

THE CARBON SEQUESTRATION NEWSLETTER

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

March 2003

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Sequestration in the News

U.S. carbon sequestration leadership forum. President Bush and Secretary Abraham announced the creation of an international Carbon Sequestration Leadership Forum to advance carbon capture and storage technologies. The Forum will be organized by DOE and the U.S. State Department and joined by representatives from invited countries. "[U.S. Department of Energy and U.S. Department of State to Announce Carbon Capture and Storage Initiatives](#)," U.S. Department of State, February 26, 2003.

FutureGen first zero-emissions coal plant. The U.S. government will sponsor the world's first coal-based, zero-emissions electricity and hydrogen production plant through a \$1 billion, 10-year public-private partnership. CO₂ emissions from the 275 MW gasification plant will be captured and stored. The DOE is seeking assistance from more than 20 countries, including the EU, Australia, India, Japan, South Africa and China. Site selection will take place in the first phase of the initiative. "[U.S. Seeking Cleaner Model of Coal Plant](#)," *The New York Times*, February 28, 2003.

U.S. News & World Report. This article discusses the Sleipner, Weyburn, and Ohio valley projects, as well as deep sea sequestration, ocean fertilizations, capture cost, trading carbon and the Chicago Climate Exchange. "[A Deep-Six Fix](#)," *U.S. News & World Report*, February 10, 2003.

AAAS webpage. Curt White, lead of the NETL Carbon Sequestration Science Focus Area, is featured in an audio news clip from the American Association for the Advancement of Science carbon sequestration symposia sponsored by NETL at the AAAS annual meeting in Denver. The clip can be accessed on the [AAAS website](#); click on February 17th: Carbon Cloisters to listen.

Economist article combines hydrogen and sequestration processes. The opportunity for hydrogen production from fossil fuels combined with CO₂ capture and storage is highlighted in this article. "These fuelish things," *The Economist*, February 15, 2003.

Mechanical Engineering. Mineral carbonation and other carbon sequestration options are presented in an article featuring Bob Kane of DOE. "[Carbon underground](#)," *Mechanical Engineering*, February 2003.

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.

DOE and EPA's Climate VISION voluntary initiative. A voluntary public-private partnership to encourage industry to set targets for GHG reductions called "Voluntary Innovative Sector Initiatives: Opportunities Now" includes the American Petroleum Institute, American Forest and Paper Association, the National Rural Electric Cooperative Association, American Public Power Association, the National Mining Association, the American Iron and Steel Institute, the Edison Electric Institute, the Association of American Railroads, and the Alliance of Automobile Manufacturers. [U.S. DOE](#), February 12, 2003.

Corporate accounting for CO₂. ChevronTexaco Corp.'s proprietary electronic information system for estimating and managing greenhouse gas emissions and energy utilization data is now available free to the energy industry. SANGEA (TM) Energy and Emissions Estimating System 2.0 covers exploration and production, refining and marketing, petrochemicals, transportation, electricity generation, manufacturing, real estate and coal activities. "[Chevron Texaco greenhouse gas management system now available to industry](#)," *PR NewsWire*, February 10, 2003.

Capture

Solid adsorbent technology development. A technology combining lithium silicate (Li₄SiO₄) absorbent with a rotary heat exchanger absorbs CO₂ in the temperature range 450-700 deg C and releases it above 700 deg C. Li₄SiO₄ is able to capture and release roughly 500 times its own volume of CO₂ and the use of a rotary heat exchanger enables continuous operation. The cost of capturing 1 ton of CO₂ is estimated to be roughly \$20. Alstom KK in Japan and Toshiba Corporate R&D Center (developer of the CO₂ absorbing material) presented a paper at the 21st annual meeting of the Japanese Society of Energy and Resources, June 2002. "Coal-fired plant technology; the CO₂ wheel: A revolutionary approach to carbon dioxide capture," *Modern Power System*, January 31, 2003.

Synthetic trees for CO₂ capture. An artificial tree designed by Klaus Lackner captures CO₂ from the air. The predicted capture rate is 90,000 tons of CO₂ per year, although a specific absorbent has not yet been chosen and engineering issues such as absorbent regeneration have yet to be worked out. "[Synthetic trees could purify air](#)," *BBC World News*, February 21, 2003.

Sequestration in the News, Cont'd

Flare gas recovery system. Emissions of CO₂ and hydrogen sulphide from Statoil's refinery near Bergen, Norway will be reduced by a new flare gas recovery plant. The plant can recover about 5 tons of gas per hour, sufficient to cut flaring by 50%, reducing annual CO₂ and hydrogen sulphide emissions by 42,000 and 50 tons respectively. The company expects to recover its \$5.08 million investment in the recovery plant within three years. The system was developed by ABB Gas Technology in co-operation with Statoil. "[Statoil cuts emissions with new flare gas recovery plant](#)," *Chemical News & Intelligence*, January 27, 2003.

Power plant CO₂ emissions used to produce methanol or gasoline. Reco-Maxam Solar Energy, LLC has announced that it will build a prototype power plant which includes a facility to capture CO₂ and use it to produce either hydrogen or simple liquid fuels. The CO₂ is reduced to carbon monoxide and oxygen using a proprietary direct solar dissociation process, followed by a water-gas shift reaction to produce hydrogen from the water. Additionally, the carbon monoxide and hydrogen can be synthesized into liquid fuels. "[Maxam Gold Corporation Enters Solar Energy Industry in Quest for Clean Environment](#)", *E-Wire*, February 5, 2003.

Stanford Partners with Industry to Form Global Climate & Energy Project. Stanford University's \$225-million, ten-year sponsorship deal with ExxonMobil (Esso), General Electric (GE), Schlumberger and E.ON, form the Global Climate & Energy Project (G-CEP). Carbon sequestration technologies are a focus of G-CEP. All patents resulting from Stanford's research will ultimately be vested in Stanford, but the sponsors will be granted first-usage rights for five years, free of royalties. "Fuel for thought," *Nature*, February 6, 2003. The [G-CEP](#).

Geologic Storage

Plans for capturing CO₂ as a commodity and resource. Houston-based Falcon Environmental Services plans to operate a commercially viable process to capture, gather, aggregate, store and distribute CO₂ for enhanced oil recovery, coal bed methane projects and sequestration in the Dallas/ Ft. Worth region. FES's facility currently has natural gas capacity of 10-12 bcf, upgradeable to 24bcf, and planned daily throughput of up to 350mm bcf, and carbon storage will be double the natural gas storage capacity. Contact: Mike Moore (713) 623-5942. "[Falcon Environmental Services A CO₂ Aggregation Facility](#)," *The Risk Desk weekly*, volume 3 (1).

Focus on ECBM. The fifth issue of C3 Views, the second of a three part series devoted to greenhouse gas technologies, focuses on Enhanced Coalbed Methane and Biomass Power. "[C3 Views Newsletter](#)," *Climate Change Central*, Spring 2003.

Terrestrial

Rainforest tree grows faster in high CO₂ environment. A botanist in Brazil has discovered that at 720 ppm CO₂ – the predicted CO₂ level for 2075 and double today's concentrations of 360 ppm – photosynthesis doubles for the Jatoba tree, or hymenaea. The genetic mechanism which causes increased CO₂ absorption could be isolated. "[Rainforest tree eats up pollution](#)," *BBC Science*, February 24, 2003.

European Parliament support of regulations monitoring forests. The European Commission's draft plan brings together existing provisions and new schemes for monitoring carbon sequestration, biodiversity, and climate change into a single text. "[Environment: EP supports new forest focus programme](#)," *European Report*, February 15, 2003.

Swedish policy strategies to reduce CO₂ emissions. Given adequate incentive, the forest industry could contribute significant renewable energy to the energy system.. "[Strategic choices: Swedish climate intervention policies and the forest industry's role in reducing CO₂ emissions](#)," *Energy Policy*, Volume 31 (10) 2003.

Forests response to increased CO₂ lessens over time. Results from NC loblolly pines show that for the first four years, tree growth increased by up to 25 percent when ambient levels of CO₂ were increased 50 percent, but then trees settle back to growing 6 percent faster than controls. "[A fading green hope for climate](#)," *US News & World Report*, February 10, 2003

Soil carbon sequestration in Saskatchewan. Two Saskatchewan farm lobby groups, the Saskatchewan Soil Conservation Association (SSCA) and the Agricultural Producers Association of Saskatchewan (APAS) advocate the potential for farmers to gain monetary value for farmland conservation practices that reduce GHGs. "[Group wants farmers paid for carbon sinks](#)," *The Star Phoenix* (Saskatoon), February 20, 2003.

2002 Farm Bill to pay farmers who use carbon-friendly methods. The 2002 Farm Bill has provisions to pay farmers to use these carbon-friendly farming techniques, either as a flat fee per acre or according to the amount of carbon captured, as much as 10-15 tons of carbon per acre. "[Get Paid for Storing Carbon](#)," *Soybean Digest*, February, 2003.

Soil carbon flux in response to warming. In a decade-long soil warming experiment in a mid-latitude hardwood forest, a group of researchers from Massachusetts documented changes in soil carbon and nitrogen cycling in order to investigate the consequences of these changes for the climate system. Soil warming accelerates soil organic matter decay and CO₂ fluxes to the atmosphere, but this response is small and short-lived for a mid-latitude forest, because of the limited size of the labile soil carbon pool. Warming is also shown to increase the availability of mineral nitrogen to plants. "Soil Warming and Carbon-Cycle Feedbacks to the Climate System," *Science*, December 13, 2002.

Trading and Policy

Seven Attorneys General push for revisions of the CAA. The Bush administration's climate change policy faces its third lawsuit since December, under the premise that the U.S. Environmental Protection Agency is 20 years overdue in its legal requirement to review, and if necessary revise, the Clean Air Act's New Source Performance Standards for fossil-fuel fired electric facilities. A coalition of seven Democratic attorneys general from New York, Connecticut, Maine, Massachusetts, New Jersey, Rhode Island and Washington, has been joined by California, Illinois, Wisconsin, Delaware and Washington D.C. "[States to sue Bush administration on pollution](#)," *Reuters*, February 20, 2003.

The US and New Zealand enhance bilateral talks. Practical cooperation efforts to stabilize GHGs will be pursued. "[US and New Zealand pursue enhanced climate change cooperation](#)," *Environmental Progress*, February 6, 2003.

White House to spend \$4.4 billion on climate change. The Bush administration has asked Congress to provide more than \$30 billion in the 2004 budget for conservation, climate change, and clean energy programs. This includes \$4.4 billion for climate change research and related programs, with \$1.7 billion spent on climate R&D to improve the understanding of global warming, and \$500 million over 4 years to the Global Environment Facility, a UN affiliated fund which transfers energy and carbon sequestration technologies to developing countries. "White House says it wants \$30B for environment, resources," *Platts Inside Energy*, February 10, 2003.

Climate risk to businesses. A poll of the chairmen of the world's 500 largest companies found that 35-40 percent said they were taking action to protect their businesses from climate risk. Some companies in the heavy industries could see their value lose as much as 40 percent from climate effects. "Carbon Finance and the Global Equity Markets," contact paul@cdproject.net. "[Companies fail to act on climate risk](#)," *Financial Times*, February 17, 2003

Events and Announcements, Cont'd

Ocean Carbon Sequestration Solicitation. The U.S. Department of Energy requests proposals for basic research projects on the purposeful enhancement of carbon sequestration in the oceans. Final applications are due 3/20/03. Contact Anna Palmisano, DOE, at (301) 903-9963 or refer to Program Notice 03-15 on the [Office of Science Grants and Contracts](#) website.

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. <http://sbir.er.doe.gov/sbir>, and <http://e-center.doe.gov/>

Call for papers for the joint CarboEurope / Global Carbon Project conference. The conference will cover the terrestrial continental carbon budget (Europe / Siberia / Amazon); process understanding; carbon management in forest and non-forest ecosystems; verification and carbon monitoring. It will be held in Lisbon, 19-21 March, 2003. Dr. Annette Freibauer email: afreib@bgc-jena.mpg.de, [3rd CarboEurope Meeting](#).

Climate change for business. [Climate change: science, impacts and responses](#) will be held in London March 31 – April 4. Arranged by Imperial College in collaboration with The Tyndall Centre for Climate Change Research and others, it will cover underlying science and business responses.

CERES 2003 Conference. "[Advancing Sustainable Governance](#)" will be held April 1-2 at the New York Hilton. The topic of global climate change will be one of the tracks.

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 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.

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.

Events and Announcements, Cont'd

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 CO₂" has been arranged. For more information, see the [webpage](#) click on session O-22.

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

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.

Call for papers: the American Institute of Chemical Engineers annual meeting. The Environmental Division and the Catalysis and Reaction Engineering Division 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. AIChE.

Recent Publications

NETL factsheets. As relatively stable CO₂ repositories, natural geologic deposits of high-purity carbon dioxide allow researchers to study the effects of long-term CO₂ exposure on reservoir minerals. "[Natural analogs for geologic sequestration](#)," NETL, February 4, 2003. Conventional processes to remove CO₂ from coal syngas utilize a solvent for removal, and subsequent solvent regeneration by heat at a lowered pressure. A new, high-pressure process cools coal syngas and feeds it into a reactor with water, forming gas hydrates which capture the CO₂ in solid hydrate crystals. The water/hydrate slurry is easily separated and decomposed, resulting in a stream of high-pressure CO₂ ready for sequestration. This reduces costs by avoiding CO₂ compression. "[Novel Process for Upgrading Coal Syngas](#)," NETL, February 2003. NETL has designed a modular test facility for use in testing new CO₂ capture technologies. The facility will generate both coal combustion flue gas and a process gas – equivalent to a coal gasification system or similar system – to test new capture technologies. "[Modular Carbon Dioxide Capture Facility](#)," NETL, February 2003.

Sequestration R&D tracking website. A website, <http://carbonsequestration.us/>, compiled with support from DOE, contains information on carbon sequestration R&D projects organized and presented from three federal government databases.

High terrestrial carbon storage potential. The Energy research Centre of the Netherlands released a report developing a methodology for estimating cost-curves of carbon sequestration with afforestation activities and its combination with existing cost-curves of carbon abatement in the energy sector. The report concludes that when the supply-curves of afforestation and energy are combined, the total emission reductions in 2010 are at least 15% larger than in the case of the energy sector alone. "[The Economics of Including Carbon Sinks in Climate Change Policy - Evaluating the carbon supply-curve through afforestation in Latin America](#)," ECN, February 2003.

Tyndall Centre researchers examine carbon sequestration processes. The first stage of the study, a pilot assessment of carbon sequestration (Tyndall research project IT1.22), is complete. A final overview and the final report [2.6MB] examine sequestration against several criteria, including economic, environmental, political, social, legal and technical factors. A larger, multi-disciplinary team has been assembled to implement a more ambitious integrated assessment of the potential for geologic sequestration in the UK (Tyndall research project T2.21). [Tyndall Centre](#), February 2003.

NAS Report on the CCSP Strategic Plan. According to a prepublication of a National Academies report, the Bush administration has taken an important step toward better understanding global warming. "[Planning Climate and Global Change Research: A Review of the Draft U.S. Climate Change Science Program Strategic Plan](#)," National Academy of Sciences, February 2003. See also "[Report gives Bush's global warming efforts mixed rating](#)," *The Washington Post*, February 26, 2003.

Recent Publications continued

UK report on low carbon energy technologies. Substantial cuts in emissions of CO₂ can be achieved without major nuclear energy increase and without stunting economic growth, according to a report on energy commissioned for the prime minister's strategy unit. Decarbonisation of fossil fuels with sequestration of CO₂ and renewable energy technology cost trends are also considered. The UK Secretary of State for Environment, Food and Rural Affairs, launched the [report](#) from Washington, DC. Imperial College Centre for Energy Policy and Technology (ICCEPT). "[UK Government: We can move toward a near-zero carbon future](#)," *Hoover's* February 4, 2003.

The new issue of Climate Policy journal focuses on EU implementation challenges. Papers include: "The EU as a frontrunner on GHG emissions trading: how did it happen and will the EU succeed?"; and "Quantifying the UK's incentives for low carbon investment," February 2003, [Climate Policy Issue 3 \(1\)](#).

Possible negative welfare effects of GHG trading. Energy system models show that trading GHGs internationally could reduce compliance costs, but international emission trading could be welfare decreasing, according to this study. The negative terms of trade and tax-interaction effects wipe out the primary income gains from emission trading. "[Is International Emissions Trading Always Beneficial?](#)" Report no 93, MIT Joint Program on the Science and Policy of Global Change, Cambridge, MA.

The summary version of the annual EIA GHG report published last year, is now available. "[Emissions of greenhouse gases in the United States 2001](#)," The Energy Information Administration, February 2003.

The "Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2001" is now available as part of a 30 day public comment period. Notable changes to this year's [report](#) include a new categorization of emissions from the electricity sector, and a new annex detailing the background behind fossil fuel carbon coefficients. Technical comments or suggestions for improvement should be sent to Bill Irving at irving.bill@epa.

A new global resource centre: the Climate Business Network. Established to further the interests of Annex I and Non-Annex I countries, CBNet contains a range of information that will be required for GHG emissions reduction activities. [Climate Business Network \(CBNet\)](#).

GHG Accounting Rules and Guidelines in Agriculture and Forestry. Presentations given by USDA and DOE representatives and invited speakers at the USDA [technical meetings](#) are now available. USDA, February 2003.

Proceedings of the 2001 Berlin Conference on the Human Dimensions of Global Environmental Change. The Proceedings from "[Global Environmental Change and the Nation State](#)" include a peer-reviewed selection of the 50 best papers presented at the 2001 Berlin Conference. Glogov, February 2003.

Legislative Activity

CO₂ and Clear Skies debate. As ranking minority member of the Senate panel that handles clean air and climate change, Senator Tom Carper (D-Del.) will pursue legislation to curb power plant emissions of CO₂ as part of a multi-pollutant bill. Carper also said he would request hearings on the CO₂ cap-and-trade bill, S. 139, introduced this year by Senators Lieberman and McCain. "Sen. Carper to push CO₂ provisions as 'Clear Skies' plan nears congress," *Electric Utility Week*, February 10, 2003. According to Senate Environment and Public Works Committee Chairman James Inhofe (R-Okla.) CO₂ restrictions on power plant emissions may have the votes to gain floor passage. Sen. Jim Jeffords (I-Vt.) reintroduced the bill S 556, which caps CO₂ at 21% below 2000 levels, or 2.05 billion tons. "Climate change: Sen. Inhofe says Dems may have the votes to pass CO₂ curbs," *Greenwire*, February 12, 2003. "Senators introduce 4P bill; CO₂ would join regulated emissions," *Octane Week*, February 17, 2003. "[Senator unveils clean power act](#)," *Environmental Finance*, February 14, 2003.

Clean Power Act of 2003. [S.366](#) was introduced by Senator Jeffords on February 12, 2003. The bill caps aggregate CO₂ emissions for electricity generating facilities at 2.05 billion tons by 2009. This bill is similar to S556 introduced by Jeffords in the 107th congress. U.S. Senate.

Energy Policy. Senator Domenici (R-NM), Chair of the Committee on Energy and Natural Resources, announced an aggressive hearing schedule to prepare for a summer bill on comprehensive energy legislation. Current plans call for developing and passing individual sections of a bill by the relevant committees and then combining each section into one larger bill for introduction on the Senate floor. The new draft is expected to retain many of the provisions from H.R. 4 introduced during the 107th Congress. Late February House Energy and Air Quality Subcommittee Chairman Joe Barton (R-Texas) released a comprehensive energy bill that mirrors House legislation from last year.

Introduced last month:

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.