

Department of the Navy SBIR/STTR Transition Program

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MCSC-PRR-3595

Topic # N132-086

Prime Power System Development for Active Denial Technology (ADT) and High-Power Radio-Frequency (RF) Systems
Candent Technologies Incorporated

WHO

SYSCOM: MARCOR

Sponsoring Program: Joint Intermediate Force Capabilities Office (JIFCO), formerly Joint Non-Lethal Weapons Directorate (JNLWD)

Transition Target: Active Denial Technology (ADT) Non-Lethal Weapon (NLW)

TPOC:

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Other transition opportunities:

Shipboard Power, micro grid power, hybrid electric propulsion

Notes:

(HEL) High Energy Laser
(MEP) Mobile Electric Power
(SWaP) Size, Weight, and Power
(MTBF) Mean Time Between Failure

Technology is highly scalable in the range of 50kW to 1500kW, and is also suitable for commercial applications, such as distributed generation, micro grid power, standby and baseline power, as well as marine and ground system hybrid electric propulsion



Mock-Up

Image Courtesy of Candent Technologies

Candent Turbogenerator

- **Rating:** 250kW (300kW max.)
- **Rated Voltage:** 345/700VDC, +
- **Fuel Burn*** 20 GPH
- **Dimension (in.)** 28x28x50
- **Power Density** 500 W/lb

WHAT

Operational Need and Improvement:

Non-Lethal Weapons Program seeks to develop a small, lightweight, prime power system for Directed Energy Weapons (DEW) capable of producing large amounts of power in very short but numerous bursts.

Specifications Required:

- Average Power Output: 150 kW to 250 kW
- Fuel Type: JP8 Fuel
- Fuel Efficiency: 4.6 kWh/kg at 75% load factor, > 4 kWh/kg at 25% load factor
- Operating Temperature Range: -50° C to +50° C
- Output Voltage: 345 VDC +/- 10%
- Output Specific Power (Volume): Threshold: 6,000 W/ft³; Objective: 16,000 W/ft³
- Output Specific Power (Weight): Threshold: 100 W/lb; Objective: 500 W/lb
- Efficiency: 96% efficient generator head

Technology Developed: Candent has developed advanced, high efficiency small gas turbine and high speed generator technology, integrated with state of the art microtube heat exchangers, which create an enabling technology prime power source for Directed Energy Weapon systems.

Warfighter Value:

Provides a non-lethal escalation of force options, avoiding casualties & collateral damage as well as:

- Reduced weight and size vs current diesel gensets, while meeting SWaP
 - o 90% Weight Reduction (9300 lbs. down to 950 lbs.)
 - o 80% Size Reduction (x cubic ft down to y cubic ft)
- Lower operating costs, on-condition maintenance
- Reduced noise and IR signature transportation costs
- Higher MTBF and TBO (Increases Operational Availability)
- Improved mobility and transportability

WHEN

Contract Number: M67854-19-C-6500 **Ending on:** March 26, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
SBIR Phase II Base – System Design	Low	SWaP Design Compliance	TRL 4	4th QTR FY16
SBIR Phase II Option – Prototype Fabrication & Demo	Med	In a relevant laboratory environment, successfully demonstrated advanced high speed generator	TRL 5	4th QTR FY20
SBIR Seq Phase II – Heat Recovery & Control System Integration	Med	In relevant environment successfully demonstrate system performance and efficiency	TRL 6	2nd QTR FY21
SBIR Phase III – Production Configuration Prototype Testing	Med	Successfully conduct production qualification and DT&E	TRL 8	1st QTR FY23
EMD – Milestone B	Med	Full Spec Compliance	TRL 9	1st QTR FY24

HOW

Projected Business Model: is based on three strategic premises; 1) to leverage the strengths of the company; 2) to outsource the manufacturing function; and 3) to partner with Prime(s)

1. Leverage of Strengths. Our greatest strength is the breadth of knowledge and expertise of the Candent team with over 80 years' experience in aerospace and defense industry, such as engineering, management, manufacturing, supply chain, logistics support, and business development.
2. Outsourcing Manufacturing: Substantially lowering our overhead rates and avoiding the need for capital infusion to establish a manufacturing facility will allow Candent to focus on our strength: engineering, assembly, and testing.
3. Partnering: We want to partner with Tier 1 Directed Energy Weapons and power generation, suppliers while maintaining our focus on R&D on prime power generation.

Company Objectives:

Fully develop, test, and deliver our 250kW Turbogenerator for integration into Non-Lethal Weapon Program of Record, and continue to develop power and propulsion derivatives for other military applications and commercial markets.

Potential Commercial Applications: The versatility and scalability of the Candent system makes it highly compatible with commercial power generation applications, such as standby and baseline power for systems up to 1500kW, distributed generation/micro grids, mobile electric power, and marine vessel service/auxiliary power, as well as hybrid electric propulsion systems for land or marine vehicles

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