The Methane Hydrate Advisory Committee

Advisory Committee to the Secretary of Energy

November 12, 2018

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

Dear Mr. Secretary:

Natural gas in the United States is increasing in importance, with consumption expected to rise from 27 trillion cubic feet (TCF) today to 40 TCF in 2040[1], and worldwide natural gas consumption is approximately 132 TCF/year today, rising to 185 TCF/year in 2040.[2] Natural gas from potentially recoverable methane hydrate in the U.S. is larger than the total U.S. technically recoverable natural gas resources (including gas and oil shale resources), with 85 TCF estimated in onshore Alaska and about a hundred times more estimated for the offshore Gulf of Mexico and the Atlantic margin.

Methane hydrate is important to the long-term energy security of the U.S. The U.S. is currently the technology leader in methane hydrates, where this leadership can be attributed to the success of the DOE methane hydrate research program; as exemplified by the two flagship field projects in the Alaska North Slope and the Gulf of Mexico. The DOE methane hydrate program is also highly leveraged, with a large fraction of its activities funded by foreign governments, including national programs in Japan, India, China, whose budgets far exceed the U.S. program.

As a technical advisory committee, our priorities are to demonstrate the technical feasibility of natural gas production from methane hydrates through a long-term production test, to evaluate the methane hydrate reservoir quality in offshore U.S. resources, and to maintain global leadership in methane hydrate technology. There has been *no long-term, sustained production test anywhere in the world*. This leaves unanswered critical questions about recovery rates and production reliability over the many years that a commercial well would have to flow.

Reservoir modelling predicts that in marked contrast with rapidly depleting resources such as gas shale, the gas production rate from a methane hydrate well will grow during the first several years of production. Hence, in order to establish and verify economic viability – a field-scale experiment lasting one to three years is required. The Alaska North Slope provides a globally unique locale for such a sustained, long-term production experiment. An opportunity in the North Slope exists presently, including site access from industry operators and international support, but has a finite window.

[1] https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2018&cases=ref2018&sourcekey=0
[2] https://www.eia.gov/outlooks/archive/ieo17/pdf/0484(2017).pdf *(page 49)*

The MHAC recommends Key Tasks 1-5 given below, where the proposed long-term production test will ensure continued U.S. technical leadership in methane hydrate. **Table 1** provides estimates of resources required over the next five years to achieve these key goals.

1. **Extended reservoir response experiment followed by a long-term, full-scale production test on the Alaska North Slope (2018-2024).** The DOE, in partnership with the Japan Oil, Gas, and Metals National Corporation, the US Geological Survey, and the State of Alaska Department of Natural Resources will initiate field operations this December 2018 toward a multi-year scientific field experiment designed to assess the response of gas hydrate reservoirs to depressurization. These results will allow for the design and implementation of a full-scale demonstration of reservoir deliverability by 2024.
2. **Gulf of Mexico reservoir characterization through drilling & coring, and geophysical investigation (2020-2024).** 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.
3. **Evaluation of hydrate reservoir quality in offshore U.S. waters, other than the Gulf of Mexico and the Alaska North Slope.** Significant concentrations of methane hydrate in sand-rich marine reservoirs are believed to be present in other offshore U.S. waters, but need screening and verification. Scientific evaluation including but not limited to drilling and coring is required to assess the extent, quality, and economic viability of U.S. offshore reservoirs.
4. **Maintain U.S. leadership in foundational methane hydrate R&D.** Continue to enhance DOE laboratory, university, and industry partnerships that focus on essential assessment of resource concentrations, recovery rates, reservoir behavior, wellbore completions, and hydrate investigations from the petroleum system and carbon cycle perspective, and the development of large biogenic gas systems.
5. **Leverage international partnerships.** Continue participation in major international programs in order to advance our understanding of methane hydrate in various 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	2023	2024
1	North Slope of Alaska Production	14	16	20	20	20	30	30
2	Gulf of Mexico – Characterization	1	0	20	20	5	15	15
3	Other U.S. Margins Screening	0	0	5	5	20	20	20
4	Foundational R&D	5	4	5	5	5	5	5
5	International Collabora-tions & Outreach	0	0	3	5	5	5	5
	Total	**$20M**	**$20M**	**$53M**	**$55M**	**$55M**	**$75M**	**$75M**

In summary, the above requested support for this program is to maintain the unrivaled technical U.S. leadership in sustained domestic natural gas production from massive gas hydrate resources, that will lead to major commercialization in the U.S and enhanced long-term national energy security. The MHAC would like to present to you 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. Christopher Carstens	Carbo Culture Inc., Woodside, CA
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 Fellow - Retired, Cambridge, MA
Dr. Michael Max	Hydrate Energy International, Inc., Washington, DC
Mr. Daniel McConnell	Fugro, Houston, TX
Dr. George J. Moridis	Lawrence Berkeley National Lab, Berkeley, CA
Dr. Mark D. Myers	Myenergies, Anchorage, AK
Dr. Craig Shipp	Shell International E&P Inc., Houston, TX
Dr. Evan A. Solomon	University of Washington, Seattle, WA
Dr. John Thurmond	Equinor Natural Gas LLC, Houston, TX