

Oil & Natural Gas Technology

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Quarterly Research Performance Progress Report (Period Ending 12/31/2014)

Alaska Natural Gas Hydrate Production Testing, Test Site Selection, Characterization and Testing Operations

Project Period (09/01/2014 – 12/31/2015)

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ABSTRACT

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The objective of this Department of Energy (DOE)-United States Geological Survey (USGS) Interagency Agreement is to provide geologic and geophysical technical support to identify and characterize gas hydrate production test sites on the Alaska North Slope as specified in the goals of the 2005 Energy Act for National Methane Hydrates R&D, the DOE-led US Interagency Roadmap for Gas Hydrate Research, and elements of the USGS mission related to energy resources.

This effort is addressing critical issues associated with production of gas hydrates, and is contributing to our understanding of the geologic nature of the gas hydrate accumulations, the geophysical characteristics of in-situ natural gas hydrates, and helping develop plans for an extended gas hydrate production testing program in northern Alaska. This project is focused on the Eileen gas hydrate accumulation, which was drilled by the DOE sponsored Mount Elbert stratigraphic test well in February of 2007 and the Iġnik Sikumi well in April 2011. This project is designed as a cooperative research effort, with USGS providing technical geoscience support in a partnership that has included so far the DOE, the Alaska Department of Natural Resources, and the Japan Oil Gas and Metals National Corporation (JOGMEC).

During this reporting period, the USGS and JOGMEC have jointly led a technical study to identify and characterize potential drill sites to conduct an extended gas hydrate production test in northern Alaska. These efforts have focused on a total of 11 State of Alaska Lease Tracks on the North Slope that were designated by the Alaska Department of Natural Resources, in July, 2013, for long-term gas hydrate production testing. The USGS and JOGMEC have been evaluating these specific tracts to determine their potential suitability as a gas hydrate production test research site.

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EXECUTIVE SUMMARY

Project Scope and Accomplishments

Work conducted under this Interagency Agreement is intended to provide support to the DOE and its research partners in understanding, predicting, and testing the recoverability and potential production characteristics of onshore natural gas hydrate in the Greater Prudhoe Bay area on the Alaska North Slope (including but not limited to Prudhoe Bay, Kuparuk River and Milne Point field areas) or other areas deemed suitable, through mutual agreement of DOE and USGS, for potential long term production testing of gas hydrate. To do so, this project is designed to evaluate the occurrence and resource potential of the known gas hydrate accumulations in the Eileen trend. Recently acquired geologic, geochemical, and geophysical (2D and 3D seismic surveys) data from northern Alaska and other data sources, including wireline and mud log surveys of wells of opportunity, are being used to assess the occurrence and nature of the known gas hydrate accumulations.

The effort consists of one task that includes two subtasks. The first subtask involves the geologic and engineering assessment of the Eileen gas hydrate accumulation. The second subtask supports DOE and their industry partners with evaluation, planning and preparations for drilling and testing of gas hydrate research wells in northern Alaska.

Formal planning for the next gas hydrate production-related testing project in northern Alaska has commenced, with the USGS providing guidance and technical support to the DOE, JOGMEC, Arctic Slope Regional Corporation, and Petrotechnical Resources. The USGS is leading the test site review effort under the new JOGMEC-DOE-USGS gas hydrate production testing project. The project is enabled through a new MOU between the DOE and JOGMEC and this Interagency Agreement between the USGS and DOE. With the support of BP and DOE, the USGS (Energy Resources Program - Geophysics Group, Denver) has obtained a portion of a BP Alaska Incorporated 3D seismic data volume along the eastern edge of the Milne Point Unit that overlies the area of one of the more promising gas hydrate prospects (SOA Prospect No. 2) identified on the State of Alaska (SOA) withheld lands that was first discovered by the Alaska Department of Natural Resources in a joint project with the USGS in 2013.

During this reporting period, the USGS hosted a test site review meeting in Denver, Colorado (November 19-22, 2014) that was attended by JOGMEC and DOE geoscience technical staff. The USGS also participated in a series of project planning meetings in Anchorage, Alaska (December 15-17, 2014). The USGS also hosted biweekly web style meetings in support of this effort. The USGS is scheduled to co-host two site review meetings, one in late February-2015 (in Denver, Colorado) and a second in late March-2015 (in Chiba, Japan) to select and prioritize the gas hydrate prospects that will be advanced to the stratigraphic test phase of the JOGMEC-DOE-USGS project. The USGS is also working with JOGMEC to develop technical support contracts with potential service providers in Alaska. It is envisioned that these service contracts will provide the technical support for the (1) stratigraphic test drilling and (2) multi-year production test phases of this project.

For the most part, our technical research efforts during this reporting period have focused on the acquisition and analysis of geologic, geophysical and reservoir engineering data on gas hydrates along the Eileen gas hydrate trend in the Greater Prudhoe Bay area to provide a better understanding of the potential gas hydrate prospects in the area of the SOA withheld lands. The USGS also worked with JOGMEC to refine our understanding of the distribution and nature of the gas hydrate stability zone in the area of the SOA withheld lands.

Project Meetings, Outreach, and Presentations

October 15, 2014: Hosted an Alaska North Slope gas hydrate test site review meeting (web meeting).

October 30, 2014: Participated in a technical review meeting in Denver, Colorado with Dr. Anyon Duchkov Institute of Petroleum, Geology and Geophysics IPGG, Novosibirsk, Russia. Reviewed recent developments in gas hydrate seismic imaging techniques. Also discussed the geologic evolution of the creator like features recently discovered along the Russian Yamal Peninsula; IPGG is leading the investigation of these features.

November 3-6, 2014: Member of U.S. delegation to the Canada - United States Northern Oil and Gas Research Forum, Yellowknife, Northwest Territories, Canada, November 4-6, 2014. Presentation titled "Arctic Gas Hydrate Research Accomplishments" by T.S. Collett.

November 16-18, 2014: Participated in a technical review workshop in Salt Lake City, Utah organized by the University of Texas and Aumann and Associates to review the develop and status of the DOE developed Hybrid Pressure Core System.

November 19-22, 2014: Hosted a technical site review meeting in Denver, Colorado with members of the JOGMEC and DOE gas hydrate project geoscience teams in support of the Alaska North Slope cooperative gas hydrate test site review project.

December 10, 2014: Hosted an Alaska North Slope gas hydrate test site review meeting (web meeting).

December 15-17, 2014: Participated in a series or project development and review meetings (arranged by DOE) in Anchorage, Alaska in support of the Alaska North Slope cooperative gas hydrate test site review project.

Publications

Boswell, R., Saeki, T., Shipp, C., Frye, M., Shedd, B., Collett, T.S., Shelander, D., and McConnell, D., 2014, Prospecting for gas hydrate resources: DOE-NETL Fire in the Ice Newsletter, v. 14, Issue 2, 4 p.

Collett, T.S., 2014, Arctic Gas Hydrate Research Accomplishments, in Proceedings of the Canada - United States Northern Oil and Gas Research Forum, Yellowknife, Northwest Territories, Canada, November 4-6, 2014, 10 p.

Collett, T.S., Bahk, J.J., Baker, R., Boswell, R., Divins, D., Frye, M., Goldberg, D., Husebø, Jarle, Koh, C., Malone, M., Morell, M., Myers, G., Shipp, C. and Torres, M., 2015, Methane hydrates in nature – current knowledge and challenges: Journal of Chemical and Engineering Data, 11 p. (in press)

Collett, T.S., Boswell, R., Cochran, J.R., Kumar, P., Lall, M., Mazumdar, A., Ramana, M.V., Ramprasad, T., Riedel, M., Sain, K., Sathe, A.V., Vishwanath, K., the NGHP Expedition 01 Scientific Party, 2014, Geologic implications of gas hydrates in the offshore of India: results of

the National Gas Hydrate Program Expedition 01: *Journal of Marine and Petroleum Geology*, v. 58, p. 3-28 (DOE funds were not used to support this publication, included for informational purposes).

Kumar, P., Collett, T.S., Boswell, R., Cochran, J.R., Lall, M., Mazumdar, A., Ramana, M.V., Ramprasad, T., Riedel, M., Sain, K., Sathe, A.V., Vishwanath, K., the NGHP Expedition 01 Scientific Party, 2014, Geologic implications of gas hydrates in the offshore of India: Krishna-Godavari Basin, Mahanadi Basin, Andaman Sea, Kerala-Konkan Basin: *Journal of Marine and Petroleum Geology*, v. 58, p. 29-98 (DOE funds were not used to support this publication, included for informational purposes).

Wang, X., Collett, T.S., Lee, M.W., Yang, S., Guo, Y., and Wu, S., 2014, Geological controls on the occurrence of gas hydrate from core, downhole log, and seismic data in the Shenhu area, South China Sea: *Journal of Marine Geology*, v. 357, p. 272-292 (DOE funds were not used to support this publication, included for informational purposes).

COST STATUS

Within the USGS accounting system, overhead is subtracted from the project available funds when the project is established, which in this case was an expenditure of \$17,613.44. There were no other funds spent from this account during this reporting period (10/1/2014 through 12/31/2014).

Total DOE Award	\$	51,608.00
USGS Overhead	\$	(17,613.44)
Expenses 10/1 through 12/31	\$	-
Project Account Balance	\$	33,994.56

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