

THE CARBON SEQUESTRATION NEWSLETTER

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

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April 2003

Sequestration in the News

Mapping NETL's carbon sequestration research and development pathways. The current vision of how to proceed in the development of carbon sequestration technology has been presented in a program plan and roadmap. This document reflects important new developments, and readers are invited to provide questions or comments to the contact persons listed on the back cover. "[Carbon Sequestration Technology Roadmap and Program Plan](#)," NETL, March 12, 2003.

FutureGen press. The U.S.' \$1-billion, [ten-year clean coal-fired power plant project](#) will produce electricity, hydrogen and sequester CO₂ emissions underground. Financed with Federal, private and international funds, it will serve as a working prototype for clean-coal technologies. "Coal-fired power plant to bury issue of emissions," *Nature*, March 6, 2003.

Capture

International Test Centre for CO₂ capture opens. The [International Test Centre for Carbon Dioxide Capture](#) (ITC) has opened in Regina, Saskatchewan at the University of Regina. The ITC will conduct technology development-scale and industry-scale tests, and bring together findings from around the world to develop economically viable technologies for CO₂ capture. "NRCan: International Test Centre for Carbon Dioxide Capture Opens and New Funding for Climate Change Research Project Announced," *Canadian Corporate Newswire*, March 3, 2003.

Analysis predicts large carbon reductions necessary by 2050. Researchers from LLNL, University of Illinois at Urbana-Champaign, and NYU model a variety of stabilization pathways to show that massive reductions in carbon emissions will be required by 2050 even in the case of low climate sensitivity. "Climate Sensitivity Uncertainty and the Need for Energy Without CO₂ Emission," *Science*, March 28, 2003. [Science Daily article](#).

East to West Texas: Connecting CO₂ supply and demand. Falcon Environmental Services has been working closely with a Ontario Power Generation, Oxy Permian, a Texas oil producer and buyer of CO₂ for 13,000 producing wells, and others, to work on aggregating CO₂ from multiple producers, storing it, and redistributing it to end users. "[Connecting the CO₂ dots](#)," *Houston Business Journal*, March 21, 2003.

SOFC with CO₂ capture. A methane and oxygen powered solid oxide fuel cell achieves a thermal efficiency of 63.6% with carbon capture, according to this paper. "Performance of High Performance SOFC Combined Power Generation System with Carbon Dioxide Recovery," *Energy Conversion & Management*, Mar 2003, Vol. 44 (4).

Geologic Storage

First U.S. geologic sequestration field test underway in depleted oil well. In early 2003 researchers injected 2,100 tons of CO₂ into Strata's West Pearl Queen reservoir, New Mexico – about 40 tons per day. The plume migration will be tracked by 3-D seismic survey equipment for 3 years. NETL, SNL, LANL, and Strata Production Co are partnering in the project. Kinder Morgan CO₂ Company LP supplied the CO₂. [Department of Energy's Fossil Energy](#), and "DOE Tests Oil Fields To Store CO₂ Emissions," *AIR Daily*, March 21, 2003.

Mining the possibilities for carbon storage. Covering a broad range of sequestration options, this article identifies the key geologic uncertainties surrounding reservoir heterogeneity: the distribution of porosity, permeability and large-scale connectivity associated with facies changes, diagenesis, stratigraphy and fracture characteristics. Sealing, interactions among brine, rock and gas, geomicrobiological interactions, analogs, monitoring and verification are also important aspects of CO₂ storage efforts. "[Storing Carbon in Earth](#)," *Geotimes*, March 21, 2003.

Carbon storage field experiments. A *Geotimes* article covers the various activities in the carbon sequestration program of the U.S. Department of Energy's National Energy Technology Laboratory, as well as other projects in the world. According to the article, Statoil's Sleipner natural gas field in the North Sea saves about \$110,000 per day in Norwegian CO₂-taxes. Also mentioned in the article are EnCana's Weyburn oil field in Saskatchewan, Canada; the Texas Bureau of Economic Geology plan to inject 3,000 tons of CO₂ below an abandoned oil field; the SACS partnership; CONSOL Energy's 7-year \$9-million project to inject CO₂ into coal seams in WV; Burlington's San Juan Basin NM ECBM project, BP's injection of more than 300,000 tons CO₂ in San Juan wells; the European Union's RECOPOL: 'Reduction of CO₂ emissions by means of CO₂ storage in coal seams in the Silesian Coal Basin of Poland'; and the Canadian Alberta Resources Council's coal seam experiments. "[Demonstrating Carbon Sequestration](#)" *Geotimes*, March 21, 2003.

Commercial CO₂ sequestration in EOR and ECBM operations. Enhanced oil production (EOR) and enhanced coalbed methane production (ECBM) in wells or depleted gas reservoirs improve fuel recovery and sequester carbon, increasing production by roughly 7-15% of the original oil in place over the 10-30 year life span of the project. Current costs for capturing and processing CO₂ from anthropogenic sources is \$1-3/Mcf. Projects using anthropogenic CO₂ in the U.S. and Canada are: Encana, of the Weyburn project; Pan West Petroleum Ltd.'s Joffre Viking CO₂ flood in Alberta; Petro Source Carbon Co. of Midland, Texas supplied by gas plants, ChevronTexaco Inc.'s Rangley CO₂ flood in Colorado, and Merit Energy Co.'s CO₂ floods near Bairoil, Wyoming. Also, Anadarko Petroleum Corp. is constructing a pipeline from ExxonMobil Corp's LaBarge gas processing plant in Wyoming, to the Salt Creek CO₂ flood. Natural gas processing plants and a fertilizer plant in Enid, OK are CO₂ sources. "Special Report: CO₂ sequestration adds new dimension to oil, gas production" *Oil & Gas Journal*, March 3, 2003.

Australian zero CO₂ emissions from power and sequestration. The Australian Federal government and Australian Coal Association set up "Coal 21" to research and develop capture technology and underground storage of CO₂ emissions from energy generation. "Coal sector seeks carbon cuts," [One Business](#), Geoscience Australia and the UNSW, March 2003. Also, the Australian Co-operative Research Centres Association Inc (CRC) is planning a demonstration of the large-scale disposal of CO₂ in a saline reservoir deep underground. "[Storing carbon dioxide underground](#)," *Yorke Peninsula Country Times*, March 11, 2003.

Terrestrial

Poplar tree research. Researchers at ORNL will examine the genetic and molecular mechanisms that control carbon uptake and movement in poplar trees, and hope to use this knowledge to enhance the trees ability to sequester carbon. The focus on poplar trees is a result of their high growth rate and adaptability in North America. "Poplar genes being studied," [Knoxville News Sentinel](#), March 24, 2003.

Diffuse light increases carbon sequestration. Researchers at ORNL, UCB, Harvard, and SUNY Albany correlated a sharp decrease in atmospheric CO₂ levels with the 1991 Philippines' Mt. Pinatubo eruption. They suggest that plants' photosynthesis rates increased up to 23% in the two years of increased diffuse radiation, where light bounced back and forth on volcanic aerosols. The article, published in *Science*, is entitled "Response of a Deciduous Forest to the Mount Pinatubo Eruption: Enhanced Photosynthesis." "[In Aftermath of Volcanic Eruption, Photosynthesis Waxes, Carbon Dioxide Wanes](#)," *Scientific American*, March 28, 2003.

Net carbon storage in Boreal forest trees dependent on age. Scientists from UC Irvine and Harvard used solar-powered anemometers and infrared gas analyzers to monitor carbon emissions of five black spruce stands in Manitoba, Canada. They found that most of the net carbon absorption takes place 20-50 years after a fire. The study appeared in the *Journal of Geophysical Research – Atmospheres*. NASA data from the Boreal Ecosystem-Atmosphere Study (BOREAS) was also used. "[Fire frequency determines forest carbon storage](#)," NASA/Goddard Space Flight Center, March 21, 2003.

Sequestration project in Bolivia receives award. Harvard presented an award to the [Noel Kempff Mercado](#) Climate Action Project for sequestering carbon and protecting 4 million acres of tropical forest. The project partners are AEP, BP, PacifiCorp, the Nature Conservancy, Friends of Nature Foundation, and the Government of Bolivia. "[Kennedy School Bestows Inaugural Roy Family Award to Bolivia-U.S. Public-Private Partnership](#)," JFK School of Government, March 24, 2003.

Trading and Policy

U.S. Policy on sustainable development, energy and climate change. Paula Dobriansky, Undersecretary of State for Global Affairs, cited Climate VISION and the Carbon Sequestration Leadership Forum as a foundation for a revolution in energy affairs in a speech at Rice University. "[U.S. Policy on Sustainable Development, Energy & Climate Change](#)," U.S. State Department, March 18, 2003.

Washington State proposes GHG registry. House Bill 2119 and Senate Bill 5945 in the state Legislature proposes creating the Washington Climate Action Registry, a voluntary program that would catalog the amount of greenhouse gas emissions and the mitigation programs used by power plants and heavy industry. "[Bill takes aim at greenhouse gas emissions](#)," *Puget Sound Business Journal*, February 28, 2003.

International framework. The Secretary-General of the World Meteorological Organization (WMO) called for strengthening coordinated international efforts to address climate change. "[U.N. official calls for global action to mitigate climate change](#)," U.S. Department of State, March 23, 2003.

U.S. and Mexico pledge climate cooperation. The U.S. and Mexico have issued a joint press statement on bilateral cooperation to combat climate change. "[Enhanced climate change cooperation](#)," US Department of State, March 18, 2003,

Reporting on greenhouse gas trading. A background article on emissions trading enumerates trading strategies. "Selling smoke," *Time*, March 5, 2003.

Sequestration in the News, Cont'd

UK Government announces fall in greenhouse gas emissions. UK GHG emissions dropped between 14% and 15% below 1990 levels. "[Government announces fall in greenhouse gas emissions](#)," *Ananova*, March 27, 2003.

Musicians, festivals, and Formula One motor-racing championships plant trees for carbon neutrality. An increasing number of entities work with the Edinburgh Centre for Carbon Management ([ECCM](#)) and Future Forests to make activities "carbon neutral." "The Man With Green Figures," *Edinburgh Evening News*, March 19, 2003.

Events and Announcements

NETL Carbon Sequestration webpage. The newly revised webpage reflects changes in the organization of NETL's projects and vision. Transparent program information on FutureGen, the Regional Partnerships, carbon capture, sequestration, measurement monitoring and verification, breakthrough concepts, non-CO₂ greenhouse gas control, and short descriptions of current R&D projects, hyperlinked to more extensive factsheets, will enhance collaboration and education.

NETL's Second National Conference on Carbon Sequestration. "[Developing and Validating the Technology Base to Reduce GHG Intensity](#)" will be held May 5-8, 2003 in Alexandria, VA. The conference will focus on the "innovation", science, technological advances necessary to make carbon sequestration a practicable and commercially deployable technology in order to meet GHG intensity reduction goals. Non-profit participants are eligible to register for the reduced \$395 rate.

Two landfill gas electricity generation proposal requests. [Austin Energy](#) requests proposals for purchase of renewable electric energy, due by April 25, 2003. Click on Purchasing, Current Purchasing Notices, and then on the gray button entitled "Click to Retrieve Selected Ads." Also, the USDA and DOE jointly announce the availability of funds for a grant under the [Biomass Research and Development Act of 2000](#), due May 16, 2003.

Call for papers: the American Institute of Chemical Engineers annual meeting. The Environmental Division and the Catalysis and Reaction Engineering Division of AIChE will sponsor a session entitled "[Greenhouse Gas Sequestration Technology](#)" during the 2003 Annual Meeting in San Francisco (Nov 16 - 21, 2003). Proposals covering new technologies for (1) separation and capture, (2) transport, and/or (3) long-term sequestration (geologic, terrestrial, etc.) are desired. Technical paper submissions are due April 21.

NARSTO MM&V technologies call for papers. "[North American Research Strategy for Tropospheric Ozone](#)," a public/private partnership of government, utilities, industry, and academia entities throughout Mexico, the U.S., and Canada, is organizing a workshop on Innovative Methods for Emission-Inventory Development and Evaluation at the University of Texas, Austin; October 14-17, 2003. Send 250 word abstracts to mobley.david@epa.gov by April 15.

Two DOE Solicitations. Carbon sequestration is mentioned in two broad procurement efforts: the [DOE Small Business Innovation Research](#) and the solicitation for grants in [basic energy, biological and environmental sciences](#) by the DOE Office of Science.

EPA announces grant competitions for State and local GHG efforts. The U.S. EPA's State and Local Capacity Building Branch seeks [proposals](#) for two projects: National Forum(s) on State-Level Best Practices for Reducing GHGs, and Integrating Energy and Environmental Policies in the Northeast. The deadlines are April 11 and 18, 2003, respectively. Grant size is from \$50,000-70,000. EPA.

ZEW's 5th workshop of the BLUEPRINT network. [Foresight and Strategies for Integrating Environmental and Innovation Policy](#) will be held in Brussels on April 3-4.

The Second Annual GreenTrading Summit: Emissions, Renewables & Negawatts will be held April 7-8, 2003 in Rockefeller Center New York City.

The Earth Technologies Forum: the [Conference on Climate Change and Ozone Protection](#) will be held April 22-24, 2003 in Washington, DC.

The 6th workshop on international climate policy will be held at the Vienna University of Business Administration in Vienna, Austria April 25 and 26. Email: c.ploechl@ic-vienna.at for more information.

Introduction to Emissions Trading. The Emissions Marketing Association has arranged [introductory conferences](#) on emissions trading during 2003. The next (and last) will be May 4: Phoenix, Arizona, prior to the EMA 7th Annual Spring Meeting. ET101.

GHG Registries: The Building Blocks of Climate Policy will be held May 4-6 in San Francisco. Hosted by California Climate Action Registry, IETA and BP.

Petroleum Geologist Convention. The next annual convention of the American Association of Petroleum Geologists (AAPG), entitled "[Energy: Our Monumental Task](#)" will be in Salt Lake City, Utah, on May 11-14, 2003. Session O-22 is entitled "Geological Sequestration of CO₂."

Events and Announcements, Cont'd

The **3rd Annual Emissions Trading Conference** will be held May 12-13 in London.

The **Brussels Climate Change Conference** will be held May 20-21 in Brussels, Belgium. Arranged by CEPS and EU Conferences.

The **Global Warming International Center** is sponsoring the **14th Global Warming Conference** on May 27-30, 2003, in Boston, Massachusetts. Topics include energy and transportation, industry emissions, agricultural and forestry resources management, and the carbon budget.

International Conference on Regional Climate Change and Agriculture. Arranged by the Indira Gandhi Agriculture University in Raipur, India on 5-7 June. For further information e-mail asastri@yahoo.com.

The **Greening of Industry Network** and the EPA are sponsoring the **Greening of Industry Network Conference: Innovating for Sustainability** on October 12-15, 2003, in San Francisco, California. The conference will focus on overcoming barriers to sustainable development by addressing issues, including climate change.

The **12th International Conference on Coal Science** at the Cairns Convention Centre, Australia, November 2nd – 6th 2003 will cover global warming, GHG emissions, CO₂ mitigation and sequestration. The Australian Institute of Energy, the International Energy Agency & IEA Clean Coal Centre.

Recent Publications

NETL's Project Portfolio. A comprehensive document designed to serve as your key resource on the Carbon Sequestration Program, the portfolio includes maps of project distribution, a copy of the Roadmap and Program Plan, budget information, information about each individual research project, and an index of project participants. The [Portfolio](#) can be printed and used in a three-ring binder, or viewed online. Frequent updates will be posted to ensure that new information is incorporated.

Economics and state of the science of sequestration technologies. "[Prospects for Carbon Capture and Storage Technologies](#)," Resources for the Future, January 2003.

UNEP Guidelines for calculating greenhouse gas emissions for businesses. "[The GHG Indicator: UNEP Guidelines for Calculating Greenhouse Gas Emissions for Businesses and Non-Commercial Organizations](#)" helps organizations estimate and report GHG emissions. UNEPFI, March 2003.

U.S. Forest resources and climate change impact report. This Pew report presents the current state of knowledge about the ecological and economic effects of climate change on U.S. forestry. Forest location, composition, and productivity will be altered by changes in temperature, precipitation, and CO₂ fertilization. "[Forests and Global Climate Change: Potential Impacts on U.S. Forest Resources](#)," Pew Center on Climate Change, March 2003.

Non-CO₂ policy report. In order to cost-effectively limit climate change, climate policies must address emissions of CO₂ and the other greenhouse gases. "[Multi-Gas Contributors to Global Climate Change: Climate Impacts and Mitigation Costs of Non-CO₂ Gases](#)," Pew Center on Climate Change, March 2003.

State and local GHG reduction programs. New case studies from Minnesota, Nebraska, Nevada, and West Virginia have been added to the [database](#). Pew Center on Climate Change, March 2003.

Report on international monitoring activities. A compilation of information on monitoring topics, involved organizations, policy integration, and relevant publications has been presented in a recent report from ECN. "Energy and emission indicators - International inventory and assessment," ECN.

Greenhouse Gas Emissions Trading Report. This report details the benefits of emissions trading, techniques that are employed in the execution of GHG transactions, current regulatory climate and commercially relevant factors pertaining to evolving markets. [Utilis Energy](#).

Technological change articles. The latest issue of [Resource and Energy Economics](#) includes the articles "Endogenous Technical Change and the Costs of Kyoto" and "Gross World Product and Consumption in a Global Warming Model with Endogenous Technological Change." *Resource and Energy Economics*, March 2003.

GHG trading guide. A step-by-step approach to emissions trading allows readers to build understanding of environmental and economic aspects of trading. The Guide covers the various types of emissions trading system designs. "[An Emerging Market for the Environment: A Guide to Emissions Trading](#)," the UNEP Collaborating Centre on Energy and Environment (UCCEE) and the UNCTAD/Earth Council Carbon Market Programme, March 2003.

Legislative Activity

Comprehensive Energy Legislation. The House Subcommittee on Energy and Air Quality (Committee on Energy and Commerce), under the direction of chairman Joe Barton (R-TX), marked-up [The Energy Policy Act of 2003](#) on April 1, with 22 amendments. Refer to the following sections of interest: Title IV: DOE Programs, pg, 183; Subtitle E: Fossil Energy Pg. 211; and Title VIII: Coal, pg 301. The Senate will begin mark-up of their energy bill April 8, to be reported May 1. The staff draft does not open the Arctic National Wildlife Refuge for oil development. Title XI - Climate Change creates a White House Office of Climate Change, charged with developing a strategic plan to contain greenhouse gas emissions. "[Staff draft of Senate energy bill does not open ANWR for oil development](#)," Senate Committee on Energy and Natural Resources, March 28, 2003.

Representative Olver (D-MA) introduced H.R.1245. The National Greenhouse Gas Emissions Inventory Act of 2003 would amend the Clean Air Act to establish a mandatory inventory, registry, and information system of U.S. GHG emissions. March 12, 2003, Committee on Energy and Commerce.

Representative Whitfield (R-KY) introduced H.R.1213. The Clean Coal Power Act of 2003 would facilitate the production and generation of clean coal-based power, including carbon sequestration, through funding projects and initiating clean coal production tax credits. March 11, 2003.

Introduced February: Clean Power Act of 2003, [S.366](#), Jeffords.

Introduced January:

The Climate Stewardship Act of 2003, [S.139](#), McCain and Lieberman.

National Greenhouse Gas Emissions Inventory and Registry Act of 2003, [S.194](#), Corzine, Lieberman, Jeffords.

The Global Climate Security Act of 2003, [S.17](#), Daschle.

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.