

# Departmental Response: Assessment of the Report of the SEAB Task Force on Methane Hydrates



## 1. Introduction

Recent research confirms that gas hydrates are abundant in nature and exist in a wide variety of forms with varying relevance to future energy, long-term global carbon cycling, near-term climate change, and both natural and operational geohazards. Further, recent assessments within the Department of the Interior suggest large potential resources in gas hydrate deposits onshore Alaska and throughout the U.S. Outer Continental Shelf. Drilling programs in both Alaska and the Gulf of Mexico (GOM) have demonstrated viable exploration approaches and provided initial confirmation of potentially producible gas hydrate resources. Internationally, the most recent field trial of hydrate production was conducted by the Japanese in offshore Japan.

Methane hydrates are a massive natural gas resource in the United States and elsewhere in the world. The estimated cost of producing methane hydrates is such that industrial research remains limited and development and commercialization in the U.S. are not expected as long as conventional and unconventional North American natural gas production remain cost effective. The production of methane hydrates may also involve potential environmental impacts including seafloor subsidence and leakage of methane (a potent greenhouse gas) into the atmosphere.

On June 17, 2015, U.S. Secretary of Energy, Dr. Ernest Moniz, asked the Secretary of Energy Advisory Board (SEAB) to form a task force to review the U.S. Department of Energy's (DOE) methane hydrate research program. The purpose of this task force was to provide a framework for DOE's methane hydrate research effort. Specifically, the SEAB Methane Hydrates Task Force was directed to:

- Review the existing DOE program and evaluate this program taking into account the findings of the 2010 National Research Council Study<sup>1</sup> and the reports of DOE's Fossil Energy Methane Hydrate Advisory Committee.<sup>2</sup>
- Review plans for understanding what answers field experiments on Alaska's North Slope and other relevant regions of interest such as the GOM, including collaboration with U.S. Geological Survey and Japan, should provide.
- Recommend the roles of private industry, the U.S. government, and foreign governments in developing methane hydrates production technology and environmental controls.

---

<sup>1</sup> [nap.edu/download.php?record\\_id=12831#](http://nap.edu/download.php?record_id=12831#)

<sup>2</sup> <http://energy.gov/fe/services/advisory-committees/methane-hydrate-advisory-committee>

It was envisioned that the findings and recommendations by the SEAB task force would provide a clear forward path in the further evaluation of gas hydrate's energy and environmental implications. Furthermore, the task force report would clarify DOE's role to assess gas hydrates.

## 2. SEAB Review

In January 2016, the Task Force submitted its report to the SEAB and the SEAB provided the Task Force report to the Secretary on January 26, 2016. It contained six summary recommendations:

- 1. DOE should continue to support funding at approximately its current FY 2015 level (\$15 million per year).** The effort to understand the production of methane from hydrates is important and should continue, even though U.S. domestic demand for natural gas is likely to be met for several decades via U.S. production of conventional gas, coalbed methane, and shale gas. The same is not necessarily true, however, for the global market. Other nations, owing to their own energy profiles, see methane hydrates as a potentially important resource in the medium term. The program has made valuable scientific and technological contributions and should remain a DOE priority, with funding at its current level of \$15 million per year. The program will benefit greatly from steady, more reliable funding that will facilitate planning around the long-term strategic objectives.
- 2. Estimates suggest that carbon emissions could be less than existing alternatives.** The potential contribution of fossil carbon to the atmosphere through the commercial extraction of methane from hydrate reservoirs is relatively small compared to that of other fossil resources. If extracted, natural gas is likely to replace future coal use, providing a net climate benefit.
- 3. Approximately one-third of the program budget should be dedicated to fundamental science questions.** It is important that the program provide sufficient resources for fundamental research on the basic science of methane hydrates, as well as the behavior of methane hydrate deposits in the environment, including deposits that are not targets for methane extraction. The task force recommends that the combined research budget for these activities should be equal to approximately one-third of the total program budget (\$5 million per year) and should be separated and protected from the funding for field projects.
- 4. Two-thirds of the program budget is adequate for U.S. participation in larger international hydrates activities.** International investment in methane hydrates is increasing dramatically and includes the active research and development involvement of Japan, India, Korea, New Zealand, the European Union, Norway, Canada, Taiwan, Brazil, Mexico, Columbia, and Uruguay. International funding now far exceeds U.S. federal funding; however, the United States still maintains a scientific and technological leadership position on fundamental hydrate research. The contribution of U.S. expertise enhances the ability of collaborative efforts to improve international energy security. The task force recommendation of a budget of approximately \$15 million per year (see recommendation #2) allows for support of fundamental research on methane hydrates,

but also allows a steady budget of \$10 million per year for U.S. participation in field programs that will be largely supported by other countries.

5. **Industry and external academic engagement to set program priorities should be increased.** The committee recommends that the program enhance the depth of consultation, input, and industry participation to ensure effective industry engagement, even if the industry is unwilling to provide direct support for the program. Industry participation in the Methane Hydrate Federal Advisory Committee should be strengthened. The role of the Federal Advisory Committee in setting program priorities has been limited; the committee has been consulted only after program leadership has made important decisions. More stable funding levels should enable more systematic long-term planning and committee engagement in the planning process. In particular, the task force recommends that the Federal Advisory Committee strengthen active industry participation in strategic planning for field experiments.
6. **The task force recommends that, as much as possible given the international collaborations, research priority for field experiments be placed on questions involving the production of hydrates, such as understanding the instabilities that can arise during production.** Industry now understands the management of short-term risk of drilling into hydrates; therefore, that aspect need not be a program priority.

This report summarizes the Department's analysis and assessment to the recommendations provided by the SEAB Task Force in response to the Secretary's original charge.

### 3. DOE Assessment Overview

Regarding some of the important findings of the report:

- DOE concurs with SEAB's assessment of the program's outstanding contributions to the development of the current understanding of gas hydrates.
- DOE concurs with the SEAB report's emphasis on the need for the DOE to secure steady, more reliable funding in order to facilitate planning and program execution toward long-term strategic objectives.
- DOE concurs that gas hydrate is a potential option for enhancing the energy security of many key allies and, therefore, may be an important asset in global energy security.
- DOE concurs with the SEAB report's call to keep U.S. core capabilities relevant and to support other countries' efforts to develop their gas hydrates resources more effectively.
- DOE concurs with the SEAB report that the U.S. views its cooperation with foreign governments on international energy security as a high priority.
- DOE concurs that attempts to increase industry input in setting Program priorities should be pursued.

- DOE concurs with the SEAB report’s confirmation for the need of a strong Federal role for gas hydrate research in the areas of resource evaluation, development of pre-commercial production approaches, and fundamental science related to properties of methane hydrate-bearing sediments and their behavior in the natural environment.
- DOE concurs with the SEAB report recommendation to continue efforts to assess gas hydrate’s role in the natural environment, including potential feedbacks to climate change.
- DOE concurs with the SEAB conclusion that gas hydrate research investment is not in conflict with the long-term goals of lowering carbon emissions for climate mitigation; while the program, if successful, would enable the extraction of a potentially vast resource of fossil carbon, it would help to better quantify the potential environmental impact. Only a small fraction of all the methane hydrate deposits could ever be commercially extractable, even at very high natural gas prices.
- DOE concurs with the SEAB analysis that the potential contribution of fossil carbon to the atmosphere through the commercial extraction of methane from hydrate reservoirs is relatively small compared to that of other fossil resources; and if extracted, natural gas is likely to replace future coal use, providing a net climate benefit.

The SEAB Task Force noted that as part of DOE’s participation in international field experiments involving production of methane from hydrates, it would be most beneficial to address a series of key topics of high concern to the industry and the reservoir engineering community. The Department concurs with the science issues posed by SEAB Task Force and those which have not been addressed in past research will certainly be included in future research efforts.

#### 4. SEAB Task Force on Methane Hydrates Recommendations and Actions Summary

Recommendations from the report and actions being undertaken by DOE to implement those recommendations are presented in the table below.

SEAB Recommendations	DOE Assessment and Implementation Actions
<p><b>1. DOE should continue to support funding at approximately its current FY 2015 level (\$15 million per year).</b> The effort to understand the production of methane from hydrates is important and should continue, even though U.S. domestic demand for natural gas is likely to be met for several decades via U.S. production of</p>	<p>DOE generally concurs. Given the long-term nature of the program, DOE concurs that there should be greater funding certainty than in the past. Within the Department, annual funding requests at \$15 million per year for gas hydrates will</p>

<p>conventional gas, coalbed methane, and shale gas. The same is not necessarily true, however, for the global market. Other nations, owing to their own energy profiles, see methane hydrates as a potentially important resource in the medium term. The program has made valuable scientific and technological contributions and should remain a DOE priority, with funding at its current level of \$15 million per year. The program will benefit greatly from steady, more reliable funding that will facilitate planning around the long-term strategic objectives.</p>	<p>be weighed against all other Departmental priorities.</p> <p>The Department notes that the recommended level of annual funding is significantly below the amounts most recently recommended by the MHAC in May 2014.</p> <p>The Program will prepare an FY 2018 budget request that is consistent with the SEAB recommendations. Until that time, the Program will make a concerted effort to address the task force recommendations as it utilizes the appropriation from FY 2016 (\$19.8 million) and the FY 2017 request (\$2.5 million).</p>
<p><b>2. Estimates suggest that carbon emissions could be less than existing alternatives.</b> The potential contribution of fossil carbon to the atmosphere through the commercial extraction of methane from hydrate reservoirs is relatively small compared to that of other fossil resources. If extracted, natural gas is likely to replace future coal use, providing a net climate benefit.</p>	<p>DOE concurs with this finding. This finding could be useful in support of the Department’s gas hydrate budget request justifications.</p>
<p><b>3. Approximately one-third of the program budget should be dedicated to fundamental science questions.</b> It is important that the program provide sufficient resources for fundamental research on the basic science of methane hydrates, as well as the behavior of methane hydrate deposits in the environment, including deposits that are not targets for methane extraction. The task force recommends that the combined research budget for these activities should be equal to approximately one-third of the total program budget (\$5 million per year) and should be separated and protected from the funding for field projects.</p>	<p>DOE concurs. Historically, one-third of the program budget has been dedicated to fundamental scientific questions whose answers are necessary for understanding methane hydrates as an energy resource and their environmental impact and it is anticipated that that will continue.</p> <p>DOE also concurs that the program should continue to support R&amp;D that addresses all implications of gas hydrate in the environment, including those issues related to gas hydrates that are not energy resource targets.</p> <p>DOE notes that the work described here by the SEAB has, and will continue, to rely heavily on complex field projects. Studying those fundamental and environmental implications requires field</p>

	<p>projects. DOE concurs that \$5 million annually is a reasonable level for such fundamental research.</p> <p>The Program’s initial and immediate implementation effort will include:</p> <ul style="list-style-type: none"> <li>• Issuance of a Funding Opportunity Announcement (FOA) in FY 2016 that will address fundamental research related to the response of gas hydrate systems to both natural and induced environmental change</li> <li>• A substantial increase to the allocation to the NETL effort in fundamental science research for FY 2016.</li> </ul>
<p><b>4. Two-thirds of the program budget is adequate for U.S. participation in larger international hydrates activities.</b> International investment in methane hydrates is increasing dramatically and includes the active research and development involvement of Japan, India, Korea, New Zealand, the European Union, Norway, Canada, Taiwan, Brazil, Mexico, Columbia, and Uruguay. International funding now far exceeds U.S. federal funding; however, the United States still maintains the world’s scientific and technological leadership on fundamental hydrate research. The contribution of U.S. expertise enhances the ability of collaborative efforts to improve international energy security. The task force recommendation of a budget of approximately \$15 million per year (see recommendation #2) allows for support of fundamental research on methane hydrates, but also allows a steady budget of \$10 million per year for U.S. participation in field programs that will be largely supported by other countries.</p>	<p>DOE concurs. Approximately two-thirds of the program budget—approximately \$10 million per year based on the amount noted in recommendation #1—is to be used to support U.S. participation in larger international hydrates activities and complex field research.</p> <p>DOE is currently pursuing substantial leveraging of DOE funding in collaborative ventures with Japan (seeking field production experiments in Alaska), as well as India and Korea (seeking exploration, characterization, and field production experiments in the Indian Ocean and East Seas respectively); and will continue this effort under the recommended budget levels.</p>
<p><b>5. Industry and external academic engagement to set program priorities should be increased.</b> The committee recommends that the program enhance the depth of consultation, input, and industry participation to ensure effective industry</p>	<p>DOE concurs. DOE’s long-standing program priorities have been set through extensive engagement with both the academic and industry communities. However, industry participation on the</p>

engagement, even if the industry is unwilling to provide direct support for the program. Industry participation in the Methane Hydrate Federal Advisory Committee should be strengthened. The role of the Federal Advisory Committee (FAC) in setting program priorities has been limited; the committee has been consulted only after program leadership has made important decisions. More stable funding levels should enable more systematic long-term planning and committee engagement in the planning process. In particular, the task force recommends that the Federal Advisory Committee strengthen active industry participation in strategic planning for field experiments.

FAC has been historically limited, although largely commensurate with industry interest in gas hydrate issues.

The MHAC has had a long and extensive role in the setting of the long-term research priorities, including full review of, and input to, prior Interagency R&D Roadmaps developed in 2006, 2010, and 2013.

All DOE’s prior field experiments have been conducted in partnership with industry, and all future field-based resource-evaluation programs will also rely fully on industry participation.

Implementation actions include:

- On March 21, 2016, an emerging resources advisor with ExxonMobil Upstream Research Co. was appointed to the MHAC. In addition, when the new members are recruited/invited next year, the Program will be sure to further attempt to re-shape the composition of the MHAC by strengthening industry membership.
- With regard to long-term strategic planning, the Program will seek opportunities to build on prior strong FAC engagement in the Interagency R&D Roadmapping efforts for input involving setting overarching goals and determining actions to achieve the goals.
- The MHAC has been meeting about annually in recent years; the number of meetings will be increased which could include involvement in strategic planning.

**6. The task force recommends that, as much as possible given the international collaborations,**

DOE concurs. This will continue to be the primary focus of any field experiments

**research priority for field experiments be placed on questions involving the production of hydrates, such as understanding the instabilities that can arise during production.** Industry now understands the management of short-term risk of drilling into hydrates; therefore, that aspect need not be a program priority.

DOE is able to conduct. The production of hydrates and understanding the instabilities that can arise during production are the research priorities that are being addressed through ongoing experimental and numerical modeling studies, and is the precise goal of the long-term production test that the program continues to pursue in Alaska with the funding support of Japan.

The Department views its cooperation with foreign governments on international energy security as a high priority. DOE concurs that such collaboration keeps U.S. core capabilities relevant and supports other countries' efforts to develop their methane hydrates resources more effectively. Some examples of the Departments ongoing and planned collaboration to benefit from international investments and avoid U.S. exclusion from development and information about the technology are:

- DOE will continue its collaboration with Japan, the State of Alaska, Alaska industry, and the USGS, to design and conduct a long-term field experiment of gas hydrate response to depressurization.
- DOE will continue to seek scientific insights from its prior collaborative field ventures in Alaska.
- DOE will continue to seek scientific insights from collaborations in the planning and execution of field programs in India, with Korea, and with other nations as opportunities arise.



## 5. Next Steps

DOE will share SEAB's recommendations related to the Methane Hydrates Program with international partners and interagency colleagues. In particular, we will highlight how science and field activities are necessary for resource characterization, as well as to understand hydrates in the climate cycle. DOE will also seek to better contextualize its gas hydrates research and how it relates to the mission to fight climate change:

- As identified by SEAB, "The potential contribution of fossil carbon to the atmosphere through the commercial extraction of methane from hydrate reservoirs is relatively small compared to that of other fossil resources. If extracted, natural gas is likely to replace future coal use, providing a net climate benefit."
- U.S. leadership can help ensure that gas hydrates development takes place responsibly, stressing the need to prevent methane leaks from any production activities.
- As per SEAB's findings, commercial extraction of hydrates is not likely to occur for a couple of decades. We will pursue gas hydrates within the context of achieving commercial carbon capture and storage (CCS) technology for natural gas fired power plants before that time.

To stress this context, DOE will explore creation of a unified Advanced Natural Gas Technologies program, which can house research efforts on natural gas hydrates, natural gas CCS, efforts to fight methane emissions, and other potential low carbon pathways related to natural gas.