**Solid Oxide Fuel Cells in UUV**

(U unmanned Undersea Vehicle) Applications

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**INTRODUCTION**

- The U.S. Navy is currently investigating SECA solid oxide fuel cells for the propulsion of Unmanned Undersea Vehicles (UUVs).
- Key goal is to operate a SOFC power source on logistic (military) cells.
- SOFCs offer several distinct advantages over rechargeable battery technology:
  - Potential for achieving specific energy greater than 300 Wh/kg.
  - Capable of utilizing energy-dense fuel (extended mission time).
  - "Gas and go"-allowing a UUV to be re-launched at short notice.
  - Self-sustaining while supplying heat to reforming processes.

**APPROACH**

- Test SECA SOFC Stacks under pure oxygen and reformate.
- Evaluate other major system components besides SOFC stacks.
- Operate SOFC stacks and components under simulated UUV operating conditions, which is also similar to oxygen-blown coal gasifier plants with hot anode-gas recycle and CO2 sequestration.

**R&D Dynamics**

U.S. DOE sponsored SBIR Phase II prototype matches 21" UUV design goals.

**RESULTS**

- SOFC stacks from Delphi Corporation and Versa Power Systems have been tested at NUWCDIVNPT’s facility.

**CONCLUSIONS**

- SOFC technology has the potential to greatly increase UUV mission time compared with current rechargeable battery technology.
- NUWC DIV NPT is collaborating with DOE & industry to evaluate technologies for undersea power systems. Continued testing in 2010 will evaluate Delphi’s fuel processor using several types of fuel and hot anode exhaust from the SOFC.
- Main challenges for UUV application:
  - Oxygen Storage
  - Sorbent Regeneration
  - Start-up
  - Thermal Management