The Methane Hydrate Advisory Committee

Advisory Committee to the Secretary of Energy

April 13, 2017

The Honorable Rick Perry
Secretary of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Secretary:

Natural gas is increasingly important to the United States. Although shale gas is a huge resource, the amount of natural gas in methane hydrate (a solid composed of natural gas and water) in the U.S. is significantly larger. Potentially recoverable methane hydrate resources are about 85 trillion cubic feet (TCF) in onshore Alaska and about a hundred times more in the offshore Gulf of Mexico and the Atlantic margin. These estimates are larger than the Energy Information Administrator (EIA) estimate for total U.S. technically recoverable natural gas resources, which is about 2,500 TCF. Hence, methane hydrate could significantly contribute to the long-term energy security of the U.S. At present, the U.S. is the technology leader in methane hydrate. However, for the U.S. to exploit these resources scientific understanding must be improved through a long-term reservoir response experiment, evaluation of hydrate reservoir quality in offshore U.S., and support of academic and national laboratory research on methane hydrates in natural systems.

Methods of methane hydrate exploitation are still in early-stage research and development. Technologically, the situation is comparable to that of coalbed methane and shale gas in the 1980s. At that time, pre-competitive research sponsored by the Department of Energy (DOE) resulted in resource definition and technology development – including advances in horizontal drilling and massive hydraulic fracturing – at a time when there was no commercial interest in these resources. The DOE methane hydrate research program is at an early stage today: it is answering fundamental, long-term questions required to assess the technical and economic viability of methane hydrate production, and providing a better understanding of hazards such as seafloor slope and wellbore instabilities. These questions are not being addressed by industry, whose technology developments are instead directed to resources likely to be produced in the immediate future.

The Methane Hydrate Advisory Committee (MHAC) has found that, since Congress enacted the Methane Hydrate Research and Development Act of 2000, the DOE methane hydrate program has been well-managed, impactful, and cost effective. Steady, methodical work, funded by very modest budgets, has resulted in a remarkable body of scientific and technical knowledge, and a corps of highly skilled American scientists, engineers and technicians. Funds have been widely distributed among the states. A major portion of the FY 2016 budget has been expended in public universities and other state agencies, the balance supporting work in Federal laboratories. It is also highly leveraged, with a large fraction of its activities funded by foreign governments, including those of Japan and India, each of which sponsors national methane hydrate programs with budgets many times more than the U.S. program. The U.S. technical leadership in large

international programs has maintained and enhanced U.S. dominance in advanced fossil fuel technology.

Multiple external evaluations of the program have all been favorable. However, key fundamental science questions remain, many of which can be only answered by targeted field programs, including scientific drilling and reservoir response experiments, in which methane hydrate is stimulated by depressurization, and/or heating, to release natural gas from the earth.

The MHAC has determined that a long-term reservoir response experiment is the indispensable next step in a forward-looking methane hydrate research program. There has been no such long-term experiment anywhere in the world, which leaves key questions unanswered about production over the many years that a commercial well would have to flow. Brief tests in Alaska, Canada, and offshore Japan provided encouraging results, and demonstrated a long-term reservoir response experiment is needed. Reservoir simulation shows that, in marked contrast with quickly depleting resources such as gas shale, gas production from methane hydrate grows during the first several years of production. In order to verify these model-based studies, which is crucial to establish economic viability – a field-scale experiment lasting one to three years is required.

The North Slope of Alaska provides a globally unique locale for such a long-term experiment. A site that meets all geologic criteria and has the necessary facilities and infrastructure has been identified. This opportunity, including site access from industry operators and international support, has a finite window.

In view of the above, the MHAC recommends key tasks 1-5 described below, where the proposed reservoir response experiment is one step in a long-term program designed to ensure continued U.S. technical leadership in methane hydrate. Table 1 (below) provides estimates of resources required over the next five years to achieve these key goals.

1. **Reservoir response experiment on the North Slope of Alaska.** Significant progress has been made toward meeting this goal. DOE, the U.S. Geological Survey, the State of Alaska Department of Natural Resources, and the Japan Oil, Gas and Metals National Corporation with support from industry operators have shared data, identified an optimal drilling location, and are working toward a high-level conceptual plan of operations.

2. **Evaluation of hydrate reservoir quality in offshore U.S. exclusive economic zones.** Significant concentrations of methane hydrate in sand-rich marine reservoirs have been estimated for U.S. waters. However, scientific drilling and coring are required to assess the extent, quality, and economic viability of U.S. offshore reservoirs in the Gulf of Mexico and the Atlantic Margin.

3. **Maintain U.S. leadership in fundamental and applied energy R&D.** Continue and enhance DOE laboratory, university, and industry partnerships that focus on essential assessment of resource concentrations, recovery rates, reservoir behavior, and wellbore stability during methane hydrate production.

4. **Continue to support fundamental academic and national laboratory research on methane hydrate in natural systems.** This includes research on methane hydrate as a widespread constituent of the shallow geosphere in arctic and marine settings.

5. **Leverage international partnerships.** Continue participation in major international programs in order to advance our understanding of methane hydrate in natural settings, and techniques for its production.

Table 1. Summary of MHAC Recommendations for the DOE Methane Hydrate Program.

	Activity/Location	Estimated Cost in $million				
		2018	2019	2020	2021	2022
1	North Slope of Alaska	15	10	10	10	10
2	Gulf of Mexico	5	15	15	5	5
2	Atlantic Margin	0	0	5	15	15
3,4	Academic R&D	5	5	5	5	5
5	International	5	5	5	5	5
	Total	**$30M**	**$35M**	**$40M**	**$40M**	**$40M**

The current $20 million funding level should be incremented by $10 million in FY 2018 and subsequently by 5 million in FY 2019 and FY 2020 to achieve goals 1-5 above. This will allow for timely completion of both the land-based reservoir experiments and offshore resource delineation tasks.

We emphasize that without the above requested support for this program, the unrivaled technical leadership of the U.S. in this advanced fossil fuel technology is at risk. U.S. investments lag far behind those of our global energy competitors. Maintaining scientific and technical leadership today will place the U.S. in a more competitive position decades from now, as we begin to exploit this resource. The long-run program deliverable is sustained domestic natural gas production from massive, technically recoverable resources, leading to major commercialization in the U.S., enhanced long-term national energy security, and greater global energy security as the U.S. aids key allies in the development of this new industry.

At your earliest convenience, the MHAC will appreciate your willingness to meet with representatives of our committee so that we could convey our optimism that methane hydrate is emerging as a significant potential domestic energy source and our strategy to realize this enormous U.S. natural gas resource.

Yours truly,

Carolyn A. Koh (Chair)

Miriam Kastner (Vice-Chair)

On behalf of the Methane Hydrate Advisory Committee

APPENDIX

The Methane Hydrate Advisory Committee (MHAC)

Chair: Carolyn A. Koh

Professor Carolyn Koh is the William K. Coors Distinguished Chair and Professor in the Chemical and Biological Engineering Department at the Colorado School of Mines (CSM). She studies the interfacial interactions of natural gas hydrate in multiphase flow and offshore conditions. She is the Director of the CSM Center for Hydrate Research, which involves a consortium of energy industries to develop and advance new flow assurance strategies to ensure uninterrupted production of oil and natural gas in subsea flowlines. She has served on several key national and international advisory committees, and has a prolific publication and mentorship record in gas hydrate research.

Vice Chair: Miriam Kastner

Miriam Kastner is the Distinguished Professor of Geosciences at the University of California, San Diego, Scripps Institution of Oceanography. She is an oceanographer and geochemist who combines mineralogical and geochemical expertise to tackle a range of geoscience problems. She has sailed on countless marine science expeditions, many of them focused on hydrate research. She has served on dozens of key national and international advisory panels and editorial boards for prestigious journals, acting as an outspoken advocate for science of the highest quality.

Dr. Thomas Blasingame	Texas A&M University, College Station, TX
Mr. Richard Charter	The Ocean Foundation, Bodega Bay, CA
Dr. Peter Flemings	University of Texas at Austin, Austin, TX
Dr. Matthew J. Hornbach	Southern Methodist University, Dallas, TX
Dr. Joel E. Johnson	University of New Hampshire, Durham, NH
Dr. Robert D. Kaminsky	ExxonMobil Upstream Research Co., Spring, TX
Dr. Robert L. Kleinberg	Schlumberger-Doll Research, Cambridge, MA
Dr. Michael Max	Hydrate Energy International, Inc., Washington, DC
Dr. George J. Moridis	Lawrence Berkeley National Lab, Berkeley, CA
Dr. Mark D. Myers	Principal, Myenergies, Anchorage, AK
Dr. Craig Shipp	Shell International E&P Inc., Houston, TX
Dr. Evan A. Solomon	University of Washington, Seattle, WA