

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-5839-19

Topic # N10A-T030

High-Energy-Density Hydrogen Delivery System_Topic Number: N10A-T030
Giner, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: ONR

Transition Target: Underwater Unmanned Vehicle Power (Knifefish, Snakehead, Orca UUV programs)

TPOC:

Ms. Maria Medeiros

maria.medeiros1@navy.mil

Other transition opportunities:

Underwater Unmanned Vehicles (UUV). This technology is applicable to any system needing a high energy density power system for long-duration missions with a simplified balance-of-plant with respect to traditional fuel cells.

Notes: The figure shows Giner's 5 kW lightweight non-flow-through fuel cell stack for a reversible fuel cell application.



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WHAT

Operational Need and Improvement: The US Navy requires advanced power systems for emerging autonomous underwater vehicle platforms. Hydrogen/oxygen fuel cells have been identified as a suitable replacement for the costly and hazardous primary lithium batteries currently in use.

Specifications Required: 21" diameter Unmanned underwater vehicles (UUVs) need 40 continuous hours of operation, without need to surface for snorkel. Additionally, they are required to perform with 2-5 kW power output at 40 hours continuous operation with a system energy density of up to 500 kWh/kg; the energy system must also be neutrally buoyant.

Technology Developed: Giner will refine its Non-Flow-Through Fuel Cell (NFTFC) technology, combined with solid hydrogen storage for high temperature operation to enable increased efficiency and ease of operation as a high density, compact, lightweight power source for long-endurance UUV missions.

Warfighter Value: Giner's high-temperature NFTFC technology will greatly expand the current mission duration for UUV applications with >30 hours continuous sub-surface operation - longer on intermittent operation, without the need to surface and with no to minimal acoustical signature.

WHEN

Contract Number: N68335-19-C-0193 **Ending on:** January 2, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Preliminary Design Review (PDR)	Low	Design Approval	3	4th QTR FY19
Critical Design Review (CDR)	Low	Successful Single-cell Operation, Design Approval	4	2nd QTR FY20
25-cell Stack Acceptance	Med	Testing profile passed	4	3rd QTR FY20
75-cell Stack Acceptance	Med	Testing profile passed	4	4th QTR FY20
Demonstration and System Acceptance	Low	Testing completed successfully	4	4th QTR FY20
Installation at ONR Facility	Low	System installed and operational at ONR	5	1st QTR FY20

HOW

Projected Business Model: Giner is seeking a joint development and license agreement with a UUV manufacturer and prime contractor such as Boeing, Lockheed Martin or General Dynamics.

Company Objectives: With respect to this technology; the company's objective is to transition to Navy fleet of Extra Large Unmanned Undersea Vehicle (XLUUV) and Large Displacement Unmanned Underwater Vehicle (LDUUV).

Potential Commercial Applications: Commercial applications include ocean mapping and exploration, cable laying, ocean floor geo studies for extractable resources, high altitude pseudo satellites for telecommunications. Giner has developed demonstrations with several private companies for reversible fuel cell applications in unmanned aerospace vehicles. Giner is currently under contract with NASA for applying this technology for continuous energy during the 354-hour lunar night.

Contact: Ed Hogan, VP Business Development
ehogan@ginerinc.com 781-529-0504