

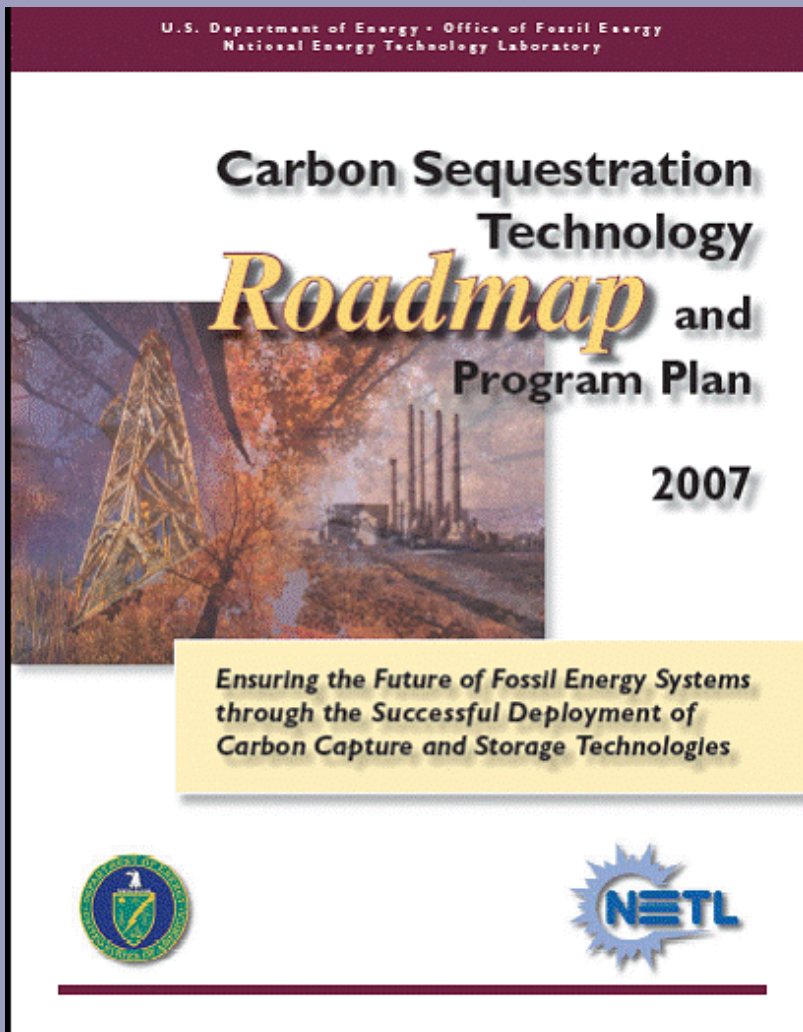
THE CARBON SEQUESTRATION NEWSLETTER

http://www.netl.doe.gov/publications/carbon_seq/subscribe.html

June 2007

- Sequestration in the News
- Science
- Policy
- Geology
- Technology
- Terrestrial/Ocean
- Trading
- Recent Publications
- Legislative Activity
- Events & Announcements
- Contact Information

HIGHLIGHTS



NETL News Release, "DOE Releases 2007 Carbon Sequestration Technology Roadmap, Marks Tenth Year of Carbon Sequestration Program." On May 10, the US Department of Energy's (DOE) Carbon Sequestration Program announced the release of "The 2007 Carbon Sequestration Technology Roadmap and Program Plan." The roadmap contains a carbon sequestration program overview with highlights and accomplishments to date, a section describing the challenges facing the program, and an extensive description of the program portfolio of technologies. The Carbon Sequestration Program is managed by DOE's National Energy Technology Laboratory (NETL) and has been very successful in researching, developing, and deploying technologies for the advancement of carbon sequestration technologies. The capture and storage of carbon dioxide (CO₂) and other greenhouse gases is the focus of the program, whose overall goal is to develop fossil fuel conversion systems by 2012 that achieve 90 percent CO₂ capture with 99 percent storage permanence at less than a 10 percent increase in the cost of energy services. To download the 2007 Carbon Sequestration Roadmap from the NETL website, go to: http://www.netl.doe.gov/publications/carbon_seq/project%20portfolio/2007/2007Roadmap.pdf. May 10, 2007, http://www.netl.doe.gov/publications/press/2007/PrintFriendlyHTML_1_104305_104305.html.

Highlights (continued)

Fossil Energy Techline, “DOE, EPA Launch Coordinated Carbon Sequestration Project.” As part of DOE’s Carbon Sequestration Program, researchers from DOE and the US Environmental Protection Agency (EPA) are collaborating on a joint carbon sequestration research project. DOE will fund Lawrence Berkeley National Laboratory (LBNL) to examine the potential impact that carbon sequestration will have on groundwater resources, ensuring that the US drinking water supply will not be adversely affected. In general, DOE will focus on large-scale injection of CO₂ into deep saline formations and the potential for water displacement into shallow groundwater systems, and the EPA will concentrate on the migration of CO₂ and its possible impact on underground sources of drinking water. To date, LBNL has completed simulation modeling and initiated a literature review on the effects of water displacement and pressure buildup in various geologic formation parameters. Findings from the three-year long project will assist DOE’s Regional Carbon Sequestration Partnership Program by identifying potential areas of concern in each of the seven partnerships’ regions of the country. It will also contribute to meeting the goals set forth in the President’s Global Climate Change Initiative. May 1, 2007, http://www.fossil.energy.gov/news/techlines/2007/PrintVersion_1_29071_29071.html?print.

Sequestration in the News

Fossil Energy Techline, “Carbon Sequestration Field Test Begins in Illinois Basin.” The Midwest Geological Sequestration Consortium (MGSC), one of DOE’s seven Regional Partnerships, initiated its first validation phase field test, an enhanced oil recovery project in the Loudon Field in Illinois. Also known as the “huff-n-puff” project, the test will evaluate the potential for geologic sequestration of CO₂ in mature oil reservoirs in the Illinois Basin, an area underlying most of Illinois, western Indiana, and western Kentucky and covering 60,000 square miles. During the testing process CO₂ gas is injected into a producing well (the “huff” phase) and allowed to penetrate the formation. The well is then placed back on production (the “puff” phase) after a short waiting period. Benefits of this test include a potential to recover oil that otherwise would remain in the reservoirs, as well as proving the safety and effectiveness of geologic sequestration of CO₂ to

reduce greenhouse gas emissions. For more information about the MGSC, visit their website at: <http://www.sequestration.org/>. May 15, 2007, http://www.fossil.energy.gov/news/techlines/2007/PrintVersion_1_29149_29149.html?print.

Fossil Energy Techline, “Regional Partnership Completes 8,000-foot Well for Critical Carbon Sequestration Assessment.” On April 24, DOE announced that the Midwest Regional Carbon Sequestration Partnership (MRCSP) completed drilling of an 8,000-foot carbon sequestration test well at FirstEnergy’s R. E. Burger Plant near Shadyside, Ohio. Researchers will use the well in order to determine the geology of the rock strata at the test site, thus determining whether the location is suitable for safe and permanent storage of CO₂. MRCSP is working to assess the potential for geologic sequestration of CO₂ in depleting oil and gas wells, unmineable coal seams, and deep saline and other geologic formations in the Appalachian Basin. This field test, sponsored by DOE’s National Energy Technology Laboratory, is the first of three similar tests that will be conducted by the MRCSP to determine the best sequestration options in the partnership’s seven-state region of Indiana, Kentucky, Maryland, Michigan, Ohio, Pennsylvania, and West Virginia. If test results obtained from the Burger



plant are approved by Ohio regulators, the next step of testing will involve injecting a small amount of CO₂ into the well, permanently storing it into an underlying saline formation. Powerspan Corporation will conduct a pilot demonstration of a CO₂ capture technology at the Burger plant, anticipating the use of the captured CO₂ for the injection phase of the test. MRCSP anticipates conducting large-scale geologic storage of CO₂ upon completion of the small-scale test at this site. Similar projects are

Announcements

The Department of Energy's Carbon Sequestration Program Releases "2007 Carbon Sequestration Technology Roadmap and Program Plan." This year's annual update to the Carbon Sequestration Program roadmap provides a detailed analysis of the program's ten year history and the plan that will guide the program in the years to come. (See **Highlights** section of this newsletter for the article **"DOE Releases 2007 Carbon Sequestration Technology Roadmap, Marks Tenth Year of Carbon Sequestration Program"** and the **Publications** section for more information regarding the document. NETL has made the Roadmap available online at: http://www.netl.doe.gov/publications/carbon_seq/project%20portfolio/2007/2007Roadmap.pdf.

Read **"Why Put CO₂ in the Air When You Can Bury It?"** an article about the Recently Held **Sixth Annual Conference on Carbon Capture and Storage**. This article appeared in the Environment section of the Pittsburgh Post Gazette following the conference and describes briefly how carbon sequestration can be used to mitigate carbon dioxide and other greenhouse gas emissions. The article also includes comments from some of the conference keynote and other featured speakers. To read the article in its entirety, go to: <http://www.post-gazette.com/pg/07133/785696-113.stm>.

The United States Climate Action Partnership (USCAP) Announces Fourteen New Members on May 8. New members include American International Group (AIG), Alcan, Boston Scientific, ConocoPhillips, Deere & Company, The Dow Chemical Company, General Motors Corporation, Johnson & Johnson, Marsh, PepsiCo, Shell, and Siemens, along with the Nature Conservancy and the National Wildlife Federation. The USCAP objective calls for the federal government to enact mandatory legislation for the reduction of greenhouse gas emissions. The coalition is made up of nongovernmental businesses and environmental organizations with a collective workforce exceeding 2 million people. To read the USCAP press release of the announcement, go to: <http://www.pewclimate.org/docUploads/USCAP%205%2E8%2E07%20Release%2Epdf>.

currently being conducted across the country by the other Regional Sequestration Partnerships, formed as part of DOE's Carbon Sequestration Program in 1992. April 24, 2007, <http://www.fossil.energy.gov/news/techlines/2007/07025-SequestrationWellCompleted.html>.

Fossil Energy Techline, "Petroleum Geologists Recognize DOE for Environmental Stewardship." The American Association of Petroleum Geologist's (AAPG) Division of Environmental Geosciences presented a prestigious award to DOE, recognizing them for their accomplishments in advancing carbon sequestration technology through research and funding efforts. Specific acknowledgement was given to DOE's Regional Carbon Sequestration Partnerships Program. The AAPG Corporate Award for Excellence in Environmental Stewardship Award was accepted at the AAPG Annual Convention in Long Beach, California by John Litynski, Regional Carbon Sequestration Program Coordinator at DOE's National Energy Technology Laboratory. DOE has made significant progress, especially in geologic sequestration, through the Regional Carbon Sequestration Partnerships Program, started in

2002 to research and develop ways to capture and permanently store CO₂, a greenhouse gas. To date, the Regional Partnerships have completed the characterization phase of their work by evaluating and identifying sequestration opportunities in various regions of the country. They will now initiate field tests for the injection of carbon dioxide at various sites that have been selected as potential storage locations for the geologic storage of CO₂. April 26, 2007, <http://www.fossil.energy.gov/news/techlines/2007/07026-DOEEarnsEnvironmentalAward.html>.

Science

The New York Times, "Climate Panel Reaches Consensus on the Need to Reduce Harmful Emissions." On May 4, the Working Group III contribution to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report was released in Bangkok. While the preceding report released by the Working Group II in April 2007 concluded that CO₂ emissions are causing apparent and measurable changes in weather patterns, this report described a number of actions that will need to be taken in the near future. The report describes how



individuals, industry, and governments can slow and eventually reverse greenhouse gas (GHG) levels by implementing current and emerging technologies and adopting more aggressive climate change policies. The report underscores the need for immediate action, as GHG emission levels have risen 70 percent since 1970, and claims that inactivity by individuals and countries will only worsen the problem. The report states that countries will need to adhere to emissions targets described in the Kyoto Protocol, either by the implementation of fuel taxes, or by pursuing alternative energy sources. Although the cost to the global economy is not clear, agreement exists that inactivity is no longer a viable option, given the current situation. It is expected that findings from the three IPCC reports released to date will be discussed at the June Group of Eight Summit and at talks to be held in Bali, Indonesia concerning post-Kyoto emissions restrictions. May 4, 2007, <http://www.nytimes.com/2007/05/04/science/04climate.html?ref=environment&pagewanted=print>. (Subscription required.) (See “Working Group III Contribution to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, “Mitigation of Climate Change” in the Recent Publications Section of this newsletter for a link to the report.)

International Herald Tribune, “Recruiting Plankton to Fight Global Warming.” A California-based company has started a commercial project involving the massive growth of plankton to absorb CO₂ and then sequester it into the ocean floor. Russ George, chief executive of Planktos, the company pursuing the project, sees profitability in commercializing the science behind this global warming solution. The process is analogous to the terrestrial sequestration solution of planting trees to offset CO₂, in that both processes involve accelerating the absorption of CO₂ from the atmosphere. The

commercial project is expected to start in May 2007 and will involve scattering large quantities of iron into the ocean over an area equivalent to 2.47 million acres of land. The project acquired its name “WeatherBird II” from the 115-foot research vessel that will be used to transport and dissolve the iron in the Galapagos and South Pacific. Planktos hopes to bring in \$5 a ton for capturing the CO₂, an amount that would make the venture a profitable one. The company is confident that the price of carbon offsets will rise as limits set by the Kyoto Protocol approach their deadline. Controversy over the iron fertilization solution has been raised because some scientists have expressed doubts as to whether long-term absorption of CO₂ from the atmosphere will occur with the process. Also, some feel that an increase in greenhouse gases may actually result by creating plankton blooms, as methane and nitrous oxide could be released into the atmosphere. A conference has been scheduled for the fall to discuss whether iron fertilization is a valid carbon sequestration option. April 30, 2007, <http://www.iht.com/articles/2007/04/30/business/0430plankton.php>.

Policy

News Blaze, “U.S. Energy Agency Leads Effort to Cut Carbon Dioxide Emissions.” On May 7 and May 10, the Carbon Sequestration Leadership Forum (CSLF) conducted a “Capacity Building in Emerging Economies Workshop,” held in conjunction with the Sixth Annual Conference on Carbon Capture and Sequestration (CCS) in Pittsburgh, Pennsylvania. Fifty-five delegates from the six emerging nation countries, including Brazil, China, Columbia, India, Mexico, and South Africa, attended the workshop. Discussions focused on international efforts in developing improved cost-effective technologies related to the separation, capture, transport, and long-term storage of CO₂. International delegates presented concerns they face in advancing CCS development and deployment in their countries, citing that technology transfer will play a major role in building CCS capacity. The delegates also discussed the importance of implementation, regulatory aspects, environmental issues, and public perception in building capacity for CCS. The CSLF workshop concluded with a visit to NETL in Pittsburgh. More information about this recent CSLF workshop is available at the organization’s web site: <http://www.cslforum.org/may072007.htm>, which includes links to download the complete agenda, introductory remarks, and presentations. May 12, 2007, <http://newsblaze.com/story/20070512073935leon.nb/newsblaze/TOPSTORY/Top-Stories.html>.

The Australian, "On Track to Meet Kyoto Targets."

Australian Environmental Minister Malcolm Turnbull announced that the country is on track to meet their commitment under the Kyoto Protocol. The Australian Greenhouse Office compiled the data which shows that CO₂ emission levels decreased slightly between 2004 and 2005 from 564 million metric tons to 559 million metric tons (102 percent of 1990 levels). More significant is the fact that the country's economy has grown 61 percent while sustaining growth in greenhouse gas emissions to only two percentage points above 1990 levels. At this pace, predictions indicate that the country will be able to meet its Kyoto targets to within one percentage point for 2008 through 2012, the dates established under the agreement. Although Australia has not ratified the Kyoto Protocol, the country has voluntarily tried to keep to its commitments. May 2, 2007, Link unavailable.

"A synopsis of land use, land-use change and forestry (LULUCF) under the Kyoto Protocol and Marrakech Accords."

The complexities inherent in land use, land-use change and forestry (LULUCF) activities have led to contentious and prolonged debates about the merits of their inclusion in the 2008–2012 first commitment period of the Kyoto Protocol. Yet the inclusion of these activities played a key role in agreement on the general framework of the Kyoto Protocol, and LULUCF will likely continue to play a substantial part in negotiations on national commitments post-2012. The Marrakech Accords dictate which LULUCF activities are to be included under the Kyoto Protocol and provide rules on

how they are to be accounted in the first commitment period. However, these rules have limitations and drawbacks that may be avoided in the structure of future commitments beyond 2012. Through adherence to the objectives of the United Nations Framework Convention on Climate Change (UNFCCC), and the incorporation of several critical features, a future framework can more effectively address the mitigation challenges and opportunities of this sector.

B. Schlamadinger, N. Bird, T. Johns, S. Brown, J. Canadell, L. Ciccarese, M. Dutschke, J. Fiedler, A. Fischlin, P. Fearnside, C. Forner, A. Freibauer, P. Frumhoff, N. Hoehne, M.U.F. Kirschbaum, A. Labat, G. Marland, A. Michaelowa, L. Montanarella, P. Moutinho, D. Murdiyarso, N. Pena, K. Pingoud, Z. Rakonczay, E. Rametsteiner, J. Rock, M.J. Sanz, U.A. Schneider, A. Shvidenko, M. Skutsch, P. Smith, Z. Somogyi, E. Trines, M. Ward and Y. Yamagata, *Environmental Science and Policy*, Published online March 26, 2007, [doi:10.1016/j.envsci.2006.11.002](https://doi.org/10.1016/j.envsci.2006.11.002), <http://www.sciencedirect.com/science/article/B6VP6-4NBR47S-2/2/50d2307857e7d9307e7cbd1ff74368a8#FCANote>. (Subscription may be required.)

Geology

"Coupling of geochemical reactions and convective mixing in the long-term geological storage of carbon dioxide." The effect of coupling of geochemical reactions with convective mixing of dissolved carbon dioxide during geological storage is investigated by both analytical and numerical techniques. In the limit of fast reactions, scaling arguments and stability analysis show that the time for the onset of convection could be increased by up to an order of magnitude due to consumption of the dissolved CO₂ in mineralization. Numerical simulations are then used to investigate the effect of general reaction rates in two contrasting mineralogies, including overall dissolution and the distribution of ion and mineral concentrations. **Jonathan Ennis-King and Lincoln Paterson**, *International Journal of Greenhouse Gas Control*, Published online March 26, 2007, [doi:10.1016/S1750-5836\(07\)00034-5](https://doi.org/10.1016/S1750-5836(07)00034-5), <http://www.sciencedirect.com/science/article/B83WP-4NBR48X-1/2/74b4cb407c2a187ceaa90b29ade7b7f3>. (Subscription may be required.)





“Evaluating geological sequestration of CO₂ in bituminous coals: The southern Sydney Basin, Australia as a natural analogue.” Carbon dioxide contents of coals in the Sydney Basin vary both aeri-ally and stratigraphically. In places, the coal seam gas is almost pure CO₂ that was introduced from deep magmatic sources via faults and replaced pre-existing CH₄ [methane]. In some respects this process is analogous to sequestration of anthropogenic CO₂. Laboratory studies indicate that CO₂:CH₄ storage capacity ratios for Sydney Basin coals are up to ≈ 2 and gas diffusivity is greater for CO₂ by a factor of up to 1.5. Present-day distribution of CO₂ in the coals is controlled by geological structure, depth and a combination of hydrostatic and capillary pressures. Under present-day P - T conditions, most of the CO₂ occurs in solution at depths greater than about 650 meters; at shallower depths, larger volumes of CO₂ occur in gaseous form and as adsorbed molecules in the coal due to rapidly decreasing CO₂ solubility. The CO₂ has apparently migrated up to structural highs and is concentrated in anticlines and in up-dip sections of monoclines and sealing faults. CO₂ sequestered in coal measure sequences similar to those of the Sydney Basin may behave in a similar way and, in the long term, equilibrate according to the prevailing P - T conditions. In situ CO₂ contents of Sydney Basin coals range up to 20 m³/t [cubic meters per ton]. Comparisons of adsorption isotherm data measured on ground coal particles with

in situ gas contents of Sydney Basin coals indicate that the volumes of CO₂ stored do not exceed ≈ 60 [percent] of the total CO₂ storage capacity. Therefore, the maximum CO₂ saturation that may be achieved during sequestration in analogous coals is likely to be considerably lower than the theoretical values indicated by adsorption isotherms. **M.M. Faiz, A. Saghafi, S.A. Barclay, L. Stalker, N.R. Sherwood, D.J. Whitford and Commonwealth Scientific and Industrial Research Organisation (CSIRO) Energy Transformed Flagship**, *International Journal of Greenhouse Gas Control*, Available online March 28, 2007, [doi:10.1016/S1750-5836\(07\)00026-6](https://doi.org/10.1016/S1750-5836(07)00026-6), <http://www.sciencedirect.com/science/article/B83WP-4NC5VCG-1/2/588443b7a8c6883f0ad06e51b8ca614d>. (Subscription may be required.)

Technology

“A novel process integration, optimization and design approach for large-scale implementation of oxy-fired coal power plants with CO₂ capture.” The widespread use of fossil fuels within the current energy infrastructure is considered as the largest source of anthropogenic emissions of carbon dioxide [CO₂], which is largely blamed for global warming and climate change. At the current state of development, the risks and costs of non-fossil energy alternatives, such as nuclear, biomass, solar, and wind energy, are so high that they cannot replace the entire share of fossil fuels in the near future timeframe. Additionally, any rapid change towards non-fossil energy sources, even if possible, would result in large disruptions to the existing energy supply infrastructure. As an alternative, the existing and new fossil fuel-based plants can be modified or designed to be either “capture” or “capture-ready” plants in order to reduce their emission intensity through the capture and permanent storage of carbon dioxide in geological formations. This would give the coal-fired power generation units the option to sustain their operations for longer time, while meeting the stringent environmental regulations on air pollutants and carbon emissions in years to come. Currently, there are three main approaches to capturing CO₂ from the combustion of fossil fuels, namely, pre-combustion capture, post-combustion capture, and oxy-fuel combustion. Among these technology options, oxy-fuel combustion provides an elegant approach to CO₂ capture. In this approach, by replacing air with oxygen in the combustion process, a CO₂-rich flue gas stream is produced that can be readily compressed for pipeline transport and storage. In this paper, [the authors] propose a new approach that allows air to be partially used in the oxy-fired coal power plants. In this novel approach, the air can be used to carry the coal from the mills to the boiler

(similar to the conventional air-fired coal power plants), while O₂ is added to the secondary recycle flow as well as directly to the combustion zone (if needed). From a practical point of view, this approach eliminates problems with the primary recycle and also lessens concerns about the air leakage into the system. At the same time, it allows the boiler and its back-end piping to operate under slight suction; this avoids the potential danger to the plant operators and equipment due to possible exposure to hot combustion gases, CO₂ and particulates. As well, by integrating oxy-fuel system components and optimizing the overall process over a wide range of operating conditions, an optimum or near-optimum design can be achieved that is both cost-effective and practical for large-scale implementation of oxy-fired coal power plants. **Kouros E. Zanganeh and Ahmed Shafeen**, *International Journal of Greenhouse Gas Control*, Published online March 26, 2007, [doi:10.1016/S1750-5836\(07\)00035-7](https://doi.org/10.1016/S1750-5836(07)00035-7), <http://www.sciencedirect.com/science/article/B83WP-4NBR48X-2/2/0c4c28f2bfb47d74035258ee5115e87c>. (Subscription may be required.)

Terrestrial/Ocean

“Total Soil Carbon and Water Quality: An Implication for Carbon Sequestration.” Carbon sequestration in soil has been suggested as a means of reducing the rate of increase of atmospheric CO₂. Most soil science research has been on soil organic carbon (SOC) sequestration but in arid and semiarid climates, soil inorganic carbon (SIC) may offer another option for carbon sequestration. A field study was conducted in Bakersfield, California, to determine if irrigation water quality (fresh water [FW] vs. treated effluent [TE]) affected the distribution and amount of SIC and SOC in the upper 4 m [meters] of soil and parent material compared to a nonirrigated (NI) field. Significant carbonate depletions were found in the upper 2 m in both irrigated fields compared with the NI. Differences in carbonate content between irrigated fields were also related to soil texture. Total carbonate and clay-size carbonate were more abundant at the sites irrigated with TE than at the sites irrigated with FW, indicating that the TE had inhibited carbonate dissolution. Based on stable isotope analyses (¹³C and ¹⁸O) and radiocarbon dating, [the authors] estimated that irrigation for greater than 75 years sequestered about 7.15 kilograms per meters squared (kg m⁻²) (4 m)⁻¹ of SIC under FW and between 0.9 and 2.4 kg m⁻² (4 m)⁻¹ under TE, if carbonate dissolution is carbon sequestration. Adding carbon loss due to SOC decomposition to the SIC sequestration, the fields may be a source for 8.8 and 17.4 to 15.9 kg m⁻² (4 m)⁻¹ of carbon under FW and TE, respectively. This study provides

some of the first evidence of how water quality affects the carbon budget in an arid region. **Gil Eshel, Pinchas Fine and Michael J. Singer**, *Soil Science Society of America Journal*, Published online March 12, 2007, DOI: 10.2136/sssaj2006.0061, <http://soil.scijournals.org/cgi/content/abstract/71/2/397>. (Subscription may be required.)

Trading

Carbon Market Update, May 14, 2007	
CCX-CFI 2007 (\$/tCO ₂) \$3.70 (Vintage 2007)	EU ETS-EUA DEC 2007 (\$/tCO ₂) \$.45
(Converted from € to US\$)	

The Associated Press, “EU Makes 6 Percent Cut to Italy’s Carbon Trading Cap.” On May 15, the executive body of the European Union (EU) modified Italy’s original carbon trading cap to a level 6.3 percent below the amount requested. Due to the modification, Italy will now be permitted to emit 195.8 million metric tons per year of emissions versus the 201 million metric tons per year initially requested. It is the European Commission that sets



the carbon trading caps for each of the 25 EU nations bound by the Kyoto Protocol. In practice, this system creates a financial incentive for emissions reductions by assigning a cost to polluting. Generally, companies that can reduce emissions at a low cost can sell off their residual permits to other companies who are not able to meet their caps. However, one recent glitch arose when it was determined that some countries were supplying a surplus of permits to power plants and factories, which gave

them no incentive to reduce their greenhouse gas emission levels. The EU Commission is hoping to limit the number of permits granted in order to reach its goals to cut CO₂ emissions by eight percent from 1990 levels by 2012, and ultimately by 20 percent by 2020. May 15, 2007, <http://www.iht.com/articles/ap/2007/05/15/business/EU-FIN-EU-Italy-Carbon-Trading.php>.

The Atlanta Journal-Constitution, “Delta’s New Flyers’ Perk: A Tree.” In conjunction with Earth Day on June 1, Delta Air Lines will kick off a voluntary carbon offsetting program with its customers. The program will be the first of its kind initiated by a US carrier and will allow customers to compensate for the CO₂ produced during their flight with the planting of a tree. Delta has teamed up with The Conservation Fund, an environmental nonprofit organization dedicated to similar terrestrial carbon sequestration projects throughout the country. The organization’s efforts have allowed them to plant nine million trees in the US which will make up for 13.5 million tons of CO₂ emissions over a century. The Conservation Fund will direct donations from Delta’s program to aid in the reforestation of Gulf Coast areas damaged by Hurricane Katrina. Customers willing to participate in the program will be charged \$5.50 for a domestic round trip ticket and \$11 for an international flight. Delta announced that the company will donate an additional \$300,000 to kick off this program. Other international carriers offering similar programs to their customers include British Airways and Scandinavian Airlines Group. April 18, 2007, Link unavailable.

Recent Publications

“Carbon Sequestration Technology Roadmap and Program Plan 2007.” This document describes the Technology Roadmap and Program Plan that will guide the Carbon Sequestration Program in 2007 and beyond. An overview of the Program and the key accomplishments in its 10-year history are presented as well as the challenges confronting deployment and successful commercialization of carbon sequestration technologies. The research pathways that will be used to achieve Program goals and information on key contacts and web links related to the Program are included. This document is intended to be a valuable tool in engaging interested stakeholders. (See article in this month’s Highlights section, “DOE Releases 2007 Carbon Sequestration Technology Roadmap, Marks Tenth Year of Carbon Sequestration Program,” which references the release of the Roadmap.) To download the 2007 Carbon Sequestration Roadmap, go to: http://www.netl.doe.gov/publications/carbon_seq/project%20portfolio/2007/2007Roadmap.pdf.



Working Group III Contribution to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, “Mitigation of Climate Change.” The Working Group III contribution to the IPCC Fourth Assessment Report (AR4) focuses on new literature on the scientific, technological, environmental, economic and social aspects of mitigation of climate change, published since the IPCC Third Assessment Report (TAR) and the Special Reports on CO₂ Capture and Storage (SRCCS) and on Safeguarding the Ozone Layer and the Global Climate System (SROC). The summary is organized into five sections: Greenhouse gas (GHG) emission trends; Mitigation in the short and medium term, across different economic sectors (until 2030); Mitigation in the long-term (beyond 2030); Policies, measures and instruments to mitigate climate change; and, Sustainable development and climate change mitigation. To download the Summary for Policymakers which was released on May 4 in Bangkok, Thailand, go to: <http://www.ipcc.ch/SPM040507.pdf>. To watch a video webcast of the press conference in Bangkok, go to: <http://ipcc.bravehost.com/>. (See article entitled, “Climate Panel Reaches Consensus on the Need to Reduce Harmful Emissions,” in the Science section of this newsletter, which references this report.)

“Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005.” An emissions inventory that identifies and quantifies a country’s primary anthropogenic sources and sinks of greenhouse gases is essential for addressing climate change. This inventory adheres to both 1) a comprehensive

and detailed set of methodologies for estimating sources and sinks of anthropogenic greenhouse gases, and 2) a common and consistent mechanism that enables Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to compare the relative contribution of different emission sources and greenhouse gases to climate change. In 1992, the United States signed and ratified the UNFCCC. As stated in Article 2 of the UNFCCC, “The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.” Parties to the Convention, by ratifying, “shall develop, periodically update, publish and make available... national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the “Montreal Protocol,” using comparable methodologies...”³ The United States views this report as an opportunity to fulfill these commitments. The pdf of the full report, which was published in April 2007, can be accessed by going to: <http://epa.gov/climatechange/emissions/downloads06/07CR.pdf>.

“U.S. Climate Change Science Program Synthesis and Assessment Product 2.2, The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle.” A primary objective of the US Climate Change Science Program (CCSP) is to provide the best possible scientific information to support public discussion, as well as government and private sector decision-making, on key climate-related issues. To help meet this objective, the CCSP has identified an initial set of 21 Synthesis

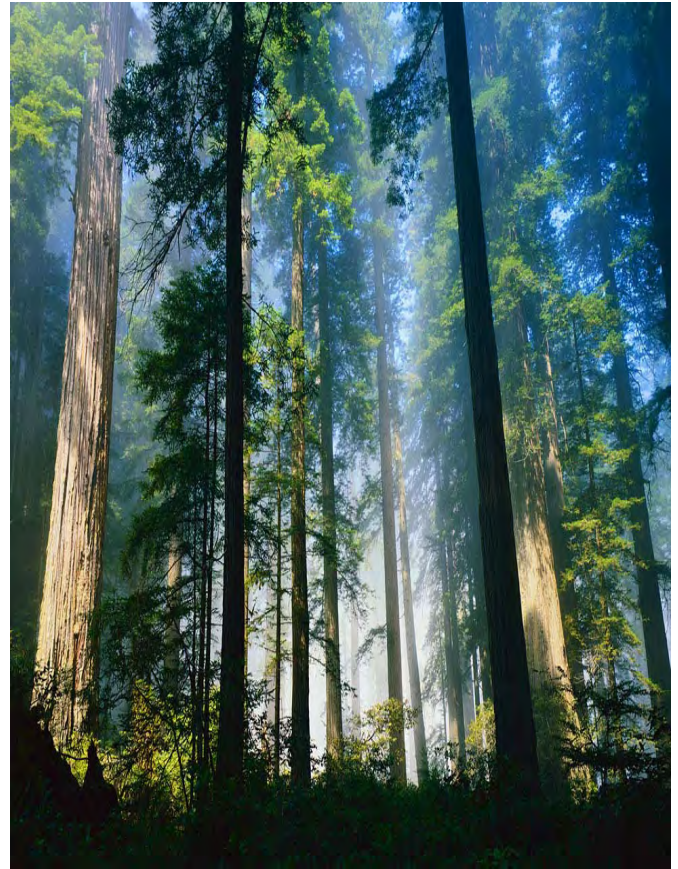
and Assessment Products that address its highest priority research, observation, and decision-support needs. This Report—CCSP Synthesis and Assessment Product (SAP) 2.2—addresses Goal 2 of the CCSP Strategic Plan: Improve quantification of the forces bringing about changes in the Earth’s climate and related systems. The report provides a synthesis and integration of the current knowledge of the North American carbon budget and its context within the global carbon cycle. In a format useful to decision makers, it (1) summarizes [the authors’] knowledge of carbon cycle properties and changes relevant to the contributions of and impacts upon North America and the rest of the world, and (2) provides scientific information for decision support focused on key issues for carbon management and policy. Consequently, this Report is aimed at both the decision-maker audience and to the expert scientific and stakeholder communities. The pdf of the March 2007 (Draft subsequent from National Oceanic and Atmospheric Administration review) version can be found on the SOCCR website at: http://cdiac.ornl.gov/SOCCR/pdf/SAP2.2_Entire_Report_March2007.pdf.



Legislative Activity

United Press International, “Bingaman-Domenici Bill Passed In Committee.” In a 20-3 vote, the Senate Energy and Natural Resources Committee passed the Bingaman-Domenici bill on May 2, a key piece of energy legislation encompassing incentives for energy efficiency and renewables. The bill will be brought before the Senate soon. The legislation combines energy improvement initiatives from three important bipartisan measures that have surfaced over the past several months. First, the bill includes \$125 million in carbon sequestration research and development. Second, the measure calls for a 20 percent reduction in US gasoline consumption over the next ten years. Finally, increased federal funding for research and development in bioenergy technologies is authorized in the legislation. This includes new energy efficiency requirements for household appliances. Important to state and county lawmakers is the inclusion of an Energy and Environment Block Grant. This passes funding to local governments to enact energy saving programs in their communities, a grant stemming from requests voiced during the Conference of Mayors held in January. May 3, 2007, http://www.upi.com/Energy/Briefing/2007/05/03/bingamandomenici_bill_passed_in_committee/.

Environment & Energy Daily, “Rahall-Sponsored Climate, Energy Bill Starts to Take Shape.” Nick Rahall (D-W. Va.), chairman of the House Natural Resources Committee, is sponsoring a climate bill that will incorporate two key provisions to draft legislation expected to be brought before the House floor this summer. The first provision is to study the potential of carbon sequestration in the United States. Rahall cites legislation introduced by House Science and Technology Committee Chairman Bart Gordon (D-TN) that would produce a comprehensive inventory of the nation’s ability to store CO₂ in geologic formations and other natural basins. The USGS would work with the DOE and US Environmental Protection Agency to establish this inventory, as well as developing a “rigorous methodology” for the assessment. The US Geological Survey (USGS) endorses the bill, H.R. 1267, in addition to supporting a companion bill being brought before the Senate’s Energy and Natural Resources Committee. The House and Senate versions of the legislation have been endorsed by several environmental groups and energy industry groups. The second provision repeals to Section 390 of the 2005 Energy Policy Act that allows for categorical exclusions from oil and gas National Environmental Policy Act studies of drilling projects on Western public



lands. Categorical exclusions such as this one are generally opposed because they often result in shortened approval time for permit requests and do not leave time to conduct public hearings. It is often during the public comment periods that opposition and concern over wildlife and habitat concerns are voiced. The Western Governors’ Association and other environmental groups endorse the repeal. To review the content of H.R. 1267, go to: <http://www.eenews.net/features/bills/110/House/010507175934.pdf>. May 2, 2007, <http://www.eenews.net/EEDaily/print/2007/05/02/3>.

Events

June 4-5, 2007, **European Carbon Capture and Storage Conference**, *Amsterdam, Netherlands*. Carbon capture and storage appears as a highly attractive idea. It offers to resolve the contradiction between limiting carbon dioxide emissions and meeting growing energy demand. Moreover, it promises to do so without a radical change in energy sources, thereby avoiding the tremendous challenges posed by transitioning to a nonhydrocarbon based energy economy. Even on a small scale, it would provide a valuable wedge in the gradual transition to more sustainable energy systems. This conference will bring together key leaders from across Europe to share the challenges of development, manage the risks and ensure viability. For details about the event or to request a brochure, see: <http://www.platts.com/Events/pc773/>.

June 6-7, 2007, **Climate Change Strategies and Environmental Communication**, *Hilton Boston Back Bay Hotel, Boston, Massachusetts*. This conference will address the concerns of the business community and provide a forum for sharing insights on how companies can adapt to climate change. It will offer invaluable resources for any company wanting to grow and succeed in a low-carbon future. Topics to be covered include: how to develop sound climate change policies and communication strategies, innovative solutions and the economic opportunities tied to them, the tools you need to effectively engage your consumers, emissions reduction and disclosure: what the benefits are. To visit the conference website, click on: <http://www.ethicalcorp.com/climatechangeusa2007/index.shtml>.

June 10-15, 2007, **The 32nd International Technical Conference on Coal Utilization and Fuel Systems**, *Sheraton Sand Key, Clearwater, Florida*. Conference attendees will share their knowledge and expertise on coal technologies. The issues on the front burners of the electric utility industry will be spotlighted. All in attendance will have a firm grasp on the major issues facing the industry today and tomorrow. Sessions of interest include: "Update on FutureGen," "Panel: Update on the Regional Carbon Sequestration Partnership," "Effective Carbon Management," and "The Future of Coal; Options for a Carbon Constrained World-Review of the MIT Coal Study." To read the complete conference brochure and for registration details, see: <http://www.coaltechnologies.com/Program%20Announcement%202007.pdf>.

June 13-15, 2007, **Carbon Finance North America 2007**, *New York Marriott East Side, New York, New York*. Attendees of Carbon Finance North America 2007 will hear leading industry and government specialists explain what is driving the price of carbon credits and allowances and find out how the US can benefit from what's happening in Europe. Participants can discover how other companies are participating in the market and gain an understanding of how carbon emissions are fast emerging as an exciting new asset class. The latest proposals for the Regional Greenhouse Gas Initiative (RGGI) and the state of California will be discussed. To download a PDF version of the conference brochure, go to: <http://www.environmental-finance.com/conferences/2007/CFNA07/cfna2.pdf>.

June 14-15, 2007, **Carbon Markets Asia**, *Orchard Hotel Singapore, Singapore*. Asia is fast becoming one of the world's most exciting carbon markets. In the seven months since last year's Carbon Markets Asia 2006 event over 140 new Clean Development Mechanism (CDM) projects have been listed across the region, and the pace does not appear to be slowing down. This event will bring together the key players in this vibrant market in a forum of debate, analysis and learning. For event details and an agenda overview, visit: http://www.greenpowerconferences.com/carbonmarkets/carbonmarkets_singapore07.html#Venue.

Events (continued)

June 25-26, 2007, **Carbon Emissions: Understanding and Managing Carbon Risk**, *Hilton Alexandria Mark Center, Alexandria, Virginia*. This conference will outline regulatory developments, carbon emissions reduction technologies, carbon mitigation solutions, management and financial support for carbon programs, and how to integrate them into utility planning and development. To view an online conference brochure, go to: <https://www.euci.com/conferences/0607-carbon-emissions/index.php>.

June 26-28, 2007, **Power-Gen Europe 2007**, *Feria de Madrid, Madrid, Spain*. Join the European power generation industry at the one place that both leading product suppliers and leading technical and strategic decision-makers gather. Power-Gen Europe 2007 promises even more, being co-located alongside two new industry gatherings, Renewable Energy Europe and Powergrid Europe, thereby bringing together three key elements of power production and delivery today – conventional power generation, renewable power generation, and transmission and distribution. For complete conference details, go to: <http://pge07.events.pennnet.com/fl/content.cfm?NavId=4701&Language=Engl>.

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>.

For subscription details....

For Carbon Sequestration Newsletter 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 sean.plasynski@netl.doe.gov, or Dawn Deel at dawn.deel@netl.doe.gov.