



Carbon Sequestration Newsletter

OCTOBER 2008

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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

NETL News Release, "Underground Monitoring of Carbon Storage Site Begins in Mississippi."

The U.S. Department of Energy's (DOE) Southeast Regional Carbon Sequestration Partnership (SECARB) is using innovative, real-time monitoring equipment installed two miles beneath the Earth's surface to track the movement of carbon dioxide (CO₂) being injected for oil recovery. The project, led by the Southern States Energy Board and hosted by Denbury Resources, includes downhole pressure and

temperature measurements conducted by the Gulf Coast Carbon Center (GCCC) at the Bureau of Economic Geology, University of Texas at Austin. The effort will examine the instrumentation necessary to ensure safe CO₂ storage by verifying CO₂ retention in the injection zone, quantify storage capacity, and quantify near- and far-field pressure response to injection. SECARB began injecting CO₂ on July 15, 2008, at a depth of 10,300 feet for enhanced oil recovery (EOR) at the Cranfield oilfield near Natchez, Mississippi. The naturally occurring CO₂ is obtained from Jackson Dome and transported by pipeline to the injection site. SECARB plans to inject CO₂ at a rate of 250,000 to 500,000 metric tons per year over the next several years into the lower Tuscaloosa Formation. The Tuscaloosa Formation, which is representative of the CO₂ storage options that exist throughout the Gulf Coast region, lies beneath an area of approximately 46,000 square miles in southern Alabama and Mississippi, the Florida Panhandle, and Louisiana. The Massachusetts Institute of Technology (MIT) projected that the Tuscaloosa Formation has a potential storage capacity of 10 billion metric tons of CO₂. SECARB, one of seven National Energy Technology Laboratory- (NETL) managed Regional Carbon Sequestration Partnerships (RCSPs), includes 13 southeastern states – Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, and West Virginia – and roughly 100 partners and stakeholders. The Cranfield test is one of four pilot tests that SECARB is conducting during the effort's Validation Phase to evaluate storage potential in advance of a large-scale injection that will occur during the initiative's Deployment Phase. For more information about SECARB, visit: <http://www.secarbon.org/>, or click: <http://www.beg.utexas.edu/enviro/qly/co201.htm> to learn more about GCCC. August 27, 2008, http://www.netl.doe.gov/publications/press/2008/08035-Carbon_Storage_Monitoring_Begins.html.

SEQUESTRATION IN THE NEWS

MRCSP News Release, "MRCSP has Received the Final Permit from the Ohio Environmental Protection Agency (OEPA) to Begin Injection of Carbon Dioxide," and **State of Ohio Environmental Protection Agency News Release, "Ohio EPA Issues Permit for Carbon Sequestration Project: Capturing Carbon Dioxide May Help Fight Global Warming."**

The Midwest Regional Carbon Sequestration Partnership (MRCSP) received the final permit needed from the Ohio Environmental Protection Agency (OEPA) for Battelle Memorial Institute to initiate the injection of 3,000 tons of CO₂ at First Energy Corporation's R.E. Burger Plant in



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SEQUESTRATION IN THE NEWS (CONTINUED)

Shadyside, Ohio. Beginning in mid-September, MRCSP plans to inject CO₂ over a three- to eight-week timeframe, dependant upon injection zone properties, project setup, and regulatory oversight and monitoring. The OEPA permit allows for the CO₂ captured from the coal-fired power plant to be heated under pressure and injected underground for long-term storage. In addition, the permit authorizes injection into three different rock formations: 8,207- to 8,274-foot deep Clinton sandstone; 5,923- to 5,954-foot deep Oriskany sandstone; and the 6,734- to 7,470-foot deep Salina formation. OEPA's well regulations are designed to protect underground sources of drinking water (USDWs) from the injected CO₂. For more information about MRCSP, visit: <http://www.mrcsp.org>. September 5, 2008, <http://216.109.210.162/NewsPage.aspx?action=view&newsid=27>, and September 9, 2008, <http://www.epa.state.oh.us/pic/nr/2008/september/BattelleUIC.html>.

Carbon Capture Journal, "DNV Developing First CO₂ Pipeline Standard."



DNV, a risk management service, is teaming with several industry partners and government representatives to develop a new standard for the transportation of dense, high-pressure CO₂ in pipelines within the next 18 months. The guideline, intended to help designers and operators limit and manage the risks related to the transmission of CO₂ by pipeline, will incorporate current knowledge related to both offshore and onshore operations. DNV will use lessons learned from existing and previous projects to craft guidelines for managing risks throughout the pipeline's lifetime, ranging from CO₂ pipeline design, testing, inspection, operation, maintenance, and decommissioning phases. As some issues related to CO₂ transportation in dense, high-pressure phases are not covered in existing pipeline standards or regulations, the point of departure will be pipeline standards for the transmission of hydrocarbons, such as International Standard for Organization (ISO) 13623 and DNV OS-F101. For more information about DNV's carbon capture and storage (CCS) initiatives, go to: http://www.dnv.com/industry/energy/segments/carbon_capture_storage/index.asp. August 27, 2008, <http://www.carboncapturejournal.com/displaynews.php?NewsID=262?PHPSESSID=d209a20e427c384e9ea7c8c8ee318a97>. (Subscription may be required.)

SEQUESTRATION IN THE NEWS (CONTINUED)

ClimateWire, “Germans to Unveil Clean-Coal Plant Prototype,” and *GreenTech Media*, “Vattenfall to Trap Carbon Emissions.”

The 30-megawatt Schwarze Pumpe power plant began operating in Germany on September 8, following two and a half years of construction at a cost of \$100 million. The Schwarze Pumpe, a pilot-scale operation equipped with CCS technology, will capture CO₂ and transport it to a depleted natural gas field owned by Gaz de France in northern Germany. Vattenfall plans to operate the plant, which is expected to produce nine metric tons of CO₂ per hour, for nearly 10 years in order to advance the design for future demonstration plants in Germany, Norway, and Denmark. The larger, 250- to 350-megawatt demonstration plants are the next step in Vattenfall’s efforts to commercialize CCS technology within the 2015 to 2020 timeframe. The pilot-scale project will employ Alstom’s oxyfuel combustion process, in which coal is burned in oxygen, resulting in a flue gas consisting of high-purity CO₂ that can be transported to the sequestration site. For more details about Vattenfall’s Schwarze Pumpe-related CCS operations, visit: http://www.vattenfall.com/www/vf_com/vf_com/365787ourxc/366203opera/366779resea/366811co2-f/index.jsp, or click: http://www.vattenfall.com/www/co2_en/co2_en/879177td/879211pilot/901887test/index.jsp to view a live web-camera of the site. A photo gallery is available at: <http://www.spiegel.de/fotostrecke/fotostrecke-35101.html>. September 5, 2008, <http://www.eenews.net/climatewire/2008/09/05/5/>, and September

8, 2008, <http://www.greentechmedia.com/articles/vattenfall-to-trap-carbon-emissions-1362.html>.

Reuters, “Norway Surveys Troll Field for Carbon Storage,” and *Norwegian Petroleum Directorate Press Release*, “Seismic Survey of Potential Carbon Dioxide Storage Site.”

On September 5, Norwegian Petroleum Directorate (NPD) officials announced that 3-D seismic surveys will be conducted at the Troll natural gas and oil field to determine whether the Johansen formation located beneath the field is suitable for storing CO₂ emissions. The Johansen formation, located approximately 8,200 feet beneath the Earth’s surface, is believed to be one of the three potential North Sea sites for storing CO₂ emissions generated by power plants in Mongstad and Kårstø. By using a vessel to transmit pressure waves into the earth, 3-D seismic surveys map the subsurface; these waves are then reflected back when they encounter interfaces between different layers of rock, which are captured by long cables towed behind the vessel. These signals are then used to create an image of subsurface characteristics. The processing and interpretation of the 3-D seismic data will be carried out by StatoilHydro and is expected to be completed in early 2009. Troll field, which has been on stream since 1996, holds more than 1 billion barrels of oil equivalent of recoverable reserves – nearly one-third of Norway’s total reserve estimate. September 5, 2008, <http://www.reuters.com/article/environmentNews/idUSL566817720080905>, and September 5, 2008, http://www.npd.no/English/Aktuelt/Pressemeldinger/2008/2008_9_5_pressemelding.htm.

ANNOUNCEMENTS

Regional Carbon Sequestration Partnerships Initiative Review Meeting.

This NETL-hosted event will focus on topics such as: CO₂ sequestration in oil fields and coal seams; sequestration in saline formations; and RCSP field tests. RCSP representatives will review their activities from Validation Phase of the NETL-managed program and discuss the progress of their Deployment Phase field tests. The meeting will take place on October 6-8, 2008, at the Hyatt Regency Pittsburgh International Airport Hotel in Pittsburgh, Pennsylvania. For registration information and an updated agenda, visit: <http://www.netl.doe.gov/events/08conferences/rcsp/>.

Big Sky Annual Meeting.

This year’s annual Big Sky Carbon Sequestration Partnership meeting, scheduled for October 28-29 in Spokane, Washington, will cover topics such as: climate change science and CO₂ emissions; how CCS will be deployed; global warming mitigation strategies; the state of CO₂ capture, compression, transportation, and injection technologies; economic costs and impacts of CCS; climate change and CO₂ policies; and CO₂ monitoring and verification techniques. Registration to attend is required by October 17, 2008. A detailed agenda is available by clicking: http://www.bigskyco2.org/files/documents/Annual_Energy_2008agenda.pdf.

New Workgroup Focuses on Carbon Capture Regulations.

Created by the Utah Department of Environmental Quality, the newly formed Carbon Capture and Geologic Sequestration Workgroup will develop state regulations for capturing CO₂ from coal-fired power plants. The workgroup is composed of three subcommittees that will study the environmental and health impacts of CO₂ capture from an emission source, the transportation of pressurized CO₂ to the sequestration site, and the injection of CO₂ into the Earth’s crust. The official news release is available at: http://www.deq.utah.gov/News/2008/docs/New_Workgroup_Focuses_on_Carbon_Capture_Regs_090308.pdf.



ANNOUNCEMENTS (CONTINUED)

Oklahoma to Give Carbon Credits.

The Carbon Council of Oklahoma (CCO₂) assisted the Oklahoma Conservation Commission (OCC) in establishing a procedure allowing Oklahoma to become the first state to formally authorize the issuing of carbon credits for the underground injection of CO₂. The action permits OCC to issue carbon credits for specific forestry and agricultural activities. To view the CCO₂ website, go to: <http://www.cco2.org/>.

Interactive CCS Map Launched.

The Scottish Centre for Carbon Storage (SCCS) recently launched an interactive CCS Google world map for the emerging CCS industry and interested individuals (www.geos.ed.ac.uk/ccsmap). The CCS map serves as an accurate resource where users can “zoom in” to locate further information on their relevant site, such as the company name, a project description, the separation technology in use, and the amount of CO₂ injected. This map is a free resource and individuals are invited to send project updates. For further information or to provide updates, please contact Yasmin Bushby (yasmin.bushby@ed.ac.uk) or visit: <http://www.geos.ed.ac.uk/sccs>.

SCIENCE

Reuters, “Australia Hit by More ‘Extreme Waves,’” and *The Australian*, “Climate Change ‘Causing Extreme Waves.’”

Scientists researching wave sizes on Australia’s coastline over the past 45 years claim that the waves are becoming more frequent and destructive. According to a



report prepared by Australia’s national science agency, the Commonwealth Scientific and Industrial Research Organization (CSIRO), the increase in the intensity of waves 9.8 feet tall or higher is driven by possible climate change. As the world’s driest inhabited continent, Australia is more susceptible to changes in temperature and rainfall because of its many arid and semi-arid areas. The United Nations (UN) has included Australia on a list of vulnerable climate shift “hot spots,” because the country’s average yearly temperatures are estimated to increase by as much as six percent by 2070. With most Australians populating the southeast coastal cities and towns, “extreme waves” represent a heightened threat in the form of coastal erosion and flooding. The report also found a correlation between an increase in wave power in northern Australia and the length and strength of northern tropical monsoon seasons. Lastly, the report provides information to help coastal zone managers prepare for the potential impacts of climate change, such as developing a network of long-term coastal observation sites to improve the understanding of large waves. To view the CSIRO website, click: <http://www.csiro.au/>. September 10, 2008, <http://www.reuters.com/article/environmentNews/idUS SYD21540420080910?pageNumber=1&virtualBrandChannel=10284>, and September 10, 2008, <http://www.theaustralian.news.com.au/story/0,25197,24325113-12377,00.html>.

***Science Daily*, “Thawing Permafrost Likely To Boost Global Warming, New Assessment Concludes.”**

A new University of Florida study more than doubles previous estimates of the amount of carbon stored in permafrost and specifies that CO₂ emissions from the microbial decomposition of organic carbon found in thawing permafrost could amount to roughly half those resulting from global land-use change during this century. By mixing soil from different depths during the yearly melting and freezing of permafrost, the assessment concludes that more than 1 trillion metric tons of organic compounds have been buried in the world’s permafrost regions. The scientists believe current conditions are returning organic material back into the ecosystem by turning over soil. Some effects of permafrost thawing are apparent in Arctic areas called thermokarst (the land surface that forms as permafrost melts). However, complexities exist in gathering data, as emissions are influenced by factors ranging from the amount of surface water, topography, wildfires, snow cover, and the difficulty in accurately modeling the thawing. The Arctic Region’s warming-related trends, like the advancement of trees into tundra, may cause absorption of CO₂, which could counter some effects of permafrost thawing. Permafrost is frozen ground that contains soil organic matter; when permafrost thaws, bacteria and fungi breakdown the carbon contained in this organic matter more quickly, releasing CO₂ or methane (CH₄) into the atmosphere. The study, titled, “Vulnerability of Permafrost Carbon to Climate Change: Implications for the Global Carbon Cycle,” is available at: <http://www.bioone.org/perlserv/?request=get-abstract&doi=10.1641%2FB580807>. (Subscription required.) September 2, 2008, <http://www.sciencedaily.com/releases/2008/09/080901084854.htm>.

POLICY

Reuters, “New Zealand Parliament Passes Carbon Trading Bill,” and *Bloomberg*, “New Zealand Parliament Passes Law to Curb Greenhouse Gases.”

New Zealand passed an emissions trading bill on September 10, 2008, that will set up the first national GHG cap-and-trade scheme outside

POLICY (CONTINUED)

of Europe. The climate change bill, which passed with a 63-57 vote, will eventually bring all sectors of the economy under a regime that will set limits on emitted carbon. If the limit is breached, the credits will have to be purchased from users who produced emissions below their limit. New Zealand is joining the 27 European Union (EU) nations that adopted an emissions trading scheme in 2005; the passing of the bill could also help New Zealand meet its Kyoto Protocol obligations. The percentage of the country's emissions to be captured is not expected to surpass 40 percent of the total, covering 25 million tonnes of CO₂ per year. The New Zealand trading scheme will include all forestry emissions from 2008, stationary energy by 2010, transport fuels from 2011, and agricultural waste by 2013. New Zealand is also currently in discussions to possibly combine carbon schemes with Australia. The trading of carbon credits is set to begin in 2009. **The "New Zealand Energy Greenhouse Gas Emissions 1990-2007" report is available in the Recent Publications section.** September 10, 2008, <http://uk.reuters.com/article/oilRpt/idUKLA22139820080910?pageNumber=2&virtualBrandChannel=0&sp=true>, and September 10, 2008, <http://www.bloomberg.com/apps/news?pid=20601081&sid=apIsG4Shwdh4&refer=australia>.

"Public risk perspectives on the geologic storage of carbon dioxide."

The following is the abstract of this article: "CCS technology has the potential to enable large reductions in global GHG emissions, but one of the unanswered questions about CCS is to what extent it will be accepted by the public. To provide insight regarding risk perception as an important component that will influence the public acceptance of CCS, this study discusses different notions of risk and their varying uses by the public, who generally use a social constructivist risk perspective, and risk experts, who generally use a realist perspective. Previous studies discussing the public acceptance of CCS have relied on survey response data and/or focus groups. This study instead uses the psychometric theory of public risk perception to postulate how the public is likely to respond to efforts to use geologic storage of CO₂, a component of the CCS architecture. Additionally this paper proposes further actions that could favorably impact the public's perception of risk from geologic storage projects. Through the psychometric analysis this study concludes that the risks of geologic storage are likely to eventually be considered no worse than existing fossil fuel energy technologies. However, since geologic storage of CO₂ is a new technology with little operational experience, additional field tests and a demonstrated ability to mitigate problems should they arise will be necessary to improve the public's perception of risk from CCS technologies." **Gregory Singletona, Howard Herzoga, and Stephen Ansolabehere**, *International Journal of Greenhouse Gas Control*, Available online September 2, 2008, doi:10.1016/j.ijggc.2008.07.006, <http://www.sciencedirect.com/science/article/B83WP-4TBVR08-1/2/21a4d8b7d4bef16a66311a9aa0c705d4>. (Subscription may be required.)

GEOLOGY

"Shrinkage and Swelling of Coal Induced by Desorption and Sorption Of Fluids: Theoretical Model and Interpretation of a Field Project."

The following is the abstract of this article: "Geologic sequestration in deep unmineable coal seams and enhanced coalbed methane [ECBM] production is a promising choice, economically and environmentally, to reduce anthropogenic gases such as CO₂ in the atmosphere. Unmineable coal seams are typically known to adsorb large amounts of CO₂ in comparison to the sizeable amounts of sorbed CH₄, which raises the potential for large scale sequestration projects. During the process of sequestration, CO₂ is injected into the coalbed and desorbed CH₄ is produced. The coal matrix is believed to shrink when a gas is desorbed and swell when a gas is sorbed, sometimes causing profound changes in the cleat porosity and permeability of the coal seam. These changes may have significant impact on the reservoir performance. Therefore, it is necessary to understand the combined influence of swelling and shrinkage, and geomechanical properties including elastic modulus, cleat porosity, and permeability of the reservoir. The present paper deals with the influence of swelling and shrinkage on the reservoir performance, and the geomechanical response of the reservoir system during the process of geologic sequestration of CO₂ and ECBM production in an actual field project located in northern New Mexico. A 3-D swelling and shrinkage model was developed and implemented into an existing reservoir model to understand the influence of geomechanical parameters, as well as swelling and shrinkage properties, on the reservoir performance. Numerical results obtained from the modified simulator were compared to available measured values from that site and previous studies. Results show that swelling and shrinkage, and the combination of geomechanical and operational parameters, have a significant influence on the performance of the reservoir system." **Hema J. Siriwardane, Raj K. Gondle, and Duane H. Smith**, *International Journal of Coal Geology*, Available online August 16, 2008, doi:10.1016/j.coal.2008.08.005, <http://www.sciencedirect.com/science/article/B6V8C-4T77G1W-1/2/1c1ce97c960863b9f726dd4b87655dfb>. (Subscription may be required.)

"Long-term variations of CO₂ trapped in different mechanisms in deep saline formations: A case study of the Songliao Basin, China."

The following is the abstract of this article: "The geological storage of CO₂ in deep saline formations is increasingly seen as a viable strategy to reduce the release of GHGs to the atmosphere. There are numerous sedimentary basins in China, in which a number of suitable CO₂ geologic reservoirs are potentially available. To identify the multi-phase processes, geochemical changes and mineral alteration, and CO₂ trapping mechanisms after CO₂ injection, reactive geochemical transport simulations using a simple 2-D model were performed. Mineralogical composition and water chemistry from a deep saline formation of Songliao Basin were used. Results indicate that different storage forms of CO₂ vary with time. In the CO₂ injection period, a large amount of CO₂ remains as a free supercritical phase (gas trapping), and the amount dissolved in the formation water (solubility trapping) gradually increases. Later, gas trapping decrease,

GEOLOGY (CONTINUED)

solubility trapping increases significantly due to the migration and diffusion of CO₂ plume and the convective mixing between CO₂-saturated water and unsaturated water, and the amount trapped by carbonate minerals increases gradually with time. The residual CO₂ gas keeps dissolving into groundwater and precipitating carbonate minerals. For the Songliao Basin sandstone, variations in the reaction rate and abundance of chlorite, and plagioclase composition affect significantly the estimates of mineral alteration and CO₂ storage in different trapping mechanisms. The effect of vertical permeability and residual gas saturation on the overall storage is smaller compared to the geochemical factors. However, they can affect the spatial distribution of the injected CO₂ in the formations. The CO₂ mineral trapping capacity could be in the order of 10 kg/m³ medium for the Songliao Basin sandstone, and may be higher depending on the composition of primary aluminosilicate minerals especially the content of [calcium (Ca), magnesium (Mg), and iron (Fe)].” **Wei Zhang, Yilian Li, Tianfu Xu, Huilin Cheng, Yan Zheng, and Peng Xiong**, *International Journal of Greenhouse Gas Control*, Available online September 4, 2008, doi:10.1016/j.ijggc.2008.07.007, <http://www.sciencedirect.com/science/article/B83WP-4TC8J70-1/2/ff21d85bfa76edf5046ee0db7088520d>. (Subscription may be required.)

TECHNOLOGY

“Life cycle assessment of carbon dioxide capture and storage from lignite power plants.”

The following is the abstract of this article: “In this article, [the authors] present a life cycle assessment (LCA) of CCS for several lignite power plant technologies. The LCA includes post-combustion, pre-combustion and oxyfuel capture processes as well as subsequent pipeline transport and storage of the separated CO₂ in a depleted gas field. The results show an increase in cumulative energy demand and a substantial decrease in GHG emissions for all CO₂ capture approaches in comparison with power plants without CCS, assuming negligible leakage within the time horizon under consideration. Leakage will, however, not be zero. Due to the energy penalty, CCS leads to additional production of CO₂. However, the CO₂ emissions occur at a much lower rate and are significantly delayed, thus leading to different, and most likely smaller, impacts compared to the no-sequestration case. In addition, a certain share of the CO₂ will be captured permanently due to chemical reactions and physical trapping. For other environmental impact categories, the results depend strongly on the chosen technology and the details of the process. The post-combustion approach, which is closest to commercial application, leads to sharp increases in many categories of impacts, with the impacts in only one category, acidification, reduced. In comparison with a conventional power plant, the pre-combustion approach results in decreased impact in all categories. This is mainly due to the different power generation process (IGCC) which is coupled with the pre-combustion technology. In the case of the oxyfuel approach, the outcome of the LCA depends highly on two uncertain parameters: the energy demand for air separation and the feasibility of co-capture of pollutants other than CO₂. If co-capture were possible, oxyfuel

could lead to a near-zero emission power plant.” **Martin Pehnta and Johannes Henke**, *International Journal of Greenhouse Gas Control*, Available online August 15, 2008, doi:10.1016/j.ijggc.2008.07.001,

<http://www.sciencedirect.com/science/article/B83WP-4T72K6K-1/2/98dc4f678050645d3752da6a8f069507>. (Subscription may be required.)



TERRESTRIAL/OCEAN

“Tillage and residue management effects on soil carbon and CO₂ emission in a wheat-corn double-cropping system.”

The following is the abstract of this article: “The mitigation of CO₂ emission into the atmosphere is important and any information on how to implement adjustments to agricultural practices and improve soil organic matter (SOM) stock would be helpful. [The authors] studied the effect of tillage and residue management on soil carbon sequestration and CO₂ emissions in loam soil cropped in a winter wheat-corn rotation in northern China. There were five treatments: mouldboard ploughing, rotary tillage and no-tillage with chopped residues (MC, RC, and NC), additional no-tillage with whole residue (NW) and mouldboard ploughing without residue (CK). After [five] years of each tillage system, MC and RC had higher annual CO₂ efflux from soil. The CO₂ effluxes were correlated with the ratio of dissolved organic carbon to soil microbial biomass (DOC/MBC) among treatments. This effect may be due to less immobilization of soil carbon by microorganisms under long-time intensive tillage. Although both MBC and DOC showed seasonal variability, when averaged across the sampling period only MBC discriminated between treatments. After [five] years of tillage, all treatments except CK increased SOM (0.16-0.99 Mg [carbon] ha⁻¹ year⁻¹) at 0-30 cm depth and NC was the greatest, resulting from historical SOM depletion and large [carbon] return from recent residues. Despite the lowest CO₂ flux being from the NW treatment, lower input residue from decreased biomass may have lowered [carbon] sequestration. To improve soil [carbon] sequestration in rotations, the input of residue and the CO₂ emission should be balanced by adopting appropriate tillage and residue management.” **Wenxu Dong, Chunsheng Hu, Suying Chen, and Yuming Zhang**, *Nutrient Cycling in Agroecosystems*, Available online August 15, 2008, DOI: 10.1007/s10705-008-9195-x, <http://www.springerlink.com/content/q37t8t37416423j4/?p=9a776e82ce334c30baa165f053c10d44&pi=0>.

(Subscription may be required.)



TRADING

Carbon Market Update, September 16, 2008

CCX-CFI 2008 (\$/tCO ₂)	EU ETS-EUA DEC 2008
\$2.40 (Vintage 2008)	(\$/tCO ₂) \$32.58

(Converted from € to US\$)

Blue Source News Release, “Blue Source Forms Strategic Partnership with Affiliate Investment Funds of Och-Ziff Capital Management Group,” and *ClimateWire*, “**Och-Ziff Putting \$500M into CCS Projects.**”

Blue Source LLC and the hedge fund firm Och-Ziff Capital Management Group LLC announced an investment partnership on August 19 to fund the development of carbon infrastructure projects. Och-Ziff’s investment funds will commit \$500 million for new GHG reduction projects in partnership with Blue Source, a CCS and CH₄ project

finance company. Blue Source will use the investment to support the ongoing development of pipeline infrastructure projects across North America that capture, transport, and sequester anthropogenic CO₂. The Och-Ziff investment will also support other ventures, such as climate change projects derived from power generation, fertilizer production, advanced energy conservation, natural gas production, and CH₄ management. According to Blue Source officials, the deal will fund their enterprises for three years, as Och-Ziff will also buy 10 percent of the emission credit generator. Blue Source has already sold credits representing 10 million metric tons of CO₂. August 19, 2008, <http://www.ghgworks.com/5c-pr08-08-19.html>, and August 20, 2008, <http://www.eenews.net/climatewire/2008/08/20/8/>.



RECENT PUBLICATIONS

“Towards Carbon Capture and Storage.”

The following is from the executive summary of the document: “CCS is an integrated process that involves the capture of CO₂ from combustion plants (typically a fossil fuel power station); the compression of the CO₂ to a form where it is suitable for transport; the transport of the captured CO₂ to a storage site; and the permanent storage of the CO₂ in deep geological sites. The geology of the United Kingdom (UK) North Sea is thought to be particularly well suited to the storage of CO₂. CCS has the potential to reduce emissions from fossil fuel power stations by up to 90 [percent]. It is the only technology option currently available that could allow abundant and flexible fossil fuels to continue to be used for electricity generation without adding to the damaging effects of climate change. Whilst there is considerable confidence that CCS can be effectively deployed at commercial scale, there is, as yet, no practical experience of operating such a facility. The UK Government has launched a competition to build one of the worlds first commercial scale CCS projects. This is the first step towards demonstrating the full chain of CO₂ capture, transport and storage by 2014. In the meantime work is progressing on the regulatory and policy framework within which CCS should operate, both at the national level through the Energy Bill now in Parliament and at [the] EU level. This consultation deals with aspects of this framework.” The complete consultation is available at: <http://www.berr.gov.uk/files/file46810.pdf>.

“Energy-Efficiency and Carbon Capture in New Fossil Power Plants in the EU.”

The following is from the executive summary of the document: “In this study [the authors] focus on energy-efficiency and capture-readiness of recently built (>1997) and planned fossil-fired power plants. The study has two main purposes: (1) to evaluate energy-efficiency of new fossil power plants and compare them with the energy-efficiency that would be expected when using best available techniques (BAT) [and] (2) to see what share of new power plants can be considered as capture-ready. For this purpose [the authors] first look at the energy-efficiency that would be expected to be achieved by applying BAT and [the authors] define requirements for capture-readiness. In the second step [the authors] analyze the new power plants with respect to these two characteristics, i.e. energy efficiency and carbon capture readiness. Capture-ready means that a plant can be equipped with CO₂ capture technology while it is under construction or after it is built. If a plant is not capture-ready this means it is either more expensive to add CO₂ capture technology or impossible due to insufficient space at the site or no suitable reservoir to store the CO₂ in. This means that it is important for new fossil plants to be capture-ready in order to have the possibility to add CO₂ capture and storage at a later stage. In order for a power plant to be capture-ready the following requirements should be met: (1) a study on the possible options for CCS in terms of technology and feasibility should be done; (2) an assessment should be made of the elements of the plant that would need to be adapted when adding CO₂ capture equipment, their place in the plant layout and their physical size; (3) an assessment of the possible pre-investments that can be done in comparison to the costs of making changes when the power plant is built; (4) the availability of sufficient space for the required CCS technology during operation as well as during construction, at the same time normal operation of the existing plant has to be assured both during construction and operation of CCS; and (5) an assessment of a storage site and a credible route to the storage site is needed. Capture-ready plants are somewhat more expensive to build. The costs consist mainly of the purchase of additional land area.” The complete document is available at: <http://www.ecofys.com/com/publications/documents/RPTEnergy-efficiencyandcarboncaptureinnewpowerplantsENFinal.pdf>. (Subscription required.)

RECENT PUBLICATIONS (CONTINUED)

“New Zealand Energy Greenhouse Gas Emissions 1990-2007.”

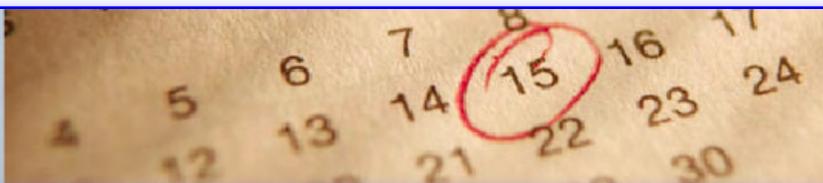
The following is from the overview of the report: “Like many countries, New Zealand is concerned about the potential adverse effects on climate change. Long-term risk to New Zealand’s national interests include rising sea levels affecting the coastal environment and infrastructure, reduced agricultural production, and adverse effects on native ecosystems and natural resources. New Zealand has also recognized that climate change is a global challenge and that inaction would risk its international credibility. It was in this broad context that in 1993 New Zealand ratified the United Nations Framework Convention on Climate Change (UNFCCC). This step was followed by ratification of the Kyoto Protocol in 2002. As a party to the Kyoto Protocol, New Zealand has committed to reducing its emissions of GHGs over 2008-2012 (the first commitment period) to 1990 levels or take responsibility for any emissions above this level if it cannot meet this target. The information on energy sector emissions in this report will feed into the 2009 edition of the New Zealand’s Greenhouse Gas Inventory, published by the Ministry for the Environment (MfE) as part of New Zealand’s obligations under the UNFCCC and the Kyoto Protocol. The national inventory of GHG emissions includes emissions from agriculture, waste, land use change, and other factors. In 2006, it was estimated that New Zealand emitted around 78 millions tonnes of CO₂ equivalent GHGs into the atmosphere. However, through carbon sinks, such as forested land, and estimated 23 million tonnes was removed. This resulted in New Zealand’s estimated ‘net’ emissions of CO₂ equivalent GHGs for 2006 totaling 55 million tonnes.” The complete MfE document is available at: <http://www.med.govt.nz/upload/63349/GHG%20Report.pdf>.

LEGISLATIVE ACTIVITY

Congresswoman Tammy Baldwin Press Release, “Baldwin Crafts Greenhouse Gas Registry,” and Carbon Control News, “House Bill Would Set New Requirements For EPA GHG Registry.”

On September 11, Congresswoman Tammy Baldwin introduced legislation to ensure the U.S. Environmental Protection Agency’s (EPA) national GHG registry will contain complete, reliable, and accurate information to reduce GHG emissions and address possible global climate change. The new bill, entitled the “Greenhouse Gas Registry Act,” will provide additional guidance to previous legislation that requires EPA to establish a method for mandatory reporting of GHG

emissions. The new legislation hopes to ensure comprehensive GHG emissions reporting while providing publicly available data that will support national, regional, state, and local climate change policies; define what entities are covered by the registry; set verification protocols without specifying “third party” verification (current EPA regulations allow for self-reporting); and mandate that EPA consider existing state and multi-state efforts, including the Climate Registry. Under current law, EPA is required to create a final registry rule by July 1, 2009. To view Congresswoman Baldwin’s bill, go to: <http://climate.alston.com/files/docs/EPAGHGRegistryBill.pdf>. September 11, 2008, <http://tammybaldwin.house.gov/PRArticle.aspx?NewsID=1494>, and September 11, 2008, <http://carboncontrolnews.com/index.php/ccn/show/6900>. (Subscription required.)

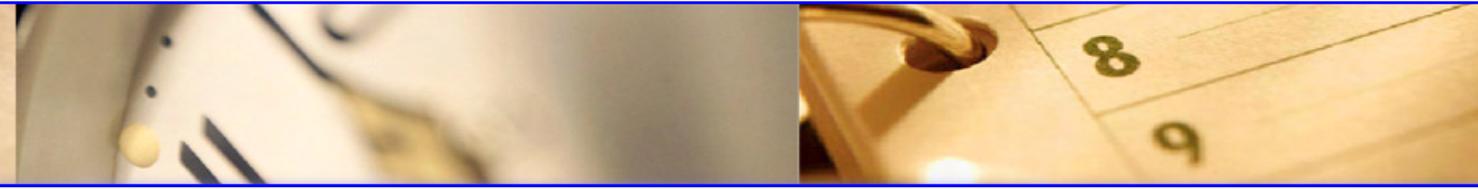


EVENTS

October 5-8, 2008, **Gasification Technologies Conference 2008**, *Wardman Park Marriott, Washington DC, USA*. This three-day event will feature presentations on the latest information and analysis of developments and trends driving the gasification industry. Some topics to be covered include: technical solutions in carbon management; research, development, and demonstration of new and emerging technologies; and industrial gasification. To learn more about the conference, go to: <http://www.gasification.org/conferences/overview.aspx>.

October 6-17, 2008, **Carbon Trading**, *The Hospital de los Venerables, Seville, Spain*. This event will help train attendees interested in participating in the carbon market. Some of the topics to be discussed include: understanding the principles of cap-and-trade programs; assessing the legal and political implications of the carbon markets; and understanding carbon in the supply chain. To learn more about this training event, click: <http://www.carbon-training.com/>.

October 7-10, 2008, **Carbon Finance Asia 2008**, *Grand Hyatt Singapore, Singapore*. The second edition of this event aims to facilitate the meeting of buyers and sellers of certified emissions reductions (CER) across Asia. Some of the key topics to be covered include: clean energy development: challenges and prospects; clean energy development through regulatory support; and pricing, trading, and exchange of carbon credits. To view a detailed schedule of the event, visit: <http://www.terrapinn.com/2008/carbon/index.stm>.



EVENTS (CONTINUED)

October 14-15, 2008, **Voluntary Carbon Markets**, *London, England, United Kingdom*. This forum provides a platform for individuals to learn about the latest developments in voluntary carbon market (VCM) standards and opportunities. Topics include an overview of VCM, carbon offset programs, VCM project trends, and future direction. To view the complete forum agenda, click: http://www.greenpowerconferences.com/carbonmarkets/vcm_2008.html.

October 20-23, 2008, **World Carbon Emission Reduction Summit 2008**, *Abu Dhabi, United Arab Emirates*. This event offers attendees the opportunity to connect with investors and learn from global carbon market participants about their experiences with the Clean Development Mechanism (CDM). Included in this summit is a section dedicated to maximizing the value from carbon projects. To view a downloadable brochure with the complete agenda, go to: <http://www.allevntsgroup.com/emissions/wcersbrochure.pdf>.

October 22-24, 2008, **2nd Annual Carbon Sequestration Development and Finance Summit**, *Crowne Plaza Downtown, Houston, Texas, USA*. This summit is designed for individuals interested in the business side of carbon sequestration. Summit topics include: regulatory developments; partnerships EOR players are looking for; an overview on the business of carbon credits; an update on international projects; the role of pipeline companies; and the types of projects that interest financial players. The complete summit agenda can be found at: http://www.infocastinc.com/downloads_pdf/sequestration_agenda.pdf.

November 16-20, 2008, **9th International Conference on Greenhouse Gas Technologies**, *The Omni Shoreham Hotel, Washington, DC, USA*. MIT and the IEA Greenhouse Gas R&D Programme (IEA GHG) have teamed with DOE to present this conference series on GHG mitigation technologies. Attendees will be presented with 50 technical sessions that examine issues such as CO₂ transport infrastructure, coalbed methane (CBM) storage, CCS policy, CO₂ storage capacity, long-term liability, and risk assessment. To learn more, click: <http://mit.edu/ghgt9/index.html>.

November 17-19, 2008, **Carbon Markets Africa**, *Cape Town, South Africa*. Carbon Markets Africa provides a platform for businesses to learn about the latest developments for CDM in Africa. Talks will centralize around CDM and new investment and market developments. Among the many topics to be discussed is a session focused on the future of CCS in Africa. To view the conference website, go to: http://greenpowerconferences.com/carbonmarkets/carbonmarkets_africa_2008.html.

December 2-4, 2008, **2nd Annual European Carbon Capture and Storage Summit**, *Thistle Marble Arch, London, England, United Kingdom*. This two-day event focuses on CCS demonstrations in Europe. Attendees can listen to panel discussions on the latest developments in CCS and several other topics, including: CO₂ capture, transport, and storage technologies; economics of commercial CCS; and EU and European national policies. To view the online brochure, click: <http://www.cityandfinancial.com/conferences/index.asp?id=227>.

December 3-5, 2008, **Carbon Capture: Status and Outlook**, *Almas Temple Club, Washington DC, USA*. This conference provides a global update on technical, economic, financial, and policy developments in implementing carbon capture for power plants and other industrial applications. Included is a discussion on the challenges facing carbon capture. For more information, go to: <http://www.infocastinc.com/static/capture.html>.

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.