



Carbon Sequestration Newsletter

MAY 2009



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Illinois. The injection well is being drilled into a test area approximately 2,000 feet thick in the Mount Simon Sandstone to a depth more than one mile beneath the surface where core samples of the sandstone will be acquired and analyzed to determine the best area for injection. Once the area is selected, up to 1 million metric tons of CO₂ captured from ADM's ethanol production facility will be injected into a deep saline formation from 2010 to 2013. The results of the injection, which will be monitored to ensure safe and permanent storage of the CO₂, will provide analysis on the future of carbon sequestration as a viable option for CO₂ storage. This is the first drilling into the Mount Simon Sandstone since oil and gas exploratory drilling was conducted some 15 to 40 years ago. Drilling operations for the injection well began in February 2009 and the 10-year life of the project is expected to create nearly 250 full-time jobs. The injection test is part of the Regional Carbon Sequestration Partnership (RCSP) Program's Development Phase managed by the National Energy Technology Laboratory (NETL) for the U.S. Department of Energy's (DOE) Office of Fossil Energy (FE). MGSC is led by the Illinois State, Indiana, and Kentucky Geological Surveys and is one of seven NETL-managed RCSPs. For more information about MGSC, visit: <http://www.sequestration.org/>, or click: <http://www.fossil.energy.gov/programs/sequestration/partnerships/index.html> for information about the NETL-managed RCSP Program. April 6, 2009, http://www.fossil.energy.gov/news/techlines/2009/09022-Large-Scale_CCS_Advances.html.

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, "First U.S. Large-Scale CO₂ Storage Project Advances."

The Midwest Geological Sequestration Consortium (MGSC) has nearly completed drilling the first large-scale carbon dioxide (CO₂) injection well in the United States at the Archer Daniels Midland Company's (ADM) ethanol facility in Decatur,



SEQUESTRATION IN THE NEWS

EPA News Release, "ADEQ and EPA Issue Permits for Carbon Sequestration Injection Project Beneath APS Power Plant in Joseph City / Pilot Project First of its Kind in the Southwest."

The Arizona Department of Environmental Quality (ADEQ) and U.S. Environmental Protection Agency (EPA) issued permits to the West Coast Regional Carbon Sequestration Partnership (WESTCARB) that allow the partnership to inject 2,000 tons of CO₂ into an underground saline formation in Joseph City, Arizona. The injection will incur at an approximate depth of 3,500 feet on Arizona Public Service Company's Cholla Power Plant site in Navajo County. ADEQ also issued a temporary one-year Aquifer Protection Permit that requires the project to use the best available technology and meet Arizona's aquifer water quality standards. The injection wells will also be regulated under the EPA-administered Safe Drinking Water Act's (SDWA) Underground Injection Control (UIC) Program, which aims to prevent the contamination of underground sources of drinking water (USDWs) by regulating the



National Energy Technology Laboratory

626 Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880

One West Third Street, Suite 1400
Tulsa, OK 74103-3519

1450 Queen Avenue SW
Albany, OR 97321-2198

2175 University Ave. South, Suite 201
Fairbanks, AK 99709

Sean I. Plasynski
412-386-4867
sean.plasynski@netl.doe.gov

Dawn M. Deel
304-285-4133
dawn.deel@netl.doe.gov

Visit the NETL website at:
www.netl.doe.gov

Customer Service:
1-800-553-7681

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SEQUESTRATION IN THE NEWS (CONTINUED)

permitting, construction, operation, and safe closure of injection wells that place fluids underground for storage, enhanced oil and gas recovery (EOR/EGR), or disposal. To view the WESTCARB website, visit: <http://www.westcarb.org/>. March 25, 2009, <http://yosemite.epa.gov/opa/admpress.nsf/0/220b7b1e753178ee85257584005ef34a?OpenDocument>.

Power Engineering International, "E.ON Announces Pipeline Survey Work for UK's Kingsnorth CCS Project."

E.ON has initiated field work to identify potential routes to pipe CO₂ from a newly-proposed coal-fired power plant at Kingsnorth Power Station in Kent, United Kingdom, to the North Sea gas field for storage. The survey will investigate the area along the Grain Peninsula for potential pipeline routes. Once potential routes have been identified, the planning process will begin, which includes consultation with landowners, the public, and statutory organizations, such as the Medway Council and the Environmental Agency. E.ON also committed to add carbon capture and storage (CCS) technology to the proposed coal units at Kingsnorth Power Station if incentives are in place. The option of transporting the captured CO₂ by ship is also being considered. March 17, 2009, http://pepei.pennnet.com/Articles/Article_Display.cfm?Section=ARTCL&SubSection=Display&PUBLICATION_ID=6&ARTICLE_ID=356422.

Reuters, "S. Africa Plans Carbon Capture Storage Plant by 2020," and *Engineering News*, "SA Launches Carbon Capture Storage Centre, Plans Plant by 2020."

On March 27, 2009, a government official said that South Africa expects to build its first pilot-scale CCS plant by 2020. The South African National Energy Research Institute (SANERI) has secured \$27.2 million for the next five years to support the research and development (R&D) activities conducted by



the South African Centre of Carbon Capture and Storage. The centre's main objectives are to ensure the development of South African CCS projects and to gain an understanding of how CO₂ would react with South African geology. South Africa plans to implement a CO₂ injection experiment by 2016, after which it would develop a demonstration plant by 2020. A CO₂ storage atlas, which will identify potential CO₂ storage capacity in South Africa, is expected to be completed by April 2010. Preliminary studies conducted by the Council of Geosciences show that South Africa has an available storage capacity of 100 gigatons. For more information about SANERI, visit: <http://www.saneri.org.za/index.html>. March 27, 2009, <http://af.reuters.com/article/investingNews/idAFJ0E52Q0CR20090327>, and March 27, 2009, <http://www.engineeringnews.co.za/article/sa-launches-carbon-capture-storage-centre-plans-demonstration-plant-by-2020-2009-03-27>.

ANNOUNCEMENTS

Research Experiment in Carbon Sequestration.

The Research Experience in Carbon Sequestration 2009 (RECS) will be held in collaboration with the Southwest Regional Partnership (SWP) on July 19-29, 2009, in Albuquerque, New Mexico. The 10-day program combines classroom instruction; a geology field tour; and visits to a power plant, coal mine, and geologic storage test site. Topics cover a range of scientific, technical, and policy issues associated with CCS deployment. Applications are being accepted through May 10, 2009. For information on how to apply or become a corporate sponsor, go to: <http://www.recsco2.org>, or contact RECS Director Pamela Tomski at recesco2@mac.com or at (202) 390-8896.

Tracking the First 20 CCS Demonstrations Workshop.

The International Energy Agency (IEA) will hold a Global Peer Review in Bergen, Norway, on May 27, 2009. The documentation that will be reported to the Group of Eight (G-8) in 2010 will be reviewed, including regional demonstration activities, preliminary findings on CCS demonstrations, and a global overview of the progress of the first 20 CCS projects. To view an agenda, visit: <http://www.iea.org/Textbase/work/2009/bergen/agenda.pdf>.

Carbon Capture and Sequestration: The Legal Hurdles Webinar.

Electric Utility Consultants, Inc. (EUCI) is conducting a webinar on June 3, 2009, designed to assist in the implementation of CCS projects by generating an understanding of the legal issues surrounding CCS among utility executives, in-house council, managers, project planners, and developers. To view the course website, which includes a downloadable brochure, click: https://www.euci.com/web_conferences/0609-ccs/.

Global Carbon Capture and Storage Institute Launched.

The Australian Government launched the Global Carbon Capture and Storage Institute (GCCSI) on April 16, 2009, to accelerate the global deployment of CCS technology and the sharing of information. GCCSI is part of the Australian Government's climate change strategy, which is designed to reduce carbon pollution, adapt to the impact of potential climate change, and help to develop a global solution. To view the Prime Minister of Australia's news release, go to: http://www.pm.gov.au/media/Release/2009/media_release_0913.cfm.

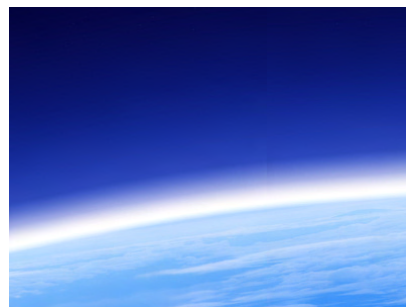
SCIENCE

U.S. Geological Survey News Release, "New Science Gauges Potential to Store CO₂."

The U.S. Geological Survey (USGS) released a report, titled, "Development of a Probabilistic Assessment Methodology for Evaluation of Carbon Dioxide Storage," describing its new methodology to assess the potential for carbon sequestration in the United States. The new USGS methodology identifies methods to assess the volume of pore space in subsurface rocks and characterize the storage potential of saline formations and oil and gas reservoirs in the United States. The methodology depends upon constructing geologic models of the areas to be assessed; statistical methods are used to integrate uncertainty and natural geologic variability on the ranges of potential storage resources within a storage assessment unit. DOE, NETL, EPA, and the Bureau of Land Management contributed to the research. USGS will begin accepting technical comments on the methodology from the public in the near future. (See Recent Publications section in this newsletter to view a portion of the Introduction and a link to USGS's "Development of a Probabilistic Assessment Methodology for Evaluation of Carbon Dioxide Storage.") For more information on this methodology and other USGS carbon sequestration efforts, visit: http://energy.er.usgs.gov/health_environment/co2_sequestration/. March 16, 2009, http://www.usgs.gov/newsroom/article.asp?ID=2163&from=rss_home.

Science Daily, "Carbon Dioxide in Atmosphere Can Now Be Measured From Space."

INESC Porto and the European Space Agency (ESA) have developed a technology that will measure atmospheric gases more effectively than currently used technologies. The new technology, which is an optical fiber filter capable of measuring CO₂ levels from space, can also measure other greenhouse gases (GHGs), such as methane (CH₄), nitrous oxide (NO_x), and ozone. The system is developed by INESC Porto's Optoelectronics and Electronic System Unit (UOSE) and has a high potential of applicability in satellites due to its efficiency, compactness, and reduced volume and mass. Those satellites equipped with the system, which will be able to detect GHGs in the Earth's atmosphere in concentrations less than one kilometer high and at an altitude of 400 kilometers, also will be able to three-dimensionally map the atmosphere from a single position and with a higher resolution; currently used technologies consist of atmospheric balloons and airplanes. The technology is based on optical fiber technology that can monitor the atmosphere with the reflection of laser impulses. April 12, 2009, <http://www.sciencedaily.com/releases/2009/04/090401204201.htm>.



POLICY

U.S. Environmental Protection Agency News Release, “EPA Finds Greenhouse Gases Pose Threat to Public Health, Welfare / Proposed Finding Comes in Response to 2007 Supreme Court Ruling.”

Following a scientific review ordered in 2007 by the U.S. Supreme Court, EPA issued a proposed finding on April 17, 2009, that declares GHGs contribute to air pollution that may endanger public health or welfare. The proposed finding identifies six GHGs that may pose a threat – CO₂, CH₄, NO_x, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). In addition, the finding states that the concentrations of these GHGs are at unprecedented levels in the atmosphere due to human emissions and that the EPA believes they serve as the likely cause of increased average temperatures. The analysis also reveals that climate change could present national security implications. The proposed endangerment finding, which does not include any proposed regulations, will now enter a public comment period. For more information about the proposed finding, visit: <http://www.epa.gov/climatechange/endangerment.html>. (See the Recent Publications section in this newsletter to view a portion of the Summary and a link to EPA’s “Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act.”) April 17, 2009, <http://yosemite.epa.gov/opa/admpress.nsf/0/0E77DF675805295D8525759B00566924>.

Financial Times, “Berlin Agrees Carbon Capture Rules.”

German ministers have agreed on draft legislation that creates a regulatory and technical framework for trial CCS projects and provides utilities with planning and investment guidelines and environmental and public safety rules. The draft legislation covers the separation, transportation, and underground storage of CO₂ and states that German-based utilities will not be allowed to transfer responsibility for their CO₂ repositories to the state until 30 years after the plant that produced the gas has closed. Officials said the first CCS trials will be reviewed in 2015 and a decision will be made on whether to revise the environment standards. Three pilot-scale CCS projects are currently underway in Germany, including the world’s first operating CCS power plant owned by Vattenfall. April 1, 2009, http://www.ft.com/cms/s/0/e44194ee-1ee4-11de-a748-00144feabdc0.html?nclick_check=1. (Subscription required.)

“Regulating Geologic Sequestration in the United States: Early Rules Take Divergent Approaches.”

The following is the Abstract of this article: “Regulations for geological sequestration (GS) of CO₂ have been adopted in the state of Washington and proposed by the state of Kansas and the EPA UIC Program. These three sets of rules take significantly different approaches to regulating GS of CO₂. This paper compares these rules, focusing on elements where their differences highlight the choices that must be made to create a regulatory framework for GS in the United States. Consensus is emerging in some areas, but there is still substantial disagreement regarding the allowable composition of the CO₂ stream, the size of the area of review, reservoir performance goals, and management of risks other than those to groundwater. Gaps include issues related to

ownership of subsurface pore space, [GHG] accounting, and long-term stewardship. The divergent approaches of these rules raise two overarching questions: (1) Should policymakers create GS regulations by modifying and supplementing UIC rules or through new enabling legislation? (2) What should be the relative roles of state and federal governments in GS regulation? [The authors] outline trade-offs between the consistency and coordination that federal involvement could offer and the reality that states need to be heavily involved with implementation of GS regulations. [The authors] conclude that federal involvement above and beyond the proposed EPA Class VI rules is needed to create effective GS regulation in the United States.” **Melisa F. Pollak and Elizabeth J. Wilson**, *Environmental Science and Technology*, Available online March 30, 2009, doi:10.1021/es803094f, <http://pubs.acs.org/doi/abs/10.1021/es803094f>. (Subscription may be required.)

“Global learning on carbon capture and storage: A call for strong international cooperation on CCS demonstration.”

The following is the Abstract of this article: “CCS rhetoric and technical progress is critically important to global climate mitigation efforts. Developing strong international cooperation on CCS demonstration with global coordination, transparency, cost-sharing and communication as guiding principles would facilitate efficient and cost-effective collaborative global learning on CCS, would allow for improved understanding of the global capacity and applicability of CCS, and would strengthen global trust, awareness and public confidence in the technology.” **Heleen de Coninck, Jennie C. Stephens, and Bert Metz**, *Energy Policy*, Available online March 12, 2009, doi:10.1016/j.enpol.2009.01.020, <http://www.sciencedirect.com/science/article/B6V2W-4VTK5RT-1/2/2503c41caf0d85100136da818a9b0d3e>. (Subscription may be required.)

GEOLOGY

“Effect of Moisture on Adsorption Isotherms and Adsorption Capacities of CO₂ on Coals.”

The following is the Abstract of this article: “The effect of moisture on the adsorption isotherms and adsorption capacities of CO₂ on Argonne Premium coals has been investigated. In some experiments a small hysteresis was observed between the adsorption and desorption isotherms. The hysteresis was absent or negligible for high-rank and as-received coals but was discernible for lower rank and dried coals. An equation that accounted for the volumetric changes when an adsorbate alters the structure of an adsorbent was employed to interpret the data. The best-fit solutions indicate that the coal volume decreases upon drying. The microscopic shrinkage estimated using helium expansion was greater than the shrinkage reported using the bed-height technique. The microscopic shrinkage was 5-10 [percent] for low-moisture medium and high-rank coals and up to 40 [percent] for low-rank coals having higher moisture contents. The CO₂ swelling of coals during adsorption isotherm measurements was estimated to be about the same as the shrinkage that occurred during the moisture loss. The adsorption capacity, isosteric heat of adsorption, average pore size, and surface area of the as-received (moist) and dried Argonne coals were estimated after accounting for the volume changes. The isosteric heat of adsorption of CO₂ was found to be between 23 and 25 kJ/mol for as-received coals

GEOLOGY (CONTINUED)

and between 25 and 27 kJ/mol for dried coals, regardless of the rank. The degree of drying was shown to affect the adsorption capacity and the calculated surface area. For dried coals, the adsorption capacity showed the typical 'U-shape' dependence on rank whereas the as-received coals displayed a more linear dependence. A relationship is proposed to quantify the effect of moisture on the adsorption capacity. The mechanism of CO₂ adsorption on moist coals and the implications of the lower adsorption capacity of wet coals to coal seam sequestration of CO₂ are presented." **Ekrem Ozdemir and Karl Schroeder**, *Energy Fuels*, Available online April 1, 2009, doi:10.1021/ef801126a, <http://pubs.acs.org/doi/abs/10.1021/ef801126a>. (Subscription may be required.)

"Carbon sequestration in coal-beds with structural deformation effects."

The following is the Abstract of this article: "[CO₂] sequestration in a coal-bed is a profitable method to reduce the concentration of [GHG] in the atmosphere and to recover byproduct methane from the coal seam. The important factor to



be considered is the stability of the coal-bed with the increased [CO₂] injection. It is crucial to avoid [CO₂] escaping from the coal seam caused by structural deformation. Meanwhile, structural deformation also depends on such properties of the geological coal basin as fracture state and phase equilibrium, especially the porosity, permeability and saturation of the coal seam. In this study, a structural deformation effect was simulated with the purpose of predicting [CO₂] storage in the environment of a typical unmineable coal seam. As an example, Appalachian Basin is considered in the deformation analysis of [CO₂] sequestration based on the variable saturation model. Moreover, the comparison between simulations with and without the account of structural deformation is given. The results indicate that modeling of structural deformation in carbon sequestration is feasible by directly coupling structure terms to a variable saturated model. Moreover, introducing structural deformation effects into carbon sequestration modeling is important because it affects the fluid flow and leads to a faster drop of the resulting capillary pressure and relative permeability of the gas phase. This faster drop directly results in the diminished [CO₂] storage capacity in a coal bed basin. In addition, structural deformation modeling in carbon sequestration simulations can provide important insights into how to avoid carbon leakage and seepage by monitoring the effective stress and displacement of coal-bed basin during [CO₂] injection." **Guoxiang Liu and Andrei V. Smirnov**, *Energy Conversion and Management*, Available online March 27, 2009, doi: 10.1016/j.enconman.2009.02.012, <http://www.sciencedirect.com/science/article/B6V2P-4VXT0NH-2/2/d94313b8143e7d3c6084884af7a70755>. (Subscription may be required.)

TECHNOLOGY

"Progress and New Developments in Carbon Capture and Storage."

The following is from the Abstract of this article: "Growing concern over the impact on global climate change of the buildup of GHGs in the atmosphere has resulted in proposals to capture CO₂ at large point sources and store it



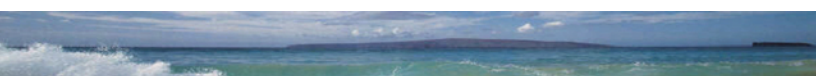
in geologic formations, such as oil and gas reservoirs, unmineable coal seams, and saline formations, referred to as CCS. There are three options for capturing CO₂ from point sources: post-combustion capture, pre-combustion capture, and oxy-combustion. Several processes are available to capture CO₂, and new or improved processes are under development. However, CO₂ capture is the most expensive part of CCS, typically accounting for 75 [percent] of overall cost. CCS will benefit significantly from the development of a lower cost post-combustion CO₂ capture process that can be retrofitted to existing power plants. Once captured, the CO₂ is compressed to about 150 atm and pipelined at supercritical conditions to a suitable storage site. Oil and gas reservoirs, because they have assured seals and are well characterized, are promising early opportunity sites. Saline formations are much more extensive and have a huge potential storage capacity, but are much less characterized. Several commercial and a number of pilot CCS projects are underway around the world. Information from these projects will form the basis for the development of CCS as a climate change mitigation strategy. These projects are contributing to the development of suitable regulations, determining best operating practices, improving mathematical models, and providing information to the public and other stakeholders. Based on current knowledge, CCS appears to be a promising option for reducing GHG emissions." **S.I. Plasynski, J.T. Litynski, H.G. McIlvried, R.D. Srivastava**, *Critical Reviews in Plant Sciences*, Available online May 1, 2009, doi: 10.1080/07352680902776440, <http://www.informaworld.com/10.1080/07352680902776440>. (Subscription may be required.)

"Certification framework based on effective trapping for geologic carbon sequestration."

The following is the Abstract of this article: "[The authors] have developed a certification framework (CF) for certifying the safety and effectiveness of geologic carbon sequestration (GCS) sites. Safety and effectiveness are achieved if CO₂ and displaced brine have no significant impact on humans, other living things, resources, or the environment. In the CF, [the authors] relate effective trapping to CO₂ leakage risk which takes into account both the impact and probability of leakage. [The authors] achieve simplicity in the CF by using (1) wells and faults as the potential leakage pathways, (2) compartments to represent environmental resources that may be impacted by leakage, (3) CO₂ fluxes and concentrations in the compartments as proxies for impact to vulnerable entities, (4) broad ranges of storage formation properties to generate a catalog of simulated plume

TECHNOLOGY (CONTINUED)

movements, and (5) probabilities of intersection of the CO₂ plume with the conduits and compartments. [The authors] demonstrate the approach on a hypothetical GCS site in a Texas Gulf Coast saline formation. Through its generality and flexibility, the CF can contribute to the assessment of risk of CO₂ and brine leakage as part of the certification process for licensing and permitting of GCS sites around the world regardless of the specific regulations in place in any given country.” **Curtis M. Oldenburg, Steven L. Bryant, and Jean-Philippe Nicot.** *International Journal of Greenhouse Gas Control*, Available online April 3, 2009, doi: 10.1016/j.ijggc.2009.02.009, <http://www.sciencedirect.com/science/article/B83WP-4W09GSM-1/2/34f13d55c513ef08db0fcdfaeabad114>. (Subscription may be required.)



TERRESTRIAL

“Soil Carbon Sequestration in Tropical Agroforestry Systems: a Feasibility Appraisal.”

The following is the Abstract of this article: “Agroforestry is recognized as a strategy for soil carbon sequestration (SCS) under the afforestation/reforestation activities, but [society’s] understanding of soil carbon dynamics under agroforestry systems (AFS) is not adequate. Although some SCS estimates are available, many of them lack scientific rigor. Several interrelated and site-specific factors ranging from agroecological conditions to system management practices influence the rate and extent of SCS under AFS, so that generalizations tend to become unrealistic. Furthermore, widely and easily adoptable methodologies are not available for estimating the SCS potential under different conditions. In spite of these, there is an increasing demand for developing “best-bet estimates” based on the current level of knowledge and experience. This document presents an attempt in that direction. The appraisal validates the conjecture that AFS can contribute to SCS, and presents indicative ranges of SCS under different AFS in the major agroecological regions of the tropics. The suggested values range from 5 to 10 kg [carbon] ha⁻¹ in about 25 years in extensive tree-intercropping systems of arid and semiarid lands to 100–250 kg [carbon] ha⁻¹ in about 10 years in species-intensive multistrata shaded perennial systems and homegardens of humid tropics.” **P.K. Ramachandran Nair, Vimala D. Nair, B. Mohan Kumar, and Solomon G. Haile,** *Environmental Science and Policy*, Available online March 9, 2009, doi: 10.1016/j.envsci.2009.01.010, <http://www.sciencedirect.com/science/article/B6VP6-4VT17XH-2/2/37e663dfb58ddab6d5a7deb222b842fe>. (Subscription may be required.)



TRADING

Carbon Market Update, April 14, 2009

CCX-CFI 2009 (\$/tCO ₂) \$1.70 (Vintage 2009)	EU ETS-EUA DEC 2009 (\$/tCO ₂) \$18.92
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(Converted from € to US\$)

RGGI News Release, “States Initiate Bidding Process for Fourth RGGI CO₂ Allowance Auction.”

The Regional Greenhouse Gas Initiative (RGGI) released the Auction Notice, Qualification Application, and Intent to Bid for RGGI’s fourth CO₂ allowance auction scheduled for June 17, 2009. The release starts the bidder qualification process and publicizes auction details, including the reserve price and number of allowances offered for sale; a reserve price of \$1.86 for all allowances will continue to be used. The 10 participating states will offer 30,887,620 current control period allowances (2009 vintage) and 2,172,540 allowances for the future control period (2012 vintage). The June auction will be the second auction since compliance obligations under RGGI’s CO₂ Budget Trading Programs became effective on January 1, 2009, and the second to offer allowances from current (2009-2011) and future (2012-2014) control periods. Auction documents are available for download at: <http://www.rggi.org/co2-auctions/information>. April 13, 2009, http://www.rggi.org/docs/Auction%204%20notice%20release_final.pdf.

Reuters, “Big China Hydro Plant Can Sell Carbon Credits- Xinhua.”

The United Nations (UN) approved the Bingling hydropower plant in northwest China’s Gansu province to begin selling carbon credits under the Clean Development Mechanism (CDM), making it the largest hydro project to receive this accreditation.



The project, which is scheduled to go into full operation at the end of September 2009, will have a total generation capacity of 240,000 kilowatts and sell 760,000 tons worth of certified emission reductions (CERs) per year. Under the agreement, Gansu Electric Power Investment will sell the carbon credits to Italy’s Enel. In order to receive CDM accreditation, a project needs to demonstrate that a quantifiable reduction in GHGs will result and the project would not have been economically viable without the capital generated by carbon trading. As part of the Kyoto Protocol, the CDM allows developed countries to achieve their emission reduction targets by investing in clean projects in developing nations. April 3, 2009, <http://uk.reuters.com/article/oilRpt/idUKPEK3967320090403>.

RECENT PUBLICATIONS

“Development of a Probabilistic Assessment Methodology for Evaluation of Carbon Dioxide Storage.”

The following is from the Introduction of this document: “USGS has a long history of assessing national and global ground- and surface-water resources and geologically based energy and mineral resources. In 2007, the Energy Independence and Security Act (Public Law 110–140) authorized the USGS to conduct a national assessment of geologic storage resources for CO₂ in cooperation with EPA and DOE. A first step in planning for a national assessment is the development of a methodology to estimate storage resource potential that can be applied uniformly to geologic formations across the United States. This report defines and describes an assessment methodology for evaluation of the resource potential for storage of CO₂ in the subsurface. Descriptions of assessment methods are available in the literature that address storage resources and capacities at a variety of scales, using a variety of storage mechanisms. The methodology presented in this report is intended for evaluations from the regional to sub-regional scale in which storage assessment units (SAUs) can be defined on the basis of common geologic and hydrologic characteristics. The resource that is assessed is the volume of pore space into which CO₂ can be injected and retained for tens of thousands of years. The calculation of subsurface pore volume for potential CO₂ storage has been described in a number of publications. The methodology in this report uses probabilistic methods to incorporate uncertainty and natural variability in volumetric parameters. The methodology incorporates statistical evaluation of the sizes and numbers of potential storage sites to identify the range of possible storage resources within a storage assessment unit and the probability that some fraction of all the storage sites could retain a minimum storage mass of CO₂. The estimated mass of storage resource is further evaluated with parameters that describe the probability of successful containment of CO₂.” The document is available at: <http://pubs.usgs.gov/of/2009/1035/ofr2009-1035.pdf>.

“Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act.”

The following is from the Summary of this document: “Today the Administrator is proposing to find that [GHGs] in the atmosphere endanger the public health and welfare of current and future generations. Concentrations of [GHGs] are at unprecedented levels compared to the recent and distant past. These high atmospheric levels are the unambiguous result of human emissions, and are very likely the cause of the observed increase in average temperatures and other climatic changes. The effects of climate change observed to date and projected to occur in the future – including but not limited to the increased likelihood of more frequent and intense heat waves, more wildfires, degraded air quality, more heavy downpours and flooding, increased drought, greater sea level rise, more intense storms, harm to water resources, harm to agriculture, and harm to wildlife and ecosystems – are effects on public health and welfare within the meaning of the Clean Air Act. In light of the likelihood that [GHGs] cause these effects, and the magnitude of the effects that are occurring and are very likely to occur in the future, the Administrator proposes to find that atmospheric concentrations of [GHGs] endanger public health and welfare within the meaning of Section 202(a) of the Clean Air Act. [Administrator Lisa P. Jackson] proposes to make this finding specifically with respect to six [GHGs] that together constitute the root of the climate change problem: [CO₂], [CH₄], [NO_x], [HFCs], [PFCs], and [SF₆].” A pre-publication copy of this document is available at: <http://www.epa.gov/climatechange/endangerment/downloads/GHGEndangermentProposal.pdf>.

“Measurement, Reporting, and Verification in a Post-2012 Climate Agreement.”

The following is from the Introduction of this document: “The Bali Action Plan initiated a new round of negotiations under the UN Framework Convention on Climate Change (UNFCCC) with the aim of achieving an ‘agreed outcome’ addressing the full range of climate-related issues, including mitigation, adaptation, technology, and finance. In framing these negotiations, the Bali plan introduces a new construct with its requirement that certain actions be ‘measurable, reportable and verifiable.’ Specifically, in paragraphs 1(b)(i) and (ii), addressing mitigation, the plan calls for consideration of: ‘Measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, by all developed country Parties....[and] Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.’ The Bali plan appears, then, to anticipate that a new climate agreement will provide for the measurement, reporting, and verification of three categories of action: developed country mitigation commitments or actions, developing country mitigation actions, and the provision of support for developing country mitigation actions.” The complete document, which is part of the Pew Center’s series on “Advancing the International Effort Against Climate Change,” is available at: <http://www.pewclimate.org/docUploads/mrv-report.pdf>.

LEGISLATIVE ACTIVITY

Energy and Commerce Committee News Release, “Chairmen Waxman, Markey Release Discussion Draft of New Clean Energy Legislation.”

On March 21, 2009, Chairman Henry A. Waxman of the Energy and Commerce Committee and Chairman Edward J. Markey of the

Energy and Environment Subcommittee released a draft of clean energy legislation, called the “American Clean Energy and Security Act of 2009.” The draft legislation is composed of four primary sections: (1) a clean energy portion that promotes renewable sources of energy, CCS technologies, the Smart Grid, and electricity transmission; (2) an energy efficiency portion that increases energy efficiency; (3) a climate change portion that places limits on GHG emissions; (4) and a transitioning portion that promotes green jobs. In regards to CCS, the draft includes plans for a CCS demonstration program, incentives for the

LEGISLATIVE ACTIVITY (CONTINUED)

commercial deployment of CCS, and performance standards for new coal-fired power plants. A discussion draft summary of the American Clean Energy and Security Act of 2009 is available at: http://energycommerce.house.gov/Press_111/20090331/acesa_summary.pdf and the complete text is available at: http://energycommerce.house.gov/Press_111/20090331/acesa_discussiondraft.pdf. March 31, 2009, http://energycommerce.house.gov/index.php?option=com_content&task=view&id=1560&Itemid=1.

Congressman Jim McDermott News Release, “Rep. McDermott Introduces Breakthrough Legislation on Climate Change.”

On March 24, 2009, U.S. Representative Jim McDermott of Washington introduced H.R. 1683, known as “The Clean Environment and Stable Energy Market Act of 2009,” which would reduce GHG emissions by 80 percent by the middle of the century. Under H.R. 1683, the producers of products and/or resources that emit GHGs would be required to purchase Federal Emission Permits. The Secretary of the Treasury would establish the price for permits, which would be made available in a limited supply and occasionally adjusted to ensure that permit demand does not exceed an annual national allocation. The legislation sets a five-year price schedule for permits and prohibits the trading of permits. In addition, the legislation would also create a “Climate

Protection and Economic Security Trust Fund” that would hold the revenue generated from permit sales. To view The Clean Environment and Stable Energy Market Act of 2009, go to: <http://www.house.gov/mcdermott/The%20Clean%20Environment%20and%20Stable%20Energy%20Market%20Act.pdf>. March 24, 2009, <http://www.house.gov/mcdermott/pr090324.shtml>.

Congressman Rick Boucher News Release, “Boucher Introduces Legislation to Accelerate the Availability of Carbon Capture and Storage Technology.”

U.S. Representative Rick Boucher of Virginia introduced legislation on March 24, 2009, to advance the development and deployment of CCS technologies. The legislation would establish an annual \$1 billion fund to award grants to large-scale CCS projects and finance research projects investigating several CO₂ capture methods, ranging from combustion processes and the reliability of conversion or storage in multiple storage sites. The legislation would authorize the Nation’s fossil fuel-based electricity distribution utilities to hold a referendum on the establishment of a Carbon Storage Research Corporation; if approved by representatives from two-thirds of these utilities, the corporation would be created and authorized to collect a tax on most consumer electric bills derived from fossil fuel-based electricity generation. The corporation would operate as a division of the Electric Power Research Institute (EPRI). To view the legislation, click: <http://www.boucher.house.gov/images//ccs%20111th.pdf>. March 24, 2009, http://www.boucher.house.gov/index.php?option=com_content&task=view&id=1634&Itemid=75.



EVENTS

May 4-7, 2009, **8th Annual Conference on Carbon Capture and Sequestration**, *Sheraton at Station Square, Pittsburgh, Pennsylvania, USA*. This NETL-hosted conference will focus on CCS technologies that are being or could be deployed in the United States and North America; provide a forum for the exchange of experience(s) among United States and international scientific and engineering communities working on such technologies and systems; facilitate the necessary dialogue between technology developers, industry, and the public on the development and deployment of viable technologies; and work to develop the necessary capacity within the public and private sector to move the technology base forward. To learn more, click: <http://www.carbonsq.com/index.htm>.

May 12-15, 2009, **2nd Climate Change Technology Conference**, *McMaster University, Hamilton, Ontario, Canada*. The Climate Change Technology Conference (CCTC 2009) offers a forum for scientists, engineers, policy advisors, and industry to exchange new information with other stakeholders that deal with potential climate change issues. The conference includes a technical program that emphasizes the importance of developing practical engineering and administrative responses to address such issues. To view the conference website, visit: <http://cctc2009.ca/en/index.html>.

May 13-14, 2009, **Carbon Capture and Storage**, *Berlin, Germany*. This two-day event will cover current global CCS projects and the challenges that exist for the commercialization of CCS. Some of the topics to be discussed include the efficient creation of commercially viable technologies; advanced carbon storage solutions; and safe, cost-effective transportation methods. For more information, click: <http://www.acius.net/wiki.aspx/Conferences/Upcoming?view=overview&id=121>.



EVENTS (CONTINUED)

May 18-21, 2009, **Fourth International Conference on Clean Coal Technologies**, *Maritim Hotel and International Congress Center, Dresden, Germany*. The fourth installment of this conference will provide information on the sustainable worldwide use of coal. The conference includes presentations on clean coal-related topics, such as combustion and chemical looping, gasification, and oxy-combustion. For a detailed program, visit the conference website at: <http://www.cct2009.org/ibis/iea-cct-2009/clean-coal-technology-conference>.

May 26-28, 2009, **POWER-GEN Europe**, *Koelnmesse, Cologne, Germany*. This event includes discussion of a range of technologies that can be employed to reduce CO₂ in power production while focusing on policies at a national and corporate level that would improve energy efficiency. To view the conference website, which includes a detailed program, visit: <http://pge09.events.pennnet.com/fl/content.cfm?NavId=8447&Language=Engl>.

May 27-29, 2009, **Carbon Expo**, *Barcelona, Spain*. This event will provide participants with an opportunity to explore local government's responses to the carbon market, while also offering industry, project and carbon finance agents, clean technology developers and providers, and other relevant stakeholders with a market place for clean urban development solutions. To learn more, click: <http://www.carbonexpo.com/wEnglisch/carbonexpo2/index.htm>.

May 27-29, 2009, **International Conference on Deep Saline Aquifers for Geological Storage of CO₂ and Energy**, *IFP in Rueil-Malmaison, France (suburbs of Paris)*. The conference will focus on the storage of natural gas in aquifers; aquifer thermal energy storage (ATES); and CO₂ storage in saline aquifers, including processes induced by CO₂ disposal and an evaluation of storage potential and assessment of suitable disposal sites. To read more, visit the conference website at: <http://www.ifp.com/actualites/evenements/congres-et-conferences/organises-par-l-ifp/rs-deep-saline-aquifers>.

June 9-10, 2009, **The Petroleum Economist Forum on CCS**, *London, UK*. This CCS forum investigates the challenges of implementing CCS projects and explores the regulatory framework supporting the drive for a reduction in CO₂ emissions. This forum will also cover the political opportunities in CCS, as well as the development of key commercial strategies for CCS. For more information, visit the conference website at: <http://www.petroleum-economist.com/default.asp?page=19&searchtype=6&productid=10032>.

June 17-18, 2009, **Carbon Capture, Storage, and Transport Summit 2009**, *Le Meridien Piccadilly, London, UK*. The 2nd Annual Carbon Capture, Storage, and Transport Summit is a senior level forum directed at covering commercial, technical, legislative, and scientific challenges in carbon capture, storage, and transport implementation. To view the conference website, which includes a downloadable brochure, go to: <http://www.iqpc.com/ShowEvent.aspx?id=173566>.

July 5-9, 2009, **Global Conference on Global Warming 2009**, *Istanbul Grand Cevahir Hotel, Istanbul, Turkey*. This conference focuses on global warming and climate change, covering a broad range of relevant topics, such as energy and environmental policies; energy resources, conversion technologies, management, and security; renewables; emissions reduction and abatement; carbon tax; sustainable development; and policy development. To view the conference website, go to: <http://www.gcgw.org/gcgw09/index.php?conference=gcgw09&schedConf=gcgw09&page=index>.

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Please visit <http://listserv.netl.doe.gov/mailman/listinfo/sequestration>, enter your email address, and create a password. This will enable you to receive a pdf version of the Carbon Sequestration Newsletter at no cost.

To view an archive with past issues of the newsletter, see: http://www.netl.doe.gov/technologies/carbon_seq/refshelf/subscribe.html.

To learn more about DOE's Carbon Sequestration Program, please contact Sean Plasynski at sean.plasynski@netl.doe.gov, or Dawn Deel at dawn.deel@netl.doe.gov.