

## **Testing and Evaluation of Solid Oxide Fuel Cells in Extreme Conditions**

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The objective of this work is to conduct independent testing and evaluation of solid oxide fuel cell (SOFC) systems being developed within the DOE's Solid State Energy Conversion Alliance (SECA) program under "extreme" conditions – pure oxygen on the cathode side. The Naval Undersea Warfare Center is developing SOFC-based power sources for unmanned undersea vehicles (UUVs) that must operate in an air free environment. Oxygen-blown coal gasifiers could be designed to provide pure oxygen feed to the SOFC power plant block. Understanding SOFC performance under these extreme conditions will be useful for future coal gasification plants as well as Navy UUVs. SOFCs operating on pure oxygen instead of air are unique to the SOFC research community but are of common interest to both NUWCDIVNPT and DOE.

Results will be presented concerning tests of a Versa Power Systems SOFC stack with R&D Dynamics anode recycle blower, TDA Research CO<sub>2</sub> sorbent, and InnovaTek steam reformer. An updated system model will also be presented that describes the key parameters to monitor for maintaining a reliable state for steady operation in UUV application. Planned tests involving a Delphi Corporation SOFC stack and reformer will also be discussed.