**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.

**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

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<tr>
<th>Milestone</th>
<th>Risk Level</th>
<th>Measure of Success</th>
<th>Ending TRL</th>
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<td>Preliminary Design Review (PDR)</td>
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<td>Design Approval</td>
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<td>4th QTR FY19</td>
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<td>Critical Design Review (CDR)</td>
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<td>Successful Single-cell Operation, Design Approval</td>
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<td>Installation at ONR Facility</td>
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<td>System installed and operational at ONR</td>
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**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