Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2021-0433

Topic # N19A-T007

Power-Dense Electrical Rotating Machines for Propulsion and Power Generation

Continuous Solutions LLC

WHO

SYSCOM: NAVSEA

Sponsoring Program: Guided-Missile Destroyer Program - PMS 460

Transition Target: Guided-Missile Destroyer Program - PMS 460

TPOC:
215-897-7627

Other transition opportunities: The Navy will be able to utilize these advances as well as the new solution that yields an increase in power density. Other transition opportunities for this technology include commercial ship and offshore systems that could benefit from reduced volume of mechanical equipment.

Notes: The Navy seeks to develop technology necessary to support design, construction, and qualification of affordable power-dense electrical rotating machines (motors and generators) for shipboard application. Rotating machines have not seen comparable improvement due to physics limitations, lack of business case for typical commercial applications, and limited industry base.

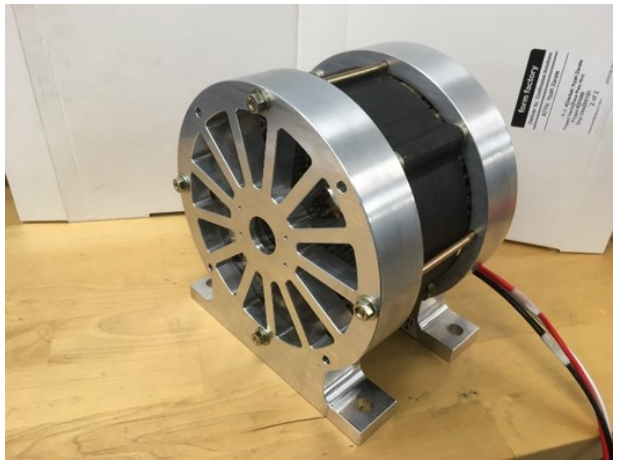

Image courtesy Continuous Solutions, LLC

WHAT

Operational Need and Improvement: The Navy is embarking on an aggressive and innovative Power and Energy Program for application on future surface ships and underwater vehicles. Enabling an Integrated Power and Energy System (IPES) on smaller surface combatants will allow smaller ship classes to implement high-power/energy weapons and sensors, such as larger directed energy weapons, sensors with further range and fidelity, and higher-speed operations. Navy is striving to distribute an order of magnitude increase in electrical power without increasing system space and weight, or reducing efficiency.

Specifications Required: The Navy seeks technologies to develop a high-power density rotating machine that features an increase in power density of at least 50% more than the present state of the art. A goal of this effort would be to deliver a system that provides 50% more power without an increase in weight or space requirements. This will enable high-energy weapons and sensors to be deployed on ship platforms that would otherwise not have sufficient margin to power these systems.

Technology Developed: Future Navy Ships will require more powerful rotating machines to fit within similar volumes as the current equipment to accommodate new high-power/energy weapons and sensor systems currently under development. This increase in power density will require new techniques for heat removal, increased magnetic flux densities, and increased mechanical stresses simultaneously. Advances in power electronics have allowed reductions in power converter size. Increased space availability is realized due to usage of a more power-dense machine. Continuous Solutions' has designed and built a scalable electric motor with over 50% increase in power density than state of the art.

Warfighter Value: The increase in power density may also produce spatial savings within the distribution and power conditioning equipment by improving power quality and reducing the amount of power conversion equipment needed to meet mission system power requirements. Increasing power density in the large rotating machines (generators, large motors) will make more space available for advanced weapons and sensor systems and the power distribution and conditioning equipment necessary to provide electrical power to them.

WHEN

Contract Number: N68335-21-C-0081 **Ending on:** November 20, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
10 kW Verification and Validation	Med	Testing completed	6	October 2021
100 kW Critical Design Review	Low	Approval from TPOC on design approach	6	September 2021
100 kW Preliminary Design Review	Low	Approval from TPOC on design approach	6	August 2021
100 kW Procure and Assembly	High	100 kW assembled on time	7	March 2022
100 kW Test Plan	Low	Submit Test Plan to TPOC with approval	7	May 2022
100kW Verification and Validation	Med	Testing completed	7	July 2022

HOW

Projected Business Model: The goal is to secure the IP for both the inverter and motor technology combined and separately if possible. We are able to low scale manufacture our units (sub 100 units), once we get orders above 100 units, we'll leverage our corporate partnerships to find line of credits on their manufacturing floor.

Company Objectives: Continuous Solutions will expand development for the inverter (motor controller) for applications in the Electric Vehicle market to be the number 1 manufacturer of WBG inverters for EV applications. Continuous Solutions will develop further the packaging and implementation of the larger power levels for commercial electric ship applications which will lead to military applications.

Potential Commercial Applications: Commercial shipping electrification efforts, Electric Vehicle applications, generators, HVAC systems.

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