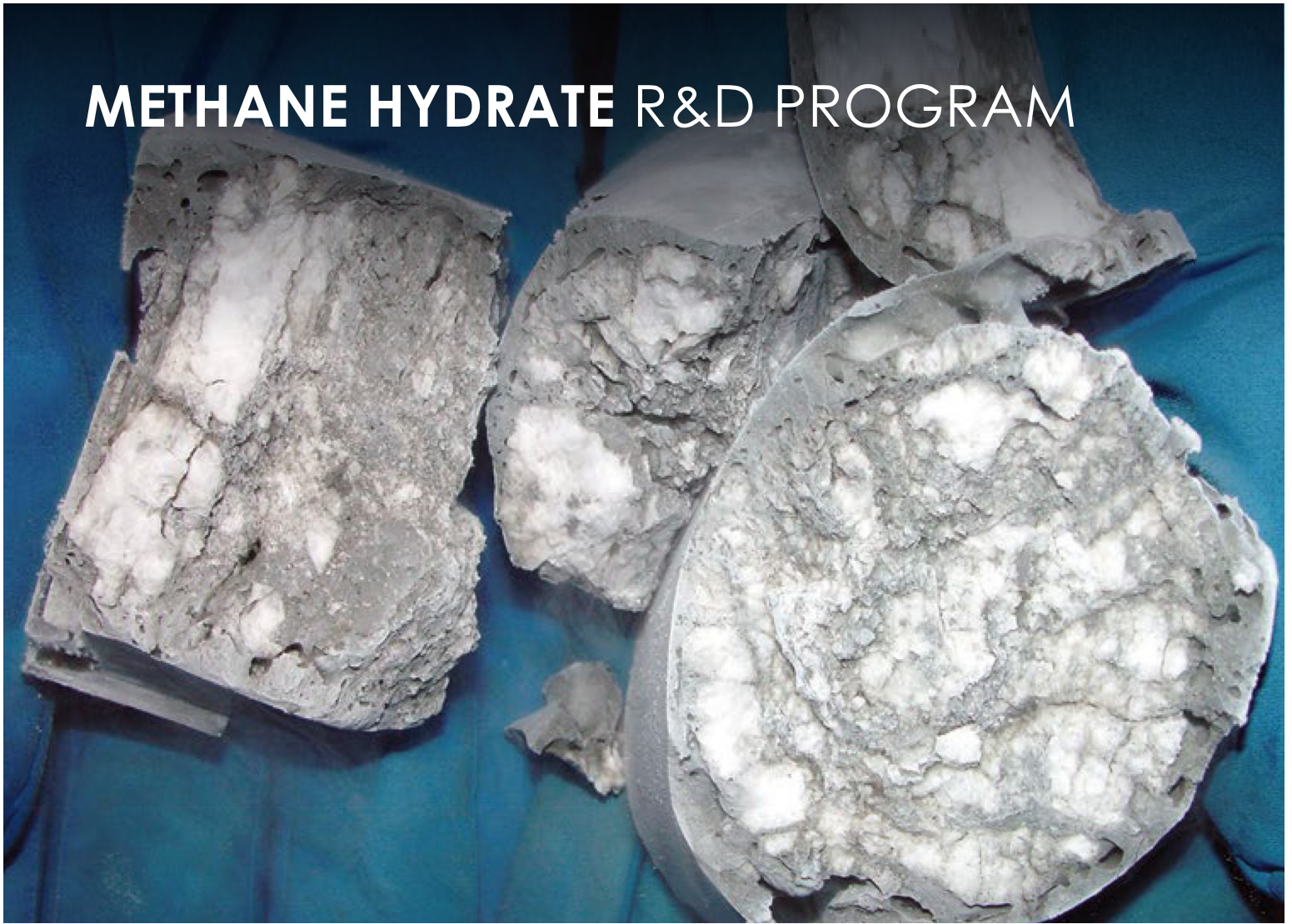


# METHANE HYDRATE R&D PROGRAM



Program 099, January 2025



## OVERVIEW

Since 2000, NETL has been leading DOE's Methane Hydrate R&D Program. The program's primary mission is to advance the scientific understanding of gas hydrates as they occur in nature so that their resource potential and role in climate change can be fully understood. DOE is working with our international and domestic partners to ensure safe and environmentally prudent gas hydrate development and to maintain U.S. leadership in fundamental and applied energy R&D on gas hydrates in natural systems. This includes enhancing 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.



## PARTNERSHIPS AND STRENGTHS

To achieve goals and expand scientific knowledge of naturally occurring hydrate-bearing formations, NETL's Methane Hydrate Program created partnerships with top researchers across a broad spectrum of organizations, including U.S. national laboratories and government agencies including the U.S. Geological Survey (USGS), domestic and international research organizations, public and private universities and industry entities.

Through these partnerships, NETL's Methane Hydrate R&D Program has succeeded in supporting a range of investigations including: geophysical data analysis for mapping subsurface hydrates; field sampling of hydrate-bearing formations for on-site and laboratory analysis; development of specialized pressure core sampling and handling tools; establishment of world-class laboratory facilities for physical property analysis of hydrate specimens under controlled pressure and temperature conditions; and expansion and optimization of numerical models that predict hydrate reservoir behavior. In addition, NETL has established itself as a supporter of emerging hydrate scientists and a communication hub for hydrate researchers and stakeholders worldwide.

## PAST PROGRAM ACCOMPLISHMENTS

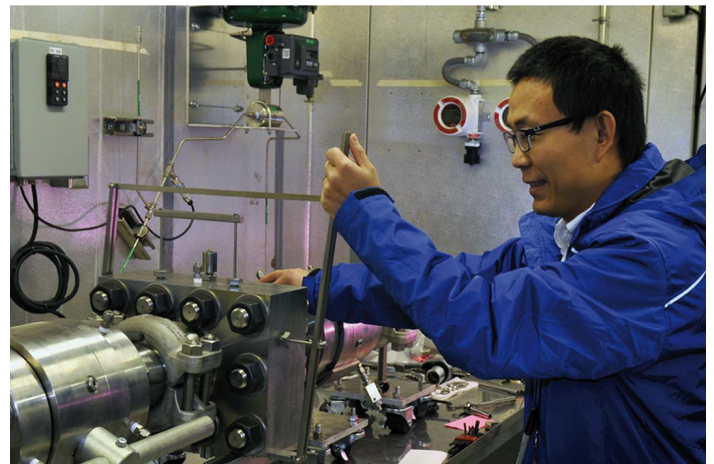
In its 22 years of collaborative efforts with committed partners, the program has made significant strides in the following R&D areas:

- Evaluating and characterizing the gas hydrate resource in the Gulf of Mexico and Alaska North Slope (ANS).
- Designing and testing hydrate sampling and analysis technologies in onshore and offshore environments.
- Sharing knowledge and exchanging data with international partners on hydrate field projects around the world.
- Developing and testing reservoir modeling codes that incorporate hydrate behavior.
- Building data and knowledge on the role of hydrate deposits in the global carbon cycle and global climate change.
- Leading outreach and communication efforts through the Methane Hydrate Fellowship Program and the "Fire in the Ice" newsletter.

## NEW AND ONGOING RESEARCH THRUSTS

**HYDRATE-CLIMATE INTERACTIONS** — Several national lab-led research efforts to address hydrate-climate interactions have recently concluded. These projects focused on determining the effect of climate change on hydrate stability in continental margin settings, an environmental life cycle analysis of gas hydrate systems to understand potential climate impacts of possible future production of gas from hydrates, modeling of subsea permafrost and sub-permafrost hydrate systems in continental shelf settings using the Tough+hydrate family of modeling tools, and an investigation of strategies for creating stable CO<sub>2</sub> gas hydrate in subsurface geologic reservoirs.

During 2023, DOE, in partnership with seven universities, the USGS and U.S. Bureau of Ocean Energy Management, completed a drilling and coring expedition in the Gulf of Mexico Outer Continental Slope to characterize the nature of gas hydrate deposits in the deepwater Gulf of Mexico. A key focus of this project was to evaluate the ability of a new pressure coring tool to effectively recover hydrate-bearing sediment pressure cores. Twenty-one pressurized core samples, each 3.3 feet in length, were recovered in pristine condition with high-quality gas hydrates. The team drilled two boreholes in 3,454 feet water depths at the Walker Ridge 313 site, using a semisubmersible drillship. These pressure cores will form the foundation of future work measuring the reservoir's hydrate concentration, strength and permeability.

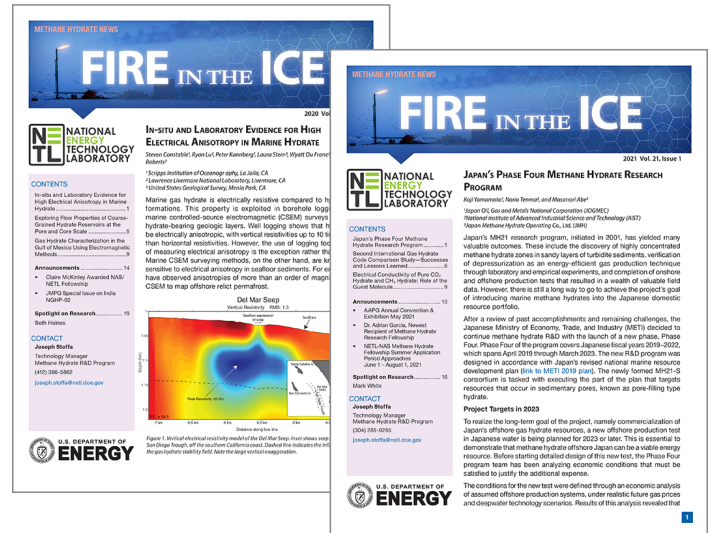


**ESTABLISHING A LONG-TERM TEST SITE** — An ongoing and successful effort has been to establish a site for long-term testing of methane hydrate reservoirs on the ANS. The plan for this project was developed through collaboration between NETL and Japan Oil, Gas, and Metals National Corporation, with the USGS providing technical and scientific expertise. During 2023-24, the research team completed a 10-month-long gas hydrates production testing project at the Prudhoe Bay Unit on the ANS. The collected data and subsequent modeling are expected to shed light on the resource potential and environmental impacts of arctic gas hydrates.

**INTERNATIONAL COLLABORATION** — NETL continues to collaborate with methane hydrate scientists and engineers around the world, in an environment of cooperation and knowledge sharing, to achieve a more complete understanding of hydrate deposits as they occur in a wide variety of geologic settings.

**OUTREACH** — NETL continues to publish “Fire in the Ice,” the methane hydrate newsletter that serves the international hydrate R&D community, on an ad hoc basis and to use

the newsletter mailing list to highlight news and events important to the methane hydrate scientific community. In addition, NETL and the National Academies of Science, Engineering, and Medicine continue their Methane Hydrate Fellowship program to support promising new researchers in methane hydrate science.



**RELEVANT LINKS**

- NETL Methane Hydrate R&D Program Web Site: <https://netl.doe.gov/resource-sustainability/art/gas-hydrates>
- NETL's Fire in the Ice Methane Hydrate Newsletter: <https://www.netl.doe.gov/advsearch?tid=113>
- U.S. DOE Office of Fossil Energy Methane Hydrate Web Page: <https://www.energy.gov/fecm/gas-hydrates>





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NETL is a U.S. Department of Energy (DOE) national laboratory dedicated to advancing the nation's energy future by creating innovative solutions that strengthen the security, affordability and reliability of energy systems and natural resources. With laboratories and computational capabilities at research facilities in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania, NETL addresses energy challenges through implementing DOE programs across the nation and advancing energy technologies related to fossil fuels. By fostering collaborations and conducting world-class research, NETL strives to strengthen national energy security through energy technology development

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