

Topic: N13A-T017

Physical Sciences Inc.

High-Temperature Metamaterial Emitter For Thermophotovoltaics

Providing technology solutions and innovative products, this organization has developed and successfully demonstrated an engineered material that when heated emits in a wavelength range ideally matched to a thermo-photovoltaic (TPV) cell. Addressing future Navy / Marine Corps need for compact, efficient power sources, the enhanced efficiency of this fuel to energy conversion process is the core of the all solid-state generator. Achieving power densities greater than 100 W/kg and energy densities greater than 1200 W-hr/kg, the combustion TPV has no moving parts, is quieter, and has lower maintenance costs. With an energy density ten times that of rechargeable batteries, the TPV reduces logistics costs and maintenance burden on Forward Operating Bases (FOBs), for Unmanned Aerial Vehicles (UAVs) and for Unmanned Underwater Vehicles (UUVs).

Technology Category Alignment:

None

None

None

Contact:

Joel Hensley

Hensley@PSICorp.com

(978) 738-8128

<http://www.psicorp.com>

SYSCOM: ONR

Contract: N00014-15-C-0041

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N00014-15-C-0041

Department of the Navy SBIR/STTR Transition Program

STATEMENT A. Approved for public release; distribution is unlimited. ONR

Approval # 43-1256-16

Topic # N13A-T017

High-Temperature Metamaterial Emitter For Thermophotovoltaics

Physical Sciences Inc.

WHO

SYSKOM: ONR

Sponsoring Program: Potentially Expeditionary Power Systems Program Office

Transition Target: Next generation generator

TPOC:

Dr. Mark Spector

mark.spector@navy.mil

Other transition opportunities: >

> Army PM for Expeditionary Energy & Sustainment Systems (E2S2)

> Army PM for Soldier Warrior

(SWAR)

> NASA Radioisotope Thermoelectric Generator (RTG)

- **Example mission:** 5 crew, 72 hours, 10W average power use per person



2015 Physical Sciences Inc.

WHAT

Operational Need and Improvement:

- > Increase weight savings by 30%
- > Reduce maintenance costs (All solid state)
- > Reduce noise
- > Reduce logistics burden

Specifications Required:

- > Man portable
- > ~1000W
- > Runs on JP-8

Technology Developed:

- > Novel high temperature emitter improves fuel to electrical conversion efficiency

Warfighter Value:

- > Silent Operation
- > Used in Unmanned Underwater Vehicles
- > Used in Unattended Aerial Vehicles (UAV)
- > Used in Warrior Portable Power

WHEN

Contract Number: N00014-15-C-0041 **Ending on:** August 9, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate >30% conversion efficiency	Med	Efficiency > 20%	4	March 2016
Fabricate large scale TPV cell	Med	reproduce current performance levels	4	September 2016
Integrate enhanced emitter with TPV cell	Med	functional demo unit	4	March 2017
Integrate converter unit with combustor	Med	functional prototype	4	December 2017
Add balance of plant	Low	functional prototype generator	4	June 2018

HOW

Projected Business Model:

- > License technology or supply component technology to DoD prime contractor

Company Objectives:

- > Provide technology solutions and innovative products to our government and commercial customers.

Potential Commercial Applications:

- > Residential combined heat and power
- > Remote site generators (oil industry)

Contact: Joel Hensley, Area Manager

Hensley@PSICorp.com

(978) 738-8128