

Topic: N153-124

Midé Technology Corporation

BISCEP (Biomass Incinerating Stirling Cycle Energy Producer)

The United States Marine Corps wants to eliminate liquid fuel needs except for mobility platforms by 2025. Mide, an agile company with proven ability to develop advanced engineering solutions and a proven track record of generating innovative ideas, is developing a Biomass-Incinerating-Stirling Cycle-Energy-Provider (BISCEP) power source. Our Stirling Engine will provide Marines with an alternate power source thereby reducing their dependency on fossil fuels. The end product will have energy densities greater than 25W/sq ft and 5W/lbs. In addition, our revolutionary engine will be produce either nominal 24VDC output or a 120VAC output.

Technology Category Alignment:

Satellite Communications (SATCOM)

Robotics/Automated Material Handling Equipment

Shipyards/Shipbuilding

Supply; Storage

Satellite Communications (SATCOM)

Satellite Communications (SATCOM)

Supply; Storage

Supply; Storage

Satellite Communications (SATCOM)

Shipyards/Shipbuilding

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Robotics/Automated Material Handling Equipment

Protection, Sustainment, and Warfighter Performance

Medical Chem-Bio Defense

Military Infectious Diseases

Propulsion and Extreme Environments

Fixed Wing Vehicles (includes UAS)

Survivability

Maintainability/Sustainability

Unmanned Ground and Sea Vehicles

Corrosion

Advanced Computing/Software Development

Networks and Communications

Modular/Open/Reconfigurable Architectures

RF Components for sensing, transmission and communication

Electronics Integration

Broadband/Multispectral Components and Systems

Sensors, Electronics and Photonics

Radio Frequency (RF) (non-EW)

Survivability

Broadband/Multispectral Components and Systems

RF Components for sensing, transmission and communication

Radio Frequency (RF) (non-EW)

Networks and Communications

Guidance, Navigation & Control (GN&C) and Data Links

RF Components for sensing, transmission and communication

Networks and Communications
Cognitive/Adaptive Capabilities
Preemptive/Proactive Effects
Broadband/Multispectral Components and Systems
Advanced Computing/Software Development
Networks and Communications
Personalized Assessment, Education, and Training
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Modeling, Simulation & Test Infrastructure
Rotary Wing Vehicles
Fixed Wing Vehicles (includes UAS)
Fixed Wing Vehicles (includes UAS)
Acoustic, Seismic and Magnetic
Rotary Wing Vehicles
Structures and Protection
Energy storage
Unmanned Ground and Sea Vehicles
Mobility
Power and Energy
Synthesis/Analytics/Decision Tools
Information Collection/Management
Advanced Computing/Software Development
Survivability
Unmanned Ground and Sea Vehicles
Radio Frequency (RF) (non-EW)
Power Generation/Energy Conversion
Energy storage
Power and Energy
Sensors, Electronics and Photonics
Maintainability/Sustainability
Advanced Computing/Software Development
EO/IR Components for sensing, transmission and communication
Microelectronics and Nanoelectronics
Networks and Communications
Mobility
Broadband/Multispectral Components and Systems
Sensors, Electronics and Photonics
Structures and Protection
Electro-Optical/Infrared (EO/IR)
Human/Autonomous System Interaction and Collaboration
Maintainability/Sustainability
System Interfaces & Cognitive Processes
Aircraft Propulsion, Power and Thermal
Power Generation/Energy Conversion
High Energy Lasers (HEL)
Propulsion

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Modeling, Simulation & Test Infrastructure
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Mobility
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Acoustic, Seismic and Magnetic
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Electromechanical conversion
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Power Control and Distribution
Power Generation/Energy Conversion
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RF Components for sensing, transmission and communication
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Fixed Wing Vehicles (includes UAS)
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Rotary Wing Vehicles
Protection, Sustainment, and Warfighter Performance
System Interfaces & Cognitive Processes

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Assuring Effective Missions
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Power Generation/Energy Conversion
Maintainability/Sustainability
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Fixed Wing Vehicles (includes UAS)
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Aircraft Propulsion, Power and Thermal
Propulsion and Extreme Environments

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RF Components for sensing, transmission and communication
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Biomedical Informatics / Health Information Systems & Technology
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High Energy Lasers (HEL)
EO/IR Components for sensing, transmission and communication
Networks and Communications

Sensors, Electronics and Photonics
Electro-Optical/Infrared (EO/IR)
Human Computer Interfaces (HCI) for Decision Making
Information Collection/Management
Synthesis/Analytics/Decision Tools
Human Aspects of Operations in Military Environments
System Interfaces & Cognitive Processes
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Combat Casualty Care
Military Operational Medicine
Protection, Sustainment, and Warfighter Performance
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Personalized Assessment, Education, and Training
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Microelectronics and Nanoelectronics
Networks and Communications
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Propulsion and Extreme Environments
Readiness
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Fixed Wing Vehicles (includes UAS)
Machine Perception, Reasoning and Intelligence
Resilient Infrastructure
Trust Foundations
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EO/IR Components for sensing, transmission and communication
Satellite Communications (SATCOM)
Networks and Communications
Trust Foundations
Electro-Optical/Infrared (EO/IR)
Unmanned Ground and Sea Vehicles
Maintainability/Sustainability
Modularity
Survivability
Electro-Optical/Infrared (EO/IR)
Sensors, Electronics and Photonics
EO/IR Components for sensing, transmission and communication
RF Components for sensing, transmission and communication
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Clinical & Rehabilitative Medicine
Combat Casualty Care
Medical Chem-Bio Defense
Energy storage
Protection, Sustainment, and Warfighter Performance
Human Computer Interfaces (HCI) for Decision Making
Synthesis/Analytics/Decision Tools
Undersea Weapons
Human Computer Interfaces (HCI) for Decision Making
Information Collection/Management
Synthesis/Analytics/Decision Tools

Power and Energy
Propulsion and Extreme Environments
RF Components for sensing, transmission and communication
Fixed Wing Vehicles (includes UAS)
Broadband/Multispectral Components and Systems
Preemptive/Proactive Effects
Radio Frequency (RF) (non-EW)
Energy storage
Manufacturing Technology for Affordability
Power and Energy
Structures and Protection
Synthesis/Analytics/Decision Tools
Fixed Wing Vehicles (includes UAS)
Advanced Computing/Software Development
Trust Foundations
Integrating Architecture and Capability Demonstrations
Unmanned Ground and Sea Vehicles
Aircraft Propulsion, Power and Thermal
Synthesis/Analytics/Decision Tools
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Networks and Communications
Preemptive/Proactive Effects
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Test, Evaluation, Validation, and Verification
Propulsion and Extreme Environments
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Networks and Communications
Mobility
Unmanned Ground and Sea Vehicles
Fixed Wing Vehicles (includes UAS)
Rotary Wing Vehicles
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Propulsion
Protection, Sustainment, and Warfighter Performance
Individual Warfighter
Synthesis/Analytics/Decision Tools
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RF Components for sensing, transmission and communication
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Electromechanical conversion
Energy storage
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Power Generation/Energy Conversion
Electronics Integration
Energy storage
Power Control and Distribution
Power Generation/Energy Conversion
Survivability
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Electromechanical conversion
Energy storage
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Power Generation/Energy Conversion
Thermal Transport and Control
Thermal Transport and Control
Protection, Sustainment, and Warfighter Performance
Modeling, Simulation & Test Infrastructure
Microelectronics and Nanoelectronics

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Networks and Communications
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Aircraft Propulsion, Power and Thermal
Corrosion
Propulsion and Extreme Environments
Readiness

Sensors, Electronics and Photonics

Structures and Protection

Electronics Integration

Networks and Communications

None

None

None

None

None

None

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None

None

Department of the Navy SBIR/STTR Transition Program

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MCSC-PRR-2433

Topic # N153-124

BISCEP (Biomass Incinerating Stirling Cycle Energy Producer)

Midé Technology Corporation

WHO

SYSCOM: MARCOR

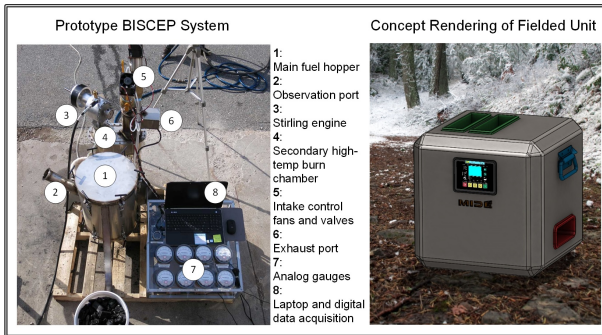
Sponsoring Program: MARCOR
SYSCOM / Expeditionary Power

Transition Target: P4M Logistics
Combat Element Systems (LCES), PM
Engineer Systems, Power Team

TPOC:

sbir.admin@usmc.mil

Other transition opportunities: Joint Deployable Waste to Energy (JDW2E) initiatives are working to convert waste to usable energy for base camps. Waste generated at bases is typically back hauled (very expensive) or burned, which is hazardous to the environment. An incinerating solution that converts waste to electrical energy will reduce pollution, make more effective use of land and manpower, and reduce the need of fuel shipments. The initiative is a joint effort by the Army, Air Force, and Navy and targets bases from 50-6,000 people with 1 to 5 tons of waste per day.



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WHAT

Operational Need and Improvement:

Logistics resupply of power, both fuel and batteries, is a major burden on a Marine Company. There is a need for technology that can harvest energy in covered locations which would reduce this logistical burden. Wind and solar power solutions do not perform well near or under covered locations such as in forests or jungles. Other efforts have been looked at such as micro-hydro turbines, and hand crank generators: none of these systems meet size, weight, operational area limitation, or ease of deployment, making them unsuitable as a power source.

Specifications Required:

- Proposed concepts must meet the following operational requirements:
- operate in temperature ranges of -20°F to 125°F
 - operate in rain, dust, salt conditions and survive transit over rough terrain
 - must be compact, meeting 2-person lift (88 lbs)
 - scalable and have energy densities greater than 25W/ft² and 5W/lbs
 - minimal start up time (< 10 minutes for 2 people)
 - meet MIL-STD-1275F (nominal 24VDC output)
 - meet MIL-STD-1332B (120VAC output)

Technology Developed:

Midé's Biomass Incinerating Stirling Cycle Energy Provider (BISCEP) is able to burn wood, twigs, leaves, used packaging material (including for MRE's), waste building material, dunnage, and garbage.

Warfighter Value:

- reduces dependency on fuel
- meets SWaP requirements
- meets MIL-STD 1275F and 1332B
- system is scalable

WHEN

Contract Number: M67854-17-C-6505 **Ending on:** January 31, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype Burner and Stirling demonstrated individually	Low	Achieved	4	3rd QTR FY17
Complete generator demonstrated	Low	Achieved	5	1st QTR FY18
System at desired performance level and deliver to MCSC for eval	Med	Prototype system is fully assembled and outputting ~400W of electrical power when powered by biomass	6	1st QTR FY19
System packaging and design are finalized	Low	Unit has been repackaged to meet the SWaP requirements.	7	3rd QTR FY19
Testing complete	Med	Qualified by passing MIL-STD 1275F and 1332B as well as MIL-STD-810F as required.	8	1st QTR FY20

HOW

Projected Business Model: Mide has the facilities and expertise to begin low rate production of a finalized system. For a more cost-effective solution, it may be more appropriate to license the technology to a company that manufactures complementary hardware such as conventional generators, alternative power systems, or base accessories.

Mide does not have a set business model and considers what is best for the product when the time comes. Mide is registered on GSA and currently sells products to government, Primes, industry, and the public.

Company Objectives:

For this technology, the first goal is identifying additional needs within the DoD for the technology. These needs can be for the existing system (~500 W) or a larger scale system that produces ~10 kW.

A secondary goal is identifying Primes or manufacturing partners for the product. Mide is able to manufacture the system in house, however, it may be more beneficial when offered with complementary systems such as power storage units, mobile base infrastructure, and other renewable energy solutions.

Potential Commercial Applications:

The proposed system is well suited to replace gasoline and diesel-powered generators. In many situations where a generator is required, it is often difficult to acquire liquid fuel. In natural disasters, power outages and demand spikes can limit the availability of fuel. In remote locations, the user must transport fuel with the generator, which is limited. The proposed BISCEP system can address these shortcomings since it is able to burn locally sourced biomass. In natural disasters, there is often an abundance of debris, trash, and branches that must be disposed of. When operating the generator in remote locations, the user doesn't have to transport fuel to the site and can instead locally source the fuel.

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