Carbon Sequestration Newsletter

November 2007

What's Inside?

Highlights

***NETL News Release*, "DOE Awards First Three Large-Scale Carbon Sequestration Projects."**

On October 9, US Deputy Secretary of Energy Clay Sell announced the awards for the first of three large-scale carbon sequestration projects to be deployed as part of the Department of Energy's (DOE) Regional Carbon Sequestration Partnership Program. The ventures represent the first of several DOE large-scale sequestration projects to be awarded, each with the goal to store at least one million tons of carbon dioxide (CO_2) in deep geologic formations. The projects will kick off the third phase of work being done by the Regional Partnerships. Previous phases of work consisted of evaluating CO_2 sources and sinks in various parts of the United States and Canada and conducting a series of small-scale field tests to validate the various geologic formations for safe and permanent storage of CO_2. The first project award, which consists of geologic sequestration projects in North Dakota and northwestern Alberta, Canada, was made to the Plains CO_2 Reduction Partnership (PCOR), led by the Energy and Environmental Research Center at the University of North Dakota. PCOR's projects will demonstrate both enhanced oil recovery and sequestration of CO_2. The Southeast Regional Carbon Sequestration Partnership (SECARB), led by the Southern States Energy Board, received the second project award, which is expected to begin in late 2008. SECARB will conduct a large-scale CO_2 injection test in two steps in the lower Tuscaloosa Formation Massive Sand Unit. The third award was made to the Southwest Regional Partnership (SWP) for Carbon Sequestration, led by the New Mexico Institute of Mining and Technology. SWP plans to inject several million tons of CO_2 into the Jurassic Entrada Formation, a deep saline formation present throughout the SWP region. Each of the Deployment Phase tests will encompass site characterization, injection operations and monitoring, and site closure and post-injection monitoring. To learn more about DOE's Regional Carbon Sequestration Partnerships, click on: http://www.netl.doe.gov/technologies/carbon_seq/partnerships/partnerships.html. October 9, 2007, http://www.doe.gov/print/5597.htm.

Sequestration in the News

***Odessa American Online*, "More on FutureGen."**

Research conducted by Dr. Weon Shik Han of the New Mexico Institute of Mining and Technology shows that a local brine formation near the possible FutureGen site in Odessa, Texas is best suited for sequestering the plant's CO_2. By simulating the injection history of the United States' oldest CO_2 sequestration site, located at the Scurry Area Canyon Reef Operators Committee (SACROC) field near Snyder, Texas, Han deduced that having an oil reservoir near the injection site creates a physical barrier to prevent CO_2 leakage. Han created a numerical model based on the 13 million tons of CO_2 injected into the field's northern quadrant, thus allowing him to identify the range of the trapping mechanisms. The well records showed that six million tons of CO_2 had been produced in secondary recovery operations, while the remaining seven million tons of CO_2 were successfully sequestered. Han, whose research is partly affiliated with President Bush's Global Climate Change Initiative, concluded that when CO_2 density is greater than oil density, a perfect seal is created. The Penwell site is vying against Jewett, Texas, and two Illinois towns, Mattoon and Tuscola, for the $1.5 billion, near-zero emissions, coal-fired power plant, whose final location will be announced by the FutureGen Alliance in December 2007. September 28, 2007, http://www.oaoa.com/news/co2_8216___article.html/futuregen_site.html.

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This newsletter 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.

Sequestration in the News (continued)

***RWE News Release*, "RWE Npower to Develop First 'Carbon Dioxide Capture' Technology Pilot at a UK Coal Power Station."**

By 2010, RWE npower plans to have the United Kingdom's (UK) first CO_2 capture pilot plant fully operational at the coal powered Aberthaw Power Station in South Wales. The UK's largest electricity supplier will direct an initial $17.1 million (£8.4 million) toward a 1 megawatt (MW) capture plant, then focus further investment on a CO_2 capture and storage demonstrator plant of at least 25 MW. Unlike other CO_2 capture and storage techniques, RWE will utilize post-combustion technology in both plants, a technology which is functional in already existing coal power plants. Once completed, the pilot plant will allow RWE to harness the technical and commercial issues surrounding CO_2 capture and storage technology. The larger CO_2 capture and storage demonstrator plant, currently under testing at existing plant sites in Tilbury, Essex, and Blyth, Northumberland, will form part of RWE's high efficiency, supercritical power stations. This development came on the heels of RWE npower's sister company announcing that it will team with BASF and The Linde Group to design, construct, and operate a CO_2 capture and storage system at the lignite-fired Niederaussem Power Station in Germany. October 10, 2007, http://www.rwe.com/generator.aspx/presse/language=en/id=76864?pmid=4001863.

***Blue Source LLC News Release*, "Blue Source Announces Reduction of $C0_2$ Emissions at Natural Gas Plant in Carbon Capture Project for South Central Colorado,"** and ***Reuters*, "Blue Source to Pipe Colorado CO_2 to Boost Oil Output."**

Blue Source LLC, a leader in the marketing of greenhouse gas offsets in North America, announced plans to capture 20 million cubic feet of CO_2 per day from the Apple Tree natural gas processing plant in southwest Colorado and pipe it to an aging petroleum field in the Permian Basin. In order for the 20 million cubic feet of CO_2, equal to the emissions of 70,000 cars, to reach its destination, Blue Source will need an $8 million capital infusion to connect the Apple Tree vent stack to the Sheep Mountain CO_2 Pipeline located 16 miles from the site. Blue Source officials said they plan to sell the gas to energy producers or purchase market credits, known as Voluntary Emissions Reductions (VERs), which will work to finance the investment. In addition to the Apple Tree development, Blue Source previously announced plans in August to capture CO_2 from a Kansas fertilizer plant and pipe it from 70 to 120 miles for enhanced oil recovery at a cost of $50 million to $80 million. Similar Blue Source projects are in the works. October 8, 2007, http://www.ghgworks.com/5c-pr07-10-08.html and October 9, 2007, http://uk.reuters.com/article/oilRpt/idUKN09418364200710 09?pageNumber=1.

***NETL News Release*, "DOE Releases Draft Funding Opportunity Announcement for CCPI Round 3."**

DOE has released the draft Funding Opportunity Announcement (FOA), Model Cooperative Agreement, and Model Payment Agreement for Round 3 of the Clean Coal Power Initiative (CCPI), which focuses

Sequestration in the News (continued)

on technologies that capture and sequester CO_2 emissions and put them to beneficial use. DOE established the following goals for demonstration at a commercial scale in a commercial setting: technologies that capture and sequester at least 50 percent of CO_2 emissions from the proposed facility, or put them to beneficial reuse; technologies that show significant progress toward 90 percent carbon capture; and technologies that show significant progress toward CO_2 capture and sequestration with less than 10 percent increase in electricity costs. Round 3 is structured for demonstration projects that align with ongoing sequestration field tests, which could already be operational when new projects become available. Interested parties are encouraged to inquire about the cost-shared partnership during the public comment period, which began October 4, 2007 and ends November 9, 2007. A public workshop will be held in Pittsburgh, PA on November 1, 2007 related to the FOA. The final FOA is expected to be released by the end of November 2007 with an application due date of April 29, 2008. Serving as part of President Bush's commitment to clean coal technology, the CCPI began in 2002 as a 10-year, $2 billion program to advance coal based power generation by seeking innovative technologies on a commercial scale. To read the Draft FOA, click on: https://e-center.doe.gov/iips/faopor.nsf/UNID/381D0BFF0BCDDEFD852572E60065938E?OpenDocument.

(See the Announcements section of this newsletter for more information about the CCPI public meeting being held in response to this announcement.) October 4, 2007, http://www.netl.doe.gov/publications/press/2007/07071-DOE_Seeks_CCPI_Comments_.html.

Announcements

Carbon Sequestration Forum VIII.

The MIT Carbon Sequestration Initiative (http://sequestration.mit.edu) and Stanford University's Global Climate and Energy Project (http://gcep.stanford.edu) will host a forum on November 13-14, 2007 at Stanford University in Palo Alto, California. The meeting will focus on this year's theme, "The State of Geological Storage of CO_2." Presenters include experts from MIT and Stanford; consortium members; and other governmental, academic, and industrial organizations. Forum attendance is by invitation only.

Interactive Multimedia, "Vital Signs of a Warming World: The science, impacts, and scenarios of climate shifts."

MSNBC investigates the impact of temperature changes across the globe through the use of pictures, videos, and full length stories to examine issues such as melting ice in the Polar Regions, potential animal extinctions, landscape alterations, and the detrimental effects on low lying coastal areas. A link to this website is available at: http://www.msnbc.msn.com/id/19463513/.

Clean Coal Power Initiative (CCPI) Round 3 Workshop.

A public meeting will be conducted to address the draft Round 3 Funding Opportunity Announcement focusing on carbon capture and sequestration technologies. The workshop will be held at the Hyatt Regency Hotel at the Pittsburgh International Airport in Pittsburgh, PA on November 1, 2007. For more information, go to: http://www.netl.doe.gov/events/07conferences/ccpi/index.html. **(See the News section of this newsletter, "DOE Releases Draft Funding Opportunity Announcement for CCPI Round 3," to find out more about this FOA.)**

Science

***CNN.com*, "Gore Shares Nobel Peace Prize with U.N. Panel," and *Chicago Tribune*, "Local Nobel 'Winners' Were Just Glad to Help."**

In recognition of their work to raise awareness about global warming, former Vice President Al Gore and the UN Intergovernmental Panel on Climate Change (IPCC) received the 2007 Nobel Peace Prize. The Nobel committee commended both recipients on their efforts to expand knowledge and research about man-made climate change and formulate policies necessary to bringing about change. The committee also dubbed Gore, who plans to donate his share of the $1.5 million prize to the Alliance for Climate Protection, as "one of the world's leading environmental politicians." The Nobel Prize is the most recent of several awards bestowed to Gore, who collected two Oscars for his film "An Inconvenient Truth" and an Emmy for a television show he co-created called "Current TV." Rajendra Pachauri, chairman of the IPCC, praised the 2,000 scientists that contribute to the IPCC and encouraged them to do even more in the future. Many of the panel members conducted their work pro bono, mostly reading journal articles and editing reports for several years. The award draws attention to work that otherwise goes overlooked by many. Former President Bill Clinton praised Gore's foresight of the dangers accompanying climate change and President Bush offered his congratulations through a spokesman. The award ceremony will take place December 10, 2007 in Oslo, Norway. To view the Nobel Committee press release, click: http://nobelprize.org/nobel_prizes/peace/laureates/2007/press.html. October 12, 2007, http://www.cnn.com/2007/POLITICS/10/12/nobel.gore/index.html and October 13, 2007, Link unavailable.

Science (continued)

***Associated Press*, "Lacking Sea Ice, Walruses Head for Shore."**

www.hi.is/~oi/svalbard wildlife.htm

Likely due to record low Arctic sea ice and warming temperatures, thousands of walruses currently line Alaska's northwest shore, spanning from Barrow, America's northernmost point, to Cape Lisburne, located about 300 miles southwest on the Chukchi Sea. The arrival of the walruses in late July, occurring a month earlier than usual, has fueled concerns among individuals affiliated with the US Fish and Wildlife Service in Anchorage, Alaska. These fears include walruses stampeding into the water due to avoidable human contact, losing energy from having to travel farther to hunt food, and leaving orphan calves to fend for themselves. Also, some worry about the walruses' anxiety and stress levels and sometimes thin appearance. During the 2007 melt season, the National Snow and Ice Data Center (NSIDC) reported that Arctic sea ice dropped to its lowest levels since measurements started in 1979. This further hampers the walruses' ability to hunt for food, forcing them to dive to the sea bottom in waters that exceed their maximum diving depth of about 630 feet. At 1.65 million square miles, this September's average sea ice extent is the lowest September on record, passing the previous record set in 2005 by 23 percent. The walruses are expected to remain along the Alaskan shore until November, when they will move south as the Chukchi Sea freezes. To read the complete NSIDC press release, which includes statistical data, video analysis, and high-resolution photos, go to: http://www.nsidc.org/news/press/2007_seaiceminimum/20071001_pressrelease.html. October 5, 2007, http://www.msnbc.msn.com/id/21148381/.

Policy

***Reuters*, "UN Chief Sees Major Commitment to Climate Change."**

On September 24, U.N. Secretary-General Ban Ki-moon convened a one day event titled "The Future in our Hands: Addressing the Leadership Challenge of Climate Change" with hopes to build momentum in advance of the U.N. Climate Change Conference in December. Ban believes the conference served as a turning point in the battle against global warming and said he was pleased with the political commitment. Some 80 heads of state or government attended, including Brazilian President Luiz Ignacio Lula da Silva, Greenpeace China leader Lo Sze Ping, and US Secretary of State Condoleezza Rice, who represented President George Bush. Speaking to the attendees, Rice acknowledged that climate change is a generational and global challenge because of the issue's complex nature and stressed that the US is committed to the U.N. Framework Convention on Climate Change. Also, Rice encouraged a technological revolution based on clean energy technology, such as hydrogen technologies; carbon sequestration; and advanced nuclear energy, which would lessen humans' dependence on fossil fuels. With President Bush contending the Kyoto Protocol burdens rich countries and the European Commission insisting success is possible only with US involvement, talks to replace the soon expiring agreement could prove to be challenging. The U.N. Climate Change Conference is scheduled to be held December 3-14 in Bali, Indonesia. To view the complete text of Secretary Rice's "Remarks at the U.N. General Assembly High-Level Event on Climate Technology Session," click: http://www.state.gov/secretary/rm/2007/09/92662.htm. September 24, 2007, http://www.reuters.com/article/homepageCrisis/idUSN24278607._CH_.2400.

"Investment risks under certain climate change policy."

This paper describes results from a model of decision-making under uncertainty using a real options methodology, developed by the International Energy Agency (IEA). The model represents investment decisions in power generation from the perspective of a private company. The investments are subject to uncertain future climate policy, which is treated as an external risk factor over which the company has no control. The aims of this paper are to (i) quantify these regulatory risks in order to improve understanding of how policy uncertainty may affect investment behavior by private companies and (ii) illustrate the effectiveness of the real options approach as a policy analysis tool. The study analyzed firms' investment options of coal- and gas-fired power plants and carbon capture and storage (CCS) technologies. Policy uncertainty is represented as an exogenous event that creates uncertainty in the carbon price. [The authors'] findings indicate that climate policy uncertainty creates a risk premium for power generation investments. In the case of gas- and coal-fired power generation, the risk premium would lead to an increase in electricity prices of 5–10 [percent] in order to stimulate investment. In the case of CCS, the risk premium would increase the carbon price required to stimulate investment by 16–37 [percent] compared to a situation of perfect certainty. The option to retrofit CCS acts as a hedge against high future carbon prices, and could accelerate investment in coal plant. This paper concludes that to minimize investment risks in low carbon technologies, policy-makers should aim to provide some long-term regulatory certainty. **William Blyth, Richard Bradley, Derek Bunn, Charlie Clarke, Tom Wilson and Ming Yang**, *Energy Policy*, Volume 31, Issue 11, November 2007, Pages 5766-5773. Available online August 17, 2007, doi:10.1016/j.enpol.2007.05.030, http://www.sciencedirect.com/science/article/B6V2W-4PFDPNY-1/2/69e44caf1745e2e072cc26fda459d35d. (Subscription may be required.)

Geology

"Coalbed methane reservoir data and simulator parameter uncertainty modelling for CO_2 storage performance assessment."

Laboratory studies and a number of field pilots have demonstrated that CO_2 injection into coal seams has the potential to enhance coalbed methane (CBM) recovery with the added advantage that most of the

Geology (Continued)

injected CO_2 can be stored permanently in coal. The concept of storing CO_2 in geologic formations as a safe and effective greenhouse gas mitigation option requires public and regulatory acceptance. In this context it is important to develop a good understanding of the reservoir performance, uncertainties and the risks that are associated with geological storage. The paper presented refers to the sources of uncertainty involved in CO_2 storage performance assessment in coalbed methane reservoirs and demonstrates their significance using extensive digital well log data representing the Manville coals in Alberta, Canada. The spatial variability of the reservoir properties was captured through geostatistical analysis, and sequential Gaussian simulations of these provided multiple realizations for the reservoir simulator inputs. A number of CO_2 injection scenarios with variable matrix swelling coefficients were evaluated using a 2D reservoir model and spatially distributed realizations of total net thickness and permeability. **Anna Korre, Ji Quan Shi, Claire Imrie, Carlos Grattoni and Sevket Durucan**, *International Journal of Greenhouse Gas Control*, Volume 1, Issue 4, October 2007, Pages 492-501, Available online August 28, 2007, doi:10.1016/S1750-5836(07)00093-X, http://www.sciencedirect.com/science/article/B83WP-4PHSFSB-1/2/f17f8ebfcb3f1335d5535c46dc4f14ee. (Subscription may be required.)

"Effects of matrix shrinkage and swelling on the economics of enhanced-coalbed-methane production and CO_2 sequestration in coal."

Increases in carbon dioxide (CO_2) levels in the atmosphere and their contributions to global climate change are a major concern. [Carbon] sequestration in unmineable coals may be a very attractive option, for economic as well as environmental reasons, if a combination of enhanced-coalbed-methane (ECBM) production and tax incentives becomes sufficiently favorable compared to the costs of capture, transport, and injection of CO_2. Darcy flow through cleats is an important transport mechanism in coal. Cleat compression and permeability changes caused by gas sorption/desorption, changes of effective stress, and matrix swelling and shrinkage introduce a high level of complexity into the feasibility of a coal sequestration project. The economic effects of CO_2-induced swelling on permeabilities and injectivities has received little (if any) detailed attention. [Carbon dioxide] and methane (CH_4) have different swelling effects on coal. In this work, the Palmer-Mansoori model for coal shrinkage and permeability increases during primary methane production was rewritten to also account for coal swelling caused by CO_2 sorption. The generalized model was added to a compositional, dual-porosity coalbed-methane reservoir simulator for primary (CBM) and ECBM production. A standard five-spot of vertical wells and representative coal properties for Appalachian coals was used (Rogers 1994). Simulations and sensitivity analyses were performed with the modified simulator for nine different parameters, including coal seam and operational parameters and economic criteria. The coal properties and operating parameters that were varied included Young's modulus, Poisson's ratio, cleat porosity, and injection pressure. The economic variables included CH_4 price, CO_2 cost, CO_2 credit, water disposal cost, and interest rate. Net-present-value (NPV) analyses of the simulation results included profits resulting from CH_4 production and potential incentives for sequestered CO_2. This work shows that for some coal seams, the combination of compressibility, cleat porosity, and shrinkage/swelling of the coal may have a significant impact on project economics. **F. Burcu Gorucu, Sinisha A. Jikich, Grant S. Bromhal, W. Neal Sams, Turgay Ertekin and Duane H. Smith**, *SPE Reservoir Evaluation & Engineering*, Volume 10, Issue 4, August 2007, Pages 382-392. DOI: 10.2118/97963PA. (Link Unavailable.)

Technology

"Advances in CO_2 capture technology—The U.S. Department of Energy's Carbon Sequestration Program."

There is growing concern that anthropogenic carbon dioxide (CO_2) emissions are contributing to global climate change. Therefore, it is critical to develop technologies to mitigate this problem. One very promising approach to reducing CO_2 emissions is CO_2 capture at a power plant, transport to an injection site, and sequestration for long-term storage in any of a variety of suitable geologic formations. However, if the promise of this approach is to come to fruition, capture costs will have to be reduced. The Department of Energy's Carbon Sequestration Program is actively pursuing this goal. CO_2 capture from coal-derived power generation can be achieved by various approaches: post-combustion capture, pre-combustion capture, and oxy-combustion. All three of these pathways are under investigation, some at an early stage of development. A wide variety of separation techniques is being pursued, including gas phase separation, absorption into a liquid, and adsorption on a solid, as well as hybrid processes, such as adsorption/membrane systems. Current efforts cover not only improvements to state-of-the-art technologies but also development of several innovative concepts, such as metal organic frameworks, ionic liquids, and enzyme-based systems. This paper discusses the current status of the development of CO_2 capture technology. **José D. Figueroa, Timothy Fout, Sean Plasynski, Howard McIlvried and Rameshwar D. Srivastava**, *International Journal of Greenhouse Gas Control*, Available online September 17, 2007, doi:10.1016/S1750-5836(07)00094-1, http://www.sciencedirect.com/science/article/B83WP-4PP201T-1/2/ea6e3a43ec03a55cc371a4d1a9ece690. (Subscription may be required.)

Terrestrial/Ocean

"Strengthening the soil organic carbon pool by increasing contributions from recalcitrant aliphatic bio(macro)molecules."

Photosynthetically fixed CO_2 is converted into terrestrial bio(macro)molecules and sequestered as soil organic matter (SOM) by (bio)chemical and physical stabilization processes. SOM is generally divided in arbitrary pools for modeling SOM dynamics. Biochemically recalcitrant SOM fractions are enriched with alkyl carbon (C) structures and resist decomposition due to intrinsic molecular properties. The proportion of alkyl C and the mean age of SOM increase with increase in soil depth. Precursors of these recalcitrant bio(macro)molecules such as glycerides, waxes, and terpenoids occur in plants, microorganisms and animals. The intrinsic biochemical stability of naturally occurring recalcitrant aliphatic biomacromolecules may enhance the terrestrial storage of atmospheric CO_2. Also, aliphatic macromolecules may be formed in soils upon non-enzymatic polymerization of low-molecular-weight lipids. In this review [the authors] propose that increasing the soil organic carbon (SOC) pool by land-use and management practices should also include strategies to increase the proportion of aliphatic compounds in the belowground biomass. Thus, collaborative research is needed to study the fate of plant-, microbial- and animal-derived aliphatic C as precursors for stabilized aliphatic SOC fractions, in particular in deeper soil horizons. **Klaus Lorenz, Rattan Lal, Caroline M. Preston and Klaas G.J. Nierop**. *Geoderma*, Available online September 5, 2007, doi:10.1016/j.geoderma.2007.07.013, http://www.sciencedirect.com/science/article/B6V67-4PKG610-2/2/49cab6c07fef7e4e82bf795e804cf15f#secx12. (Subscription may be required.)

http://wfsc.tamu.edu/davislab/wetlands%20ecosystems.html

Trading

Carbon Market Update, Oct. 15, 2007	
CCX-CFI 2007 ($/tCO$_2$) $2.25 (Vintage 2007)	EU ETS-EUA DEC 2008 ($/tCO$_2$) $32.05 (Converted from € to US$)

***Chicago Climate Exchange*, "Chicago Climate Exchange Announces Landmark Growth in Binding Greenhouse Gas Reduction Commitments, Membership and New International Activities at Clinton Global Initiative."**

On October 1, the Chicago Climate Exchange (CCX) announced that emission reduction commitments by its members have reached over a million metric tons of CO_2. These reductions represent the only reductions being achieved in North America by a legally binding compliance regime. Additional announcements regarding the CCX's recent growth were made at the Third Clinton Global Initiative meeting in New York City, a conference for global leaders to devise and implement innovative solutions to some of the world's most pressing challenges, including energy and climate change. The Governor of the State of Santa Catarina, Brazil announced the country's membership to the CCX, making it the first state outside of the United States to join the exchange. Also announced were commitments from various companies in India that will join the US-based exchange as offset aggregators and verifiers for CCX offset projects. October 1, 2007, http://www.chicagoclimateexchange.com/news.jsf?story=1881.

Brazil Ministry of Tourism

Recent Publications

"Climate Change Legislation Design White Paper, Scope of a Cap-and-Trade Program."

The Committee on Energy and Commerce and its Subcommittee on Energy and Air Quality are issuing a series of Climate Change Legislation Design White Papers as the next step in the legislative process leading to enactment of a mandatory, economy-wide climate change program. While the hearings earlier in the year were designed to give the Committee an understanding of the status and projected path of climate change and potential ways to address it, these White Papers and the hearings on them will focus the Committee's attention on crafting mandatory, economy-wide climate change legislation. The White Papers will lay out the basic design and key principles of a program, and also identify issues about which further information and discussion is needed. This White Paper addresses the scope and coverage of the climate change program. It discusses what sectors and activities are directly emitting greenhouse gases, and how those emissions could be included in a cap-and-trade program. Other White Papers will address a number of other cap-and-trade design elements and additional topics, including: cap levels and timetables, measures for containing costs in a cap-and-trade program, carbon sequestration, offsets and credits, developing countries, distribution of allowances, and additional measures to complement the cap-and-trade program. To read the complete White Paper prepared by the US House of Representatives Committee on Energy and Commerce staff, go to: http://energycommerce.house.gov/Climate_Change/White_Paper.100307.pdf.

"The Future of Coal Under a Carbon Cap and Trade Regime."

Global climate change is the greatest environmental challenge we face. We have at most a few decades to make the necessary investments to prevent the most serious impacts of climate change. Future generations will judge us based on the investments we are considering now. In its February 2007 report, the Intergovernmental Panel on Climate Change (IPCC) warns that global emissions must peak no later than 2015 if we are to hold average global temperature increases to 2.4 degrees Celsius (4.3 [degrees Fahrenheit]) or less. Moving to an emissions pathway that will hold temperature increases and other impacts to a minimum will require a colossal effort. There is no time to lose given the long lag in research and development cycles, and energy-intensive infrastructure and product turnover. Fundamentally altering the world's energy system is unlikely to occur within this timeframe. It is thus imperative to find means to reduce the footprint of the existing system – most particularly, of coal, which is the most greenhouse gas intensive of the fossil fuels driving climate change. It is in this context that carbon dioxide capture and sequestration (CCS) becomes one of the most critical technologies in the menu of choices we have to cut greenhouse gas emissions. It is the only option that provides a potentially near-term solution to rapidly expanding coal use here, in China and around the world. CCS must play the critical role of curbing growth in emissions from coal until other alternatives are ready. To download the complete paper prepared for the US House of Representatives Select Committee on Energy Independence and Global Warming, go to: http://pdf.wri.org/20070914_submission_houseeigw.pdf.

Legislative Activity

***PressMediaWire*, "EPA To Develop Regulations for Geologic Sequestration of Carbon Dioxide"** and ***USA Today*, "EPA Studies Emissions Storage."**

On October 11, The US Environmental Protection Agency (EPA) announced plans to develop geologic CO_2 sequestration regulations. Once in place, the regulations will ensure a consistent and effective permitting system under the Safe Drinking Water Act for commercial-scale projects aimed at mitigating CO_2, a greenhouse gas that contributes to global climate change. The same federal law established the Underground Injection Control (UIC) program which works with state and local governments to oversee underground injection of waste in order to prevent contamination of drinking water resources. The EPA said in a statement that it will propose regulations by the summer of 2008. For further information about the UIC program as related to the geologic sequestration of CO_2, see: http://www.epa.gov/safewater/uic/index.html. October 12, 2007, http://pressmediawire.com/printFriendly.cfm?articleID=2759, and October 14, 2007, http://www.usatoday.com/money/industries/energy/environment/2007-10-14-epa-carbon-dioxide_N.htm.

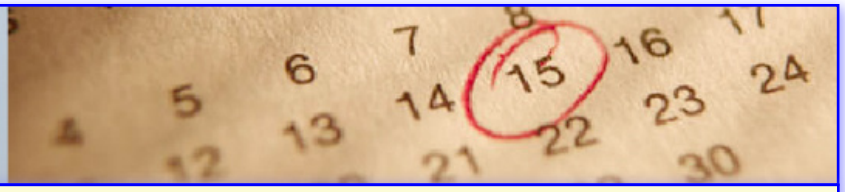
***E&E Daily*, "Senate Bill Seeks Study on CO_2 Pipeline Expansion."**

Ten United States senators introduced legislation on October 14, calling for DOE to study the safety, cost, and overall potential of transporting large amounts of CO_2 by pipeline to its eventual underground location. Cosponsored by several members of the Senate Energy and Natural Resource Committee, the bill states the DOE would partner with the Commerce and Interior departments, Federal Energy Regulatory Commission, and the Environmental Protection Agency to study the unknowns related to expanding the nearly 1,500 miles of US pipeline that ships both natural and man-made CO_2, mostly to western Texas oilfields. The bill's main objective is to examine issues such as compression rates for CO_2, potential for leakage, inspection policies, injection methods, and whether CO_2 fits the classification of a commodity or pollutant, an important difference for regulation. While engineers and lawmakers someday hope to have a sound CO_2 infrastructure, many hurdles still exist, such as rights-of-way, the absence of detailed CO_2 rules, and incentives for private lenders and developers. To view a copy of the draft legislation, "Carbon Dioxide Pipeline Study Act of 2007," click on: http://www.eenews.net/features/documents/2007/10/05/document_pm_01.pdf. October 5, 2007, http://www.eenews.net/eenewspm/print/2007/10/05/2. (Subscription may be required.)

Legislative Activity (Continued)

***Biopact*, "Towards Carbon-Negative Bioenergy: U.S. Senator Introduces Biochar Legislation."**

Legislation focused on carbon-negative bioenergy production was recently introduced in the Senate. S.1884, entitled "The Salazar Harvesting Energy Act of 2007" relates to the concept of producing carbon-negative fuels and energy. The legislation includes the creation of a joint US Department of Agriculture/DOE research program that involves a quantification and verification of the carbon sequestration benefits of various bioenergy and agricultural crops and practices. Unlike "carbon-neutral" technologies which factor out the CO_2 emissions with the growth of new energy crops, carbon-negative bioenergy effectively removes more CO_2 from the atmosphere than is released. Proponents of the biochar technology boast of its low cost and long-term benefits. The technology involves heating green waste or other biomass without oxygen to generate renewable energy through a process called pyrolysis. Because of the absence of oxygen in this process, no CO_2 is emitted. The byproduct of this process is agrichar, a black carbon substance which is added to agricultural soils where it can be stored safely for hundreds or even thousands of years. Benefits of agrichar use in soils are numerous. It reduces fertilizer requirements, increases crop yields, and reduces the impact of croplands on the climate and environment. Also, the low-cost technique can be applied world-wide on agricultural soils in developing countries. To read S.1884, "The Salazar Harvesting Energy Act of 2007," click on: http://www.biochar-international.org/images/S.1884_Salazar_Harvesting_Energy_Act_of_2007.pdf. October 7, 2007, http://biopact.com/2007/10/towards-carbon-negative-bioenergy-us.html.



Events

November 5-7, 2007, **8th Annual Alberta Power Summit**, *The Metropolitan Centre, Calgary, Alberta, Canada*. This conference offers industry operators the opportunity to convene and discuss developments in the growing energy market. The conference features a carbon trading seminar and topics such as emerging North American carbon markets, global trends, rethinking strategy, and the features necessary for a good trading scheme will be addressed. To view conference information and the agenda, go to: http://www.insightinfo.com/index.cfm?ci_id=25039&la_id=1.

November 11-15, 2007, **20th World Energy Congress and Exhibition**, *Nuova Fiera, Rome, Italy*. With member committees in over 90 countries, the World Energy Congress aims to monitor the status of the energy sector and to find solutions to promote the economic development of the most industrialized and developing countries and, at the same time, a sustainable supply and use of energy for the greatest benefit to all people. The Congress is held every three years and is considered the most important energy forum. For complete information, see: http://www.rome2007.it/Congress/Congress.asp.

November 13-15, 2007, **Carbon Capture and Storage**, *The InterContinental Stephen F. Austin, Austin, Texas, USA*. This conference will examine the current status of carbon capture and storage (CCS) in North America, and includes sessions on leveraging Federal and State regulatory incentives to begin projects, determining means for working within the framework of DOE's Regional Partnerships, FutureGen, CO_2 transportation and sequestration options, and public perception of CCS. For further details, see: http://www.americanconference.com/Energy___Resources/CCS.htm.

November 13-15, 2007, **Carbon Markets Africa**, *The Pavilion Conference Centre, Cape Town, South Africa*. Carbon Markets Africa focuses on raising awareness about the Clean Development Mechanism process and other greenhouse gas measures that are experiencing rapid growth for both large and small businesses in Africa. Specifically, issues such as renewable energy, landfill gas capture, industrial energy efficiency, and reforestation projects will be discussed. To find out more about this conference opportunity, go to: http://www.greenpowerconferences.com/carbonmarkets/carbonmarkets_capetown07.html.

November 14-16, 2007, **Carbon Reduction Project Development and Finance**, *Omni Houston Westside Hotel, Houston, Texas*. This event brings together experienced carbon market players, developers, and financiers from throughout the world to share their insights into developing, certifying, and financing profitable greenhouse gas emission reduction projects. Participants will explore how to take advantage of carbon revenue flows in geologic capture and other carbon reduction projects in overseas and US markets. To learn more about this event, go to: http://www.infocastinc.com/carbonred/conference.html.

Events (Continued)

November 28-29, 2007, **The Inaugural European Carbon Capture & Storage Summit**, *Kingsway Hall Hotel, London, United Kingdom*. This conference addresses the prospects of carbon capture and storage on a commercial scale in Europe, focusing on the policy, economics, technology developments, and regulatory framework. Case studies, such as the North Sea Carbon Capture and Storage Project and the European Union and China near-Zero Emissions Coal (nZEC) project, will be discussed. To view a PDF version of the conference brochure, go to: http://www.cityandfinancial.com/assets/documents/20071011162231CCS_Summit_WEB.pdf.

December 3-5, 2007, **Carbon Capture Status and Outlook**, *Almas Temple Club, Washington DC*. This conference will provide attendees with a global update on key technical, economic, financial, and policy developments in implementing carbon capture for power plants and other major industrial applications. To download the conference agenda and obtain registration information, go to: http://www.infocastinc.com/capture.html.

December 3-7, 2007, **CO_2 Flooding Conference**, *Onmi Mandalay Hotel Las Colinas, Irving, Texas and Midland Center Downtown, Midland, Texas*. This unique, two-part conference brings together players from both the oil industry and leaders in the emerging carbon capture and storage industry, whose expertise entails CO_2 processing, compression, injection, and reservoir maintenance and surveillance. The conference will examine FutureGen; case histories of actual CO_2 floods and sequestration projects; reports from DOE's Regional Carbon Sequestration Partnerships; and geological parameters affecting CO_2 enhanced oil recovery and CO_2 storage. In addition, attendees will take a "field trip" to Whiting Petroleum's new North Ward Estes CO_2 flood near Monahans, Texas. For further information and registration, go to: http://www.hartenergyconferences.com/index.php?area=details&confID=54.

December 10-14, 2007, **AGU Fall Meeting**, *Moscone Center, San Francisco, California*. The AGU Fall Meeting provides an opportunity for researchers, teachers, students, and consultants to present and review the latest issues affecting the Earth, the planets, and their environments in space. This meeting will cover topics in all areas of Earth and space sciences. A session entitled "Carbon Sequestration: Reservoirs, Techniques, Policy" will cover novel and current work in geologic, terrestrial, and oceanic carbon sequestration, as well as Monitoring, Mitigation and Verification (MMV) development as it relates to sequestration. For complete information, visit: http://www.agu.org/meetings/fm07/.

January 24-25, 2008, **Platts Carbon Trading: Opportunities and Risks in Global Emissions Markets**, *JW Marriott Hotel, Houston, Texas*. Designed for aiding energy traders, emission traders, and investors with knowledge about the evolving carbon trading market, this inaugural conference focuses on several key issues: mechanisms of carbon trading, managing risk in carbon markets, allocations versus auctions of allowances, market impact of Phase II carbon trading rules in the EU, and the next steps in the US carbon trading market. For event registration and agenda, visit: http://www.platts.com/Events/2008/pc803/index.xml.

For subscription details...

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.

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