Methane Hydrate Advisory Committee (MHAC) Meeting
July 26, 2012
8:30 am – 5:00 pm (CDT)
Houston, Texas

MEETING SUMMARY

DFO Welcome and Introductions

The meeting was called to order at 8:36 am by Christopher A. Smith, Deputy Assistant Secretary for Oil and Gas within the U.S. Department of Energy (DOE) and Designated Federal Officer (DFO) for the Methane Hydrate Advisory Committee (MHAC). He thanked the members of the MHAC for their public service and stated that this program is of great interest and importance to DOE. Secretary Chu has been personally engaged in this program and it is within his personal area of knowledge from his time in the national laboratory system. Secretary Chu has emphasized the right kind of partnerships between government and academia. In order to succeed in new frontiers, DOE cannot work by itself. The right stakeholders must be leveraged for their knowledge and expertise. Presentations were to include a case study on a successful test well in the Arctic. The DFO reminded the group that all federal advisory committees are open to the public and deliberations must be done openly and transparently.

Chair's Welcome and Expectations

Dr. Mary (Missy) Feeley of the ExxonMobil Exploration Company and Chair of the MHAC welcomed the group. She asked that this meeting be used to set objectives, including:

- Identifying interests of the committee
- Current program outline and results
- Future program plans and long term strategy subject to funding constraints
- If a communication to the Secretary of Energy would be formulated, key elements and format must be agreed to and voted upon

Peter Flemings of the Bureau of Economic Geology within The University of Texas at Austin and Co-Chair of the Committee recommended using the Committee Discussion period to formulate the key messages for communication to the Secretary of Energy.

Robert Swenson recommended going around the room for introductions. Robert Swenson, Richard Charter, Thomas Blasingame, Miriam Kastner, Peter Flemings, Lou Capitanio, Christopher Smith, Missy Feely, David Scholl, Craig Shipp, Joseph Wilder, and Carolyn Koh all gave brief introductions of their backgrounds from the meeting room. Dave Goldberg gave his introduction via phone. The presenters, Tim Collett, Rick Baker, Keith Hester, and Helen Farrell also introduced themselves. A complete list of attendees can be found in Attachment 1, the attendance record is included in Attachment 2, and the event's sign-in sheets can be found in Attachment 3.

Committee Business

Lou Capitanio, the Committee Manager, outlined committee business. He informed the committee that no public comments were received in advance of the meeting. He stated that Federal advisory committee meetings are now considered to be conferences. This means that any expenditure over $100,000 must be approved by senior officials in DOE; this Committee will not reach that number, but there will be an emphasis on teleconferences, rather than face-to-face meetings going forward. The members must receive an annual ethics briefing this September by DOE's General Council via phone.

Presentation: Update on Prudhoe Bay Testing – Helen Farrell and Keith Hester of ConocoPhillips

Helen Farrell and Keith Hester of ConocoPhillips presented on Prudhoe Bay Testing. A field trial in the winter season was conducted in Alaska. This was a reservoir scale test to evaluate production through CO_2/CH_4 exchange and via depressurization. It was not a commercial test, but it was the first field-scale, non-laboratory test on the CO_2/CH_4 hydrate exchange technology. There were three basic goals: (1) validate the ability to inject into naturally-occurring a methane hydrate reservoir, (2) confirm that exchange process would release methane without producing sand and water, and (3) gather reaction rate data.

The award funding was received in 2008. From 2008-2010, the team worked to identify an accessible test site. In 2011, the well was drilled, logged, and completed. Since then, the exchange test was performed and the well site was remediated. The Iġnik Sikumi #1 well was 200 feet away from the nearest adjacent well bore; all infrastructure was contained to protect mechanisms from inclement weather. The site encountered hydrates in C sand, D sand, and E sand – all well below permafrost. The Upper C sand at a depth of 2,250 feet was selected for the test. It is homogenous sand with a total porosity of 39%. Thirty feet of the 34 foot interval were perforated.

Primary concerns included:

- Formation: Apparent free water in pore system of C sand and resulting potential for CO_2 hydrate formation,
- Test Parameters: Delivery of CO_2 to the formation,
- Test Design: Unavailability of a suitable reservoir simulator.

The field test used a mixture of CO_2 and nitrogen, operating in a single gas phase for displacement. This mixture was chosen based on calculations from a cell-to-cell tank model simulation tool developed by ConocoPhillips. With a mixture of CO_2 (23%) and N_2 (77%), hydrate saturations never went greatly above 80%, indicating a high likelihood of maintaining permeability during production. They also looked at presence of free water to see if it could be displaced by nitrogen. However, the model predicted cooling due to hydrate dissociation caused by the N_2 could result in ice formation. While the injection rate was quite low, injection of the 210 MCF of the CO_2 and nitrogen mixture went more quickly than anticipated and was concluded in 12 days. After the initial unassisted flowback, the well was placed on jet pump operation. There were no spike events. Methane content in the production stream initially quickly rose to 60%-80% and steadily increased over the course of the test to greater than 90%. Near the end of the test CO_2 comprised less than 1% of the production stream with the balance being N_2.

Data was compiled in a SQL database, analyzed, and 1- and 5-minute time average datasets were created. Conclusions are being developed as the analysis continues. History match of compositional data is being performed which will indicate definitively whether the CO_2/CH_4 exchange took place. This information will ultimately be critical in designing a long term production test. Next steps will include issuing a final report and final database and holding a DOE workshop to present said products by the end of the year.

The Committee broke for a coffee break at 11:10 am and reconvened in full at 11:25 am.

Presentation: FY 2012 Program Activities – Rick Baker and Yongkoo Seol, DOE's National Energy Technology Laboratory (NETL)

Rick Baker is a Project Manager with NETL and presented on behalf of Ray Boswell. Yongkoo Seol from NETL was available to answer technical questions related to the NETL in-house research. They presented that hydrates can be a next generation energy source and can contribute to increased domestic energy independence. Field-based research will help to show where recoverable hydrates can be viably extracted; field research is ongoing in Alaska under projects with ConocoPhillips and BP Exploration Alaska and the Gulf of Mexico (GoM) through the Chevron led Joint Industry Project (JIP). Other research within the program is also beginning to reveal what role gas hydrate may play in the global carbon cycle, the environment, and climate.

DOE leads the Federal program in gas hydrates which is made up of seven collaborating U.S. government agencies. DOE also maintains formal international agreements related to hydrate research with Korea, Japan, and India. The program is subject to review and oversight through avenues including: federal advisory committees, the National Academy of Sciences / National Research Council reviews, and interagency committees. The Program includes a focus on gas hydrate in nature and an approach where major program goals are targeted through field-based research that is then supported by efforts advancing modeling, critical science and technology development.

To date, results included four major field activities since 2005 (two in the Arctic and two in the GoM). This research addressed hydrate-related drilling hazards in the GoM, proved out an approach for hydrate exploration, identified hydrate resource targets in the Arctic and GoM, measured key hydrate reservoir properties and confirmed that hydrate research activities could safely be performed.

Major focuses of ongoing research include: evaluation and interpretation of data from the 2012 gas hydrate production field trial in Prudhoe Bay with ConocoPhillips and the Japan Oil, Gas and Metals National Corporation (JOGMEC), continuing to pursue a long-term hydrate production testing program on the Alaska North Slope , continuing to develop marine hydrate characterization and sampling programs, and supporting focused arctic field sampling programs to assess hydrate-climate interactions.

In FY 2010, the Program budget was $15 million for the program, while in FY 2011, there was a $5 million in funding transferred from the DOE Office of Science. In FY 2012, the program budget is $10 million with the majority of FY 2012 funding targeted toward initiation of a new suite of research efforts selected under a competitive funding opportunity announcement.

Planned activities for FY 2012 include:

1. Conduct detailed analyses and initiation of public reporting of test results from ConocoPhillips Prudhoe Bay project
2. Continue to move toward establishment of long term test site on Alaska North Slope with DOE engagement
3. Coordinate with the GoM JIP, Japan, U.S. Geological Survey (USGS), and others to finalize the design, build, and testing of pressure coring devices and associated equipment as well as developing feasible options for equipment use
4. Track results of completing environmental hydrate projects, including the University of California- Santa Barbara (methane flux and fate) and University of Alaska Fairbanks/USGS (study of methane seepage from Alaska thermokarst lake)
5. Renew and rebuild program portfolio through the selection of new research efforts under a targeted funding opportunity announcement in the following topic areas:
    - Field Programs for Deepwater Hydrate Characterization; Response of Methane Hydrate Systems to Changing Climates; and Advances in the Understanding of Gas Hydrate Bearing Sediments
6. Continue to enable full international collaboration with India, South Korea, and Japan
7. Solicit and evaluate new Hydrate Fellowship candidates (fellowship program administered through the National Academy of Sciences). There have been seven fellows since 2007 and there are currently two active fellows.
8. Continue NETL in-house research efforts to advance the understanding of where, why, and what controls the occurrence of natural gas hydrate and address key climate, stability, and energy/resource related issues. This research includes numerical and experimental studies.
9. Continue / Initiate Interagency efforts, including:
    - Technical Coordination Team: GoM JIP (including USGS and Bureau of Ocean Energy Management [BOEM]); University of Mississippi Consortium with BOEM and National Oceanic and Atmospheric Administration (NOAA); DOE-USGS Interagency Agreement; USGS-NETL Interagency Agreement; and DOE-Naval Research Laboratory Interagency Agreement
10. Support International collaborations, including:

- Statement of Intent with Japan's Ministry of Economy, Trade and Industry; Statement of Intent with Korea's Ministry of Knowledge Economy; Memorandum of Understanding with India's Ministry of Petroleum & Natural Gas; and Collaborations and contacts with China, Canada, New Zealand, and Norway

11. Continue Program Outreach and Results dissemination through avenues including, but not limited to:
    - NETL Website; Industry conferences / events; National Petroleum Council Topical Paper (2011); Dedicated research results volumes; Publication of scientific / technical articles on project results; Hydrates Primer; Videos and specialized web updates on key project activities; Fire-in-the-Ice biannual newsletter publication; Review of hydrate science (Product from the United Nations Environment Program); Iğnik Sikumi Workshops (in planning for Japan in November 2012 and Houston January 2013); and Potential Program Review in 2013

The NETL Program's questions for the Committee relate to what the focus and thrust of the program should be both in general, and in specific research areas including: fundamental science, tool/technology development, hydrate environmental science, geohazards, and energy resource issues. The Committee expressed that it is necessary for the hydrate program to update their technology roadmap from 2007 including successes and paths forward.

The Committee broke for lunch at 12:45 pm and reconvened immediately in full for a working lunch to conclude NETL's presentation at 1:35 pm.

Presentation: Update on International Activity – Tim Collett, USGS

Tim Collett of USGS presented on international gas hydrate research. Tim overviewed gas hydrate field projects, including the GOM JIP, UBGH1 and UBGH2 in Korea, MH21 in Japan, NGHP01 and NGHP02 in India, GMGS01 in China, and the Arctic Permafrost Gas Hydrate Testing. These projects were all examples of collaborative efforts between government and industry. Drilling R&D has been completed in deepwater marine (Japan, USA, Korea, India, China), in permafrost (Canada, USA, and China), and Arctic Ocean drilling environments (USA and Canada). Future R&D is planned for deepwater marine environments in Asia, permafrost systems in the Arctic, in the North Atlantic, GoM, and the Vancouver margin.

Tim anticipates opportunities ahead in both Arctic and marine environments. In the Arctic, he suggested a need for field long-term testing and a variety of scientific test programs. In marine environments, multi-well field programs are needed to test geologic models and provide data for remote sensing calibration; new remote sensing data acquisition programs will advance the assessment of resources.

Presentation: Program Budget Requests – Lou Capitanio, DOE

Lou Capitanio, the Committee Manager, overviewed DOE's Methane Hydrate program budget. In FY 2012, there was an appropriation of $10 million. A Funding Opportunity Announcement was released to fund the development of alternative field and supporting laboratory and modeling research opportunities. The budget was also used to continue ongoing industry, National Lab, interagency, and in-house research work.

The FY 2013 budget request was $5 million. The House Appropriations Subcommittee Mark was at $10 million "for ongoing methane hydrates research and development". The Senate Appropriation Committee Mark was at $5 million "for research into the cost-effective and responsible extraction of methane hydrates." The Appropriation can be at either of these Marks or at a level in-between, The Program primary focus will be to continue work with industry and international collaborators on project structures and scientific designs for a testing program. Recognizing the operational and logistical constraints of that project, alternatively the Program intends to initiate a new GoM marine hydrate resource characterization field program. Additionally, DOE plans to continue to use the National Lab system and interagency collaborations for their competencies, studies, and advancements of numerical models.

The FY 2014 budget process began in June 2012 when DOE's Office of Fossil Energy prepared an internal budget for the Secretary. This budget contained the continued evaluation of methane hydrate as an economical energy resource. By August 2012, the Secretary of Energy will review all Office's budgets and make final decisions. On September 10, 2012, DOE will submit a budget request to the Office of Management and Budget (OMB). By late November 2012, OMB will pass back the budget. In early February 2013, the Administration budget request will be sent to Congress. In February and March of 2013, Congress will hold budget hearings; they will conduct their budget mark-up in June and July of 2013. If there is an administration change, the Administration budget request will be delayed and will be sent to Congress closer to April 2013 with all subsequent milestones being compressed. By late 2013, a Congressional Appropriation Bill is expected to be passed to allocate the FY 2014 funding.

Methane Hydrate Program Strategic Direction Discussion

Christopher Smith, DFO, discussed strategic program direction. He stated that this Committee can help to demonstrate how methane hydrate research is in the public interest and what the government's role in this research should be. The success of the Prudhoe Bay test, with a limited budget, showed that the U.S. remains in the forefront of hydrate research.

He described how shale gas research is being coordinated through DOE, USGS, and the U.S. Environmental Protection Agency through a Steering Team to create a multi-year research plan with synchronized budgets.

The Secretary may want to see what the Committee views as necessary to happen to propel hydrate research. DOE wants to build the science to which point the commercial viability of a technology or process is demonstrated and seeks input from the Committee as to how to make that happen. It will be up to industry to determine if a technology or process is economically viable enough to commercialize.

Committee Discussion

Dr. Mary (Missy) Feeley, Chair of the MHAC, led a committee discussion. The Committee would like to present declarative statements based upon the Committee's vast expertise related to the needs of methane hydrate research to the Secretary. The Committee plans to use the National Academy of Sciences' (NAS) recommendations on methane hydrates needs (http://www.nap.edu/catalog.php?record_id=12831).

The outlined discussion goals include:

- Describe what is in the public interest
- Define the key scientific issues
- Determine how to strategically move forward.

The Committee plans to send a letter to the Secretary of Energy. The purpose of the letter will be determined during this meeting and consensus must be achieved in order to move forward with sending a letter. Items the Committee would like to include in the letter are:

- Establish and prioritize goals, as informed by the NAS report. Goals will include:
    1. The need for a long term production test (preferably onshore with an active infrastructure)
    2. Determine the impact of long term geohazards during production
    3. Resource quantification
        - Identify large reservoirs, rich in hydrates located near infrastructure
        - Range of geologic occurrences
- Acknowledge the successes of the program to-date and realize that there is currently a window of opportunity due to recent successes:
    - Identification of resources in recent experiments
    - Mt. Elbert, Prudhoe Bay, and GoM JIP testing successes

- Maintain leadership in light of increased international activity and investment
- Convey the consensus of the Committee on the scientific challenges and approaches that should be taken to advance methane hydrate research.
- Role of hydrates in global carbon cycling
- Further understanding of CO_2 exchange and the impact of hydrate melting in Arctic regions
- Further understanding of hydrate stability
- Ensure safe operations
- A need to maintain intertwined laboratory, theoretical, and field programs to achieve the goals of the program
- Must have funding at an appropriate level to meet the above goals
- The methane hydrate program should fulfill information needs to enable a precautionary approach ensuring safe operations and environmental protection, while advancing society's understanding of geohazards and climate implications, including CO_2 exchange, as methane hydrate science and R&D goes forward.

The Committee agreed to the above content and determined that the Chair (Missy Feeley) and Co-Chair (Peter Flemings) will use this framework to draft a letter by August 3, 2012. Missy will incorporate individual Member's comments into a final draft by August 15, 2012.

Public Comments

The DFO noted that the meeting was open for public comment, but no requests to speak were made. The meeting was adjourned at 4:37 pm.

Mary Feeley, Chair

Christopher A. Smith, DFO