Alaska Ice Tested as Possible New Energy Source

DAN JOLING,Associated Press

ANCHORAGE, Alaska (AP) — A half mile (800 meters) below the ground at Prudhoe Bay, above the vast oil field that helped trigger construction of the trans-Alaska pipeline, a drill rig has tapped what might one day be the next big energy source.

The U.S. Department of Energy and industry partners over two winters drilled into a reservoir of methane hydrate, which looks like ice but burns like a candle if a match warms its molecules. There is little need now for methane, the main ingredient of natural gas. With the boom in production from hydraulic fracturing, the United States is awash in natural gas for the near future and is considering exporting it, but the DOE wants to be ready with methane if there's a need.

"If you wait until you need it, and then you have 20 years of research to do, that's not a good plan," said Ray Boswell, technology manager for methane hydrates within the DOE's National Energy Technology Laboratory.

The nearly $29 million science experiment on the North Slope produced 1 million cubic feet (30,000 cubic meters) of methane. Researchers have begun the complex task of analyzing how the reservoir responded to extraction.

Much is unknown but interest has accelerated over the last decade, said Tim Collett, a research geologist for the U.S. Geological Survey in Denver.

U.S. operators in Alaska, he said, may want to harvest methane so they can re-inject it into the ground. Crude oil is more lucrative than natural gas, which is routinely injected into North Slope fields to maintain underground pressure to aid in oil extraction. Japan, South Korea, India and China, however, want to cut down on natural gas imports by burning methane. Japan is setting up for a production test on a gas hydrate accumulation in the Nankai Trough south of Honshu, its main island.

"That will be the first marine gas hydrate test anywhere in the world," Collett said.

The U.S. Energy Department describes methane hydrate as a lattice of ice that traps methane molecules but does not bind them chemically. They are released when warmed or depressurized.

Methane comes from buried organic matter after it's ingested by bacteria or heated and cooked. The gas migrates upward, under high pressure and low temperature, and can combine with water to form methane hydrate.

Most deposits are below the sea floor off the continental shelf or under permafrost. Shallow pockets of methane hydrate release the potent greenhouse gas into the atmosphere and that process is exacerbated by climate warming.

Brendan Cummings of the Center for Biological Diversity said research money should be poured into renewable resources, not more fossil fuel sources. Methane is 20 times more effective at trapping heat in the atmosphere than CO_2, though not as long-lived.

"Any exploration activities designed to extract methane hydrates run the risk of unintended consequences, of unleashing the monster," he said. Even if methane is extracted safely, burning it will add to climate warming, he said.

The world has a lot of methane hydrate. A Minerals Management Service study in 2008 estimated methane hydrate resources in the northern Gulf of Mexico at 21,000 trillion cubic feet (595 trillion cubic meters), or 100 times current U.S. reserves of natural gas. The combined energy content of methane hydrate may exceed all other known fossil fuels, according to the DOE.

Not all is accessible, but high concentrations in permeable rock where there's existing drilling infrastructure would be among early candidates for development. The USGS in 2008 estimated 85 trillion cubic feet (2.41 trillion cubic meters) of undiscovered, technically recoverable gas within methane hydrate deposits on Alaska's North Slope.

It will not be simply dug out of the ground, Boswell said.

"One of the basic messages is, we're not mining," he said. "It's using existing drilling techniques."

Methane could be extracted by lowering pressure or increasing temperature in an underground reservoir.

"One of the issues with that, though, is that you are melting the ice, and adding a lot of gas and water to the reservoir, which can compromise the reservoir's strength," Boswell said.

The Alaska research focused on a method aimed at preserving the underground ice structure. The extraction technique was based on studies done by ConocoPhillips and the University of Bergen in Norway. Researchers in a laboratory injected carbon dioxide into methane hydrate. CO_2 molecules swapped places with methane molecules, freeing the methane to be harvested but preserving the ice.

The DOE worked with ConocoPhillips and Japan Oil, Gas and Metals National Corp. to see if it would work in the field. They named the North Slope well Ignik Sikumi, an Inupiat Eskimo phrase that translates as "fire in the ice."

Researchers injected 210,000 cubic feet (5,947 cubic meters)of carbon dioxide and nitrogen into the underground reservoir through perforated pipe. Instruments measured pressure, temperature and produced gases. They tracked injected gases without fracturing the formation.

Scientists collected data from 30 days of methane production, five times longer

than anyone had done before. They are now trying to determine if methane produced was from an exchange with CO2, a reaction to the nitrogen, or a reaction to pressure changes down the hole.

Researchers are optimistic.

"From the lab data we had, it seemed like it was some strong evidence that it was not a lot of wholesale destruction of the solid hydrate," Boswell said.

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