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An Energy Coup for Japan: 'Flammable Ice'



Jogmec, via European Pressphoto Agency

Gas flames being expelled from a burner in a deep-sea drilling vessel in the Pacific off Japan.

By [HIROKO TABUCHI](#)

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TOKYO — Japan said Tuesday that it had extracted gas from offshore deposits of methane hydrate — sometimes called “flammable ice” — a breakthrough that officials and experts said could be a step toward tapping a promising but still little-understood energy source.

The gas, whose extraction from the undersea hydrate reservoir was thought to be a world first, could provide an alternative source of energy to known [oil](#) and gas reserves. That could be crucial especially for Japan, which is the world’s biggest importer of liquefied [natural gas](#) and is engaged in a public debate about whether to resume the country’s heavy reliance on nuclear power.

[Experts estimate](#) that the carbon found in gas hydrates worldwide totals at least twice the amount of carbon in all of the earth’s other fossil fuels, making

it a potential game-changer for energy-poor countries like Japan. Researchers had already successfully extracted gas from onshore methane hydrate reservoirs, but not from beneath the seabed, where much of the world's deposits are thought to lie.

The exact properties of undersea hydrates and how they might affect the environment are still poorly understood, given that methane is a greenhouse gas. Japan has invested hundreds of millions of dollars since the early 2000s to explore offshore methane hydrate reserves in both the Pacific and the Sea of Japan.

That task has become all the more pressing after the Fukushima Daiichi nuclear crisis, which has all but halted Japan's [nuclear energy](#) program and caused a sharp increase in the country's fossil fuel imports. Japan's rising energy bill has weighed heavily on its economy, helping to push it to a trade deficit and reducing the benefits of the recently weaker yen to Japanese exporters.

The Japanese Ministry of Economy, Trade and Industry said a team aboard the scientific drilling ship Chikyu had started a trial extraction of gas from a layer of methane hydrates about 300 meters, or 1,000 feet, below the seabed Tuesday morning. The ship has been drilling since January in an area of the Pacific about 1,000 meters deep and 80 kilometers, or 50 miles, south of the Atsumi Peninsula in central Japan.

With specialized equipment, the team drilled into and then lowered the pressure in the undersea methane hydrate reserve, causing the methane and ice to separate. It then piped the natural gas to the surface, the ministry said in a statement.

Hours later, a flare on the ship's stern showed that gas was being produced, the ministry said.

"Japan could finally have an energy source to call its own," said Takami Kawamoto, a spokesman for the Japan Oil, Gas and Metals National Corporation, or Joggmec, the state-run company leading the trial extraction.

The team will continue the trial extraction for about two weeks before analyzing how much gas has been produced, Joggmec said. Japan hopes to make the extraction technology commercially viable in about five years.

“This is the world’s first trial production of gas from oceanic methane hydrates, and I hope we will be able to confirm stable gas production,” Toshimitsu Motegi, the Japanese trade minister, said at a news conference in Tokyo. He acknowledged that the extraction process would still face technical hurdles and other problems.

Still, “shale gas was considered technologically difficult to extract but is now produced on a large scale,” he said. “By tackling these challenges one by one, we could soon start tapping the resources that surround Japan.”

It is unclear how much the tapping of methane hydrate would affect Japan’s emissions or [global warming](#). On one hand, natural gas would provide a cleaner alternative to coal, which still provides Japan with a fifth of its primary energy needs. But new energy sources could also prompt Japan to slow its development of renewable energies or green technologies, hurting its emissions in the long run. Any accidental release of large amounts of methane during the extraction process would also be harmful.

Jogmec estimates that the surrounding area in the Nankai submarine trough holds at least 1.1 trillion cubic meters, or 39 trillion cubic feet, of methane hydrate, enough to meet 11 years’ worth of gas imports to Japan.

A separate rough estimate by the National Institute of Advanced Industrial Science and Technology has put the total amount of methane hydrate in the waters surrounding Japan at more than 7 trillion cubic meters, or what researchers have long said is closer to 100 years’ worth of Japan’s natural gas needs.

“Now we know that extraction is possible,” said Mikio Satoh, a senior researcher in marine geology at the institute who was not involved in the Nankai trough expedition. “The next step is to see how far Japan can get costs down to make the technology economically viable.”

Methane hydrate is a sherbetlike substance that can form when methane gas is trapped in ice below the seabed or underground. Though it looks like ice, it burns when it is heated.

Experts say there are abundant deposits of gas hydrates in the seabed and in some Arctic regions. Japan, together with Canada, has already succeeded in extracting gas from methane hydrate trapped in permafrost soil. American researchers are carrying out similar test projects on the North Slope of Alaska.

The difficulty had long been how to extract gas from the methane hydrate far below the seabed, where much of the deposits lie.

In onshore tests, Japanese researchers explored using hot water to warm the methane hydrate, and tried lowering pressure to free the methane molecules. Japan decided to use depressurization, partly because pumping warm water under the seabed would itself require a lot of energy.

“Gas hydrates have always been seen as a potentially vast energy source, but the question was, how do we extract gas from under the ocean?” said Ryo Matsumoto, a professor in geology at Meiji University in Tokyo who has led research into Japan’s hydrate deposits. “Now we’ve cleared one big hurdle.”

According to the United States Geological Survey, recent mapping off the North Carolina and South Carolina coasts shows large offshore accumulations of methane hydrates. Canada, China, Norway and the United States are also exploring hydrate deposits.

Scientists at the geological survey note, however, that there is still a limited understanding of how drilling for hydrates might affect the environment, particularly the possible release of methane into the atmosphere, and are calling for continued research and monitoring.

This article has been revised to reflect the following correction:

Correction: March 12, 2013

An earlier version of this article misspelled the surname of a spokesman for Joggmec. He is Takami Kawamoto, not Kawatomo.