

AAPG EMD Gas Hydrates Committee Report – 2009

By Bob Lankston and Art Johnson

Progress toward commercialization of gas hydrates in North America and Asia is continuing in 2009, with some notable advancement in both resource assessment and technology.

U.S. Exploration Activity

With many challenges and unknowns remaining long-term, economically-viable production of natural gas from hydrates is as yet unproven. Gas hydrate R&D is the type of high cost, high-risk, high-potential endeavor that calls for government economic support.

Progress in the U.S. has been limited by the relatively low budget levels of the Department of Energy (DOE) methane hydrate program, the primary source of funding for U.S. hydrate efforts. While Congress authorized \$30 million for fiscal year 2008 and \$40 million for fiscal year 2009 under the Energy Policy Act of 2005, the appropriation for each year was for only \$16 million. The new administration has shown a higher level of interest in hydrate, particularly for its carbon sequestration potential. The areas of focus for U.S. hydrate efforts are the North Slope of Alaska and the Deepwater Gulf of Mexico.

The companies that are most involved with gas hydrate programs in the U.S. include BP, Chevron, ConocoPhillips, Schlumberger, and Halliburton; although all of the operators on the North Slope are now becoming involved. Their in-kind contributions of labor and data are complemented by a substantial match of Federal funds. Several service companies are engaged in a support role as subcontractors.

A long-term, industry-scale production test is planned for the North Slope in the summer of 2010 as a follow-up to BP's successful "Mt. Elbert" stratigraphic test in 2007. The location has not yet been announced. In addition, ConocoPhillips is planning a CO₂ injection test in the summer of 2010 to evaluate the potential of CO₂ substitution in a methane hydrate-bearing sand to both sequester CO₂ and yield methane production.

In the Gulf of Mexico, the Joint Industry Program (JIP) led by Chevron initiated field operation on April 16 utilizing the semi-submersible "Helix Q4000". The three-week expedition conducted logging-while-drilling (LWD) operations at multiple sites to test a variety of geologic/geophysical models for the occurrence of gas hydrate in sand reservoirs in the deepwater Gulf of Mexico. The results from the JIP drilling program will be used to calibrate the exploration model for marine hydrate.

International Exploration Activity

While many countries have expressed interest in the resource potential of gas hydrate, few have been willing to commit the financial resources needed to begin valid assessments that could lead to commercial development. Outside of the U.S., significant programs are currently being carried out in Japan, India, Canada, South Korea, and the Peoples Republic of China.

In Japan, the evaluation of results from the 2004 drilling program in the Nankai Trough led to an announcement by the head of Japan's MH21 program that Japan will begin reservoir testing by 2011. The Japanese estimate of gas in place for the Nankai Trough is 39 TCF.

Resource Estimates

Resource estimates for the Gulf of Mexico and North Slope of Alaska were published in 2008 by federal agencies. The Minerals Management service conducted an evaluation of the petroleum system for the Gulf of Mexico and estimated a total gas hydrate volume of between 11,112 and 34,423 TCF, and a mean estimate of 6,717 TCF in place in sandstone reservoirs. Assessments for the Atlantic and Pacific margins are on-going, and the resource potential of those locations may actually be larger than the Gulf of Mexico estimate. The USGS, in cooperation with the BLM, released an assessment of the undiscovered, technically recoverable gas hydrate resources on the North Slope of Alaska. Using an assessment methodology based on detailed analysis of geological data, the USGS estimated undiscovered, technically recoverable gas resources of 85.4 TCF within gas hydrate.

Other than the Japanese estimate for the Nankai Trough, little reliable data on international basins exist regarding hydrate resource potential where reservoir lithology would permit commercial development.

Critical Technology Needs

Current commercialization efforts are constrained by technology needs in three areas: the lack of thorough and diverse exploration protocol for identifying deposits where hydrate is concentrated and has resource potential, the lack of proven technology for commercial-scale production, and the lack of an environmental impact assessment protocol. All three of these areas are being addressed by the current gas hydrate programs, particularly the U.S. and Japanese programs.

The most important “next step” will be the industry-scale production test planned for Alaska. If commercially viable flow rates are achieved, the reservoir could be quickly developed to supply gas for local use. This result would likely lead to a much greater interest and investment by industry. Current budget constraints could delay the test, however.

Environmental and Geohazard Issues

Potential hazards associated with production of natural gas from hydrate include ground subsidence, methane release, slope instability, and water and sand production. Initial studies have indicated that these issues can be mitigated; however, modeling and field validation of mitigation strategies are needed.

An additional area of interest is the opportunity for sequestering carbon dioxide as a subsurface hydrate. ConocoPhillips is investigating the possibility of using the chemical exchange of carbon dioxide for methane in hydrate-bearing reservoirs. In addition to producing natural gas without dissociating the hydrate, this technology would result in stable, long-term sequestration of carbon dioxide.

EMD Technical Sessions and Publications

A Gas Hydrate poster session is planned for the 2009 AAPG annual meeting in Denver.

The publication from the 2004 Hedberg Research Conference is in press and will be available in summer, 2009 as AAPG Memoir 89, with the title “Natural Gas Hydrates -- Energy Resource Potential and Associated Geologic Hazards”. The memoir includes an extensive summary of gas hydrate occurrence, technology, and program results that

includes results through mid-2008, written by T. Collett, A. Johnson, R. Boswell, and C. Knapp.

Another conference of interest to EMD members was the 6th International Conference on Gas Hydrates (ICGH) which convened in Vancouver in July, 2008. The conference included over 500 participants from 25 countries with 78 oral and 341 poster presentations. Most of the papers are available through the University of British Columbia website <https://circle.ubc.ca/handle/2429/1022>.