PROGRAM **facts**

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

**Strategic Center for Natural Gas & Oil**

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# METHANE HYDRATES

Over the past three decades, expeditions to polar regions and deep-water continental shelves all over the globe have confirmed the existence of extensive deposits of naturally-occurring methane hydrate. Today, the United States Geological Survey estimates that these deposits may contain more organic carbon than all the world's coal, oil, and non-hydrate natural gas *combined*. The apparent size of this previously unknown storehouse of methane is truly staggering and has raised serious inquiry into the potential of utilizing the methane stored in hydrates as a future energy source. Spurred by this potential, nations all over the globe have begun significant methane hydrate R&D programs.

However, the issues surrounding methane hydrates go well beyond its energy resource potential. As field and laboratory studies supported by the Methane Hydrates Program continue to document hydrate's integral and active role in the global environment, important new questions are raised about the influence of hydrates on the global carbon cycle, deep sea life, sea-floor stability, and other phenomena. In addition, the inherent instability of hydrates poses a hazard to the safety of drilling and producing oil and natural gas from underlying conventional accumulations in deep-water settings. Therefore, *the National Methane Hydrate R&D Program is driven by the need to better understand the nature of hydrates, hydrate-bearing sediments, and the interaction between the global methane hydrate reservoir and the world's oceans and atmosphere as a compliment to the ultimate realization of hydrate's energy potential.*

No single organization has the expertise and resources to efficiently answer all the questions associated with methane hydrates. Therefore, the National Methane Hydrate Program, representing a new model for collaborative R&D among the nation's leading research institutions, was formed. Coordinated by DOE's National Energy Technology Laboratory, scientists from DOE's network of Industrial Partners and National Laboratories, the Naval Research Lab (NRL), the United States Geological Survey (USGS), the Minerals Management Service (MMS), the National Oceanographic and Atmospheric Administration (NOAA) and the National Science Foundation (NSF), are working to provide the knowledge and technologies to allow the full realization of methane hydrate's potential in supporting our nation's continued economic growth, energy security, and environmental protection.

*Methane is actively dissociating from a hydrate mound on the Gulf of Mexico deep sea floor.*

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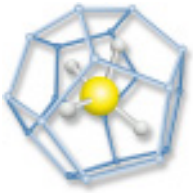

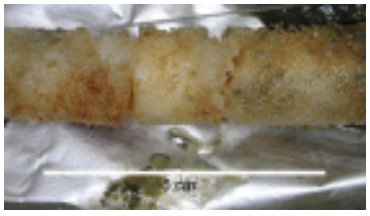

*Core samples of gas hydrates are collected from Gulf of Mexico seeps using a mini-drill and a gas hydrate recovery chamber deployed from the submersible Johnson Sea Link.*

*New species of polychaete worm found living in gas hydrates during a NOAA/NURP-sponsored sub cruise in 1997 on the northern Gulf of Mexico continental slope at a depth of 549 m (1,800 ft).*

Over the past two decades, hydrate research in the lab has addressed many fundamental questions such as quantities, distributions, modes of occurrence, physical and chemical properties, and others. More recently, the focus has shifted to the recovery and study of hydrates in the field. Together, these studies are allowing the refinement of computer models that will accurately predict the behavior of hydrates and hydrate-sediment systems under changing conditions. Currently, there are several projects focused on studying naturally-occurring hydrates in the Arctic and the Gulf of Mexico. Some of these projects are listed below:

- A regional characterization of northern Alaska hydrates in association with British Petroleum, the Universities of Alaska and Arizona, and the USGS. The project's goal is to assess hydrate's potential to become part of the Alaska North Slope gas resource portfolio.
- A Joint Industry Project led by ChevronTexaco to provide detailed information on hydrate accumulations in the deep water Gulf of Mexico. This work is focused on understanding and avoiding the hazards involved in drilling and producing oil and gas through or near hydrate-bearing sediments.
- The installation of a permanent monitoring station on the floor of the Gulf of Mexico. The station, operated by a consortium of researchers coordinated through the Center for Marine Resources and Environmental Technology at the University of Mississippi will provide information on ongoing, natural processes that affect hydrate formation and decomposition.

As these and other ongoing projects provide new information and analytical tools, our improving understanding of natural methane hydrates will be brought to bear on four broad groups of issues:

- the *role hydrate plays in global processes* such as climate and the carbon cycle.
- *hydrates as a natural part of deep-sea environments*, including its connection to sea-floor stability and deep-sea life.
- *assuring the safety of deep-water oil and gas E&P operations* that increasingly require drilling through overlying marine hydrate deposits, and
- ensuring the long-term supply of natural gas *by developing the knowledge and technology base to allow commercial production of methane from domestic hydrate deposits by the year 2015*.

*The gas flare from the Mallik 5L-38 production well illustrates the success of the production tests.*