



Carbon Sequestration Newsletter



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JANUARY 2008


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HIGHLIGHTS

NETL News Release, "NETL Signs Memorandum of Understanding with Brazil."

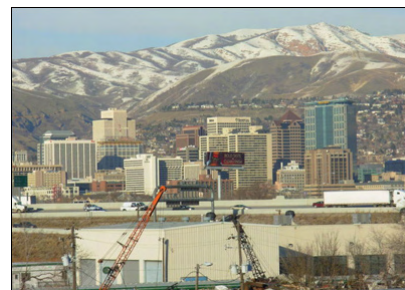
On November 20, the US Department of Energy's (DOE) National Energy Technology Laboratory (NETL) and Brazil's Pontifical Catholic University of Rio Grande do Sul (PUC) signed a Memorandum of Understanding (MOU) to pursue collaborative work that advances the technological, environmental, and cost performance of carbon capture and storage (CCS) technologies. This follows initial discussions that began at the first Carbon Sequestration Leadership Forum (CSLF) workshop on Capacity Building for Emerging Economies in May 2007. The MOU includes the exchange of information; the exchange of scientists between NETL's Office of Research and Development and PUC's Center for Excellence on Carbon Storage Research (CEPAC); technical assistance in specific projects; and jointly funded activities between NETL and PUC. Research conducted under the MOU will primarily focus on the development of clean technologies for the use of fossil fuels, the development and assessment of sequestration options for carbon dioxide (CO₂) and other greenhouse gases, the development and assessment of technologies to recover coalbed methane and enhanced

coalbed methane with CO₂, and the development and assessment of technologies for underground coal gasification and production of syngas from high-ash coals. With Brazil's designation as the world's tenth largest energy consumer and third largest in the western hemisphere behind the United States and Canada, the MOU has the potential to help reduce the country's anthropogenic CO₂ emissions. For further information about NETL's Carbon Sequestration Program, go to: http://www.netl.doe.gov/technologies/carbon_seq/. To learn more about CSLF endorsed projects, click: <http://www.cslforum.org/>. November 20, 2007, http://www.netl.doe.gov/publications/press/2007/071120-NETL_Signs_Memorandum_with_Brazil.html.

SEQUESTRATION IN THE NEWS

Salt Lake Tribune, "Project Plans to Bury CO₂," and Salt Lake Tribune, "Putting a Lid on Global Warming."

A 10-year, \$88 million carbon sequestration research project, funded primarily by a \$67 million grant from DOE's NETL, is targeting the long term CO₂ injection and storage capabilities of mile-deep, saltwater-filled sandstone formations located 130 miles southeast of Salt Lake City in



Wellington, Utah. The project, managed by the Southwest Regional Partnership (SWP), plans to capture naturally occurring CO₂ from the Pure Energy-owned site and pipe CO₂ from a coalbed methane site; compress the CO₂ at 2,200 pounds per square inch (psi); and inject some three million tons of CO₂ over the next four years into a 200 to 300 feet thick sandstone formation covered by an impervious layer of shale. The new, Wellington-based project phase is focused on an area called Farnham Dome, a storage site located 5,000 feet below the desert surface that has naturally stored CO₂ for some 10 to 50 million years. In fact, businesses collected CO₂ from the naturally occurring CO₂ pool until 1979 for use during the production of dry ice and soft drinks. For further information about SWP projects, partners, and events, go to: <http://www.southwestcarbonpartnership.org/>. November 16, 2007, http://www.sltrib.com/ci_7488186 and November 16, 2007, http://www.sltrib.com/ci_7478872 (Subscription required).



SEQUESTRATION IN THE NEWS (CONTINUED)

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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.

Tulsa World, “Capturing Carbon: AEP-PSO Program to Route CO₂ to State Oil Fields.”



After signing a Memorandum of Understanding (MOU) with SemGreen in October, American Electric Power-Public Service Company of Oklahoma (AEP-PSO) announced plans to capture and pipe about half of the CO₂ produced from one of its 450-megawatt units located at the Northeastern Station in Oologah, Oklahoma to mature oil fields. Under the agreement, SemGreen, a subsidiary of Tulsa-based SemGroup LP, will receive 1.5 million tons of CO₂ per year that will be used by SemGreen or sold to other companies for enhanced oil recovery. AEP expects the project, which is billed as the largest of its kind in the nation, to be installed and operational by 2012, helping to reduce the emissions from the world’s seventh largest CO₂ producing company. In addition, AEP selected Oklahoma as a viable location for the technology due to the state’s active energy industry and the prospect that the recovered CO₂ could be used for developing declining oil resources. Although Oklahoma’s oil production has recently dipped, industry hopes CO₂ injection can increase oil production at more than 74,000 wells that are responsible for producing about 85 percent of the state’s total oil output. November 17, 2007, http://www.tulsaworld.com/business/article.aspx?articleID=071117_238_E1_hAEP48341.

Penn West Energy Trust News Release, “Penn West Announces Update on South Swan Hills CO₂ Pilot Project.”

Penn West Energy Trust announced a partnership with the Government of Alberta to initiate a CO₂ enhanced oil recovery pilot test at the South Swan Hills Unit, which includes the permanent sequestration of large volumes of CO₂ in a portion of the reservoir that has not yet been effectively tapped by prior hydrocarbon injection. By using the CO₂ flooding process, Penn West hopes to safely store CO₂ underground that would otherwise be emitted into the air and develop infrastructure necessary for an industry wide movement toward commercial scale CO₂ enhanced oil recovery projects within the basin. Penn West officials believe the project is the first key step in evaluating and confirming the economic viability of recovering additional oil from the Swan Hills area using CO₂ enhanced oil recovery techniques. The project is expected to begin during the first quarter of 2008, with Penn West and Alberta Energy investing approximately \$20 million and \$6.5 million, respectively, to bring the project to life. As part of Alberta Energy’s Innovative Energy Technologies Program (IETP), the project is one of several that benefits from a five-year, \$200 million commitment to pilot projects that demonstrate new technologies that increase and encourage responsible development of oil and natural gas reserves. December 11, 2007, <http://www.pennwest.com/documents/SSHUPressRelease.pdf>.

ANNOUNCEMENTS



The 7th Annual Conference on Carbon Capture & Sequestration, scheduled for May 5-8, 2008 in Pittsburgh, Pennsylvania, is seeking abstracts addressing liability for long-term CO₂ sequestration, regulatory oversight, infrastructure requirements, retrofitting fossil fuel-based plants, and several other topics. The deadline for abstract submissions is February 12, 2008. For abstract details and guidelines, click: http://www.carbonsq.com/pdf/2008/call_for_papers.pdf or go to: <http://www.signup4.net/Public/ap.aspx?EID=08CS11E> to submit abstracts.



9th International Conference on Greenhouse Gas Control Technologies. The call for papers is now open for GHGT-9, scheduled to be held in Washington, DC on November 16-20, 2008. The conference is aimed to provide information on the latest developments on CCS, with one of the key themes designated as building awareness of the current technical status of CCS and addressing issues that we need to consider for future wide-scale implementation. Abstracts for papers or posters can be submitted online until March 28, 2008. Details can be found at: <http://mit.edu/ghgt9/papers/index.html>.

Coal Power Plant Database Now Available From DOE.

DOE's NETL has released its 2007 Coal Power Plant Database. This database provides information about 191 fields, 1,700 boilers and associated units, emissions, power generation, location, and firing data for all US coal-power plants. To browse the database, which also includes carbon sequestration resources, visit: <http://www.netl.doe.gov/energy-analyses/technology.html>.

Kyoto Protocol's Electronic Emissions Trading System Log Launched.

The UN Climate Change Secretariat announced the launching of the International Transaction Log (ITL), a computer-based system that ensures Kyoto sanctioned emissions trading complies with established rules. For further information about the UN Framework Convention on Climate Change (UNFCCC) ITL, visit: http://unfccc.int/kyoto_protocol/registry_systems/itl/items/4065.php.

Database Revealing Highest CO₂ Emitting Power Sources Created.

Carbon Monitoring for Action (CARMA) offers users the opportunity to search a power plant database by country, state, province, county, metro area, city, power company, power plant, or zip code to learn the carbon emissions of more than 50,000 power plants and 4,000 power companies located in every country on Earth. To browse the CARMA web site, click: <http://carma.org/>.

Chicago Climate Futures Exchange Improves Trading Platform.

Trading Technologies International, Inc. (TT) connected the Chicago Climate Futures Exchange to its X_TRADER 7 order-entry software, providing customers with direct, online access to Carbon Financial Instrument futures and Certified Emission Reduction futures. For more information, go to: <http://www.ccfex.com/> or http://tradingtechnologies.com/news/071127_CCFE.pdf.

SCIENCE

Science Daily, "Delay in Autumn Color Caused By Increased Carbon Dioxide Not Global Warming."

A study conducted by University of Southampton researchers suggests that the delay in autumnal leaf coloration and leaf fall is caused by increasing levels of CO₂ in the atmosphere and not by rising global temperatures. The process of plant aging where leaves discolor and fall, known as autumnal senescence, has been delayed by 1.3 to 1.8 days each decade over the last 30 years across Europe, which has been explained by rising global temperatures causing prolonged growing seasons. However, while a strong correlation exists between increased global temperatures and earlier spring "re-greening" in some 14 European countries, the association between autumn leaf color change and fall and temperature trends is weak. The researchers found that atmospheric CO₂ has risen by 13.5 percent over the 30 years

autumnal senescence has been monitored. In addition, experimental tests show that increased atmospheric CO₂ impacts plant physiology and function. By simulating atmospheric CO₂ concentrations in the year 2050, researchers were able to measure changes in



the tree canopy through the use of remote sensing. The measurements revealed that trees exposed to elevated CO₂ levels retained their leaves longer and possessed a smaller decline in end of the season chlorophyll content, consequently resulting in a greener autumn hue relative those trees exposed to ambient CO₂ levels. To read the study, titled, "Future atmospheric CO₂ leads to delayed autumnal senescence," click: <http://www.blackwell-synergy.com/doi/pdf/10.1111/j.1365-2486.2007.01473.x> (Subscription required). November 19, 2007, <http://www.sciencedaily.com/releases/2007/11/071117104404.htm>.

SCIENCE (CONTINUED)

The Independent, “Expanding Tropics ‘A Threat to Millions.’”



A recent study warns the Earth’s tropical belt is expanding north and south at an unprecedented rate, posing a threat to large regions of the world where the climate figures to become more arid or stormier depending on the location. Compared to 1980, the study reveals that during the past 25 years the region around the equator classified as “tropical” has expanded toward the poles by about 172 miles, meaning that an additional 8.5 million square miles are now thought of as having tropical climate. In other words, the Earth’s tropical region has moved

farther north and south by about 2.5 degrees of latitude, which is greater than the Intergovernmental Panel on Climate Change’s (IPCC) “extreme scenario” prediction of a 2 degree shift by 2100. Specifically, scientists warn the millions of people living in dry, subtropical regions are at risk for a more arid climate due to possible changes in rainfall patterns and wind directions; those living in the Mediterranean, southwest US, northern Mexico, southern Australia, southern Africa, and parts of South America face agricultural problems due to shrinking water supplies; and all humans are threatened with irreversible climate damage, as water vapor, an important greenhouse gas, is pumped naturally into the atmosphere at an increasing rate. Scientists believe Australia would be the most affected country, because westerly winds that deliver much needed rainfall to the continent’s southern coast would be pushed further south by the shifting tropics, meaning rain would fall over the ocean rather than land. December 3, 2007, http://environment.independent.co.uk/climate_change/article3218026.ece.

POLICY

Reuters, “Australia’s New Government Ratifies Kyoto Pact.”

Almost immediately after taking his oath of office on December 3, Australia’s newly elected Prime Minister Kevin Rudd signed the Kyoto Protocol, ending nearly a decade of Australian opposition to the global pact and isolating the US as the only developed nation not to ratify the agreement. In the past, Australia contended that ratifying Kyoto would harm its heavily coal dependant energy sector and export driven economy, because developing neighbors China and India are not bound by such targets. However, a new report from the Climate Institute found that Australian economic growth would fall by only 0.1 percent of gross domestic product (GDP) annually if Australia cut emissions levels by 20 percent by 2020 and strived to be carbon neutral by 2050, which the study’s authors believe Australia could cope with. Australia will not be a full member of Kyoto for 90 days, when full ratification will take place following the UN’s acceptance of Australia’s formal Instrument of Ratification. Despite



their reluctance to sign to global treaty, previous Australian officials allege that Australia would have met 2012 Kyoto targets, despite information suggesting their target of curbing greenhouse emissions growth to 108 percent of 1990 levels would not be met. Although Rudd has yet to determine an interim target for emissions cuts by 2020, Rudd set a long-term goal of cutting carbon emissions by 60 percent of 2000 levels by 2050. December 3, 2007, <http://www.reuters.com/article/worldNews/idUSSYD3784520071203?feedType=RSS&feedName=worldNews>.

Reuters, “U.N. Climate Talks Under Pressure to Drop 2020 Goals,” and *Associated Press*, “China Says West Should Deal With Warming.”

As of December 10, US representatives stood steadfast on their insistence U.N. officials and other nations’ representatives opt to remove a 2020 emissions reduction target from a draft text developed at the Bali talks, stating rich nations must cut greenhouse gases 25 to 40 percent below 1990 levels. The draft’s purpose is to lay out the guidelines for future negotiations, but also mentions ranges for long term emissions cuts, which the US refuses to adhere to, and scientific evidence stating the world must reduce emissions 50 percent below 2000 levels by 2050 to avert serious global warming troubles. While the US insists developing nations such as China and India be held to similar standards, China rejected mandatory emission cuts for developing nations, because their officials believe the US and other wealthy nations are responsible for global warming and should amend their environmental practices accordingly. Furthermore, some now think China is the world’s top emitter of CO₂, but a top Chinese climate expert argued that America’s emissions per person are six times higher than China’s despite having a significantly lower population. U.N. officials hope the December 3-14 talks in Bali lead to negotiations on a new global climate treaty that can be adopted at the 2009 UN conference in Copenhagen, Denmark. December 10, 2007, <http://www.reuters.com/article/environmentNews/idUSL1064001320071210>, and December 8, 2007, <http://ap.google.com/article/ALeqM5gBTCrOwOrOXV9BkLBDRmtO3XWbHQD8TCPUE80>.

GEOLOGY

“CO₂ storage in geological media: Role, means, status and barriers to deployment.”

Carbon dioxide capture and geological storage is an enabling technology that will allow the continued use well into this century of fossil fuels, mainly coal, for power generation and combustion in industrial processes because they are relatively abundant, cheap, available and globally distributed, thus enhancing the security and stability of energy systems. Geological media suitable for CO₂ storage through various physical and chemical trapping mechanisms must have the necessary capacity and injectivity, and must confine the CO₂ and impede its lateral migration and/or vertical leakage to other strata, shallow potable groundwater, soils and/or atmosphere. Such geological media are mainly oil and gas reservoirs and deep saline aquifers that are found in sedimentary basins. Storage of gases, including CO₂, in these media has been demonstrated on a commercial scale by enhanced oil recovery operations, natural gas storage and acid gas disposal. Some of the risks associated with CO₂ capture and geological storage are similar to, and comparable with,

GEOLOGY (CONTINUED)

any other industrial activity for which extensive safety and regulatory frameworks are in place. Specific risks associated with CO₂ storage relate to the operational (injection) phase and to the post-operational phase, of which the risks of most concern are those posed by the potential for acute or chronic CO₂ leakage from the storage site. Notwithstanding the global climate effect of CO₂ returning to the atmosphere, the local risks to health and safety, environment and equity need to be properly assessed and managed. Currently there are very few operations in the world where CO₂ is injected and stored in the ground, mostly if not exclusively as a by-product of an operation driven by other considerations than climate change, such as oil production or regulatory requirements regarding H₂S. These operations show that there are no major technological barriers to CO₂ geological storage, and that challenges and barriers lie elsewhere. A major challenge in the implementation of CO₂ geological storage is the high cost of CO₂ capture, particularly for dilute streams like those from power plants and industrial combustion processes. There are concerns that public opinion and public's acceptance or rejection of this technology will likely affect the large-scale implementation of CO₂ geological storage. The current paucity of policy, legislation and a proper regulatory framework in most jurisdictions is presently the most significant barrier. The resolution of these challenges will affect the economics and financial risk of CO₂ geological storage and will accelerate or delay the deployment of this technology for reducing anthropogenic CO₂ emissions into the atmosphere. **Stefan Bachu**, *Progress in Energy and Combustion Science*, Available online: November 7, 2007, doi:10.1016/j.pecs.2007.10.001, <http://www.sciencedirect.com/science/article/B6V3W-4R2Y44R-1/2/3f50590576a52cfd97d1d82454b2967>.

TECHNOLOGY

“Electric Swing Adsorption for CO₂ removal from flue gases.”

One of the most important sources of CO₂ emissions are the fossil-fuel fired plants for production of electricity. Removal of CO₂ from flue gas streams for further sequestration has been proposed by the International Panel on Climate Change experts as one of the most reliable solutions to mitigate anthropogenic greenhouse emissions. When natural gas is employed as fuel, the molar fraction of CO₂ in the flue gas is lower than 5 [percent] causing serious problems for capture. The purpose of this work is to present experimental validation of an Electric Swing Adsorption (ESA) technology that may be employed for carbon capture for low molar fractions of CO₂ in the flue gas streams. To improve energy utilization, an activated carbon honeycomb monolith with low electrical resistivity was employed as selective adsorbent. A mathematical model for this honeycomb is proposed as well as different ESA cycles for CO₂ capture. **Carlos A. Grande and Alírio E. Rodrigues**, *International Journal of Greenhouse Gas Control*, Available online: November 5, 2007, doi:10.1016/S1750-5836(07)00116-8, <http://www.sciencedirect.com/science/article/B83WP-4R2H23Y-1/2/ba3405c358651be811400f5ecd01b877>.



“An engineering-economic model of pipeline transport of CO₂ with application to carbon capture and storage.”

Carbon dioxide capture and storage (CCS) involves the capture of CO₂ at a large industrial facility, such as a power plant, and its transport to a geological (or other) storage site where CO₂ is sequestered. Previous work has identified pipeline transport of liquid CO₂ as the most economical method of transport for large volumes of CO₂. However, there is little published work on the economics of CO₂ pipeline transport. The objective of this paper is to estimate total cost and the cost per tonne of transporting varying amounts of CO₂ over a range of distances for different regions of the continental United States. An engineering-economic model of pipeline CO₂ transport is developed for this purpose. The model incorporates a probabilistic analysis capability that can be used to quantify the sensitivity of transport cost to variability and uncertainty in the model input parameters. The results of a case study show a pipeline cost of US\$ 1.16 per tonne of CO₂ transported for a 100 km pipeline constructed in the Midwest handling 5 million tonnes of CO₂ per year (the approximate output of an 800 MW coal-fired power plant with carbon capture). For the same set of assumptions, the cost of transport is US\$ 0.39 per tonne lower in the Central US and US\$ 0.20 per tonne higher in the Northeast US. Costs are sensitive to the design capacity of the pipeline and the pipeline length. For example, decreasing the design capacity of the Midwest US pipeline to 2 million tonnes per year increases the cost to US\$ 2.23 per tonne of CO₂ for a 100 km pipeline, and US\$ 4.06 per tonne CO₂ for a 200 km pipeline. An illustrative probabilistic analysis assigns uncertainty distributions to the pipeline capacity factor, pipeline inlet pressure, capital recovery factor, annual O&M cost, and escalation factors for capital cost components. The result indicates a 90 [percent] probability that the cost per tonne of CO₂ is between US\$ 1.03 and US\$ 2.63 per tonne of CO₂ transported in the Midwest US. In this case, the transport cost is shown to be most sensitive to the pipeline capacity factor and the capital recovery factor. The analytical model elaborated in this paper can be used to estimate pipeline costs for a broad range of potential CCS projects. It can also be used in conjunction with models producing more detailed estimates for specific projects, which requires substantially more information on site-specific factors affecting pipeline routing. **Sean T. McCoy and Edward S. Rubin**, *International Journal of Greenhouse Gas Control*, Available online: November 19, 2007, doi:10.1016/S1750-5836(07)00119-3, <http://www.sciencedirect.com/science/article/B83WP-4R5G8M6-4/2/9979191aebc06d41927bf47ee5ff743e>.



TERRESTRIAL/OCEAN

“Land-use conversion effects on CO₂ emissions: from agricultural to hybrid poplar plantation.”

Land-use changes such as deforestation have been considered one of the main contributors to increased greenhouse gas emissions, while verifiable [carbon] sequestration through afforestation projects is eligible to receive [carbon] credits under the Kyoto Protocol. [The authors] studied the short-term effects on CO₂ emissions of converting

TERRESTRIAL/OCEAN TRADING

(CONTINUED)

of converting agricultural land-use (planted to barley) to a hybrid poplar (*Populus deltoids* A—*Populus* A—*petrowskyana* var. Walker) plantation in the Parkland region in northern Alberta, where large areas are being planted to hybrid poplars. CO₂ emissions were measured using a static gas chamber method. No differences were found in soil temperature, volumetric moisture content, or soil respiration rates between the barley and Walker plots. The mean soil respiration rate in 2005



depts.washington.edu

was 1.83 ± 0.19 (mean ± 1 SE) and $1.89 \pm 0.13 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ in the barley and Walker plots, respectively. However, biomass production was higher in the barley plots, indicating that the agricultural land-use system had a greater ability to fix atmospheric CO₂. The [carbon] balance in the land-use systems were estimated to be a small net gain (before considering straw and grain removal through harvesting) of $0.03 \pm 0.187 \text{ Mg [carbon] ha}^{-1} \text{ year}^{-1}$ in the barley plots and a net loss of $3.35 \pm 0.080 \text{ Mg [carbon] ha}^{-1} \text{ year}^{-1}$ from the Walker poplar plots. Over the long-term, [the authors] expect the hybrid poplar plantation to become a net [carbon] sink as the trees grow bigger and net primary productivity increases. **D. D. Saurette, S. X. Chang and B. R. Thomas**, *Ecological Research*, Available online: September 21, 2007, DOI: 10.1007/s11284-007-0420-x, <http://www.springerlink.com/content/bm6015n8161k65p4>.

Carbon Market Update, Dec. 13, 2007

CCX-CFI 2007 (\$/tCO ₂)	EU ETS-EUA DEC 2008
\$2.05 (Vintage 2007)	(\$/tCO ₂) \$32.93

(Converted from € to US\$)

Reuters, “EU Eyes CO₂ Capture in Trade Scheme-Draft.”

A European Commission draft document proposes that companies electing to capture and store CO₂ will receive credit under the European Union (EU) trading scheme for not releasing emissions. In addition to requiring permits for exploring storage sites and the storage process itself, the proposal lays forth a foundation for governing CO₂ capture, transportation, and injection underground; rules mandating proper inspections and monitoring requirements; and penalties for those failing to comply with the designated standards. The document also permits EU governments the right to take over CO₂ geological storage projects under certain circumstances. Also, power companies would not be forced to engage in CCS practices. However, large combustion plants would be required to possess adequate space for renovations to equip the facility with carbon capture and storage technology. With the EU trading scheme serving as the 27-member coalition’s strongest tool for fighting climate change, officials believe the integration of carbon capture into the market will provide companies with another means for reaching emissions targets and possibly escalate the deployment of CCS in a more cost effective manner. This draft document is part of a larger climate change legislation package that the European Commission plans to release in January 2008. November 28, 2007, <http://www.reuters.com/article/idUSL2888608820071128>.

RECENT PUBLICATIONS

“Intergovernmental Panel on Climate Change Fourth Assessment Report: Climate Change 2007.”

This Synthesis Report is based on the assessment carried out by the three Working Groups of the Intergovernmental Panel on Climate Change (IPCC). It provides an integrated view of climate change as the final part of the IPCC’s Fourth Assessment Report (AR4). Topic 1 summarizes observed changes in climate and their effects on natural and human systems, regardless of their causes, while topic 2 assesses the causes of the observed changes. Topic 3 presents projections of future climate change and related impacts under different scenarios. Topic 4 discusses adaptation and mitigation options over the next few decades and their interactions with sustainable development. Topic 5 assesses the relationship between adaptation and mitigation on a more conceptual basis and takes a longer-term perspective. Topic 6 summarizes the major robust findings and remaining key uncertainties in this assessment. A schematic framework representing anthropogenic drivers, impacts of, and responses to climate change and their linkages, is shown in Figure I.1. At the time of the Third Assessment Report (TAR) in 2001, information was mainly available to describe the linkages clockwise, i.e. to derive climatic changes and impacts from socio-economic information and emissions. With increased understanding of these linkages, it is now possible to assess the linkages also counterclockwise, i.e. to evaluate possible development pathways and global emissions constraints that would reduce the risk of future impacts that society may wish to avoid. To read the IPCC’s Fourth Assessment Report, go to: <http://www.ipcc.ch/ipccreports/ar4-syr.htm> or click: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf to view the Summary for Policymakers. To watch a webcast of the press conference, go to: <http://ipcc.cac.es/>.

RECENT PUBLICATIONS - CONTINUED

“Carbon Capture and Storage in the CDM.”

Carbon dioxide capture and storage (CCS) in geological formations is a potentially important climate change mitigation measure in the coming decades, as geological formations can store large amounts of CO₂ (as well as other gases or liquids) for thousands of years. However, CCS has not been widely used to date. The largest CO₂ storage project to date (at the Sleipner field in the North Sea) has been injecting approximately 1 million tonnes of CO₂ per year since 1996 into a saline formation. The possible inclusion of CCS projects under the Clean Development Mechanism (CDM) raises a number of issues, including how to deal with potential leaks of CO₂ and associated permanence and liability issues, what an appropriate project boundary is, how to deal with CDM “leakage” (i.e. emissions resulting from the project activity beyond its boundaries) and what the possible impact of including CCS would be on the broad CDM portfolio. The paper assesses these issues. While the bulk of long-term potential CO₂ emission reductions from CCS is associated with the capture and storage of CO₂ from combustion of fossil fuels, the short-term CCS potential is in different areas. These include enhanced oil recovery (EOR) projects and capture-ready streams of CO₂ from natural gas processing and industrial processes such as refineries, ammonia and hydrogen plants. The maximum short-term (i.e. in 2012) theoretical potential of CCS CDM projects is estimated at 584 Mt CO₂/year - larger than under the current CDM portfolio. However, this potential is unlikely to be reached given the long lead-time of projects. Hence, the risk that CCS technology could “crowd out” other technologies in the CDM portfolio seems unfounded. To read the entire International Energy Agency paper, go to: http://www.iea.org/textbase/papers/2007/CCS_in_CDM.pdf.

“Building Public Acceptability for Carbon Capture and Sequestration.”

Carbon dioxide capture and sequestration (CCS) could prove an essential component of the effort to address the climate change challenge. While demonstration projects across the globe can show that CCS risks are low, public perception of such risks will be critical in influencing how policy and regulatory frameworks develop around the technology. This brief outlines the risks associated with CCS, describes how the public views the technology, and explains what can be done to develop long-term public support. [The authors] conclude that the best way to build public acceptance for CCS is by developing large, well-managed demonstration projects; promoting robust regulations and industry standards; and creating more interactive public outreach and education programs. To read the complete brief from the World Resources Institute, click: <http://pdf.wri.org/building-public-acceptability-for-ccs.pdf>.

“Key Elements of a Post-2012 Agreement on Climate Change.”

Affordable, secure and reliable energy supply enables economic development which is absolutely essential to the achievement of the global objectives of the United Nations Universal Declaration of Human Rights. Fossil fuels currently dominate primary energy supply – they meet 80 [percent] of global energy needs and will likely supply 81 [percent] of energy in 2030. Coal is the most abundant, affordable and geographically dispersed fossil fuel. Against a background of global rising demand for energy, coal provides a level of energy security not matched by any other fuel. Coal will continue to play an important role in underpinning global economic development, improving standards of living, and alleviating poverty for the foreseeable future. Reducing greenhouse gas (GHG) emissions will require a transformation in the way we produce and use energy. A portfolio of new and existing near-zero and low emission energy technologies, including carbon capture and storage (CCS) is required to deliver that transformation. To read the second in a series of several World Coal Institute policy papers, go to: http://www.worldcoal.org/assets_cm/files/PDF/wci_post_2012_report.pdf.

LEGISLATIVE ACTIVITY

Reuters, “Climate Change Bill Heads for Full Senate,” and *E&E Daily*, “Focus Shifts to Senate Floor as Lieberman-Warner Clears Committee.”

On December 5, the Senate Environment and Public Works (EPW) Committee approved S. 2192, America’s Climate Security Act of 2007, with an 11-8 committee vote, clearing the path for the global warming legislation to be considered by the full Senate in 2008. If the bill reaches fruition, a federal program to reduce greenhouse gas emissions from power, industry, and transportation sectors by 70 percent by 2050 would be created, with special care taken to protect the economy and citizens from hardships. During the nine-and-a-half hour markup, Senators addressed many issues arising from the broad climate bill. In particular, the EPW committee added an amendment

setting a new low-carbon fuel standard for the nation’s motor vehicles and several state related amendments regarding emission allowances and financial incentives for new technology. However, Senators failed to pass amendments concerning the following issues: exemptions for major industries undertaking projects to reduce greenhouse gas levels, increasing the bill’s emissions reduction target for 2050 from 70 percent to 80 percent, auctioning of the climate program’s emission credits, expanding nuclear power, endorsing a 10 percent production tax credit for new nuclear power plants, and the conditions that would negate the new US climate program. EPW Committee head, Barbara Boxer, promised to discuss unaddressed issues on the Senate floor. To view the S. 2192 bill, titled, “America’s Climate Security Act of 2007,” click: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:s2191is.txt.pdf. December 6, 2007, <http://www.reuters.com/article/environmentNews/idUSN058916420071206> and December 6, 2007, <http://www.eenews.net/EEDaily/2007/12/06/1/#1>.

LEGISLATIVE ACTIVITY (CONTINUED)

E&E Daily, “Feinstein Looks Ahead to Carbon Market Oversight.”

California Senator Dianne Feinstein introduced a carbon market bill on December 6 that would designate the EPA as regulators of the estimated \$300 billion carbon market created by the Senate bound Climate Security Act of 2007. Feinstein chose the EPA to oversee the new carbon markets because the Agency currently regulates under the Clean Air Act of 1990 that created cap-and-trade programs for sulfur

dioxide and nitrogen oxide emissions. The bill, designed to prevent Enron like fraud from entering into carbon markets, would require EPA to publish market price data to increase market transparency, monitor trading for manipulation and fraud, and enforce position limits, referring to the total number of emission credits a company can hold at one time. Furthermore, the bill would prevent carbon market participants from false reporting, engaging in manipulation or deception as defined in the Securities Exchange Act, and cheating or defrauding another market participant. Violators of the aforementioned offenses would be subject to EPA sanctioned \$1 million fines and 10 year jail sentences per each offense. In addition, the Feinstein Bill gives the Commodity Futures Trading Commission (CFTC) exclusive jurisdiction over CO₂ futures markets. December 7, 2007, <http://www.eenews.net/EEDaily/2007/12/07/3/#3>.



EVENTS

January 14-16, 2008, **2008 Groundwater Protection Council UIC Conference**, *Hotel Intercontinental, New Orleans, Louisiana*. The 2008 Groundwater Protection Council UIC Conference offers a CO₂ Geosequestration MMV Workshop on January 16, including presentations on monitoring methods, monitoring efficiency and effectiveness, measuring criteria and standards, and verification processes. For event registration and agenda, visit: http://www.gwpc.org/meetings/meetings_uic/meetings_uic.htm or for further MMV Workshop information, click: http://www.gwpc.org/meetings/meetings_uic/uic08/CO2%20Flyer%20UIC08.pdf.

January 15-16, 2008, **Seizing the Investment & Compliance Opportunities of Carbon Emissions**, *Marriott Bloor Yorkville, Toronto, Ontario, Canada*. This two day event teaches attendees solutions for measuring, monitoring, and profiting from emission reduction investments falling under the Canadian government’s regulatory framework. Speakers will cover topics ranging from the latest international efforts to stimulate investment in emission reduction, the opportunities to reduce carbon emissions, and the challenges and solutions being adopted. To view agenda and request a conference brochure, go to: https://webserv.c5groupinc.com/www_secure/conf_details.php?conf=4892&view=ovrv.

January 17-18, 2008, **Emerging Opportunities in Carbon Markets**, *Westin Colonnade Coral Gables, Coral Gables, Florida*. Emerging Opportunities in Carbon Markets will address the development of current emissions trading systems, focusing on budding business opportunities, the fostering of technological development and innovation, and the impact on global finance. In addition to providing stimulating discussion and numerous networking opportunities, this event offers several carbon related forums including a panel discussion about the cap-and-trade system versus a carbon tax. For further conference details, go to: <http://www.environmental-finance.com/conferences/2007/Miami08/details.htm>.

January 17-18, 2008, **3rd EU Energy and Environment Law and Policy Seminar & Conference**, *Radisson SAS Royal Hotel, Brussels, Belgium*. This conference brings together important market players and policy makers to discuss the future of the European energy market. In addition to four sessions titled Europe’s Emerging Energy and Environmental Policy, The Internal Energy Market: The Third Liberalization Package, Competition Policy and the Internal Energy Market, and Meeting the Challenges of Kyoto, included is a break-out session about carbon sequestration, focusing on objectives, financing, research, and policy. For complete information, visit: <http://www.claeys-casteels.com/energyconference/1718january.php?pg=A000>.

January 24-25, 2008, **Carbon Trading: Opportunities and Risks in Global Emissions Markets**, *JW Marriott Hotel, Houston, Texas*. Designed for aiding energy traders, emission traders, and investors with knowledge about the evolving carbon trading market, this inaugural conference focuses on several key issues, such as: the mechanisms of carbon trading, managing risk in carbon markets, allocations versus auctions of allowances, market impact of Phase II carbon trading rules in the EU, and the next steps in the US carbon trading market. For event registration and agenda, visit: <http://www.platts.com/Events/2008/pc803/index.xml>.



EVENTS (CONTINUED)

January 27-28, 2008, **11th Annual EUEC Energy and Environment Conference**, *Westin La Paloma, Tucson, Arizona*. One of America's most recognized technical meetings, the EUEC Energy and Environment Conference offers attendees six concurrently running tracks and several pre-conference workshop opportunities. Among the topics to be addressed: the development of ongoing and future carbon capture and storage techniques and projects; terrestrial sequestration activities; domestic and international climate policy; and regional climate initiatives. To view the extensive conference agenda, visit: <http://www.euec.com/downloads/Program%20Agenda.pdf>.

January 29-30, 2008, **The Canadian Institute's Carbon Capture and Storage**, *The Fairmont Palliser, Calgary, AB, Canada*. This conference offers presentations about Canada's Clean Air Act and CO₂ capture and storage projects across Canada, addressing topics such as: CO₂ capture and storage regulations; new technology for CO₂ removal; pipeline infrastructure, logistics, and management; geological applications; and elevating public awareness and improving community involvement for carbon capture and storage projects. Also, included are three "Interactive Learning Sessions" about retrofitting plants with new CO₂ removal technology, regulatory challenges, and risk analysis. For complete information, visit: https://webserv.c5groupinc.com/www_secure/conf_details.php?conf=4991.

February 26-27, 2008, **The Future of the Carbon Market**, *Le Méridien Piccadilly, London, England*. In an industry where regulatory and economic developments are driving change, The Future of the Carbon Market strives to aid participants with their preparation for Phase II of the EU Emission Trading Scheme and its increasingly strict emissions cap. Discussion will focus on market liquidity and the price of carbon; the adaptation of businesses to the new regime; making sound, long-term strategic decisions; and the regulatory uncertainty as political leaders negotiate a follow up to the soon expiring Kyoto Protocol. For conference registration and agenda, go to: <http://www.marketforce.eu.com/carbon/>.

February 26-27, 2008, **Carbon Forum America**, *Moscone Center, San Francisco, California*. Carbon Forum America is the first US industry event that combines a trade fair with a conference, creating a unique opportunity for attendees to mingle with key players in the carbon community. Presentations will cover subjects ranging from new solutions and technologies for carbon abatement; the market's use of voluntary carbon standards; new energy sources and their effects on energy pricing; and the interaction of Green Investment Schemes with the CDM. To view a PDF version of the conference brochure, go to: http://www.carbonforumamerica.com/documents/CFAExhibit10_11_07.pdf.

March 11-13, 2008, **Carbon Market Insights 2008**, *Bella Center, Copenhagen, Denmark*. This annually successful event provides attendees with unrivaled insight into everything carbon markets, including several "streams" based on: Carbon Trading, Carbon Projects, Carbon and Energy, and the Voluntary Market. For this year's event, Point Carbon is offering participants the opportunity to hold side events during designated times, with preference given to those offering a fresh view on climate policy and the carbon market. To view a detailed conference brochure, visit: <http://www.pointcarbon.com/Events/Carbon%20Market%20Insights/category401.html>.

March 12-14, 2008, **Globe 2008**, *Vancouver Convention and Exhibition Centre, Vancouver, British Columbia, Canada*. Globe 2008 brings together some 2,000 delegates from all over the world to access strategic business issues influencing global economic and environmental agenda. This conference is highly recommended for corporate executives, policymakers, environmental industry executives, international agency representatives, urban leaders and design professionals, and financial executives. To browse the Preliminary Conference Program, containing agenda and registration information, go to: http://www.globe2008.ca/documents/GL08_PreProgram_single.pdf.

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To learn more about DOE's Carbon Sequestration Program, please contact Sean Plasynski at sean.plasynski@netl.doe.gov, or Dawn Deel at dawn.deel@netl.doe.gov.