

## Seismic Work Begins on Kevin Dome Carbon Storage Project

The Big Sky Carbon Sequestration Partnership (BSCSP) is pleased to announce that one of the first major activities of the Kevin Dome Carbon Sequestration Project is set to begin. Crews and equipment are arriving in the area to conduct seismic surveys at the project site.



Seismic surveys use sound waves to develop three dimensional (3-D) images of the rock layers underground. They help researchers understand the subsurface environment, select the best locations for wells, and conduct the project in a safe manner. For more information on the technology, see the article "Science and Applications" on page 4 of this newsletter.

A portion of the project area will be surveyed in late 2011, and a larger area will be surveyed in the fall of 2012. During this period you may see survey crews placing small, palm-sized sensors in the fields as well as large seismic vibration trucks, driving in pairs in a grid pattern.

Seismic surveys will be conducted in close cooperation with landowners and the community:

- Seismic crews have obtained permission to access public and private lands
- All seismic surveys will be conducted at ground level
- Vibrations from the truck will only be felt about 100 feet from the source
- Trucks will intentionally avoid water resources and sensitive habitat areas
- At the end of the survey, trucks and receivers will be removed, leaving little impact on the area.

## The Kevin Dome Project

Big Sky Carbon Sequestration Partnership (BSCSP) is excited to begin these surveys, which will guide subsequent steps in the project.

The Kevin Dome Carbon Storage Project is a very large, eight-year carbon storage research effort. BSCSP, based at Montana State University in Bozeman, received funding in July 2011 from the U.S. Department of Energy to lead this cutting edge research. The overall goal is to demonstrate that carbon dioxide (CO<sub>2</sub>) can be stored safely and viably in regional geologic formations. The project involves permitting and injecting one million tonnes of CO<sub>2</sub> into deep porous rock formations, and monitoring the site at the surface and underground to gain a greater understanding of the economic and research complexities of long-term carbon storage.



*Seismic vibration trucks move together along the grid stopping at intervals to create soundwaves.*

For more information about the Kevin Dome project, go to: [www.bigskyco2.org/research/geologic/kevinstorage](http://www.bigskyco2.org/research/geologic/kevinstorage)

For questions, please contact Lindsey Tollefson or Lee Spangler at 406-994-3800.

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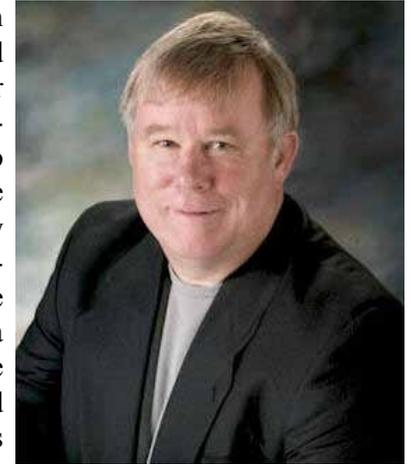
**Notable Neighbor:** Mayor Larry Bonderud

As many of our readers know, Mayor Larry Bonderud has served the town of Shelby as a volunteer and/or elected official for nearly 35 years. It is evident through Shelby’s strikingly low unemployment rate that this mayor is a man with a plan. Dr. Bonderud has ambitious and well-founded goals for Shelby’s continued economic development and sees the Kevin Dome Carbon Storage Project as an important leg in Shelby’s economic stool.

“We’ve made a conscious effort to diversify the economic base in our area to make us stronger even when markets outside our control may fluctuate. This long-term project is exactly the type of project we like to be involved in, and it fits very nicely with what we’re already doing. For instance, a power plant that is used to stabilize wind power could sequester some of its carbon dioxide emissions to make it cleaner. This stable energy source can then be sold in the open market. So it all fits together.”

In addition to the grander-scale impacts of this project, the Mayor also recognizes the more immediate benefits of this

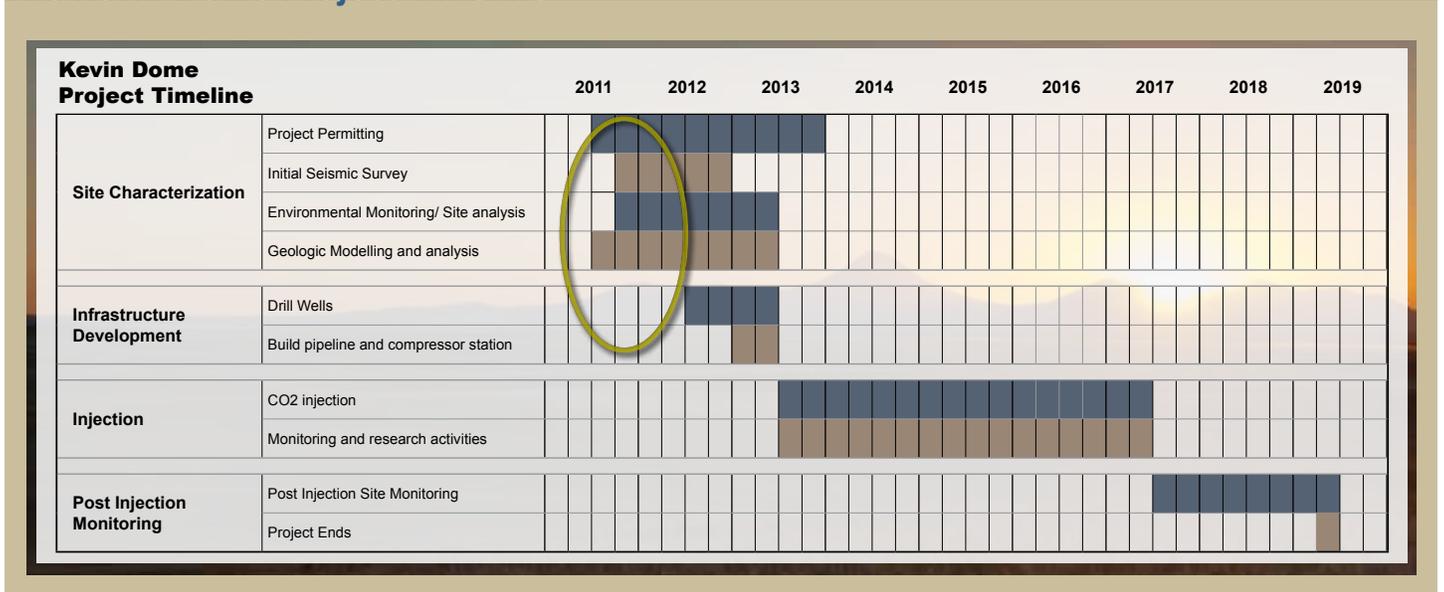
project to the area such as increased gas, food and lodging sales. Mayor Bonderud, true to Montanan hospitality, also notes that “we welcome the economic activity in the area, and we appreciate support of the project. We think it’s a win-win for the entire area, and we look forward to working with folks on the project to successfully complete this project.” To learn more about Mayor Larry Bonderud please visit



*Mayor Larry Bonderud.*

[www.shelbymt.com/mayor.htm](http://www.shelbymt.com/mayor.htm)

**The Kevin Dome Project Timeline**



Montana State University received funding for the Kevin Dome Carbon Storage Project at the end of July, 2011. Activities to date include planning, permitting, and initiating the seismic survey. The seismic survey crew will work during the winter of 2011-2012 and then take a break for the spring and summer. BSCSP plans to finish the seismic survey in the fall of 2012.



## Did You Know?

Carbon dioxide (CO<sub>2</sub>) is part of our everyday lives. This substance can be a solid (also known as “dry ice”), liquid or gas depending on its temperature and pressure. Typically, we experience CO<sub>2</sub> as a gas. It is the primary substance in the air we



exhale and the bubbles in our soda pop. Carbon dioxide is also a greenhouse gas in our atmosphere and along with sunlight it helps plants grow. In carbon capture and storage projects, when CO<sub>2</sub> is injected deep underground,

the CO<sub>2</sub> gas is in a “supercritical” state. In this state the CO<sub>2</sub> is midway between a gas and a liquid and has properties of both.

Carbon dioxide was first discovered back in the 17<sup>th</sup> century, and still plays a major role in our lives today. We use this substance to make soda water, bread, wine, fire extinguishers, life jackets, medicines and countless other products. Carbon dioxide’s properties are also partly to thank for refrigeration, medical advances and enhanced oil recovery.

*Do you have a question for our staff? Call or email us anytime at 406-994-3800 or [bigskycarbon@montana.edu](mailto:bigskycarbon@montana.edu), and let us know.*

## A-B-CCS: Word of the Day

“Carbon Sequestration.” Carbon sequestration is the capture and storage of carbon dioxide (CO<sub>2</sub>), a gas that can be naturally occurring or man-made. The phrase “carbon sequestration” can also be called “carbon capture and storage” or “CCS” for short. Carbon may be sequestered in both living and non-living things, such as plants or rocks. Our current carbon sequestration project in Kevin Dome will use deep rock layers for storage of carbon. There are three main parts to a carbon sequestration project: capture, transport and storage. Through each step of this process, researchers monitor pieces to make sure that CCS is not only an option for meeting our future energy needs, but is also safe for humans and the environment.

### Project By The Numbers

- Years of project = 8
- Proposed tons of CO<sub>2</sub> injected = 1 million
- CO<sub>2</sub> production wells planned = 3-5
- Injection wells planned = 1
- CO<sub>2</sub> monitoring wells planned = 4
- Percent of project that is privately funded ~ 20%
- Percent of project that is federally funded ~ 80%
- Square miles of seismic survey ~ 55

## Project Partner Spotlight: Meet Mark Russell, “Principal Geophysicist”

Mark is one of the lucky few who turned his love of science and the outdoors into his full-time job. As our Principal Geophysicist, Mark leads a crew of roughly 30 people during the seismic survey portion of our project. He has earned degrees in anthropology, geology and physics from the University of Illinois, a Master’s degree in geophysics from the University of Michigan and has over 17 years of experience working in the oil and gas industry.

Starting this fall, Mark and his team will begin taking 3-D images of the Kevin Dome. These images will show us how the layers of rock fit together underground with more detail than ever before. With a better understanding of the resource, Mark and the rest of the Big Sky Carbon Sequestration Partnership will be able to determine the safest and most effective ways to produce, transport and inject CO<sub>2</sub>.

When Mark is not working, he and his family enjoy spending time hiking and camping. “I love this part of the world,” Mark notes, “one of the reasons I do geophysics is to get out and experience the outdoors.” To learn more about Mark’s work, please visit [www.bigskyco2.org/research/geologic/kevinstorage](http://www.bigskyco2.org/research/geologic/kevinstorage)



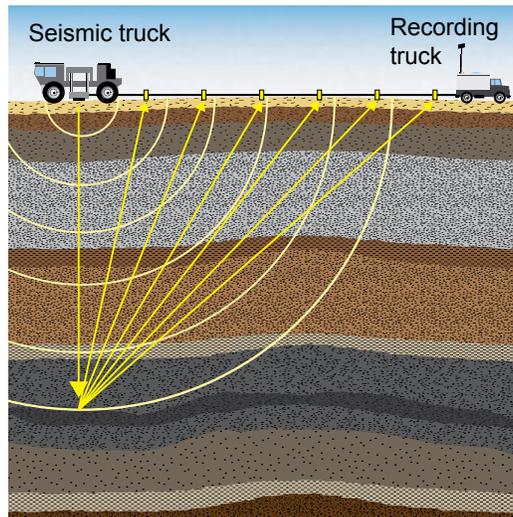
*Mark Russell discusses seismic survey work in the field.*



## Science and Application:

### Advancements in Sensor Technology Bring New Life to Underground Imaging

Thanks to advancements in sensor technologies, the seismic surveys for the Kevin Dome project will generate detailed 3-D images and models, with minimal disturbance to the land or the community. Seismic surveys use sound waves to help researchers understand the thickness and depth of rock layers beneath the earth's surface and reveal any faults or fractures in the layers. BSCSP will use sound waves to develop 3-D images of the rock layers below ground, much like an ultrasound that can show images of an unborn baby, organs or bones. For our upcoming survey, sensors (about the size of soda cans) called geophones will be temporarily installed at the surface to record the reflected sound waves from rock layers.



*Seismic trucks generate sound waves which are reflected back and detected by the sensor array.*

To create the sound waves, seismic vibration trucks equipped with large pads will send vibrations through the earth. Once the geophones are placed, the trucks will move together in a grid pattern lowering the vibration pad onto the surface at

regular intervals. The sound waves travel deep underground and are reflected back as waves from the different rock layers. These reflections will be picked up by the sensors and transmitted to a recording truck, which captures the data for computer processing and analysis. From the timing of the reflection data, the depths of the layers can be determined, and an image of the subsurface can be formed.

Collection and processing of the data is a critical first step for conducting a carbon storage project. For the community, these advanced techniques provide an opportunity to collect considerably more detailed geologic data for the northern Montana region than has previously been available. In the long-term, the data from the seismic survey may lead to additional commercial, career and research opportunities.

## Upcoming Events

# Annual Meeting

## Save the Date

### April 17-19, 2012

Great Falls, Montana  
Best Western Heritage Inn

For more information go to

[www.bigskyco2.org](http://www.bigskyco2.org)

Stay up-to-date with our project, visit [www.bigskyco2.org](http://www.bigskyco2.org)

Keep in touch and join our contact list, please email Kathryn Watson, our Outreach and Communications Director, at [kwatson@montana.edu](mailto:kwatson@montana.edu) or call her at 406-994-3390.

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