

WHO

**SYSCOM:** NAVSEA

**Sponsoring Program:** PMS 460 - Guided Missile Destroyer

**Transition Target:** DDGX - Next Generation Guided Missile Destroyer

**TPOC:** (215) 897-1301

**Other Transition Opportunities:** PEO Submarines, PEO Ships, medium voltage distribution systems, cruise ships

**Notes:** Common Mode (CM) Interference  
Medium Voltage Direct Current (MVDC)  
Medium Voltage Alternating Current (MVAC)  
Integrated Power and Energy Systems (IPES)  
Common Mode Inductor (CMI) (See picture on right)  
Passive Line Impedance Stabilization Network (PLISN)  
Common Mode Shorting Network (CMSN)

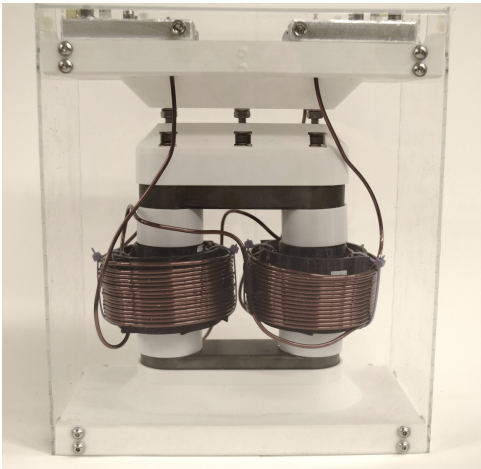


Image courtesy of Continuous Solutions, 2022

Our technologies for mitigating CM interference on shipboard medium voltage distribution systems have been validated on the Purdue Reduced Scale Naval DC Microgrid (PRSNDM), which replicates the next generation of Naval IPES

WHAT

**Operational Need and Improvement:** MVDC and MVAC zonal electrical distribution systems are being considered for future naval combatants to affordably achieve power and energy density sufficient to successfully integrate advanced high power electric weapon systems and electric propulsion. CM interference blocking, shorting, and characterization devices enables for increased efficiency of these distribution systems and lowers overall wear and required maintenance on interfaced equipment. Adaptable and customizable designs allows for use of these devices on multiple platforms and increased ability to integrate new equipment on pre-existing distribution systems.

**Specifications Required:** These technologies have been developed in conjunction with the drafting of MILSTD 1399 and IEEE 45-1 with each informing the other.

**Technology Developed:** Common Mode Inductor (CMI) for blocking CM current, the Common Mode Shorting Network (CMSN) for shorting CM current, and the Passive Line Impedance Stabilization Network (PLISN) for characterization of power electronics CM interference at various operating frequencies.

**Warfighter Value:** These technologies allow for medium voltage distribution systems with multiple, modular power electronics and converter devices, meeting the Naval Power Systems Technology Development Roadmap's call for IPES distribution schemes while lowering costs over equipment lifetimes by increasing efficiency of power converters while lowering resource allocation towards corrective and preventative maintenance. Allows for adaptability in distribution systems for integrating new equipment, such as weapons or sensor systems, in the future.

WHEN

**Contract Number:** N68335-21-C-0174      **Ending on:** Feb 24, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase II SBIR	Low	Computational Modeling in simulation	2	3rd QTR FY18
Phase II SBIR completion	Low	Component Build and test breadboard	5	3rd QTR FY19
Phase II.5 SBIR awarded	Medium	Purdue Testing in Reduced Scale Lab	6	2nd QTR FY21
Phase III	Low	FSU CAPS prototype testing	7	1st QTR FY24
Phase III	Medium	Adapted in Shipyards	8	4th QTR FY24

HOW

**Projected Business Model:** PLISN units can be used both on-board ships with existing distribution systems and in shipyards with power converters prior to installation to characterize CM interference. With this characterization, a network of CMI(s) and CMSN(s) is developed to specifically address the CM interference inherent in a particular distribution system or piece of equipment. Common equipment installed on ships can have mass produced CMIs and CMSNs.

**Company Objectives:** Currently, Continuous Solutions can meet low-rate initial production demands (LRIP), however we would need a manufacturing partner for full-rate production (FRP). Our intention is maintain ownership over the intellectual property behind these technologies, and enter into partnership with a manufacturer for FRP. We intend to bring these devices to market in commercial ship applications as well, driving up demand and allowing for more mass production to lower overall costs.

**Potential Commercial Applications:** Cruise ships have noted issues with CM interference as they have integrated medium voltage distribution systems on-board. These devices could be integrated into their power systems in a similar way to that in which they'd be integrated into Naval power systems. We expect more commercial ships will move to these types of distribution systems as part of electrification efforts and will require similar technologies as well.