

THE CARBON SEQUESTRATION NEWSLETTER

<http://www.netl.doe.gov/coalpower/sequestration/>

May 2004

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Sequestration in the News

Wall Street Journal, "All Fired Up About Coal." Coal is seeing a resurgence in the U.S. power industry, with more than 100 new coal-fired power plants in the planning stages. Explanations offered include prolonged high prices and high futures for natural gas, a relaxation of air emissions regulations by EPA, higher prices for electricity that coal plants are able to garner in deregulated power markets, the administration's policy regarding carbon dioxide emissions, and that advanced clean coal technologies are viewed as "nearly ripe for broad deployment." April 2 <http://home.hamptonroads.com/stories/story.cfm?story=68365&ran=96538>

Reuters News Service, "Using CO₂ to prolong UK North Sea oil too costly." A study conducted by the UK Department of Trade and Industry has determined that CO₂-based enhanced oil recovery is not, at present, economically feasible. The UK had hoped to use carbon dioxide to help pump oil from its North Sea reservoirs, thus sequestering carbon while offsetting the cost of doing so with revenues from easier oil recovery. But the gap between costs and revenues remains too large. April 13 <http://www.planetark.com/dailynewsstory.cfm/newsid/24659/story.htm>

The Washington Post, "Algae may not be the answer." Findings from the South Ocean have diminished hopes that using iron to fertilize algae blooms could significantly increase "carbon sink" in the deep ocean; April 18 2004. <http://www.washingtonpost.com/wp-dyn/articles/A22890-2004Apr18.html> (Scroll down in link.)

the *Oakland Tribune* gives a more optimistic interpretation "Iron Fertilization May Help Cool Off Simmering Planet," April 16 <http://www.oaklandtribune.com/Stories/0,1413,82-1865-2087949,00.html>

Scientists dumped 1 metric ton of iron and observed the impact over a ten square mile section of ocean. They were surprised at the efficiency of carbon transport to the deep ocean but the carbon flux was found to be quite low compared to natural variations at those latitudes. The original research articles, found in the April 16th issue of *Science Magazine* [no link available], are discussed in more detail in the oceans section below.

BBC News, "City trees fight global warming." Trees for Cities, a nonprofit dedicated to planting trees in urban areas to absorb carbon dioxide emissions, kicked off a five-year plan to "transform 20 cities around the world" on April 14, with tree plantings in London and Manchester. Also included in the first phase of the project will be the cities of Madrid, Bucharest, and Adis Ababa. Says Graham Simmonds, chief executive of Trees for Cities, "Our experience in London over the last 10 years has taught us people and companies want to do something for the environment and our aim is to harness this enthusiasm and generate a greening renaissance in cities around the world." April 14 http://news.bbc.co.uk/2/hi/uk_news/england/london/3623961.stm

BBC News, "Plan to build emissions scrubber." Two Tucson, Arizona companies, Global Research Technologies and Kelly, Wright Associates, have joined forces to produce the first-ever "wind scrubber," a device that would capture large volumes of carbon dioxide from the atmosphere. Though the project is in its earliest stages, the developers plan to have a working, ten-square-meter unit by 2005 and claim it is the first attempt to build such a device. Other scientists tender that, barring major breakthrough gas/liquid contacting technology, an air CO₂ scrubber will require prohibitive amounts of energy per unit CO₂ captured. April 13 <http://news.bbc.co.uk/1/hi/sci/tech/3612739.stm>

Pittsburgh Post-Gazette, "Science savvy teens test Sequestration." At the 65th annual Pittsburgh Regional Science and Engineering Fair, a high school student studied neutralizing bauxite residue, an alkaline by-product of aluminum production and possible cause of groundwater pollution, with carbon dioxide and water to sequester the carbon. Her project's subtitle was, "Turning lemons into lemonade." Said she, "I see there's a future in this idea." April 4

Fulton Valley News, "Ethanol plant project still brewing—Perdue Farms and BOC Gases sign on as strategic partners." Northeast Biofuels is securing \$140 million to convert a former Miller beer facility into a 100-million-gallon-per-year ethanol production plant. BOC Gases and Northeast Biofuels have a letter of intent outlining a future contract for BOC Gases to purchase the carbon dioxide that is produced during the ethanol production. BOC plans to construct a \$15 million carbon dioxide liquefaction plant in the business park adjacent to the proposed ethanol plant. April 10, http://www.valleynews.com/news/2004/0410/Front_Page/011.html

Announcements

Carbon Sequestration Roadmap and Program Plan The new 2004 version is now available for download at the NETL website, <http://www.netl.doe.gov/coalpower/sequestration/refshelf.html>

The following new fact sheets are also available:

[Carbon Dioxide Capture By Absorption With Potassium Carbonate.](#)

[Capture And Use Of Coal Mine Ventilation Air Methane.](#)

[Upgrading Methane Streams With Ultra-Fast Tsa.](#)

[Global Climate Change - How We Fit.](#)

[Carbon Sequestration Program Outreach Plan.](#)

[Sleipner: world's first Commercial-Scale CO₂ Capture and Storage Operation.](#)

The official Notice of Intent to prepare a Programmatic Environmental Impact Statement for Implementation of the Carbon Sequestration Program. Pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations to assess the potential environmental impacts from the Department of Energy's (DOE's) Carbon Sequestration Program. The Carbon Sequestration PEIS will evaluate issues and impacts associated with the demonstration and deployment of technologies to implement the key elements of the Program, including: CO₂ capture; sequestration (geologic, oceanic, and terrestrial); measurement, monitoring, and verification (MMV); and breakthrough concepts. <http://www.netl.doe.gov/coalpower/sequestration/eis/>

BP, Ford renew Support for the Carbon Mitigation Investigation (CMI) at Princeton University. British Petroleum and the Ford Motor Company have pledged \$20 million of financial aid over the next ten years to the CMI, awarding the project a second allocation of funds after internal and external reviews of CMI's progress over the past three years. The CMI is focused on finding "alternative ways to collect and store carbon dioxide gas." *The Daily Princetonian*, April 1, 2004. <http://www.dailyprincetonian.com/archives/2004/04/01/news/10100.shtml>

Geology

CO₂ from Coal Industry for EOR. Bellona Foundation president Frederic Hauge told an industry seminar on clean coal technology in Brussels that the coal industry's best opportunity to be green was to provide CO₂ to oil companies for enhanced oil recovery (EOR). It would be worth up to \$15/tonne for CO₂ from the European coal industry to enhance their oil recovery in the North Sea, he said. "CO₂ from coal worth up to \$ 15/tonne for oil recovery," *Platts EU Energy*, March 26, 2004; Issue 79; Pg. 3 <http://www.platts.com>

Technology

EPA GHG Center Verifies Technology to Reduce Natural Gas Emissions. The Greenhouse Gas Technology Center (GHG Center) verified the performance of the Quantum Leap Natural Gas Dehydration (QLD) Technology, developed by Engineered Concepts LLC of New Mexico. Natural gas systems represent almost two percent of the total GHG emissions in the U.S. according to the EPA (20 percent of total U.S. methane emissions). The QLD process eliminates hydrocarbon emissions from the glycol still column vent stream. A synopsis and final performance evaluation report can be accessed on the U.S. EPA ETV website, <http://www.epa.gov/etv/verifications/vcenter3-4.html> "Greenhouse Gas Technology Center Completes Verification for Engineered Concepts' Quantum Leap Natural Gas Dehydration Technology," *PR Newswire* March 31, 2004, <http://www.prnewswire.com>

Energy, H₂, and CO₂ sequestration. Greg Rau discusses a novel means of converting waste CO₂ to a solid or dissolved carbonate at ambient temperature and pressure, with carbon-free H₂ and electricity produced as byproducts. The value of these byproducts significantly offsets the cost CO₂ capture and sequestration or may even make it profitable. "Possible use of Fe/CO₂ fuel cells for CO₂ mitigation plus H₂ and electricity production," *Energy Conservation Management (ECM)*, Vol 45, Iss 13-14, August 2004. A talk on this process was recently presented at the American Chemical Society meeting in Anaheim: <http://oasys2.confex.com/acs/227nm/techprogram/P732839.HTM>

Carbon Capture from CHP/Bioenergy Systems = Negative CO₂. Researchers from International Institute for Applied Systems Analysis, Luleå University of Technology, and the Chinese Academy of Sciences combine CO₂ capture and storage with biomass-based combined heat and power production (CHP) in Kraft pulp and paper mills in this study. "Efficient energy systems with CO₂ capture and storage from renewable biomass in pulp and paper mills," *Renewable Energy*, Volume 29, Issue 9, July 2004, <http://www.sciencedirect.com/science/journal/09601481>

Ocean

The Ocean Floor's own CO₂ Emissions. For information on CO₂ coming from the sea floor, including videos of the liquid CO₂ bubbling up from the Eifuku vent along the Mariana Arc in the western Pacific, visit: <http://oceanexplorer.noaa.gov/explorations/04fire/logs/april10/april10.html>

Sequestration in the News, Cont'd

Southern Ocean Fertilization Study. Several new articles in the April 16 issue of *Science* cover the investigative efforts of over 40 researchers from 16 institutions (Moss Landing Marine Laboratories, MBARI, Woods Hole Oceanographic Institution, NOAA, Scripps, LBL and ten universities). The first, "Southern Ocean Iron Enrichment Experiment: Carbon Cycling in High- and Low-Si Waters," by Kenneth H. Coale et al., investigates the response of algae and diatoms to iron added to sea water with varying amounts of natural silica. The second, "The Effects of Iron Fertilization on Carbon Sequestration in the Southern Ocean" measured the flux of carbon to the deep ocean, and found that it was similar in magnitude to that of natural blooms in the Southern Ocean and thus small relative to global carbon budgets and proposed geoengineering plans to sequester atmospheric carbon dioxide in the deep sea. The third, "Robotic Observations of Enhanced Carbon Biomass and Export at 55°S During SOFeX," suggests that each atom of iron added to the sea could pull between 10,000 and 100,000 atoms of carbon out of the atmosphere by encouraging plankton growth. The biomass buildup and export were much higher than expected for iron-amended low-silicate waters. The fourth, "Ocean Science: Ironing Out Algal Issues in the Southern Ocean," reviews the three others. *Science*, Vol 304, Issue 5669. A number of publications discussed the findings, links below: http://www.innovations-report.com/html/reports/earth_sciences/report-28146.html
http://www.scienceagogo.com/news/20040318210325data_trunc_sys.shtml <http://www.sfsu.edu/~news/2004/spring/55.htm>
http://www.eurekalert.org/pub_releases/2004-04/osu-pms041304.php

Terrestrial

"Coaxing Soil To Soak Up Carbon." Experiments at the DOE's Pacific Northwest National Laboratory show that soil's carbon-sequestering capacity can be boosted by maintaining proper alkalinity and frequent wetting and drying cycles—plus, the same treatment reinvigorates nutrient-depleted cropland. Alkaline soil additives like "fly ash," a coal waste product, along with plenty of wetting and drying, can speed up soil's "humification" process, which fixes carbon into stable soil structures. *Science Daily*, April 2, 2004. <http://www.sciencedaily.com/releases/2004/04/040402073631.htm> See also: <http://www.solaraccess.com/news/story?storyid=6563>

Shell Canada received the first-ever Tree Canada Afforestation Leadership Award. The award recognizes achievements of the voluntary challenge and registry members. Shell planted 85,000 trees across Alberta in 2003, with the help of Tree Canada. Trees were planted to help offset some of the CO₂ emitted by the Athabasca Oil Sands Project. "Shell lauded for tree-planting efforts," *Fort McMurray Today* (Alberta, Canada), April 2, 2004

Soil Carbon's Integrative Role. Researchers Rattan Lal, Michael Griffin, Jay Apt, Lester Lave, and M. Granger Morgan, write in *Science* that no-till agriculture, in combination with mulching and crop rotation to enhance the SOC pool, is a viable strategy for carbon sequestration and sustainable management of soils of the tropics and sub-Saharan Africa. They recommend that governments implement programs to increase soil organic content or provide financial incentives to farmers. Aid programs should place greater emphasis providing technical and other assistance for soil restoration. "Ecology: Managing Soil Carbon," *Science*, Vol 304, Issue 5669, April 16 2004

Utility Sector Launches Sequestration Fund. A coalition of 25 power companies has established a multi-million fund to undertake six hardwood reforestation projects in Louisiana, Mississippi, and Arkansas. The projects are expected to capture more than 1.6 million tons of carbon dioxide over the century and restore about 3,600 acres wildlife habitat. Joined by the Conservation Fund, The Nature Conservancy, Ducks Unlimited, Old South Woodlands LLC, Central Arkansas Resources Conservation and Development Council and The Carbon Fund, PowerTree Carbon Co. will help return these marginal agricultural lands to thriving ecosystems. The Conservation Fund News Release, April 19, <http://www.conservationfund.org/?article=2873&back=true>

"Brazilian sugar bagasse wins 'best CDM project'." The Brazilian sugarcane bagasse project Vale de Rosario was awarded Best CDM Project by a panel of experts at the Carbon Market Insights conference. Point Carbon, April 22, <http://www.pointcarbon.com/article.php?articleID=3549&categoryID=147>

Trading

The CO₂ Marketplace for EOR Newly-launched web page. The CO₂ Marketplace encompasses anthropogenic and geologic CO₂ sources, use of CO₂ for enhanced oil recovery, and voluntary emission reduction credits. Website provides data on recent CO₂ trades as well as background information on EOR opportunities in the United States and requirements for emissions reduction credits. <http://www.co2resources.com>

Statoil's In-house Unit to Trade CO₂. The European Union plans to have its system for trading in CO₂ operational by Jan 1, 2005. Several leading European oil and power groups, including Statoil, are starting in-house emissions trading units to prepare for it. "Statoil Sets Up CO₂ Unit," *International Oil Daily*, April 2, 2004.

Policy

Climate Policy in the United States and Japan: A Workshop Summary. Resources for the Future and the Institute for Global Environmental Strategies (Japan) convened a workshop on domestic and international climate policy on February 12–13, 2004. The report summarizes a dialogue among representatives from the two nations. Voluntary actions and capture and sequestration of CO₂ from coal-fired power plants are emphasized for the United States. Japan's policy is centered on CO₂ emissions taxes, which will likely be combined with targeted subsidies. William Pizer and Kentaro Tamura, April 2004, <http://www.rff.org/rff/Documents/RFF-DP-04-22.pdf>

"Let the market fight emissions" This op-ed from a major Canadian paper argues that price signals are indispensable in Canada's effort to reduce GHG emissions toward meeting her Kyoto obligations. *The Globe and Mail*, March 31, 2004. <http://www.theglobeandmail.com/servlet/ArticleNews/TPStory/LAC/20040331/COJACCARD31/TPComment/TopStories>

Events

May 2-6, 2004, **Third Annual Conference on Carbon Sequestration**, Alexandria, VA. For further information, please visit <http://www.carbonsq.com>

May 5-7, 2004, **GHG Registries, Climate Policy and the Bottom Line**, California Climate Action Registry, San Diego, CA. Topics include: The Future of U.S. Climate Policy; and GHG Registries in the U.S. and beyond. Breakout Sessions on: Industry GHG Accounting for the Electric Power, Oil & Gas, and Cement Industries Emissions, Trading and GHG Registries, Forest GHG Accounting. www.climateregistry.org/EVENTS/Conference

May 10 -12, 2004, **The Ocean in a High CO₂ World: An International Science Symposium**, UNESCO, Paris, France. An open symposium to address biological and biogeochemical consequences of increasing atmospheric and oceanic CO₂ levels. Overviews ocean sequestration strategies. Papers from the symposium will be published in a special issue of the *Journal of Geophysical Research-Oceans*. <http://ioc.unesco.org/iocweb/co2panel/HighOceanCO2.htm> or contact Ed Urban (scor@jhu.edu) or Maria Hood (m.hood@unesco.org).

May 10-14, 2004 **2nd World Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection**, Rome, Italy, <http://www.conference-biomass.com/>

May 12-14, 2004, **Critical Elements of International Climate Policy**, Hamburg Institute of International Economics, Germany. Covers ten years climate policy research at Hamburg Institute Baselines and additionality, validation and verification of CDM projects, LULUCF and the Kyoto Mechanisms, and the role of sinks. <http://www.hwwa.de/climate.htm>

May 24 - 25, 2004 **5th Annual Coalbed and Coal Mine Methane Conference** The Brown Palace Hotel - Denver, CO. Includes sessions on innovative approaches to CBM recovery. http://www.srinstitute.com/ApplicationFiles/web/WebFrame.cfm?web_id=218&webpageid=2331&prioritycode=DEM004043

June 7-8, 2004, **Climate protection as development opportunity**, the Hamburg Institute of International Economics, Hamburg, Germany. Focus on the Clean Development Mechanism to reach development targets. Email amichaelowa@hwwa.de with expressions of interest. <http://www.hwwa.de/climate.htm>

June 9 to 11, 2004, **World's first Carbon Expo**. Cologne, Germany Trade fair and conference on emissions trading and the emerging carbon market co-sponsored by the World Bank. "A watershed event in the emerging carbon market, it is the first opportunity for buyers and sellers of greenhouse gas emission reductions to meet face to face." <http://www.carbonexpo.com/> The Conference Program for CARBON EXPO – Global Carbon Market Fair & Conference can be downloaded from http://www.ieta.org/CARBONEXPO_Programm_e_310304.pdf

June 10-11, 2004, **Energy & Agricultural Carbon Utilization Symposium: Sustainable Alternatives to Sequestration**, the campus of The University of Georgia in Athens, Georgia. Sessions focused on the use of charcoal and carbon black in terrestrial ecosystems. <http://www.georgiaitp.org/carbon>

August 20th - 28th 2004, **32nd International Geological Congress. Including Topical Symposium T09 – Future of Energy and Resources**, Florence, Italy. Contacts: Scientific Secretariat, Chiara Manetti, Borgo Albizi, 28 - 50121 Firenze, Italy. Tel/Fax: +39 055 2382146 casaitalia@geo.unifi.it Organising Secretariat, Newtowns, Via Augusto Righi, 8 50019 Sesto F.no - Firenze, Italy Tel: +39 055 33611 Fax: +39 055 3361250/350 secretariat@32igc.org www.32igc.org

September 5-9, 2004, **7th International Conference on Greenhouse Gas Control Technologies** Vancouver BC, Canada. GHGT-7 is being organized by University of Regina, Natural Resources Canada, and the IEA GHG R&D Programme. www.ghgt7.ca. Contact: GHGT-7 Conference Secretariat, Ted Morris, Suite 150, 10 Research Drive, Regina, SK. S4S 7J7, Canada. Tel: +1 306 337 2290 Fax: +1 306 337 2301 secretariat@ghgt7.ca

September 13-17, 2004, **The International Pittsburgh Coal Conference**, Osaka Japan. Industrial Ecology topics include: life cycle studies of coal conversion plants; Industrial ecology of emission trading; and planning future energy plants. <http://www.engr.pitt.edu/pcc> Topics: <http://www.engr.pitt.edu/pcc/04AbstractTopics.htm>

Recent Publications

IPIECA Brochure on Sequestration. "Carbon Dioxide Capture and Geological Storage: Contributing to Climate Change Solutions," summarizes the proceedings of an October, 2003 IPIECA international workshop. The brochure, presentations and transcripts of the workshop can be downloaded. International Petroleum Industry Environmental Conservation Association, April 2004, http://www.ipieca.org/working_groups/climate_change/cc_home.html

"Benchmarking Air Emissions." A study of data collected by the federal government from the utility industry from 1991 to 2002 finds that utilities generate roughly the same amount of carbon dioxide for each kilowatt of power produced that they did in 1991, while emissions of Sox and NOx, which are subject to mandatory regulations, have decreased significantly. Summary article, *The New York Times*, April 14 <http://www.nytimes.com/2004/04/14/business/14smog.html?ex=1082520000&en=be42980d29708740&ei=5062> Full report can be downloaded at: <http://www.nrdc.org/air/pollution/benchmarking/default.asp>

RFF Assesses the European Union Emissions Trading Program. Ten times the size of the Acid Rain trading program in the United States, the design of the EU program takes advantage of past lessons, but lack of data and weaker institutions in some EU Member States could make allowance allocations, compliance, and enforcement tricky. "The EU Emissions Trading Directive: Opportunities and Potential Pitfalls," Joseph Kruger and William A. Pizer, <http://www.rff.org/rff/Documents/RFF-DP-04-24.pdf>

Agricultural and Forest Meteorology. "Seasonal variation in carbon dioxide exchange over a Mediterranean annual grassland in California," Liukang Xu and Dennis Baldocchi Volume 123, Issues 1-2, 20 May 2004, <http://www.sciencedirect.com/science/article/B6V8W-4B6CPJ3-6/1/f8878c5caae25dbdd780ac2ea0a0fb73>

Soil and Tillage Research. Two articles of interest: "Transport of labile carbon in runoff as affected by land use and rainfall characteristics," P.A. Jacinthe, R. Lal, L.B. Owens and D.L. Hothem, and "Long-term tillage and crop rotation effects on microbial biomass and C and N mineralization in a Brazilian Oxisol," Elcio Balota, Arnaldo Filho, Diva Andrade and Richard Dick. Volume 77, Issue 2, June 2004, <http://www.sciencedirect.com/science/journal/01671987>

Legislative Activity

"Washington governor signs bills to curb power plant emissions" Washington Governor Gary Locke signed into law standards for new power plants that will require future power plants to offset 20 percent of their carbon dioxide emissions by planting trees, buying natural gas-powered buses, or taking other steps to curb pollution. The legislation gives the force of state law to rules Locke issued last fall. Existing plants will not be affected. The state estimates the changes will cost the average household less than \$1 per year. The new system is modeled after an Oregon program. California is developing similar rules. Associated Press, April 01 http://www.enn.com/news/2004-04-01/s_22389.asp. See also <http://www.gristmagazine.com/muck/muck040704.asp?source=weekly>

This newsletter is produced by the National Energy Technology Laboratory and presents summaries of significant recent events related to carbon sequestration. If you'd like to join the e-mail distribution list, email majordomo@list-manager.netl.doe.gov with "subscribe sequestration" in the body of the message. We encourage you to pass this along to interested persons. Contact: Scott Klara, klara@netl.doe.gov.