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Mining the Oceans' Natural Gas

By: Katrina C. Arabe - Monday, April 25, 2005

Below the ocean floor lies a vast reserve of frozen natural gas--200,000 trillion cubic feet, geologists estimate. The big question is--could this be the clean and abundant fuel source we've been searching for?

Since the 1970s, researchers have been intrigued by methane hydrates, mysterious deposits of natural gas that hold promise as a sustainable energy resource. The problem was that very little was known about these crystalline solids--where they could be found, how plentiful they were, and how to extract them. As a result, their true potential remained shrouded in mystery.

Not anymore. According to a February 2005 Mechanical Engineering magazine article, dedicated research programs in the U.S. and around the world are uncovering many answers. Encouragingly, they suggest that the "commercial production of methane from hydrate may now be just around the corner," says the article. It reports that through field studies in places such as the waters off Oregon, the Gulf of Mexico, and the Alaskan North Slope, it's become evident that tapping into the methane in these solids is both "technically feasible and economically viable." And it can be done with current technologies. In fact, in Alaska, geologists are already plotting out ways to commercially produce methane from the hydrates they have spotted.

What's more, the vastness of this potential resource has been backed up by data. Ten years ago, the U.S. Geological Survey was the first to systematically quantify the methane volumes in hydrates in the U.S. and bounding continental shelves. Now, integrating the latest data, geologists place that estimate at 200,000 trillion cubic feet, which is equivalent to about 2,000 times the current amount of energy the U.S. consumes in a year. Global estimates, meanwhile, vary by several orders of magnitude, due to remaining uncertainties. However, even by the most conservative figures, gas-in-place volumes in methane hydrates are said to be 10 times greater than all recoverable natural gas in the world.

Article author Ray Boswell, technology manager for methane hydrates at the U.S. Department of Energy's National Energy Technology Laboratory, points out that the viable production of methane from these hydrates will help ensure the "long-term supply of natural gas, an environmentally friendly fuel with enormous economic and energy security benefits to the nation."

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These frozen undersea deposits of natural gas are exceedingly difficult to study, however. Found in marine sediments and in the Arctic, they melt at room temperature at sea level, dissociating into water and methane. (Methane hydrate is a solid substance, in which host water molecules trap methane molecules without bonding them.) Thus, specialized equipment, such as pressure-retaining containers, and sophisticated technologies, such as computed tomography X-ray scanning and nuclear magnetic resonance imaging, are a must in the study of methane hydrates.

According to Mechanical Engineering, "the promise of methane hydrate is this: It is a very efficient storehouse of energy. When dissociated, a single cubic foot of solid hydrate releases as much as 180 cubic feet of methane gas." In methane hydrates, the natural gas is trapped solid within.

Now the tough part is figuring out how to competitively mine this resource. They reside after all in tough-to-reach low temperature-high pressure settings, in particular in sediments under some 500 meters or more of water and in some Arctic continental areas. Deep-water operations obviously will not come cheap. What's more, the environmental implications of exploiting these deposits still have to be explored.

Mechanical Engineering poses the question, "Will methane hydrate fuel the future?" The answer seems to be "we'll see"--researchers still have to figure out how much producible methane there is in these frozen deposits.
Source: Buried Treasure, Ray Boswell
Mechanical Engineering "Power & Energy," February 2005
www.memagazine.org/pefeb05/buriedt/buriedt.html