



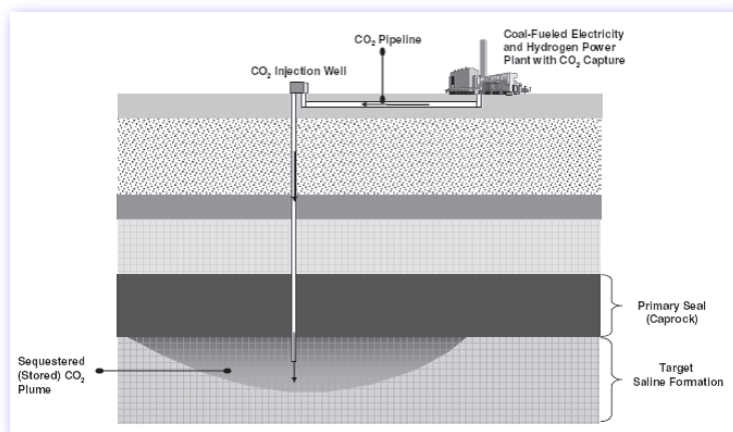
Carbon Sequestration Newsletter

JULY 2007

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FutureGen Project Overview, Source: FutureGen Draft EIS, Volume I



HIGHLIGHTS

Fossil Energy Techline, "DOE Releases Draft EIS Statement for FutureGen Project."

The US Department of Energy (DOE) has released a Draft Environmental Impact Statement (EIS) for the FutureGen Project, a detailed document describing the potential environmental effects of constructing the state-of-the-art 275-megawatt coal-fired power plant with hydrogen production capabilities. The near zero-emissions plant will use carbon sequestration technology to capture carbon dioxide (CO₂) emissions from the plant and pump the gas underground for permanent storage. The draft EIS provides detailed descriptions of the proposed power plant, CO₂ capture and storage methods, monitoring activities, planned and potential research activities, resources required for the proposed project, and construction and operation plans. The EIS also considers the various human and environmental impacts at the site and surrounding community that could result with the construction and operation of the power plant. These include potential impacts on land resources, water supply, air quality and noise, ecological resources, human health, and socioeconomics, among other

factors. Comments from DOE-hosted public hearings conducted in the communities located near the four candidate sites were also incorporated into the EIS. Locations under consideration for the FutureGen site include Mattoon, Illinois; Tuscola, Illinois; Jewett, Texas; and Odessa, Texas. Additionally, the draft EIS suggests mitigation options that will be considered as the project develops. This comprehensive assessment will be used for reference in the design, construction, and eventual operation of the FutureGen plant. DOE's National Energy Technology Laboratory will oversee the project, which is a partnership between DOE and the FutureGen Alliance, Incorporated, the non-profit consortium responsible for the design and construction of the facility. Comments to the draft EIS will be considered for inclusion in the final EIS. To read the complete FutureGen Draft Environmental Impact Statement, click on: <http://www.netl.doe.gov/technologies/coalpower/futuregen/EIS/>. To read the Federal Registrar Notice, go to: http://www.fossil.energy.gov/programs/powersystems/futuregen/futuregen_frnotice_060107.pdf.

May 25, 2007, http://www.fossil.energy.gov/news/techlines/2007/07044-FutureGen_Draft_EIS_Released.html.



SEQUESTRATION IN THE NEWS

Houston Chronicle, “Going Underground for a Greenhouse Gas Solution.”

Geologists from the University of Texas and representatives from Praxair are monitoring CO₂ injected into an underground brine-saturated formation at a depth of 4,000 feet. The carbon sequestration test, called the Frio Brine Project, was initiated near Houston two years ago and is being funded by DOE. Sue Hovorka, a geologist and principal investigator for the project, is working with her research colleagues to monitor the capacity of the brine formation to store the CO₂ and determine whether any of the injected CO₂ has been displaced. The permanent storage of CO₂ and other gases in this manner will play a major role in reducing the effects of greenhouse gases associated with global warming. Although the researchers found traces of CO₂ in the soil around the inactive oil wellheads where the injection occurred, it was determined that the gas came from a tiny leak in the wellhead and not from the injected formation. Hovorka and her team anticipate the start of a large-scale injection test in the fall. The test will inject one million tons of CO₂ into an underground formation in Mississippi. June 11, 2007, <http://www.chron.com/disp/story.mpl/business/4875523.html>.

Bloomberg News, “BP and Rio Tinto Study Clean Power Project.”

Hydrogen Energy, a joint venture company recently formed by BP and Rio Tinto Group on May 17, has begun looking into the prospect of a 500-megawatt coal-fired power plant fitted with carbon capture and storage technology. The project will cost an estimated \$1.5 billion (\$2 billion Australian) and will be capable of generating enough electricity to meet 15 percent of the electricity demand in western Australia, while at the same time capturing approximately four million metric tons of CO₂ emissions. The technology that will be used in operating the plant will reduce output of the greenhouse gas CO₂ by converting the coal used to fire the plant into hydrogen gas, which will then be used to power gas turbines to generate low-carbon electricity. The sequestered CO₂ will then be injected and permanently stored beneath the seabed of the Perth Basin. Hydrogen Energy believes that in order for the project to be successful, government policy regulating emissions will need to be in place, and government grants will need to be awarded to supplement the cost of the project. A local utility company capable of selling the base-load power may also be necessary for the project to be economically viable. Investment decisions are expected to be made by 2011, and the project would begin after a three year construction period. Similar projects proposed by BP include a 500-megawatt plant at the Carson oil refinery in California and a 475-megawatt plant in Scotland. May 21, 2007, <http://www.iht.com/articles/2007/05/21/business/sxclean.php>.

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This newsletter is produced by the National Energy Technology Laboratory to provide information on recent activities and publications related to carbon sequestration. It covers domestic, international, public sector, and private sector news.

SEQUESTRATION IN THE NEWS

(CONTINUED)

National Coal Council Press Release, “National Coal Council Calls for Increased Funding to Accelerate Development of Promising Carbon Dioxide Management Technologies.”

Following a year-long study at the request of US Secretary of Energy Samuel Bodman, the National Coal Council released findings that detail technologies to accelerate carbon dioxide management. The study makes recommendations for more efficient

and environmentally sound methods for coal use, while maintaining the nation’s reliance on it for electricity production. The report details the necessity to develop technologies for carbon capture and storage, including development of storage sites and related infrastructure within the next ten years. In order to achieve these goals, the report emphasizes the need to accelerate public-private partnerships for commercialization of these projects within the next 15 years. Additionally, affordability in commercializing these technologies will allow for retrofitting of existing plants. To visit the National Coal Council website, go to: <http://www.nationalcoalcouncil.org/>.
June 14, 2007, <http://sev.prnewswire.com/oil-energy/20070614/AQTH14214062007-1.html>.

ANNOUNCEMENTS

Round 2 Proposals Due - Solicitation for Natural Gas and Petroleum Exploration and Production, Emissions Reduction, and Carbon Sequestration.

The New York State Energy Research and Development Authority (NYSERDA) announces its Program Opportunity Notice (PON) 1111. NYSEDA invites proposals that target natural gas and petroleum exploration and production, emissions reduction in natural gas systems, and carbon sequestration. NYSEDA anticipates making multiple awards in the following categories: Type 1: Resource Characterization (\$100,000 maximum NYSEDA funding per project); Type 2: Resource Development (\$150,000 maximum NYSEDA funding per project); Type 3: Efficiency Increases and Emissions Reduction in Resource Extraction, Transportation, and Distribution (\$150,000 maximum NYSEDA funding per project); and Type 4: CO₂ Sequestration (\$400,000 maximum NYSEDA funding per project). Proposals may be submitted by individual companies, research institutions, or teams. Teaming arrangements are encouraged, including the use of outside technical expertise or joint ventures between companies/organizations. The submission deadline is 5:00 PM Eastern Time on August 8, 2007. The link to the full solicitation can be found on NYSEDA’s website at: http://www.nyserda.org/includes/funding_content_pop.asp?i=PON%201111.

Basin Electric Issues Request for Proposal (RFP) Seeking CO₂ Capture Technology.

Basin Electric Power Cooperative issued the RFP on June 1, 2007, in an effort to demonstrate CO₂ capture at its Antelope Valley Station near Beulah, North Dakota. The RFP is for a demonstration project that will evaluate various types of CO₂ removal technologies in an effort to determine which one or ones might be technologically and economically feasible. The study will be conducted at Basin Electric’s Antelope Valley Station. The CO₂ captured during the demonstration project would be fed into an existing CO₂ compression and pipeline system owned by Basin Electric’s wholly owned subsidiary, Dakota Gasification Company. Interested parties are encouraged to contact Basin Electric and to visit the plant sites. Submittals must be made to Basin Electric by September 1, 2007. Basin Electric plans to make a project decision on one or more technologies no later than December 1, 2007. The RFP can be found on Basin Electric’s website at: www.basinelectric.com/Commerce/WhatWeBuy/c02_capture_rfp.html.

National Public Radio Story About Carbon.

View a five-part animated series on National Public Radio (NPR) dedicated to carbon. This series explains how carbon atoms form bonds, break apart, and create the conditions that can lead to global warming. Listen to the accompanying story on NPR’s “All Things Considered,” by clicking on: <http://www.npr.org/templates/story/story.php?storyId=9943298>.

“Statement by the President on the Decline of United States Carbon Dioxide Emissions for 2006.”

Figures contained in the May 23 report from the Energy Information Administration show that the US is on track to meet national greenhouse gas emission reductions by 18 percent by 2012. The report contains a “flash estimate” of US carbon dioxide emissions for 2006, which show a decrease of 78 million metric tons over the prior year. To read the President’s statement in its entirety, click on: <http://www.whitehouse.gov/news/releases/2007/05/20070523-8.html>.



SCIENCE

Reuters, “Thunder? It’s the Sound of Greenland Melting.”

Greenland, the world’s largest island, is melting at an accelerated rate. Blamed on a five degree Fahrenheit temperature rise in the spring and fall, causing a longer melting period of the ice cap in those seasons, the total melt area over the last 30 years has increased by 30 percent. Consensus points to human activity, namely the burning of fossil fuels, as the culprit in the upward shift in temperatures and altering of Greenland’s characteristic makeup. The ice cap covering Greenland measures 624,000 cubic miles (2.6 million cubic kilometers), but is diminishing by 24 to 36 cubic miles (100 to 150 cubic kilometers) of ice each year. The amount of fresh water which forms this ice cap comprises ten percent of all the earth’s fresh water supply, and a complete meltdown of the ice cap would cause a 23 foot (7 meter) rise in sea levels. The accelerated melting of Greenland’s ice cap is having the ironic benefit of attracting tourists who are now able to enjoy the warmer temperatures in an area that did not historically attract many visitors. Likewise, it is also benefiting local fishermen, as warmer waters are drawing certain varieties of fish not usually found in Greenland’s waters. June 7, 2007, <http://www.planetark.com/avantgo/dailynewsstory.cfm?newsid=42460>.

Science Daily, “Human Activities Increasing Carbon Sequestration in Forests.”

Researchers from the United States, Canada and Europe completed a terrestrial sequestration study on nitrogen deposition by humans. Conclusions show that humans are influencing the carbon balance of forests across the Northern Hemisphere through the nitrogen produced by automobile engines, factories, and intensive agriculture. This study is unique in that the effects of low levels of nitrogen deposition were examined for the first time, proving that carbon sequestration by temperate and boreal forests is directly effected by nitrogen inputs. Nitrogen is often used as a plant nutrient found in fertilizers. When pumped into the environment

by human activities, plant and tree growth is accelerated which, in turn, increases the ability of the trees to absorb CO₂. Researchers will need to continue their studies to determine what proportion of CO₂ emissions are being offset by the anthropogenic release of nitrogen, because too much could have adverse ecological effects. (See **Terrestrial/Ocean section of this newsletter for the abstract and link to this study.**) June 13, 2007, <http://www.sciencedaily.com/releases/2007/06/070613131909.htm>.

POLICY

Greenwire, “G8 Agreement Helps Shape Post-Kyoto Debate.”

Despite the absence of concrete commitments, the Group of Eight (G8) summit has succeeded in making advances towards a post-Kyoto climate agreement. For the first time, the United States has agreed to participate and work with other countries on a new international agreement that will take place after the protocol’s expiry in 2012. Before leaving the G8 summit, President George Bush discussed plans to host his own global warming summit in the United States, but a specific venue or timeframe has yet to be established. He also proposed his own set of goals separate from the United Nations’ Framework Convention on Climate Change, which initially sparked concern among the European nations. The President’s plan will force Congress to move forward to enact legislation concerning emissions targets, although it appears unlikely that the President would sign such legislation. Nonetheless, efforts to address global warming will continue with several events scheduled to occur in the coming months, including the annual United Nations Climate Change Conference in Bali, Indonesia in December. Concern over China and India’s active participation in those talks remains a concern. June 12, 2007, <http://www.eenews.net/Greenwire/print/2007/6/12/12>. (Subscription may be required.)

“Societal acceptance of carbon capture and storage technologies.”

For the actual implementation of carbon capture and storage (CCS) technologies, societal support is a crucial precondition. This paper describes an extensive study on the acceptance of CCS by stakeholders in the Netherlands and explores one of the determining factors in the acceptance of CCS by the lay public, [that is] the way the Dutch press perceives and portrays CCS. The stakeholder analysis shows that there is a positive attitude towards CCS by industry, government, and environmental [non-governmental organizations], provided that the conditions they pose on the deployment of CCS are met. The content analysis of Dutch news articles conveys that the media portrayal of CCS is—to a certain extent—a balanced reflection of the way CCS is perceived by the stakeholders. Both analyses show that the concerns about CCS have not overshadowed the main promise that CCS is part of the solution to climate change. However, the current negative aspects of CCS as raised by different stakeholders and the media will remain if no action is taken. Therefore, the conditions posed on the use of CCS, as well as the actions required to meet these conditions, could function as a proxy for the ‘societal voice’, articulating the most important issues concerning the future acceptance of CCS technology. **Klaas**

POLICY (CONTINUED)

van Alphen, Quirine van Voorst tot Voorst, Marko P. Hekkert and Ruud E.H.M. Smits, Energy Policy, Published online April 20, 2007, doi:10.1016/j.enpol.2007.03.006, <http://www.sciencedirect.com/science/article/B6V2W-4NJ26S3-6/2/e539e492db4e1738533b28d7c1259eb>. (Subscription may be required.)

GEOLOGY

“The mechanical behaviour of coal with respect to CO₂ sequestration in deep coal seams.”

Carbon dioxide displays a strong affinity for coal due to its propensity to adsorb to the coal surface. The process of CO₂ adsorption on coal causes lowering of surface energy and, it is hypothesised that an associated decrease in surface film confinement results in a decrease in material tensile resistance. Following the results of work carried out on the mechanical influence of CO₂ on brown coal under in

situ conditions [Viète DR, Ranjith PG. The effect of CO₂ on the geomechanical and permeability behaviour of brown coal: implications for coal seam CO₂ sequestration. *Int J Coal Geol* 2006;66(3):204–16], a theoretical explanation is proposed for the perceived lack of a weakening effect with the adsorption of CO₂ to coal at significant confining pressures. [The authors] propose that at significant hydrostatic stresses, resistance to failure is otherwise provided (by external confinement) and the effects of adsorptive weakening are concealed. [The authors’] model predicts that adsorptive weakening, fracturing under in situ stresses, and associated permeability increases are not an issue for coal seam CO₂ sequestration for sufficiently deep target seams. Lowering of the elastic modulus of coal upon introduction of CO₂ may proceed by means other than surface energy lowering and could well occur irrespective of the depth of sequestration. The effect of elastic modulus lowering under in situ conditions would be beneficial for the long-term retention of sequestered gases. **D.R. Viète and P.G. Ranjith**, Fuel, Published online April 9, 2007, doi:10.1016/j.fuel.2007.03.020, <http://www.sciencedirect.com/science/article/B6V3B-4NFS18V-5/2/e09fc1140c45d8ca1c142766881c9d42>. (Subscription may be required.)

TECHNOLOGY

“Trade-off in emissions of acid gas pollutants and of carbon dioxide in fossil fuel power plants with carbon capture.”

This paper investigates the impact of capture of [CO₂] from fossil fuel power plants on the emissions of nitrogen oxides (NOX) and sulphur oxides (SOX), which are acid gas pollutants. This was done by estimating the emissions of these chemical compounds from natural gas combined cycle and pulverized coal plants, equipped with post-combustion carbon capture technology for the removal of CO₂ from their flue gases, and comparing them with the emissions of similar plants without CO₂ capture. The capture of CO₂ is not likely to increase the emissions of acid gas pollutants from individual power plants; on the contrary, some NOX and SOX will also be removed during the capture of CO₂. The large-scale implementation of carbon capture is however likely to increase the emission levels of NOX from the power sector due to the reduced efficiency of power plants equipped with capture technologies. Furthermore, SOX emissions from coal plants should be decreased to avoid significant losses of the chemicals that are used to capture CO₂. The increase in the quantity of NOX emissions will be however low, estimated at 5 [percent] for the natural gas power plant park and 24 [percent] for the coal plants, while the emissions of SOX from coal fired plants will be reduced by as much as 99 [percent] when at least 80 [percent] of the CO₂ generated will be captured. Evangelos Tzimas, Arnaud Mercier, Calin-Cristian Cormos and Stathis D. Petevs, Energy Policy, Published online March 26, 2007, doi:10.1016/j.enpol.2007.01.027, <http://www.sciencedirect.com/science/article/B6V2W-4NBRFXP->

[1/2/102cce4148093cece5fa1da5e933eed0](http://www.sciencedirect.com/science/article/B6V2W-4NBRFXP-1/2/102cce4148093cece5fa1da5e933eed0). (Subscription may be required.)

TERRESTRIAL/OCEAN

“The human footprint in the carbon cycle of temperate and boreal forests.”

Temperate and boreal forests in the Northern Hemisphere cover an area of about 2 x 10⁷ square [kilometers] and act as a substantial carbon sink (0.6–0.7 petagrams of carbon per year). Although forest expansion following agricultural abandonment is certainly responsible for an important fraction of this carbon sink activity, the additional effects on the carbon balance of established forests of increased atmospheric [CO₂], increasing temperatures, changes in management practices and nitrogen deposition are difficult to disentangle, despite an extensive network of measurement stations. The relevance of this measurement effort has also been questioned, because spot measurements fail to take into account the role of disturbances, either natural (fire, pests, windstorms) or anthropogenic (forest harvesting). Here [the authors] show that the temporal dynamics following stand-replacing disturbances do indeed account for a very large fraction of the overall variability in forest carbon sequestration. After the confounding effects of disturbance have been factored out, however, forest net carbon sequestration is found to be overwhelmingly driven by nitrogen deposition, largely the result of anthropogenic activities. The effect is always positive over the range of nitrogen deposition covered by currently available data sets, casting doubts on the risk of widespread ecosystem nitrogen saturation under natural

TERRESTRIAL/OCEAN

(CONTINUED)

conditions. The results demonstrate mankind is ultimately controlling the carbon balance of temperate and boreal forests, either directly (through forest management) or indirectly (through nitrogen deposition). (See **“Human Activities Increasing Carbon Sequestration in Forests”** in the Science Section of this newsletter for an article referencing this journal abstract.) **Federico Magnani, Maurizio Mencuccini, Marco Borghetti, Paul Berbigier, Frank Berninger, Sylvain Delzon, Achim Grelle, Pertti Hari, Paul G. Jarvis, Pasi Kolari, Andrew S. Kowalski, Harry Lankreijer, Beverly E. Law, Anders Lindroth, Denis Loustau, Giovanni Manca, John B. Moncrieff, Mark Rayment, Vanessa Tedeschi, Riccardo Valentini and John Grace**, *Nature*, Volume 447, June 14, 2007, Pages 849-851, doi:10.1038/nature05847, Link unavailable.

“Sensitivity of the Century Model to Scale-Related Soil Texture Variability.”



Sequestering C [carbon] in agricultural soils presents an immediate viable option to reduce atmospheric CO₂ to help mitigate global warming. Agricultural land managers who adopt practices that sequester C might market the sequestered (i.e., stored) C as a C credit to industrial CO₂ emitters who wish to reduce their net CO₂ emissions. Land managers or landowners will need to verify changes in soil organic carbon (SOC) related to a change in management practice to facilitate C credit trading. The objective of this study was to assess the accuracy of Century model predictions of SOC change due to the adoption of no-tillage using site-specific data and data from existing soil databases. [The authors] hypothesized that (i) using site-specific soil data would result in the most accurate Century estimates and (ii) Century estimates are sensitive to soil clay percentage. Five paired tillage/no-tillage farm sites in north-central Montana were used to test model predictions. Sites were chosen such that soil, landscape, climatic conditions, and historical cropping systems were similar within each tillage/no-tillage pair. The Century model overestimated SOC content using site-specific soils data by an average of 10 [percent]. Century was sensitive to the effects of clay content when predicting the total amount of SOC in a particular field. There was insufficient evidence to suggest that a linear association exists between clay content and Century-estimated C change due to no-tillage. Results suggest that (i) the effect of clay percentage on the rate of C change is not well understood and (ii) the Century model is an acceptable predictor of soil C for C trading. Further examination of the relationship between soil clay content and the rate of C storage in agricultural systems is needed to determine if adjustments to the

Century model are required. **Ross S. Bricklemeyer, P. R. Miller, P. J. Turk, K. Paustian, T. Keck and G. A. Nielsen**, *Soil Science Society of America Journal*, Published online April 5, 2007, <http://soil.scijournals.org/cgi/content/abstract/71/3/784>. (Subscription may be required.)

“A numerical study with an eddy-resolving model to evaluate chronic impacts in CO₂ ocean sequestration.”

To evaluate chronic impacts of CO₂ ocean sequestration, [the authors] simulated the distribution of injected CO₂ using an oceanic general circulation model (OGCM) with a horizontal resolution of 0.1 [degree]. The model can explicitly express transport and dispersion of dissolved CO₂ by mesoscale eddies. The CO₂ which is continuously injected by a moving ship dissolves and accumulates within the first several to 10 years, but the CO₂ concentration has an upper limit after its initial increase as a result of the dilution effect of mesoscale eddies which counterbalances the accumulation effect of injection. [The authors] can estimate the CO₂ injection flux with the CO₂ maximum concentration below the “Predicted No Effect Concentration” (PNEC), an index to estimate concentration causing no effects on biota. **Yoshio Masuda, Yasuhiro Yamanaka, Yoshikazu Sasai, Michimasa Magi and Takashi Ohsumi**, *International Journal of Greenhouse Gas Control*, Published online April 26, 2007, doi:10.1016/S1750-5836(07)00039-4, <http://www.sciencedirect.com/science/article/B83WP-4NKB28N-1/2/b5086b71d7293e1a2396e598fa2e0021>. (Subscription may be required.)

TRADING

Carbon Market Update, June 13, 2007

CCX-CFI 2007 (\$/tCO₂)
\$3.35 (Vintage 2007)

EU ETS-EUA DEC 2007
(\$/tCO₂) \$.29

(Converted from € to US\$)

U.S. House of Representatives Press Release, “Kirk Amendment Calls for House to Offset All Greenhouse Gas Emissions.”

In efforts to meet guidelines outlined in a House of Representatives report entitled “Green the Capitol,” US Representative Mark Kirk of Illinois announced the approval of an amendment that will require the US House of Representatives to offset all CO₂ emissions produced by House operations with the purchase of emissions credits through the Chicago Climate Exchange. The recommended purchase amount was set at 34,000 tons of carbon, which would cost the House approximately \$122,700, including associated fees for the transaction. Combined with the recommendation by the House Chief Administrative Officer to adopt renewable energy technologies, the House could become a carbon neutral operation. Total yearly emissions from the House of Representatives buildings produce approximately 91,000 tons of CO₂. June 12, 2007, http://www.house.gov/apps/list/press/il10_kirk/Kirk_Amendment_Calls_for_House_to_Offset_All_Greenhouse_Gas_Emissions.html.

TRADING (CONTINUED)

Entergy Corporation Press Release, Entergy Carbon Credit Purchase Makes 270,000 Megawatt Hours 'Carbon Neutral.'" On June 5, Entergy Corporation announced the purchase of 150,000 metric tons of CO₂ credits from Anadarko Petroleum Corporation, a company that supplies natural gas to Entergy for electricity production. Entergy's customer base is comprised of 2.6 million utility customers in Arkansas, Louisiana, Mississippi and Texas. This deal has made 270,000 megawatt hours of electricity produced by the company as "carbon neutral," since Entergy is, in effect, paying Anadarko for polluting rights to generate electricity. The transaction

will allow Entergy to meet its second voluntary greenhouse gas (GHG) stabilization commitment to reduce its GHG emissions to 20 percent below 2000 levels through 2010. The company met their first milestone of becoming the first US utility to voluntarily stabilize GHG emissions at 2000 levels through 2005 by 23 percent, while increasing megawatt hour sales by 21 percent for the period from 2001 to 2005. Entergy acquired the emission reduction credits by utilizing carbon capture and storage at its plants. Carbon dioxide emissions from the flue gases are captured from gas liquids production and then injected into oil-bearing formations for geologic sequestration and enhanced oil recovery. June 5, 2007, <http://biz.yahoo.com/prnews/070605/latu127.html?.v=55>.

RECENT PUBLICATIONS

"Draft Environmental Impact Statement of FutureGen Project."

The Draft Environmental Impact Statement (EIS) for the FutureGen Project provides information about the potential environmental impacts of [DOE's] proposal to provide federal funding to the FutureGen Alliance, Inc. (Alliance) for the FutureGen Project. In a March 2004 Report to Congress, DOE estimated the cost of the project at \$950 million in constant 2004 dollars shared at a 74/26 ratio by DOE and the Alliance. Accounting for escalation, based on representative industry indices, the project is currently estimated to cost \$1,757,232,310 in as-spent dollars. Including \$300,800,000 in expected revenues from the sale of electricity, which would be used to offset operational costs and research and development expenses, the total net project cost is estimated to be \$1,456,432,310 in as-spent dollars. DOE will share approximately 74 percent of the net cost (estimated at \$1,077,760,230), which includes at least \$80 million in projected contributions from foreign governments. The Alliance will share approximately 26 percent of the net cost (estimated at \$378,672,080). The cost estimate will be updated as work progresses. The Alliance is a non-profit industrial consortium led by the coal-fueled electric power industry and the coal production industry. The FutureGen Project would include the planning, design, construction, and operation by the Alliance of a coal-fueled electric power and hydrogen gas production plant integrated with [CO₂] capture and geologic sequestration of the captured gas. The FutureGen Project would employ integrated gasification combined cycle power plant technology that for the first time would be integrated with CO₂ capture and geologic sequestration. Four sites have been identified as reasonable alternatives and are considered in this EIS: (1) Mattoon, Illinois; (2) Tuscola, Illinois; (3) Jewett, Texas; and (4) Odessa, Texas. DOE determined that the proposed FutureGen Project constitutes a major federal action within the meaning of the National Environmental Policy Act. The Federal Register "Notice of Intent to Prepare an Environmental Impact Statement for FutureGen Project" was published on July 28, 2006 (71 FR 42840). DOE held public scoping meetings at Mattoon, Illinois, on August 31, 2006; Tuscola, Illinois, on August 29, 2006; Fairfield, Texas (near Jewett), on August 22, 2006; and Midland, Texas (near Odessa), on August 24, 2006. The Draft EIS provides an evaluation of the environmental consequences that may result from the Proposed Action at each of the four candidate sites, including potential impacts on air quality; climate and meteorology; geology; physiography and soils; groundwater; surface water; wetlands and floodplains; biological resources; cultural resources; land use; aesthetics; transportation and traffic; noise and vibration; utility systems; materials and waste management; human health, safety, and accidents; community services; socioeconomic; and environmental justice. The Draft EIS also provides an analysis of the No-Action Alternative, under which DOE would not provide financial assistance to the FutureGen Project. A preferred alternative has not been identified. (See article in this month's Highlights section, **"DOE Releases Draft EIS Statement for FutureGen Project,"** which references the release of the document.) To download the complete FutureGen EIS which is contained in two volumes, click on: <http://www.netl.doe.gov/technologies/coalpower/futuregen/EIS/>.

"Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California."

The Secretary for Environmental Protection created the Market Advisory Committee, a committee of national and international experts, to develop recommendations concerning the design of a market-based program for reducing California's GHG emissions. The committee was formed according to Executive Order S-20-06 and will formally submit its recommendations to the California Air Resources Board (CARB) by June 30, 2007. The Market Advisory Committee has focused on the design of a mandatory cap-and-trade program for California. The Committee members have experience in the development and implementation of a number of cap-and-trade-type programs, including the European Union's Emissions Trading Scheme, the US Acid Rain Program, the NO_x Budget Program, and the Northeast Regional Greenhouse Gas Initiative. This report offers the Committee's judgments as to the best design options for a mandatory GHG cap-and-trade system for California. To read the complete report, go to: http://www.climatechange.ca.gov/events/2007-06-12_mac_meeting/2007-06-01_MAC_DRAFT_REPORT.PDF.

RECENT PUBLICATIONS (CONTINUED)

“Pennsylvania Environmental Council releases ‘Climate Change Roadmap for Pennsylvania’.”

In brief, the “Roadmap” presents a “base case” scenario reflecting current policies, Pennsylvania’s GHG emissions are projected to grow in the coming years at roughly 10 [percent] per decade. However, Pennsylvania could lower and ultimately reverse this growth if it joins other states in setting goals for reducing GHG emissions, and adopting the necessary supporting policies. The policies should address every sector of the economy: industry, buildings, transportation, agriculture, forestry, etc. The policies should also be designed to achieve multiple goals: lower GHG emissions, energy independence, cleaner air and water for Pennsylvania, economic development and job creation. Estimates of the GHG impacts of these policies indicate that they could support a goal of reducing Pennsylvania’s emissions to 25 percent below 2000 levels by the year 2025. To read the complete “Pennsylvania Climate Change Roadmap” report, click on: <http://www.pecpa.org/FINAL%20PEC%20Roadmap%20Complete%20Report.pdf>.

“Global Energy Technology Strategy Addressing Climate Change: Phase 2 Findings from an International Public-Private Sponsored Research Program.”

This report is the capstone to nine years of research in two phases of the Global Energy Technology Strategy Program (GTSP). That research was conducted at the Joint Global Change Research Institute and in collaboration with partner research institutions around the world. The first phase of that work began at a time when the importance of a technology strategy in addressing climate change was unappreciated. GTSP Phase 1 made the case that a technology strategy was an important part of a larger strategy to address climate change and needed to be included along with the other major components: climate science research, adaptation to climate change, and emissions mitigation. The second phase of the GTSP recognized that to craft a global energy technology strategy it was important to develop a deeper understanding of potentially important technologies and technology systems, and to embed that knowledge in the context of the larger global energy and economic systems. In Phase 2 [the authors] identified six energy technologies and technology systems with the potential to play a major role in a climate-constrained world: CO₂ capture and storage, biotechnology, hydrogen systems, nuclear energy, other renewable energy, and end-use technologies that might be deployed in buildings, industry and transportation. Knowledge gained in each area has been integrated into a larger global energy-economy-climate frame. That combination of depth of study and integrated assessment produced a unique strategic perspective and a bounty of fresh insights. In this document, [the authors] have distilled and summarized some of the most salient. To download the pdf file of the full report, published in May 2007, go to: http://www.pnl.gov/gtsp/docs/gtsp_2007_final.pdf. To download the Executive Summary of this report, click on: http://www.pnl.gov/gtsp/docs/gtsp_2007_execsummfinal.pdf.

LEGISLATIVE ACTIVITY

The Associated Press, “Utah Joins Pact to Reduce Gas Emissions.”

On May 21, Republican Governor Jon Huntsman of Utah signed the Western Regional Climate Action Initiative. Utah is now the sixth state to join the group of Western states that have pledged their formal commitment to reduce greenhouse gas emissions. Governors from California, Arizona, Washington, Oregon, and New Mexico are current members of the pact, which was enacted earlier this year by California Governor Arnold Schwarzenegger. The group will work together to set collective targets for greenhouse gas reductions by August 2007 and establish a protocol for tracking and registering greenhouse gas emissions. Additionally, the agreement calls for implementation of a regional carbon market by August 2008, whereby companies that pollute in excess of their allowance must purchase credits from companies who are able to meet their emissions targets. A similar scheme is being developed in a number of Northeastern and Mid-Atlantic states as a way to mitigate climate change. Utah relies almost exclusively

on coal-fired power plants to generate electricity, so initiatives such as the Western Regional Climate Action Initiative present a viable option in reducing the state’s carbon dioxide emissions and addressing global climate change. May 21, 2007, <http://www.washingtonpost.com/wp-dyn/content/article/2007/05/21/AR2007052101280.html>.

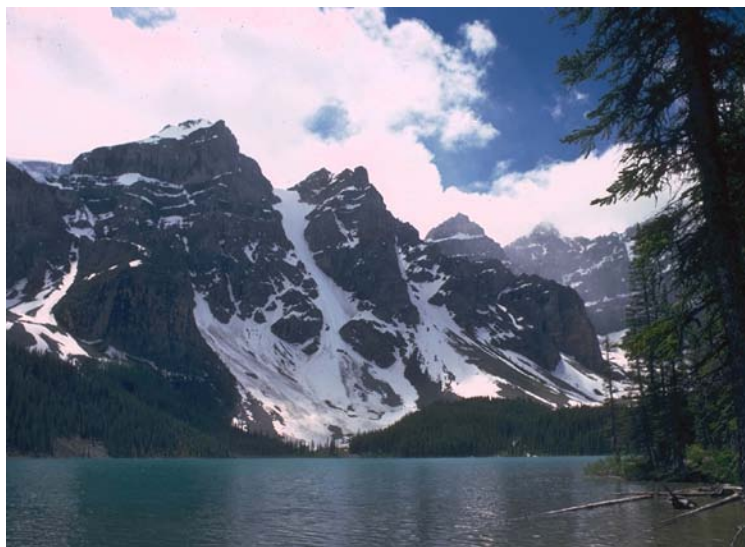


LEGISLATIVE ACTIVITY

(CONTINUED)

The Associated Press, “Western Governors Target Clean Energy.”

On June 10-12, the Western Governors’ Association held a three-day conference to discuss global warming, clean energy alternatives, agriculture policy, and reducing the impact of climate change in the region. Attendees included ten governors and the premiers of two Canadian provinces. Considerable attention was given to carbon sequestration, with a request to the federal government to increase its research and funding efforts with the technology. Economic incentives, deployment of large-scale sequestration projects, technological advances, and long-term liability are many of the issues that will need to be addressed with carbon sequestration. The commitment to move forward with large-scale solar energy projects was also discussed. June 11, 2007, <http://www.billingsgazette.net/articles/2007/06/11/news/state/40-governor.prt>.



EVENTS

July 8-12, 2007, **CHEMRAWN-XVII and ICCDU-IX Conference on Greenhouse Gases Mitigation and Utilization**, Queen’s University, Kingston, Ontario, Canada. CHEMRAWN (Chemical Research Applied to World Needs) and ICCDU (the International Conferences on Carbon Dioxide Utilization) will hold a combined conference on science and policy related to mitigation and utilization of carbon dioxide and other greenhouse gases. The meeting is being held 6 months before the Kyoto-protocol commitment period begins. The conference will cover topics including the carbon balance in nature, greenhouse gas mitigation, policy, and the utilization of CO₂. Please visit the conference website for more information: <http://www.chem.queensu.ca/greenhouse/index.php>.

July 11-13, 2007, **Carbon Sequestration Development and Finance Summit**, Hotel Derek, Houston, Texas. The “Summit” will bring together leaders in the carbon sequestration development and finance community to share their perspectives on how to get carbon sequestration project deals successfully put in place and financed in 2007 and beyond. Participants will not only hear from this remarkable group of market players about the latest developments in carbon sequestration development and finance, but the Summit will also offer an outstanding opportunity to meet and network with this group and other players in the market and to accurately gauge the current pulse of the development and finance community. Visit the Summit website at: www.infocastinc.com/sequest07.html.

July 30-31, 2007, **Carbon Trading Investment Summer Seminar**, The Westin New York at Times Square, New York, New York. The Supreme Court’s recent decision to allow the EPA to regulate carbon emissions, combined with the precedent of carbon emissions trading schemes abroad, has created the environment for increased carbon trading in the US. In order to be prepared for such legislation, it is important to analyze carbon trading fundamentals and strategies that have already been set in place by the EU Emissions Trading Scheme and the US voluntary market. This seminar is intended to be a two-day intensive program to educate US investors on the ins and outs of carbon trading, so they can be prepared for the years ahead. For further information, see: <http://www.iqpc.co.uk/cgi-bin/templates/singlecell.html?topic=221&event=13175>.



EVENTS (CONTINUED)

August 28-31, 2007, **2007 International Conference on Coal Science and Technology**, East Midlands Conference Centre, The University of Nottingham, United Kingdom. All aspects of coal science and technology will be covered at this conference, with special emphasis on clean coal and CO₂ capture. To obtain further information about the conference and to download a conference flyer, go to: <http://www.2007iccst.org/>.

August 30-31, 2007, **3rd Climate Change and Business Conference 2007**, Brisbane, Australia. This conference will examine the impact of climate change on businesses, especially in terms of risks and opportunities. It will also focus on adaptation and will provide more specific examples of new business opportunities and how business can manage the risks arising from climate change. It will explore the opportunities in other markets including Japan, China, India and other southeast Asian countries. A workshop on geo-sequestration is included in the agenda. To view a complete conference program and to obtain registration and accommodation information, see: <http://www.climateandbusiness.com/index.html>.

September 10-14, 2007, **The 24th Annual International Pittsburgh Coal Conference**, Sandton Convention Centre, Johannesburg, South Africa. The Twenty-Fourth Annual International Pittsburgh Coal Conference focuses on environmental emissions issues and technologies surrounding the continued use of coal and the development of future coal-based energy plants to achieve near-zero emissions of pollutants, reduced costs, and high thermal efficiency while producing a suite of products to meet future energy market requirements. Included in the topics of discussion will be the Kyoto protocol and policy issues, CO₂ capture technologies, sequestration in geological sinks, enhancing natural sinks, modeling and assessments, and CO₂ utilization. For complete information, click on: <http://www.engr.pitt.edu/pcc/2007%20Conference.htm>.

September 11-12, 2007, **Carbon Markets USA**, Hilton Hotel, San Francisco, California. Attendees will explore how one of the World's largest future commodity markets will develop and impact their business. A technical session examining the potential of carbon capture and storage (CCS) in achieving significant emissions reductions is included in the agenda. The session will investigate what is being done to develop CCS technology, as well as the changes needed in regulatory and policy frameworks to support the growth of this technology. For a pdf version of the conference brochure, go to: http://www.greenpowerconferences.com/carbonmarkets/documents/BrochureCarbonMarketsUSA_000.pdf.

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

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