

# DOE SBIR & STTR GRANT APPLICATION AWARDS RECOVERY ACT PHASE II

(Back to the SBIR/STTR Awards Page)

## TOPICS:

- **Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs**
- **Advanced Concepts and Technology for High Energy Accelerators**
- **Advanced Gas Turbines and Materials**
- **Advanced Industrial Technologies Development**
- **Advanced Manufacturing Processes**
- **Advanced Solar Technologies**
- **Advanced Sources for Accelerator Facilities**
- **Advanced Technologies and Materials for Fusion Energy Systems**
- **Advanced Water Power Technology Development**
- **Ancillary Technologies for Accelerator Facilities**
- **Genomes-to-Live (GTL) and Related Biotechnologies**
- **Instrumentation for Electron Microscopy and Scanning Probe Microscopy**
- **Instrumentation for Materials Research Using Synchrotron Radiation**
- **Nuclear Physics Accelerator Technology**
- **Power Plant Cooling**
- **Radio Frequency (RF) Devices and Components for Accelerator Facilities**
- **Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders**
- **Scientific Visualization and Data Understanding**
- **Sensors, Control, and Wireless Network**
- **Smart Controllers for Smart Grid Applications**
- **Software Libraries and Applications Maintenance and Scaling to Petascale**
- **Water Usage in Electric Power Production and Industrial Processes**

### TOPIC: **Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs**

[top of page](#)

#### **Company:**

Machflow Energy, Inc.  
950 Main St.  
Worcester, MA 01610-1400

#### **Title:**

Recovery Act - Development of a Novel Air Conditioning and Refrigeration System Based on Bernoulli Effect, with Zero Direct Greenhouse Impact.

#### **Summary:**

Machflow Energy, Inc. develops novel air conditioning and refrigeration technology that can be used for residential, commercial, and automotive cooling. Cooling systems built around the technology will be light, inexpensive, and environmentally friendly by using a refrigerant with no global warming potential, no effect on the ozone layer, and that is nontoxic.

#### **Company:**

Mainstream Engineering Corporation  
200 Yellow Place  
Rockledge, FL 32955-5327

#### **Title:**

Recovery Act - Phase Change Thermal Energy Storage for Residential Units

#### **Summary:**

Mainstream's passive thermal energy storage system, SR-TES, increases cooling capacity of residential air conditioners by 0.5 tonR and increases efficiency by 1.0 SEER. The net cost for the homeowner is the same incremental price incurred by a similar higher performance air conditioner. Utilities will benefit greatly from peak load shifting. This effort will create more than 158 jobs.

#### **Company:**

Nanotrons Corporation  
12A Cabot Road  
Woburn, MA 01801-1003

**Title:**

Recovery Act - Nano-Enabled TiO<sub>2</sub> UV Protective Layer for Cool-Color Roofing Application

**Summary:**

This project will develop a commercially viable cool roof that will significantly reduce the energy cost for building cooling. Waterborne clear TiO<sub>2</sub>/Acrylic nanocomposite paint coated on aluminum will fulfill commercially acceptable cool roof coating for both industrial and residential building with long life time.

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**Company:**

Rocky Research  
1598 Foothill Drive  
Boulder City, NV 89005-1803

**Title:**

Recovery Act - Efficient Solar Power Air Conditioning Using a High-Efficiency Absorption Cycle and Novel Mid-Temperature Solar Collector

**Summary:**

The project addresses the problem of making solar cooling economically viable. The approach for this project is to use low cost medium temperature solar collectors with an advanced commercially viable absorption air conditioner that is redesigned for solar driven operation.

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**Company:**

Strategic Polymer Sciences, Inc.  
200 Innovation Blvd, Suite 237  
State College, PA 16803-6602

**Title:**

Recovery Act - Unconventional Air Conditioning and Refrigeration System Based on Giant Electrocaloric Effect in Polar-Fluoropolymers

**Summary:**

This project will develop and design high efficiency, low cost and environmentally friendly refrigeration systems using ECE materials. The technology can be used in various refrigeration systems for building air conditioning, food preservation and cryogenic equipment.

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**Company:**

Technova Corporation  
3927 Dobie Road  
Okemos, MI 48864-3480

**Title:**

Recovery Act - Shape-Stable and Highly Conductive Nano-Phase Change Materials

**Summary:**

A low-cost implementation of recent developments in nanotechnology is employed to produce cost-competitive and sustainable building construction products which are compatible with common construction practices, and greatly reduce the significant energy demands and environmental impacts associated with heating and cooling of buildings.

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**Company:**

United Environment & Energy LLC  
111 Ridge Road  
Horseheads, NY 14845-1507

**Title:**

Recovery Act - Bio-Based Thermochromic Intelligent Roof Coating

**Summary:**

This project aims to develop a bio-based intelligent roof coating technology to reduce both heating and cooling loads of buildings, which will bring significant energy and cost savings to the end-users, protect the environment and improve human health, and reduce the use of petroleum based fuel.

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## TOPIC: Advanced Concepts and Technology for High Energy Accelerators

top of page

**STTR Project**

**Company:**

Incom Inc.  
P.O. Box G  
Southbridge, MA 01550-0528

**Title:**

Recovery Act - Development of Photonic Band Gap Structures for Particle Acceleration

**Summary:**

In this STTR project, Incom, Inc. and its research institution partner, the SLAC National Accelerator Laboratory, attempt to address the ever increasing particle energy and accelerator size needed for High Energy Physics research by proposing a revolutionary approach to develop compact high-gradient inexpensive accelerators using photonic band-gap (PBG) microstructures. This new generation of linear particle accelerator (linac) with a 20-100-fold

increase in accelerating gradients relative to copper structures also has the potential to spawn breakthroughs in many other fields including industrial measurement and technology, as well as medical research and diagnostics. The objective of this project is to fabricate PBG structures from borosilicate and fused silica glass. These structures serve as TM01 cavities and couplers when properly driven by lasers, and will allow tests of basic concepts for PBG accelerators.

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## TOPIC: Advanced Gas Turbines and Materials

top of page

**Company:**

Candent Technologies, Inc.  
6107 West Airport Blvd., Suite 190  
Greenfield, IN 46140-9122

**Title:**

Recovery Act - Advanced Technology High Efficiency Low Cost Small Turbine for DG and CHP

**Summary:**

Candent Technologies, an engineering research company located in Mt Comfort, Indiana, is developing an advanced technology, low cost, high efficiency, multi-fuel, small gas turbine engine, which is suitable for power generation and propulsion (marine, aviation, ground vehicles) applications, and which will greatly reduce fossil fuel consumption as well as green house gas emissions.

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**Company:**

MER Corporation  
7960 South Kolb Road  
Tucson, AZ 85756-9237

**Title:**

Recovery Act - A Very Low Cost Process for the Manufacture of Ti Heat Exchanger Components for Desalination

**Summary:**

The availability of pure water is becoming increasingly scarce in many parts of the world, and also in regions of the United States. One of the major cost factors is the high cost of the titanium used in the desalination plants. This program will accomplish a major reduction in the cost of the titanium components required.

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**Company:**

MesoCoat, Inc.  
24112 Rockwell Dr.  
Euclid, OH 44117-1252

**Title:**

Recovery Act - Nanocomposite Coatings for Life Extension in Zinc Pot Rolls

**Summary:**

Galvanization of steel is used to develop a corrosion resistant surface for use in outdoor applications; however, the liquid metal, zinc, is corrosive and reacts with tooling to form dross which can deform tooling and damage product. The goal of this project is to develop solid lubricant containing, nano-composite coatings that are resistant to liquid metal corrosion and environmental wear.

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**Company:**

Physical Optics Corporation  
20600 Gramercy Place, Bldg. 100  
Torrance, CA 90501-1821

**Title:**

Recovery Act - High-Temperature Material Microstructure Nondestructive Evaluation Compton Imaging Tomography System

**Summary:**

DOE is seeking development of new nondestructive evaluation (NDE) methods to assess materials' microstructures used in high-temperature applications. MicroCITO is a new one-sided three-dimensional imaging tomography system for NDE of these materials in situ, in one pass, providing accurate identification of internal microstructures using three-dimensional high-resolution X-ray imaging.

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**Company:**

Physical Sciences Inc.  
20 New England Business Center  
Andover, MA 01810-1077

**Title:**

Recovery Act - Advanced Laser Machining Techniques for Cooling Holes in Gas Turbines

**Summary:**

Physical Science Inc. proposes to develop high speed water guided laser drilling for cooling holes in high temperature metallic alloys used in gas turbine systems. Current hole drilling technologies produce cooling holes with plus or minus 10 percent air flow variation from hole to hole. This variation requires designers to provide extra holes and extra cooling flow. This compensation results in an excess consumption of cooling air and inordinate cooling in some areas. The novel PSI approach will control hole-to-hole variation to plus or minus 2 percent, permit more complex cooling hole shapes, and allow for more precise location of cooling holes on turbine airfoils. The benefits of the PSI water guided laser drilling technique will allow a more judicious use of cooling air while at the same time provide for

better gas turbine airfoil cooling. These attributes will allow gas turbines to run at higher temperatures and consequently more efficiently. PSI will work with leading turbine manufacturers (GE, Pratt & Whitney and Rolls Royce) to ensure manufacturing relevance and performance.

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**Company:**

Touchstone Research Laboratory, Ltd.  
The Millennium Centre, 1142 Middle Creek Road  
Triadelphia, WV 26059-1139

**Title:**

Recovery Act - High-Temperature Industrial Insulation Utilizing Aerogels

**Summary:**

This project furthers the development of a new industrial high-temperature furnace insulation material that will dramatically decrease heat loss and reduce annual energy and maintenance costs.

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**Company:**

Wilson TurboPower, Inc.  
20 Commerce Way, Suite 200  
Woburn, MA 01801-1057

**Title:**

Recovery Act - Large Silicon Nitride Blisks for High-Efficiency Gas Turbines

**Summary:**

Wilson TurboPower, Inc., in Woburn, MA, is developing a low emissions, breakthrough-efficiency gas turbine engine to enable economic small-scale generation of electricity from many kinds of fuel, including bio-fuels. The technology is also readily adapted to Brayton cycle engines that can be used in concentrated solar power applications.

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## TOPIC: Advanced Industrial Technologies Development

top of page

**Company:**

Houghton Cascade Holdings, LLC  
1145 Broadway Plaza, Suite 1500  
Tacoma, WA 98402-3524

**Title:**

Recovery Act - Demonstration of a Combustion System to Fire Solid Renewable Fuels to Replace Fossil Fuels in Lime Sludge Kilns

**Summary:**

Lime sludge is the byproduct of a number of industrial processes including pulp production for paper manufacture; converting the sludge back to active lime requires significant heat supplied to a rotary kiln. Fossil fuels such as coal and natural gas are usually used as a heat source of heat for the kilns; the use of fuels with lower heat value such as wood waste for co-firing of the lime sludge has not been widespread because of the difficulty of heat losses of the lower heating value fuels. Houghton Cascade Holdings has developed technology to use lower heat value fuels in lime kilns to convert lime sludge back to active lime, and the company is working with a number of industrial partners to commercialize the technology and meet or exceed air emissions standards of lime kiln operations.

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**Company:**

Media and Process Technology Inc  
1155 William Pitt Way  
Pittsburgh, PA 15238-1368

**Title:**

Recovery Act - Development of Advanced Transport Membrane Condenser for Energy/Water Recovery from Industrial Waste/Process Streams

**Summary:**

Significant heat, as well as water vapor of fuel combustion, is lost through industrial exhaust streams; Media and Process Technology developed new membranes to condense the water vapor and capture considerable heat of industrial process exhaust. The technical innovation of the exhaust heat and water recovery membranes includes the development of new ceramic and composite materials with durability in many potential industrial applications.

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**Company:**

NanoMech, LLC  
2447 Technology Way  
Springdale, AR 72764-9143

**Title:**

Recovery Act - Scale-up of Production of Active Nanoparticles-Based Novel Lubricant Additives to Improve Energy Efficiency and Durability

**Summary:**

Lubricant additives are important for reducing friction and wear in virtually all machinery; additives are components of petroleum and synthetic based lubricants and oils. Among other potentially useful lubricant additives, Nanomech developed a molybdenum sulfide particle based additive that is particularly useful for a number of aerospace and manufacturing applications, and Nanomech successfully demonstrated a manufacturing method to produce significant quantities of the lubricant materials to meet potential commercial demand of the new lubricant additive products. The US military has a significant interest in the availability of the new lubricant additives for a number of

applications.

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**Company:**

nGimat Co.  
5315 Peachtree Boulevard  
Atlanta, GA 30341-2107

**Title:**

Recovery Act - Scale-Up of Nanopowder Manufacturing Via Cost-Effective, Low Carbon-Footprint Process

**Summary:**

Ceramic, metal, and metal ceramic composite materials of composed of nano-scale grain sizes are useful in a number of energy technologies, such as lithium ion batteries and fuel cell components. nGimat developed a successful methodology for producing large quantities of useful nano-size grain materials ("nanomaterials") based on a plasma spray that does not require the use of solvents or other chemicals to produce the nanomaterials. nGimat is working in collaboration with a number of US manufacturers to develop and commercialize the new nanomaterials production technology.

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**STTR Project**

**Company:**

Shakti Technologies, Inc.  
728 Garland Drive  
Palo Alto, CA 94303-3603

**Title:**

Recovery Act - Nanomaterials for Batteries and Supercapacitors

**Summary:**

A number of metals and metal-ceramic composite materials with nano-size grain structures have unique electrical properties of potential use in batteries and capacitors with high power density. The high power density storage devices in turn, are needed in next-generation automobiles and renewable energy technologies such as solar cell electricity storage and wind turbine technologies. Shakti developed a novel processing method for nano-material composites in the form of ribbons, and the material processing technology was demonstrated to be capable to scaled up to produce commercially successful amounts of nano-scale ribbon material. Shakti is working on the technology development in conjunction with commercial partners to commercialize successful materials processing technology.

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**Company:**

TDA Research, Inc.  
12345 W. 52nd Ave.  
Wheat Ridge, CO 80033-1916

**Title:**

Recovery Act - Production Scale-up of Nanoporous Carbons for Ultracapacitors

**Summary:**

Certain graphitic materials with nano-sized pores have unusually high electrical capacitance properties that make the materials useful for high power density capacitors ("ultracapacitors") with potential applications in a number of uses where high power density is required, such as wind turbines and automobiles. Future automobiles will make extensive use of electrical power, and power demands will be met by a number of storage devices such as batteries and ultracapacitors. TDA Research successfully developed a technology to produce large quantities of nano-porous carbon materials for use in ultracapacitors, starting from low cost starting materials such as wood and char. TDA Research is working with a number of US manufacturers to commercialize the new carbon-based materials production technology.

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**Company:**

Techfish, LLC  
109 Smith Street  
Charleston, SC 29403-6009

**Title:**

Recovery Act - Lignin Recovery and Purification

**Summary:**

Power companies are limited by their ability to reduce coal usage by burning biomass. By recovering lignin from pulp and paper mills, the sequential liquid lignin and recovery process produces a biofuel comparable in energy density to coal.

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**TOPIC: Advanced Manufacturing Processes**

top of page

**Company:**

Applied Thin Films, Inc.  
1801 Maple Ave. Suite 5316  
Evanston, IL 60201-3135

**Title:**

Recover Act - Ultra-Thin Antifouling Surface Treatments for Industrial Heat Exchangers

**Summary:**

Fouling is a problem causing energy loss and increased operational cost in many industries including power generation, chemical production, and petrochemical refining. An innovative coating and deposition process are being

developed under this project to address this problem with a service-based business model for sustaining green job creation and growth.

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**Company:**

Compact Membrane Systems, Inc.  
335 Water Street  
Newport, DE 19804-2410

**Title:**

Recovery Act - Novel Membrane Reactor for the Manufacture and Purification of THF

**Summary:**

This program expands the productivity and purification capability of separation membranes by their novel use as catalytic membrane reactors. Energy use and greenhouse gas generation will be reduced by at least 95% for making and purifying tetrahydrofuran as well as the manufacture of other organic chemicals.

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**Company:**

Media and Process Technology Inc  
1155 William Pitt Way  
Pittsburgh, PA 15238-1368

**Title:**

Recovery Act - A No Phase Change Process to Replace Distillation in Biodiesel Production

**Summary:**

Distillation is required to meet the proposed cold soak test specification for biodiesel in the US, resulting in tremendous energy consumption on the order of 1.6 trillion BTU/year per billion gallons of biodiesel produced. The technology proposed by Media and Process Technology Inc. will deliver on-spec biodiesel, replace energy intensive distillation, save biodiesel producers hundreds of millions of dollars per year, and promote job growth in this green industry.

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**Company:**

PoroGen Corporation  
6 C Gill Street  
Woburn, MA 01801-1721

**Title:**

Recovery Act - Compact Polymeric Heat Exchanger

**Summary:**

Lightweight and efficient plastic heat exchanger will be developed by PoroGen Corporation. Improved efficiency and reduced weight will provide for energy savings in chemical process industries, and for fuel savings in aviation and automotive sectors.

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**Company:**

TDA Research, Inc.  
12345 W. 52nd Ave.  
Wheat Ridge, CO 80033-1916

**Title:**

Recovery Act - Reactive Distillation Biodiesel Process

**Summary:**

TDA Research will develop a new process for making biodiesel that can use any oil or fat feedstock, especially low-cost unrefined vegetable oils and waste greases or animal fats. The use of low-cost feedstocks will reduce the price of biodiesel and expand the nation's production beyond what is possible from refined soybeans or canola.

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## TOPIC: Advanced Solar Technologies

[top of page](#)

**Company:**

Asylum Research Corporation  
6310 Hollister Ave.  
Santa Barbara, CA 93117-3115

**Title:**

Recovery Act - Nanoscale Probe System for Organic Photovoltaics

**Summary:**

Micro- and nanoscale probing and testing is essential to rapid evaluation and development of candidate photovoltaic materials. Asylum Research proposes to develop a Nanoscale Probe System to quickly evaluate these materials for their potential for increasing solar cell efficiency and for monitoring and performing quality and failure analysis in the production environment.

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**Company:**

Luminit, LLC  
1850 W. 205 Street  
Torrance, CA 90501-1526

**Title:**

Recovery Act - Solar Photovoltaic Holographic Cogeneration System

**Summary:**

DOE is seeking advances in hybrid solar technologies for the cogeneration of heat and electrical power. The proposed technology will effectively split the solar spectrum into two spectral bands using Holographic Optical Elements, and increasing conversion efficiency of the PV cells two to three fold without overheating the PV cells/modules.

**Company:**

Luna Innovations Incorporated  
1 Riverside Circle, Suite 400  
Roanoke, VA 24016-4962

**Title:**

Recovery Act - Advancement of Nano-Material Production for OPV Acceptors

**Summary:**

Development of a new manufacturing process at Luna Innovations Incorporated will make organic solar cells more efficient and affordable.

**STTR Project**

**Company:**

Solarno Inc  
153 Hollywood Drive  
Coppell, TX 75019-7306

**Title:**

Recovery Act - Parallel Tandem Organic Solar Cells with Carbon Nanotube Sheet Interlayers

**Summary:**

Solarno and UT Dallas propose to develop innovative nanotechnology for manufacturing high efficiency "parallel" multi-junction OPVs for NASA (space deployable) and residential commercial applications. The proposed technology is cost-effective and moreover multijunction OPVs with carbon nanotube charge collecting layers can be made ultralight, flexible and semi-transparent for novelty solar products.

**Company:**

SVV Technology Innovations, Inc.  
1832 Tribute R-d, S-te C  
Sacramento, CA 95815-4309

**Title:**

Recovery Act - Hybrid Slat-Array PV System with Thermal Co-Generation

**Summary:**

This project will develop and demonstrate a new approach for making inexpensive modular systems for co-generation of heat and electricity from sunlight. It will make viable the large-scale, distributed energy production from renewables and help meet the national goals of energy independence, reduction of carbon emissions and fostering the job growth and economic progress.

**Company:**

Versatilis LLC  
488 Ridgefield Road  
Shelburne, VT 05482-6311

**Title:**

Recovery Act - Electret Field Enhanced Organic Solar Cells

**Summary:**

Versatilis proposes the world's first "electretic" solar cells based on incorporating electrets with permanent electric charge (the electrical analog to magnets), into organic solar cell structures to dramatically improve their efficiency.

**TOPIC: Advanced Sources for Accelerator Facilities**

[top of page](#)

**Company:**

RadiaBeam Technologies LLC  
1717 Stewart Street  
Santa Monica, CA 90404-4021

**Title:**

Recovery Act - Development of a CW NCRF Photoinjector Using Solid Freeform Fabrication (SFF)

**Summary:**

The goal of this project is to develop a normal conducting, very high duty cycle, high gradient photoinjector. This type of photoinjector is critical for the next generation of accelerator systems, such as X-ray free-electron lasers (FELs), inverse Compton scattering (ICS) sources, injectors for linear colliders, as well as variety of industrial systems for homeland security applications. A key issue for high average power, normal conducting photoinjectors is efficient structure cooling. The project will investigate a novel fabrication technique which will allow complex, conformal cooling channels to be integrated into a re-entrant gun design. This promises to be a key enabling technology for imaging and analysis applications of interest to homeland security and defense as well as industrial and academic programs.

**TOPIC: Advanced Technologies and Materials for Fusion Energy Systems**

[top of page](#)

**Company:**

Ultramet  
12173 Montague Street  
Pacoima, CA 91331-2210

**Title:**

Recovery Act - Optimization and Simulated Testing of Flow Channel Inserts for Dual-Coolant ITER Test Blanket Modules

**Summary:**

Nuclear fusion offers a technically viable means of generating energy consistent with current consumption levels and environmental preservation. Establishing commercial viability of fusion requires the development of advanced materials and structures that allow reliable operation in the demanding reactor environment.

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## TOPIC: Advanced Water Power Technology Development

[top of page](#)

**Company:**

Columbia Power Technologies, LLC  
236 East High Street  
Charlottesville, VA 22902-5178

**Title:**

Recovery Act - High Torque, Low Cost, Direct-Drive Rotary Generator

**Summary:**

Present technology requires gears or hydraulics to address low drive shaft speeds in renewable energy systems, but operation and maintenance for gears and hydraulics are costly. This research develops a high torque, low speed and low cost direct-connected rotary generator for renewable energy applications to reduce cost of energy.

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**Company:**

Lucid Energy Technologies, LLP  
118 East Washington Street, Suite 2  
Goshen, IN 46528-3727

**Title:**

Recovery Act - Lucid Energy Technologies In-conduit Hydropower

**Summary:**

Power pipe is a renewable energy system that will generate electricity by extracting energy from the excess head pressure in water transmission pipelines. The innovative technology has the capacity to generate millions of kilowatt-hours from an abundant source of energy which, to date, has been wasted.

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**Company:**

Natel Energy, Inc.  
2175 Monarch Street  
Alameda, CA 94501-5096

**Title:**

Recovery Act - Scale-up of low-head SLH hydroengine

**Summary:**

This SBIR Phase II Project scales up a novel low-head hydropower technology that has the potential to cut the capital cost of low-head hydromachinery in half.

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**STTR Project**

**Company:**

Ocean Renewable Power Company  
120 Exchange Street, Suite 508  
Portland, ME 04101-4696

**Title:**

Recovery Act - Refinement of Cross Flow Turbine Hydrofoils

**Summary:**

This project will help mature ocean energy technology to a commercially viable state by studying the properties of underwater turbines, which demonstrate tremendous promise as effective and environmentally safe ocean energy devices. The project will also help identify the best turbine designs and manufacturing processes for commercial scale production.

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**Company:**

Resolute Marine Energy, Inc.  
3 Post Office Square - 3rd floor  
Boston, MA 02109-3905

**Title:**

Recovery Act - Variable-Geometry Oscillating Wave Surge Converter for Utility-Scale Electricity Production

**Summary:**

Resolute Marine Energy has been awarded a grant from the Department of Energy to develop an innovative wave energy converter that will speed utilization of our nation's abundant marine renewable energy resources while contributing to U.S. electric power needs, improving energy security and mitigating the effects of climate change.

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## TOPIC: Ancillary Technologies for Accelerator Facilities

### **STTR Project**

**Company:**

Kapteyn-Murnane Laboratories, Inc.  
1855 South 57th Court  
Boulder, CO 80301

**Title:**

Recovery Act - Development of a Fiber Based Source of High Average Power Ultrafast Pulses at 2.0 Microns

**Summary:**

This project makes use of recent advances in ultrafast fiber laser design in combination with optical amplification to convert the laser output for use in free-electron lasers or high harmonic generation. Limitations on fiber laser pulse duration will be removed by using the technique known as crossed-polarized wave generation, and making fiber lasers suitable for free-electron lasers, where they will be used to enhance the peak-power output of x-ray pulses. This technology promises to be useful for basic studies in chemistry and physics, for developing super-high-resolution microscopes for biology and medicine, for viewing nanoscale materials, and for applications in the nanoelectronics industry.

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## **TOPIC: Genomes-to-Live (GTL) and Related Biotechnologies**

**Company:**

ELCRITON  
15 Innovation Way, #288  
Newark, DE 19711

**Title:**

Recovery Act - Development of Homologous Recombination and Recombineering Technologies for Clostridial-Biotechnologies

**Summary:**

The capability to easily modify of chromosomes by DNA recombinations is one of the most important tools of modern biotechnology. Commonly it is desirable to insert, replace or remove genes. Thus desirable characteristics may be introduced or enhanced. Alternatively the gene changes may be used to assess what the natural roles of the original gene are. Such modification capacities have long been used with the "test bed" bacteria Escherichia coli. But comparable facility for modifications in other species are generally lacking. For purposes of biofuels production, microbes in the Clostridia family have high promise because they are already producers of some longer fuel compatible alcohols. Elcriton Inc. has developed improved tools for Clostridia gene recombinations. These promise to greatly speed Clostridia developments in the biofuels sector. It is additionally likely that the approach will guide similar toolset development for other species in the biofuels arena and for biomedical relevant species too.

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## **TOPIC: Instrumentation for Electron Microscopy and Scanning Probe Microscopy**

**Company:**

Hummingbird Precision Machine Inc.  
3340 Windolph Lane NW  
Olympia, WA 98502-3837

**Title:**

Recovery Act - A High Applied Filed Magnetizing Cryogenic In-Situ TEM Experimental Platform

**Summary:**

This project will develop high field magnetizing holders, with cooling and rotational capabilities, which allow researchers to expose magnetic and multiferroic samples to high magnetic fields, concomitant with imaging inside advanced high-resolution electron microscopes. Integrated controllers with computer user interfaces will be developed to allow easy control of these systems. This project will result in hardware that allows researchers to study how magnetic materials respond internally to the application of high magnetic fields at the nano-scale, and can be expected to lead to new insights and the creation of improved functional magnetic devices.

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**Company:**

Hysitron, Inc.  
10025 Valley View Road  
Eden Prairie, MN 55344

**Title:**

Recovery Act - Fast-Scanning Nanoindenter

**Summary:**

The fast scanning nanoindenter proposed by Hysitron will offer a novel tool for rapid quality inspection in basic science and manufacturing processing. The investigators aim to develop the universal tool for rapid mechanical property imaging that incorporates fast control loop, capabilities for rapid scratch testing and modulus mapping, and allowing for rapid probe replacement, ultimately leading to significant increase of throughput. This instrument is expected to find multiple applications in semiconductor, data storage, polymer, and pharmaceutical industries. Beyond rapid throughput, this device will allow scientist to probe high frequency responses of materials, exploring how they accommodate and dissipate elastic energy, providing crucial feedback for optimization of medical implants, ultra-strong composites, and battery or fuel cell electrodes by elucidating the factors that ultimately determine the operation times and reliability.

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**Company:**

Micro Magnetics, Inc.  
617 Airport Road  
Fall River, MA 02720-4722

**Title:**

Recovery Act - Magnetic Tunnel Junction Nanoprobe Compatible with an Atomic Force Microscope

**Summary:**

This project will develop a sensitive magnetic tunnel junction nanoprobe sensor which is capable of measuring electromagnetic properties up to gigahertz frequencies with nanometer-scale spatial resolution at ambient conditions. The probe will offer a significant benefit of being compatible with the commercial scanning probe microscopy systems, allowing for rapid dissemination in research community worldwide. This new kind of magnetic sensor would be able to measure weak magnetic fields, such as those created by the microscopic electrical currents in computers and cell phones. This sensor will allow engineers and scientists to better understand nanometer-scale magnetic materials and performance of electrical devices, for the advancement of nanoscience and nanotechnology.

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**TOPIC: Instrumentation for Materials Research Using Synchrotron Radiation**

[top of page](#)

**Company:**

Square One Systems Design, Inc.  
PO Box 10520  
Jackson, WY 83002-1050

**Title:**

Recovery Act - An Energy Tunable X-ray Delay Device

**Summary:**

When completed, the Linac Coherent Light Source (LCLS) will produce the world's most concentrated beams of pulsed X-rays. The intense brightness and ultra-short duration of these pulses will provide materials researchers with a powerful experimental tool that promises to revolutionize our understanding of the dynamics of matter. However, to effectively probe ultra-fast dynamic phenomena, a method must be developed to temporally shape incoming X-ray pulses into two pulses with arbitrary relative intensity and time delay. For the LCLS to reach its full scientific potential, there exists an acute need for an apparatus that can manipulate the time structure of hard X-rays over a wide range of energies while preserving peak brightness. A novel, energy tunable X-ray delay device is proposed. This device employs a precisely-aligned train of crystalline beam splitters and reflectors to divide an incoming beam, direct the two resultant beams through paths of different lengths and then to recombine the beams such that their respective pulse trains are slightly out of phase. The device provides for user-selectable time delays from -1.0 to 4.0 nanoseconds. Its innovative design allows it to be automatically reconfigured for compatibility with the LCLS's full spectrum of available X-ray energies.

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**Company:**

Wang NMR Inc.  
550 North Canyons Parkway  
Livermore, CA 94551-9472

**Title:**

Recovery Act - Demonstration of a 5 Tesla Vector Magnetometer for Synchrotron Radiation Experiments

**Summary:**

Magnetic field is a critical free parameter in a number of physical systems. For complex magnetic films control of both the field amplitude and its vector components is critical for a detailed understanding of the physical mechanisms at work, as exemplified by circular and linear dichroism experiments. Such experiments are critical to understand and improve materials for a variety of high-profile applications, such as magnetic memory. The proposed equipment development would provide unprecedented access to high magnetic field vector control for soft X-ray experiments at any advanced light source facility in the world.

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**TOPIC: Nuclear Physics Accelerator Technology**

[top of page](#)

**Company:**

Poole Ventura, Inc.  
P.O. Box 5023  
Oxnard, CA 93031-5023

**Title:**

Recovery Act - Device for In-Situ Multiple Coatings of Long, Small Diameter Tubes

**Summary:**

This Phase II SBIR ARRA grant is to support an innovative method of copper coating the interior surface of an accelerator vacuum pipe while in place. The goal of this work is to reduce the undesirable electron cloud in sections of the Relativistic Heavy Ion Collider (RHIC) accelerator in a cost effective way that could ultimately lead to an increase in the luminosity of the RHIC collider. The luminosity of an accelerator is a measure of the number of particle collisions that occur each second. Scientific output of a collider such as RHIC is directly related to the luminosity and cost effectiveness, and scientists at these facilities constantly pursue methods to maximize productivity. The scope of this ARRA-funded SBIR work includes design, fabrication and operation of a full-scale robotic plasma deposition device, capable of coating a complete RHIC section of vacuum tubes. The ability to

perform coating of small diameter tubes and pipes while in place also has the potential to provide this capability for existing chemical, pharmaceutical and other high purity material processing operations, to improve product quality and extend operational life of process equipment.

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## TOPIC: Power Plant Cooling

top of page

**Company:**

MesoCoat, Inc.  
24112 Rockwell Dr.  
Euclid, OH 44117-1252

**Title:**

Recovery Act - Microcomposite Coatings for Advanced Heat Exchangers

**Summary:**

Next generation heat exchangers will operate at higher pressures and temperatures than current models in order to increase cycle efficiency, reduce fuel consumption and emissions. The problem lies in the materials that are currently used. Current materials solutions include nickel-based super alloys, but these are prohibitively expensive. This project has sought to bypass this issue through the development of micro composite coatings that are resistant to erosive wear, creep and gas corrosion at elevated temperatures. Mesocoat will develop advanced heat exchanger coatings which will allow for higher operating temperatures within thermoelectric systems. Nano materials are being engineered into micro composite coatings which will be applied using infrared and radio-frequency fusion to steel and nickel based alloys. If successful, the engineered coating could be applied to heat transfer surfaces within power plants, increasing the efficiency and thereby lowering the emissions of these systems.

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## TOPIC: Radio Frequency (RF) Devices and Components for Accelerator Facilities

top of page

**Company:**

Beam Power Technology, Inc.  
5 Rolling Green Lane  
Chelmsford, MA 01824-4469

**Title:**

Recovery Act - Design Studies of Megawatt-Class Continuous-Wave Elliptic-Beam Inductive Output Tubes

**Summary:**

The goal of this project is to develop a continuous-wave inductive output (IOT) device that satisfies the requirements for high-efficiency, high-power rf sources for current and future synchrotron radiation light sources, free electron lasers, and spallation neutron source user facilities. An innovative elliptic-beam IOT will overcome the power limitation of conventional IOTs while offering the same high efficiency at low voltages.

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**Company:**

Beam Power Technology, Inc.  
5 Rolling Green Lane  
Chelmsford, MA 01824-4469

**Title:**

Recovery Act - Development of a Pulsed, 10% Duty 140 kW, 402.5 MHz Elliptic-Beam Inductive Output Tube

**Summary:**

This project will develop an innovative inductive output tube (IOT) that meets the requirements of high output power. It will overcome the current IOT devices power limitation by use of the company's proprietary elliptic-beam technique while being as efficient as the conventional circular-beam IOT. The successful application of elliptic beams to IOT devices has the potential to open new applications for them in rf amplifier service, where the major advantages of IOT devices can be utilized to reduce hardware and operating costs. These IOTs will facilitate the construction of high-efficiency, high-power rf sources for current and future synchrotron radiation light sources free electron lasers, and spallation neutron source user facilities. These efficient, high-power IOTs will also reach the digital television broadcast community where IOTs have been widely used to answer the requirements of high power rf amplification. As a highly efficient device, elliptic-beam IOTs have the potential to replace conventional circular-beam klystrons, circular-beam IOTs and possibly multi-beam high-order-mode IOTs for accelerator applications requiring highly efficient high power RF sources and in areas such as leading edge scientific research and digital TV broadcasting where high power rf amplification is required.

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## TOPIC: Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

top of page

**Company:**

Physical Optics Corporation  
20600 Gramercy Place, Bldg. 100  
Torrance, CA 90501-1821

**Title:**

Recovery Act - Composite Energy Storage Capacitor

**Summary:**

High-energy-density storage capacitors for solid-state pulsed power systems need improved reliability while

producing fast and high peak current pulse discharge. Ceramic dielectric materials provide the large dielectric permittivity but small breakdown strength at the voids and cracks, while polymers offer significant dielectric strength but low dielectric constant. Physical Optics Corporation proposes to improve the dielectric constant (to greater than 10) and electric strength (to greater than 3 Megavolts/centimeter) of dielectric material while enabling fast discharge of the capacitor by using a three-component nanocomposite for improved linkage of inclusions to the polymer host that is used as a dielectric material. This project will result in the development of new high-energy-storage capacitors for powering a variety of applications, ranging from high-energy accelerators to medical defibrillators.

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**Company:**

RadiaBeam Technologies LLC  
1717 Stewart Street  
Santa Monica, CA 90404-4021

**Title:**

Recovery Act - Ultra-High Gradient, Compact S-Band Accelerating Structure for Laboratory and Industrial Applications

**Summary:**

In this project, RadiaBeam Technologies proposes to develop a Doubled Energy Compact Accelerator (DECA) in S-band (2.856GHz) to push the accelerating gradient above 50 MV/m, doubling existing state of the art. Upon development the DECA structure will offer an ultra-compact drop-in replacement for a conventional S-band linear accelerator (LINAC) in research and industrial applications such as drivers for compact light sources, medical and security systems. The higher operating gradient will result in a more compact system, which will be especially attractive for applications that require a small foot print such as hospital and non-destructive testing (NDT) mobile units. Furthermore, from an R&D point of view, the DECA accelerator will also be a valuable research project of its own - to investigate the frequency scaling of RF breakdown mechanisms and corresponding design limitations of high gradient structures.

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**Company:**

Simulation Technology and Applied Research  
11520 North Port Washington Road, Suite 201  
Mequon, WI 53092-3432

**Title:**

Recovery Act - Robust and Efficient Dark Current Modeling on Finite-Element Meshes

**Summary:**

Computer simulation is an important tool for understanding and guiding the design and operation of experiments. In high-energy accelerators, the onset of dark current and multipacting will limit their operating gradients and the achievable particle energy. Understanding and suppressing dark current generation is an important part of designing a variety of high field-gradient structures, including radio-frequency electron guns, slow-wave structures, and power feed systems. In this project, STAAR, Inc. proposes to create a first-of-its-kind design capability for use in dark current/multipacting amelioration for accelerator, microwave tube, and other particle beam applications. Improved software for dark current and multipacting modeling will lower development costs of components for next-generation accelerators such as the International Linear Collider. Better software will also enable more rapid design of high-power microwave tubes, helping the U.S. microwave tube industry compete in a worldwide marketplace.

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**Company:**

TPL, Incorporated  
3921 Academy Parkway North NE  
Albuquerque, NM 87109

**Title:**

Recovery Act - Nanocomposite Film Capacitors for High Energy Accelerators

**Summary:**

Capacitors represent a key component in many pulsed power systems, in particular power modulators for high energy accelerators. As switching technology improves, a need for improved capacitor performance has become more pronounced, as required for next generation solid-state pulsed power systems. The desirable parameters for such capacitors include: high energy density, high reliability, high peak current delivery, low loss, long life, and fast rise-time capability. TPL, Inc. proposes to develop a nanocomposite film to increase the energy density which will improve efficiency, reduce overall system cost, enable significant reductions in mass and volume, and enable mobile power systems. This nanocomposite, with possesses high temperature capabilities, will allow the capacitors to operate in environments without active cooling such as in vehicle engine compartments. TPL expects this technology to provide a factor of three reduction in the device size in a number of high power electronic systems. Successful results could benefit applications and enable opportunities in the defense, energy, and power electronics industries.

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**TOPIC: Scientific Visualization and Data Understanding**

[top of page](#)

**Company:**

Kitware, Inc.  
28 Corporate Drive  
Clifton Park, NY 12065-8688

**Title:**

Recovery Act - Multi-Resolution Streaming for Remote Scalable Visualization

**Summary:**

This project will extend the popular VTK and Paraview visualization software packages to provide robust and efficient adaptive mesh refinement (AMR) support. AMR techniques automatically adapt the image resolution to the needs of the user, such as providing finer details of an object as the user zooms in. While AMR techniques are common for 2D objects (photographs), 3D objects present significant challenges both in loading the large data images and in maintaining control over the zoom in/out function. This project will address these issues, allowing a wide variety of science communities including astrophysics and combustion to use multi-resolution images of 3D objects.

## TOPIC: Sensors, Control, and Wireless Network

[top of page](#)

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**Company:**

Analysis and Measurement Services Co.  
AMS Technology Center, 9119 Cross Park Drive  
Knoxville, TN 37923-4510

**Title:**

Recovery Act - A Holistic Approach for In-Situ Cable Condition Monitoring in Nuclear Power Plants

**Summary:**

As nuclear power plants apply for license renewals for 60-year operation, aging of plant assets is a great and growing safety concern, especially plant cable and wiring assets. In response, this proposal offers to produce a holistic cable aging assessment and management program that includes comprehensive condition monitoring tests, procedures, analysis tools, training, technical services, and turn-key installation for operating and future nuclear power plants.

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**Company:**

Dehlsen Associates, LLC,  
6430 Via Real, Suite 8  
Carpinteria, CA 93013-2913

**Title:**

Recovery Act - Centipod Wave Energy Converter

**Summary:**

The objectives of the project includes three series of scaled wave tank tests and validating the various subsystems and approach. The Centipod Project covers: 1) experimental validation of analytical tools/design, 2) levelized cost of energy model, 3) certification approvals, and 4) prototype commercial drawing package 5) final report.

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**Company:**

Enertechnix Inc.  
23616 SE 225th Street, PO Box 469  
Maple Valley, WA 98038

**Title:**

Recovery Act - Terahertz Imaging in Kraft Recovery Boilers

**Summary:**

Enertechnix, in collaboration with the University of Washington, proposes to develop a novel terahertz imaging system that will provide improved control capability to operators in the pulp & paper, power generation, petrochemical and other industries, generating substantial energy savings and other economic and environmental benefits.

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**Company:**

FieldMetrics Inc.  
13352 82nd Avenue  
Seminole, FL 33776-3126

**Title:**

Recovery Act - Multi-Function Sensor Platform for Real-Time Smart Grid Power Line Measurements

**Summary:**

The multi-function integrated sensor platform is an enabling technology for the smart grid. The project creates sensors for immediate deployment on the power grid to detect energy theft, improve energy delivery efficiency, provide early warning of grid instability and accurately monitor renewable energy resources.

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**Company:**

Luna Innovations Incorporated  
1 Riverside Circle, Suite 400  
Roanoke, VA 24016-4962

**Title:**

Recovery Act - Radiation Tolerant, Ultra-High Temperature Sensors for In-Core Use

**Summary:**

Stable high temperature sensors are proposed for nuclear reactor use, supporting Gen-IV Reactor and Nuclear Hydrogen initiatives. This technology enables reactor safety and high efficiencies, to reduce the US dependency on foreign oil, and to emission of green house gasses.

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**Company:**

Mainstream Engineering Corporation  
200 Yellow Place

Rockledge, FL 32955-5327

**Title:**

Recovery Act - Web-Based, Plug & Play, Wireless Remote Monitoring, Diagnostic and System Health Prediction System for Residential AC and Heat Pump Applications

**Summary:**

Mainstream has demonstrated a wireless Remote Monitoring System to automatically monitor and detect problems in residential air conditioning systems, thereby saving energy and money, avoiding unexpected failures, and creating jobs in Florida.

---

**Company:**

OG Technologies, Inc.  
4300 Varsity Drive, Suite C  
Ann Arbor, MI 48108

**Title:**

Recovery Act - Imaging-Based Optical Caliper for Objects in Hot Manufacturing Processes

**Summary:**

To improve the efficiency of dimension control and the safety of the steel and forging workers, a new product will be developed with innovations in the areas of imaging, software algorithms and wireless communication. The expected benefits include enhanced safety, energy savings, improved yields, and reduced carbon dioxide release in the steel industry, as well as job creation.

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**Company:**

Spectral Sciences, Inc.  
4 Fourth Avenue  
Burlington, MA 01803-3304

**Title:**

Recovery Act - Real-time Remote Detection of HR-VOC Content in Flares

**Summary:**

Incomplete combustion of natural gas in oil refinery flares releases hazardous organic compounds into the air, posing serious risks to the environment and public health. A sensor for real-time monitoring and control of flare combustion efficiency is being developed to mitigate the release of these chemicals into the environment.

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## TOPIC: Smart Controllers for Smart Grid Applications

[top of page](#)

**Company:**

Coincident, Inc.  
12 Reservoir Avenue  
Lakeville, MA 02347-1516

**Title:**

Recovery Act - Multi-Protocol Energy Management Gateway for Home-Area Networks

**Summary:**

Coincident helps homeowners and small businesses to realize the financial, social, and environment benefits promised by the smart grid through an energy management product that seamlessly integrates all smart appliances and meters into a web-based consumer interface.

---

**Company:**

Encryptor, Inc.  
1900 Preston Road, #267-303  
Plano, TX 75093-3604

**Title:**

Recovery Act - Smart Low-Cost Controller Chip for Grid-Friendly Household Appliances

**Summary:**

We will develop a semiconductor chip for embedding inside all electrical consumer appliances automatically reducing the power consumption during times of overload peak electrical demand each day. This almost billion-unit sub-\$1.00 chip directly impacts electrical generation infrastructure investment, reduces pollution, and lowers US consumers' electric bills by over \$1B annually.

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**Company:**

Infotility, Inc.  
2060 Broadway, Suite 320  
Boulder, CO 80302-5224

**Title:**

Recovery Act - Developing an Agent-Based Distributed Smart Controller for Plug-in Electric Vehicles and Distributed Energy Resources

**Summary:**

This project provides the basis for software applications that support next-generation SmartGrid operations and controls using novel optimized MicroGrid aggregation controls for Plug-in Electric Vehicles. This project can help increase the benefits and ultimate mass deployments of Plug-in Electric Vehicles and improves on current approaches to high-penetration renewables management integrating Plug-in Electric Vehicles, distributed solar, demand response, and distributed storage into utility grid operations. It benefits national security by developing methods to

increase grid reliability and its ability to respond to emergencies and contingencies.

---

**Company:**

People Power Company  
620 Lowell Avenue  
Palo Alto, CA 94301-3817

**Title:**

Recovery Act - The Lean Green Energy Controller Machine-A clustered Smart Controller for the Household Market

**Summary:**

People Power Company of Palo Alto, CA, is using SBIR funds to save energy and money for the residential energy consumer. Automated residential energy management services empower the consumer with "actionable intelligence" using Demand/Response services and simple, Internet-enabled consumer dashboards and scorecards.

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**Company:**

Peregrine Power, LLC  
27350 SW 95th Avenue, Suite 3022  
Wilsonville, OR 97070-7709

**Title:**

Recovery Act - Controller for Charging/Storage System

**Summary:**

In order to provide energy storage for utility grid stabilization and the incorporation of greater intermittent renewable energy, a smart controller and small storage unit will be developed. These will be installed at thousands of residential sites and dispatched by the utility using smart meters and new communication technologies.

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**STTR Project**

**Company:**

Wattminder  
1153 Bordeaux Drive, Suite 199  
Sunnyvale, CA 94089-1223

**Title:**

Recovery Act - Web-Based Diagnostic Tools for Online Monitoring of Photovoltaic Systems

**Summary:**

This project entails the fault detection, estimation and optimal maintenance scheduling of revenuecritical photovoltaics systems. A cloud-based diagnostic framework is being developed and prototyped.

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**TOPIC: Software Libraries and Applications Maintenance and Scaling to Petascale**

[top of page](#)

**Company:**

RNET Technologies, Inc.  
240 West Elmwood Drive, Suite 2010  
Dayton, OH 45459-4248

**Title:**

Recovery Act - Optimization of the PETSc Library for Clusters of MultiCore Processors

**Summary:**

This project will revise the PETSc libraries to operate more efficiently on the emerging generation of supercomputers. These new computers are moving to a hybrid architecture where CPU's and GPU's co-exist and applications are expected to take advantage of their strengths. The existing PETSc libraries, a large collection of mathematical functions used by numerous scientific applications, were written to run on CPU based computers. Revisions to these PETSc libraries are required to take advantage of this emergence of GPU and hybrid CPU/GPU based computers.

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**TOPIC: Water Usage in Electric Power Production and Industrial Processes**

[top of page](#)

**Company:**

Nanotrons Corporation  
12A Cabot Road  
Woburn, MA 01801-1003

**Title:**

Recovery Act - Carbon Nanotube Based Water Purification

**Summary:**

Nano-Enabled TiO2 UV Protective Layer for Cool-Color Roofing Application Water quality is an issue that affects industry, drinking water and the third world. Nanotrons proposes a water filter that can process water 100 times faster than the best technology available today. The implications for desalination of sea water and purification of polluted water around the globe is enormous.

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**Company:**

Nrgtek Inc.  
17120 Fremont Lane  
Yorba Linda, CA 92886-1784

**Title:**

Recovery Act - A Solar-Assisted Seawater Desalination System

**Summary:**

A 5 gallons per day, low-cost, low-energy, solar-assisted seawater and produced water desalination system was developed in Phase I, and a 100 gallons per day prototype plant will be demonstrated in Phase II to show the efficiency and cost-effectiveness of the proposed technology. The process will exhibit capability of desalination at one-half the cost of conventional desalination processes.

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**Company:**

Piedmont Biofuels Industrial  
220 Lorax Lane  
Pittsboro, NC 27312-0661

**Title:**

Recovery Act - Utilization of Immobilized Lipase System for Waste Water Reduction in the Bioenergy Industry

**Summary:**

Biodiesel is one non-traditional alternative fuel that is currently being developed as an alternative to petroleum based fuels. The current biodiesel production methodology utilizes a water washing purification technique as a simple method for removing contaminants. This results in the formation of soaps or salts in both the biodiesel and glycerin phases which are of little or negative value, and is typically discharged via low quality waste water. It is estimated that current biodiesel methods produce 1 gallon of waste water for every 4 gallons of biodiesel produced. Piedmont's system will use an enzymatic biodiesel production method which differs from traditional techniques by eliminating the washing process, and by extension eliminate the production of waste water.

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**Company:**

TDA Research, Inc.  
12345 W. 52nd Ave.  
Wheat Ridge, CO 80033-1916

**Title:**

Recovery Act - Brackish and Wastewater Cleanup for Process Cooling

**Summary:**

TDA Research Inc is developing a technology that will permit fossil fuel and nuclear power plants, as well as petroleum refiners and other industries that use large amounts of cooling water, to significantly reduce their demand for fresh water by using brackish water resources for cooling that are currently unsuitable because of their salinity.

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**Company:**

Tusaar Inc.  
1900 15th. Street  
Boulder, CO 80302-5414

**Title:**

Recovery Act - Economical Sequestering & Immobilization of Heavy Metals - Means to Recycle Water and Reduce Pollution

**Summary:**

Electric power plants generate large quantities of solid and liquid residuals which contain a broad spectrum of heavy metals. These residuals are stored in various ways including surface impoundments and landfills. In many instances, these materials come in contact with ground water and release some of these heavy metals into the surrounding environment. Tusaar, Inc. has developed a novel system which can immobilize the metals in these water discharges. The use of granulated activated carbon and benzotriazoles is being investigated for these purposes, and could lead to an effective remediation technique.

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[\(Back to the SBIR Awards Page\)](#)