

DOE-Funded Research Projects Win 39 R&D Awards for 2010

WASHINGTON, DC – U.S. Department of Energy researchers have won 39 of the 100 awards given out this year by R&D Magazine for the most outstanding technology developments with promising commercial potential. The coveted awards are presented annually in recognition of exceptional new products, processes, materials or software developed throughout the world and introduced into the market the previous year.

"I want to congratulate all of this year's winners on their awards and thank them for their work," Energy Secretary Steven Chu said. "The large number of winners from the Department of Energy's national labs every year is a clear sign that our labs are doing some of the most innovative research in the world. This work benefits us all by enhancing America's competitiveness, ensuring our security, providing new energy solutions and expanding the frontiers of our knowledge. Our national labs are truly national treasures, and it is wonderful to see their work recognized once again."

These awards highlight some of the successes made by the Department's national laboratories in technology transfer, moving basic research results into commercial products.

Since 1962, when R&D Magazine's annual competition began, the Department has received more than 800 R&D 100 awards in areas such as energy, national security and basic scientific applications. This year, scientists and engineers from 11 of the 17 DOE National Laboratories and the Y-12 National Security Complex received 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.

A list of DOE's winning sites, technologies and corresponding press releases follows:

Ames Laboratory (Ames, Iowa)

- **osgBullet Software:** This new tool integrates highly detailed 3-D drawings with physics engines to enable engineering design in a real-time computed environment. This award is shared with National Energy Technology Laboratory, Pittsburgh, Pa and Idaho National Laboratory, Idaho Falls, Idaho.

Argonne National Laboratory (Argonne, Ill.)

- **The π Steradian Transmission X-ray Detector:** This innovative technology improves the ability of researchers to study nanomaterials.
- **Hard X-ray Quad Collimator:** This compact, durable and economical system can analyze a sample with micron-sized beams of various sizes that are reproducible and precise at the micron level.

To read more about these projects, visit
http://www.anl.gov/Media_Center/News/2010/news100708.html

Idaho National Laboratory (Idaho Falls, Idaho)

- **Supercritical/Solid Catalyst (SSC):** The SSC process converts discarded and environmentally unfriendly wastes into biodiesel fuel.
- **MicroSight:** This technology allows a military marksman, hunter, or target shooter to simultaneously focus on both the gun sight and the target.
- **osgBullet Software:** This award is shared with National Energy Technology Laboratory, Pittsburgh, Pa and Ames Laboratory, Ames, Iowa.

To read more about these projects, visit https://inlportal.inl.gov/portal/server.pt?open=514&objID=1269&mode=2&featurestory=DA_551474

Lawrence Berkeley National Laboratory (Berkeley, Calif.)

- **Home Energy Saver/Hohm:** This free online web tool identifies a range of energy-saving upgrades specific to each user's home construction and geographic location.
- **Rough Silicon Nanowires for Waste Heat Utilization:** A thermoelectric material that can be used to recover waste heat from automobiles, airplanes, power plants and other sources to offset energy use.
- **Chemicals on Demand:** Laser-triggered microcapsules designed to provide controlled, remote delivery of materials such as cancer therapeutics or surgical glue for hip replacements, or industrial products such as self-repairing electronics and self-healing paint.
- **APPELS: Differentially Pumped Ambient Pressure PhotoElectron Lens System for Photoemission Studies:** A lens that enables scientists to use X-ray photoelectron spectroscopy to analyze liquid/gas and solid/gas interactions at ambient pressures and should accelerate the development of more efficient catalysts, improve fuel cells and solar cells and provide a greater understanding of the effect of atmospheric pollutants on ozone.

To read more about these projects, visit <http://newscenter.lbl.gov/news-releases/2010/07/08/berkeley-lab-wins-four-2010-rd-100-awards/>

Lawrence Livermore National Laboratory (Livermore, Calif.)

- **Statistical Radiation Detection System:** The statistical radiation detection system is a novel software solution that nonexperts can use to rapidly and reliably detect radionuclides in applications that require accurate identification of radioactive material.
- **High-Performance Strontium Iodide Scintillator for Gamma-Ray Spectroscopy:** The europium-doped strontium iodide scintillator allows the fastest, highest-resolution gamma-ray spectroscopy for detectors to identify radionuclides for homeland security and other applications. This project was developed in conjunction with Oak Ridge National Laboratory, Fisk University, Radiation Monitoring Devices Inc. and the Department of Homeland Security's Domestic Nuclear Detection Office.
- **Energy Monitor for Ultrahigh-brightness X-ray Pulses:** The X-ray free electron laser energy monitor non-intrusively measures the energy of ultrahigh intensity X-ray pulses produced by revolutionary X-ray free electron lasers.
- **Grating Actuated Transient Optical Recorder (GATOR):** This technology is a diagnostic system that can acquire sequential images of X-rays or optical light with the time resolution of a trillionth of a second or better.
- **Ultraporous Carbon Nanotube Membranes:** Extremely permeable and stable carbon nanotube membranes provide ultrafast water flow that could revolutionize the water purification industry.

- **Microelectromechanical Systems (MEMS)-based Adaptive-Optics Optical Coherence Tomography:** This system is a clinical instrument that provides non-invasive, ultrahigh resolution, three-dimensional volumetric retinal images for ophthalmologists and optometrists to view retinal structures at the cellular level.

To read more about these projects, visit <https://www.llnl.gov/news/newsreleases/2010/NR-10-07-02.html>

Los Alamos National Laboratory (Los Alamos, N.M.)

- **Ultrasonic Algal Biofuel Harvester:** The one-of-a-kind harvester uses extremely high frequency sound waves to harvest and extract oils and proteins from algae, separating out and recycling the water, all in one integrated system.
- **DAAFox Environmentally-friendly Secondary Explosive:** The new synthesis method results in an explosive material, DiAminoAzoxyFurazan, with an ideal combination of physical characteristics—it resists ignition, reducing the possibility of accidental detonation.
- **MOXIE: Movies of eXtreme Imaging Experiments:** The uses for MOXIE include nuclear weapon certification without nuclear testing through X-ray movies of mock detonations, used to verify computer models. The camera enables scientists to study the physical properties of materials, including equations of state, fusion plasmas, discharge formation, shock physics and fracture mechanics.
- **Ultraconductus:** This nanotechnology was developed for the manufacture of high-tech wires and cables that have tensile strength greater than steel, operate at room temperatures and conduct electricity more easily than any other metal alloy.
- **Solution Deposition Planarization (SDP) Superconductor Substrate Preparation Process:** This simpler and environmentally-friendly process seeks to reduce production costs of superconducting materials, while supporting significantly higher power densities and producing virtually no toxic manufacturing waste.

National Energy Technology Laboratory (Pittsburgh, Pa.)

- **Cerium Oxide Coating for Oxidation Rate Reduction in Stainless Steels and Nickel Superalloys:** This surface treatment technology extends the lifetime of metal components exposed to oxidizing environments. These ultra-supercritical operating conditions enable high-efficiency, clean power generation, thereby extending our national resources, such as coal and petroleum, while protecting our environment.
- **osgBullet:** This award is shared with Ames Laboratory, Ames, Iowa and Idaho National Laboratory, Idaho Falls, Idaho.

To read more about these projects, visit http://www.netl.doe.gov/publications/press/2010/100708-NETL_Technologies_Garner_R&D_100_Awards.html

National Renewable Energy Laboratory (Golden, Colo.)

- **Black Silicon” Nanocatalytic Wet-Chemical Etch:** "Black silicon” solar cells, which have been chemically etched to appear black, can better absorb the Sun's energy. The inexpensive, one-step method reduces light reflection from silicon wafers to less than two percent and promises to reduce manufacturing production cost and capital expense.

- **Amonix 7700 Solar Power Generator:** This highly concentrated, highly efficient bulk power generator produces 40 percent more energy than conventional fixed photovoltaic panels. The technology was developed in a partnership between NREL and Amonix.

To read more about these projects, visit <http://www.nrel.gov/news/press/2010/867.html>

Oak Ridge National Laboratory (Oak Ridge, Tenn.)

- **Liquid Microjunction Surface Sampling Probe for Mass Spectrometry:** This fast, cost-effective technology improves the ability to analyze materials under real-world conditions and will expand the range of uses within the biological sciences, including applications in pharmaceutical research and drug discovery.
- **Sulfur-Carbon Nanocomposite Cathode Material and Additives for Lithium-Sulfur Batteries:** The technology improves lithium-ion battery technology and has the potential to aid in the harnessing, storage and use of electricity from renewable energy sources.
- **Ultrasensitive Nanomechanical Transducers Based on Nonlinear Resonance:** The technology enables sensitive linear detection of force or mass for a number of important applications, including chemical and biological detection, inertial navigation and thermal imaging.
- **Strontium Iodide Scintillator for Gamma Ray Spectroscopy:** This project was submitted by Lawrence Livermore National Laboratory and developed in conjunction with ORNL, Fisk University, Radiation Monitoring Devices Inc. and the Department of Homeland Security's Domestic Nuclear Detection Office.
- **Mode-Synthesizing Atomic Force Microscope:** This novel measurement system can obtain a wealth of material information from both the surface and the subsurface domain, opening unlimited opportunities in nanoscience in a variety of endeavors, including human health, environmental studies, toxicology, nanofabrication, cell mechanics and energy research.
- **High-Performance, High-Tc Superconducting Wires enabled via Self-assembly of Non-superconducting Columnar Defects:** The technology is designed to create non-superconducting nanoscale columnar defects within high-temperature superconducting wires that enable large currents to flow through the materials in the presence of high applied magnetic fields.
- **Ztherm Modulated Thermal Analysis:** This technology provides a tool for failure analysis of devices such as electrical conductors or semi-conductors in flexible electronic devices and polymer photovoltaic devices. This project was developed and jointly submitted by ORNL and Asylum Research Company.
- **Telemedical Retinal Image Analysis and Diagnosis:** The TRIAD technology is a web-based telemedical diagnostic system designed to conduct automated eye screenings of large patient populations for blinding diseases, such as diabetic retinopathy, in a primary health care setting.

To read more about these projects, visit <http://www.ornl.gov/ornl/news/news-releases?ReleaseNumber=mr20100708-00>

Pacific Northwest National Laboratory (Richland, Wash.)

- **Ion Mobility Spectrometer on a Microchip:** This technology dramatically improves the ability to detect and identify trace molecules from explosives or disease-revealing proteins in blood.

- **IncubATR™--the Live-Cell Monitor:** This technology combines a cell culture incubator with a spectroscope to detect important biological and chemical changes in living cells that are invisible to the naked eye. The invention will speed up scientific discovery, reduce costs and curtail the need for live animal testing.
- **GammaTracker™:** This handheld device can correctly locate the source of and differentiate between different radioactive elements.
- **Propylene Glycol from Renewable Sources:** A production facility has been initiated to mass produce propylene glycol, a common additive found in household items like food, cosmetics and liquid detergents, from renewable plant-based products rather than oil.

To read more about these projects, visit <http://www.pnl.gov/news/release.aspx?id=805>

Sandia National Laboratories (Albuquerque, N.M.)

- **Acoustic Wave Biosensor for Rapid-Point-of-Care Medical Diagnosis:** This technology is a handheld instrument that performs rapid, point-of-care medical diagnostic analyses of viruses, proteins, bacteria and DNA with little or no sample preparation.
- **CANARY:** Event Detection Software: CANARY provides continuous monitoring of water quality from networked sensors for automated event detection, which enables improved security and operations within water distribution systems worldwide.
- **Micro Power Source:** The Micro Power Source is a rechargeable ultra-small form factor that integrates a lithium-ion-based solid electrolyte battery with an ultra-thin photovoltaic collector as an energy harvester. This work was performed jointly with Pacific Northwest National Laboratory and Front Edge Technology Inc.
- **Multifunctional Optical Coatings by Rapid Self-Assembly:** This simple, safe, and economical coating process enables the development of paradigm-shifting multifunctional nanomaterials and optical coatings with architectures and properties not attainable by current processing methods.

To read more about these projects, visit

https://share.sandia.gov/news/resources/news_releases/rd100/#.VJBDvv50yWg

Y-12 National Security Complex (Oak Ridge, Tenn.)

- **Modulated Tool-Path (MTP) Chip Breaking System:** The MTP chip breaking system provides an unmatched chip breaking solution for machining operations. The MTP chip breaking system produces user-selectable chip lengths and work piece finishes and is compatible with any material, work piece shape and depth of cut.

The U.S. Department of Energy's 17 world-class national laboratories are working to uncover future scientific breakthroughs to address some of the most pressing challenges of our time, including energy and the environment, national security and American competitiveness.