Carbon Sequestration Newsletter

JUNE 2008

WHAT'S INSIDE?

INTRODUCTION

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

HIGHLIGHTS

***Fossil Energy Techline*, "DOE Awards $126.6 Million for Two More Large-Scale Carbon Sequestration Projects."**

On May 6, the United States Department of Energy (DOE) announced awards totaling $126.6 million to the West Coast Regional Carbon Sequestration Partnership (WESTCARB) and the Midwest Regional Carbon Sequestration Partnership (MRCSP) to conduct large-scale tests (in California and Ohio, respectively) that demonstrate the ability of a geologic formation to store more than one million tons of carbon dioxide (CO_2). The projects are the fifth and sixth DOE grants for large-scale tests (industry partners will contribute $56.6 million in cost-shared funds) that study the three phases of geologic storage: pre-injection characterization, injection process monitoring, and post-injection monitoring. The initial 24-month stage will complete the necessary modeling, monitoring, and infrastructure improvements needed before CO_2 is injected. Led by the California Energy Commission, WESTCARB will inject one million tons of CO_2 over four years into geologic formations below the 50-megawatt Clean Energy Systems power plant in Kimberlina, California. The plant's oxyfuel system produces a relatively pure CO_2 stream that will be compressed and injected. MRCSP, headed by Battelle Memorial Laboratories, plans to inject one million tons of CO_2 from an ethanol production facility into the Mount Simon Sandstone formation at a depth of approximately 3,000 feet. The Mount Simon formation stretches from Kentucky through Ohio and has the potential to store more than 100 years of CO_2 emissions. For more information about MRCSP, click: www.mrcsp.org, or for further details about WESTCARB, visit: http://www.westcarb.org/. May 6, 2008, http://www.fossil.energy.gov/news/techlines/2008/08012-DOE_Funds_Large-Scale_Projects.html.

***Fossil Energy Techline*, "DOE Takes Next Steps with Restructured FutureGen Approach."**

DOE released a draft Funding Opportunity Announcement (FOA) to solicit public input regarding the demonstration of commercial-scale Integrated Gasification Combined Cycle (IGCC) power plants equipped with carbon capture and storage (CCS) technology as part of the restructured FutureGen approach. The FOA, which provided the public with an opportunity to review and comment through May 21, outlined the planned scope of the project, evaluation criteria, terms and conditions, and cost sharing requirements for public-private cooperation. DOE estimates the investment per project would range from $100 million to $600 million and envisions plant operation to begin as soon as the plants are commissioned by December 31, 2015. Also, the draft FOA stated that the project must produce at least 300 megawatts (MW) gross electricity output, with at least 50 percent of this output being used to produce electricity. In addition, the project must be designed to achieve approximately 90 percent capture of CO_2 (with a minimum capture rate of 81 percent). The Final FOA will be released in mid-summer 2008 and project selection is forecast for December 2008. To read the Draft FOA, http://e-center.doe.gov/iips/faopor.nsf/8df825feb86675de852564650046faea/37325dddc3cc2f5b8525744200579f33?OpenDocument.

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HIGHLIGHTS (CONTINUED)

May 7, 2008, http://www.fossil.energy.gov/news/techlines/2008/08013-DOE_Takes_Next_Steps_With_Restruct.html.

***Carbon Sequestration Leadership Forum Press Release*, "Twenty-One Nations, European Commission, Meet in South Africa to Discuss CO_2 Sequestration."**

Twenty-one Carbon Sequestration Leadership Forum (CSLF) members met in Cape Town, South Africa to discuss the development of cost-effective technologies for the separation, capture, transport, and long-term storage of CO_2. The meeting resulted in agreements on several fronts, including: (1) a CSLF declaration supporting the Group of Eight (G-8) recommendations for near-term deployment of CCS; (2) updating the CSLF strategic plan; (3) examining CSLF priorities for moving CCS forward that may be recommended to Energy Ministers; (4) appropriate initiatives and projects that would remove barriers from CCS implementation; (5) updating a CCS roadmap; (6) creating successful pathways for the transfer of technologies, knowledge, and experience about CCS; and (7) increasing the role of stakeholders in implementing the policy priorities. More information on CSLF can be obtained at: http://www.cslforum.org/index.htm, or at DOE's CSLF webpage at: http://www.fe.doe.gov/programs/sequestration/cslf/index.html. April 23, 2008, http://cslforum.org/documents/CSLFPressRelease042308.pdf.

SEQUESTRATION IN THE NEWS

***Montana State University News Service*, "Montana Carbon Sequestration Study Receives State Funding."**

The Montana Board of Research and Commercialization awarded the Big Sky Carbon Sequestration Partnership a $157,000 grant to help fund a study investigating the geological storage potential at Kevin Dome in northern Montana. Led by Montana State University geologists David Bowen and David Lageson, the study will use existing well logs, core samples, and seismic surveys to determine the porosity, permeability, thickness, areal extent, and structural features of the underground, dome-shaped rock formation. As part of the DOE-funded Regional Carbon Sequestration Program's (RCSP) Validation Phase, the project will commence this summer, under the premise that the Kevin Dome study will shed light on the storage characteristics of similar formations in the region. Additional details about DOE's Validation Phase are available at: http://www.netl.doe.gov/technologies/carbon_seq/partnerships/validation-phase.html, or visit: http://www.netl.doe.gov/technologies/carbon_seq/partnerships/validation.html to view a field test map. For more information about the Big Sky Carbon Sequestration Partnership, click: http://www.bigskyco2.org/. April 28, 2008, http://www.montana.edu/cpa/news/nwview.php?article=5868.

Sequestration in the News (Continued)

***Premier of Victoria Media Release*, "$127.4 Million to Secure Victoria's Clean Coal Future."**

An April 30th announcement by the Victoria Premier established a $102 million ($110 million Australian) fund to launch new commercial-scale CCS demonstration projects in the Latrobe Valley and an $11.4 million ($12.2 million Australian) fund to establish an organization designed for maximizing Victoria's coal resources, called Clean Coal Victoria. Another $4.9 million ($5.2 million Australian) will finance research and modeling that investigates the storage potential of the Gippsland Basin in southeastern Australia. The investment is part of the Energy Technology Innovation Strategy's (ETIS) second phase. The first phase involved the development of the Latrobe Valley Post Combustion Project at Loy Yang Power Station outside of Traralgon. The Latrobe Valley project initiated on April 30 and will capture up to 1,000 tonnes of CO_2 per year. Officials hope their additional investment will enhance the project's ability to demonstrate CCS technologies at a commercial-scale. Since 2002, the Australian government has invested some $244 million in clean coal technology. April 30, 2008, http://www.premier.vic.gov.au/newsroom/$127.4-million-to-secure-victorias-clean-coal-future.html.

***Business Wire*, "ExxonMobil to Build Commercial Demonstration Plant to Remove Carbon Dioxide from Natural Gas."**

ExxonMobil announced it will commit some $100 million toward building a commercial-scale demonstration plant near LaBarge, Wyoming that will develop and test a natural gas treatment technology that could reduce the cost of CCS technology and significantly reduce GHGs. The technology, called Controlled Freeze Zone (CFZ), is a single-step cryogenic separation process that freezes out and then melts the CO_2 and removes other components. Using the CFZ process, CO_2 and the other components are discharged as a high-pressure liquid stream conducive to CO_2 injection for underground storage or improving the enhanced oil recovery (EOR) process. The demonstration plant will be located at ExxonMobil's Shute Creek Treating Facility and will process about 14 million cubic feet of gas per day. Construction is set to commence this summer and plant startup expected in late 2009. http://www.businesswire.com/portal/site/exxonmobil/index.jsp?ndmViewId=news_view&ndmConfigId=1001106&newsId=20080505006145&newsLang=en.

***Fort Saskatchewan Record*, "Carbon Capture Project Planned for Heartland."**

Led by the Alberta Research Council and ARC Energy Trust, the Heartland Area Redwater Project will evaluate the ability to store as much as 1,000 megatonnes (1,102 megatons) of CO_2 in the Redwater Leduc Reef located near the industrial region north of Fort Saskatchewan, Canada. The 373-square-mile geological reef is capable of storing approximately 20 years worth of CO_2 emissions, because the reef's porous texture allows for CO_2 to mix with brine located about 1,000 meters below the reef. The project will be implemented in three phases: during the initial $1.8 million phase, which is expected to be completed by Spring 2009, the Redwater reef's size and suitability for storing CO_2 will be determined; during the second phase, a test well will be drilled to collect more detailed data; and efforts during the third phase will demonstrate CO_2 injection and storage. Officials also hope the sequestration project will aide EOR projects in the region and attract investors to build a CO_2 pipeline for future projects. April 18, 2008, http://cgi.bowesonline.com/pedro.php?id=10&x=story&xid=393714.

Announcements

Principles for Global Warming Legislation Released.

Representatives Henry A. Waxman, Ed Markey, and Jay Inslee released the "Principles for Global Warming Legislation" in order to provide a framework for legislation that will: (1) reduce emissions, (2) transition America to a clean energy economy, (3) recognize and minimize any economic impacts from global warming legislation, and (4) aid communities and ecosystems susceptible to harm from global warming. To browse the Select Committee on Energy Independence and Global Warming website, visit: http://globalwarming.house.gov/.

Port Authority Creates Website to Offset Emissions.

The Port Authority of New York and New Jersey announced plans to become the first tolling agency in the United States to create a website where travelers using the Port Authority's bridges, tunnels, and/or airports can buy credits to offset their CO2 emissions. For further details, click: http://www.nytimes.com/2008/04/21/nyregion/21carbon.html.

CPUC Establishes Institute for Climate Solutions.

he California Public Utilities Commission (CPUC) created the California Institute for Climate Solutions (CICS) in order to (1) facilitate research that results in technological solutions and the development of policies that work to reduce GHG emissions and (2) accelerate the transfer, deployment, and commercialization of GHG technologies. More information is available at: http://www.cpuc.ca.gov/puc/.

Announcements (Continued)

Alberta Launches Carbon Council.
Following a commitment to reduce projected emissions by 200 megatonnes (220.5 megatons) by 2050 (CCS would account for 139 megatonnes [153.2 megatons]), Alberta launched a carbon council composed of several government and industry officials that will create a roadmap outlining CCS implementation and respond to recommendations made by the Canadian Federal government in January. Details concerning Alberta's climate change action plan are accessible at: http://www.environment.alberta.ca/1319.html.

CantorCO2e Announces the Launch of the "Social Carbon Company."
The Social Carbon Company will provide carbon management services to project developers in the Verified Emission Reduction (VER) market. The company uses a methodology that enhances carbon credits by quantifying a project's contribution to sustainable development in developing countries. An explanation of the methodology is available at: http://www.socialcarbon.com/en/?page=Social_Carbon_In_Action.

Science

***The Independent*, "Insects 'Will be Climate Change's First Victims.'"**

A recent study found that tropical insects may be among the first species to face extinction as a result of climate change. New research shows that although the polar regions may experience the largest change in average temperature this century, a smaller shift in the average tropical temperature could have a more widespread impact on nature. With many insects thought to be living at the threshold of their temperature range, scientists believe an average tropical temperature rise of one or two degrees Celsius could unravel the interconnectedness of the tropical ecosystem. For example, the tropics depend on insects for breaking down organic matter, pollinating flowers to produce fruits and nuts, and providing food for animals higher up the food chain. After analyzing daily and monthly global temperatures from 1950 to 2000 and comparing the data with a series of factors like population growth rates and physical performance, the scientists arrived at their conclusion, adding that shade would provide little relief and tropical insects have no way to adapt or other locations to move to. Finally, the scientists said changing rainfall patterns resulting from climate change could impact food crops in tropical regions. The study is available at: http://beta.pnas.org/content/105/18/6668.abstract?sid=3eefb478-100c-47c3-8d3d-d2091fedf2eb. (Subscription may be required.) May 6, 2008, http://www.independent.co.uk/news/science/insects-will-be-climate-changes-first-victims-821616.html.

***Science Daily*, "Hot Climate Could Shut Down Plate Tectonics."**

A new finding that links climate and the Earth's geophysics may explain the evolutionary difference between Earth and similar planets: prolonged atmospheric heating can shut down plate tectonics and lock a planet's crust into place. For instance, while Earth and Venus are similar in size and geological composition, Venus possesses a CO_2-rich atmosphere that is 100 times denser than Earth's, causing Venus to have a surface temperature hotter than the closest planet to the sun, Mercury. The researchers found that the process where Earth's crust (segments of which are called tectonic plates) returns to the Earth's interior by sliding beneath other plates can become unstable if the Earth's surface temperature would rise by 100 degrees Fahrenheit or more over the course of a few million years. Specifically, as rising atmospheric temperatures heat the crust of a planet, the deep inside of a planet can heat to the point where tectonic plate movement ceases. For the Earth, the mantle (the flowing layer of rock that extends from the planet's outer core located about 1,800 miles below the surface to within about 30 miles of the surface) becomes less active if it heats up. The scientists said their most noteworthy finding is that the atmospheric heating needed to disrupt plate tectonics is noticeably less than the temperature that would cause free water on the Earth's surface to evaporate. The study, titled, "A climate change induced transition in the tectonic style of a terrestrial planet," is available at: http://www.sciencedirect.com/science/article/B6V61-4S6P23T-2/1/2ac76bfc6a7976a6b353da2567aa2f33. (Subscription may be required.) May 13, 2008, http://www.sciencedaily.com/releases/2008/05/080512135102.htm.

Policy

***British Columbia Ministry of Finance Media Release*, "Carbon Tax Guarantees Tax Cuts for British Columbians."**

British Columbia's Minister of Finance announced that British Columbia is the first Canadian province to implement a revenue-neutral carbon tax to reduce personal, corporate, and business income tax rates. The carbon tax, based on a $10 per tonne of CO_2 price that will increase $5 each year until reaching $30 in 2012, is expected to generate $1,849 million in revenue over its first three years. Among its several tax cuts, the revenue will reduce the bottom two personal income tax rates by two percent in 2008, with plans to increase the rate by five percent in 2009 on the first $70,000 in earnings ($784 million in tax cuts). It will also reduce the general corporate tax rate from 12 percent to 11 percent, with plans to lower the rate to 10 percent by 2011 ($415 million in tax cuts) and reduce the small business tax rate to 3.5 percent from 4.5 percent, with plans to lower the rate to 2.5 percent by 2011 ($255 million in

Policy (Continued)

tax cuts). Finally, the revenue will finance a new Climate Action Credit fund that will provide lower income British Columbians with a payment of $100 per adult and $30 per child per year, with plans to increase these amounts by five percent in 2009 ($395 million). The carbon tax will go into effect on July 1, 2008, and apply to all fossil fuels, including gasoline, diesel, natural gas, coal, propane, and home heating fuel. A breakdown of the budget is available at: http://www.bcbudget.gov.bc.ca/2008/backgrounders/backgrounder_tax_impacts.htm. For more information about British Columbia's "Climate Smart Programs," click: http://www.smartchoicesbc.ca/EN/bc's_climate_smart_programs/. April 28, 2008, http://www2.news.gov.bc.ca/news_releases_2005-2009/2008FIN0009-000645.htm.

"An indicator framework for assessing US state carbon emissions reduction efforts (with baseline trends from 1990 to 2001)."

States are at the forefront of climate-related energy policy in the US, developing innovative policy and regional institutions for reducing carbon dioxide and other greenhouse gases. States matter because the larger ones use more energy and produce more carbon emissions than most nations and because their policies, though heterogeneous and until recently quite limited in scope, are shaping the context for national climate action. Despite this significance, little is known about trends in state carbon emissions or the effectiveness of state policies in reducing emissions. This paper describes a framework for analyzing and comparing state carbon emissions performance using sectoral indicators of emissions, energy consumption and carbon intensity linked to key policy domains. The paper also describes the range of state experience across indicators during the period 1990–2001, establishing a baseline of leading, lagging and average experience against which future state and regional change can be assessed. The conceptual framework and the empirical analysis of emission trends are intended to provide a better understanding of, and means for monitoring, state contributions toward achieving energy system sustainability. **Scott Jiusto**, *Energy Policy*, Available online April 21, 2008, doi:10.1016/j.enpol.2008.02.034, http://www.sciencedirect.com/science/article/B6V2W-4SB9F1H-1/1/5ecc1650feff93f2fb3835e3eb961809. (Subscription may be required.)

Geology

"Carbon dioxide storage potential of shales."

Options for the geologic storage of carbon dioxide vary from saline aquifers and depleted oil and gas reservoirs to unminable coal seams and abandoned coal mines. Important aspects include the sealing integrity of the cap rock and potential changes in this integrity, owing to the interaction with CO_2. In this study, diffusive transport and gas sorption experiments on one well characterized shale sample (Muderong Shale, Australia) and on different clay minerals were performed to obtain information on the sealing integrity and the CO_2 storage potential of these materials. All measurements were performed under reservoir conditions relevant for CO_2 storage (T = 45–50 [degrees Celsius]; p < 20 MPa). Repeat diffusion experiments on one shale plug yielded increased effective diffusion coefficients and a decrease in the concentration of the bulk CO_2 volume in the sample. The latter is believed to be dissolved in formation water, sorbed to mineral surfaces or involved with geochemical reactions. For the Muderong Shale, bulk volume CO_2 concentrations are greater within the experimental time frame (222–389 mol/m3), when compared to coal and cemented sandstone (3–4 and 8–10 mol/ m3), respectively. This high CO_2 storage potential could not fully be explained by CO_2 dissolution in water alone. Thus, gas sorption experiments were performed on crushed shale and various clay minerals. High CO_2 sorption capacities (e.g. up to 1 mmol/g for the Muderong Shale) show that the high CO_2 concentration is related to a combination of CO_2 dissolution in water and gas sorption on clay minerals. Additionally, changes in specific surface areas before and after the sorption experiments and variations in the CO_2 sorption and diffusion behavior due to repetitive experiments on the identical sample were observed, possibly related to geochemical alteration of the Muderong Shale and the clay minerals. These could not be quantified however and seemed to occur only at high pressures. Results obtained in this study provide a more positive view on the sealing integrity of intact cap rock formations. Carbon dioxide that migrates from a storage reservoir into the cap rock through the pore network will be immobilized to a certain extent, hence minimizing (slow, diffusion-driven) leakage and providing additional CO_2 storage potential. **Andreas Busch, Sascha Alles, Yves Gensterblum, Dirk Prinz, David N. Dewhurst, Mark D. Raven, Helge Stanjek and Bernhard M. Krooss**, *International Journal of Greenhouse Gas Control*, Available online April 24, 2008, doi:10.1016/j.ijggc.2008.03.003, http://www.sciencedirect.com/science/article/B83WP-4SBYYNJ-1/1/b13d83473d16bd1d994795f097bb3f56. (Subscription may be required.)

"Sequestration of Dissolved CO_2 in the Oriskany Formation."

Experiments were conducted to determine the solubility of CO_2 in a natural brine solution of the Oriskany formation under elevated temperature and pressure conditions. These data were collected at temperatures of 22 and 75 [degrees Celsius] and pressures between 100 and 450 bar. Experimentally determined data were compared with CO2 solubility predictions using a model developed by Duan and Sun (Chem. Geol. 2003, 193, 257−271). Model results compare well with Oriskany brine CO2 solubility data collected experimentally, suggesting that the Duan and Sun model is a reliable tool for estimating solution CO_2 capacity in high salinity aquifers in the temperature and pressure range evaluated. The capacity for the Oriskany formation to sequester dissolved CO2 was calculated using results of the solubility models, estimation of the density of CO2 saturated brine, and available geographic information system (GIS) information on the formation depth and thickness. Results indicate that the Oriskany formation can hold approximately 0.36 gigatonnes of dissolved CO2 if the full basin is considered. When only the region where supercritical CO2 can exist (temperatures greater than 31 [degrees Celsius] and pressures greater than 74 bar) is considered, the capacity of the Oriskany formation to sequester dissolved CO2 is 0.31 gigatonnes. The capacity estimate considering the potential to

Geology (Continued)

sequester free-phase supercritical CO_2 if brine were displaced from formation pore space is 8.8 gigatonnes in the Oriskany formation. **Robert M. Dilmore, Douglas E. Allen, J. Richard McCarthy Jones, Sheila W. Hedges, and Yee Soong**, *Environmental Science & Technology*, Available online February 9, 2008, doi:10.1021/es702229f, http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/2008/42/i08/abs/es702229f.html. (Subscription required.)

Technology

Monitoring of CO_2 plumes during storage in geological formations using temperature signals: Numerical investigation."

Carbon dioxide (CO_2) injection into a storage formation is accompanied by non-isothermal effects. These are caused by a CO_2 injection temperature that does not correspond to the formation temperature, cooling of the carbon dioxide due to expansion (Joule–Thomson cooling) and heat of dissolution of CO_2 in brine. During flow in the subsurface, the carbon dioxide transports energy (advective heat transport) and undergoes an equilibrating process between temperature differences (heat conduction). These non-isothermal processes can be used for the purpose of monitoring the CO_2 plume propagation in the subsurface. Temperature sensors at monitoring wells at a certain distance from the injection well can detect temperature changes and give information about the CO_2 flow in the storage site. In this study, a numerical multi-phase simulation program is used to investigate the non-isothermal effects during CO_2 injection into a storage formation. The feasibility of using temperature measurements for the observation of the carbon dioxide plume in the reservoir is addressed. Various thermal processes and their dependency on the geological characterization of the reservoir are discussed in detail. **Andreas Bielinski, Andreas Kopp, Hartmut Schütt and Holger Class**, *International Journal of Greenhouse Gas Control*, Available online April 18, 2008, doi:10.1016/j.ijggc.2008.02.008, http://www.sciencedirect.com/science/article/B83WP-4S9R231-1/1/370898aa9af83be639fb8b86661bdd64. (Subscription may be required.)

Terrestrial/Ocean

"No-Tillage and Soil-Profile Carbon Sequestration: An On-Farm Assessment."

No-tillage (NT) farming is superior to intensive tillage for conserving soil and water, yet its potential for sequestering soil organic carbon (SOC) in all environments as well as its impacts on soil profile SOC distribution are not well understood. Thus, [the authors] assessed the impacts of long-term NT-based cropping systems on SOC sequestration for the whole soil profile (0–60-cm soil depth) across 11 Major Land Resource Areas (MLRAs: 121, 122, and 125 in Kentucky; 99, 124, 139A in Ohio; and 139B, 139C, 140, 147, and 148 in Pennsylvania) in the eastern United States. Soil was sampled in paired NT and plow tillage (PT) based cropping systems and an adjacent woodlot (WL). No-tillage farming impacts on SOC and [nitrogen (N)] were soil specific. The SOC and N concentrations in NT soils were greater than those in PT soils in 5 out of 11 MLRAs (121, 122, 124, 139A, and 148), but only within the 0- to 10-cm depth. Below 10 cm, NT soils had lower SOC than PT soils in MLRA 124. The total SOC with NT for the whole soil profile (0–60 cm) did not differ from that with PT ($P > 0.10$) in accord with several previous studies. In fact, total soil profile SOC in PT soils was 50 [percent] higher in MLRA 125, 21 [percent] in MLRA 99, and 41 [percent] in MLRA 124 compared with that in NT soils. Overall, this study shows that NT farming increases SOC concentrations in the upper layers of some soils, but it does not store SOC more than PT soils for the whole soil profile. **Humberto Blanco-Canqui and R. Lal**, *Soil Science Society of America Journal*, Available online April 8, 2008, DOI: 10.2136/sssaj2007.0233, http://soil.scijournals.org/cgi/content/abstract/72/3/693. (Subscription may be required.)

Trading

Carbon Market Update, May 14, 2008	
CCX-CFI 2008 ($/tCO$_2$) $6.70 (Vintage 2008)	EU ETS-EUA DEC 2008 ($/tCO$_2$) $38.43 (Converted from € to US$)

ClimateWire, "First U.S. Carbon Futures Contract Born."

The New York Mercantile Exchange (NYMEX) announced that it plans to introduce carbon allowance futures contracts under the upcoming Regional Greenhouse Gas Initiative (RGGI) through its Green Exchange. These contracts are expected to be the United States' first tradable exchange contract needed for compliance with a government cap-and-trade program, although the launch date for the new contracts has yet to be determined and regulatory review remains pending. The Green Exchange previously only offered CO_2 allowances from the European Union's Emission Trading Scheme (EU ETS), certified emissions reductions (CERs) from the Kyoto Protocol's Clean Development Mechanism (CDM), and some seasonal and annual sulfur dioxide (SO_2) and nitrogen oxide (NOx) allowances regulated by the United States Environmental Protection Agency (EPA). The Green Exchange, which hosted 1.59 million metric tons in carbon credit trades following its launch on March 17, 2008, is also waiting for responses from the Commodities Futures Trading Commission (CFTC) regarding a move into the voluntary carbon market, increasing the trading platform's market share in Europe, and a plan to become independent of NYMEX systems.

To visit the Green Exchange website, click: http://www.greenfutures.com/, or click: http://www.rggi.org/ for information related to RGGI. May 8, 2008, http://www.eenews.net/climatewire/2008/05/08/6/.

Recent Publications

"Energy Market and Economic Impacts of S.2191, the Lieberman-Warner Climate Security Act of 2007."

This report responds to a request from Senators Lieberman and Warner for an analysis of S. 2191, the Lieberman-Warner Climate Security Act of 2007 and a subsequent analysis request from Senators Barasso, Inhofe, and Voinovich. S. 2191 is a complex bill regulating emissions of greenhouse gases (GHG) through market-based mechanisms, energy efficiency programs, and economic incentives. Title I of S. 2191 establishes a cap on emissions of greenhouse gases beginning in 2012 through an emission allowance program. The Title I allowance program covers energy-related carbon dioxide (CO_2), methane, nitrous oxide, perfluorocarbons, sulfur hexafluoride, and hydrofluorocarbons (HFCs) emitted from production of hydrochlorofluorocarbons (HCFCs). Sources that are exempt from the Title I cap, but which have other emission reduction incentives under the bill, include most non-CO_2 agricultural emission sources, emissions from coal mines and landfills, and the other HFCs. The emissions covered under Title I represented approximately 87 percent of total GHG emissions in 2006 as reported by the Energy Information Administration (EIA) in its inventory. To read the EIA report, which responds to a request from Senators Lieberman and Warner for an analysis of S.2191, click: http://www.eia.doe.gov/oiaf/servicerpt/s2191/pdf/sroiaf(2008)01.pdf.

"The European Union's Emissions Trading System in Perspective."

The performance of the European Union's Emissions Trading System (EU ETS) to date cannot be evaluated without recognizing that the first three years from 2005 through 2007 constituted a "trial" period and understanding what this trial period was supposed to accomplish. Its primary goal was to develop the infrastructure and to provide the experience that would enable the successful use of a cap-and-trade system to limit European GHG emissions during a second trading period, 2008-12, corresponding to the first commitment period of the Kyoto Protocol. The trial period was a rehearsal for the later more serious engagement and it was never intended to achieve significant reductions in CO_2 emissions in only three years. In light of the speed with which the program was developed, the many sovereign countries involved, the need to develop the necessary data, information dissemination, compliance and market institutions, and the lack of extensive experience with emissions trading in Europe, [the authors] think that the system has performed surprisingly well. The document is available at: http://www.pewclimate.org/docUploads/EU-ETS-In-Perspective-Report.pdf.

"What Will It Cost to Protect Ourselves From Global Warming?"

Important parts of the world are acting to reduce greenhouse gases that cause global warming, and the United States is not debating whether to join that process. This paper examines the potential impact of a cap on greenhouse gases on the U.S. economy as a whole and on American families. What will it cost to protect ourselves against the potentially catastrophic consequences of global warming? Advocates of action anticipate minimal costs. Those who want to do nothing sometimes assert that carbon cuts will "bankrupt the economy." Who is right? This paper conducts the broadest assessment to date of the impacts on the U.S. economy of capping greenhouse gases. This report synthesizes the findings of several state-of-the-art economic models, and arrives at a strong conclusion: The United States can enjoy robust economic growth over the next several decades while making ambitious reductions in greenhouse gas emissions. If [the United States] put a cap-and-trade policy in place soon, [Americans] can achieve substantial cuts in greenhouse gas emissions without significant adverse consequences to the economy. And in the long run, the coming low-carbon economy can provide the foundation for sustained American economic growth and prosperity. To read the entire economic policy report produced by the Environmental Defense Fund (EDF), click: http://www.edf.org/documents/7815_climate_economy.pdf.

"Adapting to Climate Change: A Business Approach."

The business community has for some time been aware of the risks and opportunities associated with greenhouse gas mitigation and current and future climate change policies. Many businesses have taken steps to reduce greenhouse gas emissions voluntarily. Many are taking into account some of the impacts of climate change—potential state and federal regulations, shareholder perceptions, and changes in consumer and supplier markets, for example—on the cost of doing business now and in the future. Fewer businesses, however, are incorporating the risks and opportunities associated with the physical effects of climate change in their business planning. As trends in climate become clearer and the uncertainty surrounding future changes is reduced, more businesses will want to consider whether to adapt to projected changes by taking action now. This, in turn, involves reacting to and managing risks as well as taking advantage of opportunities. To read the complete report, which outlines a sensible business approach to analyzing and adapting to the physical risks of climate change, click: http://www.pewclimate.org/docUploads/Business-Adaptation.pdf.

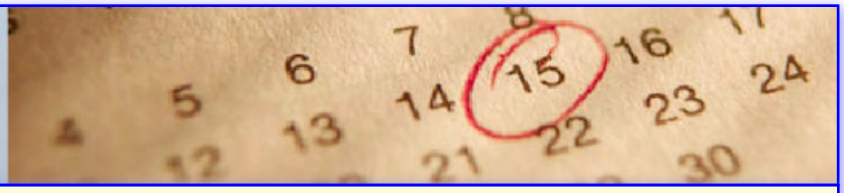
"General Reporting Protocol."

The Climate Registry (the Registry) sets best practice standards for voluntary North American greenhouse gas (GHG) emissions calculation, reporting and verification. It is a non-profit organization governed by its member U.S. States, Canadian Provinces, Mexican States and Native American Tribes. As of March 2008, the Registry's membership includes: thirty-nine U.S. states and the District of Columbia, seven Canadian provinces, six Mexican states, and three Native American Tribes. Emissions Reporters are environmental leaders in the private and public sectors. The Registry also supports the collection of high-quality GHG emissions data for mandatory emissions reporting programs. To read the complete General Report Protocol, go to: http://www.theclimateregistry.org/downloads/GRP.pdf.

Legislative Activity

***Carbon Control News*, "Senate Budget Chairman Eyes New Incentives for Carbon Storage Projects."**

According to Senate Budget Committee Chairman Kent Conrad's staff, Senator Conrad is planning to introduce or co-sponsor legislation that provides tax incentives for CCS technologies. The legislation, called "The Clean Technology Bridge Act of 2008," was discussed at a National Rural Electric Cooperative Association (NRECA) conference and is said to include a production tax credit for biomass facilities that co-fire with coal, an investment tax credit for CCS technology, and a credit for storing carbon underground. An NRECA outline of the plan (available at: http://carboncontrolnews.com/ccndocs/may08/ccn05062008_nreca.pdf) contains two incentives: (1) a 10 to 30 percent tax credit for new clean-coal power plants that capture CO_2 and (2) a 30 percent tax credit for CCS equipment installed on new or existing coal-fired power plants. The outline also states the legislation would provide a $30 per ton credit for CO_2 stored in a geologic formation, $20 per ton if transferred to the Federal government, and $10 per ton if used for EOR. Finally, the outline contains details about regulations, such as making the owner or operator of the facility that captures, transports, or injects CO_2 liable for up to $100 million in the event of an accident, transferring full liability for stored CO_2 to the Federal government after the storage project is decommissioned, and establishing the right of eminent domain for the construction of CO_2 pipelines. May 6, 2008, http://carboncontrolnews.com/index.php/ccn/show/senate_budget_chairman_eyes_new_incentives_for_carbon_storage_projects/. (Subscription required.)



Events

June 1-5, 2008, **The Clearwater Coal Conference**, *Sheraton Sand Key, Clearwater, Florida, USA*. This five day conference, coined as the most comprehensive program on coal technologies, will highlight the issues currently impacting the electric utility industry, such as: coal and CO_2 for the future; coal quality issues; coal-related opportunities in developing countries; advanced energy conversion systems; and pre-combustion, post-combustion, and Oxyfuel CO_2 solutions. To view the conference program, click: http://www.coaltechnologies.com/2008%20Program%20Announcement.pdf.

June 3-4, 2008, **Carbon Emissions Trading**, *Hilton London Kensington Hotel, London, United Kingdom*. "Carbon Emissions Trading – from EU ETS to a global carbon market" provides attendees the opportunity to learn first hand from the leading experts in the field of emissions trading and carbon finance. The speakers will discuss a wide variety of topics, such as the global carbon market, CDM projects, CCS, and Phases 2 and 3 of the EU ETS. To learn more, visit: http://www.energyforum.com/events/conferences/2008/c808/terms.php.

June 5-6, 2008, **The Myth and Reality of the Carbon Market**, *Washington, DC, USA*. Active Communications International presents "The Myth and Reality of the Carbon Market," a new forum for individuals to meet and discuss the financial and practical implications of the carbon trading market. Panel discussions and workshops will focus on the status of North American carbon markets and how they are likely to develop, opportunities for North American investors, long term global and North American carbon prices, and CCS, among other topics. For more information, visit: http://acius.net/Conferences/Upcoming?view=overview&id=57.

June 12-13, 2008, **Global CO_2 Summit**, *Millennium Gloucester Hotel, London, England*. In order to help the energy sector respond to an ever-changing environment, the Global CO_2 Summit will enhance engagement and collaboration amongst policymakers, raise awareness concerning GHG reduction, leverage the business opportunities arising from global actions to reduce CO_2, reduce exposure to future portfolio and regulatory risk, and teach how to transform CO_2 emissions liabilities into financial assets. For detailed information and a conference brochure, visit: http://www.thecwcgroup.com/conf_detail_home.asp?FP=1&CID=186.

June 25-26, 2008, **Carbon Capture and Sequestration**, *Renaissance Hotel, Houston, Texas, USA*. This conference provides attendees the latest information on new projects in different US and Canadian regions. Among the many topics to be discussed: project development, including retrofits, syngas, and transportation via pipeline; geological sequestration, including EOR and suitable formations; and the latest trends in permitting, including jurisdiction over underground storage and the rights of involved parties. For conference details, go to: http://www.platts.com/Events/2008/pc819/.

Events (Continued)

June 26-27, 2008, **Carbon Trading, Clean Energy & the Cost of Inaction**, *L'Aqua, The Terrace Level, Cockle Bay Wharf, Darling Harbour, Sydney*. This seminar will touch upon a broad spectrum of issues related to carbon trading and clean energy, such as the design challenges and possible outcomes facing the proposed ETS, the importance of legally adapting to climate change, the role of forestry and carbon sinks under a proposed ETS, risks and opportunities in carbon trading, and the legal implications of an ETS. To view the seminar details, go to: http://www.legalwiseseminars.com.au/product_details.asp?prodID=12448.

June 26-27, 2008, **Coalbed Methane Symposium**, *The Carriage House Inn, Calgary, AB, Canada*. The Coalbed Methane Symposium provides attendees with the best business practices and technological solutions to coalbed methane challenges. Some of the issues to be explored include: avoiding common errors in resource and reserve estimation, incorporating permeability into your completion strategies, preparing for regulatory changes impacting projects, and enhancing recovery techniques for potential CO2 storage. To view agenda and/or request a conference brochure, click: https://webserv.c5groupinc.com/www_secure/conf_details.php?conf=5318.

July 1-3, 2008, **COAL-GEN Europe**, *EXPO XXI, Warsaw, Poland*. This conference offers attendees presentations about the latest issues affecting the design, development, upgrading, and operation and maintenance of coal-fired power plants. Attendees have the option of taking one of three different tracks, including, "Environmental Technologies and Issues," which includes presentations on CO_2 reduction and technical issues. A detailed Pre-Show Guide is available for download at: http://downloads.pennnet.com/events/cge08/1108_cge08preshowguide.pdf.

August 18-20, 2008, **4th Australia-New Zealand Climate Change Business Conference**, *SKYCITY Convention Centre, Auckland, New Zealand.* As evident from its name, the conference will focus on the risks and opportunities posed to business by climate change. Sessions discussing voluntary carbon markets, regulating carbon markets, carbon market compliance, post-Kyoto roadmap, carbon sequestration developments, and the CDM will be included. To browse the conference website, which includes a draft agenda, visit: http://www.climateandbusiness.com/program.html.

September 29-October 2, 2008, **The 25th Annual International Pittsburgh Coal Conference**, *The Westin Convention Center, Pittsburgh, Pennsylvania, USA*. This conference focuses on the development of future coal-based energy plants as they strive to achieve near-zero emissions of pollutants while reducing costs. Some of the topics to be discussed: combustion, gasification, and environmental control technologies; synthesis of liquid fuels; and coal chemistry. A complete program outline is available at: http://www.engr.pitt.edu/pcc/2008%20Conference.htm#SESSIONS%20and%20TOPICS.

For subscription details...

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