BIG SKY CARBON SEQUESTRATION PARTNERSHIP

Big Sky Carbon News

May 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

A Tale of Two Conferences

2nd Annual Big Sky Carbon General Meeting: BSCSP held its Annual Meeting from April 18-19, 2012 in Great Falls, MT. This meeting brought together academics, business owners, community members, elected officials, state and federal employees, natural resource consultants and energy sector experts from around the country to learn about regional energy initiatives.

Nearly 90 participants from 20 different states and two Canadian provinces attended this two-day event highlighting the Kevin Dome Storage Project. Based on a voluntary evaluation, participants were "highly satisfied" with the conference overall and remarked that it was "educational," "informative," and "enjoyable." One community member noted "I have rarely attended meetings which I have felt more worthwhile. Thank you."

Also in attendance were representatives from the offices of Senator Baucus, Congressman Rehberg and Senator Tester. Our elected officials had the following to say about carbon capture and storage here in Montana:

"I believe Montana needs to lead the way towards the nation's energy independence… I look forward to working with members of this initiative to make the existing incentives work better to promote a safer, cleaner and more prosperous America" (Baucus, 2012).

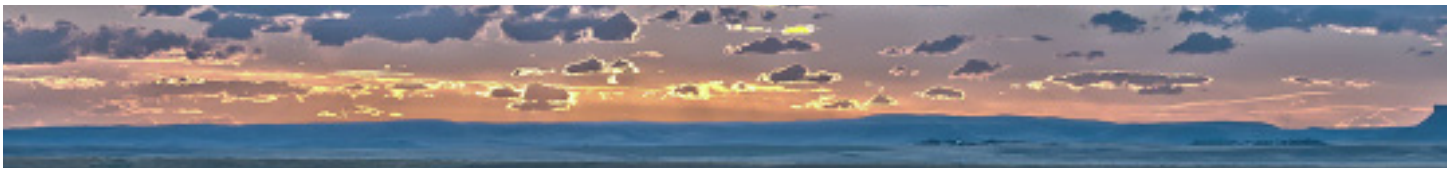
"I commend you for your work looking at ways to reduce carbon emissions and help protect our environment… I look forward to working together to grow our economy using the natural resources we have available here in Montana" (Rehberg, 2012).

"…thank you for staying on the cutting edge of climate science and working to expand the use of clean energy throughout the West. The work you do can have a lasting impact on our economy, our health and our planet" (Tester, 2012).

Detailed, scientific presentations along with complete statements from elected officials are available online at www.bigskyco2.org/resources/presentations. Read more about the technical world of Kevin Dome on page 4.

11th Annual Carbon Capture, Utilization and Storage (CCUS) Conference: BSCSP team members attended the annual CCUS conference held in Pittsburgh, PA from April 30 – May 3, 2012. (story continued on page 2) ...

In this photo: BSCSP staff and partners at April 2012 Annual Meeting



A Tale of Two Conferences (con't)

... Here BSCSP provided an exhibit booth highlighting the Kevin Dome Storage Project, distributed project brochures, and served as a panelist for the outreach and education workshop. This conference drew an audience of over 570 participants from around the world.

Notable members in attendance included the Department of Energy Assistant Secretary, the Director of the National Energy Technology Laboratory, the President of China's National Institute of Clean and Low Carbon Energy, several CEOs from global energy companies.

Regionally, Dan Cole of Denbury Resources highlighted their Montana-Wyoming enhanced oil recovery (EOR) and carbon storage project during Wednesday's plenary session. In his discussion, Cole noted the Rocky Mountain region holds an estimated 1.3 – 3.2 billion barrels of economically recoverable oil. Denbury's regular reinvestment in CO_2-driven EOR practices has helped their company grow to over 1,300 employees while providing domestic energy security and mitigating tons of CO_2. To learn more about this business success story, please visit www.denbury.com. To read more about the conference happenings as a whole, please visit www.carbonsq.com.

ABCCS: Word of the Day: Anhydrite

Anhydrite is a mineral made of calcium and sulfate ($CaSO_4$). Its molecular composition and chemical properties make this mineral a very tight-knit and largely insoluble material. This type of rock was first found in 1794 in Austria, and is now known to reside in many parts of North America, including Toole County, MT. This mineral plays an important role in many man-made products including cements, wallboards, plastics and paints; as well as other activities such as carbon capture and storage.

A suitable carbon storage site has porous rock layers deep underground that can store the CO_2 overlain by tight, impermeable rock layers that seal the CO_2 in place. These sealing layers, or caprocks, can be clays, shales or other non-porous materials like anhydrite. Anhydrite is known as the "gold standard" of caprocks because it is far less permeable than its subsurface counterparts, and thus has a remarkable ability to trap fluids underground in the desired storage reservoir.

Among the many rock layers that make up the subsurface in Kevin Dome, the presence of anhydrite is particularly important. Anhydrite caprock layers are present in not one, but two key areas in the Kevin Dome Storage Project area. The first anhydrite layer is roughly 175 feet thick, with a second, deeper layer estimated at over 200 feet thick.

These layers provide dual protection and reiterative assurance that injected CO_2 can remain trapped in the storage reservoir deep underground. In fact, this notion is already at work in Kevin Dome where naturally occurring CO_2 has been successfully stored for 50 million years.

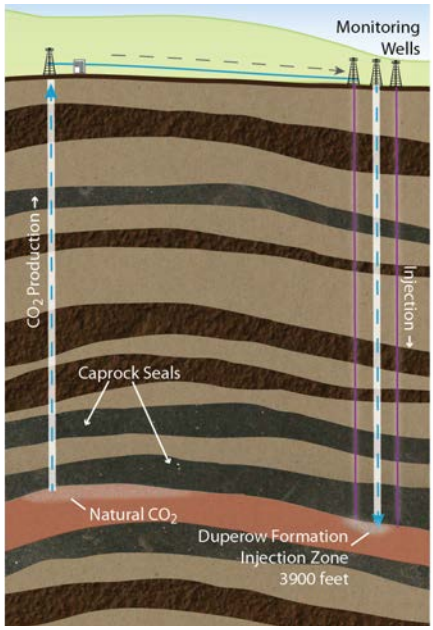


Figure 1: Cross-section of subsurface showing the role of caprock layers, like anhydrite, in securing CO_2 deep underground.

Did You Know? America's Energy Portfolio

Roughly 80% of U.S. electric power comes from fossil fuels. As the U.S. explores its long-term energy options and strategies, it will consider the ongoing role of many types of energy, including renewables and fossil fuels. Earlier this month, energy experts from around the world met at the an to discuss carbon capture, utilization and storage options.

At this conference U.S. officials asserted that our energy supply will be driven by fossil fuels for the next 50-100 years, and that coal in particular will still account for 40-50% of our energy consumption in 2050. Natural gas will play a similarly large role for years to come as the U.S. has a 90 year supply of natural gas that is "obvious and economically recoverable."

In light of the global move to unite energy development and environmental health, carbon capture, utilization and storage programs may position the U.S. as an even more competitive energy supplier and wiser energy consumer.

Project Partner Spotlight: Travis McLing, Fluid Laboratory Lead - Idaho National Laboratory

Like so many of us, Travis McLing's childhood sense of wonder about the natural world has shaped who he is today. As Idaho National Laboratory's Geofluids Energy Initiative Lab Lead, Travis studies the fluid-rock interface to expand our understanding of how aquatic systems function underground. Beyond his laboratory duties, Travis is eager to share his work with local people of all ages, and support our energy efforts for generations to come.

Growing up in eastern Montana, Travis was inspired by the geology of the northern Yellowstone Plateau and the mystery of its watercourses. McLing carried his passion for geology to college where he grew to appreciate the role of educators in helping him more intimately understand the areas he had hiked as a youth. For McLing, it seems difficult to overstate his passion for carrying on this tradition. "I'm excited about this project partly because it gives me the opportunity to convey my love and interest of geology and help other people better understand the environments they live in," Travis avows.

McLing, however, is not just interested in the present day benefits of his efforts. Travis remembers the Big Sky Partnership before it even had a name, and similarly looks to the future for guidance. "We cannot trade one problem for another. I feel a responsibility to our kids and our grandchildren to make sure that our natural resources are protected," Travis states. "There is a critical need to be able to establish the safe and secure pathway forward for carbon management." It is perhaps this spirit that has helped Idaho National Laboratory be the first of its kind to earn the Department of Energy's highest level of recognition for safety and health achievements.

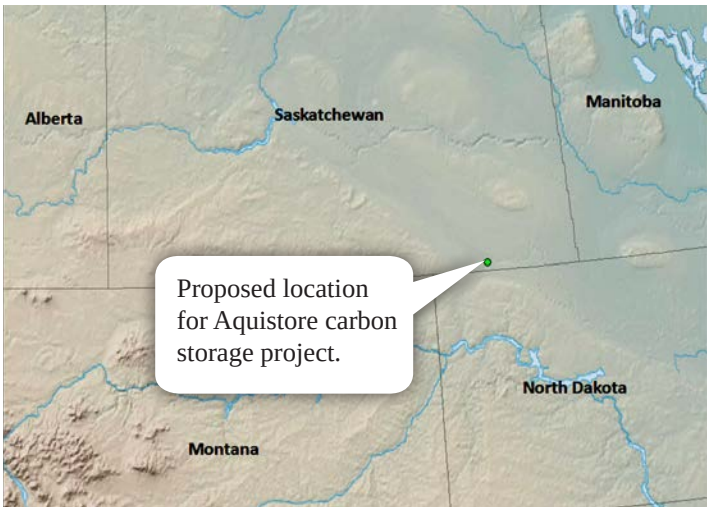
This summer Travis and his team plan to be onsite in Toole County collecting groundwater samples and establishing baseline data. Watch for opportunities to engage with this group in the future. To learn more about the work of Travis and the Idaho National Laboratory, please visit www.inlportal.inl.gov/portal/server.pt/community/home/255.

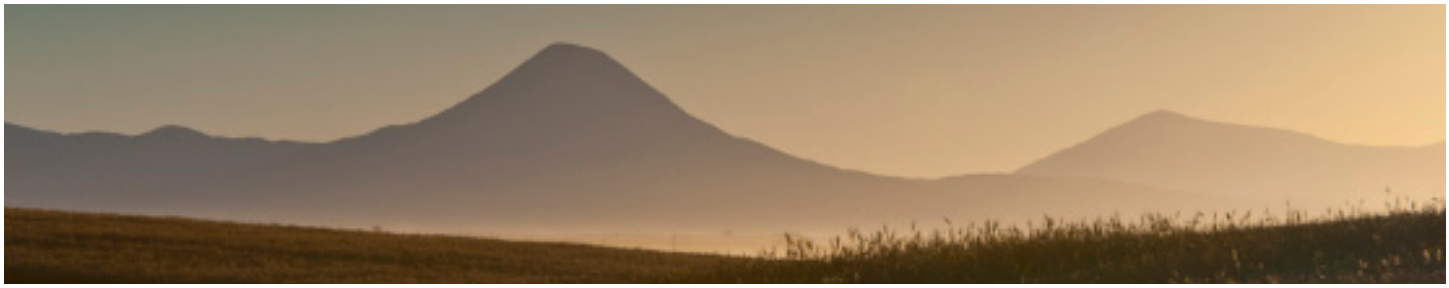
CCS Around the World: Canada's Aquistore Project

Canada's Ministry of Environment along with the Petroleum Technology Research Centre (PTRC) and other contributing partners see the value in carbon capture and storage (CCS) technologies. Together industry, university and government partners are pursuing a CO_2 storage project in Saskatchewan known as the Aquistore Project.

Through this effort, Canada aims to demonstrate that a deep saline reservoir in the Williston Basin—a formation that spans the U.S. Canadian border across Saskatechwan, Manitoba, South Dakota and Montana—is a safe and viable option for helping the nation reach its 20% emissions reductions target by 2020.

This two phase project will include extensive monitoring and modeling of the injection site. Once the site is deemed suitable for injection, CO_2 will be captured from SaskPower's Boundary Dam Power station, transported via pipeline and injected 1.8 miles underground. This commercial-scale program will be the first carbon capture and storage effort for Saskatchewan that pairs coal-fired power plant emissions with saline storage capabilities. Learn more about this project by vising www.ptrc.ca/aquistore_overview.php.





Science and Application: Models improve understanding of our resources

Geologic and CO_2 flow models play a critical role in understanding the project site. These models help scientists refine estimates for CO_2 storage capacity, ensure the integrity of the storage reservoir and monitor the subsurface throughout the course of the project. BSCSP researchers delivered several presentations about Kevin Dome modeling efforts at our Annual Meeting last month. For our readers who were unable to attend this event, here are the modeling highlights:

Geologic Models – A geologic model is a three-dimensional map of the subsurface that depicts detailed rock features such as rock type, geologic structures, porosity and permeability. Geologic models are a snapshot of the subsurface created using a suite of geologic and geophysical data. The Kevin Dome geologic model will utilize data from existing oil and gas wells, seismic data collected at the surface, and rock samples collected during well construction.

Flow Models – A flow model takes the static geologic model one step further to illustrate and predict a dynamic process over time. Examples of commonly used flow models include weather maps, tide tables, and flood forecasts. BSCSP is using flow models to simulate and track the movement of CO_2 after injection at Kevin Dome. Researchers use data regarding CO_2 fluid concentration, pressure and temperature to run different scenarios, analyze the results and provide guidance for best practices.

Modeling Status – Seismic data acquired during Fall 2011 through Spring 2012 are being interpreted and used to construct detailed images of the subsurface at the project site. The seismic images will provide high-resolution information about geologic structures, stratigraphy and fluid subsurface materials as part of the Kevin Dome model. Additional seismic data will be acquired in the fall of 2012 through the spring of 2013 to further enhance the model.

To learn more about geologic and flow models, or to read other technical presentations, please visit www.bigskyco2.org/resources/presentations.

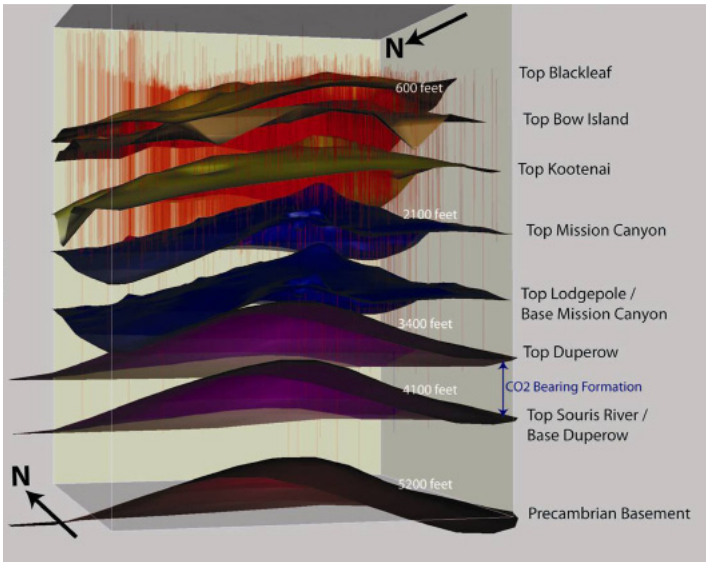


Figure 2: Geologic model depicting subsurface layers of interest at Kevin Dome. Red lines show wells drilled in various formations as of 2009. Updates to this model are ongoing.

Upcoming Events

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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