



# THE CARBON SEQUESTRATION NEWSLETTER

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## Sequestration in the News

### Technology

**Enhanced frozen methane recovery.** Researchers at the Pacific Northwest National Laboratory, University of Alaska at Fairbanks and BP Exploration Alaska Inc will examine a new concept to simplify and maximize methane production from frozen gas hydrates beneath the ocean floor or permafrost by injecting and sequestering CO<sub>2</sub>. The project is a first collaboration between PNNL and the [Arctic Energy Technology Laboratory](#). “DOE-industry partnership targets carbon 'swap' technology,” *Inside Energy /with Federal Lands*, December 2, 2002.

**Australian government looks to coal gasification and sequestration over other GHG mitigation options.** According to this article, the Australian Federal Government is directing its focus on the coal industry because coal gasification and CO<sub>2</sub> sequestration technologies offer the most affordable options for large scale GHG mitigation. “[Red light for green power](#),” *Sydney Morning Herald*, December 18, 2002.

**Canadian coal plant retrofit with CO<sub>2</sub> capture and sequestration.** The Canadian Clean Power Coalition (CCPC), a group of coal producers and coal-dependent power producers, announces a plan to retrofit an existing 300-MW coal-fired plant with new capture technology by 2007 and build a new zero emissions 300-megawatt plant by 2010. Syngas is targeted as the most promising technology for use in a new zero emissions greenfield plant. “Detested by environmentalists, coal may be fuel of the future: New technology may enable burning without any emissions,” *Edmonton Journal* November 28, 2002.

**Microbes to mitigate climate change.** A \$3 million grant to gene scientists from the Energy Department could allow the engineering of a bacterium to produce hydrogen or absorb CO<sub>2</sub>. “Customized bacteria could produce energy, reduce GHGs,” *Greenwire*, November 22, 2002.

**Geologic sequestration project in West Virginia.** [American Electric Power's Mountaineer Plant](#) in WV will be the site for a \$4.2 million 18 month geologic carbon sequestration research project funded by DOE and a consortium of public and private sector participants. Scott Klara, program manager for carbon sequestration at NETL, is quoted in the *Charleston Daily Mail*, saying the project will specifically answer the questions of whether and how much compressed CO<sub>2</sub> the Mount Simon sandstone formation can hold. Scientists from Battelle will lead the project. The Mount Simon formation ranges from 3,000 to 12,000 feet deep beneath the Ohio River Valley and extends as far west as Illinois and Wisconsin. “AEP'S Mountaineer Plant to be Site for Research Project on Climate Change Technology,” *PR Newswire*, November 21, 2002 and “Project will determine if gas can go underground Government footing the bill for most of the work,” *Charleston Daily Mail* December 2, 2002. Also, “Energy Technology: AEP, Battelle To Study Storing CO<sub>2</sub> Underground,” *New Technology Week*, December 2, 2002.

**Cleveland Plain Dealer highlights sequestration.** An article highlights the NETL program’s goals and activities. “Looking to stash greenhouse gases,” *The Plain Dealer*, December 26, 2002.

**Shell's alternative scenarios.** Royal Dutch/Shell Group uses a series of scenarios to anticipate and deliver energy-environment solutions. One scenario considers a continuation of the evolutionary progression from coal to gas to renewables or possibly to nuclear by 2050. A second scenario shows a progression to a hydrogen economy through advanced hydrocarbon technologies and CO<sub>2</sub> sequestration. "Shell sees fossil fuels central to global energy supply through 2050," *Octane Week*, November 25, 2002.

**Global warming news.** Articles in *CNN*, the *New York Times* and others have appeared in the past month focusing on evidence suggesting a possible global warming trend. A panel of scientists at a meeting of the American Geophysical Union discussed reducing sea ice across the Arctic Ocean, melting the ice sheet in Greenland and spreading shrubs into the Alaskan tundra. "[Compelling evidence of global warming](#)," *CNN*, December 7, 2002, "[Temperatures Are Likely to Go From Warm to Warmer](#)," *New York Times*, December 31, 2002, a new study of snowfall on Canada's highest peak, Mount Logan, that provides longer-term evidence that atmospheric temperatures are on the rise, *ENN*, December 12, 2002.

### Ocean Sequestration

**Modeling climate feedbacks and ocean sequestration.** Researchers at the University of Illinois at Urbana-Champaign developed an atmosphere-ocean, climate-carbon cycle model to study the impact of climate change on the oceans' ability to store injected CO<sub>2</sub> at different locations and depths. With feedback mechanisms, retention time in the Atlantic Ocean is superior to the Pacific Ocean. The findings, funded by DOE, were presented at the American Geophysical Union meeting. "[Climate change will affect carbon sequestration in oceans, scientists say](#)," *Science Daily*, December 4, 2002. Also see "[A short-term sink for atmospheric CO<sub>2</sub> in subtropical mode water of the North Atlantic Ocean](#)," *Nature*, December 2002.

**Ocean algal blooms less efficient than lab studies and emit non-CO<sub>2</sub> GHGs.** Iron fertilization involves adding iron sulphate to the ocean surface to encourage the growth of phytoplankton. The Southern Ocean Iron Fertilization Experiment (SOFEX) showed that although the bulk of the carbon absorbed by the phytoplankton stayed near the surface, one metric ton of iron spread at the ocean surface could force 1,000 metric tons of carbon below 100 meters, 100 times less than indicated in previous laboratory experiments. In addition, the blooms produced other GHGs, such as methyl bromide and isoprene. Preliminary findings were revealed at a meeting of the American Geophysical Union. "Ocean tests raise doubts over use of algae as carbon sink," *Nature*, December 26, 2002.

### Terrestrial

**Meta-analyses of the biotic effects of global warming.** Two articles in the journal *Nature* investigate the effect of climate change on natural ecosystems. In an analysis of more than 1,700 species, researchers show that recent biological trends match climate change predictions in a robust correlation. Significant range shifts average 6.1 km per decade towards the poles. Spring events, such as egg laying and tree leaf-out, were shown to occur a mean of 2.3 days per decade earlier in the year. These analyses generates 'very high confidence' that climate change is already affecting living systems according to several definitions of a 'systematic trend' from the Intergovernmental Panel on Climate Change. "A globally coherent fingerprint of climate change impacts across natural systems," and "Fingerprints of global warming on wild animals and plants," *Nature*, January 2, 2003.

**Climate change depresses plant growth.** An experiment conducted at 128 grassland plots in California found that a combination of 1) increased atmospheric CO<sub>2</sub> to 700 ppm, 2) increased temperature of one degree F on average, 3) increased nitrogen deposition; and 4) increased rainfall stunted plant growth. The research was presented in the December 6 issue of the *Journal Science*. "[Warming may stunt plants, study finds](#)," *MSNBC*, December 6.

## Sequestration in the News, Cont'd

**Rainfall variability reduces productivity** but increases the diversity of grasslands, according to the results of a four-year field study conducted at NSF's Konza Prairie Long Term Ecological Research (LTER). The biologists, of Kansas State University, NSF, and UC Santa Barbara, found that more extreme swings in rainfall patterns, without changing total amount of rainfall received in a growing season, elicited responses similar to those that would occur under drought conditions. NSF, USDA, and DOE funded the study. Results are published the December 13th issue of the journal *Science*. "[Increase in rainfall variability related to global climate change; Impacts on ecosystems are greater than previously anticipated](#)," National Science Foundation via *Science Daily*, December 13, 2002.

### Non-CO2 GHGs

**Methane and rice cultivation.** A NASA-funded study observed a decline in the net methane emissions over the last 20 years. Changes to rice farming practices in China may have contributed to the decrease. "[Shifts in Rice Farming Practices in China Reduce Greenhouse gas Methane](#)," NASA/Goddard Space Flight Center, December 20, 2002.

### Carbon Trading

**Slovakia and Japan trade carbon in first emissions trading deal under the Kyoto Protocol.** The government of Slovakia sold \$1-million worth, of GHG emission credits, or 200,000 AAUs, to a Japanese trading house by way of the international emissions trading mechanism outlined by Kyoto. Evolution Markets acted as broker. "[First Kyoto Greenhouse Deal Snapped Up by Slovakia](#)," *Reuters*, December 6, 2002.

**European Union environment ministers to create international GHG emissions trading system.** Subject to final approval by the European parliament, the scheme will cap the amount of CO<sub>2</sub> that industries can emit from 2005, while allowing them to trade emissions rights with other firms in the 15-bloc nation. The UK and Denmark already have voluntary emissions trading schemes, and Norwegians tax offshore production CO<sub>2</sub> emissions at \$32/t. "[EU agrees pollution market: On the EU emissions trading decision](#)," *BBC*, December 9, 2002. The European Commission has retained CDC IXIS, with the help of PricewaterhouseCoopers and the law firm Baker & McKenzie, to advise on the drafting of the technical, legal and IT aspects of the future GHG registry systems of the Member States. [CDC IXIS](#), December 16, 2002.

### Policy

**UK Climate Change Levy.** This paper examines cost effectiveness of UK's climate change levy (CCL), implications on competitiveness of firms, and environmental impact. The paper elucidates pros and cons of the CCL energy tax with respect to an emission trading scheme. "UK's climate change levy: cost effectiveness, competitiveness and environmental impacts," *Energy policy*, January 2003.

**Electricity generators and additional costs of separation, sequestration.** The energy regulation institutions of North America, the European Union, and Japan are beginning to address the issue of separation and disposal of CO<sub>2</sub> from power plants. The article mentions the Siemens Westinghouse solid oxide fuel cell development program, chemical looping and oxyfuels systems, the ZECA process, underground coal gasification technology, natural gas gasification, and simple amine scrubbing systems. "MPS review carbon reduction - Does competition rule out CO<sub>2</sub> capture?" *Modern Power Systems*, November 30, 2002.

**Canada ratifies Kyoto Accord.** Canada's House of Commons voted to ratify the Kyoto climate change accord. *Washington Post*, December 10, 2002. [Environment Canada](#), December 16, 2002. Agriculture Canada is encouraging farmers to take a look at ways of reducing GHG emissions. "[Farmers urged to cut greenhouse gases](#)," *The Globe & Mail*, December 1, 2002.

**Capital cycles and the timing of climate change policy.** A policy series report examines patterns of capital investment and retirement, and discusses implications for climate change policy. The report combines analysis of investment patterns with interviews of decision-makers in leading U.S. firms. [Pew Center on Climate Change](#), November 18, 2002.

## Sequestration in the News, Cont'd

**Three US-based environmental groups sue EPA over climate change.** The International Center for Technology Assessment (ICTA), Sierra Club and Greenpeace are suing the US Environmental Protection Agency inaction under requirements of the Clean Air Act to limit air pollution from vehicles that endanger public health or welfare. "[Groups sue US EPA for climate change,](#)" *Edie Weekly Summaries*, December 13, 2002.

## Events and Announcements

**Abstract request: 12<sup>th</sup> International Conference on Coal Science.** Hosted by the Australian Institute of Energy, the [International Energy Agency & IEA Clean Coal Centre at the Cairns Convention Centre](#), Australia, November 2nd – 6<sup>th</sup> 2003. Abstracts are due February 1st 2003, e-mail to [iccs@aie.org.au](mailto:iccs@aie.org.au). Topics covered include global warming, greenhouse gas emissions, CO<sub>2</sub> mitigation and sequestration.

**NETL workshop on non-liquid CO<sub>2</sub> separation and capture scrubbing technologies.** A workshop to assess state-of-the-art non-liquid capture technologies and provide a detailed tour of a new flexible Modular CO<sub>2</sub> Capture Facility (MCCF) will be offered February 25 and 26 at the Pittsburgh NETL facility. NETL is soliciting potential partners to have in-development non-liquid capture technologies for flue gas, fuel gas or other gas streams evaluated at the NETL MCCF. If interested, please contact Curt White at [curt.white@netl.doe.gov](mailto:curt.white@netl.doe.gov) before February 4, 2003.

**Abstract request: NETL's Second National Conference on Carbon Sequestration, *Developing and Validating the Technology Base to Reduce Carbon Intensity*** will be held May 5-8, 2003 in Alexandria, VA. The First National Conference was held May 2001 and was attended by over 400 national and international experts from government, academia, and industry. You are invited to submit a paper proposal that builds on what was presented at the 2001 Conference, or breaks new ground. The Steering Committee and National Energy Technology Laboratory staff will be looking for innovative ideas, as well as progress reports on development of carbon sequestration strategies to meet the national goal of an 18% reduction in carbon intensity. Guidelines for abstracts: Submit a 100 word abstract via e-mail to [carbonsq@exchangemonitor.com](mailto:carbonsq@exchangemonitor.com), by Feb. 7, 2003.

**Regional Carbon Sequestration Partnerships web area.** A new web area entitled "[Regional Carbon Sequestration Partnerships](#)" has been added to the NETL website. The area contains the DOE solicitation, frequently asked questions, and NETL contacts. NETL, December 11, 2002.

**Two DOE Solicitations.** The Department of Energy Small Business Innovation Research will select 200 Phase I grant applications for up to \$100,000 over a period of six to nine months. The DOE Office of Science will make approximately \$400 million available for grants in basic energy, biological and environmental sciences in FY 2003. [Small Business Innovation Research](#). *Office of Science Financial Assistance Program --Notice 03-01*.

**Climate science and mass media writers.** A conference for journalists and news editors January 13 at Tufts University will offer participants access to prominent thinkers about climate change, including: Steve Curwood, host and producer, "Living On Earth," NPR, Dr. Moomaw, coordinating lead author, IPCC Working Group III (emissions reductions); and Susan F. Tierney, former US Asst. Secretary of Energy, chairman of board of The Energy Foundation, Senior Vice President, Lexecon, Inc. "[Reporting on Nature's Deadline](#)."

**Voluntary GHG Reporting Rules.** The Departments of Energy and Agriculture, and the Environmental Protection Agency announce workshops to help improve the Department of Energy's Voluntary Greenhouse Gas Reporting Program and related programs. Dates for the workshops organized by USDA are: [Agriculture Accounting Rules and Guidelines](#), January 14-15, 2003 and [Forest Accounting Rules and Guidelines](#), January 23, 2003. The three workshops organized by DOE took place in December.

**Carbon Finance 2003** will be held in London January 23 and 24. [Arranged by Environmental Finance](#).

**A European CO<sub>2</sub> Capture and Storage Seminar** entitled 'FP6: opportunities for [CO<sub>2</sub> capture and storage](#)' will be held in London, UK on 8 January 2003 with the support of the Research DG of the European Commission, Technology Initiatives Ltd, as the coordinator of CO2NET.

## Events and Announcements Cont'd

**Electric Utilities Environmental Conference.** The [6th Annual Conference on Air Quality & Global Climate Change](#) will be held January 27-30, 2003, in Tucson, Arizona. The conference will cover policy, trading, voluntary programs, and science and technology options, including carbon sequestration. DOE is one of the conference sponsors, along with EPA, EEI, EPRI, and A&WMA.

**Emissions trading and project-based mechanisms :** Synergies between emerging regimes. [The workshop](#) will be held in Budapest, Hungary, February 7 and 8 and will cover such issues as the role of project-based activities in trading regimes, ensuring coherent accounting and institution building, and linking different domestic, regional and international trading regimes. It is organized by FIELD, UNEP, and CEU. For further information, e-mail [Noemi Byrd](#).

**NETL at the February AAAS Meetings.** Carbon Sequestration is on the agenda at [The American Association for the Advancement of Science annual meeting](#), which will be held February 13-18, 2003, in Denver, Colorado. NETL has organized two symposia, "Comparative Assessment: Carbon Sequestration as a Greenhouse Gas Mitigation Strategy" and "Climate Change Mitigation Strategy: Technical Challenges for Carbon Sequestration," which will be included in the Dealing with Global Change track on Monday, February 17, 2003.

**The [Earth Technologies Forum](#)** will be held April 22-24, 2003 in Washington, DC.

**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. A special session on "Geological Sequestration of CO<sub>2</sub>" has been arranged.

**Three new NETL project factsheets on the web.** "Optimal Geological Environments for Carbon Dioxide Disposal in Saline Aquifers," "Geologic Screening Criteria for Sequestration of CO<sub>2</sub> in Coal: Quantifying Potential of the Black Warrior Coalbed Methane in Fairway, Alabama," "Unminable Coalbeds & Enhancing Methane Production and Sequestering Carbon Dioxide" have been posted on the [NETL website](#) reference shelf. December 5, 2002.

## Recent Publications

**US greenhouse gas emissions** fell by 1.2 percent last year, the largest decrease in a decade, due in part to slow economic growth and a milder winter. "[Emissions of Greenhouse Gases in the United States 2001](#)," DOE EIA, December 2002. "[Greenhouse Gases Decrease Experts Cite U.S. Economic Decline, Warm Winter](#)," *Washington Post*, December 21, 2002.

**[USDA terrestrial sequestration conference proceedings](#).** 168 presentations from USDA Symposium on Natural Resource Management to Offset Greenhouse Gas Emissions in Raleigh cover landowner behavior and incentives, methodology for carbon estimation datasets, and other terrestrial carbon sequestration issues. November 19-21, USDA.

**IETA 2002 conference proceedings.** "[Forum on the State and Development of The Greenhouse Gas Market](#)," the [International Emissions Trading Association's Annual Conference](#) in Brussels, Belgium covered market participants, trends, and U.S. state's actions in the GHG stabilization goal. The keynote address was by EU Commissioner Margot Wallström. IETA, December 4-6, 2002.

**Netherlands and GHGs.** This report focuses on what can be done reduce GHG emissions in the Netherlands. "[Final Report Dutch National Research Programme on Global Air Pollution and Climate Change](#)," Focal Point Climate Change, December 2002. It is available free by request.

## Recent Publications Cont'd

**World energy policies.** An analysis of developments in energy policies and markets in the Member countries of the International Energy Agency. CO<sub>2</sub> emissions by sector in selected countries are provided. "[Energy Policies of IEA Countries - 2002 Compendium](#)," IEA, December 2002.

**World GHG Markets.** Reports prepared on behalf of the NSS program of the World Bank give an overview of opportunities and current status of the Latin American GHG market. An updated version of 'World GHG Market' is also available. "[The Latin American GHG Market](#)," Grütter Consulting, December 2002.

**Three recent working papers from CICERO:** "[Market power in the market for greenhouse gas emission permits - the interplay with the fossil fuel markets](#);" "[Enforcing the climate regime: Game theory and the Marrakesh Accords](#);" "[Estimating and managing uncertainties in order to detect terrestrial greenhouse gas removals](#)." CICERO, December 2002.

**IPCC next steps.** The Intergovernmental Panel on Climate Change established the beginnings of anthropogenic climate change and the merits of a concerted response. Gaps in current science and integration with socioeconomic science need to be addressed to determine appropriate mitigation and adaptation strategies, according to this article. "What next for IPCC?" *Environment*, December 2002,

**Game methodology to analyze long-term climate policy prospects.** Players sequentially choose the best policy, among a series of options, while reacting to past moves of the other players. The non-cooperative equilibrium arising from a five-stage sequential game with two large players (Annex B and non-Annex B regions, in Kyoto and beyond Kyoto scenarios) is studied. "Prospective analysis of beyond Kyoto climate policy: a sequential game framework," *Energy Policy*, December 2002.

**Forest carbon accounting tool.** Building on a decade of work in the development of the C Budget Model of the Canadian Forest Sector (CBM-CFS2), the Canadian Forest Service Carbon Accounting Team is working with the Model Forest Network to develop an operational scale carbon accounting tool and its supporting regional databases. The tool aims to comply with evolving international accounting rules and flexible in addressing the types of scenarios and management questions forest managers have when assessing alternate management activities. "[Forest carbon accounting at the operational scale](#)," *Forestry chronicle*, October 2002.

## Legislative Activity

**New EPW Senate chair.** The Senate Environment and Public Works Committee will be chaired by Sen. James M. Inhofe (R-Ok). "[For Senate Committee, a Big Change New Environment Chairman Opposes Many Protections](#)," *Washington Post*, December 30, 2002.

**Database of state and local GHG reduction programs.** 13 new case studies have been added to the database as of December 15. [Pew Center on Climate Change](#).

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

*We encourage you to pass this along to those whom you believe will be interested.*