

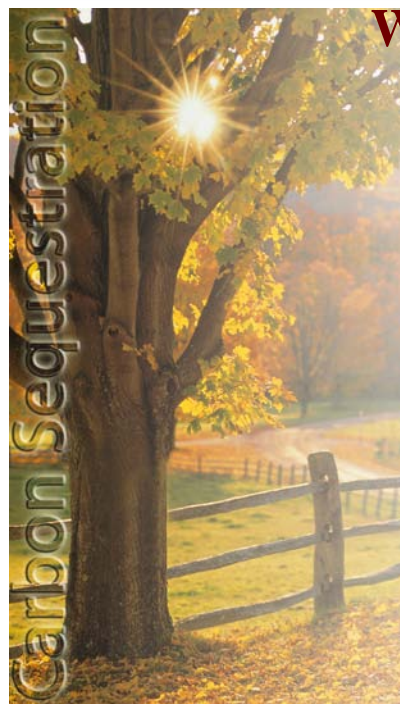


Carbon Sequestration Newsletter

AUGUST 2007

WHAT'S INSIDE?

Sequestration in the News
Announcements
Science
Policy
Geology
Technology
Terrestrial/Ocean
Trading
Recent Publications
Events
Subscription Information



HIGHLIGHTS

NETL News Release, "Department of Energy Supported Technologies Recognized with R&D 100 Awards."

R&D Magazine has awarded the prestigious R&D 100 Awards to three technologies developed at the US Department of Energy's (DOE) National Energy Technology Laboratory (NETL). The magazine annually recognizes organizations for the most technologically significant products introduced into the marketplace. SEQUIRE™, a commercially available well finding technology that locates potential carbon sequestration sites, was designated as one of the winners. SEQUIRE™ effectively locates abandoned and leaking oil and gas wells by using magnetic and methane sensors deployed on helicopters. The technology ultimately provides for the secure and successful storage of carbon dioxide (CO₂) that may otherwise be released back into the atmosphere. The CO₂ sequestration technology offers a promising solution to mitigating global warming. The other award recipients include Armstrong Process CP (Continuous Process) Ti (Titanium) and Ti Alloy Powder and Products, and MFIX (Multiphase Flow with Interphase eXchanges). The September issue

of R&D Magazine will feature the awards. July 9, 2007, http://www.netl.doe.gov/publications/press/2007/PrinterFriendlyHTML_1_108430_108430.html.

SEQUESTRATION IN THE NEWS

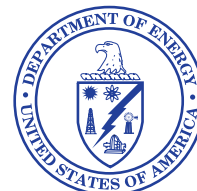
Gaylord Herald Times, "Carbon Dioxide Storage?"

The Midwest Regional Carbon Sequestration Partnership (MRCSP), one of the seven Regional Carbon Sequestration Partnerships funded by DOE, will conduct a public meeting to focus on the MRCSP's proposed geologic field demonstration in Otsego County, Michigan of sequestering 10,000 tons of CO₂. The purpose of the test is to determine the feasibility of sequestration in deep geologic formations, such as those in the Michigan basin. A natural gas processing plant owned by DTE Energy will supply the CO₂ for the pilot test. Although the Regional Partnership is awaiting final Environmental Protection Agency permitting, it hopes to begin injection sometime this summer. The public meeting, scheduled for July 18, will allow the public to learn more about carbon sequestration technology and provide them with details about the test. MRCSP plans to conduct two additional geologic field tests in the near future. To learn more about the MRCSP and to view the official notice and public meeting agenda, visit the partnership's website at: <http://198.87.0.58/Default.aspx>.

July 14, 2007, http://www.gaylordheraldtimes.com/articles/2007/07/15/news/top_stories/doc4697dd33a0f82872157458.prt.

The Seattle Times, "Power Plant Would Bury Greenhouse Gas."

Wallula Resource Recovery, a small Northwest company with financial backing from a division of Edison International, is proposing to build a coal-fired power plant using carbon capture and sequestration technology. At a cost of \$2.2 billion, the power plant would be located in the vicinity of Wallula, Washington near the banks of the Columbia River and would produce enough power to supply one third of Seattle's power needs. The plant would meet a new requirement under Washington State law that requires new coal-fired plants to sequester CO₂ emissions. In order to reduce its emissions output, the plant would capture CO₂ from the flue gas, convert it into a liquid, and then pump the CO₂ into basalt formations located



SEQUESTRATION IN THE NEWS (CONTINUED)

National Energy Technology Laboratory

626 Cochran's Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880

One West Third Street, Suite 1400
Tulsa, OK 74103-3519

1450 Queen Avenue SW
Albany, OR 97321-2198

2175 University Ave. South, Suite 201
Fairbanks, AK 99709

Sean I. Plasynski
412-386-4867
sean.plasynski@netl.doe.gov

Dawn M. Deel
304-286-4133
dawn.deel@netl.doe.gov

Visit the NETL website at:
www.netl.doe.gov

Customer Service:
1-800-553-7681

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.

underground near the proposed plant site. Emissions could be reduced by 65 percent using this sequestration technique. Scientists at DOE's Pacific Northwest National Laboratory (PNNL) are currently conducting tests to sequester CO₂ in basalt formations and plan to drill a test well near the proposed plant site. PNNL has been able to demonstrate the advantages of storing CO₂ in basalt formations through extensive laboratory testing. Results show that when injected into the porous rock, the CO₂ reacts with it to form calcium carbonate, which is a solid. If approved by the state, the company hopes to have the plant in operation by 2013. July 5, 2007, http://seattletimes.nwsource.com/cgi-bin/PrintStory.pl?document_id=2003775192&slug=power05m&date=20070705.

Greenwire, "Norwegian Refinery to Test CO₂-Capture Technology."

Alstom Power Systems has selected Statoil's chilled ammonia facility in Mongstad, Norway for testing their new carbon capture technology. The initial small-scale test will use the novel CO₂ technology to capture 80,000 tons of annual emissions generated by Statoil's cracker unit or from a combined-cycle heat and power plant that is under construction on the site. If successful, Statoil intends to conduct large-scale use of the chilled ammonia technology to capture more than 2 million tons of CO₂ annually at Mongstad. Preceding this announcement, Alstom reached an agreement with power and gas provider E.ON, to launch a 5-megawatt CO₂ capture demonstration plant at the Kalshamn Power Plant in southern Sweden. These projects follow two other projects announced by Alstom earlier this year that will take place at two US-operated coal-fired power plants. American Electric Power's Mountaineer Plant in West Virginia will be the location of the first test. The second test will take place at a plant in Oklahoma. June 22, 2007, <http://www.eenews.net/Greenwire/print/2007/06/22/13>.

The Guardian, "Energy Firms Seek One Billion British Pounds for Carbon Capture Projects."

Companies planning to utilize carbon capture and storage (CCS) in newly proposed facilities are pressuring the British government to move forward with plans to invest in the technology. E.ON, RWI, and British Gas parent, Centrica, are requesting more than \$610 million (£300 million) to build each of three state-of-the-art facilities. Power companies E.ON and RWE are both planning "supercritical" clean coal power plants utilizing CO₂ capture technology, and Centrica is planning to build an 800 megawatt, low emission coal-fired plant. Prime Minister Gordon Brown has talked about Britain's role in adopting CCS technologies to reduce emissions levels, and the country's recently released Energy White Paper describes the funding criteria for the projects. However, due to government funding delays, BP has opted to forego the construction of a hydrogen plant with CO₂ capture capabilities due to government delays for funding commitments. July 9, 2007, <http://environment.guardian.co.uk/energy/story/0,,2121951,00.html?gusrc=rss&feed=29>.

ANNOUNCEMENTS

Proceedings available for Sixth Annual Conference on Carbon Capture & Sequestration.

Individuals who were not able to attend the conference can purchase a user-friendly, searchable CD-ROM containing the presentations made by the key decision makers and the over 200 technical papers. The CD provides the latest updates on actions being taken and the status of RD&D from the leading organizations and experts on carbon capture, storage and sequestration. For order information, visit the conference website at: <http://www.carbonsq.com/index.htm>.

US – India Coal Working Group Meeting Scheduled.

On August 21-23, a workshop on pre-combustion coal cleaning is scheduled to be conducted in Ranchi, India. This meeting will foster the US and India's ongoing cooperative efforts to elevate energy security, reduce pollution and mitigate the growth of CO₂ emissions. The Coal Working Group is chaired by Thomas Shope, DOE's Acting Assistant Secretary for Fossil Energy and Dr. S.P. Seth, Additional Secretary of India's Ministry of Coal. One of the working group objectives is to encourage India's active participation in the Carbon Sequestration Leadership Forum. To learn more about the US – India Coal Working Group and the upcoming workshop, see: http://www.fossil.energy.gov/news/techlines/2007/07056-US-India_Coal_Meeting.html.

Read “Companies Judged for Global-Warming Awareness, Found Lacking.”

The excerpt appeared in the Wall Street Journal on June 19, 2007. Climate Counts, a nonprofit group, ranked 56 companies on their commitment to climate change based on carbon conscious criteria. The study's goal was to demonstrate that companies have a major impact on climate change. Only four companies scored a 70/100 or higher and no company exceeded 77. To read the full blog post, see: <http://blogs.wsj.com/energy/2007/06/19/companies-measured-for-global-warming-awareness-found-lacking/>.

7th Annual Workshop of Greenhouse Gas Emission Trading.

The International Energy Agency, the International Emissions Trading Association and the Electric Power Research Institute are hosting their international emissions trading workshop in Paris, on October 8-9, 2007. The workshop will provide an opportunity for government, business and NGO stakeholders in the emissions trading debate to discuss some of the key issues relating to international climate policy. Workshop attendance is by invitation only. For more information, go to: http://www.iea.org/Textbase/work/workshopdetail.asp?WS_ID=319.

SCIENCE

***Science Daily*, “Antarctic Icebergs: Hotspots of Ocean Life.”**

Researchers at the University of California in San Diego are studying the effects of global climate change on Antarctic ice shelves broken apart into thousands of icebergs by rising temperatures. They have found that the floating islands of ice have a major impact on the ecology of the ocean around them, with large numbers of seabirds above them and phytoplankton, krill, and fish present below the surface. As the icebergs melt, the terrestrial material which was trapped within them is dispersed out to a radius of more than two miles, producing a “halo effect.” Research results produced from extensive study of the icebergs suggests that they may influence global climate change by serving as a route for CO₂ drawdown and sequestration of particulate carbon as it sinks into the deep sea as a result of increased biological productivity. The new findings may have implications for global climate models that have, to date, considered only the variables of the melting Antarctic ice shelves and their contribution to rising sea levels and other climate change dynamics. June 22, 2007, <http://www.sciencedaily.com/releases/2007/06/070621140754.htm>.

POLICY

***San Francisco Chronicle*, “U.S. is Pressured to Help China Curb Emissions.”**

The United States is being urged to assist China in reducing emissions generated from the country's coal-fired power plants. With China overtaking the United States in CO₂ emissions, there is growing concern that China's emissions output will cancel out current and future global efforts to curb global warming. Recent data suggests that China's coal-fired power plants are releasing annual emissions quantities twice as great as the amount emitted by all of the world's industrialized economies combined. In 2006, China released 6.2 billion tons of CO₂ emissions, which is an increase of 8.4 percent from the prior year. Democratic representative Steve Israel of New York is proposing legislation to create a \$20 million program that would fund US research and development assistance with Chinese universities for low-emissions energy technology. Mr. Israel is urging US policymakers to seize this opportunity. The US-China Economic and Security Review Commission, a bipartisan congressional advisory panel, conducted hearings last month to discuss the issues facing the two nations and offer support for the



POLICY (CONTINUED)

formation of a US emergency program to assist China to reduce emissions from coal-fired power plants and improve their efficiency. The US currently spends approximately \$1 million per year in energy cooperation with China. July 5, 2007, <http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/07/05/MNG1QQR9R01.DTL&type=printable>.

Oilvoice Press Release, “Carbon on the Agenda in Oslo.”

On June 22, the International Energy Agency (IEA) and the Carbon Sequestration Leadership Forum (CSLF) conducted a workshop in Oslo, Norway for G8 summit participants to discuss CO₂ capture and sequestration opportunities. Statoil served as the seminar’s co-organizer. The goal of the seminar was to provide the attendees with national and international policy-making suggestions on the subject of carbon capture and storage, in addition to incentives, regulations and legislation that must be in place for the successful implementation of the technology. Possible considerations for the next G8 summit in 2008 were also discussed. To view the keynote speech presented at the IEA-CSLF Workshop for the G8, “Early Opportunities for Carbon Capture and Storage – Global Assessment,” see: http://www.iea.org/CSLF_Workshop.pdf. June 22, 2007, http://www.oilvoice.com/Carbon_on_the_Agenda_in_Oslo/9949.htm.

GEOLOGY

“Time-lapse carbon dioxide monitoring with pulsed neutron logging.”

Elevated levels of CO₂ in the atmosphere have been linked to the rise in land and sea temperature [Climate Change, 2001. In: Houghton, J.T., Ding, Y., Griggs, D.J., Noguer, M., van der Linden, P.J., Xiaosu, D. (Eds.), *The Scientific Basis Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*. Cambridge University Press, UK, p. 944]. To demonstrate geological [CO₂] sequestration as a mitigation technique, a carbon dioxide injection experiment was conducted in East Texas. The target – Frio formation – is a highly porous, permeable and unconsolidated sandstone. The specific interval is the Frio C [carbon] sand, which originally was saturated with saline formation water. At the injection location, the Frio C sand dips 18 [degrees] to the south. To monitor the injected CO₂ spreading in the formation, an old well from 1956 drilled into the deeper Yegua formation was selected as the observation well. The injection well was drilled at a distance of 100 [feet] downdip from the monitoring well. Several borehole measurement methods were available to monitor the CO₂ injection, but the most suitable technology was thought to be the pulsed neutron logging. This logging is used widely in cased hole, and the measured macroscopic thermal absorption cross-section (Σ) is sensitive to CO₂ saturation in high porosity saline water environments. Several log examples are given demonstrating successful the monitoring of the CO₂ plume moving through the two boreholes and the resulting saturation changes. **Nadja Müller, T.S. Ramakrishnan, Austin Boyd and Shinichi Sakruai**, *International Journal of Greenhouse Gas Control*, Published online June 18, 2007, doi:10.1016/S1750-5836(07)00071-0, <http://www.sciencedirect.com/science/article/B83WP-4P0N2C8-1/2/0e586e1881861b0383d03b849ca088c9>. (Subscription may be required.)

“Numerical simulation of multicomponent gas diffusion and flow in coals for CO₂ enhanced coalbed methane recovery.”

This paper presents an alternative model of multicomponent gas diffusion and flow in bulk coals, focusing on CH₄ [methane]–CO₂ counter-diffusion associated with CO₂-sequestration enhanced coalbed methane (CO₂-ECBM) recovery. The model was developed based on the bidisperse diffusion mechanism and the Maxwell–Stefan (MS) diffusion theory, which provides an improved simulation of multicomponent gas diffusion dynamics. The model was firstly validated under the condition of pure gas diffusion by comparing with the analytical solutions of a bidisperse diffusion model and the experimental data obtained from pure-gas sorption kinetic tests. Then it was numerically solved by considering CH₄–CO₂ COUNTER-diffusion and flow in a large coal sample to simulate a laboratory CO₂-injection core flush experiment. The simulation shows an excellent agreement with the CO₂ flush experiment. A quantitative description of the relationship between micropore diffusivity and concentration has been achieved, which is a deficiency in currently available CBM/ECBM models. The concentration-dependent diffusivities need to be taken into account in modeling the coalbed methane (CBM) recovery, in particular for simulation of ECBM

GEOLOGY (CONTINUED)

production from and CO₂ sequestration in coal seams. **X.R. Wei, G.X. Wang, P. Massarotto, S.D. Golding and V. Rudolph**, *Chemical Engineering Science*, Published online May 10, 2007, doi:10.1016/j.ces.2007.04.032, <http://www.sciencedirect.com/science/article/B6TFK-4NPG0FN-2/2/ce7a7b7fd5415a8ad48dcf9804e47617>. (Subscription may be required.)

“Numerical modeling of injection and mineral trapping of CO₂ with H₂S and SO₂ in a sandstone formation.”

Carbon dioxide (CO₂) injection into deep geologic formations could decrease the atmospheric accumulation of this gas from anthropogenic sources. Furthermore, by co-injecting H₂S [hydrogen sulfide] or SO₂ [sulfur dioxide], the products respectively of coal gasification or combustion, with captured CO₂, problems associated with surface disposal would be mitigated. [The authors] developed models that simulate the co-injection of H₂S or SO₂ with CO₂ into an arkose formation at a depth of about 2 [kilometers] and 75 [degrees Celsius]. The hydrogeology and mineralogy of the injected formation are typical of those encountered in Gulf Coast aquifers of the United States. Six numerical simulations of a simplified 1-D radial region surrounding the injection well were performed. The injection of CO₂ alone or co-injection with SO₂ or H₂S results in a concentrically zoned distribution of secondary minerals surrounding a leached and acidified region adjacent to the injection well. Co-injection of SO₂ with CO₂ results in a larger and more strongly acidified zone, and alteration differs substantially from that caused by the co-injection of H₂S or injection of CO₂ alone. Precipitation of carbonates occurs within a higher pH (pH > 5) peripheral zone. Significant quantities of CO₂ are sequestered by ankerite, dawsonite, and lesser siderite. The CO₂ mineral-trapping capacity of the formation can attain 40–50 kg/m³ [kilograms per cubic meter] medium for the selected arkose. In contrast, secondary sulfates precipitate at lower pH (pH < 5) within the acidified zone. Most of the injected SO₂ is transformed and immobilized through alunite precipitation with lesser amounts of anhydrite and minor quantities of pyrite. The dissolved CO₂ increases with time (enhanced solubility trapping). The mineral alteration induced by injection of CO₂ with either SO₂ or H₂S leads to corresponding changes in porosity. Significant increases in porosity occur in the acidified zones where mineral dissolution dominates. With co-injection of SO₂, the porosity increases from an initial 0.3 to 0.43 after 100 years. However, within the CO₂ mineral-trapping zone, the porosity decreases to about 0.28 for both cases, because of the addition of CO₂ mass as secondary carbonates to the rock matrix. Precipitation of sulfates at the acidification front causes porosity to decrease to 0.23. The limited information currently available on the mineralogy of naturally occurring high-pressure CO₂ reservoirs is generally consistent with [the authors’] simulations. **Tianfu Xu, John A. Apps, Karsten Pruess and Hajime Yamamoto**, *Chemical Geology*, Published online May 4, 2007, doi:10.1016/j.chemgeo.2007.03.022, <http://www.sciencedirect.com/science/article/B6V5Y-4NN0WDJ-2/2/5111183747c7e74b3f5133ed24a6dc29>. (Subscription may be required.)

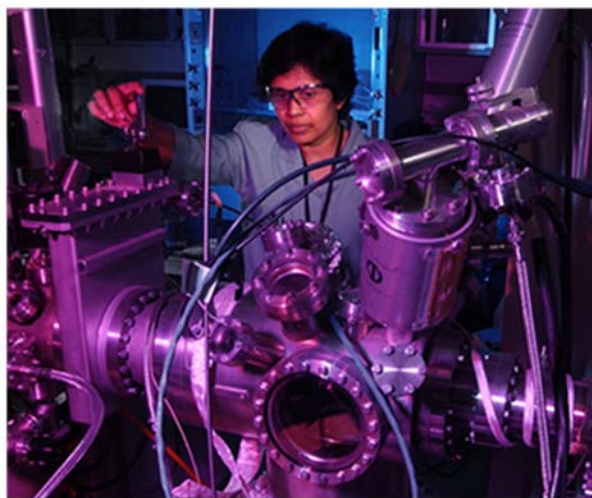
TECHNOLOGY

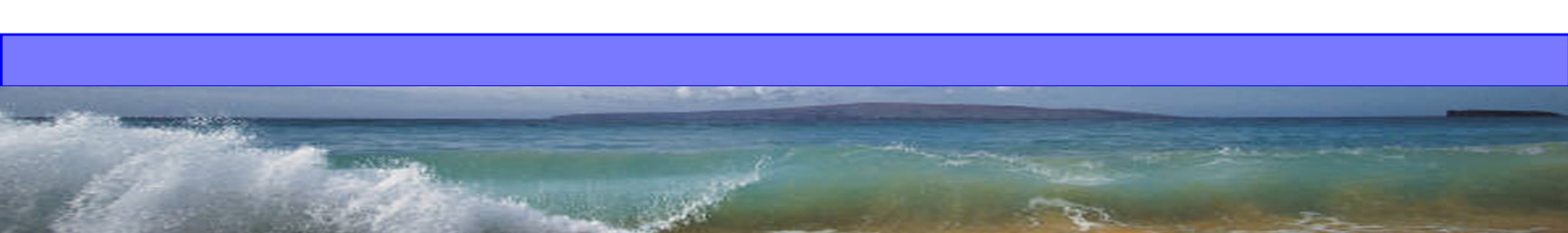
“CO₂ capture by adsorption with nitrogen enriched carbons.”

The success of CO₂ capture with solid sorbents is dependent on the development of a low cost sorbent with high CO₂ selectivity and adsorption capacity. Immobilised amines are expected to offer the benefits of liquid amines in the typical absorption process, with the added advantages that solids are easy to handle and that they do not give rise to corrosion problems. In this work, different alkylamines were evaluated as a potential source of basic sites for CO₂ capture, and a commercial activated carbon was used as a preliminary support in order to study the effect of the impregnation. The amine coating increased the basicity and nitrogen content of the carbon. However, it drastically reduced the microporous volume of the activated carbon, which is chiefly responsible for CO₂ physisorption, thus decreasing the capacity of raw carbon at room temperature. **M.G. Plaza, C. Pevida, A. Arenillas, F. Rubiera and J.J. Pis**, *Fuel*, Published online July 2, 2007, doi:10.1016/j.fuel.2007.06.001, <http://www.sciencedirect.com/science/article/B6V3B-4P3KYKW-1/2/8ae9e8eecebc889199c179357f27b505>. (Subscription may be required.)

“Novel Regenerable Sodium-Based Sorbents for CO₂ Capture at Warm Gas Temperatures.”

A novel sorbent consisting of NaOH/CaO [sodium hydroxide/calcium oxide] was developed for CO₂ capture at 315° C [degrees Celsius] suitable for high-temperature CO₂-capture applications, such as coal gasification systems. The sorbent is regenerable at 700° C, and steam does not affect the sorbent performance. A multicycle test conducted in the atmospheric reactor at 315° C indicated that the sorbent improved the performance with an increased number of cycles. The sorbent can also capture CO₂ at a wide range of temperatures from ambient to 500° C. However, the mechanism of CO₂ capture is different at ambient temperature. The sorbent is unique because it has a high CO₂-capture capacity of more than 3 mol/kg at 315° C and is regenerable at 700° C. **Ranjani V. Siriwardane, Clark Robinson, Ming Shen, and Tom Simonyi**, *Energy Fuels*, Published online June 9, 2007, doi: 10.1021/ef070008v, Link unavailable.





TERRESTRIAL/OCEAN

“Terrestrial carbon pools in southeast and south-central United States.”

Analyses of regional carbon sources and sinks are essential to assess the economical feasibility of various carbon sequestration technologies for mitigating atmospheric CO₂ accumulation and for preventing global warming. Such an inventory is a prerequisite for regional trading of CO₂ emissions. As a US Department of Energy Southeast Regional Carbon Sequestration Partner, [the authors] have estimated the state-level terrestrial carbon pools in the southeast and south-central US. This region includes: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. [The authors] have also projected the potential for terrestrial carbon sequestration in the region. Texas is the largest contributor (34 [percent]) to greenhouse gas emission in the region. The total terrestrial carbon storage (forest biomass and soils) in the southeast and south-central US is estimated to be 130 Tg C/year [teragrams carbon per year]. An annual forest carbon sink (estimated as 76 Tg C/year) could compensate for 13 [percent] of the regional total annual greenhouse gas emission (505 Tg C, 1990 estimate). Through proper policies and the best land management practices, 54 Tg C/year could be sequestered in soils. Thus, terrestrial sinks can capture 23 [percent] of the regional total greenhouse emission and hence are one of the most cost-effective options for mitigating greenhouse emission in the region. **Fengxiang X. Han, M. John Plodinec, Yi Su, David L. Monts and Zhongpei Li**, *Climatic Change*, Published online March 1, 2007, DOI: 10.1007/s10584-007-9244-5, <http://www.springerlink.com/content/j86t187ur3u6nt53>. (Subscription may be required.)

“A pilot-scale continuous-jet hydrate reactor.”

A three-phase, pilot-scale continuous-jet hydrate reactor (CJHR) has been developed for the production of gas hydrates. The reactor receives water and a hydrate-forming species to produce the solid gas hydrate. The CJHR has been tested for the production of CO₂ hydrate for the purpose of ocean carbon sequestration. Formation of CO₂ hydrate was investigated using various reactor/injector designs in a 72-l high-pressure vessel. Designs of the CJHR varied from single-capillary to multiple-capillary injectors that dispersed (1) liquid CO₂ into water or (2) water into liquid CO₂. The novel injector is designed to improve the dispersion of one reactant into the other and, thus, eliminate mass transfer barriers that negatively affect conversion. An additional goal was an increase in production rates of two orders of magnitude. The designed injectors were tested in both distilled and saline water. Hydrate production experiments were conducted at different CO₂ and water flow rates and for pressures and temperatures equivalent to intermediate ocean depths (1100–1700 [meters]). The pilot-scale reactor with the novel injection system successfully increased hydrate production rates and efficiency. **Phillip Szymcek, Scott D. McCallum, Patricia Taboada-Serrano and Costas**

Tsouris, *Chemical Engineering Journal*, Published online March 24, 2007, doi:10.1016/j.cej.2007.03.029, <http://www.sciencedirect.com/science/article/B6TFJ-4NB99NK-1/2/941654ab98c370806b7ab30e0d8511b1>. (Subscription may be required.)

TRADING

Carbon Market Update, July 13, 2007

CCX-CFI 2007 (\$/tCO ₂) \$3.35 (Vintage 2007)	EU ETS-EUA DEC 2007 (\$/tCO ₂) \$19.93 (Converted from € to US\$)
--	---

Bloomberg, “Asian Swamps Worth \$39 Billion in Emission Credits.”

Indonesia is seeking international assistance to help prevent the draining of tropical swamps, known as peatlands, which they develop for plantations by starting fires to clear the land. Indonesia releases approximately two billion metric tons of CO₂ per year through this practice. The request came at the global government-sponsored Convention on Biological Diversity in Paris, which was attended by twelve countries, including Indonesia, the Netherlands, Germany, Canada and Switzerland. By discontinuing the burning, the carbon could instead be stored, thus allowing Indonesia to generate emission credits worth \$39 billion (29 billion euros), using the United Nations estimate of 14.59 euros per ton. The money generated would be spent towards alternative projects that would not involve intrusion of the peatlands. July 6, 2007, <http://www.bloomberg.com/apps/news?pid=20601207&sid=azeZfyJQ8NIE&refer=energy>.

Toronto Star, “Air Canada Goes Green.”

Air Canada kicked off a voluntary carbon offsetting program to their customers. The program will allow travelers to offset the CO₂ produced during their flight at the completion of their online ticket purchase. The company’s website will provide patrons with an online carbon calculator to determine how much CO₂ the trip will generate and the price to offset the emissions. Money generated from the program will be designated to a project aimed at reducing greenhouse gases, such as planting a tree. Zerofootprint is the nonprofit organization in charge of managing Air Canada’s program. An Air Canada passenger would pay \$19.20 to offset the CO₂ produced to fly from Toronto to London, for example. July 2, 2007, <http://www.thestar.com/printArticle/231461>.

RECENT PUBLICATIONS

“Legal Aspects of Storing CO₂.”

In 2004, the International Energy Agency (IEA) Working Party on Fossil Fuel jointly organized a workshop with the Carbon Sequestration Leadership Forum (CSLF) on the legal aspects of CO₂ storage. This workshop, held in Paris, was the first international event to systematically examine the legal issues affecting the storage of CO₂ as a greenhouse gas (GHG) mitigation strategy. The workshop concluded by highlighting the urgent need for appropriate regulatory and legal frameworks to facilitate the successful uptake of CO₂ storage, with a particular emphasis on the need to facilitate large-scale demonstration projects. The subsequent IEA publication, “Legal Aspects of Storing CO₂” (IEA, 2005), provided an overview of the main legal and regulatory issues. The publication noted five important areas that merited further work and analysis. The five areas were: (1) increase the number of CO₂ storage demonstration projects; (2) governments should ensure that there is an appropriate national legal and regulatory framework for storage demonstration projects; (3) Contracting parties to international instruments should take a proactive approach to clarifying the legal status of carbon storage in the marine environment protection instruments; (4) governments should create a level-playing field for CO₂ storage with other climate change mitigation technologies; and (5) increase public awareness and work on gaining public acceptance of CO₂ storage. In October 2006, the IEA and the CSLF revisited these themes at a follow-on workshop, the 2nd IEA Workshop on “Legal Aspects for Storing CO₂” in Paris, France. The second workshop explored the five issue areas in greater detail, asking whether these five areas merited further international attention. Workshop participants also examined additional gaps and barriers to the deployment of CO₂ capture, and identified recommendations to guide further development of appropriate legal and regulatory frameworks. This publication summarizes the discussions and developments related to the IEA/CSLF October 2006 workshop, and reorganizes issue areas to reflect changed priorities. It also includes recommendations for priorities for future work in this critical area. Each chapter is designed to provide an overview of key legal aspects of CO₂ storage, and includes relevant case studies where appropriate. Published by the International Energy Agency, ISBN 978-92-64-03408-2, Copyright 2007, Link unavailable.

“Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California, Recommendations of the Market Advisory Committee to the California Air Resources Board – Final Report.”

The California Global Warming Solutions Act of 2006 (Act) requires the State of California to dramatically reduce greenhouse gas emissions by 2020. Specifically, this forward-looking statute charges the California Air Resources Board with responsibility for overseeing the development and implementation of a plan that will reduce California’s aggregate greenhouse gas emissions to 1990 levels by 2020. This challenging emissions reduction target will need to be achieved during a period of significant population growth and continued expansion of the state’s economy. Successfully implementing the Act’s requirements will again signal California’s leadership in environmental protection and demonstrate that meaningful steps to address climate change are compatible with promoting balanced and sustainable economic growth and development. In support of the Act, Governor Arnold Schwarzenegger directed the Secretary for Environmental Protection to create a Market Advisory Committee (Committee) to advise the Air Resources Board regarding the development of a greenhouse gas-reduction plan for California. The Committee is composed of national and international experts who have backgrounds in economics, environmental policy, regulatory affairs, and energy technologies. The Act recognizes that a market-based system can be used in conjunction with regulatory and other strategies to meet an economy-wide emissions reduction target. Therefore, the Secretary for Environmental Protection charged the Market Advisory Committee with providing recommendations to the Air Resources Board regarding the design of an appropriate cap-and-trade program for reducing the state’s greenhouse gas emissions. The objective of the Committee was to design a cap-and-trade program to achieve cost-effective emissions reductions within and across all sectors of the State’s economy. To achieve this objective, the Committee used a systems approach, one that considers connections among all sectors of the economy and that examines how a cap-and-trade program interacts with existing and proposed emission reduction measures including regulations, performance-based standards, price subsidies, tax credits, and other technology promoting initiatives. The Committee concluded that a well-designed cap-and-trade program is fully compatible with and complementary to these other regulatory programs and could contribute significantly to achieving the goals of the Act. To read the Market Advisory Committee’s final report dated June 30, 2007, click on: http://www.climatechange.ca.gov/documents/2007-06-29_MAC_FINAL_REPORT.PDF.

LEGISLATIVE ACTIVITY

Bloomberg, “Bill Would Cut Greenhouse Gas Emissions Twenty Percent by 2030.”

On July 11, Senators Jeff Bingaman (D-NM) and Arlen Specter (R-PA) unveiled an industry-backed climate change bill that would impose mandatory limits on US CO₂ emissions. The bill calls for emission levels to be cut by 20 percent by 2030 through a cap-and-trade system requiring industry to reduce emissions or buy credits if they exceed their quotas. If the legislation moves forward, industries affected by the regulations would begin the cap-and-trade system in 2012, with an allotment of 53 percent of their emissions allowances. Industries who fail to reduce their pollution levels would be required to purchase additional allowances in the market. To secure industry support, the bill sets limits for tradable allowances at \$12 per ton of CO₂, although the price would increase by five percent per year plus the cost of inflation. Although President Bush has called for voluntary reductions in emissions, he stipulates that any greenhouse gas trading scheme must include China and other Asian economies before becoming mandatory in the US. July 11, 2007, <http://www.bloomberg.com/apps/news?pid=20601070&sid=a5qSZkX.S2kQ&refer=home>.

US House of Representatives Committee on Science and Technology Press Release, “Energy and Climate Change R&D Measures Clear Committee, Contribute to House Energy Package.”

On June 27, four bills were passed by the House Committee on Science and Technology, including H.R. 1933, the Department of Energy Carbon Capture and Storage Research, Development and Demonstration Act of 2007. The bill is designed to enhance the country’s knowledge and use of carbon capture and sequestration. The primary sponsor of the legislation is Mark Udall (D-CO). H.R. 1933 reauthorizes DOE-funded research and development programs, and specifically funds demonstration of carbon sequestration field test projects currently underway by the seven Regional Carbon Sequestration Partnerships. Other bills passed by the full Committee include: H.R. 906, the Global Change Research and Data Management Act; H.R. 2773, the Biofuels Research and Development Enhancement Act; and H.R. 2774, the Solar Energy Research and Advancement Act of 2007. To read H.R. 1933 reported (as amended) by the full Committee on June 27, 2007, click on: http://democrats.science.house.gov/Media/File/Commdocs/markups/full/27jun/1933_adopted_amnds.pdf. June 27, 2007, <http://science.house.gov/press/PRArticle.aspx?NewsID=1908>.

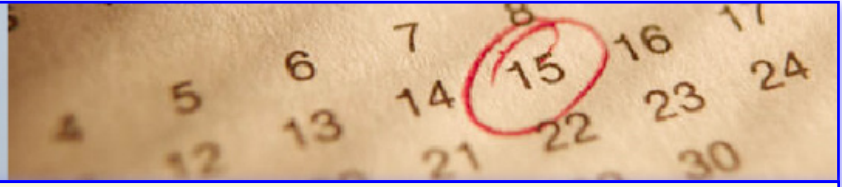
Newsday, “NJ Enacts Long-Reaching Anti-Global Warming Law” and Assembly Democrats News Release, ““Global Warming Response Act’ Signed Into Law.”

On July 6, New Jersey Governor Jon S. Corzine signed the “Global Warming Response Act” into law, an initiative that places the state at the forefront in US efforts to combat global warming. The law sets forth strict emissions standards for New Jersey, requiring a reduction in greenhouse gas (GHG) emission levels to 1990 levels by the year 2020. By 2050, the law calls for emission levels not to exceed 80 percent of levels present in 2006, an objective that makes New Jersey the first state to set a global warming target so far into the future. Additionally, the mandate makes the state the first to require that energy imports adhere to New Jersey’s standards. The New Jersey Department of Environmental Protection (DEP) will play an integral part in the state’s efforts to reach the goals set forth in the new law. In the first year, the DEP will conduct an emissions inventory which will identify GHG emission levels from 1990, 2006, and the present. The new law mirrors an executive order signed by the governor in January. By 2009, the DEP will establish a GHG emissions monitoring and reporting program and will set standards for industry. By June 30, 2008, the DEP will report its recommendations to reach 1990 levels by 2020. The 2050 milestone recommendations will be described in a second report expected no later than June 30, 2010. The DEP will be required to inventory and establish industry emission caps for six greenhouse gases, including CO₂, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons (HFCs), and polyfluorochemicals (PFCs). Former Vice-President Al Gore was present at the signing of the law, which took place at Giant’s Stadium on the eve of the “Live Earth” concert aimed at raising awareness of global warming. New Jersey joins California



and Hawaii in adopting the anti-global warming law and eight other states are considering similar actions. July 6, 2007, <http://www.newsday.com/news/local/wire/newjersey/ny-bc-nj--globalwarming-nj0706jul06,0,7721814.print.story?coll=ny-region-apnewjersey>, and July 6, 2007, <http://www.politicsnj.com/assembly-democrats-globalwarming-response-act-signed-law-10157>.





EVENTS

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 10-12, 2007, **The 8th European Gasification Conference**, *Hilton Antwerp Hotel, Antwerp, Belgium*. This conference provides the ideal platform for those with an interest in this versatile technology to update their knowledge and pursue business opportunities. For more information, go to: <http://www.icheme.org/gasification2007/index.htm>.

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.

September 18-20, 2007, **Carbon Finance World 2007**, *The University of Chicago Gleacher Center, Chicago, Illinois*. This conference has been developed to examine the emerging opportunities in this new global market. This event will provide attendees with countless business development and networking opportunities, real investment prospects and an action plan for profitable growth. To find out more about this conference opportunity, go to: http://www.terrapiinn.com/2007/carbon/Custom_14373.stm.

September 24-25, 2007, **European Clean Coal Conference: Optimizing the Energy Mix**, *The Westin Grand Hotel Berlin, Berlin, Germany*. The cost advantage of coal with CO₂ sequestration against natural gas is increasingly highlighting this fossil fuel as a key means of securing Europe's energy supply. This conference will highlight how the right mix of research, investment, and market incentives will stake a place for clean coal in a sustainable and secure energy future and how to optimize an energy portfolio in this rapidly evolving market place. For more information about this event, please see: <http://www.platts.com/Events/pc775/index.xml>.



EVENTS (CONTINUED)

October 2-5, 2007, **Greenhouse 2007**, *The Hilton, Sydney, Australia*. The conference will focus on projections for the future, the use of probabilities for risk management, the impact climate change will have on human activity, and changing perceptions of climate change. There will be many examples of industry and government approaches to tackling climate change, as well as presentations on the latest Australian and international science findings. This high-profile, prestigious international event is designed for representatives from industry, research organizations, government and the community. Links to the conference program, registration and accommodation information, and other useful links can be found at: <http://www.greenhouse2007.com/>.

October 4-5, 2007, **2nd International Symposium on Capture and Geological Storage of CO₂**, *Hôtel Le Méridien Étoile, Paris, France*. In order to reconcile the use of fossil fuels with the need to control the emissions responsible for global warming, CO₂ capture and storage represents a highly promising avenue, with much at stake, in both economic and industrial terms. This event follows the success of the first international symposium on emission reduction and CO₂ capture and geological storage held in Paris in 2005. In particular, the event will be an opportunity to present feedback from a number of pilot projects being conducted around the world. To view complete conference information, click on: http://www.co2symposium.com/IFP/en/CO2site/colloque_va.htm.

October 16-17, 2007, **The 4th Trondheim Conference on CO₂ Capture, Transport and Storage**, *Nova Conference Center, Trondheim, Norway*. This international event focuses on research and development regarding CO₂ capture, transport and storage. The conference series has grown to become the key scientific CO₂ technologies conference in Norway, with all the major R&D institutions, oil and gas industry, Gassnova and the Research Council of Norway involved. To access the event website, go to: http://www.energy.sintef.no/arr/CO2_2007/index.asp.

FOR SUBSCRIPTION DETAILS...

Please visit <http://listserv.netl.doe.gov/mailman/listinfo/sequestration>, enter your email address, and create a password to receive the newsletter at no cost, both as text and in pdf format. (If you prefer not to receive the pdf file in your email, choose “yes” for the daily digest option. Otherwise leave the default value at “no.”) To view the archive of newsletters, see: http://www.netl.doe.gov/publications/carbon_seq/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.

[HTTP://WWW.NETL.DOE.GOV/PUBLICATIONS/CARBONSEQ/SUBSCRIBE.HTMLTML](http://www.netl.doe.gov/publications/carbonseq/subscribe.html)

