Department of the Navy SBIR/STTR Transition Program

STATEMENT A. Approved for public release; distribution is unlimited.
ONR Approval # 43-2203-16

Topic # N131-067
High Efficiency Solid Oxide Fuel Cells for Expeditionary Power
Atrex Energy, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Code 33

Transition Target: Renewable Sustainable Expeditionary Power, USMC

TPOC:
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Other transition opportunities: The product developed under this program serves as an efficient electric power source for the armed forces in general.

Notes: Our goal is to develop a highly efficient electric power generator for US Military expeditionary missions by further increasing fuel cell efficiency through internal reforming of Jet fuel while maintaining silent watch capabilities.

WHAT

Operational Need and Improvement: Operational energy is a prerequisite for projection of military power. However, the ability to deliver operational energy to where and when it's needed is at increased risk. The difficulty of moving energy across the last tactical mile of resupply mission, in the face of improvised explosive devices, irregular adversaries, and insurgent attacks increase cost in terms of both personnel and materiel risk. Together, these threats, and the tyranny of distance mean a greater risk to assured delivery of operational energy.
Projection of military force cannot be compromised, and thus the burden of reducing mission risk lies in more efficient generation and usage of electricity.

Specifications Required: The technology is designed to enhance our SOFC product to achieve up to 40% fuel savings (JP8, F24, ULSD) over incumbent technologies while also providing or maintaining multi-fuel and silent-watch capabilities.

Technology Developed: Internal reforming of the fuel has been engineered in this SBIR to increase the energy efficiency of a solid oxide fuel cell (SOFC) generator. The enhancement of the fuel cell can effect up to 40% fuel savings over incumbent gen-set technologies while reducing the system size and number of system components.

Warfighter Value: Fuel will last longer at the front helping to reduce operational energy costs (fuel and fuel logistics costs including increasingly riskier re-supply missions). The new generator has minimal moving parts and can perform maintenance- and operator- free for months. The fuel cells silence expands mission capability.

WHEN

Contract Number: N00014-14-C-0226 **Ending on:** May 31, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Proof of concept - Unit cell operation	Low	100 hour operation using internal reforming concept	4	December 2014
Stack level operation - 20 cell bundle	Low	500 hour operation	5	December 2015
Stack level operation - 48 cell bundle	Med	Thermally integrated generator operation	5	December 2016
3kilowatt generator build and demonstration	Med	System level integration test	6	December 2017
Detailed design of a 10kilowatt generator	Low	10kW Design	n/a	June 2018

HOW

Projected Business Model: Atrex Energy currently manufactures the core components of our commercial product line in-house as well as the catalyst enhancements developed for this SBIR product. Low technology ancillary component (sheet metal parts, manifolds, hotbox etc.) manufacturing will be outsourced to specialist manufacturers. Atrex Energy's fuel cell products are ruggedized and resist thermal shock for fast start-up capability for our military and private sector clients. Atrex Energy is well positioned to bring the new product to its client base, expanding our commercial product lines, giving the end user more choices for both application and fuel savings.

Company Objectives: Atrex Energy's TRL5-6 prototypes have been showcased at Fort Bliss and Carderock. Follow on development programs are sought for test deployments and for hardening the technology to TRL 9. The support of a Prime would no doubt be beneficial for field deployment. Atrex Energy has pioneered rugged SOFC production over 16 years and has a commercial line of propane and natural gas fuel cells.

Potential Commercial Applications: The energy efficiency and fuel flexibility aspects that are unique to this technology will allow us to enter the markets that are currently being served by kerosene and diesel (IC based). The technology also allows for the use of methanol and ethanol which is of interest in the rural regions of developing countries where traditional petroleum fuels are less accessible

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