NETL

Carbon Sequestration Newsletter

A Call for Papers

see page 3

March 2008

What's Inside?

Highlights

***Fossil Energy Techline*, "DOE Announces Restructured FutureGen Approach to Demonstrate Carbon Capture and Storage Technology at Multiple Clean Coal Plants."**

On January 30, US Secretary of Energy Samuel W. Bodman announced a restructured approach to the FutureGen project, which involves the demonstration of carbon capture and storage (CCS) technology at several commercial-scale Integrated Gasification Combined Cycle (IGCC) power plants. The US Department of Energy (DOE) said that the reorganized approach caps their financing at no more than the plant's CCS component, allowing for plants to be operational as early as 2015. Under this restructured approach, DOE believes that at least twice the amount of carbon dioxide (CO_2) will be sequestered compared to the FutureGen project. The four sites evaluated in DOE's Environmental Impact Statement – Mattoon, Illinois; Tuscola, Illinois; Jewett, Texas; and Odessa, Texas – are still eligible to host a commercial-scale IGCC plant with CCS technology. DOE also issued a Request for Information (RFI) seeking industries' input by March 3, 2008 on the viability of building IGCC plants that achieve FutureGen's objectives. After the RFI period ends, DOE will issue a Funding Opportunity Announcement (FOA) to provide financing for CCS technology at IGCC plants that generate at least 300 megawatts. Announced in 2003, the FutureGen concept planned the creation of a near-zero emissions, 275-megawatt power plant that produced hydrogen and electricity from coal. Secretary Bodman also announced President Bush's budget request of $648 million, a $129 million increase from the FY2008 request, for DOE's Office of Fossil Energy's Clean Coal Technology Program for Fiscal Year (FY) 2009, including $407 million for coal research and $241 million to demonstrate technologies for cost-effective CCS. To view DOE's RFI, click: http://www.fossil.energy.gov/programs/powersystems/futuregen/final_futuregen_rfi0108.pdf. January 30, 2008, http://www.fossil.energy.gov/news/techlines/2008/08003-DOE_Announces_Restructured_FutureG.html.

***Fossil Energy Techline*, "Fossil Energy Requests $1.1 Billion for FY 2009 Budget."**

DOE's FY 2009 coal budget request of $648 million is the largest for coal research in over 25 years, including $406.5 million for coal research and development (R&D), $85 million for the Clean Coal Power Initiative (CCPI), and $156 million for the restructured FutureGen approach. In regards to specific programs, the budget allocates the following: an $81.7 million funding increase from the FY 2008 FutureGen budget, increasing the total to $156 million; a $30 million increase to $149 million for carbon sequestration; a $15.5 million increase to $69 million for gasification technology; $60 million for fuel cells; and $85 million for Round 3 of President Bush's CCPI. For more detailed information about the budget, click http://www.fossil.energy.gov/aboutus/budget/09/fe_budgetfactsheet_fy09.pdf to read DOE's "Budget in Brief FY09." February 4, 2008, http://www.fossil.energy.gov/news/techlines/2008/08004-FY2009_Budget_Request.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

***Wall Street Journal Online*, "China Works To Trap, Use Carbon Output."**

On January 30, Hong Kong-based Enviro Energy International Holding Ltd. and Canada-based Petromin Resources Ltd. signed an agreement with China United Coalbed Methane Corp. to initiate a five-year, multi-well CO_2 injection-based enhanced coal bed methane pilot project. The $1.39 million (10 million yuan) project, partially funded by the Chinese Ministry of Science and Technology, includes drilling wells in an unminable coal bed located about 3,000 feet below the surface. China is interested in using methane to power turbines in power plants because of the country's 90-gigawatt rise in electricity capacity over the past two years – a figure equivalent to the combined generating capacity of the United Kingdom and France in 2006-07. A $9 million (64.6 million yuan) pilot test conducted near the South Qinshui Basin in Shanxi Province revealed that methane rates double when CO_2 was injected into the coal bed. January 30, 2008, http://online.wsj.com/article/SB120166910098728185.html.

***The Canadian Press*, "Enbridge to Lead Group of 19 Energy Companies in Carbon Capture Project."**

Enbridge Inc., a Canadian pipeline company, is leading the Alberta Saline Aquifer Project (ASAP), an initiative that intends to inject CO_2 emissions into underground saltwater pools. The project, conducted by a group of 19 energy industry members, is currently in its first phase, which includes a study to find ideal locations to commence the project at a cost of $750,000. Officials said a small-scale pilot project capable of injecting 1,000 tonnes of CO_2 per day would cost $20 million to $30 million and the price of commercializing the technology would exceed $200 million – a figure significantly lower than a $2 billion fee estimated by a Canadian government taskforce on CO_2 capture and storage. A similar Canadian initiative, the Integrated CO_2 Network (ICO2N), seeks to create a nationwide system to capture emissions from a number of industrial sites and move them by pipeline to depleted oil and gas fields, unmineable coal formations, or deep saline aquifers. February 4, 2008, http://canadianpress.google.com/article/ALeqM5jkXSSwenMdSK8TW3j7Jwrlrn4krA.

***Norway Post*, "Aker to Invest in Pioneering Carbon Capture Facility," and *Aker ASA Press Release*, "Invests Close to a Billion Kroner in Pioneering Carbon Capture Facility."**

Aker Clean Carbon announced plans to build a CO_2 capture and storage facility near the natural gas-fired power plant and gas processing facilities at Kårstø in Rogoland, Norway, capable of capturing 100,000 tons of CO_2 annually from exhaust gases – a project billed as the world's first and largest CO_2 capture facility of its kind. The facility, expected to be operational in 2009, is connected to both CO_2 point sources to allow for continuous CO_2 removal. In addition, the new CO_2 capture plant is projected to cost $160 million (NOK 875 million), with operating costs of $27 million (NOK 150 million) over a three-year period. Aker said that their recent efforts have focused on mitigating the cost of carbon sequestration, so that building facilities for CO_2 capture and storage becomes a more economically friendly option than polluting.

Sequestration in the News (Continued)

January 24, 2008, http://www.norwaypost.no/cgi-bin/norwaypost/imaker?id=127340 and January 24, 2008, http://www.akercleancarbon.com/publish_files/080124_Aker_Clean_Carbon_PME_1100.pdf.

***Reuters UK*, "UAE Carbon Storage to Cost $2-$3 Billion - SNC Lavalin."**

The Canadian engineering and construction company SNC-Lavalin revealed that a plan to build CO_2 capture and storage network would reduce the United Arab Emirates' (UAE) CO_2 emissions by around 10 percent, boost oil output, and cost from $2 billion to $3 billion. Based on an estimated 76 million tonnes of CO_2 emissions per year, a study proposed that four to six projects, costing approximately $500 million each, could be quickly built to reduce CO_2 emissions from six million to eight million tonnes per year. The aim of the project, which would be the largest single integrated CO_2 capture and storage project in the world, is to inject CO_2 into oilfields to maintain oil pressure and enhance output. UAE, the world's fifth-largest oil exporter, will benefit from the close proximity of emissions sites to oilfields and the abundance of large reservoirs that can be used for CO_2 storage. January 22, 2008, http://uk.reuters.com/article/UK_SMALLCAPSRPT/idUKL2265559420080122.

***Kyodo News*, "Power Firm Succeeds in Injecting Large Amount of CO_2 into Coal Beds."**

General Environmental Technos Corporation, a subsidiary of Kansai Electric Power Corp. (KEPCO), announced the successful, large scale injection of CO_2 into deep coal beds through the use of nitrogen – a first in the world. The nitrogen technology enabled 6.6 tons of CO_2 to be injected per day, equivalent to the amount of CO_2 absorbed by 900,000 cedar trees each day. In addition to enhancing the recovery of coal bed methane, the use of nitrogen prevents the coal bed from swelling, which would reduce the space available for greenhouse gas (GHG) storage. The nitrogen-based technology has undergone testing since 2004 in Yubari, Hokkaido under a project promoted by the Japanese Ministry of Economy, Trade and Industry. January 28, 2008, http://home.kyodo.co.jp/modules/fstStory/index.php?storyid=360105. (Subscription required.)

Announcements

9th International Conference on Greenhouse Gas Control Technologies. The call for papers is now open for GHGT-9, scheduled to be held in Washington, DC on November 16-20, 2008. The conference is aimed to provide information on the latest developments on CCS, with one of the key themes designated as building awareness of the current technical status of CCS and addressing issues that we need to consider for future wide-scale implementation. Abstracts for papers or posters can be submitted online until March 28, 2008. Details can be found at: http://mit.edu/ghgt9/papers/index.html.

Principles of Geologic Carbon Sequestration Workshop.

The American Association of Petroleum Geologists (AAPG) is offering a workshop at their annual convention for individuals interested in the basics of carbon sequestration, such as criteria for site selection, CO_2 sources, MMV, regulatory issues, and enhanced oil recovery. The workshop is scheduled for Saturday, April 19 from 8:00 a.m. until 5:00 p.m. at the Henry B. Gonzalez Convention Center in San Antonio, Texas. For more information about the pre-convention course, visit: http://www.aapg.org/sanantonio/course08.cfm.

Leading Wall Street Banks Establish "The Carbon Principles."

Citi, JPMorgan Chase, and Morgan Stanley announced the formation of climate change guidelines for power company advisors and lenders in the United States. The Carbon Principles were created to assess the risk associated with power companies and global climate change legislation. For more information about the principles – energy efficiency, renewable and low carbon technologies, and conventional and advanced generation – click: http://www.citigroup.com/citigroup/press/2008/080204a.htm.

North America's First Online Carbon Emissions Auction.

World Energy Solutions, Inc., the operator of several online exchanges for energy commodities, announced on January 23 that the company oversaw North America's first online carbon emissions auction. Verdant Energy, a leading Canadian power supplier, made history by auctioning 80,000 tonnes of carbon offsets using the World Green Exchange recently established under the Alberta Offset System. For further information, go to: http://biz.yahoo.com/cnw/080123/world_energy_auction.html?.v=1.

Science

***Associated Press*, "Study: Warming May Cut US Hurricane Hits."**

Researchers at the National Oceanic and Atmospheric Administration's (NOAA) Miami Lab and the University of Miami believe that global warming could reduce the number of hurricanes that make landfall in the United States. In the study, warming waters in the Indian and Pacific Oceans are linked to increased wind shear – referring to a change in wind speed or direction – in the Atlantic Ocean to show that global warming makes it more difficult for hurricanes to form, strengthen, and subsist. The study also suggests that wind shear within the 10 degree to 20 degree North latitude belt that stretches from West Africa to Central America is crucial to determining future Atlantic hurricane activity. Specifically, Chunzai Wang, the study's author, believes that wind shear increases up to 10 miles per hour for every degree Celsius that the oceans warm, consequently weakening a storm's ability to form. Data analyzed from 1854 to 2006 show sea surface temperatures increasing across the globe, although at a higher rate in the tropical regions of the Pacific, Atlantic, and Indian Oceans – producing increased vertical wind shear in the area where Atlantic hurricanes typically form. Thus, the warming of the Pacific and Indian Oceans increases vertical wind shear, which curbs Atlantic hurricane activity. Wang said that while wind shear is the most important factor, atmospheric humidity, sea level pressure, and sea surface temperature also affect hurricane strength. To read an abstract of the study, titled "Global warming and United States landfalling hurricanes," click: http://www.agu.org/pubs/crossref/2008/2007GL032396.shtml. January 23, 2008, http://www.msnbc.msn.com/id/22790698/.

***Science Daily*, "Tipping Elements in Earth's Climate System."**

According to a climate research report published by the Potsdam Institute, several elements of the Earth's climate system could exceed a critical threshold, dubbed the "tipping element," this century. However, the authors stress that even small changes in human activities can have positive, long-term consequences for the Earth's climate system. The study presents nine tipping elements and a forecast for when these events may occur: melting of Arctic sea ice (approximately 10 years); decay of the Greenland ice sheet (more than 300 years); collapse of the West Antarctic ice sheet (more than 300 years); collapse of the Atlantic thermohaline circulation (approximately 100 years); increase in the El Nino Southern Oscillation (approximately 100 years); collapse of the Indian summer monsoon (approximately 1 year); greening of the Sahara/Sahel and disruption of the West African monsoon (approximately 10 years); dieback of the Amazon rainforest (approximately 50 years); and dieback of the Boreal Forest (approximately 50 years). The study says the most sensitive tipping elements with the smallest uncertainty, due to global warming, are the Arctic sea-ice and Greenland ice sheet scenarios. The scenarios with the largest uncertainty are the West Antarctic ice sheet, Amazon rainforest and Boreal forests, the El Niño phenomenon, and the West African monsoon scenarios. February 4, 2008, http://www.sciencedaily.com/releases/2008/02/080204172224.htm.

Policy

***Reuters*, "EU Agrees Goal for Climate Deal by April 2009," and *Reuters*, "Factbox-The EU's Energy and Climate Plan."**

On January 24, European Union (EU) chair, Slovenia, reached an agreement with the three countries that will succeed its rule to strive toward enacting extensive climate change and energy laws by April 2009. Slovenian Environment Minister Janez Podobnik said that the EU's 27 member states have agreed to quickly reach an accord on the proposal's first reading, so that Europe is able to take a primary role in the global climate change negotiations set for December 2009 in Copenhagen. The European Commission proposed several goals: to cut GHG emissions by 20 percent from 1990 levels, including a stipulation to increase the reduction figure to 30 percent if an international climate change deal is in place; increase renewable energy such as solar, wind, wave, hydro, and biomass by 20 percent by 2020; and use 10 percent of biofuels for transport by 2020. These initiatives will cost an estimated 0.5 percent of gross domestic product (GDP), or $86.53 billion (60 billion euros) per year, and raise electricity prices 10 percent to 15 percent per year. However, the changes will reduce energy imports totaling $74 billion (50 billion euros) per year and save $16.3 billion (11 billion euros) a year by 2020 on air pollution control. For information about proposed changes to the European Union Emissions Trading Scheme (EU ETS), see the "Trading" section below. January 24, 2008, http://www.reuters.com/article/environmentNews/idUSL242321720080124 and January 23, 2008, http://www.reuters.com/article/environmentNews/idUSL2347327520080123.

***Reuters*, "Alberta Targets Emission Cuts with Carbon Capture."**

Alberta Premier Ed Stelmach revealed on January 24 that a new climate change strategy will reduce CO_2 emissions 14 percent below 2005 levels by 2050 through the implementation of CCS programs. As Canada's top oil producing province, Alberta plans to let GHG emissions rise until around 2020, due to more than $100 billion worth of planned oil sands projects that will triple current oil output. Stelmach said that he will allow GHGs to rise for the next decade because the province is a large oil provider to the United States and he did not want to risk harming Alberta's $73 billion in annual exports to the United States. Under Stelmach's climate change initiative, 12 percent of the emissions reductions will result from energy efficiency and conservation efforts, while some 70 percent of the targeted 200 megatonne emissions cut over the next 42 years will come from CO_2 capture and storage. In addition, Stelmach has been fining industrial emitters $15 per tonne of CO_2 emissions above a designated limit and contributing the money into a $503 million CCS R&D fund. Part of this fund would finance a study to explore the costs of developing a pipeline to transport CO_2 emissions to old oilfields for use in enhanced oil recovery. January 24, 2008, http://www.reuters.com/article/latestCrisis/idUSN24260627.

GEOLOGY

"Effect of coal properties on CO_2 sorption capacity under supercritical conditions."

Relationships between coal properties and CO_2 sorption capacity have been investigated for 30 coals from various sources in Australia and elsewhere, selected to cover a wide range of rank and maceral composition. Samples were characterized by their CO_2 sorption capacity, porosity, density and chemical and petrographic composition. Carbon dioxide adsorption isotherms were measured on dry coal at 53 [degrees Celsius] and at pressures up 16 MPa using a gravimetric apparatus. Isotherms were fitted to a modified Dubinin–Radushkevich (DR) model using gas density rather than pressure to enable the model to be applied to supercritical conditions. A term related to Henry's Law to account for gas absorbed by the coal is also included in the model. This model provided excellent fits to the experimental data; in most cases the difference between the predicted and measured value was less than 1 [percent] of the sorption capacity over the entire pressure range. Sorption capacities of the coals investigated were found to vary by over a factor of 2, even when comparing on a dry-ash-free basis. Carbon dioxide sorption capacity tended to reduce with rank to reach a minimum that corresponded to a vitrinite reflectance of about 1.2 [percent] after which it began to increase. Increasing hydrogen content tended to result in a decrease in sorption capacity. Two of the coals showed significantly higher sorption capacity than any of the other samples examined. In both of these cases, the coals had been naturally weathered and exhibited high porosity relative to the other samples. In general, however, the correlations observed were quite weak with considerable scatter in the data. This implies that CO_2 sorption capacity, required for assessing sequestration potential, cannot be reliably inferred from the coal properties investigated here. **Stuart Day, Greg Duffy, Richard Sakurovs and Steve Weir**, *International Journal of Greenhouse Gas Control*, Available online December 4, 2007, doi:10.1016/S1750-5836(07)00120-X, http://www.sciencedirect.com/science/article/B83WP-4R8PNX1-1/2/fed79a15dc708c2775daf2337d18f734. (Subscription may be required.)

TECHNOLOGY

"Capture of CO_2 from high humidity flue gas by vacuum swing adsorption with zeolite 13X."

Capture of CO_2 from flue gas streams using adsorption processes must deal with the prospect of high humidity streams containing bulk CO_2 as well as other impurities such as SO_X, NO_X, etc. Most studies to date have ignored this aspect of CO_2 capture. In this study, we have experimentally examined the capture of CO_2 from a 12 [percent] synthetic flue gas stream at a relative humidity of 95 [percent] at 30 [degrees Celsius]. A 13X adsorbent was used and the migration of the water and its subsequent impact on capture performance was evaluated. Binary breakthrough of CO_2/water vapor was performed and indicated a significant effect of water on CO_2 adsorption capacity, as expected. Cyclic experiments indicate that the water zone migrates a quarter of the way into the column and stabilizes its position so that CO_2 capture is still possible although decreased. The formation of a water zone creates a "cold spot" which has implications for the system performance. The recovery of CO_2 dropped from 78.5 [percent] to 60 [percent] when moving from dry to wet flue gas while the productivity dropped by 22 [percent]. Although the concentration of water leaving the bed under vacuum was 27 [percent] (vol), the low vacuum pressure prevented condensation of water in this stream. However, the vacuum pump acted as a condenser and separator to remove bulk water. An important consequence of the presence of a water zone was to elevate the vacuum level thereby reducing CO_2 working capacity. Thus although there is a detrimental effect of water on CO_2 capture, long term recovery of CO_2 is still possible in a single VSA process. Pre-drying of the flue gas steam is not required. However, careful consideration of the impact of water and accommodation thereof must be made particularly when the feed stream temperature increases resulting in higher feed water concentration. **Gang Li, Penny Xiao, Paul Webley, Jun Zhang, Ranjeet Singh and Marc Marshall**, *Adsorption*, Available online January 16, 2008, DOI: 10.1007/s10450-007-9100-y, http://www.springerlink.com/content/343150385122754x/?p=07dbd91f560f4dd597c93aa7542cc9b1&pi=2. (Subscription required.)

"Infrared monitoring of underground CO_2 storage using chalcogenide glass fibers."

An optical-fiber-based system suitable for monitoring the presence of carbon dioxide, so-called "greenhouse gas", is investigated. Since each pollutant gas shows a characteristic optical absorption spectrum in the mid-infrared (mid-IR), it is possible to detect selectively and quantitatively the presence of gases in a given environment by analyzing mid-IR spectra. The main infrared signature of carbon dioxide gas is a double absorption peak located at 4.2 µm. Chalcogenide optical fibers, which can transmit light in the 1–6 µm range, are well-adapted for CO_2 analysis. In this wavelength range, they show attenuation losses that compare favorably with other types of fiber such as silver halide fibers. In this paper, the detection limit of CO_2 is established as a function of optical path length. The dynamic parameters of the sensors, such as reversibility, response time and recovery time, are also studied. It is concluded that optical fibers based on chalcogenide glasses could be used to transport infrared light

Technology (Continued)

from a black body source to a remote CO_2 geological storage zone in order to monitor, in real time, CO_2 gas leakage. **Frédéric Charpentier, Bruno Bureau, Johann Troles, Catherine Boussard-Plédel, Karine Michel-Le Pierrès, Frédéric Smektala and Jean-Luc Adam**, *Optical Materials*, Available online January 30, 2008, doi:10.1016/j.optmat.2007.10.014, http://www.sciencedirect.com/science/article/B6TXP-4RPVJ1T-3/2/dd503718e8de6c01fbc829496d947048. (Subscription may be required.)

Terrestrial/Ocean

"The effect of the tillage system on soil organic carbon content under moist, cold-temperate conditions."

Soil tillage and its interaction with climate change are widely discussed as a measure fostering carbon sequestration. To determine possible carbon sinks in agriculture, it is necessary to study carbon sequestration potentials in relation to agricultural management. The aim of this paper is to evaluate the soil carbon sequestration potential of a site in northeastern Switzerland under different tillage systems. The study was performed as a long-term (19-year) trial on an Orthic Luvisol (sandy loam) with a mean annual air temperature of 8.4 [degrees Celsius] and a long-term precipitation mean of 1183 mm. The soil organic carbon (SOC) concentration was determined five times during the study period, with the paper focusing mainly on the year 2006. The main objective was to quantify the influence of moldboard plowing (PL), shallow tillage (ST), no-tillage (NT) practices, and grassland (GL) on soil organic carbon content, the latter's different fractions (labile, intermediate, and stable), and its distribution by depth. In calculating the SOC content of the whole soil profile, we included a correction factor accounting for variations in bulk density (equivalent soil mass). The total SOC stock at a depth of 0–40 cm was 65 Mg [carbon] [per hectare], and although higher under GL, did not differ significantly between PL, ST, and NT. SOC concentrations per soil layer were significantly greater for NT and ST (0–10 cm) than for PL, which had greater SOC concentrations than NT and ST at 20–30 cm depth. Both SOC concentrations and stocks (0–20 cm) were largest under GL. In all treatments, most of the carbon was found in the intermediate carbon fraction. There was no significant difference in any of the three SOC fractions between NT and ST, although there was between ST and PL. A sharp decrease in [carbon]-concentrations was observed in the first 7 years after the transition from grassland to arable land, with a new equilibrium of the carbon concentration in the 0–40 cm layer being reached 12 years later, with no significant difference between the tillage treatments. Overall, the results indicate that effects of tillage on soil carbon are small in moist, cold-temperate soils, challenging conversion into no-till as a measure for sequestering [carbon]. **Sandra Hermle, Thomas Anken, Jens Leifeld and Peter Weisskopf**, *Soil and Tillage Research*, Available online January 16, 2008, doi:10.1016/j.still.2007.10.010, http://www.sciencedirect.com/science/article/B6TC6-4RKVHJ9-1/2/f14d7b5e1f8f9906b17ef6f1f91d4d71. (Subscription may be required.)

Trading

Carbon Market Update, Feb. 13, 2008

CCX-CFI 2008 ($/tCO$_2$)	EU ETS-EUA DEC 2008 ($/tCO$_2$)
$4.50 (Vintage 2008)	$29.05
	(Converted from € to US$)

***Greenwire*, "Northeast States Prep for Inaugural Carbon Auction."**

Following a 2005 agreement to reduce GHGs 10 percent by 2020, several participants in the 10-member Regional Greenhouse Gas Initiative (RGGI) are preparing for a June 2, 2008 auction of emissions credits in advance of the scheme's January 2009 start date. Under the agreement, members elected to cap GHG emissions at 188 million short tons per year from 2009 through 2014, followed by a cap reduction of 2.5 percent a year through 2018 to achieve the overall 10 percent emission reduction goal. Not all RGGI members plan to participate in the auction, which will provide the first U.S. opportunity to gauge GHG prices, but individual utilities and power generators can participate even if their home states do not. While the states still must determine exactly how many emissions credits to put up for auction and how many free credits should be distributed to offset RGGI compliance costs, the 2007 RGGI Model Rule regulates the number of credits allocated per state, permitted offsets for power generators, and how the auction proceeds will be invested. Participants have agreed that auction proceeds will be spent on renewable energy programs and at least 25 percent of the permits will be auctioned. To view the RGGI Model Rule, click: http://www.rggi.org/docs/model_rule_corrected_1_5_07.pdf. January 22, 2008, http://www.eenews.net/Greenwire/2008/01/22/1/.

***Carbon Positive*, "Europe Reveals Tight ETS Phase III Plan," and *Reuters UK*, "Factbox-EU Plans Carbon Trading Overhaul."**

A plan released by the European Commission reveals that the European Union Emissions Trading Scheme's (EU ETS) Third Phase will cut emission allowances by 21 percent. From 2013 through 2020, industries covered under the EU ETS will have their emission allowances annually reduced, so that emissions drop 21 percent below 2005 levels by 2020; this would result in emissions dropping to 1.72 billion tonnes of CO_2, compared to the current 2 billion tonnes of CO_2. Under the proposal, the proportion of total EU emissions covered in the ETS will increase from about 40 percent to 50 percent and the emissions reduction target would be raised from 20 percent to 30 percent by 2020 if foreign emitters agree to emission caps. In addition, national allocations plans, which regulate the emissions cap for each country, sector, and individual installation until 2012, would be

Trading (Continued)

eliminated and replaced by a single EU emissions allocation; owners of unused allowances issued in 2008 to 2012 would be allowed to use these credits until 2020; and around 60 percent of. allowances would be auctioned off in 2013, up from 10 percent currently. The European Commission plan, which would include a 10 percent to 15 percent increase in electricity prices, must be approved by the 27-member states and the EU Parliament before becoming a law. January 24, 2008, http://www.carbonpositive.net/viewarticle.aspx?articleID=968 and January 23, 2008, http://uk.reuters.com/article/oilRpt/idUKL2359672920080123?sp=true.

Recent Publications

"The Future of Carbon Capture and Storage."

A global consensus has formed on the need for government intervention to reduce GHGs, particularly carbon dioxide (CO_2), in order to fight the potentially disastrous impacts of climate change. This will have a huge impact on the energy industry, one of the leading sources of GHG emissions. While there is some potential for switching to carbon-free methods of generation, it is likely that coal and natural gas will be a part of the generation mix for a long time. This means that methods of reducing the CO_2 produced by power generation must be developed. CCS is one way in which carbon emissions can be reduced and there is a need for members of the industry to understand the technology of CCS, the role it can play in helping generators succeed in a carbon constrained environment, and the impact that its implementation will have on generation costs. The report aims to provide the reader with a thorough understanding of CCS and how it serves as a GHG mitigation option. It also aims to provide a look at the options that exist to implement CCS and the current programs underway to develop and implement CCS technology. The report focuses specifically on the needs of the electric power industry as they relate to CCS, providing the information necessary for industry participants to start moving forward with participation in CCS opportunities. This report will be of interest to the utility industry, power plant developers, and generation technology vendors. It will also be of interest to energy industry vendors, academics, consultants, and analysts. To order the 3rd Edition of Research Reports International's "The Future of Carbon Capture and Storage report," go to: http://www.researchandmarkets.com/reports/c80081. (Subscription required.)

"Pipelines for Carbon Dioxide (CO_2) Control: Network Needs and Cost Uncertainties."

Congress is considering policies promoting the capture and sequestration of carbon dioxide (CO_2) from sources such as electric power plants. Carbon capture and sequestration (CCS) is a process involving a CO_2 source facility, a long-term CO_2 sequestration site, and CO_2 pipelines. There is an increasing perception in Congress that a national CCS program could require the construction of a substantial network of interstate CO_2 pipelines. However, divergent views on CO_2 pipeline requirements introduce significant uncertainty into overall CCS cost estimates and may complicate the federal role, if any, in CO_2 pipeline development. S. 2144 and S. 2191 would require the Secretary of Energy to study the feasibility of constructing and operating such a network of pipelines. S. 2323 would require carbon sequestration projects to evaluate the most cost-efficient ways to integrate CO_2 sequestration, capture, and transportation. P.L. 110-140, signed by President Bush on December 19, 2007, requires the Secretary of the Interior to recommend legislation to clarify the issuance of CO_2 pipeline rights-of-way on public land. To read the complete CRS Report for Congress, click: http://assets.opencrs.com/rpts/RL34316_20080110.pdf.

"Geologic Storage of Carbon Dioxide - Staying Safely Underground."

Geologic storage of carbon dioxide (CO_2) is the underground disposal of CO_2 from large industrial sources such as power plants. Carbon Capture and Storage (CCS), also known as Carbon Capture and Sequestration, includes geologic storage as one of its components. CCS is a powerful tool – along with energy efficiency, fuel switching and renewable energy sources – essential to reducing atmospheric CO_2 levels. Many studies show that the most effective and least-costly way to reduce CO_2 levels to avoid climate change is to use all CO_2 reduction tools, including CCS. CO_2 is a natural substance in the air that is essential to life. As part of the natural carbon cycle, people and animals inhale oxygen from the air and exhale CO_2. Meanwhile, green plants absorb CO_2 for photosynthesis and emit oxygen back into the atmosphere. CO_2 is also widely used for many purposes such as carbonating drinks and filling fire extinguishers. As a greenhouse gas, its presence in the atmosphere traps heat from the sun. Normally, this keeps the climate warm enough for life to continue. However, the burning of fossil fuels is increasing CO_2 levels in the atmosphere above naturally-occurring levels, contributing to global climate change. To view the complete booklet, published by the IEA Working Party on Fossil Fuels and the IEA Greenhouse Gas R&D Programme, click: http://www.cslforum.org/documents/geostoragesafe.pdf.

Legislative Activity

***E&E Daily*, "States Should Keep Control for Pipeline Siting, Officials Say."**

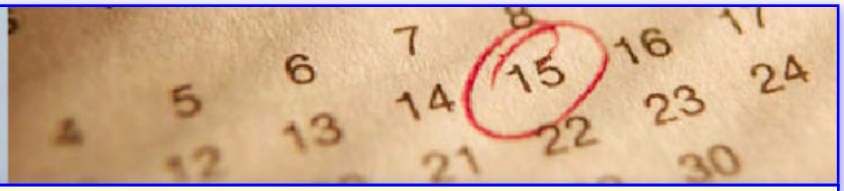
Following testimony before the Senate's Energy and Natural Resource Committee, witnesses said it was argued that states should play a prominent role in the regulation of CO_2 pipelines, which currently span around 3,900 miles and would need to be significantly expanded for effective CCS. In particular, Federal Energy Regulatory Commission (FERC) Chairman Joseph Kelliher, who believes states should maintain their regulatory authority, supported a proposal sponsored by Senator Norm Coleman (R-Minnesota) that called for

Legislative Activity (Continued)

a DOE led study of the regulatory factors impacting the expansion of the nation's CO_2 pipeline network. The alternatives to the states maintaining regulatory authority include FERC establishing a set CO_2 transportation rate or granting FERC both siting and rate jurisdiction. It was also urged that the Interstate Oil and Gas Compact Commission (IOGCC) be consulted because of the commission's experience in CO_2 regulation. Currently, states and pipeline operators are free to establish their own rates, with the US Department of Transportation's (DOT) Surface Transportation Board settling rate disputes and US DOT's Office of Pipeline Safety providing oversight. February 1, 2008, http://www.eenews.net/EEDaily/2008/02/01/2/.

***Environmental News Service*, "States Seek Fraud Protection for Carbon Offset Market."**

With the US market for carbon offset credits expected to reach $100 million annually within the next four years, California Attorney General Edmund G. Brown, Jr. teamed with attorneys from nine other states to advocate that the Federal Trade Commission (FTC) hone carbon credits guidelines to prevent fraud. The letter recommended that the FTC conduct research on consumers' understanding of carbon offsets, guarantee that offset projects do not double sell credits or claim credits for practices that are already required by law, and ensure that consumers understand carbon offsets and the potential for fraud. The states also called for a more concrete definition of what constitutes a carbon offset. Finally, the states said that the FTC, responsible for ensuring that carbon offsets are honestly marketed to consumers, offer consumer tips on its website and describe details about offsets on all marketing material. The letter came in response to an FTC request for comments on marketing carbon offsets. January 25, 2008, http://www.ens-newswire.com/ens/jan2008/2008-01-25-091.asp.



Events

March 3-4, 2008, **Atlantic Climate Change Conference**, *Westin Nova Scotia, Halifax, Nova Scotia*. The Environmental Services Association of Nova Scotia presents the Atlantic Climate Change Conference for the private and public sectors, civic organizations and associations, infrastructure designers, and decision makers. Presentations address GHG emissions management, climate change science, and tools for adaptation. Included is a session titled, "Carbon Capture and Storage: A Carbon Sense Solution to Climate Change." To view the event program, go to: http://www.esans.ca/pdf/ACCCProgramv2.pdf.

March 11-13, 2008, **Carbon Market Insights 2008**, *Bella Center, Copenhagen, Denmark*. This annually successful event provides attendees with unrivaled insight into everything carbon markets, including several "streams" based on: carbon trading, carbon projects, carbon and energy, and the voluntary market. For this year's event, Point Carbon is offering participants the opportunity to hold side events during designated times, with preference given to those offering a fresh view on climate policy and the carbon market. To view a detailed conference brochure, visit: http://www.pointcarbon.com/Events/Carbon%20Market%20Insights/category401.html.

March 12-14, 2008, **Globe 2008**, *Vancouver Convention and Exhibition Centre, Vancouver, British Columbia, Canada*. Globe 2008 brings together some 2,000 delegates from all over the world to address strategic business issues influencing global economic and environmental agendas. This conference is highly recommended for corporate executives, policymakers, environmental industry executives, international agency representatives, urban leaders and design professionals, and financial executives. To browse the Preliminary Conference Program, containing agenda and registration information, go to: http://www.globe2008.ca/documents/GL08_PreProgram_single.pdf.

March 27-28, 2008, **The Law of Climate Change**, *Esplanade Hotel, Fremantle, Western Australia*. The Law of Climate Change affords conference attendees the chance to discuss their insights into the legal issues and challenges arising from the threat of climate change. Session topics include emissions trading schemes, establishing a regulatory scheme for carbon geosequestration, carbon offsets, and carbon neutrality. For a detailed conference brochure and registration information, click: http://www.nela.org.au/.

April 5-11, 2008, **8th International Conference on Environmental Compliance and Enforcement**, *Cape Town, South Africa*. With participants from more 80 countries and organizations across the globe, this conference brings together environmental enforcement practitioners to discuss compliance with international and domestic environmental laws. The agenda includes a segment about climate change and compliance composed of discussions about integrity in emissions trading, energy efficiency, the Clean Development Mechanism, and Post-2012 compliance mechanisms. For more information, visit: http://www.inece.org/conference/8/.

Events (Continued)

April 10-11, 2008, **Sixth International Forum on Geologic Sequestration of CO_2 in Deep, Unmineable Coalseams "Coal-Seq VI**," *Marriott Westchase, Houston, Texas*. This year's forum objectives address topics such as technical and non-technical CO_2 sequestration issues, worldwide sequestration projects, understanding state-of-the-art in various technical areas, and an update of activities presented at "Coal-Seq V." For further information contact Susan Pershall, Advanced Resources International at 1-281-558-9200 or by email (spershall@adv-res-hou.com). For event updates and registration information, click: http://www.coal-seq.com/upcomingevents.htm.

April 11-12, 2008, **2008 MIT Energy Conference**, *Marriott Hotel in Kendall Square, Cambridge, Massachusetts, USA*. The 2008 MIT Energy Conference is the ideal forum for assembling technology, policy, and industry leaders to develop solutions for capitalizing on the opportunities present in modern energy markets. The two-day event opens with a showcase for energy research and inventive businesses to the community, followed by a one-day conference that opens with a panel discussion about carbon capture and sequestration. For general conference details, go to: http://www.mitenergyconference.com/.

April 17, 2008, **Living in a Low Carbon World**, *Geographical Society, London, England*. The participants in Living in a Low Carbon World 2008 will examine how the development, property, finance, transport, energy and retail sectors can collaborate to communicate more effectively with the public about climate change. Through panel discussions, interactive voting, case studies, and keynote speeches, several United Kingdom-based strategic developments to combat climate change will be discussed. To browse the conference website, click: http://conference.lowcarbonworld.net/main.php?pid=80.

May 5-8, 2008, **7th Annual Carbon Capture and Sequestration Conference**, *Sheraton at Station Square, Pittsburgh, PA, USA*. This conference brings together experts directly involved in developing, demonstrating and deploying CO_2 capture, separation, and sequestration technologies. The 7th annual conference will address the knowledge, policy, regulatory, and technology gaps hindering expedited CCS deployment. Attendees will have the opportunities to discuss carbon capture, separation, and sequestration technologies and share experiences on developing the necessary capacity within the public and private sector to move the technology base forward. To browse the conference website, click: http://www.carbonsq.com/.

May 7-9, 2008, **Carbon Expo 2008**, *Exhibition Center, Cologne, Germany*. Carbon Expo 2008 offers attendees a total of eight plenary sessions and 22 workshops divided into three parallel "streams" – Project, Traders, or Global – about the state of the global carbon market, Joint Implementation (JI), Clean Development Mechanism (CDM), European Union Emissions Trading Scheme (EU ETS), carbon markets, non-Kyoto markets, and market outlook. For a conference brochure, visit: http://www.carbonexpo.com/wEnglisch/carbonexpo2/img/dokumente/Conferenz_Programm.pdf or http://www.carbonexpo.com/ for general conference information.

May 15-16, 2008, **Navigating the New Carbon World**, *San Diego Marriott Hall & Marina, San Diego, California, USA*. This annual conference allows over 1,000 climate change leaders to discuss evolving climate policies, standards, and trends. Topics include: National Climate Registry developments, carbon Markets, plans to curb emissions, international standards and reduction projects, carbon capture and sequestration technologies, and new and emerging climate change issues. To register for Navigating the Carbon World, click: http://www.pointcarbon.com/Events/Navigating%20the%20Carbon%20World/category1538.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.