development projects to the region. To view any of these bills, visit the Texas Legislature website at: http://www.legis.state.tx.us/. June 4, 2009, http://pepei.pennnet.com/display_article/364023/6/ARTCL/none/none/1/Texas-lawmakers-pass-clean-coal-bills/.

***U.S. Senate Committee on Energy and Natural Resources Press Release*, "Capturing Carbon."**

On May 14, the U.S. Senate Committee on Energy and Natural Resources held a hearing on S. 1013, the "Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2009," which would establish a national indemnity program through DOE for up to 10 commercial-scale CCS projects. The legislation authorizes DOE to conduct these commercial-scale geological storage demonstrations to reduce GHG emissions from industrial facilities, such as coal- and natural gas-fired utilities, cement plants, refineries, and other industrial processes. The legislation also requires sufficient geologic information to prove safe and permanent storage, provides liability protection and Federal indemnity for these demonstration projects, addresses legal rights property rights, requires compliance with existing relevant laws for environmental protection, outlines criteria for site closure certification, includes provisions for siting the demonstrations on public land, and establishes a training program for state regulators. The bill is available at: http://energy.senate.gov/public/_files/END09611_xml2.pdf. May 14, 2009, http://energy.senate.gov/public/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=62320b82-66cc-4e77-991f-5e418cd5e6a9&Month=5&Year=2009.

# Events

July 9-10, 2009, **EU Emissions Trading 2009**, *Sheraton Brussels Hotel and Towers, Brussels, Germany*. The conference agenda covers Phase II and Phase III of the European Union Emissions Trading Scheme (EU ETS), as well as carbon trading and financial instruments linked to carbon allowances. To download a brochure, visit the conference website at: http://www.environmental-finance.com/conferences/2009/EUET09/intro.htm.

July 15-17, 2009, **3rd Annual Carbon Capture: Status & Outlook**, *AED Conference Center, Washington, DC, USA*. This event focuses on the business side of carbon capture by assessing the impact of new funding, policies, and technology, and by highlighting the leading domestic and international $CO_2$ capture pilot projects. Topics include: new carbon policies at the U.S. Environment Protection Agency (EPA), international CCS policy, and funding increases for CCS pilots. To learn more about this event, click: http://www.infocastinc.com/index.php/conference/carbon09.

August 16-19, 2009, **Geological Carbon Sequestration: Prediction and Verification**, *Vancouver, British Columbia, Canada*. This research conference will bring together experts from government, industry, and academia to discuss geological $CO_2$ sequestration and improve the ability to predict and verify the fate of injected $CO_2$ in the subsurface. Topics include site selection and characterization, large-scale simulations, and MVA. For more information, visit the conference website at: http://www.aapg.org/education/hedberg/vancouver/index.cfm.

August 19-21, 2009, **COAL-GEN 2009**, *Charlotte Convention Center, Charlotte, North Carolina, USA*. This three-day event covers the current state of the coal industry and offers attendees the opportunity to learn how to capitalize on the challenges facing coal-fired power plants. Also included are technical tours of Duke Energy's Cliffside and Allen Steam Stations. For more information, visit: http://www.coal-gen.com/index/exhibition.html.

# Events (Continued)

September 1-4, 2009, **COAL-GEN Europe**, *Expo Silesia, Katowice, Poland*. COAL-GEN Europe offers attendees two parallel conference tracks to examine the latest clean coal technology developments and discuss the issues facing the European coal-fired power generation sector. To view the conference topics, registration information, and the two-track agenda, go to: http://cge09.events.pennnet.com/fl/content.cfm?NavId=8523&Language=Engl.

September 13-19, 2009, **8th International Carbon Dioxide Conference**, *Friedrich-Schiller-University, Jena, Germany*. This conference provides a multidisciplinary forum for all aspects of modern carbon cycle research relevant to understanding the natural and anthropogenic controls of atmospheric $CO_2$ and its interactions in the global ecosystem. For registration information, visit the conference website at: http://www.conventus.de/icdc8/.

September 14-15, 2009, **Carbon Capture and Sequestration Summit**, *Omni Shoreham Hotel, Washington, DC, USA*. The goal of this summit is to develop a greater understanding of current and future needs for the commercialization of CCS. Topics to be discussed include: current Federal and state legal and regulatory environments; CCS economics and business models; and the challenges facing $CO_2$ transportation and storage. To learn more, click: http://www.americanconference.com/energy/Energy.htm?PageMode=Search.

September 14-15, 2009, **Platts 2nd Annual Carbon Capture & Sequestration**, *Westin Grand Hotel in Washington, D.C, USA*. This two-day conference has three main focuses: new policy directions and economic challenges for large-scale deployment; jurisdiction and regulatory framework; and CCS economics. To view the full agenda, visit the conference website by clicking: http://www.platts.com/Events/2009/pc919/index.xml.

September 22-24, 2009, **Carbon Capture and Storage World Summit**, *Hotel Palomar Arlington, Arlington, Virginia, USA*. This summit will provide a comprehensive look at CCS by examining the most up-to-date information on CCS policy and funding, as well as technology and industry updates. For more information, visit the summit website at: http://www.carboncaptureandstorageconference.com/.

September 30-October 2, 2009, **5th Conference on Carbon Credit Market and Carbon Capture and Storage**, *Rome Fair Centre, Rome, Italy*. The only Italian event specializing in GHG emissions and the technology used for GHG reductions, this conference will take place in conjunction with CCS EXPO, the first event for the Mediterranean area focused on CCS. To learn more information, click: http://www.zeroemissionrome.eu/en/index_co2.asp.

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