

Department of Energy Research Projects Win 36 R&D 100 Awards

U.S. Department of Energy researchers have won 36 of the 100 awards given out this year by R&D Magazine for the most outstanding technology developments of 2012. The awards are presented annually in recognition of exceptional new products, processes, materials, or software that were developed throughout the world and introduced into the market the previous year.

Researchers at ten of DOE's national laboratories and the Y-12 National Security Complex won awards this year. The R&D 100 awards highlight some of the successes achieved by the Department's national laboratories in technology transfer of basic research results into commercial products.

Since 1962, when R&D Magazine's annual competition began, DOE national laboratories have been the recipient of over 800 R&D 100 awards. R&D 100 awards are selected by an independent panel of judges based on the technical significance, uniqueness, and usefulness of projects and technologies from across industry, government, and academia.

The following DOE national laboratories and technologies won awards:

ARGONNE NATIONAL LABORATORY

Argonne, Illinois

Miraj Diamond™ Platform: The Platform combines two newly developed diamond technologies: a low-temperature nanocrystalline diamond deposition technology and an efficient n-type semiconductor doping process. The combination allows for a commercially feasible approach to creating cheaper, better devices that rely on integrated circuits, which could transform telecommunications, defense, and aviation electronics. (Jointly developed by AKHAN Technologies)

Nanocomposite Charge Drain Coatings: This technology represents a significant breakthrough development of microelectromechanical systems, or MEMS. One of the most significant potential obstacles to the creation of these devices lies in the fact that electrons can sometimes become trapped in the substrate. Argonne scientists used atomic layer deposition to create extremely thin coatings that would enable the material to function more efficiently.

NCD Technologies Plus coating: This diamond coating is used primarily for extremely hard and tiny drill bits that are less than a hair's width in diameter. These drill bits are used in industrial micromanufacturing for making everything from extremely precise locks for aviation to printing circuit boards. (Jointly with NCD Technologies)

The Rhodobacter Membrane Protein Expression System: This system allows researchers to create much larger amounts of membrane protein than was ever before available, driving down production costs and making studies of membrane proteins easier both in terms of scalability and purification. This could aid researchers in better understanding the structures of these essential proteins.

Read more about these projects at [HERE](#)

IDAHO NATIONAL LABORATORY

Idaho Falls, Idaho

Switchable Polarity Solvents Forward Osmosis (SPS FO): This innovation cleanses industrial waste-water by drawing it through a specialized semi-permeable membrane. By permitting water reuse, the technology offers a significant benefit to water-intensive industrial processes, including oil-gas fracking operations that can use three to five million gallons of water per well.

Read more about this project [HERE](#).

LAWRENCE BERKELEY NATIONAL LABORATORY

Berkeley, California

Bacteriophage Power Generator: This technology generates power using harmless viruses that convert mechanical energy into electricity, providing a sustainable, cost-effective, and nontoxic energy source capable of powering electronics and microdevices.

Berkeley Lab Campanile Probe: The Campanile Probe delivers nanoscale information about material composition and behavior with a resolution 100 times greater than what is now possible. This will help researchers design the materials of tomorrow, including faster semiconductors, cheaper solar cells, or better drugs.

Conducting Polymer Binder: The Conducting Polymer Binder is a new material for use in rechargeable batteries that is strong, elastic, porous, highly conductive, and can boost power storage capacity by 30 percent.

High-throughput NIMS Screening: The High-Throughput Nanostructure-Initiator Mass Spectrometry is a high-speed chemical screening system that can precisely determine the molecular composition of thousands of samples arrayed on a small slide of silicon at speeds 100 times faster than conventional methods. (Jointly with Nextval Inc.)

On-demand Secure Circuits and Reservation System (OSCARS): OSCARS is a software service that creates dedicated bandwidth channels needed by scientists who must move massive, time-critical data sets between collaborators and computing centers around the world.

Optically-Detected Oil Well Logging by MRI: OWL-MRI measures the distribution and quality of oil and gas in large geological formations and the physical properties that most influence the economic and environmental expense of petrochemical extraction. It can increase the accuracy and speed of oil-well logging measurements by a factor of 10 to 100, reducing the cost of oil exploration as well as the environmental impact of its extraction.

Universal Smart Window Coating: This technology enables dynamic control over how much of the sun's heat and light enters a building through its windows, reducing the need for both air-conditioning and artificial lighting. Its low cost, minimal power requirements, and responsiveness are expected to drive wide deployment and make a significant impact on energy consumption.

VOTO: VOTO is a cheap, rugged solid oxide fuel cell that produces electricity from burning charcoal, wood, or other types of biomass. The fuel cell sits in the fire and is attached to circuitry in a handle that is charged as the fuel cell heats up. The handle, which contains an LED bulb, can then be detached and used for lighting or to charge a phone. (Jointly with Point Source Power)

Read more about these projects [HERE](#)

LAWRENCE LIVERMORE NATIONAL LABORATORY

Livermore, California

DNA Tagged Reagents for Aerosol Experiments (DNATRAX): DNATRAX is a safe and versatile material that can be used to reliably and rapidly diagnose airflow patterns and problems in both indoor and outdoor venues.

Efficient Mode-Converters for High-Power Fiber Amplifiers: LLNL researchers have demonstrated a “mode-converter” system that enables the scaling of fiber-based lasers to high power levels while allowing the laser to still be effectively focused.

Laser SHIELD (Screening at High-throughput to Identify Energetic Laser Distortion): The Laser SHIELD technology dramatically increases the operational flexibility and efficiency at the world’s largest laser, the National Ignition Facility.

Mantevo Suite 1.0: This pioneering suite of small software programs (miniapps) allows computational scientists to measure the performance of new computing environments and will help in the design of new high performance computers. (The work was done in collaboration with Sandia, Los Alamos, and Lawrence Livermore National Laboratories, and the United Kingdom-based Atomic Weapons Establishment and NVIDIA Corp.)

Movie Mode Dynamic Transmission Electron Microscopy: Using this revolutionary imaging technique, a range of fundamental and technologically important material and biological processes can be captured in action and in complete nanoscale detail, for the first time. (The work was done in collaboration with Integrated Dynamic Electron Solutions)

Read more about these projects [HERE](#).

LOS ALAMOS NATIONAL LABORATORY

Los Alamos, New Mexico

KiloPower: This technology uses a nuclear fission system as a heat source that transfers heat via a heat pipe to a small Stirling-engine-based power convertor to produce electricity. KiloPower helps make possible the development of new probes and spacecraft for exploration of deep space. (Joint entry with NASA Glenn Research Center and National Security Technologies, LLC.)

Mantevo Suite 1.0: See Lawrence Livermore National Laboratory.

MiniMax: MiniMax is a battery powered, digital x-ray imaging system that is completely self-contained, lightweight, compact, and portable. Its applications include homeland security (postal

inspection of suspicious packages and explosive ordinance disposal), weld inspection, and disaster relief. (Joint entry with Leica Camera AG, JDS Uniphase, and JENOPTIK Optical Systems LLC.)

Multi-Mode Passive Detection System: This technology is a scanning device using muon particles from cosmic rays for quickly detecting unshielded to heavily shielded nuclear and radiological threats as well as explosives and other contraband. (Joint entry with Decision Sciences International Corporation)

Read more about these projects [HERE](#).

NATIONAL ENERGY TECHNOLOGY LABORATORY

Morgantown, West Virginia

Arc Position Sensing Technology: By digitally monitoring arc location during vacuum arc remelting – the primary method for melting and refining specialty metals for aerospace and advanced energy applications – this technology provides real time quality control for improved safety and reduction of defects. Use of APS also could lead to increased yield and production of materials with stronger chemical and mechanical homogeneity. (Developed with support from ATI Albany Operations)

Note: The name of the above technology has been corrected since the original posting on July 18th, 2013.

BlackGold: BlackGold is a nanocoating material and application process that, when applied to gas turbine aircraft engines, can significantly reduce erosion of compressor airfoils, leading to improved engine performance and fuel efficiency. The nanocoating has the potential to save the U.S. commercial aviation industry up to 100 million gallons of fuel annually and garner cost savings greater than \$300 million per year. (Developed by MDS Coating Technologies Corp. with support from NETL and Delta Air Lines).

Read more about these projects [HERE](#).

NATIONAL RENEWABLE ENERGY LABORATORY

Golden, Colorado

Image Processing Occupancy Sensor (IPOS): This technology combines an inexpensive camera with computer vision algorithms that can recognize the presence of human occupants in office buildings and retail stores. The information can be used to save energy by helping make instantaneous decisions on the amount of lighting, ventilation, air conditioning, or daylighting needed.

Isothermal Battery Calorimeters: These calorimeters are capable of performing the precise thermal measurements needed to make safer, longer-lasting, and more cost-effective lithium-ion batteries. They allow for the development of new thermal management techniques to ensure that the batteries in plug-in vehicles meet their warranty specifications and provide the needed power during their life. (Jointly with NETZSCH)

TetraCell Silicon Solar Cell: This high efficiency, low-cost PV technology reduces cost by using a simplified processing step of plating copper instead of the traditional printing of silver. (Jointly with TetraSun).

Read more about these projects [HERE](#).

OAK RIDGE NATIONAL LABORATORY

Oak Ridge, Tennessee

Adaptable I/O System for Big Data, or ADIOS: ADIOS is a portable, scalable, and easy-to-use software framework conceived to solve “big data” problems. It significantly reduces the input or output complexities encountered by scientists running on high performance computers, along with reducing their time to solution, which allows researchers to spend more time achieving scientific insight and less time managing data. (Jointly with Georgia Institute of Technology, Rutgers University, and North Carolina State University.)

ClimateMaster Trilogy 40 Q-Mode Geothermal Heat Pump: This water-to-air packaged heat pump provides significantly lower energy costs, reduces peak demand for electricity, and provides environmental benefits, especially through reductions in greenhouse gases and pollutants. (Jointly with ClimateMaster)

Da Vinci Fuel-in-Oil, or DAFIO™: This technology uses a fiber optic probe to obtain real-time measurements of oil in an operating engine to quantify the fuel dissolved in the lubricant oil. That enables combustion engineers to rapidly assess any issues related to fuel dilution of oil during development of efficient, clean, and reliable engines. (Jointly with Da Vinci Emissions Services Ltd. and Cummins Inc.)

Distribute The Highest Selected Textual Recommendation: This patent-pending technology automates the discovery of selected information from massive dynamic streams of text, which can aid in the discovery of threats and help law enforcement agencies safeguard the nation.

SYMMETRIX HPX-F Nanocomposite Separator for Improved Lithium Ion Battery: This breakthrough membrane technology lowers lithium ion battery costs and improves safety through the replacement of polymer separators. It could affect electric vehicles, grid storage applications, portable electronic applications, filters, barrier fabrics, transdermal drug delivery, and toxic chemical absorption. (Jointly with Porous Power Technologies LLC)

V-shaped External Cavity Laser Diode Array: This technology gives an efficient method to extract a high-quality laser beam from a broad-area laser array. The result is a laser source with high brightness and wavelength tunability that has applications in spectroscopy, laser radar, material surface processing, optical communications, sensing, and metrology.

Read more about these projects [HERE](#)

PACIFIC NORTHWEST NATIONAL LABORATORY

Richland, Washington

Combined Orthogonal Mobility & Mass Evaluation Technology (CoMet): This technology is an instrument that quickly and effectively analyzes complex biological and environmental samples, which can be crucial in biomedical research, clinical practices, natural product management, and environmental studies.

Read more about this project [HERE](#).

SANDIA NATIONAL LABORATORIES

Albuquerque, NM

Mantevo Suite 1.0: See Lawrence Livermore National Laboratory.

Membrane Projection Lithography: This fabrication technique enables the creation of a diverse array of microscopic 3D structures with macroscopic impact. The technique can be used to create 3-dimensional integrated circuits as well as structured electromagnetic materials. The technique is being licensed by Plasmonics, Inc., to make thermal antennas which can control the direction of heat emitted from an object, potentially easing cooling and heating needs for satellites.

Solar Glare Hazard Analysis Tool: To help address concerns over glare from solar energy installations and their impacts on pilots, air traffic controllers, and motorists, this web-based tool can quickly locate a site, outline the proposed array, and identify glare throughout the year to predict potential ocular hazards. The tool also can evaluate alternative designs and layouts to help mitigate glare impact.

Read more about these projects [HERE](#).

Y-12 NATIONAL SECURITY COMPLEX

Oak Ridge, Tennessee

LISeTM: A High-Efficiency Thermal Neutron Detector: This single-crystalline, solid-state device offers the significant advantages of portability, sensitivity, simplicity, and low cost, and will be used in handheld nuclear nonproliferation and homeland security applications to find fissile materials.

Read more about this project [HERE](#).

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