DEPARTMENT OF THE NAVY
SBIR/STTR TRANSITION PROGRAM

SUCCESS STORY

TOPIC NUMBER: N241-060

SBIR INVESTMENT: $1,726,575

PHASE III FUNDING: $41,699,946



Photo credit: Chief Petty Officer Justin Stumb

HIGH EFFICIENCY/LOW MAINTENANCE ULTRA RELIABLE (HELMUR) POWER GENERATION UNIT (PGU)

KARNO™ Power Module from Hyliion gives the Navy a fuel-agnostic power-generation technology designed to extend mission endurance by reducing maintenance requirements.

Hyliion Inc.

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THE CHALLENGE

The Navy uses unmanned surface vessels (USVs) for a wide variety of operational roles, including reconnaissance, anti-submarine warfare and long-range missions. At sea, USVs rely on marine diesel generators for power. While effective, these systems have many moving parts and therefore require frequent maintenance. To increase USV range and time on station, the Navy sought a new generator capable of supporting longer missions and reducing maintenance requirements.

THE TECHNOLOGY

The KARNO™ Power Module from Hyliion is a fuel-agnostic, external-combustion linear generator. Unlike internal combustion engines, the KARNO technology uses heat generated in an external reaction chamber to expand a sealed working fluid. The expanding fluid drives a piston assembly through a magnetic field, generating electricity. Through additive manufacturing, the KARNO system can incorporate complex heat-transfer geometries designed to improve thermal performance. The KARNO Core has only one moving part per shaft, simplifying the system and potentially significantly reducing maintenance costs and downtime compared to conventional generators.

THE TRANSITION

The Office of Naval Research (ONR) awarded Hyliion a Phase I contract in July 2024 for the High Efficiency/Low Maintenance Ultra-Reliable Modular Generator topic. The effort called for Hyliion to develop a preliminary design for a megawatt-scale modular generator system capable of meeting the Navy's unmanned surface vessel requirements. The design combined multiple 200-kilowatt KARNO units to achieve higher power output. Hyliion continued developing the technology to meet the Navy's size, weight, power and cost (SWaP-C) requirements. In July 2025, ONR awarded Hyliion a Phase II contract to continue developing the modular generator concept and advance the technology toward higher power levels.

The effort included combining multiple KARNO Power Modules into a larger system and developing the controls needed to operate the modules as an integrated power-generation system. In July 2026, ONR awarded Hyliion a $41.7 million contract to design, develop, construct, test and deliver 2-megawatt and 3-megawatt KARNO power generation systems. The Phase III effort builds on the KARNO system's modular architecture to scale the technology for higher-power military applications. The contract will support continued testing and validation for Navy applications at NAVSEA Philadelphia.

THE NAVAL BENEFIT

The KARNO Power Module offers the Navy a combination of fuel flexibility, efficiency, low maintenance requirements and a modular architecture. The technology can operate on a range of fuel sources, while its modular architecture allows power output to be scaled to meet different platform requirements. With relatively few moving parts, the KARNO technology simplifies the power generation system and is expected to reduce maintenance costs and downtime. Its efficiency and modular construction could support longer-duration USV missions and increase time on station while reducing the maintenance burden associated with extended unmanned operations. These capabilities could expand USV mission capability and allow Sailors to spend more time focused on mission-critical tasks rather than generator maintenance.

THE FUTURE

The KARNO Power Module will continue to be tested at increasing power levels as the Navy evaluates the technology for maritime applications. Beyond USVs, the technology has potential applications for manned vessels and other military applications such as stationary power. Its fuel flexibility, modular architecture and scalable power output could support distributed power applications such as data centers, as well as other military and commercial power needs.

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