West Coast Regional Carbon Sequestration Partnership

Quarterly Report

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ABSTRACT

The West Coast Regional Carbon Sequestration Partnership is one of seven partnerships which have been established by the US Department of Energy (DOE) to evaluate carbon dioxide capture, transport and sequestration (CT&S) technologies best suited for different regions of the country. The West Coast Region comprises Arizona, California, Nevada, Oregon, Washington, and the North Slope of Alaska. Led by the California Energy Commission, the West Coast Partnership is a consortium of over thirty five organizations, including state natural resource and environmental protection agencies; national labs and universities; private companies working on CO_2 capture, transportation, and storage technologies; utilities; oil and gas companies; nonprofit organizations; and policy/governance coordinating organizations. In an eighteen month Phase I project, the Partnership will evaluate both terrestrial and geologic sequestration options. Work will focus on five major objectives:

1) Collect data to characterize major CO_2 point sources, the transportation options, and the terrestrial and geologic sinks in the region, and compile and organize this data via a geographic information system (GIS) database;
2) Address key issues affecting deployment of CT&S technologies, including storage site permitting and monitoring, injection regulations, and health and environmental risks
3) Conduct public outreach and maintain an open dialogue with stakeholders in CT&S technologies through public meetings, joint research, and education work
4) Integrate and analyze data and information from the above tasks in order to develop supply curves and cost effective, environmentally acceptable sequestration options, both near- and long-term
5) Identify appropriate terrestrial and geologic demonstration projects consistent with the options defined above, and create action plans for their safe and effective implementation

A kickoff meeting for the West Coast Partnership was held on Sept 30 - Oct.1. Contracts were then put into place with twelve organizations which will carry out the technical work required to meet Partnership objectives.

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EXECUTIVE SUMMARY

The West Coast Regional Carbon Sequestration Partnership will evaluate carbon dioxide capture, transport and sequestration (CT&S) technologies best suited for the region comprising Arizona, California, Nevada, Oregon, Washington, and the North Slope of Alaska. Led by the California Energy Commission (CEC), the West Coast Partnership is a consortium of over thirty five organizations, including state natural resource and environmental protection agencies; national labs and universities; private companies working on CO_2 capture, transportation, and storage technologies; utilities; oil and gas companies; nonprofit organizations; and policy/governance coordinating organizations. In an eighteen month Phase I project, the Partnership will evaluate both terrestrial and geologic sequestration options.

A kickoff meeting for the Partnership was held at the CEC in Sacramento, California on Sept 30 - Oct.1. Following an overview of the Partnership objectives, 24 presentations were given which described the technical activities, contributions and roles planned by the organizations participating in the Partnership. These presentations will be posted on the Partnership website. On the second day, the Partnership Advisory Committee met, and breakout groups met to discuss work plans in more detail. Five working groups were established to carry out the partnership tasks: I, Geologic Sequestration Source-Sink Characterization; II, Geologic Sequestration Options and Pilots; III, Terrestrial Sequestration Baselines, Supply Curves and Pilots; IV, Public Outreach; and V, Technology Deployment Issues. Most of the effort in the First Quarter was focused on developing detailed work scopes and contracts needed to accomplish these tasks.

The objectives of Task I, Geologic Sequestration Source-Sink Characterization, are to collect data to characterize major CO_2 point sources, the transportation options, and the geologic sinks in the region, and to compile and organize this data via a geographic information system (GIS) database. This Task is led by the California Institute for Energy Efficiency (CIEE). Geologic sink characterization data is being assembled by the California Department of Conservation (DOC) Geologic Survey, and the Nevada Bureau of Mines and Geology with additional data provided by BP and other partners. Nexant is assembling point source data for power plants and major industrial sources, with input from PacifiCorp, TransAlta, Sierra Pacific Resources, Salt River Project, BP, ConocoPhillips, and ChevronTexaco. Nexant will work with KinderMorgan on development of transportation data. A consolidated GIS-based geologic sequestration database is being developed as a cooperative effort between the DOC, the Utah Automated Geographic Reference Center (AGRC), the Massachusetts Institute of Technology (MIT), and the Western Governors Association (WGA).

Task II, Geologic Sequestration Options and Pilots, will use the data from Task I, in combination with results from the later Tasks IV and V, to define cost effective, environmentally acceptable geologic source-sink options and potential pilots for the region. E2I, through the Electric Power Research Institute (EPRI), will lead this effort, working with the utilities (see above), oil companies (BP, Shell, Occidental, ChevronTexaco, etc), and technology providers (e.g., Clean Energy Systems (CES)), to

define near- and long-term CT&S options. MIT will conduct GIS-based economic and other analyses. Sfa Pacific will perform economic and engineering analyses of capture options, and Advanced Resources International (ARI) will perform analyses required to assess the potential for sequestration combined with enhanced oil and gas recovery. Action plans will be developed for the safe and effective implementation of pilot projects.

The objectives of Task III, Terrestrial Sequestration Baselines, Supply Curves and Pilots, are to collect data to characterize the terrestrial carbon baseline in the region, to compile and organize this data via a geographic information system (GIS) database, to develop supply curves for the region, and define potential terrestrial pilot projects. This Task is led by the Oregon Department of Forestry. Winrock International will work with the Washington State Department of Natural Resources, the Oregon Department of Forestry, the California Department of Forestry and Fire Protection, and the Arizona Department of Forestry to develop two point terrestrial baselines. Additional baseline data for soil carbon storage in California will be provided by the Kearney Foundation. Winrock will then use methodologies developed as part of ongoing CEC research to prepare supply curves for major land use classes in the region. Winrock will coordinate with the state resource agencies, Pacific Forest Trust, and others in this activity.

The objectives of Task IV, Public Outreach are to maintain an open dialogue with stakeholders in CT&S technologies through public meetings, joint research, and education work. Science Strategies will lead this task, providing coordination between the Partnership and existing public outreach activities being conducted by the state forestry departments, working with the Pacific Forest Trust, other NGOs and local agencies such as the San Francisco Department of the Environment on public outreach approaches, working with the California State University Bakersfield, and California Polytechnic University on educational programs, and coordinating with other partnerships on the development of outreach materials.

Task V, Technology Deployment Issues, addresses key issues affecting deployment of CT&S technologies, including storage site permitting and monitoring, injection regulations, and health and environmental risks. Terralog Technologies will compile and assess regulations and permits, working in coordination with state regulatory agencies and the EPA. Lawrence Berkeley National Laboratory (LBNL) will develop a risk assessment framework for geologic sequestration. LBNL will also work with Lawrence Livermore National Laboratory (LLNL) in development of monitoring protocols, using modeling and site specific data from Aera, ChevronTexaco, and Occidiental Petroleum to assess candidate techniques.

EXPERIMENTAL

The experimental approach for characterization of large point sources, and potential geologic and terrestrial sinks, involves collection and evaluation of various types of data which are already available in public and private databases. These data will be assembled in standard Geographic Information System (GIS) formats and made accessible to the Partnership participants and the public via commercially available software. Analysis of terrestrial baselines and development of supply curves for terrestrial land use categories will use methodologies developed by Winrock International. GIS-based economic analyses of geologic source/sink options will use software being developed by MIT. Algorithms for economic analyses will be developed based on previous work by various participants in the Partnership, including Sfa Pacific, EPRI, and ARI. Regulatory assessments and public outreach materials will be derived from information in the literature and data available from state and federal agencies. Development of a risk assessment methodology will use Features, Elements, and Processes (FEPs) from the literature and available from the ongoing Weyburn and Carbon Capture Project, Reservoir simulation, reactive chemical transport and geophysical modeling, in support of risk assessment and development of monitoring protocols, will use numerical codes available at LBNL and LLNL.

RESULTS AND DISCUSSION

Task I Geologic Sequestration Source-Sink Characterization

Contracts were placed with the California Geologic Survey and the Nevada Bureau of Mines and Geology to carry out characterization of geologic sinks. The California Geologic Survey contract in an interagency agreement with the CEC while the Nevada Bureau of Mines and Geology work is subcontracted through the CIEE. The Nevada Bureau of Mines and Geology will collect and analyze, using GIS systems the following data:

- Surface outcropping of bedrock versus alluvium
- Interpreted geophysical data.
- Presence of favorable geologic formations for storage; thickness and continuity of aquitards.
- Depth to water table and depth to non-potable water deeper than 800m, if known.
- Proximity of active faults to potential CO_2 sequestration sites.
- Proximity to extractable geological resources (e.g., mineral, petroleum, geothermal, and water).
- Proximity to large generators of CO_2 (power plants; refineries; cement plants).
- Proximity to urban areas and areas of future urban growth.
- Proximity to existing petroleum transportation infrastructure (pipelines, storage facilities); transportation routes; restricted lands (Parks and Recreation areas, Wilderness Areas, Indian Reservations, military reservations); and other appropriate data.

The California Geologic Survey will conduct similar analyses. In addition, because of the oil and gas fields in California, the Geologic Survey will analyze:

- Geologic data from both depleted and operating oil and gas fields, including those with potential for enhanced oil and gas recovery using CO_2 injection.
- Geologic data from saline aquifers that may or may not be associated spatially with oil or gas reservoirs.
- Proximity of active faults to potential CO_2 sequestration sites; probable seismic intensity and ground motion affecting potential CO_2 sequestration sites.

The Geologic Survey began work in California by identifying candidate sedimentary basins and developing a list of data to be collected for each. In basins containing oil and gas reservoirs, the following information about physical rock and fluid properties will be tabulated (from California Division of Oil, Gas, and Geothermal Resources files) for each reservoir in producing/depleted oil and gas fields: reservoir fluids (oil, gas, water), zone status, average depth, average thickness, producing area, porosity, permeability, initial pressure and temperature, salinity of formation water, seal thickness, trap type (structural or stratigraphic), and history of secondary/tertiary recovery efforts. These data will be used to characterize reservoir/aquifer rock and fluid properties, and evaluated to identify possible depleted or abandoned fields for CO_2 EOR or sequestration opportunities.

Basins are evaluated for potential reservoirs and seals and Statewide GIS layers are being produced which display:

- California Oil and gas fields
- Depth to basement or structure on basement for candidate basins.
- Gross isopach or gross sand thickness maps of promising reservoirs or regional sand packages.
- Gross isopach or gross shale thickness maps of significant regional seals.

Not all basins are being evaluated. Basins may be excluded due to insufficient sediment cover (<1,000 m), lack of widespread seal, lack of porous and/or permeable strata, lack of saline aquifers, or other identified characteristics that may make them unsuitable for CO_2 sequestration.

A contract was also placed with the Utah AGRC to support GIS activities. The work will be carried out under a subcontract to the CIEE. The AGRC will:

- Develop standards protocols for GIS activities of the Partnership
- Provide the Internet Map Services (IMS) site for public access to the Partnership GIS data
- Interface with the Western Governors Association Geographic Information Council in the above activities.

For characterization of large point sources of CO_2 and transportation options in the Region, a contract was placed with Nexant. The work will be carried out under a subcontract to E2I. Nexant will:

- Collect data for large utility and industrial point sources, including power plants, refineries, natural gas processing, ethanol, cement, paper, waste, and steel plants.
- Collect data on plant operating characteristics
- Collect data on transportation options
- In addition to CO_2, collect data on SO_x, NO_x, particulates and other toxic emissions.
- Analyze how CO_2 capture, transport and storage affects other emissions

Task II Geologic Sequestration Options and Pilots

A contract was placed with EPRI through E2I to (1) craft a portfolio of capture, transport, and geologic storage and terrestrial sequestration solutions appropriate for short-, medium-, and long-term carbon management goals in the West Coast region, and (2) to identify appropriate Phase II demonstration projects consistent with this "portfolio approach." Subcontracts were placed with MIT, Sfa Pacific and ARI to assist in analyses as described below. EPRI will:

- Develop economics of capture, transport and storage for all identified sources. MIT, ARI, and SFA pacific will assist in this effort
- Review and refine MIT's prioritization algorithms. MIT, ARI and SFA Pacific will assist in this effort
- Use the new algorithms from the first subtask to perform regional economic, transportation, geologic screening, and other analyses using the GIS database developed in Task 1. MIT will have the lead for this effort
- Incorporate EPRI CO_2 Test Center project results into the action plans for follow-on pilots

Task III Terrestrial Sequestration Baselines, Supply Curves and Pilots

A contract was placed with Winrock International to quantify terrestrial carbon sequestration opportunities in Arizona, Oregon, and Washington and develop supply curves which estimate the volume of carbon credits that might be available at different price points. The work will be carried out under a subcontract to CIEE. Winrock will (1) develop baselines of carbon emissions and /or sequestration in land use and the forestry sector; (2) develop supply curves for the major classes of potential land use and forest-based activities; and (3) conduct field studies to measure the amount of carbon sequestered in four classes of terrestrial sequestration projects. In order to develop baselines, Winrock will:

- Use data primarily from available national datasets to develop overall baselines for carbon sources and sinks from changes in use and management of lands and forests for the period of about 1990-2000.
- Consult with state level experts to discuss the suitability of federal datasets and, if feasible, make use of datasets generated by the different states.
- Report results by land classes and graphical displays using a GIS framework

In order to develop supply curves, Winrock will:

- Use standard data and available methodologies to estimate the amount of carbon that will be sequestered by a particular change in land use or management practice.
- Estimate the number of credits likely to be offered at different price points taking into account project risks and environmental impacts, co-benefits and other externalities
- Estimate the type of monitoring system that will be needed

The field measurement activities will involve:

- Working with the representatives from the four states involved in this project to select, at the most, four field measurement activities, including: riparian management, wild land fire hazard treatments and biomass energy; alternative silviculture; conversion of marginal agricultural, grazing or understocked forestlands; and enhancement of large wood
- Review of baselines, additionality, leakage, measurement and monitoring issues, risk of loss, and positive and negative environmental impacts
- Preparation of final carbon supply curves

In California work supported by the CEC PIER program was already underway to develop terrestrial baselines and supply curves. In one effort, Winrock International is using the tools and methods developed through the Collaborative Carbon Initiative (supported by EPRI) to prepare datasets specific to carbon market opportunities in California. The work for the State of California includes the following modules:

- Baseline for carbon emissions and/or sequestration in the land use and forestry sector for the period about 1990-2000.
- Classification of the major opportunities for carbon storage on the land within the State;
- Improved data on the quantity and costs of carbon storage for major classes of land-use and forest-based projects in California in a format that allows comparison with opportunities in other regions;
- Measurement services and design for monitoring plans for carbon storage opportunities in the State of California enabling accurate and precise estimation of the quantity of credits available from selected classes of projects.

1. BASELINE COMPONENT

1. a: Agriculture

Using the Natural Resources Inventory (NRI) of the Natural Resources Conservation Service (NRCS) of the USDA, a study was completed and a report, '*Module 1a: Baseline for Agriculture in California*' submitted on December 31, 2003. This document is undergoing internal review by the Commission and the Department of Forestry prior to its release for external review. The report included analyses of changes in carbon stocks during the period 1987-1997 (the recent 2002 NRI data base is not available as of this writing) for woody and annual agricultural crop lands for the whole state and by county.

1. b: Rangelands/Forests

Estimates have been made on carbon emissions in selected regions of the state over the decade of the '90's. The data that were used in the developed methodology are those of the California Department of Forestry's Fire and Resource Assessment Program's Multi-Source Land Cover Map and Land Cover Mapping and Monitoring Project (LCMMP). The LCMMP data are produced in a repeating cycle across five regions in the state. Those regions where data have been produced by the LCMMP ('North Coast' and 'Cascade Northeast' regions) have been analyzed by Winrock and a report, '*Module 1b: Baseline for Forests and Rangelands in California*', was submitted on December 31, 2003. The remaining three regions will be completed when the LCMMP data become available (see table).

The report includes estimates of the gross and net changes in carbon stocks on forest and rangelands by each cause (fire, forest management, development, regrowth, disease).

Area	Baseline years	FRAP - Change data completion	FRAP - Cause data completion	Winrock – carbon emissions baseline completion
Cascade Northeast	1994(6) - 1999	Completed	Completed	December, 2003
North Coast	1994 - 1998	Completed	Completed	December, 2003
North Sierra	1995/6 - 2000	Completed (*01/20/04*)	Completed but potential cause for missing area still needed (*01/20/04*)	TBD
South Coast	1995(7) - 2002	Aug/Sept, 2004	Nov/Dec, 2004	TBD
South Sierra	1995 - 2001	Feb/Mar, 2004	Aug/Sept, 2004	TBD

2. CARBON SUPPLY CURVE COMPONENT

2. a: Rangelands

Using a GIS model and publicly available datasets (CDF-FRAP, STATSGO, DAYMET, USGS, etc), the potential for afforestation of rangelands in California was mapped. Estimations on the cost of such projects included an analysis of rangeland economics to determine likely opportunity costs and such project costs as plantation establishment, measurement and monitoring and maintenance. Comparison of project costs and carbon sequestration potential yielded carbon supply curves for the state. A draft report, '*Carbon Supply Curves for California: Rangelands*', was submitted on December 31, 2003. This document is undergoing internal review by the Commission and the Department of Forestry prior to its release for external review.

2. b: Forests:

A methodology was developed using USFS Forest Inventory and Analysis data and field data from the measuring and monitoring modules for the state of California to analyze the potential for carbon sequestration through changes in forest management and its costs. The draft report will be submitted for review in early March 2004.

3. MEASUREMENT AND MONITORING COMPONENT

3. a: Blodgett Forest Research Station

Fieldwork was undertaken in October of 2003 at the University of California's Blodgett Forest Research Station in the Sierra Nevada Mountains of El Dorado County, California. Research was conducted on the effect on carbon sequestration of changes in forest management practices (e.g.: large clearcuts versus group selection) and changes in regulations for required riparian buffer zones in commercial forestry. A report, '*Module 3a: Measuring and Monitoring Plans for Baseline Development and Estimation of Carbon Benefits for Two Classes of Forest Projects: 1. Blodgett. DRAFT REPORT*', was submitted on December 31, 2003. The report includes detailed carbon measurement and a preliminary monitoring protocol for the site. This document is undergoing internal review by the Commission and the Department of Forestry prior to its release for external review.

3. b: Jackson State Experimental Forest

In February of 2004, fieldwork will be conducted in Jackson State Experimental Forest in Mendocino County to examine the same research questions as in Blodgett in the ecologically distinct north-coastal forests. The report will include a detailed carbon measurement and monitoring protocol for the site.

A second CEC-supported effort being carried out by the Kearney Foundation is focused on assessing carbon sequestration in agricultural soils in California. Agriculture represents a significant opportunity for greenhouse gas mitigation projects through soil carbon sequestration and reductions of methane (CH_4) and nitrous oxide (N_2O) emissions. Changes in farming management practices, such as tillage, fertilization, irrigation, manure amendment, rotation with cover crops etc., are being evaluated for

their potential in mitigating greenhouse gases emitted from the agricultural sector. Due to the tightly linked cycles of water, carbon (C) and nitrogen (N) in the agroecosystems, any change in farming management could simultaneously alter crop yields, soil fertility, N leaching, soil C storage and trace gas emissions. New methodologies linking GIS databases with process-based models are being used to bring complex agroecosystems into a computable framework for assessing the impact of alternative management practices on soil C storage and greenhouse gas emissions.

Process-based models have been developed to examine the complex interactions of agricultural management practices, soil C dynamics and N_2O emissions. A agroecosystem biogeochemistry model, The Denitrification-Decomposition or DNDC, model was adopted for this project. DNDC was constructed based on four basic biogeochemical concepts, i.e., biogeochemical abundance, field, coupling and cycling. DNDC consists of the six sub-models for soil climate, crop growth, decomposition, nitrification, denitrification, and fermentation. The six interacting sub-models have included the fundamental factors and reactions, which integrate C and N cycles into a computing system. DNDC has been validated and tested by the researchers in many countries and applied for their national C sequestration and N_2O and CH_4 inventory studies. By tracking crop biomass production and soil organic carbon (SOC) decomposition rates, DNDC captures long-term SOC dynamics. DNDC predicts N_2O emissions by tracking the reaction kinetics of nitrification and denitrification across climatic zones, soil types, and management regimes. With its prediction capacity of both SOC, and N_2O and CH_4, DNDC is ready to serve offset analysis between C sequestration and non-CO_2 greenhouse gas (N_2O and CH_4) emissions for agro-ecosystems.

In this project, DNDC is being used to estimate recent SOC dynamics and N_2O emissions at the county scale for all of the counties in California and to recommend a county for more detailed studies on carbon sequestration and N_2O emissions under a wide scope of alternative management scenarios. DNDC is also being used to evaluate the impact of several management alternatives (e.g. changing irrigation practices, use of reduced tillage or no-till, use of cover crops and other alternative farming practices) on county scale estimates of SOC dynamics, CH_4 and N_2O emissions. These management alternatives are being assessed for exploring the potential of mitigating GHG emissions from agriculture in California.

County summary data on soils, crop acreage, and climate have been compiled in a GIS database. Daily climate data on precipitation, maximum and minimum temperature were obtained from the DAYMET and National Climate Data Center station data from 1980 through 1997. County crop acreages were derived from a GIS coverage based on the California Department of Water Resources (DWR) analyses of aerial photos and field surveys taken in the mid 1990s. Soils were derived from statewide STATSGO database. The major crop types such as strawberry, artichoke, tomatoes, truck crops etc. have been parameterized in DNDC based on the communications with the local experts. For each county, we calculated the min, max, area weighted min and area weighted max values of clay fraction, bulk density, organic matter and pH. Agricultural management practices (e.g. fertilizer use, residue incorporation, tillage practices, planting and harvesting dates,

etc) were compiled based on discussions with CDFA, CARB, and UCCE Crop Cost and Return reports. Since the soil properties are one of the major sources of the uncertainties produced during the upscaling processes, including the soil range values will enable to use Monte Carlo or other statistical approaches to bring the uncertainties under control.

Preliminary results indicate that, as a whole, California agricultural soils are sequestering carbon. However, there are large differences in carbon dynamics across crop types and counties. In general, pastures are the largest sink of carbon. Cotton, corn, rice with winter flooding, tomatoes, citrus and deciduous fruit cropping systems are additional sinks of carbon. On the other hand, truck crops (e.g. lettuce), beans, oats and winter wheat cropping systems appear to be a net source of carbon. Areas of rice paddies (without winter flooding), beets, sorghum, sunflowers and viticulture do not appear to be significant sources or sinks of carbon. Fresno, Kern and Kings counties had the largest net carbon sequestration primarily due to their large areas of pasture and cotton production. San Joaquin, Monterey and Santa Barbara were net sources of carbon due to their relatively large areas of truck crops (e.g. lettuce) and relatively little cotton and pasture. These preliminary results suggest that (1) management of agricultural soils in California has the potential for increasing C sequestration and reducing N_2O emissions, and (2) effective alternative management policies or regulations should be spatially differentiated.

Task IV Public Outreach

A contract was placed with Science Strategies to lead the public outreach effort for the Partnership. The work is carried out through a subcontract with the CIEE. Activities include:

- Establish a Website with an outreach and public education component which reflects the public outreach activities of the Partnership
- Work with CSUB, Cal Poly, and LBNL to identify CSUB/Cal Poly Faculty-Student Research teams that will participate in summer research fellowships at LBNL through the LBNL Center for Science and Engineering Education
- Produce materials for use as curriculum units on carbon sequestration and its impacts and opportunities for California and the Region
- Convene annual meetings at selected locations in the Region with a focus on technological progress and readiness

Task V Technology Deployment Issues

A contract was placed with Terralog Technologies to assemble, review and evaluate state and federal regulations related to CT&S technologies. Work will be performed through a subcontract with CIEE. Terralog will:

- Review, document and summarize regulations for waste disposal, gas storage operations, energy production practices, air and water quality as well as local zoning laws, and other regulations related to sequestration technologies

- Evaluate permitting requirements for state and federal agencies with jurisdiction over carbon capture and sequestration
- Review and summarize proposed new regulations under consideration by state and federal agencies that may impact carbon capture and sequestration activities
- Identify potential gaps, regulatory uncertainties or possible conflicting regulations

Field Work Proposals were submitted by LBNL covering work required for the development of a risk assessment framework and monitoring protocols. Work will begin in the second quarter.

CONCLUSION

The West Coast Regional Carbon Sequestration Partnership will evaluate carbon dioxide capture, transport and sequestration (CT&S) technologies best suited for the region comprising Arizona, California, Nevada, Oregon, Washington, and the North Slope of Alaska. Led by the California Energy Commission (CEC), the West Coast Partnership is a consortium of over thirty five organizations, including state natural resource and environmental protection agencies; national labs and universities; private companies working on CO_2 capture, transportation, and storage technologies; utilities; oil and gas companies; nonprofit organizations; and policy/governance coordinating organizations. In an eighteen month Phase I project, the Partnership will evaluate both terrestrial and geologic sequestration options. A kickoff and technical planning meeting for the Partnership was held at the CEC in Sacramento, California on Sept 30 - Oct.1. As a result of this meeting, five working groups were established to carry out the partnership tasks: I, Geologic Sequestration Source-Sink Characterization; II, Geologic Sequestration Options and Pilots; III, Terrestrial Sequestration Baselines, Supply Curves and Pilots; IV, Public Outreach; and V, Technology Deployment Issues. During the First Quarter detailed work scopes were developed and contracts put in place to accomplish these tasks.