

**DEPARTMENT OF ENERGY
SMALL BUSINESS INNOVATION RESEARCH PROGRAM AND
SMALL BUSINESS TECHNOLOGY TRANSFER PROGRAM**

**PHASE II RECOVERY ACT APPLICATIONS SELECTED FOR AWARDS
BY STATE**

ARKANSAS



Company:

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

Topic:

Advanced Industrial Technologies Development

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.

ARIZONA



Company:

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

Topic:

Advanced Gas Turbines and Materials

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.

CALIFORNIA

Company:

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



Topic:

Water Usage in Electric Power Production and Industrial Processes

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.

Company:

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

Topic:

Advanced Gas Turbines and Materials

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.

Company:

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

Topic:

Sensors, Control, and Wireless Network

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) leveled cost of energy model, 3) certification approvals, and 4) prototype commercial drawing package 5) final report.

Company:

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

Topic:

Advanced Water Power Technology Development

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.

Company:

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

Topic:

Smart Controllers for Smart Grid Applications

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.

*STTR Project***Company:**

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

Topic:

Smart Controllers for Smart Grid Applications

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 revenue-critical photovoltaics systems. A cloud-based diagnostic framework is being developed and prototyped.

Company:

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

Topic:

Advanced Solar Technologies

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:

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

Topic:

Advanced Solar Technologies

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:

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

Topic:

Advanced Solar Technologies

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.

STTR Project

Company:

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

Topic:

Advanced Industrial Technologies Development

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.

Company:

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

Topic:

Instrumentation for Materials Research Using Synchrotron Radiation

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.

Company:

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

Topic:

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

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.

Company:

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

Topic:

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

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.

Company:

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

Topic:

Nuclear Physics Accelerator Technology

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.

Company:

Ultramet
12173 Montague Street
Pacoima, CA 91331-2210

Topic:

Advanced Technologies and Materials for Fusion Energy Systems

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.

Company:

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

Topic:

Advanced Sources for Accelerator Facilities

Title:

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

Summary:

This project will develop an efficient, high average power, high brightness electron gun. This electron gun will enable imaging and analysis applications that can be used for homeland security and defense, as well as for industrial and academic programs.

COLORADO

Company:

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



Topic:

Water Usage in Electric Power Production and Industrial Processes

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.

Company:

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

Topic:

Water Usage in Electric Power Production and Industrial Processes

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. Tussar, 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.

Company:

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

Topic:

Smart Controllers for Smart Grid Applications

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:

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

Topic:

Advanced Industrial Technologies Development

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.

Company:

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

Topic:

Advanced Manufacturing Processes

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.

*STTR Project***Company:**

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

Topic:

Ancillary Technologies for Accelerator Facilities

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.

DELAWARE

Company:

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



Topic:

Advanced Manufacturing Processes

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.

Company:

ELCRITON
15 Innovation Way, #288
Newark, DE 19711

Topic:

Genomes-to-Live (GTL) and Related Biotechnologies

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.

FLORIDA

Company:

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



Topic:

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

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:

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

Topic:

Sensors, Control, and Wireless Network

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:

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

Topic:

Sensors, Control, and Wireless Network

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.

GEORGIA**Company:**

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

**Topic:**

Advanced Industrial Technologies Development

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.

ILLINOIS**Company:**

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

**Topic:**

Advanced Manufacturing Processes

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.

INDIANA**Company:**

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

**Topic:**

Advanced Gas Turbines and Materials

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.

Company:

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

Topic:

Advanced Water Power Technology Development

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.

MASSACHUETTS**Company:**

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

Topic:

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

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:

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

Topic:

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

Title:

Recovery Act - Nano-Enabled TiO₂ 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 TiO₂/Acrylic nanocomposite paint coated on aluminum will fulfill commercially acceptable cool roof coating for both industrial and residential building with long life time.

Company:

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

Topic:

Water Usage in Electric Power Production and Industrial Processes

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.

Company:

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

Topic:

Advanced Gas Turbines and Materials

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 manufactures (GE, Pratt & Whitney and Rolls Royce) to ensure manufacturing relevance and performance.

Company:

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

Topic:

Advanced Gas Turbines and Materials

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.

Company:

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

Topic:

Sensors, Control, and Wireless Network

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.

Company:

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

Topic:

Advanced Water Power Technology Development

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.

Company:

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

Topic:

Smart Controllers for Smart Grid Applications

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:

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

Topic:

Advanced Manufacturing Processes

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.

Company:

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

Topic:

Radio Frequency (RF) Devices and Components for Accelerator Facilities

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.

Company:

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

Topic:

Radio Frequency (RF) Devices and Components for Accelerator Facilities

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.

Company:

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

Topic:

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

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.

*STTR Project***Company:**

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

Topic:

Advanced Concepts and Technology for High Energy Accelerators

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.

MAINE*STTR Project***Company:**

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



Topic:

Advanced Water Power Technology Development

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.

MICHIGAN**Company:**

Technova Corporation
3927 Dobie Road
Okemos, MI 48864-3480

**Topic:**

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

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.

Company:

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

Topic:

Sensors, Control, and Wireless Network

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.

MINNESOTA

Company:

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



Topic:

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

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.

NEVADA

Company:

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



Topic:

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

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.

NEW MEXICO

Company:

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



Topic:

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

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, which 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.

NEW YORK**Company:**

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

**Topic:**

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

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.

Company:

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

Topic:

Scientific Visualization and Data Understanding

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.

NORTH CAROLINA



Company:

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

Topic:

Water Usage in Electric Power Production and Industrial Processes

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.

OHIO



Company:

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

Topic:

Power Plant Cooling

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.

Company:

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

Topic:

Advanced Gas Turbines and Materials

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.

Company:

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

Topic:

Software Libraries and Applications Maintenance and Scaling to Petascale

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.

OREGON**Company:**

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

**Topic:**

Smart Controllers for Smart Grid Applications

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.

PENNSYLVANIA

**Company:**

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

Topic:

Advanced Building Air Conditioning and Refrigeration, Thermal Load Shifting, and Cool Roofs

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.

Company:

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

Topic:

Advanced Industrial Technologies Development

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.

Company:

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

Topic:

Advanced Manufacturing Processes

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.

SOUTH CAROLINA



Company:

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

Topic:

Advanced Industrial Technologies Development

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.

TENNESSEE



Company:

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

Topic:

Sensors, Control, and Wireless Network

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.

TEXAS



Company:

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

Topic:

Smart Controllers for Smart Grid Applications

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.

STTR Project

Company:

Solarno Inc
153 Hollywood Drive
Coppell, TX 75019-7306

Topic:

Advanced Solar Technologies

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.

VIRGINIA

Company:

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

**Topic:**

Sensors, Control, and Wireless Network

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.

Company:

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

Topic:

Advanced Water Power Technology Development

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.

Company:

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

Topic:

Advanced Solar Technologies

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.

VERMONT

Company:

Versatilis LLC
488 Ridgefield Road
Shelburne, VT 05482-6311



Topic:

Advanced Solar Technologies

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.

WEST VIRGINIA

Company:

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



Topic:

Advanced Gas Turbines and Materials

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.

WASHINGTON**Company:**

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

Topic:

Sensors, Control, and Wireless Network

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.

Company:

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

Topic:

Advanced Industrial Technologies Development

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.

Company:

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

Topic:

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

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.

WISCONSIN**Company:**

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

**Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

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.

WYOMING**Company:**

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

**Topic:**

Instrumentation for Materials Research Using Synchrotron Radiation

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.