



# Hawai'i Natural Energy Institute Research Highlights

## Alternative Fuels

### DARPA STTR Ph. 1: Methane Harvesting for Seafloor Power Generation

**OBJECTIVE AND SIGNIFICANCE:** Seafloor seeps of natural gas (comprising primarily methane) exist at many locations throughout the world. These seeps have the potential to provide *in situ* power for a host of scientific and military marine applications, such as bottom-mounted oceanographic instrumentation, surveillance equipment, and recharging stations for autonomous underwater vehicles (AUVs). In cooperation with Makai Ocean Engineering (MOE), HNEI is conducting a study to identify robust, practicable systems to harvest fuel methane from seafloor seeps and convert it to electrical power; and to develop a conceptual design of the best candidate system(s) for a 1 kW subsea AUV charging station based on the results of this study. If successful, then this novel approach to subsea power generation would greatly expand our ability to explore the deep oceans.

**BACKGROUND:** Between 2005 and 2006, HNEI performed a feasibility analysis of utilizing seafloor methane—either from gas seeps or solid methane hydrates—for power generation applications. The results of that study are available in a Final Report to DARPA (“[Subsea Power Generation Systems Utilizing Seafloor Methane](#),” Final Technical Report for the Defense Advanced Research Project Agency). Figure 1 below, taken from the 2006 Final Technical Report, provides a sketch of a proposed AUV recharging station that uses surface deposits of methane hydrate as fuel.

DARPA subsequently suspended its program on seafloor power sources until 2018 when an RFP was issued on this topic. MOE, a private company based in Honolulu, HI, responded to that RFP and was awarded an STTR grant in December 2018. HNEI has been subcontracted by MOE to collaborate on this study since it can leverage the technical resources and expertise developed during the earlier project.

**PROJECT STATUS/RESULTS:** This research activity was initiated at HNEI in July 2019. HNEI engineers have been providing technical support to MOE on key technologies including fuel gas reforming, gas purification, fuel cell performance, and system engineering. HNEI also is working closely with MOE to prepare a proposal for a Phase 2 STTR project in which field testing of a prototype will be undertaken. Results of the Phase 1 investigation will be reported at a later date, following review by DARPA.

*Funding Source:* DARPA via Makai Ocean Engineering

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*Last Updated:* October 2019

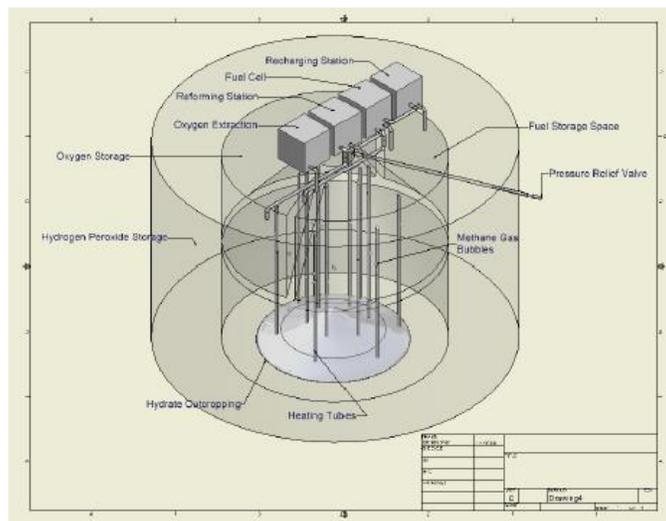


Figure 1. Sketch of seafloor AUV recharging system.