
March 17, 2010

Wyo.'s Crash Program to Develop 'Green' Coal

By JOHN J. FIALKA of [ClimateWire](#)

CASPER, Wyo. -- In the summer of 2008, Wyoming's governor, Dave Freudenthal, went to California for meetings with state officials and utility executives. What he brought was, quite literally, a burning question.

California was in the throes of putting together the nation's first cap on greenhouse gases, and it appeared that if a Democrat were elected president, there might soon be a federal law, as well. At stake was Wyoming's biggest industry -- coal production. Wyoming lawmakers worried that California would lead the nation to impose a ban on imports of out-of-state electricity if it were produced by coal-fired power plants. For both states, these are meat-and-potatoes questions. Wyoming is, by far, the nation's biggest coal producer. California is the second-largest electricity market in the United States. Freudenthal took the issue one step further: Were there any circumstances under which California regulators and utilities would consider power produced by Wyoming coal to be "green" enough to sell for premium prices?

The governor, a Democrat, and Wyoming state Rep. Thomas Lubnau II, a Republican, had both been impressed by the exploits of Anadarko Petroleum Corp., a Texas-based oil exploration company that had rejuvenated a century-old Wyoming oil field by injecting carbon dioxide into the formation. The company was touting its new production as "green oil," because it had taken millions of tons of man-made carbon dioxide being vented into the atmosphere and successfully injected it underground to produce more oil. Would California recognize "green coal"? Moreover, if engineers in Wyoming figured out a way to separate and bury most of the CO₂ emissions resulting from generating electricity by burning coal, could the electricity fetch the high prices being paid by California utilities for wind and solar energy?

"We never got a clear answer," explains Freudenthal, a tall former state planning coordinator. But he got the Wyoming Legislature to begin setting up the legal framework needed to support carbon capture and sequestration. He has also been engaged in a bit of foreign policy, visiting China's coal provinces and pushing state officials to work with China and Australia on carbon capture and sequestration.

Freudenthal, who is also a lawyer, got the campaign going two years before the Obama administration embraced the issue. He started with a February 2008 article he wrote for the state's law journal describing the issues involved in capturing and storing carbon as a "Pandora's Box" of legal and regulatory questions that had, as yet, no answers. Pointing out that Wyoming is, by far, the nation's largest coal producer, he injected a note of urgency: "No one else in the marketplace has as much at stake as we do and no one is likely to act on our behalf."

Stanley Young, a spokesman for California's Air Resources Board, explained that under current law, utilities in the state can't make long-term contracts to import coal-fired power. If Wyoming power producers could cut their CO₂ emissions by about half to match natural gas emissions, the utilities might,

depending on whether they met pending California regulations. Currently, Young said, a blue-ribbon commission is pondering how to measure and deal with lower-carbon coal-generated power.

Fired up by science fiction

As it happened, Wyoming Republicans, who dominate the Legislature in the nation's least densely populated state, were already fired up. Stefanie Judson-Kivelin, a former babysitter for the speaker of the state's House of Representatives, had accomplished this with a term paper she wrote at Princeton while getting an engineering degree. She composed a science-fiction scenario explaining how, by 2020, the state had attracted billions of dollars of new business by stimulating the production, storage and sequestration of CO₂.

Rather than falling victim to federal and state carbon caps, her paper said, Wyoming saw its coal industry flourish by developing a carbon policy that capitalized on them. In her study, the state encouraged such things as new coal plants near mining areas that separated CO₂ from their emissions and then shipped electricity rather than coal out of state.

Wyoming also profited from building pipelines to carry the resulting CO₂ to oil fields and other places where it was buried. Still more money, she envisioned, would come from developing and selling Wyoming underground burial space to other states that could dispose of their CO₂ by sending through extensions of this pipeline system, which she called big interstate carbon "superhighways" leading to Wyoming.

In Stefanie's world, coal-laden trains are old hat. Her paper had coal leaving new power plants in the form of clean electricity that could be shipped as a premium product -- like California oranges -- to West Coast cities at the speed of light.

Stefanie's paper ended with a parade in the streets of Casper in 2020. "I had them be successful," recalls Judson-Kivelin, who currently works as an energy engineer in California.

Climate 'agnostics' push through CCS laws

Her paper went through the speaker of the House's office and found its way to the desk of Rep. Lubnau, a lawyer who represents the district that includes Wyoming's biggest coal-producing area, the Powder River Basin. Lubnau picked up his phone and called the governor.

"If the governor doesn't pick up by the second ring, I know he's out of town," said Lubnau, explaining the folksy and often nonpartisan way politics works in his state. The two lawyers -- both of whom describe themselves as "agnostics" when it comes to believing in man-made causes of global warming -- worked out a plan to create a legal structure authorizing and regulating the permanent storage of CO₂ from power plants.

As Lubnau explained in an interview, Wyoming would never impose a cap on carbon emissions, but if the United States or other states did, Wyoming wanted to lead the country in establishing laws that would support and regulate carbon sequestration. So far, the Legislature has passed five laws and organized a working committee to study what else might be needed.

Getting clear answers to business-related questions "is important to us," explained the governor, who said that waiting for Washington to deliver answers could take years. The current climate bill passed by the House, he added, is "never going anywhere. It's not well drafted."

In its solo efforts to blaze a new legal-regulatory trail for carbon capture and storage, Wyoming has attracted some interested allies. One is David Victor, a professor of international relations at the University

of California, San Diego. He believes that coal is so plentiful and inexpensive around the world that it will continue to be used in large quantities.

Even with twice the cost penalties imposed on carbon by pending legislation before Congress, Victor argued, burning coal to make electricity will still remain cheaper than alternatives such as nuclear or wind power. Wyoming's huge strip mines, he notes, are among the most efficient in the world. Other nations, he added, such as China and Australia, are already competing for the necessary investments to establish carbon capture and storage regimes.

Competing with other states and China for capital

The professor said Wyoming's efforts are impressive because the questions of property rights and liability issues surrounding carbon storage have to be settled for the United States to compete, and "historically, they're mainly settled at the state level." He sees Wyoming "at the forefront" of a handful of states, including Texas and Illinois, that will be competing with each other to attract the capital needed to build the multibillion-dollar infrastructure that carbon capture and sequestration will require.

Lindeen Patton, the chief climate product officer of Zurich Financial Services, one of the largest property and casualty insurers in the world, has also been working with Wyoming's effort. Currently, coal-fired power supplies about half of the electricity in the United States. In China, it's closer to 80 percent. After analyzing future energy sources and their relative costs, she said, the insurance company concluded there could eventually be a multibillion-dollar market in carbon capture and sequestration. "We sat back and said there is no way that coal will not be part of this mix."

The company did a computer analysis of the regulatory needs and liability risks of carbon capture and saw many similarities to risks the company already insures, among them gas pipelines and the injection of wastes and natural gas into underground reservoirs.

In each case, insurers have helped minimize risks by working with regulators and companies to develop safety regulations and to pick the most leak-free disposal sites. "Companies, when they buy insurance, get a competitive advantage if they can buy low-priced insurance," Patton said. "So we come in and say, 'Here is what we'd consider important, and if you do this, we'd put a substantial amount of capital at risk.'"

While the United States and other countries have launched projects to demonstrate carbon capture and sequestration, both Victor and Patton caution that large numbers of commercial-scale projects may still be as much as 20 years away. And they both note that to make them happen, the federal government may have to take on some of the bigger long-term liability involved, as it does currently with nuclear power plants.

Wyoming may have a head start in gaining the financing, because it estimates that there are 1 billion barrels of "stranded oil" that oil companies could produce from existing fields other than Salt Creek by using more CO₂ injection, assuming they could tap redesigned power plants to get the gas.

"We could do 10 more Salt Creeks, but we wouldn't make a dent in what we emit," explained Ronald Surdam, Wyoming's state geologist. To further reduce emissions would require a place to put the excess CO₂ from power plants, and that raises a host of new problems. At Salt Creek, for example, the CO₂ goes into porous rock formations where space has already been created by sucking out some of the oil.

Dipping a toe into the water business

When it comes to finding new formations where CO₂ exhaled by power plants could be safely buried, Surdam explained that geologists are looking at underground reservoirs already saturated with briny water, which will have to be removed to create space. Otherwise, pushing more CO₂ underground would create hydraulic pressures that might damage neighboring underground uses miles away, such as oil and gas production.

So Wyoming is planning to create underground storage space by pumping up the briny water, treating it and selling it. "We're talking large-scale desalination," Surdam explained. "Then you could put it in the [Colorado] river, or we could use it in the state," he added. "I think 50 years from now, water will be one of the most valuable commodities in the West."

Surdam is quick to add that the overall costs of the infrastructure that will be needed to capture and sequester CO₂ on a commercial scale remain a huge unknown. To settle that question, his office is planning a demonstration injection into a rock formation where 10 million tons of CO₂ will be stored in one year -- an experiment at least 10 times larger than current demonstration projects run by the U.S. Department of Energy.

"We're trying to figure out what you can do and what you can't do and how much it's going to cost. Society will have to figure out whether to pay the cost," said Surdam. The first drilling into a larger sequestration site will begin later this year, and injection could begin by 2012, he and Mark Northam, a geochemist at the University of Wyoming, explained.

Wyoming's efforts are aided by U.S. Department of Energy grants and access to a new supercomputer being built in Cheyenne. Wyoming delegations have made two visits to China, which is helping them explore carbon capture technology and the use of so-called "mine mouth" coal-fired plants -- industry complexes recently built in China's coal provinces that produce chemicals as well as electricity from coal, thus eliminating the need to move it. "They're helping us and we're helping them delineate and characterize the best places for the sequestering of CO₂," said Surdam.

Because coal-fired power plants are among the globe's largest sources of man-made CO₂, these are not small questions. In June, experts from Australia, another nation heavily committed to coal use, will arrive here to consult with Surdam, Northam and other leaders of Wyoming's big sequestration effort, said Northam. "We're really on a crash course to understand what it is we need to do."