BIG SKY CARBON SEQUESTRATION PARTNERSHIP

Big Sky Carbon News

April 2012

Introduction

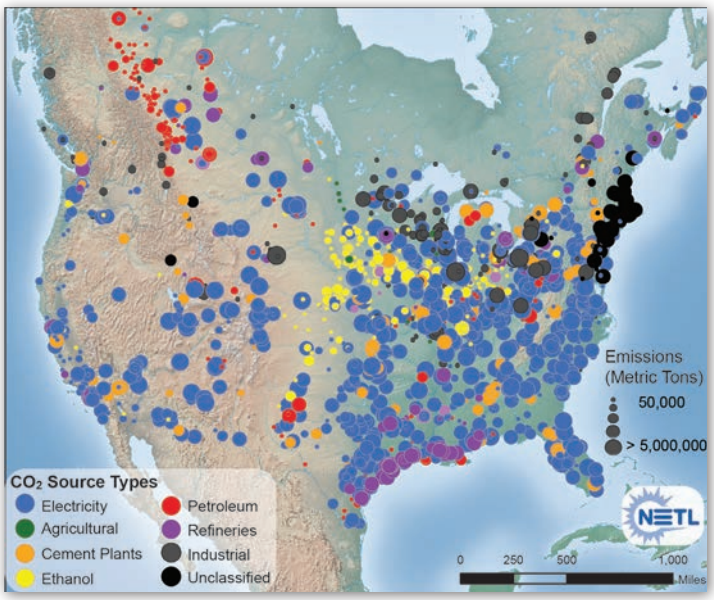
This newsletter is created by the Big Sky Carbon Sequestration Partnership (BSCSP). BSCSP is part of Montana State University's Energy Research Institute, and is supported by the U.S. Department of Energy as one of seven regional carbon sequestration partnerships. Through this newsletter, our team is working to engage our audience, improve understanding of carbon storage technologies and facilitate communication.

In This Issue

Regional Carbon Sequestration Partnership Program

Countries around the world are recognizing the growing need for balanced energy solutions and are taking action accordingly. Today, 11 countries including Canada and China are actively pursuing carbon capture and storage projects as one way to meet our growing energy demands and uphold human and environmental health standards.

Here in the United States, the Department of Energy (DOE) has joined this international movement towards establishing a safe, viable, and diverse energy portfolio. In 2003, the U.S. DOE formally established seven Regional Carbon Sequestration Partnerships (RCSPs) and tasked them with moving carbon capture, utilization and storage technologies along the track to commercialization.



BSCSP is one of seven RCSPs that form a national network of over 400 universities, laboratories and businesses across 43 states. Together, the geographic regions represented by the seven RCSPs encompass almost all of the nation's industrial CO_2 emissions and potential geologic storage sites. This coupling of emission sources and storage locations enable RCSPs to develop technologies and strategies for the wise use of the resources within their own region.

The RCSP program is divided into three phases: characterization, validation and development. During the first phase, RCSPs identified potential CO_2 geologic storage options including oil, gas, coal and saline formations. This initial phase also included the identification of terrestrial storage options such as soils and biomass.

In the second phase, RCSPs verified potential storage sites by conducting 20 small-scale storage tests across the country. These small scale tests were an important first step towards the current large-scale projects that make up the Phase III initiatives. These Phase III, large-scale projects will demonstrate the ability of carefully selected sites to safely store regional carbon emissions in the U.S., and expand our understanding of the economics, infrastructure and technology for future carbon storage efforts.

To learn more about the seven RCSPs, please visit www.bigskyco2.org/about/rcsp or www.fe.doe.gov/programs/sequestration/partnerships/

A-B-CCS: Words of the Day

"**Eddy Covariance**" BSCSP plans to install a high-tech weather station (roughly 10 feet tall) at the Phase III project site in Toole County, MT. The station will use eddy covariance methods to measure and track field conditions.

Much like eddies or whirlpools in water, the air around us has several pockets that circulate in different directions and move at various scales based on factors in the environment. We can see whirlpools in water with our naked eye, but we need special devices to detect eddies in the air. Instruments like sonic anemometers and infrared gas analyzers mounted on the tower will be used to measure the winds various attributes.

By measuring the upward and downward changes in various air parcels, eddy covariance methods can measure the exchanges of CO_2, water, and heat in the air. The eddy covariance tower will also have instruments to continuously measure: wind speed and direction, air and soil temperature, humidity, atmospheric pressure, rainfall, and sunlight.

The BSCSP monitoring team is scheduled to install an eddy covariance tower at the Kevin Dome project site for year-round monitoring. This highly mathematical and complex technique will help scientists understand background conditions and verify the proper performance of our injection well.

Notable Neighbor: Kevin Rim, Geologic Feature

There are a number of notable people in our project area, but perhaps one of the most notable "neighbors" is the Kevin Rim itself. The Kevin (pronounced Key-vin) Rim was formed millions of years ago by geologic uplift and has since then undergone both wind and water-driven erosion to make it the feature we recognize today. Though the Kevin Rim is roughly 20 miles northwest of Shelby, Montana and well outside our project area, Montana's open skies and low humidity make this distant feature seem ever present.

These sandstone cliffs overlook sprawling grasslands that are home to several raptor species including Golden Eagles, Great-horned Owls and American Kestrels. Numerous migratory bird species likewise call this area home, albeit for briefer periods of time, as they make their way across the North American continent. In an effort to minimize the impact of our work, BSCSP suspended seismic activity on March 8, in part, to respect the nesting habits of these migratory animals.

Did You Know?

Carbon dioxide is a gas that contributes to the rising concentration of greenhouse gases in our atmosphere. Annual combustion of fossil fuels adds about 8 billion metric tons of CO_2 into the atmosphere; roughly the volume of 6.6 billion homes.

This number is rising, and expected to double in the next 50 years. Innovative technologies such as increased efficiency, fuel cells, wind and solar power are all part of the solution. However, scientists estimate that the full transition to these technologies will take 30-50 years. For example, in order to prevent just one of the eight billion tons of CO_2 emitted into the atmosphere each year, we would have to convert six times the current U.S. acreage devoted to corn to biofuels.

Carbon sequestration is one of the approaches that can help reduce global CO_2 emissions in the short term and support stable power supplies as we make the transition to renewable resources. Learn more about managing carbon resources at cmi.princeton.edu/wedges/

Project Partner Spotlight: Michelle Leonti, Administrative Manager, BSCSP

If you have called our office recently, you likely heard Michelle Leonti's friendly voice on the other end of the phone: "Energy Research Institute, Michelle speaking." As our Administrative Manager, Michelle helps coordinate activities for a large and diverse group of people including students, staff, and faculty to make sure our operations run smoothly.

"I feel quite fortunate to be part of the BSCSP team. Since my role encompasses not only the BSCSP project, but other programs under the Energy Research Institute umbrella, my work often changes and allows me to work on a variety of different energy issues." Given that the Energy Research Institute interfaces with over 230 staff, partners and students across 11 disciplines and several different project budgets, it's no wonder that Michelle has also become a master planner. Michelle is responsible for general office management, scheduling, responding to requests, travel logistics, human resources and proposal submittals.

Like the rest of the BSCSP staff, Michelle is excited about the upcoming Annual Meeting and is looking forward to seeing the outcome of all her coordination and scheduling efforts. "Everyone has worked so hard for so long on all the proposal documents, it was great to earn the Phase III award last year and see all the activity pick up."

When Michelle is not hard at work in Bozeman, she enjoys exploring beaches and mountains in her travel trailer, hiking and camping with her husband and daughter.

CCS Around the World

Basalt is a volcanic rock known for its exceptionally permeable, porous and geochemically reactive properties. These characteristics are a large part of what makes basalt a great storage option for CO_2 emissions.

In southwest Iceland, a group known as CarbFix is diverting emissions from the Hellisheiði Geothermal Power Station and injecting them deep underground into basalt formations. This project mimics the natural geothermal processes already found in nature, and demonstrates the ability of basalt to safely and permanently store CO_2. Once the basalt comes in contact with the CO_2, geochemical reactions occur that ultimately form new rocks (namely limestone and calcium carbonate), thus locking the CO_2 away indefinitely.

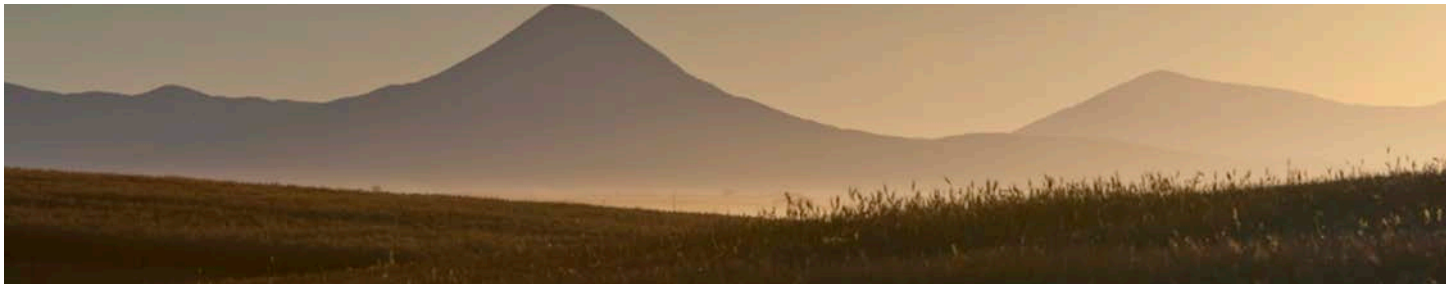
BSCSP is working with Battelle Pacific Northwest National Laboratory to pursue a similar project in southeast Washington State. This project is one of the first in the world to examine both the viability and capacity of deep basalt formations and will expand laboratory findings to real world environments. By assessing the technical issues associated with injection, fate and transport of CO_2, scientists aim to verify that basalts are a safe and practical site for large-scale storage activities. The two-week injection is scheduled to take place in 2012.

Hear more about Iceland's basalt project from project manager Jüerg Matter at the BSCSP Annual Meeting, April 18-19, 2012 in Great Falls, MT.

Learn more about CarbFix and their basalt project in southwest Iceland by visiting www.or.is/english/projects/carbfix/

Field Updates: Seismic Survey and Modeling

At the Kevin Dome Project site, the first round of seismic surveying concluded on March 8, 2012 and is scheduled to begin again on August 15, 2012. Interim field activities include baseline environmental monitoring (see page 4), permitting and geologic modeling. Project partners will provide detailed project updates on both the seismic survey and modeling efforts at the upcoming annual meeting. View the Annual Meeting agenda by visiting www.bigskyco2.org and following the respective links.



Science and Application: Monitoring, Verification and Accounting

Monitoring, verification and accounting (MVA) are an integral part of activities in the Big Sky Region. BSCSP has developed a comprehensive monitoring program for the Phase III geologic storage project located in Toole County, Montana.

This program incorporates geophysical, geochemical, surface, and other monitoring methods that will be implemented before, during and after injection activities. This detailed approach allows scientists to compare changes over both space and time.

Surface detection methodologies include: eddy covariance towers, soil gas flux chamber measurements, remote sensing technologies as well as traditional soil gas analysis to establish background CO_2 levels.

Conditions at the Kevin Dome Carbon Storage Project site are expected to have large seasonal variation in temperature and other environmental variables; thus, baseline measurements will start at least one year in advance of injection and serve as a sturdy comparison for later data.

To monitor the subsurface, a 3-D nine component (9-C) seismic survey is being conducted to properly characterize the target formation and seals, and to determine optimum placement of the production, injection and monitoring wells. The results of the survey will be incorporated into the static geologic model.

A second 3-D 9-C seismic survey will be conducted post injection to facilitate a composite 4-D seismic survey that includes changes over time. Baseline measurements of geochemical and geophysical properties will be acquired during or after drilling and before injection. Reservoir condition and CO_2 plume monitoring techniques will likely include vertical seismic profilings, cross well seismic, a modern logging suite, tracers, additional surface geophysical surveys and fluid geochemical analysis.

Upcoming Events

Annual Meeting
Registration Open

- **April 18-19, 2012**
- **Great Falls, Montana**
  Best Western Heritage Inn

For more information go to:
www.bigskyco2.org

To Register Directly:
www.bigskyco2.org/webform/annual-meeting-april-18-19-2012

Stay up-to-date with our project, visit www.bigskyco2.org

Keep in touch and join our contact list. Please email Kathryn Watson, our Outreach and Communications Director, at kwatson@montana.edu or call her at 406-994-3390.

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