The University of Texas at Austin
Center for Electromechanics
Cockrell School of Engineering

Electric Ship

The U.S. Office of Naval Research is investing in technology for an electric naval force to enable increasing affordability and military capability. This transformational war fighting capability represents unprecedented levels of system complexity, through integrated electric power systems technologies, that will include electric propulsion, energy storage, and enable integration of future electric weapons and sensors, while ensuring system communality. As a result, the Office of Naval Research established the Electric Ship Research and Development Consortium (ESRDC) in 2002 to stimulate a multidisciplinary approach to the electric naval force system complexity, and to develop the necessary tools for the complex system design and engineering to reduce the risk and costs of early decisions. CEM is a foundational member of the ESRDC, actively participating with other ESRDC member universities to conduct research into both MVDC hardware and controls to enable this new Naval capability.

Ship power systems are isolated microgrids with power levels ranging from less than 1 MW to approaching 100 MW. Reliability in these systems is imperative, thus extensive research is being conducted into system controls, particularly for protection and reconfiguration. In order to design effective control protocols, an emphasis is placed on reliable power system modeling to understand system dynamics so the prescribed controls can account for this behavior prior to any major failures. The modeling and controls must be flexible to account for emerging technologies that promise to improve efficiency while reducing onboard component size and weight.

For model validation and testing, researchers leverage CEM's megawatt-level microgrid incorporating controlled fault simulation equipment. Both Real-Time Simulation and FPGA hardware was recently added to this facility to enable CHIL and HIL testing. This facility provides a test bed to validate power system models, test control strategies, evaluate approaches to fault management, and assess incipient stability problems due to close coupling of the loads to the power system.

For more information, please contact:
Shannon Striank
Deputy Director
s.strank@cem.utexas.edu
512-232-1690