Small Business Innovation Research

Small Business Technology Transfer Innovation

Energy Independence and Security Act

Annual Report

Fiscal Year 2017

Pursuant to the Energy Independence and Security Act of 2007 (Pub. L. No. 110-140) and Policy Directives issued by the SBA, Agencies must give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system R/R&D projects. Section 9(z) of the Small Business Act, 15 U.S.C. §638(z) requires that the annual report include a determination of whether the following priority described is being carried out: (A) ensure that such departments and agencies give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system research and development projects; and (B) include in the annual report to Congress under subsection (b)(7) a determination of whether the priority described in subparagraph (A) is being carried out.

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FY17 Agency Compliance with the Energy Independence and Security Act of 2007 (EISA)

Section 9(z) of the Small Business Act, 15 U.S.C. §638(z) requires that the annual report include a determination of whether the priority described below is being carried out:

(A) ensure that such departments and agencies give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system research and development projects; and

(B) include in the annual report to Congress under subsection (b)(7) a determination of whether the priority described in subparagraph (A) is being carried out.

Pursuant to the Energy Independence and Security Act of 2007 (Pub. L. No. 110-140) and Policy Directives issued by the SBA, Agencies must give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system R/R&D projects. Agencies utilize a variety of approaches to comply with EISA and the Policy Directives. For some, such as DOE, these efforts are engrained in the Agency mission and therefore easy to assess in very tangible ways. Mechanisms commonly used by Agencies – aside from specifically adding energy related topics in solicitations – include adding that solicitation proposals address any energy efficiency or renewable energy aspects related to the small businesses' technological approach, delivery or technological applicability and often provide such proposals a competitive advantage in the award selection process. Cross-Agency collaborations, outreach efforts, and other initiatives also become critical to assessing the collective achievements of the program rather than focusing on individual Agency performance. Each Agency's Annual Report addresses EISA compliance by including: examples of SBIR/STTR projects related to energy efficiency or renewable energy; procedures and mechanisms used during the reporting fiscal year to give priority to energy efficiency and renewable energy projects in SBIR/STTR; and, specific actions taken to promote and support energy efficiency and renewable energy research projects. Individual detailed reports on each Agencies' EISA-related activities and initiatives are located at https://www.sbir.gov/annual-reports-files.

This report is a compilation of all the Agencies' FY16 efforts to comply with the Energy Independence and Security Act of 2007 (EISA).

Department of Health and Human Services (HHS)

Examples of HHS SBIR and STTR projects related to Energy Efficiency and Renewable Energy

In FY 2017, there were no new awards made that relate to energy efficiency or renewable energy.

Procedures and mechanisms HHS used during the reporting fiscal year to give priority in the SBIR/STTR programs to Energy Efficiency and Renewable Energy projects

In direct response to the Independence and Security Act of 2007, HHS has, in previous years, developed targeted funding opportunity announcements (FOAs) focused on soliciting project ideas related to energy efficient or renewable energy systems research and development (R&D). Presently, the most recent FOAs have expired in 2012. HHS may utilize this targeted approach in future years again as appropriate to encourage participation and application submission from small businesses in this important targeted area.

Specific actions HHS has taken to promote and support Energy Efficiency and Renewable Energy Research projects

In addition to releasing targeted FOAs such as mentioned above, the HHS investigator-initiated funding model lends itself to receiving applications from the small business community throughout the year under NIH's annual Omnibus grant solicitations with several standard submission due dates. Under these solicitations, small business applicants can propose projects related to energy efficiency or renewable energy systems for Phase I, Phase II and Fast-Track options under the SBIR and STTR programs within the mission of HHS.

Department of Energy (DOE)

The Department of Energy in very active in funding R&D in the fields of energy efficiency and renewable energy through its Office of Energy Efficiency and Renewable Energy (EERE). The mission and goals of EERE are presented below. More information about EEERE is available at their website: https://energy.gov/eere/office-energy-efficiency-renewable-energy.

MISSION

The mission of EERE is to create and sustain American leadership in the transition to a global clean energy economy. Its vision is a strong and prosperous America powered by clean, affordable, and secure energy.

To date, third-party evaluations have assessed one-third of EERE's research and development portfolio and found that an EERE taxpayer investment of $12 billion has already yielded an estimated net economic benefit to the United States of more than $230 billion, with an overall annual return on investment of more than 20%.

STRATEGIC GOALS

EERE aims to achieve the following strategic goals:

1. Accelerate the development and adoption of sustainable transportation technologies. Through improvements in engine efficiency, vehicle weight reduction, battery performance, drop-in biofuels, fuel cell performance, and reduced biofuel and hydrogen production costs, EERE can meet this goal. This includes supporting advanced vehicles and alternative fuels.

2. Increase the generation of electric power from renewable sources. Through reducing the cost of hydropower and solar, wind, wave and tidal, and geothermal power, EERE can increase renewable generation.

3. Improve the energy efficiency of our homes, buildings, and industries. EERE has set milestones for providing energy savings of 25%–50% by 2020–2030. By developing new

materials, technologies and processes for American homes, buildings, and industry, EERE will implement minimum energy performance standards, improve building energy codes, and support home weatherization.

4. Stimulate the growth of a thriving domestic clean energy manufacturing industry. Through reducing the life-cycle energy consumption of EERE-targeted manufactured goods by 50% by 2025, EERE will encourage the manufacture of clean energy technologies in the United States.

5. Enable the integration of clean energy into a reliable, resilient, and efficient electricity grid. Through new grid-support technologies, as well as standards, test procedures, sensors, communication protocols, cyber security, and resilience these technologies need, EERE can meet clean energy goals.

6. Lead efforts to improve federal sustainability and implementation of clean energy solutions. Through EERE technical support to all federal agencies and federal agency access to third-party financing, EERE can help federal agencies to be early leaders in deploying clean energy.

7. Enable a high-performing, results-driven culture through effective management approaches and processes. Through enhancing and maintaining EERE's workforce and establishing clear plans to deliver on EERE's mission, the organization will see a high-performing culture.

Energy Efficiency and Renewable Energy SBIR and STTR Topics and Projects for FY 2017

Topic Title	Subtopic Title	Grantee	Project Title
11. Advanced Materials And Components For Solid-State Lighting	a. Efficiency and Performance Advancements of Down Converting Materials Systems	LumiD2:H2syn LLC, 1200 Ridgeway Avenue Suite 124, Rochester, NY, 14615-3758	High performance nanocrystals in silicones
	b. Optical Performance of Photonic Materials	Pixelligent Technologies LLC, 6411 Beckley Street, Baltimore, MD, 21224-6538	Light Extraction for OLED Lighting with 3-D Gradient Index
	c. Emitter and Substrate Materials	SC Solutions Inc, 1261 Oakmead Parkway, Sunnyvale, CA, 94085-4040	Laser-assisted MOCVD Heating for Improved Within-wafer Temperature Uniformity in LED Manufacturing
	c. Emitter and Substrate Materials	MicroLink Devices, 6457 West Howard Street, Niles, IL 60714-3301	AlxIn1-xP LEDs with II-VI Cladding Layers for Efficient Red and Amber Emission
	c. Emitter and Substrate Materials	OLEDWorks LLC, 1645 Lyell Avenue Suite 140 , Rochester, NY 14606-2331	OLED lighting substrate and encapsulation system for breakthrough cost reductions

14. Biofuels And Bioproduct Precursors From Wet Organic Waste Streams	a. Anaerobic Membrane Bioreactors (AnMBRs) and Microbial Electrochemical Cells (MxCs) as Enablers for Wastewater Integrated Biorefineries (IBRs)	Nano Terra, Inc, 737 Concord Avenue, Cambridge, MA 02138-1002	Efficient Anaerobic Membrane Bioreactors through Low-Fouling Membranes
	b. Production of Biofuels and Bioproduct Precursors via Arrested Methanogenesis	Visolis, Inc, 1904 Haste Street, Berkeley, CA 94704-1910	Production of Lipids and Carotenoids from Organic Waste Streams
	c. Other	KSE, Inc, 665 Amherst Road, Sunderland, MA 01375-9420	Manufacture of 2,5 Furandicarboxylic Acid from Furfural produced from a Wet Waste Stream
15. Membranes and Materials for Energy Efficiency	a. Atomically Precise Membranes	Mainstream Engineering Corporation, 200 Yellow Place, Rockledge, FL 32955-5327	Design and Synthesis of Atomically Precise Membranes
	a. Atomically Precise Membranes	NCO Technologies LLC, 1330 Middlecrest Dr NW, Concord, NC 28027-2955	Novel Low Cost Two-dimensional Atomically Precise Covalent Organic Membranes
	a. Atomically Precise Membranes	Angstrom Thin Film Technologies LLC, 2825 Broadbent pkwy, Broadbent Business park, Unit A, Albuquerque, NM 87107-1607	Layer-by-layer deposition of ultra-thin hybrid/ microporous membrane for CO2 separation
	a. Atomically Precise Membranes	Covalent, LLC, 4616 W. Sahara Ave., Ste 562, Las Vegas, NV 89102-3654	Ultra Low Energy, Low Cost Industrial Nanomembrane Substrate for Desalination, Water Purification, and Remediation.
	a. Atomically Precise Membranes	Covalent, LLC, 4616 W. Sahara Ave., Ste 562, Las Vegas, NV 89102-3654	Nanomembrane Interactive Forward Osmosis (FO) Polymers for Desalination and Remediation

	b. Wide Bandgap Semiconductors	iBeam Materials, Inc., 2778A Agua Fria St., Santa Fe, NM 87507-5491	Novel process for large-area GaN templates
	c. Innovative Approaches Toward Discovery and Development of Novel, Durable Supports for Low-Platinum Group Metal (PGM) Catalysts for Polymer Electrolyte Membrane Fuel Cells	Pneumaticoat Technologies LLC, 7180A West 117th Avenue, Broomfield, CO 80020-2973	Highly Robust Low-PGM MEAs Based upon Composite Supports
	c. Innovative Approaches Toward Discovery and Development of Novel, Durable Supports for Low-Platinum Group Metal (PGM) Catalysts for Polymer Electrolyte Membrane Fuel Cells	Verge NewTech I, LLC DBA Pajarito Powder	Durable Active Supports for Low Platinum Group Metal Catalysts
	c. Innovative Approaches Toward Discovery and Development of Novel, Durable Supports for Low-Platinum Group Metal (PGM) Catalysts for Polymer Electrolyte Membrane Fuel Cells	CERTAINTECH INC, 20695 Settlers Point Place, Sterling, VA 20165-7398	Mesoporous non-carbon catalyst supports for PEMFC
	d. Metal Hydride Materials for Compression	Greenway Energy, LLC, 301 Gateway Drive, Aiken, SC 29803-9747	Metal Hydride Material Development for High Efficiency and Low Cost Hydrogen Compressors

	e Other	nGimat LLC, 2436 Over Drive, Suite B, Lexington, KY 40511-2637	Fabrication of high-quality zeolite membranes with a novel plate & frame configuration for molecular-scale mixture separations
	e Other	Warner Babcock Institute for Green Chemistry, 100 Research Drive, Wilmington, MA 01887-4406	Low-cost, light-switched, forward-osmosis desalination system
	e Other	Lilac Solutions, Inc., 9 Sakonnet Terr, Middletown, RI 02842-5328	Ion Exchange Materials for Lithium Extraction
	e Other	Luna Innovations Incorporated, 301 1st Street, SW, Suite 200, Roanoke, VA 24011-1921	NH_3 separation membrane for CO_2 Utilization
16. Subsurface Technology And Engineering Research And Development	a. Development of Advanced Methods to Access the Subsurface in High-Temperature and High-Pressure Environments	Ozark Integrated Circuits, Inc., 700 West Research Center Boulevard, Fayetteville, AR 72701-9332	Advanced Data Logging Electronics for High Pressure and Temperature Subsurface Environments
	a. Development of Advanced Methods to Access the Subsurface in High-Temperature and High-Pressure Environments	Diamond Materials, Inc., 23 Brahms Court, East Stroudsburg, PA 18301-8038	Method for the production of diamond-hardfaced TiC/Ti bits for geothermal drilling
	a. Development of Advanced Methods to Access the Subsurface in High-Temperature and High-Pressure Environments	E-Spectrum Technologies, Inc., 12725 Spectrum Drive, San Antonio, TX 78249-3400	A near-real-time electromagnetic data-link for geothermal downhole instruments

	a. Development of Advanced Methods to Access the Subsurface in High-Temperature and High-Pressure Environments	NanoSonic, Inc., 158 Wheatland Drive, Pembroke, VA 24136-3645	Piezoresistive Metal RubberTM Sensors for the Health Monitoring of Packer Materials for Geothermal Wells
	a. Development of Advanced Methods to Access the Subsurface in High-Temperature and High-Pressure Environments	Olympic Research, Inc., 907 Taft St., Port Townsend, WA 98368-5440	Controlled-porosity ceramic materials for high temperature downhole applications
6. BUILDINGS & SOLAR JOINT TOPIC: SOLAR BUILDING ENERGY STORAGE MANAGEMENT	a. Software Innovations for Monitoring and Control of Battery Energy Storage in Commercial and Industrial Buildings	Battery Informatics, Inc., 19491 Willet Ln NE, Poulsbo, WA 98370-8051	Integration of Battery Modeling with Solar Building Energy Storage
	a. Software Innovations for Monitoring and Control of Battery Energy Storage in Commercial and Industrial Buildings	BlazeTech Corporation, 29B Montvale Avenue, Woburn, MA 01801-7021	Solar Building Energy Storage Management

	a. Software Innovations for Monitoring and Control of Battery Energy Storage in Commercial and Industrial Buildings	Leaptran, Inc., SRL 1.402,One UTSA Circle, San Antonio, TX 78249-1644	An Open Source Proactive Energy Management System (PEMS) for Integrated Control of Energy Storage and Solar Powered Buildings
7. GEOTHERMAL & BUILDINGS JOINT TOPIC : GEOTHERMAL HEAT PUMPS	a. Innovations to Improve Geothermal Heat Pump Ground-Loop Cost and Performance	Ground Energy Support LLC, 2 Maple St, Durham, NH 03824-1905	Advanced Analysis of Geothermal Heat Pump System Data
	a. Innovations to Improve Geothermal Heat Pump Ground-Loop Cost and Performance	Mainstream Engineering Corporation, 200 Yellow Place, Rockledge, FL 32955-5327	Advanced, Low-Cost Indoor Heat Exchanger for Geothermal Heat Pump Systems
	a. Innovations to Improve Geothermal Heat Pump Ground-Loop Cost and Performance	Melink Corporation, 5140 River Valley Road, Cincinnati, OH 45150-9119	Geothermal HVAC - PCM Seasonal Energy Storage
8. ADVANCED MANUFACTURING	a. Surface Compatibility of Cellulosic Nanomaterial in Hydrophobic Matrix Materials	Luna Innovations Incorporated, 301 1st St, Suite 200, Roanoke, VA 24011-1921	Surface Modification of Cellulose Nanofibrils for Reinforcement of Composites
	a. Surface Compatibility of Cellulosic Nanomaterial in Hydrophobic Matrix Materials	Nano Terra, Inc, 737 Concord Ave, Cambridge, MA 02138-1002	A Cost-Effective and Environmentally-Friendly Method to Improve Surface Compatibility of Cellulose Nanofibrils (CNF) in Hydrophobic Matrix Materials
	a. Surface Compatibility of Cellulosic Nanomaterial in Hydrophobic Matrix Materials	Powdermet, Inc., 24112 Rockwell Dr, Suite A, Euclid, OH 44117-1252	Bio-Amphiphilic Surface Modification for Cellulosic Nanomaterials as Structural Fillers
	a. Surface Compatibility of Cellulosic Nanomaterial in Hydrophobic Matrix Materials	TDA Research, Inc., 12345 W. 52nd Ave., Wheat Ridge, CO 80033-1916	Surface Modification of Cellulose Nanomaterial for Use in Hydrophobic Matrix Materials

	b. Intelligent Systems for Materials Discovery	RadiaBeam Systems, 1713 Stewart Street, Santa Monica, CA 90404-4021	Demonstration of Combinatorial Additive Manufacturing Approach for the Design of Alloys
	b. Intelligent Systems for Materials Discovery	Sheeta Global Tech Corp, 727 Arrow Grand Circle, Covina, CA 91722-2147	Robust Molecular Predictive Methods for Novel Polymer Discovery and Applications
	c. Atomically Precise Structures and Devices for Catalysis	Fulcrum BioScience LLC, 1567 W. Marty Cir, West Jordan, UT 84084-2411	Biologically Inspired Ammonia Production with Immobilized Nitrogenase
9. BIOENERGY	a. Biofuel and Bioproduct Precursors from Gaseous Waste Streams	Opus 12 Incorporated, 2342 Shattuck Ave Num 820, Berkeley, CA 94704-1517	Utilization of Waste CO2 to Make Renewable Chemicals and Fuels
	a. Biofuel and Bioproduct Precursors from Gaseous Waste Streams	Reactive Innovations, LLC, 2 Park Drive, Unit 4, Westford, MA 01886-3525	Novel Cold Plasma System for the Reaction of CO2 and Liquid Feed Streams for the Production of Value Added Products
	a. Biofuel and Bioproduct Precursors from Gaseous Waste Streams	Sustainable Innovations, LLC, 111 Roberts Street, Suite J, East Hartford, CT 06108-3653	Renewables-Driven Production of Organic Acids from Industrial CO2 Waste Streams
	a. Biofuel and Bioproduct Precursors from Gaseous Waste Streams	Visolis, Inc, 1904 Haste St., Berkeley, CA 94704-1910	Production of High Value Products from Gaseous Waste Streams
	b. Manipulation of Nanocellulose into High-Value Products	InnoSense LLC, 2531 West 237th St, Suite 127, Torrance, CA 90505-5245	Supramolecular Nanocellulose Drug Excipients
	b. Manipulation of Nanocellulose into High-Value Products	Innovatech Engineering LLC, 2073 Summit Lake Dr, Suite 155, Tallahassee, FL 32317-7949	High-Performance Nanocellulose Composite for Aviation and Aerospace
	c. Energy- and Cost-Effective Generation of Nanocellulose	Glucan Biorenewables LLC, 505 South Rosa Rd, Suite 112, Madison, WI 53719-6006	High Purity Cellulose for Low-Cost Nanocellulose and Biofuel Production
10. BUILDINGS	a. Innovations to Improve Window Cost and Performance	V-Glass LLC, W265N3011 Peterson Drive, Pewaukee, WI 53072-4431	Vacuum Glass for R10 Windows

	b. Innovations in Solid-State Lighting for Buildings	Luminit, LLC, 1850 W. 205th Street, Torrance, CA 90501-1526	Light Extraction System for OLED (LESO)
	b. Innovations in Solid-State Lighting for Buildings	OLEDWorks LLC, 1645 Lyell Ave, Suite 140, Rochester, NY 14606-2331	Ultra-thin, Curved, High Efficacy OLED Light Engine
	c. Innovations to Improve IAQ and Comfort Performance in Energy Efficient Residential Buildings	Aspen Products Group, Inc., 184 Cedar Hill St., Marlborough, MA 01752-3017	Low-Cost Energy Recovery Ventilator Incorporating a High Flux Moisture-Permeable Membrane
11. FUEL CELLS	a. Innovative Materials and/or Technologies for Bipolar Plates for PEM Fuel Cell	American Fuel Cell, 1200 Ridgeway Ave Ste 123, Rochester, NY 14615-3758	Over-Molded Plates for Reduced Cost and Mass PEM Fuel Cells
	c. Emergency Hydrogen Refuelers	Reactive Innovations, LLC, 2 Park Drive, Unit 4, Westford, MA 01886-3525	Emergency Hydrogen Refueler for Individual Consumer Fuel Cell Vehicles
12. GEOTHERMAL	a. Innovations that Enable Commercial Deployment of Enhanced Geothermal Systems	GeoMechanics Technologies, 103 E. Lemon Ave., Suite 200, Monrovia, CA 91016-5116	Use of Fiber Optic Distributed Acoustic Sensing for Measuring Hydraulic Connectivity for Geothermal Applications
	a. Innovations that Enable Commercial Deployment of Enhanced Geothermal Systems	Itasca Consulting Group, Inc., 111 Third Ave South, Suite 450, Minneapolis, MN 55401-2546	A Numerical Tool for the Design of Enhanced Geothermal Reservoirs based on Modeling of Thermo-Hydro-Mechanical Processes and Explicit Representation of 3D Discrete Fracture Networks
	a. Innovations that Enable Commercial Deployment of Enhanced Geothermal Systems	Ozark Integrated Circuits, Inc., 700 W. Research Center Blvd., Fayetteville, AR 72701-9332	Rugged, Long-Life Flow Monitoring for Enhanced Geothermal Systems
13. SOLAR	a. Next Generation CSP Components For High Temperature Molten Chloride Salt Development	Applied Thermal Coatings, Inc, 200 Compress Street, Chattanooga, TN 37405-3764	Advanced Low Cost Intermetallic Coatings for Molten Salt Pump Impeller

	a. Next Generation CSP Components For High Temperature Molten Chloride Salt Development	HiFunda LLC, 421 Wakara Way Ste 300, Salt Lake City, UT 84108-3549	Development of Novel Alloys Identified by High-Throughput Computational Methods for Use in Concentrated Solar Power Components
	a. Next Generation CSP Components For High Temperature Molten Chloride Salt Development	LM Group Holdings Inc., 20505 Crescent Bay Drive, Lake Forest, CA 92630-8825	Novel Corrosion and Erosion Protective Amorphous Alloys Coatings
	a. Next Generation CSP Components For High Temperature Molten Chloride Salt Development	Powdermet, Inc., 24112 Rockwell Dr, Suite A, Euclid, OH 44117-1252	High Toughness Cermets for Molten Salt Pumps
	a. Next Generation CSP Components For High Temperature Molten Chloride Salt Development	Sporian Microsystems, Inc., 515 Courtney Way - Suite B, Lafayette, CO 80026-8821	High Temperature, Raman Spectroscopy Based, Inline, Molten Salt Composition Monitoring System for Concentrating Solar Power Systems
	c, Photovoltaic Performance And Reliability Tools And Characterization Methods	Advanced Power Electronics Corporation (APECOR), 12612 Challenger Pkwy, Suite 350, Orlando, FL 32826-2783	Predictive Module Degradation and Failure Identification Solution
	c, Photovoltaic Performance And Reliability Tools And Characterization Methods	Fracsun, LLC, 16850 Walnut Avenue, Atascadero, CA 93422-8853	Automatic Reference for Empirical Soiling
	c, Photovoltaic Performance And Reliability Tools And Characterization Methods	Tau Science Corporation, 2350 NE Griffin Oaks St. STE 300, Hillsboro, OR 97124-2418	Mobile In-situ Imaging of Photovoltaic Modules
14. VEHICLES	a. Electric Drive Vehicle Batteries	Amastan Technologies LLC, 25 Commerce Way, Suite 1, Andover, MA 01845-1002	Single Step and Continuous Synthesis of Advanced Lithium Ion Positive Electrode Material Powders using UniMelt Microwave Plasma Process
	a. Electric Drive Vehicle Batteries	CAMX Power LLC, 35 Hartwell Ave, Lexington, MA 02421-3102	Long Life, High-Performance Battery for Start-Stop Applications

	a. Electric Drive Vehicle Batteries	CAMX Power LLC, 35 Hartwell Ave, Lexington, MA 02421-3102	Novel Pre-lithiation Technology for High Energy Density Electric Vehicle Batteries
	a. Electric Drive Vehicle Batteries	Ge Solartech, LLC, 1195 Rochester Road, Suite N, Troy, MI 48083-6027	Demonstration of Novel Process to Produce Nickel-rich NMC Cathodes for Electric Drive Vehicle Batteries
	a. Electric Drive Vehicle Batteries	Giner, Inc., 89 Rumford Avenue, Newton, MA 02466-1311	High Energy-Density and Long Life-time Lithium-Sulfur Batteries
	a. Electric Drive Vehicle Batteries	Hazen Research, Inc., 4601 Indiana Street, Golden, CO 80403-1848	Improved Manufacturing Methods for Compositionally Gradient Layered Nickel-Rich NMC Cathode Materials Using a Combined Spray Pyrolysis and Fluidized-Bed Reactor
	a. Electric Drive Vehicle Batteries	NextGen Battery Technologies, LLC, 1901 N. Moore St., Suite 1200, Arlington, VA 22209-1706	A New Class of Low-Cost, High Capacity Cathode Materials for Next Generation Rechargebale Lithium-ion Batteries
	a. Electric Drive Vehicle Batteries	PH Matter, LLC, 1275 Kinnear Road, Columbus, OH 43212-1155	Engineered Silicon for Improved-Performance EV Batteries
	a. Electric Drive Vehicle Batteries	Saratoga Energy Research Partners, LLC., 820 Heinz Avenue, Berkeley, CA 94720-2737	A Novel Electrode Architecture Enabling Low-Cost, High-Energy Automotive Lithium-Ion Batteries
	b. SiC Device Qualification for Electric Drive Vehicle Power Electronics	GeneSiC Semiconductor Inc, 43670 Trade Center Place, Suite 155, Dulles, VA 20166-2123	Automotive-qualified 900 V/250 A SiC DMOSFETs with integrated Schottky Rectifiers
	b. SiC Device Qualification for Electric Drive Vehicle Power Electronics	Global Power Technologies Group, Inc, 20692 Prism Place, Lake Forest, CA 92630-7803	Advanced SiC MOSFET for Automotive Applications
	d. Wide-Range High-Boost Turbocharging System	Concepts NREC, LLC, 217 Billings Farm Road, White River Junction, VT 05001-9486	Wide-Range High-Boost Turbocharging System Using Advanced Aerodynamic Design Features
	e. TECHNOLOGY TRANSFER OPPORTUNITY: Catalyst for Reducing Nitrogen Oxides in Emissions	Pneumaticoat Technologies LLC, 1172 Century Drive, Suite 240, Louisville, CO 80027-1681	Low-Cost Manufacturing of High Performance deNOx Catalysts

15. WIND	a. Enabling Wind Power Nationwide	Bergey Windpower Co., 2200 Industrial Blvd., Norman, OK 73069-8516	Development of a Concentrated Winding PM Alternator for a Small Wind Turbine
	a. Enabling Wind Power Nationwide	eFormative Options, 11824 Vashon Hwy SW, Vashon, WA 98070-3101	SMART Wind Health: Development of an Inexpensive Prognostic Condition Monitoring/Control System for Distributed Wind Turbines
	a. Enabling Wind Power Nationwide	Resodyn Corporation, 130 North Main Street, Butte, MT 59701-9314	Abrasion/Impact Resistant Coatings for Wind Turbine Blade Protection
	a. Enabling Wind Power Nationwide	Triton Systems, Inc., 200 Turnpike Road, Chelmsford, MA 01824-0440	Innovative Deepwater Mooring for Floating Offshore Wind
WIND	a. Enabling Wind Power Nationwide	Waldemar S. Nelson and Company, 1200 St. Charles Avenue, New Orleans, LA 70130-4334	Fixed-Bottom Foundation and Support Structure for Offshore Wind Turbines, Optimized for Assembly-Line Production
16. WATER	a. Marine and Hydrokinetic Systems for Producing Non-Electric Products	Creare LLC, 16 Great Hollow Road, Hanover, NH 03755-3116	Low-Cost Desalination System Driven by Hydrokinetic Power
WATER	a. Marine and Hydrokinetic Systems for Producing Non-Electric Products	Physical Optics Corporation, 1845 West 205th Street, Torrance, CA 90501-1510	Hydrogen by Osmotic Disparity
WATER	a. Marine and Hydrokinetic Systems for Producing Non-Electric Products	Resolute Marine Energy, Inc., 3 Post Office Square, 3rd floor, Boston, MA 02109-3905	Wave-Powered Desalination System

National Aeronautics and Space Administration (NASA)

Examples of NASA SBIR and/or STTR projects related to Energy Efficiency and Renewable Energy

For FY 2017 NASA's SBIR/STTR program had specific subtopics that actively solicit for technology in energy generation and storage in the form of photovoltaics, advanced batteries, and nuclear technology, the topics include:

- A1.03 Low Emissions Propulsion and Power-Turboelectric and Hybrid Electric Aircraft Propulsion
- H3.03 Environmental Control and Life Support
- H5.01 Mars Surface Solar Array Structures
- S3.01 Power Generation and Conversion
- S3.03 Power Electronics and Management, and Energy Storage
- S3.05 Terrestrial and Planetary Balloons
- T15.01 Distributed Electric Propulsion Aircraft Research
- T15.02 Bio-inspired and Biomimetic Technologies and Processes for Earth and Space
- T3.01 Energy Harvesting, Transformation and Multifunctional Power Dissemination
- T3.02 Intelligent/Autonomous Electrical Power Systems
- Z1.01 High Power, High Voltage Electronics
- Z1.02 Surface Energy Storage
- Z1.03 Surface Power Generation
- Z8.03 Small Spacecraft Power and Thermal Control

Phase I awards made in FY 2017 associated from these topics include:

Proposal Title	Contract#	Firm Name
Wide Bandgap Semiconductor Based Solid State Smart Circuit Protection	NNX17CC54P	LaunchPoint Technologies, Inc.
Advanced Superconducting Rotors Coils for Turboelectric Aircraft Propulsion	NNX17CC50P	Hyper Tech Research, Inc.
Low AC-Loss Superconducting Cable Technology for Electric Aircraft Propulsion	NNX17CC51P	Hyper Tech Research, Inc.
A Software Toolkit to Accelerate Emission Predictions for Turboelectric/Hybrid Electric Aircraft Propulsion	NNX17CC35P	Combustion Research and Flow Technology
Spacecraft Cabin Air CO2 Recovery	NNX17CM55P	TDA Research, Inc.
Solid State Oxygen Concentrator and Compressor	NNX17CJ31P	Sustainable Innovations, LLC
Regenerable Carbon Filter	80NSSC17P0061	UMPQUA Research Company
Self-Deploying Tent Array	NNX17CL35P	Analytical Mechanics Associates, Inc.
Modular Extendable Terrestrial Array	NNX17CL74P	LoadPath
OmniFlex - Modular Power for Mars Surface Missions	NNX17CL37P	Angstrom Designs, Inc.
Solar Transportable Array Rover for Conformable	NNX17CL88P	San Diego Composites, Inc.

Deployment Retraction on Mars		
Concentrically Mounted Wrapped Array with Cable Support	NNX17CL90P	TentGuild Engineering Company
GaN-Based High Power High Frequency Wide Range LLC Resonant Converter	NNX17CC76P	SET Group, LLC
Ultra-High Energy Density, High Power and High Efficiency Nanocomposite Capacitor for Aerospace Power System	NNX17CC72P	Powdermet, Inc.
Lightweight Electrical Power Cable Production	NNX17CC80P	Structured Materials Industries, Inc.
Silicon Carbide Gate Driver	NNX17CC84P	UNITED SILICON CARBIDE, INC.
Single-Chip DC-DC Converter for Harsh Environments	NNX17CC30P	Alphacore, Inc.
Lightweight High Energy Density Capacitors for NASA AMPS and PPUs	NNX17CC78P	Sigma Technologies International, Inc.
A Universal High Efficiency Modular Discharge Over a Wide Input/Output Voltage Range for Hall Thruster Power Processing Unit	NNX17CC32P	Busek Company, Inc.
Liquefied Gas Catholytes for Ultra-Low Temperature Lithium Primary Batteries	NNX17CP67P	South 8 Technologies, Inc.
Advanced Li Batteries for Terrestrial Balloons	NNX17CG51P	Lynntech, Inc.
High Power Ga2O3-Based Schottky Diode	NNX17CG70P	Structured Materials Industries, Inc.
Radiation and High Temperature Tolerant GaN Power Electronics	NNX17CG31P	CFD Research Corporation
Highly Efficient, Durable Regenerative Solid Oxide Stack	NNX17CC73P	Precision Combustion, Inc.
High Energy-Density Lithium-Sulfur Batteries with Extended Cycle Life	NNX17CC47P	Giner, Inc.
Bifunctional Membrane for High Energy, Long Shelf Life Li-S Batteries	NNX17CC64P	Navitas Advanced Solutions Group, LLC
Ultra-Radiation-Hardened Power Conversion	NNX17CC37P	Creare, LLC
High Effectiveness and Low Pressure Drop Recuperator for Closed Brayton Cycle Turboalternator	NNX17CC62P	Mohawk Innovative Technology, Inc.
Linear Acoustic Nuclear Conversion Engine (LANCE)	80NSSC17P1229	Nirvana Energy Systems, Inc.
High Power Radiation Tolerant CubeSat Power System	NNX17CP38P	ExoTerra Resource, LLC
Flexible High-Efficiency Solar Panels for SmallSats and CubeSats	NNX17CC61P	MicroLink Devices, Inc.
High-Strain Composite Deployable Radiators for CubeSats	NNX17CM52P	ROCCOR, LLC
High Watts Per Kilogram - Advanced Integration and Heat Management Solar Array Technology (HaWK-AIHM)	NNX17CM38P	MMA Design, LLC
Dynamically Reconfigurable Electrical Power System(EPS) with Integrated Thermal Management and High Voltage capability for Small Spacecraft	NNX17CG63P	QorTek, Inc.
Methodology for Distributed Electric Propulsion Aircraft Control Development with Simulation and	NNX17CD10P	Empirical Systems Aerospace, Inc.

Flight Demonstration		
Distributed Electric Propulsion Aircraft Comprehensive Analysis and Design Tool	NNX17CA22P	Continuum Dynamics, Inc.
Maneuvering Environment for Tiltwing Aircraft with Distributed Electric Propulsion	NNX17CL61P	Embedded Dynamics
25x Space Fresnel Lens Concentrator Using 4(+) Junction IMM Solar Cells and Nyctinastic Graphene Radiators to Mitigate LILT Effects for Outer Planet Missions	NNX17CC56P	Mark O'Neill, LLC
Encrypted Self-Targeting Energy Beams for Power Transmission Designed for Satellite and Space Habitat Applications	NNX17CS08P	Applied Material Systems Engineering, Inc. (AMSENG)
Electrical Power from Thermal Energy Scavenging in High Temperature Environments	NNX17CS12P	Physical Sciences, Inc.
Waste Heat Recovery by Thermo-Radiative Cell for Space Applications	NNX17CS05P	Advanced Cooling Technologies, Inc.
Autonomous Power Controller for Mission Critical Microgrids	NNX17CC67P	PC Krause and Associates, Inc.
Intelligent, Autonomous Electrical Power System Management and Distribution	NNX17CC79P	Stottler Henke Associates, Inc.
Holomorphic Embedding for Loadflow Integration of Operational Thermal and Electric Reliable Procedural Systems	NNX17CC42P	EleQuant Knowledge Innovation Data Science, LLC

In addition, the following Phase II awards were made:

Proposal Title	Contract#	Firm Name
Membrane-Supported Thermoelectric Generator	NNX17CP04C	Nanohmics, Inc.
Advanced Lithium Sulfur Battery	NNX17CC08C	Cornerstone Research Group, Inc.
Ultracapacitor Based Power Supply for CubeSats	NNX17CC23C	FastCAP Systems Corporation

Procedures and mechanisms NASA used during the reporting fiscal year to give priority in the SBIR/STTR programs to Energy Efficiency and Renewable Energy projects

NASA searches—via various wide-ranging research endeavors (including SBIR/STTR) — for novel concepts and technologies that provide advanced capabilities at ever improving levels of efficiency in missions and projects across all Mission Directorates. At the heart of NASA's needs are advanced technologies for energy/power generation and storage – touching areas from photovoltaics, batteries, to nuclear technology for space exploration. NASA missions require maintaining power far from the Earth, for long periods of time, with no means of repair or refueling. Further, NASA technology must be resilient to survive the launch environment, as well as be light enough to be launched by existing launch vehicles. Therefore, there is no special priority required for technology associated with energy efficiency, as it is a critical thrust to all of NASA's missions.

Specific actions NASA has taken to promote and support Energy Efficiency and Renewable Energy Research projects

There are a variety of NASA projects associated with renewable energy – projects associated with green aviation, environmental protection, clean energy, and sustainable systems. Information about these projects, in areas of biofuels, solar energy, and wind energy, can be found here: http://www.nasa.gov/centers/ames/greenspace/index.html. NASA's efforts in the area of energy innovation associated with responses to climate change can be found here: http://climate.nasa.gov/energy_innovations

National Science Foundation (NSF)

Examples of NSF SBIR and STTR projects related to Energy Efficiency and Renewable Energy

The following table lists several NSF SBIR Phase I FY17 Renewable Energy and Energy Efficiency Related Project Examples:

Award Title or Description	NSF SBIR Phase I Awardee
Nanostructured Ceramics Membranes for Redox Flow Batteries with Superior Performance and Low Cost	Membrion, Inc.
Low-Volume Low-Cost Modular Manufacturing Process for Electric Tractor	Solectrac LLC
Energy-Efficient Perception for Autonomous Road Vehicles	DeepScale, Inc

Procedures and mechanisms NSF used during the reporting fiscal year to give priority in the SBIR/STTR programs to Energy Efficiency and Renewable Energy projects

Research in energy efficiency and renewable energy systems was a significant component of all of our FY2017 SBIR/STTR funding announcements, with specific energy-focused subtopics in the topics of Chemical and Environmental Technologies, Electronic Hardware, Robotics and Wireless Technologies, Advanced Materials and Instrumentation, Advanced Manufacturing and Nanotechnology and Photonic Devices. We've also done outreach to many groups focused on the energy space, with one example being our attendance and participation at the 2017 ARPA-E Energy Innovation Summit.

Specific actions NSF has taken to promote and support Energy Efficiency and Renewable Energy Research projects

The NSF's merit review process has two primary criteria. One of these is "broader impact," and the outcomes of almost all renewable energy and energy efficiency projects are well-aligned with this criterion. This important program criterion has resulted in the program funding a broad spectrum of energy efficiency and renewable energy projects without compromising the quality standards or technical criteria of the program. In FY 2017, NSF SBIR/STTR supported 109 projects where energy efficiency and/or renewable energy were a major thrust of the proposal. These projects included awards focused on new technology in solar power, wind power, hydropower, biomass, renewable and bio-based fuels, vehicle lightweighting, energy-efficient infrastructure, smart homes, and energy efficiency in industrial settings.

Department of Agriculture (USDA)

Examples of USDA SBIR awarded projects that contained Energy Efficiency and Alternative and Renewable Energy technologies

Examples of USDA SBIR Phase I and Phase II awarded projects that contained Energy Efficiency and Alternative and Renewable Energy technologies are listed in the following table:

Award Title	USDA SBIR Phase I Awardee
Diversifying and Adding Value to the Food Industry: Mealworm Powder as an Ingredient	All Things Bugs LLC
Advanced Dryer for High-Diffusion Rate Biomass	Forest Concepts, LLC
Growth and Production of Fungal Resin for Novel Agricultural-Wood Hybrid Particleboard	Ecovative Design LLC
Enhanced Membranes for Dewatering of Black Liquor	Compact Membrane Systems, Inc.
Industrial Relevant Microbial Electrochemical Reactor for Wastewater Processing	Reactive Innovations, LLC

The USDA SBIR program issues a request for application or program solicitation each fiscal year that lists 10 broad topic areas that encompass the full range of research and development priorities for USDA. From the beginning of the USDA SBIR program, topic areas have been discipline-specific, not technology specific. The 10 topic areas contained in the program solicitation are; Forests and Related Resources; Plant Production and Protection – Biology; Animal Production and Protection; Air, Water and Soils; Food Science and Nutrition; Rural and Community Development; Aquaculture; Biofuels and Biobased Products; Small and Mid-Size Farms; and Plant Production and Protection – Engineering. All of these technology areas have been supported and will continue to be supported.

The USDA SBIR Phase I and II Program Solicitation contains the following statement.

> **Energy Efficiency and Alternative and Renewable Energy**
>
> In an effort to find alternatives to fossil fuels and to reduce overall energy usage, the USDA established research on energy efficiency and alternative and renewable energy as a high priority. Such research includes development of new energy crops, improved methods for producing biofuels, such as ethanol, butanol and biodiesel, producing hydrogen and other fuel gases from agricultural waste, and more efficient use of energy in agricultural production and in rural communities. Energy issues impact all aspects of agriculture and rural development and thus applications dealing with energy efficiency and alternative and renewable energy could be submitted to any of the topic areas.

Department of Homeland Security (DHS)

Examples of DHS SBIR and STTR projects related to Energy Efficiency and Renewable Energy

In FY2017, 56 Phase I proposals were received in response to the joint DHS SBIR Phase I solicitation. Of these, two offerors self-identified that their proposed efforts were either related to energy efficiency or renewable energy. Both proposals were submitted for S&T Directorate Topic 005: Blockchain Applications for Homeland Security Missions.

S&T Directorate SBIR Program: Of the two Phase I proposals that were submitted in response to the S&T Directorate's FY2017 topics that self-identified as being related to energy efficiency or renewable energy, neither was funded in FY2017.

DNDO SBIR Program: No energy related proposals were submitted to DNDO in FY2017.

Procedures and mechanisms DHS used during the reporting fiscal year to give priority in the SBIR/STTR programs to Energy Efficiency and Renewable Energy projects

S&T Directorate SBIR Program: None, as neither of the two proposals that self-identified as being related to energy efficiency and/or renewable energy were recommended for funding. It should be noted that the mission of the Homeland Security Advanced Research Projects Agency (HSARPA) within the S&T Directorate is to focus on identifying, developing, and transitioning technologies and capabilities to counter chemical, biological, explosive, and cyber terrorist threats, as well as protecting our nation's borders and infrastructure. Similarly, the Directorate's First Responder Group (FRG) has a mission to strengthen the response community's abilities to protect the homeland and respond to disasters. Program managers within HSARPA and FRG develop topics in support of their missions and stakeholders. When appropriate, topic descriptions from HSARPA and FRG address energy efficiency and/or renewable energy as they relate to their specific missions.

DNDO SBIR Program: None. The DNDO projects are related to detection. However, low-power solutions are sought if viable for deployment.

Specific actions DHS has taken to promote and support Energy Efficiency and Renewable Energy Research projects

S&T Directorate SBIR Program: The mission of the Homeland Security Advanced Research Projects Agency (HSARPA) within the S&T Directorate is to focus on identifying, developing, and transitioning technologies and capabilities to counter chemical, biological, explosive, and cyber terrorist threats, as well as protecting our nation's borders and infrastructure. In addition, the Directorate's First Responder Group (FRG) has a mission to strengthen the response community's abilities to protect the homeland and respond to disasters. Program managers within HSARPA and FRG develop topics in support of their missions and stakeholders. When appropriate, topic descriptions address energy efficiency and renewable energy as they relate to the DHS mission.

DNDO SBIR Program: None. The DNDO projects are related to detection. However, low-power solutions are sought if viable for deployment.

Education Department (ED)

Examples of ED SBIR and STTR projects related to Energy Efficiency and Renewable Energy

The ED SBIR Program uses a contracts mechanism to provide up to $1,050,000 in funding ($150,000 for Phase I; $900,000 for Phase II) to small business firms and partners for the research and development (R&D) of commercially viable education technology products for use by students and teachers in education and in special education settings.

At ED SBIR in FY2017, the program topic areas permitted proposals for the development of products to promote student learning and teacher instruction in areas of STEM, which includes energy efficiency and renewable energy. In FY2017, several proposals focused on science projects related to energy efficiency and renewable energy.

Within the ED SBIR portfolio, examples of projects directly focusing on student learning in the area of energy efficiency and renewable energy systems are as follows:

With a 2015 Phase II award, Strange Loop Games is developing Eco, a multi-player game to teach ecology and prepare middle schools students to be environmentally literate citizens, including learning about energy. To play the game, students enter a shared online world featuring a simulated ecosystem of plants and animals. Students co-create a civilization by measuring, modeling, and analyzing the underlying ecosystem. Students advocate for proposed plans to classmates and make decisions as a group. Cooperation and science-based decision making activities occur in order to prevent the destruction of the environment. The game includes teacher resources to support the alignment of game play to learning goals, and implementation.

Procedures and mechanisms ED used during the reporting fiscal year to give priority in the SBIR/STTR programs to Energy Efficiency and Renewable Energy projects

At ED/IES SBIR in FY2017, the program topic areas permitted proposals for the development of products to promote student learning and teacher instruction in areas of STEM, which includes energy efficiency and renewable energy. Several proposals focused on science projects related to energy efficiency and renewable energy. The ED SBIR program will continue to consult with SBA and the other Federal SBIR programs regarding how to best give priority to energy efficiency and renewable energy.

Specific actions ED has taken to promote and support Energy Efficiency and Renewable Energy Research projects

Specific actions ED SBIR agency has taken to promote and support energy efficiency and renewable energy research projects:

1) The ED SBIR program supports energy efficiency and renewable energy within priorities and topics in solicitations.
2) The ED SBIR program promotes energy efficiency and renewable energy initiatives at conferences and meetings.
3) The ED SBIR program tracks and report success stories demonstrating the impact of the SBIR programs on energy-related projects.
4) The ED SBIR program will consider new or additional initiatives/efforts to coordinate with other programs that support energy efficiency and renewable energy.

Department of Commerce (DOC)

NIST

In developing topics and subtopics and when reviewing applications, **NIST** gives high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system R&D projects, consistent with Executive Order (EO) 13329 (http://www.gpo.gov/fdsys/pkg/FR-2004-02-26/pdf/04-4436.pdf) "Encouraging Innovation in Manufacturing," the Energy Independence and Security Act of 2007 (P.L. 110-140 § 1203(e), codified at 15 U.S.C. § 638(z)), and the Small Business Administration (SBA) SBIR Policy Directive, § 9, found at http://www.sbir.gov/sites/default/files/sbir_pd_with_1-8-14_amendments_2-24-14.pdf.

Standards for the Smart Grid, energy efficient lighting, photovoltaics, net-zero-energy buildings, and software for "smart" building are examples of **NIST** research areas related to energy use and conservation. NIST develops the testing, measurements, and reference materials needed to ensure the quality of energy related products and services and ensure fairness in the marketplace.

NIST FY 2017 SBIR Phase II award:

XCSpec
300 Riviera Circle
Larkspur, CA 9439

Title: Air Movement Efficiency Monitor

Abstract: The Air Movement Efficiency Monitor is composed of small, inexpensive Microelectromechanical system (MEMS) sensors, connected wirelessly to the Internet, and distributed through a building to measure pressure readings at key points. We consider this a "FitBit" for a building's air-movement efficiency, employing many of the sensors used by a fitbit – temperature, humidity, acceleration. We expand on that concept and incorporate new emerging sensors from the drone and wearables industries, allowing our system to capture high-resolution absolute and differential pressure data, along with information from the fan shaft speed. These various sensors are deployed on a multi-sensor module and connected wirelessly to the system – exposing this previously hidden information at an affordable cost, with a small form factor and low power profile. This information is continuously monitored and can be used for a number of applications including: duct leakage, air balancing and fan efficiency measurement. The aggregated data is curated using flow network model simulations to calculate envelope leakage and duct leakage for the building, along with alerts or alarms to maintenance, building occupants or building managers. This "Performance" based approach to building efficiency provides a EM&V basis for more sustainable energy savings.

NOAA

For FY2017, there was one SBIR Phase I award in which the project (or its component) is related to energy efficiency or renewable energy.

NOAA FY 2017 SBIR Phase I Award:

Tridentis LLC
433 S. Lee Street
Alexandria, VA 22314

Title: Design of an Autonomous, Green Powered, Mobile Coastal Monitor

Technical Abstract: The mobile coastal monitor project is designed to research the state-of-the-art green power supplies and apply them as the propulsion and sensor power source for a highly efficient surface platform. The platform will be equipped with a modular sensor bay that is capable of housing a wide variety of atmospheric, air/sea interface, and sub-surface sensors suitable for a wide range of sensing operations from benthic and flora/fauna surveying, to pollutant mapping, to calibration and validation of space borne optical sensors. The platform will incorporate the latest unmanned vessel controls that conform to current Collision Regulations (COLREGS) and obstacle (surface and sub-surface) avoidance technology. This will be a clean sheet design as current autonomous surface vehicles either do not run on green power, or smaller battery, sail, or wave powered vehicles do not have the appropriate COLREGS / collision avoidance capability.

In addition and in order to promote energy efficiency or renewable energy in SBIR funded projects, NOAA utilizes them as tie-breakers during the evaluation of proposal. Per the FY2017 SBIR Phase I Solicitation (Page 40, Section 4.3*),"In the event of a "tie" between proposals, manufacturing-related projects as well as those regarding energy efficiency and renewable energy systems will receive priority in the award selection process."*

Department of Transportation (DOT)

Examples of DOT SBIR and STTR projects related to Energy Efficiency and Renewable Energy

FY17 DOT Phase I Topics and Awards that address energy efficiency or renewable energy include:

- DOT's 17.1 Solicitation contained a topic sponsored by the Office of the Secretary (OST) for a "System and Supply Chain for Recycling Lithium-ion batteries in the Transportation System". 2 Phase 1 awards were issued for that topic.

As part of the DOT's Call for Topics, DOT includes on the Topic Submission form a question asking if the project is related to energy efficiency or renewable energy and include the following statement: *SBIR agencies are encouraged to give high priority to small business concerns that participate in or conduct energy efficiency or renewable energy system R&D projects. This information is provided to SBA*.

Environmental Protection Agency (EPA)

Examples of EPA SBIR and STTR projects related to Energy Efficiency and Renewable Energy

In FY 2017, EPA awarded 16 new SBIR Phase I awards and 6 new Phase II awards. Two Phase I and 2 Phase II awards promote energy efficiency and renewable energy related initiatives under P.L. 110-140. These awards (listed below) are for technologies that generate renewable energy and technologies with improved energy efficiency over traditional technologies.

FY 2017 Phase I awards

- **EPD17031 SPEC Sensors, LLC, Newark CA**
  Zero Power Electrochemical Formaldehyde Sensor with Novel Catalyst for Indoor Air Quality

- **EPD17034 KWJ Engineering Incorporated Newark, CA**
  Inexpensive Low Power Nano-Sensor Based Measurement of Fugitive Methane Emissions

FY 2017 Phase II awards

- **EPD18009 ASAT, INC. Cottage Grove, OR**
  Integrated Cookstove-Heating-Electricity Generation for Small homes- Integrated cooking, heating, and electric power generation

- **EPD18004 Hi-Z Technology, Inc. San Diego, CA**
  Biofueled Thermoelectric Cookstove

Procedures and mechanisms EPA used during the reporting fiscal year to give priority in the SBIR/STTR programs to Energy Efficiency and Renewable Energy projects

EPA's SBIR Program includes energy as an overall criterion in selecting which environmental technologies it funds because EPA cares about the lifecycle environmental impacts of the technology and energy demand and usage are major factors in the environmental impact of a technology.

Specific language from the FY 2017 Phase I solicitation addressing lifecycle and energy is as follows and is used repeatedly in outreach about the program:

> SBIR proposals should directly pertain to EPA's mission of protecting human health and the environment and should consider the lifecycle environmental impacts of the technology itself including (if applicable) minimizing resource use, minimizing toxicity of materials, **efficient use of water and energy**, minimizing pollution and minimizing impacts of disposal.

EPA also uses energy in specific topic descriptions to give priority to projects that address energy efficiency and renewable energy. For example, the EPA SBIR program solicitation includes energy efficiency and renewable energy criteria in almost all of its environmental topics including Air and Climate, Water, and Manufacturing. Specific language from the solicitation related to energy demand within the manufacturing topic is as follows:

The EPA is seeking more sustainable ways of manufacturing plastics that eliminate the use of toxic chemicals in their production, **greatly reduce the amount of energy** used, and eliminate toxic pollutants that result from the manufacturing process.

Specific actions EPA has taken to promote and support Energy Efficiency and Renewable Energy Research projects

EPA's SBIR program continues to emphasize energy efficiency and renewable energy related topics and priorities at national, regional and state SBIR conferences and includes energy efficiency and renewable energy as criteria for other topic areas including air and climate, water, and manufacturing. Emphasis has been placed on opportunities for small businesses to submit new technology proposals which emphasize energy efficiency (and therefore reduction of carbon emissions) in almost all topic areas in the EPA solicitation. This is emphasized as a way to demonstrate the lifecycle environmental benefits of the proposed technology.

Department of Defense (DOD)

Energy Efficiency and Renewable Energy Related SBIR/STTR Awards FY17				
Agency	**Dollar Amount Phase I**	**Number of Awards Phase I**	**Dollar Amount Phase II**	**Number of Awards Phase II**
Air Force	$10,325,278	69	$17,274,556	23
Army	$1,790,516	12	$5,677,942	6
CBD	-	-	-	-
DARPA	$2,496,679	17	$14,189,959	10
DHA	$149,953	1	-	-
DLA	-	-	-	-
DTRA	-	-	-	-
MDA	-	-	-	-
Navy	$10,783,733	91	$32,153,339	46
OSD	-	-	-	-
SOCOM	-	-	-	-
DoD TOTAL	**$25,546,159**	**190**	**$69,295,796**	**85**

Procedures and Mechanisms Used to Give Priority to Energy-Related Projects

DoD employs a multitude of procedures and mechanisms to give priority to energy-related projects. Components include Energy and Power Technology focus areas, as well as, Power and Directed Energy focus areas as part of SBIR/STTR solicitations.

Actions Taken Toward Promoting and Supporting Energy Efficiency and Renewable Energy Projects

DoD SBIR/STTR participating components promote energy efficiency and renewable energy projects is through information sharing and networking via component specific websites. These websites bring together the small business community, researchers, Programs of Record, and prime contractors for possible collaboration new and ongoing SBIR/STTR projects. Another successful method for promoting energy efficiency and renewable energy projects is through collaboration with various stakeholders. These groups provide unique insights into alternative fuels, energy efficiency, and power generation as the relate to reducing logistic requirements and meeting Army and DoD goals.

Components also track and report SBIR/STTR success DARPAries through these same websites, as well as brochures such as the Army Commercialization Brochure. These brochures are an excellent opportunity for organizations and Small Businesses to share information about their SBIR/STTR projects and the success of their projects. These brochures are typically distributed at conferences providing exposure to these exceptional SBIR/STTR projects.

Additional component specific examples of actions taken toward promoting and supporting energy efficiency and renewable energy are found below:

a. DARPA recently continues to use the Materials for Transduction (MATRIX) program to develop new transductional materials, reducing significant size, weight, and power (SWAP) for military devices and systems. MATRIX takes a systems approach that integrates state-of-the-art materials science, predictive modeling methods, and domain-specific expertise to rapidly validate and optimize new functional architectures that offer transformative defense-related capabilities. Potential applications include:

1. Thermoelectrics – Energy transfer, thermal management, and refrigeration
2. Multiferroics – Enhanced sensors, actuation, micro-power generation, tunable RF and microwave field engineering
3. Phase-Change Materials – Fast switching and sensor application

b. The MDA SBIR/STTR programs, in support of the Ballistic Missile Defense System, continue to explore new ways for promoting and facilitating energy efficiency and renewable energy products. Examples of MDA SBIR/STTR projects related to energy include long-term electronics power sources, advanced reserve battery technologies, lithium oxyhalide battery separator material, low-cost green propellant, and green monopropellant thruster technology maturation.

c. The Army SBIR program is collaborating with the National Defense Center for Energy and Environment (NDCEE) to encourage continued research efforts for promising SBIR projects in the areas of the environment, safety and occupational health, and energy performance and efficiency. The programs are sharing information about applicable SBIR activities and encourage transition activities with the NDCEE. The Army has an ongoing Phase II Enhancement/CRP project co-funded by the Army SBIR program and the NDCEE for a Sulfur-Tolerant Solid Oxide Fuel Cell Stack effort sponsored by the Army's Tank Automotive Research, Development, and Engineering Center (TARDEC).

Examples of DoD SBIR and/or STTR projects related to Energy Efficiency and Renewable Energy

DoD SBIR/STTR releases three solicitations per year; included in these solicitations are topics related to and promoting energy efficiency and renewable energy. A list of projects promoting energy efficiency and renewable energy can be provided upon request.