

THE CARBON SEQUESTRATION NEWSLETTER

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October 2004

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Sequestration in the News

Carbon Sequestration Leadership Forum (CSLF) meets in Australia. Senior energy officials from 17 countries, including US Deputy Secretary of Energy Kyle McSlarrow, met in Melbourne to advance carbon sequestration research. The forum participants endorsed 10 collaborative geosequestration projects, with the expectation that members of the Leadership Forum would share information from them. France, Germany, and South Africa were new members for this meeting. Said Australian Petroleum Production and Exploration Association chief Barry Jones, "This research on monitoring storage is essential to building public confidence in clean fossil fuel technologies and is an essential precursor to the development of a hydrogen economy." The ministerial communiqué can be found at: <http://www.cslforum.org/documents/Communique.pdf>. "Carbon burying pushed," *The Australian*, September 13, 2004, http://www.theaustralian.news.com.au/common/story_page/0,5744,10746007%255E643,00.html. And "Global forum meets to pursue clean energy," *The Advertiser*, September 13, 2004.

Weyburn Project Releases Phase 1 Report. A Phase 1 report from the Weyburn CO₂ EOR project was released at the Greenhouse Gas Technologies conference in Vancouver, Canada. The report covers four technical themes: geological characterization of the geosphere and biosphere; prediction, monitoring, and verification of CO₂ movements; CO₂ storage capacity and distribution predictions; and long-term risk assessment of the storage site. "Successful CO₂ sequestration and enhanced oil recovery project heads into phase II," *Capitol Reports*, September 22, 2004, <http://www.caprep.com/0904041.htm>.

Australia Report Finds Geosequestration Less Effective than Efficiency Improvements. A recent report prepared for the Australia Institute finds that geosequestration would be less effective and more expensive than increasing energy efficiency and encouraging renewable energy generation in the years to 2030. "Institute floats new view on CO₂," *The Age*, September 29, 2004, <http://www.theage.com.au/articles/2004/09/28/1096137231989.html>.

Announcements

California Registry Final Draft Forest Protocols Now Available. On September 28, 2004, the California Climate Action Registry announced that its final draft forest protocols are available online at www.climateregistry.org/protocols/industry/. The Registry staff will be presenting these protocols to their Board of Directors for consideration and approval at the October 21st board meeting. The final draft power/utility reporting protocols should also be presented for the Board's consideration at that time.

Science

"Global Warning," National Geographic Cover Story on Climate Change. The September 2004 issue of National Geographic Magazine featured four articles on evidence of climate change and its effects on plants and animals. "Signs from Earth," *National Geographic*, September 2004, <http://magma.nationalgeographic.com/ngm/0409/feature1/index.html>.

"Scientists Debunk Global Warming Effect on Hurricanes." In a letter to Sen. John McCain a group of climatologists, scientists, professors, and other experts in climate change pointed out two "misconceptions" reported in the press about hurricanes and their relation to climate change. "First is the erroneous claim that hurricane intensity or frequency has risen significantly in recent decades in response to the warming trend seen in surface temperature. Second is the claim that a future surface warming trend would lead to more frequent and stronger storms. We believe that both of these are demonstrably false," the scientists wrote. They noted the National Hurricane Center reports in the last century the decade with the largest number of hurricanes to hit the U.S. was the 1940s, and the frequency of hurricanes has gone down since then. In addition, according to the United Nations Environment Programme of the World Meteorological Organization, "Reliable data ... since the 1940s indicate that the peak strength of the strongest hurricanes has not changed, and the mean maximum intensity of all hurricanes has decreased." *Cybercast News Service*, September 15, 2004, <http://www.cnsnews.com/ViewNation.asp?Page=%5CNation%5Carchive%5C200409%5CNAT20040915c.html>. A different point of view is set forth in "Global Warming May Spur Fiercer Hurricanes – Experts," *Reuters*, September 15, 2004, http://story.news.yahoo.com/news?tmpl=story&cid=570&ncid=753&e=6&u=/nm/20040915/sc_nm/weather_ivan_hurricanes_dc.

Sequestration in the News, Cont'd

Study Shows Dramatic Global Warming Impacts on Arctic Species. Four years ago, the United States and other nations launched the Arctic Climate Impact Assessment, a comprehensive regional study involving more than 300 scientists. The scientific analysis concluded that many of the arctic region's species that depend on sea ice - such as polar bears, seals, walrus and some birds - will decline and may become extinct as a result of climate change. Sheila Watt-Cloutier, chair of the Inuit Circumpolar Conference, told the Senate Commerce Committee that State Department officials are blocking the release of a second report that contains policy recommendations on how to prevent the species extinctions. "U.S. trying to ice report on global warming, senate told," *Scripps Howard News Service*, September 15, 2004, <http://www.knoxstudio.com/shns/story.cfm?pk=CLIMATEIMPACTS-09-15-04&cat=WW>.

"Climate Impact on Plankton Ecosystems in the Northeast Atlantic." Article shows that sea surface warming in the Northeast Atlantic is accompanied by increasing phytoplankton abundance in cooler regions, and decreasing phytoplankton abundance in warmer regions. This impact propagates up the food web (bottom-up control) through copepod herbivores to zooplankton carnivores because of tight trophic coupling. Future warming is therefore likely to alter the spatial distribution of primary and secondary pelagic production, affecting ecosystem services and placing additional stress on already-depleted fish and mammal populations. *Science*, Vol 305, Issue 5690, 1609-1612, September 10, 2004, <http://www.sciencemag.org/cgi/content/abstract/305/5690/1609> (subscription required).

DNA analysis shows how some deep-sea microbes limit global warming. By analyzing the DNA of an entire community of microorganisms in deep-sea sediment, researchers at MBARI and the Joint Genome Institute have shown how some of these microbes could consume methane, an important contributor to global warming. Microbes in marine sediments are known to produce huge quantities of methane, but very little reaches the atmosphere. Scientists have speculated that most of this methane is consumed by other microbes that also live in the sediment. "Microbes and methane - DNA analysis shows how some deep-sea microbes limit global warming," *MBARI press release*, September 5, 2004, <http://www.spaceref.com/news/viewpr.html?pid=14959>.

Policy

"Blair calls for 'immediate action' to tackle global warming." Immediate action is needed to tackle global warming if the world is to avoid facing "catastrophic consequences," the Prime Minister warned in a strongly worded speech. Blair said that the "irreversible and destructive" effects of global warming could "radically alter" human existence within his own lifetime. As part of the drive to reduce the impact of modern living on the environment, Mr. Blair said that new schools and housing in the UK would be built in a way that is environmentally sustainable. *Northern Ireland on the Internet*, September 15, 2004, <http://www.4ni.co.uk/nationalnews.asp?id=33208>.

"Russia Moves Toward Ratification of the Kyoto Protocol." The Russian Cabinet approved the ratification of the Kyoto Protocol, clearing the way for parliament's vote on the pact. If Russia ratifies the protocol, it will come into effect. *CBS News*, September 30, 2004, <http://www.cbsnews.com/stories/2004/09/30/tech/main646485.shtml>.

West Virginia Governor Bob Wise Speaks on Global Climate Change. Governor Wise made statements in support of action on climate change during a meeting of southern governors and energy leaders, "As governor of one of this nation's largest coal-producing states, I want to see our coal resources used well into the future in the most effective, efficient, and environmental friendly manner as possible." Wise noted that greenhouse gases released by the burning of fossil fuels are becoming an escalating problem for all nations. "Some have predicted that global emissions of these gases must be reduced by 60 to 90 percent over the next 50 years," he said. Governor Wise highlighted the pilot launch of the Carbon Offset Opportunity Program (CO-OP), www.offsetopportunity.com, an Internet-based tool that helps industry, government, and other organizations develop energy and environmental projects that offset or reduce greenhouse gas emissions. "Wise Touts State's Energy and Environmental Leadership," September 13, 2004, <http://www.wvgov.org/FullArticle.asp?index=1067>.

Canadian Environment Minister Dion endorses CO₂ EOR. Environment Minister Stephane Dion says Canada lags behind the rest of the world in seizing economic opportunities from the environment and challenged energy executives to take a lead role in what he termed a new Industrial Revolution. Dion said more attention must be focused on innovative science. For example, cleaner production methods for oil and gas must be developed. "We need to support research such as the sequestration of carbon dioxide that could one day replace water as a means of enhancing oil recovery, a true win-win situation for our environment and our economy...Nations that manage to reconcile the environment and the economy will derive an enormous economic opportunity, while those who continue to view the environment as a barrier to competitiveness will fall behind," he said. "Environment Minister Dion says Canada trailing in environmental initiatives," *Cnews*, September 10, 2004, <http://cnews.canoe.ca/CNEWS/Canada/2004/09/10/624018-cp.html>.

"Airline Passengers Asked to Pay Voluntary CO₂ Levy." The British Government proposed that passengers on airlines should be encouraged to voluntarily offset greenhouse gas emissions from their flights by funding GHG emissions reductions projects. Several organizations and companies around the world offer the chance to sponsor such projects, e.g., forestry projects. *Point Carbon*, September 24, 2004, <http://www.pointcarbon.com/article.php?articleID=4627&categoryID=147>.

"Yemen ratifies Kyoto Protocol." Yemen has ratified the Kyoto Protocol, the UNFCCC Secretariat said. It is formally listed as having acceded to the Protocol on September 15, 2004. Yemen is a small, Annex II country, but it is noteworthy that an oil-rich middle eastern state is ratifying a protocol to limit GHG emissions. *Point Carbon*, September 29, 2004, <http://www.pointcarbon.com/article.php?articleID=4659&categoryID=147>

“Cinergy Announces Greenhouse Gas Reduction Projects.” Cinergy announced the first series of projects in its voluntary program of reducing greenhouse gas emissions by five percent below 2000 levels between 2010 and 2012. Fourteen projects totaling nearly \$3 million have been selected for 2004 and will provide reductions and offsets of approximately 360,000 tons annually of carbon dioxide. The 2004 projects include: eight projects that will improve the efficiency of Cinergy's electricity generating units, three renewable energy projects, an energy conservation project in concert with a Cinergy customer, a carbon sequestration project, the purchase of five hybrid gasoline/electric energy vehicles, and a research project to analyze greenhouse gas emissions limitations and related technology. In the carbon sequestration area, Cinergy is funding the purchase of trees for a 300-acre reforestation project being managed by the Nature Conservancy in Harrison County, Indiana. The project will sequester approximately 75,000 tons of carbon dioxide annually. *Business Wire*, September 15, 2004, http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20040915005788&newsLang=en.

San Francisco Announces Ambitious GHG Target. San Francisco Mayor Gavin Newsom unveiled a new GHG plan, seeking to slash annual carbon dioxide emissions by 2.5 million tonnes by 2012 - a 20 percent cut below 1990 emissions. Newsom's plan calls for transit improvements to increase ridership and it encourages agencies to use alternative fuel and hybrid transportation fleets. “Newsom Unveils Plan To Combat Global Warming Locally,” *Bay City News*, September 27, 2004, <http://www.ktvu.com/news/3765270/detail.html>.

New Jersey Redefines CO₂ as Air Contaminant. Governor James E. McGreevey proposed new rules that redefine carbon dioxide as an air contaminant, clearing the way for New Jersey to participate in the Regional Greenhouse Gas Initiative (RGGI). “As a coastal state, New Jersey is especially vulnerable to the consequences of global warming,” said McGreevey. “McGreevey Announces New Proposal to Address Global Warming,” *Environmental Media Services*, September 17, 2004, http://www.ems.org/nws/2004/09/17/mcgreevey_announ.

Geology

“CO₂ sequestration in Ontario, Canada. Part I: storage evaluation of potential reservoirs.” Two saline formations amenable to CO₂ storage are identified in Ontario, Canada. The first, located in the southern part of Lake Huron, has an estimated CO₂ storage capacity of 289 million tons. The second is located inside Lake Erie and could store 442 millions tons of CO₂. *Energy Conversion and Management*, Volume 45, Issue 17, October 2004, Pages 2645-2659, http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5708&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=2b1146f594aa18a4d2ea20a4b02ec486&chunk=45#45.

Technology

Penn State Researchers Claim Breakthrough in CO₂ Mineralization. The researchers' method involves dissolving the crushed serpentine in sulfuric acid. When serpentine dissolves in sulfuric acid, the silicon in the mineral becomes silicon dioxide, or sand, and falls to the bottom, while the magnesium becomes magnesium sulfate. Treating some of this magnesium sulfate with sodium hydroxide also creates some magnesium hydroxide. The researchers were able to convert large amounts of the serpentine's magnesium to these chemicals providing large surface areas for reactions to occur in solution at room temperature. “Researchers study natural mineral that locks up carbon dioxide,” *Penn State Newswire*, September 7, 2004, <http://live.psu.edu/story/7907>.

Ocean

Experiments on Ecological Impacts of CO₂ Injection into Ocean Water. Researchers have conducted experiments using a natural plume of CO₂ that bubbles up from a subsea volcano called Loihi, near Hawaii. In one experiment, researchers set cages baited with mackerel close to the Loihi plume and at various distances from the CO₂. The bait away from the plume was eaten in less than 24 hours, whereas the bait over the vent remained untouched for more than a week. These initial results seem to indicate that fish can sense a CO₂ plume and avoid it. “Ocean fix for climate change finds tentative support,” *Nature*, September 9, 2004, http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v431/n7005/full/431115b_fs.html (subscription required).

Researchers seek to study ocean acidity. Researchers met in Germany to discuss work to be done in studying the effects of increased ocean acidity. The increased acidity is caused by the increased uptake of CO₂, which is caused by the elevated concentrations of CO₂ in the atmosphere. “We're taking a huge risk,” says Ulf Riebesell, a marine biologist at the Leibniz Institute of Marine Sciences in Kiel, Germany. “Chemical ocean conditions 100 years from now will probably have no equivalent in the geological past, and key organisms may have no mechanisms to adapt to the change.” “Researchers seek to turn the tide on problem of acid seas,” *Nature*, August 19, 2004, http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v430/n7002/full/430820b_fs.html (subscription required).

Terrestrial

Boreal Forest Shown to be Able to Accumulate Carbon for Thousands of Years. In a study of four Swedish forests, the authors attempt to take an inventory of the nitrogen that accumulates in the forests. Nitrogen is the limiting nutrient for vegetation growth and its presence is an indicator of a forest's ability to absorb CO₂. The results suggest that earth's boreal forests can continue to accumulate carbon in their soils for literally thousands of years. “How long can carbon continue to accumulate in the soils of boreal forests?” *Center for the Study of Carbon Dioxide and Global Change*, September 2004, <http://www.co2science.org/journal/v7/v7n37b1.htm>. The original article, “Calculating the long-term stable nitrogen sink in northern European forests,” appears in *Acta Oecologica* 26: 15-21, July, 2004.

Experiments Reverse Notion of Tundra Response to Warming Climate.

A recent series of experiments in the Alaska tundra have debunked the theory that as temperatures rise, tundra ecosystems will flourish and store carbon underground, slowing the pace of global warming. Researchers have found that over the course of 20 years, deliberate fertilization led to a net loss of about 25 percent of the carbon in the tundra soil, or 4.4 pounds carbon for every 10.8 square feet. The researchers warned that high-latitude warming could accelerate carbon loss from soil, "causing a net loss of ecosystem carbon and a positive feedback to global warming." "Ecosystem carbon storage in arctic tundra reduced by long-term nutrient fertilization," *Nature*, September 23, 2004, http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v431/n7007/abs/nature02887_fs.html.

Accompanying tundra article, Wendy M. Loya, an ecologist at Michigan Technological University, said in an interview that carbon stored in the soil of northern Arctic and sub-Arctic ecosystems "equals two-thirds of the amount presently found in the atmosphere." Given that these areas are most vulnerable to warming, she said, if they start releasing large amounts of carbon into the air in future decades, "it's a huge deal." "Global change: Carbon conundrum on the tundra," *Nature*, September 23, 2004, http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v431/n7007/full/431406a_fs.html (subscription required).

Carbon Sequestration in Iran. A terrestrial carbon sequestration project is being carried out in a village in the eastern Khorasan Province of Iran. Underway since April 2003, the project is a collaboration between the Iranian Forest and Range Organization (FRO) and the United Nations Development Program (UNDP). Local villagers are planting crops on 9,000 hectares of abandoned rangelands. "The project also aims to establish a local credit fund – like what the UNDP did in southeast Asia – which is an efficient way to reduce poverty in the region and establish self-organized groups centralized by women and low-income people," the project manager said. "Carbon sequestration under progress in Iran," *IranMania*, September 21, 2004, <http://www.iranmania.com/News/ArticleView/Default.asp?NewsCode=25423&NewsKind=Business%20%26%20Economy>.

Entergy sponsors carbon sequestration program. Entergy Corp. announced that it will contribute more than \$1 million to help finance the expansion of the Tensas River National Wildlife Refuge in Tallulah in northern Louisiana. The donation, described as part of a unique partnership between the Trust for Public Land and the U.S. Fish and Wildlife Service, will help pay for the planting of native bottomland hardwood trees in an attempt to reduce carbon dioxide emissions associated with global warming. Under the agreement, the Fish and Wildlife Service will buy the 2,209 acres of land from the Trust for Public Land. Entergy will provide more than \$1 million for the purchase, replanting, and maintenance of the forest land. "Entergy pays to enlarge refuge," *The Times-Picayune*, September 29, 2004, <http://www.nola.com/news/t-p/washington/index.ssf?/base/news-01/1096437479215430.xml>.

"Senate Committee Approves \$2 Million for Tensas National Wildlife Refuge."

The Senate Appropriations Committee provided \$2 million in funding from the Land and Water Conservation Fund (LWCF) for the Tensas National Wildlife Refuge. The LWCF funds will allow the refuge to acquire the second phase, 2727 acres, of the Chicago Mill property in Madison County. At present, the Tensas NWR exists as two separate units. With the acquisition of the Chicago Mill property, these two units will be bridged, thus providing a protected wildlife corridor for the refuge species, most notably the Louisiana black bear. This acquisition will be leveraged by private carbon sequestration dollars, which will also be used to reforest nearly 2000 acres of the phase II lands. *U.S. Newswire*, September 16, 2004, <http://releases.usnewswire.com/GetRelease.asp?id=36380>.

Trading

Creation of European Climate Exchange, for trading of emissions credits. The European Climate Exchange (ECX), in an agreement between the Chicago Climate Exchange (CCX) and London's International Petroleum Exchange (IPE), will offer European companies a place to trade emissions credits for greenhouse gases. "A green future; Carbon-emissions trading," *The Economist* (print edition), September 11, 2004.

Assessment of an Emissions Trading Scheme for Japan.

A WWF report evaluates options for an emissions trading scheme that would help Japan reach its commitment under the Kyoto Protocol. "Japan should adopt emission trading scheme says WWF," September 28, 2004, http://www.panda.org/downloads/climate_change/final0926.pdf.

Events

October 3-6, 2004, **Gasification Technologies 2004**, Washington, DC. The annual worldwide conference of the gasification industry brings together more than 400 representatives from the power, refining, and chemicals sectors for two and one-half days of informed presentations, discussions and networking. For more information concerning this event visit <http://www.gasification.org/>.

October 12-14, 2004, **Western Fuels Symposium – 19th International Conference on Lignite, Brown, and Subbituminous Coals**, Billings, Montana. The Symposium provides a forum in which industry, government, and research organizations can share up-to-date information on the role of lignite, brown, and subbituminous coals in meeting future energy demands. Mark R. Maddox, Acting Assistant Secretary for Fossil Energy has been invited to deliver a key-note address. For up-to-date program information, to register, or to reserve exhibit space, visit <http://www.undeerc.org/wfs> or contact Anne Fiala at (701) 777-3119 or afiala@undeerc.org.

Events, Cont'd

October, 15-16, 2004, **Ninth European PhD Workshop on International Climate Policy**, Viterbo, Italy. The workshop is open to Ph.D. students and researchers from all disciplines working on different aspects of International Climate Policy. It offers a forum to present (preliminary) PhD research ideas and results and discuss them with other students and researchers working in the field. Further information on the workshop, as well as on past PhD workshops, is available on the following websites: http://gaia.agraria.unitus.it/phd_ws9 or <http://www.ku-eichstaett.de/Fakultaeten/WWF/Lehrstuehle/WWF/icp/>. For registration, please contact Lucia Perugini (perugini@unitus.it).

October 18-19, 2004, **3rd US-China Clean Energy Workshop**, National Research Center for Coal and Energy, Morgantown, WV. Topics to be discussed include: U. S. – China cooperation for the 2008 Green Olympics, emissions controls for coal-fired power generation, clean coal technologies, and environmental and efficiency improvements for district heating systems. For more information concerning this event visit <http://www.fe.doe.gov/news/events/us-china-cleanenergyworkshop/us-china-cleanenergyworkshop.html>.

November 3-5, 2004, **Climate Change and Business**, Auckland, New Zealand. Seven partner organizations are putting together a conference on the business opportunities arising from climate change. For further information, see: <http://www.climateandbusiness.com/>.

November 7-12, 2004, **American Institute of Chemical Engineers (AIChE) Annual Meeting**, Austin, TX, Session 09005, Greenhouse Gas Sequestration Technology. Proposals covering technologies for (1) separation and capture, (2) transport, and/or (3) long-term sequestration (geologic, terrestrial, etc.) of greenhouse gases are especially desired. CO₂ is the focus, but technologies specific to other greenhouse gases (CH₄, N₂O, etc.) are also welcomed. Proposals to Present (PTP) technical papers can be submitted at <http://www.aiche.org/annualapp>.

November 10-11, 2004, **The Successful Commercialization of Global Coalbed and Coalmine Methane Projects**, London, UK. This event will provide content that will respond to coalbed and coalmine methane lifecycle development. It will contain several GHG market relevant sessions. For more information, see: http://www.thecwcgroup.com/conf_detail_home.asp?FP=1&CID=74.

January 13-14, 2005, **Climate Change Risks & Opportunities: Learning from the Leaders**, New York, NY. The conference will be divided into three blocks: Expert Briefings on the scientific basis for climate change mitigation and emerging policy frameworks; Corporate Spotlight on the business case for action on climate change and how leading companies have responded; and Interactive Workshops with industry leaders and policymakers to assist companies with integrating climate change into their strategic planning. Contact the Center for Economic and Environmental Partnership, Inc. in New York (Robyn Stewart, robyn@ceepinc.org, +1 518 432 6400) with any questions you might have.

January 16-20, 2005, **Chapman Conference on the Science and Technology of Carbon Sequestration**, Bahia Resort Hotel, San Diego, CA. The goal of this conference is to bring together scientists, engineers, and others who study long-term sequestration of carbon as a way of reducing potential global warming. For more information see <http://www.agu.org/meetings/cc05acall.html>.

Recent Publications

Energy Economics, Special Edition. This special edition, "EMF 19 Alternative technology strategies for climate change policy," includes 13 articles. Three are summarized below:

"Stabilization of CO₂ in a B2 world: insights on the roles of carbon capture and disposal, hydrogen, and transportation technologies." Performs a MiniCAM analysis of the B-2 scenario developed by SRES and uses a revamped transportation sector model. Predicts continued expansion of fossil fuels through 2095. Authors find that "the existence of advanced technologies, including high efficiency vehicles, does not significantly lower emissions in the absence of policies that limit CO₂ emissions." Carbon taxes are found to have little effect on the behavior/emissions in the transportation sector because fuel costs are only 10% of the total cost of transportation service. *Energy Economics*, Volume 26, Issue 4, July 2004, Pages 517-537, http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5842&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=219927eb1dc336fc3f465a292b416c24.

"Technological learning for carbon capture and sequestration technologies." Applies reductions in cost achieved with SO_x control technologies to CO₂ capture and storage. Shows a reduction in avoided cost of emissions for CO₂ capture from \$100-110 \$/tC today to 30-50 \$/tC after 1,000 GW of power plant capacity with capture has been deployed. *Energy Economics*, Volume 26, Issue 4, July 2004, Pages 539-564, http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5842&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=219927eb1dc336fc3f465a292b416c24.

"The impact of learning-by-doing on the timing and costs of CO₂ abatement." Authors find that the benefits of learning-by-doing do not necessarily mean that stringent near-term limitations on carbon emissions reduce the cost of emissions abatement. *Energy Economics*, Volume 26, Issue 4, July 2004, Pages 603-619, http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5842&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=219927eb1dc336fc3f465a292b416c24.

UCS Report. The Union of Concerned Scientists (UCS) released a report entitled, "Choosing Our Future: Climate Change in California." The UCS report and accompanying products include a summary of projected impacts on: temperature, precipitation, sea level, extreme heat, human health, water resources, agriculture, and vegetation distribution; a summary of climate change solution options available for California; and expanded pieces on heat and risks to human health, and declining snowpack and risks to water supplies. All of these materials are available online at www.climatechoices.org.

Return To Coal: Why Utilities Must Reconsider This Cheap, Plentiful Fuel. Thinking Energy has developed a 258-page technical and economic study setting forth the benefits of coal utilization by the power industry. Report is available for \$250 at www.thinkingenergy.com/coal.htm. *Business Wire*, September 16, 2004, http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20040916005400&newsLang=en.

"New Study Examines Business Impacts of Energy and Climate Choices." Energy demand could double or triple by 2050, as population rises and developing countries expand their economies and overcome poverty, according to a new study. The study, by the World Business Council for Sustainable Development, explores challenges in achieving a sustainable energy situation globally, and future energy options and infrastructures. *GreenBiz.com*, September 7, 2004. The study can be downloaded at <http://www.wbcscd.ch/plugins/DocSearch/details.asp?MenuId=1&ClickMenu=&doOpen=1&type=DocDet&ObjectId=NzE1OQ>.

Legislative Activity

California has adopted the world's first rules to reduce greenhouse emissions for autos. Under the regulations the auto industry must cut exhaust from California's cars and light trucks by 25 percent and from larger trucks and sport utility vehicles by 18 percent. The industry will have until 2009 to begin introducing cleaner technology, and will have until 2016 to meet the new exhaust standards. The proposals would require automakers to reduce emissions by using such technological innovations as better air conditioners, more efficient transmissions, and smaller engines. *Yahoo News*, September 25, 2004, http://story.news.yahoo.com/news?tmpl=story&cid=514&e=13&u=/ap/20040925/ap_on_sc/greenhouse_emissions_27.

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. Contacts: Scott Klara, scott.klara@netl.doe.gov or Sarah Forbes, sarah.forbes@netl.doe.gov.