CARBON NATION

CO_2 INJECTION HITS THE NORTHWEST

By Camilla Mortensen

In 2000, energy giant Cenovus began injecting CO2 into an aging oil field to store carbon and force oil to the surface. Three years later Cameron and Jane Kerr dug a couple gravel pits on their nearby farm in Saskatchewan, Canada; the pits filled in with water and soon the ponds bubbled, animals died and clots of foam bubbled up. The land was fizzing like soda pop.

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Carbon capture and storage. It sounds boring, but really it's magic; it's like Harry Potter takes on climate change but with flue gases instead of floo powder: If CO2 gas is a big factor in global warming, then why not just conjure it away?

First take the CO2-filled flue gases from the power plant; then with a little hocus pocus the gas is turned to a special liquid. Inject that liquid into the ground, and magically the liquid becomes part of the rock and, poof! — your little CO2 problem is gone.

It's not that simple. It might be a little more like a curse than a spell, or it least it has been for the Kerr's farm.

"There's no silver bullet, only silver buckshot for climate change," says Cesia Kearns of the Sierra Club. "The challenge with carbon capture and storage is that it's unproven, and we're not prepared to deal with the unknown consequences," she says.

But the Big Sky Carbon Sequestration Partnership, a U.S. Department of Energy-funded project, is looking to store carbon underground in basalt rock formations. A test site in Washington is all drilled and set to go, and if things go Big Sky's way, Oregon too could be home to tons of stored carbon. Power plants pumping out CO2 could send carbon to injection sites, pump the stuff into the ground and never deal with it again. Drill a hole and bury it. That's much easier than managing a forest or a rangeland for CO2 storage.

According to a DOE document about the Big Sky project, "To date, Wyoming, Montana, Washington and North Dakota have developed specific statutory requirements to regulate geologic storage of CO2." Oregon is not included on that list of states with laws about carbon storage.

THE CO2 PROBLEM

The first step is admitting you have a problem. The U.S. has a problem: It's one of the world's biggest global warming gas emitters, but it never ratified the Kyoto Protocol that sought to cut carbon dioxide emissions. Neither did the other big offender, China. The environmental treaty, once seen as the world's biggest hope for cutting back on CO2, appears to be a bust.

Under Kyoto, countries agreed to reduce their carbon emissions by an average of 5.2 percent from 1990 levels by the year 2012. Now that 2012 is drawing near, the targets are about to expire and countries at the 2009 Copenhagen climate summit failed to agree to a new global warming treaty. Climate change hasn't gone away, but if CO2 injection takes off, we might be one step closer to sweeping our little CO2 mess under a basalt doormat.

Cap and trade was an option under the treaty — putting mandatory caps on CO2 emissions, but letting companies buy emissions credits from others who are not polluting as much or from projects that are storing carbon. But that hasn't really taken off in the U.S., says Tony Svejcar, a research leader with the USDA Agricultural Research Service. "Carbon is not worth very much right now," he says. Carbon in the U.S. is worth about $1.50 a ton. In Europe, Svejcar says, carbon offsets go for $15 to $20 a ton.

According to work by Oregon State University professor John Antle, results from the Big Sky project show CO2 emissions in the region could be sequestered at a cost in the range of $40 to $50 a metric ton in a measurement called carbon dioxide equivalents.

"As much talk as there is about carbon and the effort to reduce carbon," Svejcar says, "we can't get the funding to research this kind of stuff."

The Big Sky Carbon Sequestration Partnership doesn't have that funding problem. Phase III of the project, carbon injection into sandstone rocks in Wyoming, got $66.9 million from the DOE and the rest of the $139 million for the project will come from "industry partners, matching funds and other funding sources," according to Montana State University, where the partnership has its home.

The Wallula, Wash., test site, just across the Columbia River from Oregon, was part of Phase II, and it got $10 million in funding to drill into the basalt on the site of a Boise White Paper, LLC mill, 2,000 feet from the river. It's been billed as the world's first CO2 injection into basalt, though the project is running a couple years behind schedule. Phase II of Big Sky and the other six DOE-funded regional carbon sequestration projects also included looking at some terrestrial projects such as soils, forests, grazing and croplands.

The basalt injection site was planned originally as part of the Wallula Energy Resource Center, a coal-fired plant that would have turned coal to liquid and then vaporized it. The gas would run turbines, and the CO2 released would have been injected underground into the basalt. But the project, whose sponsors included Sunwest Management Inc. of Salem, fell through due to the length of time it was taking to begin the CO2 injection experiment. Without CO2 injection the new coal-powered plant would have emitted CO2 above Washington state standards.

Pete McGrail, the basalt pilot project manager, says workers have drilled 4,110 feet into the basalt, and when injection begins, the gas will be injected about 3,000 feet underground. He says the CO2 that will be stored is "food grade," the same stuff used to make soda pop. The permits, he says, are all in place and injection will get under way when shipments of CO2 are timed just right. "I've ceased making predictions on timelines," he says.

McGrail is unclear on exactly where the CO2 will be coming from. He says the CO2 will arrive by rail, "from which plant I don't know." The SEPA checklist says 1,000 metric tons of CO2 will be "shipped by Praxair Inc., staff from the ConocoPhillips Ferndale refinery."

The flue gases from a refinery are first processed to remove other gases, McGrail says. The process, he says, is "so highly selective for CO2 you can get to the 99.9 percent purity." The CO2 is then heated and placed under pressure until it becomes fluid. "This magical state is called supercritical," McGrail says. The supercritical CO2 is then transported to the injection site and basically squirted into the rocks beneath Washington — or in the future Oregon and Idaho.

McGrail says the unique thing about basalt is the way it reacts with CO2. Almost like medieval alchemy, basalt turns CO2 into rock. A series of chemical reactions combines carbon dioxide with calcium in the basalt to form calcium carbonate. This is not to be confused with the carbonite in *The Empire Strikes Back* that Darth Vader encased Han Solo in, but the idea is pretty similar. Presto! A pesky problem, be it a swashbuckling intergalactic pirate or globe heating CO2, becomes a nice, quiet rock.

The process happens over weeks or months, McGrail says, and it works great in lab pressure vessels. "It can't go anywhere," he says, "it's trapped." He calls it — if it works in the field as it does in the lab — the "safest and most secure storage."