the ENERGY lab

Fire in the Ice

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CONTENTS

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U.S. DEPARTMENT OF ENERGY

BOEM Releases Assessment of In-Place Gas Hydrate Resources of the Lower 48 United States Outer Continental Shelf

Matthew Frye (BOEM – Herndon, VA), William Shedd (BOEM – New Orleans, LA), Kenneth Piper (BOEM – Camarillo, CA), John Schuenemeyer (Southwest Statistical Consulting – Cortez, CO)

The Bureau of Ocean Energy Management (BOEM; formerly the Minerals Management Service or MMS) recently released an assessment of undiscovered in-place gas hydrate resources on the Atlantic (Figure 1) and Pacific (Figure 2) margins of the U.S. Outer Continental Shelf (OCS). BOEM is the U.S. Department of Interior agency charged with managing the nation's natural gas, oil, and other mineral resources on the OCS. Combined with the 2008 publication of assessment results for the

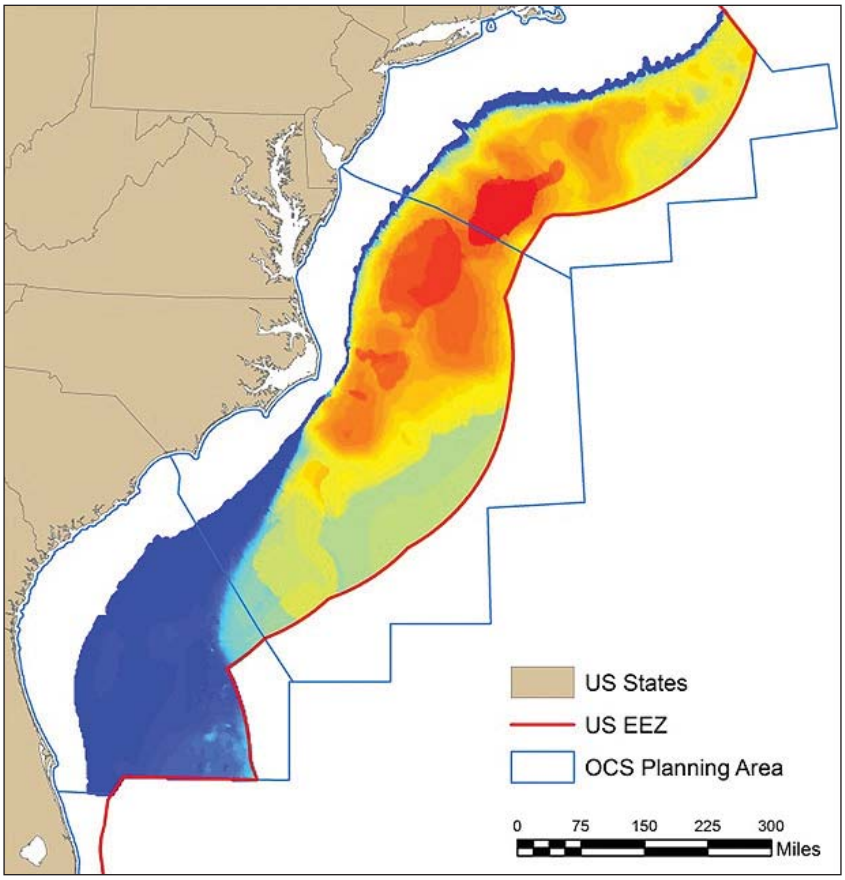

Figure 1. Spatial representation of mean in-place gas hydrate volume for the Atlantic OCS. Red colors indicate rich accumulations; blue colors indicate minimal accumulations.

Field Data from 2011/2012 ConocoPhillips-JOGMEC-DOE Iġnik Sikumi Gas Hydrate Field Trial Now Available

Well log and production test data from the ConocoPhillips-JOGMEC-DOE Iġnik Sikumi gas hydrate field trial, which was carried out on the North Slope of Alaska during the winters of 2010/2011 and 2011/2012, are now available for scientific use from the DOE/NETL. These *in-situ* data represent valuable ground-truth information that will serve to bolster our understanding of gas hydrate reservoirs. With this data release, the DOE/NETL hopes to foster collaboration among field scientists, laboratory researchers, and numerical modelers who are striving to describe and constrain the geology and production behavior of sub-permafrost methane hydrate deposits.

The Iġnik Sikumi gas hydrate test well on the North Slope of Alaska was drilled and logged during the winter of 2010/2011, and gas hydrate production testing was carried out there during the winter of 2011/2012. For more information on the Iġnik Sikumi project, please visit the project web site as well as previous issues of this newsletter (FITI, Vol. 8, Iss. 4; FITI, Vol. 10, Iss. 3; FITI, Vol. 11, Iss. 1).

Available data include:

- Log data from the 2010/2011 logging program in las format
- Production test data from the 2011/2012 program in xls, matlab, and SQL formats
- Volumes and rates of produced CH_4, CO_2, and N_2 (see Figure 1)

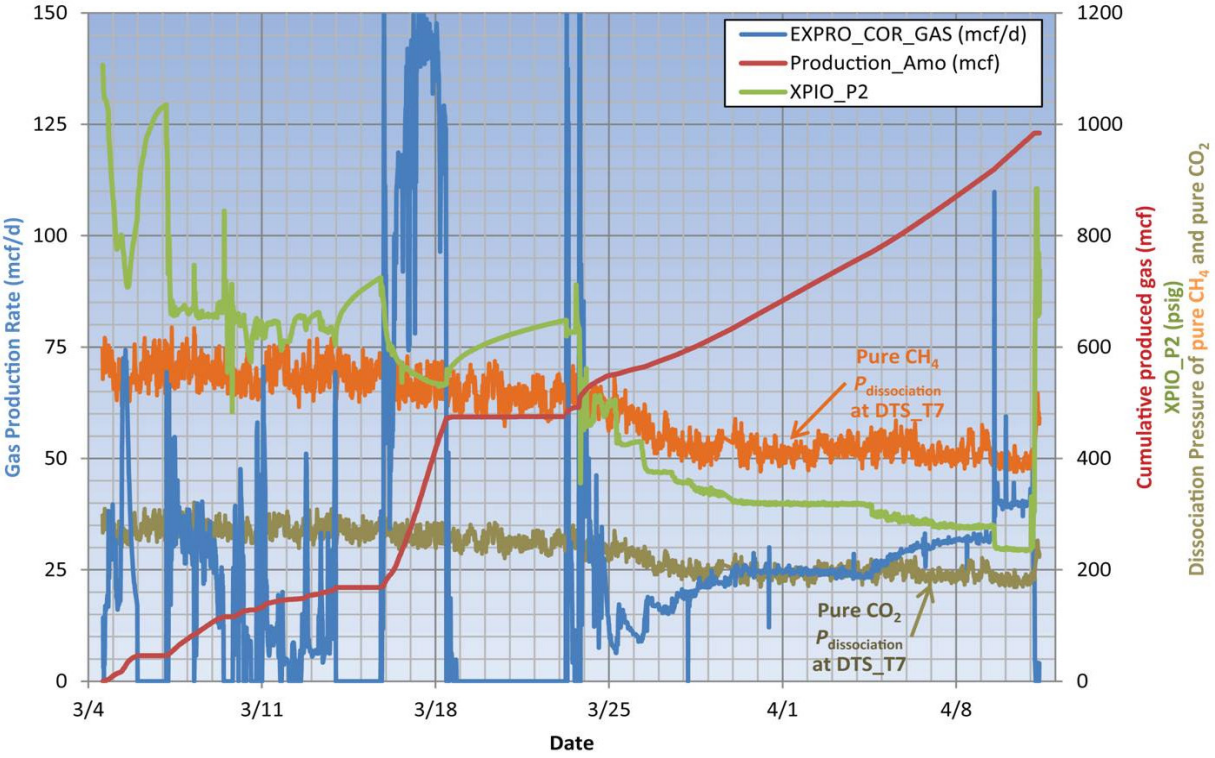

Figure 1. Summary of flowback phase, including gas production rate (blue), cumulative gas production (red), and pressure (green). Changing dissociation pressure at ambient temperature for pure methane (orange) and CO_2 (olive) hydrate are also shown although these data are not included in the dataset.

- Volumes and rates of injected N_2 and CO_2 (see Figure 2)
- Temperature and pressure data recorded throughout both field programs using downhole gauges
- A detailed operations log from production test program
- Physical descriptions of the test well and facilities layouts

Data are available in raw form and in final, corrected form, and in both 1-minute and 5-minute averages.

The data are available for download at: http://www.netl.doe.gov/technologies/oil-gas/FutureSupply/MethaneHydrates/rd-program/ANSWell/co2_ch4exchange.html

The DOE strongly supports scientific collaboration in the analysis of these datasets. Therefore, our Iġnik Sikumi field data download site includes a request for information on your general research goals and plans for use of these data. Within approximately 1 year, we plan to begin assembling research results that utilize the Iġnik Sikumi data. Results will be combined into a single, comprehensive Iġnik Sikumi Scientific Results Volume (please go to http://www.sciencedirect.com/science/journal/02648172/28/2 for an example). We will contact those who have downloaded the data to assess your interest in contributing to this Special Volume.

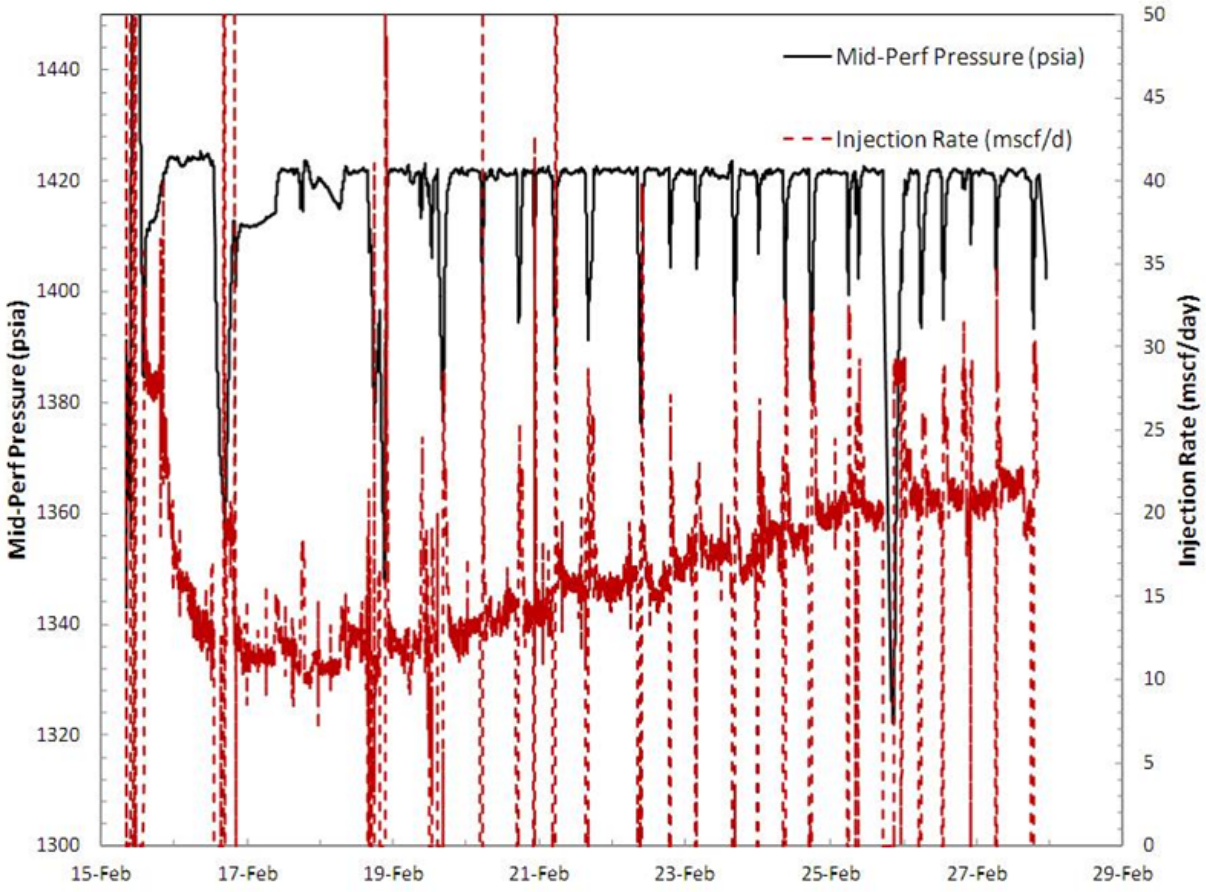

Figure 2. Rate of gas injection during the initial injection phase of the test (red) end pressure at the mid-point of the perforated interval (black).

Spotlight on Research

BJØRN KVAMME

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Dr. Bjørn Kvamme was raised in Bergen, Norway, a picturesque harbor city on the west coast of Norway. Situated against a backdrop of spectacular mountains, Bergen is a popular tourist destination and an international center for North Sea petroleum research and development.

Kvamme studied in Bergen as an undergraduate, pursuing a degree in chemical engineering at Bergen University College. He later pursued a Master of Science in chemical engineering and a PhD in molecular physics at the Norwegian University of Science and Technology, in Trondheim, 700 km to the north.

Kvamme says that during his graduate studies, he grew increasingly independent, because there were not many experts available in the highly specialized subjects that he chose to study. He became fascinated by molecular physics and focused his graduate research on statistical mechanics and molecular modeling.

While he was completing his PhD, Kvamme was asked by a new student to supervise him in a methane hydrate study sponsored by STATOIL. This student was Are Lund, who became Kvamme's first PhD student and his first methane hydrate research collaborator. After a few years at Bergen University College, Kvamme spent 11 years at Telemark University College, and then joined the faculty at the University of Bergen.

Kvamme says that his natural curiosity played a big role in fueling his interest in methane hydrate research. He says "Many groups were doing hydrate experiments, and many of the results seemed confusing. I wanted to know why things happened the way they did. Molecular modeling gave me a completely different perspective on methane hydrate dissociation processes, and hydrate phase transitions in general."

Dr. Kvamme worked with scientists at University of Bergen and ConocoPhillips to prove and further develop a process for producing methane from natural hydrate deposits by exchanging CO_2 for CH_4 in the hydrate structure. The simplicity of CO_2 and CH_4 exchange as a production strategy was met with optimism by the scientific community and was recently tested at a methane hydrate production test on the North Slope of Alaska.

Dr. Kvamme reflects, "Regarding the exchange between CH_4 and CO_2, my background in molecular modeling gave me very detailed insight into the role of entropy – and then, also, how methane hydrate dissociation processes can be optimized."

Today, Dr. Kvamme has 12 PhD students and 1 postdoc, whom he supervises, together with Dr. Tatiana Kuznetsova in the Group for Thermodynamic Modeling at University of Bergen. He says the most fulfilling part of his job is interacting with his students. He is dedicated to helping them progress in their research, and he admits that he also serves as a substitute parent, at times, because their real parents are so often on the other side of the globe!

When he is not working, Dr. Kvamme enjoys music, film, theater, and long dinners that involve "small amounts of quality wine, plenty of good food, and interesting conversations with people of different backgrounds and education."