

Department of Energy Projects Win 36 R&D 100 Awards for 2011

*Technology Developments Aim to Address Energy,
Environment and National Security Issues*

Washington, D.C.– 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 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 this year’s R&D 100 award winners. The Department of Energy’s national laboratories and sites are at the forefront of innovation, and it is gratifying to see their work recognized once again,” said Energy Secretary Steven Chu. “The cutting-edge research and development done in our national labs and facilities is helping to meet our energy challenges, strengthen our national security and enhance our economic competitiveness.”

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

This year, scientists and engineers from 13 DOE National Laboratories and facilities will receive awards. Since 1962, when R&D Magazine’s annual competition began, DOE has been the recipient of over 800 R&D 100 awards in areas such as energy, national security and basic scientific applications.

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. View the complete list of R&D100 awards

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

Argonne National Laboratory

- **Integrated RF MEMS Switch/CMOS Device:** These devices will enable the next generation of communications devices to more seamlessly handle data, voice, audio and video simultaneously while supporting multiple radio frequency systems operating in several different frequency bands ranging from megahertz to gigahertz.
- **Advanced Ceramic Film Capacitors for Power Electronics in Electric Drive Vehicles:** This technology substantially reduces the weight, volume and cost of capacitor materials of the inverters that will be used to power the motors of electric vehicles.
- **Enhanced Renewable Methane Production System:** This system is a low-cost process that accelerates biological methane production rates by at least fivefold. The system could enhance biological methane production at waste water treatment plants, farms and landfills, thereby addressing one of the largest barriers to the expansion of renewable methane – the naturally slow rate of production.
- **Photoacoustic Spectroscopy (PAS) System for Remote Detection of Explosives and Chemicals:** This system can be used for homeland security and defense applications to identify and locate toxic chemicals, roadside bombs, or special nuclear materials with high sensitivity and great selectivity for chemicals and explosives in an open-field

environment. It can also be used for environmental monitoring, crime scene forensics and cargo and food inspections.

Read more about these projects at :

http://www.anl.gov/Media_Center/News/2011/news110622.html

Brookhaven National Laboratory

- **Maia X-ray Microprobe Detector System (Maia):** This non-destructive system, which is about a 1,000 times faster than previous methods, will enhance studies that use X-ray fluorescence, a powerful technique often used in the biological, environmental and geological sciences for measuring trace element concentrations in a sample.
- **Multimodal Optical Nanoprobe (MON):** The nanoprobe is used in a transmission electron microscope to measure numerous properties (optical, electrical, mechanical, and structural) of a sample simultaneously, in addition to imaging.

Read more about these projects at: <http://www.bnl.gov/bnlweb/pubaf/pr/newsroom.asp>

Idaho National Laboratory

- **Rad-Release Chemical Decontamination Technology (Rad-Release):** Rad-Release is a viscous foam that removes radioactive and concentrated metals from various surfaces. The technology allows contaminated buildings and equipment to become usable, is non-destructive, reduces workers' exposure to contaminated materials, and minimizes waste costs and volume.
- **Impedance Measurement Box (IMB):** IMB assesses the health of batteries with a well-engineered breakthrough that directly measures impedance during battery operation, an engineering feat never accomplished before.

Read more about these projects at: <https://inlportal.inl.gov/portal/server.pt/community/home/255>

Lawrence Berkeley National Laboratory

- **Magnetic Resonance Microarray Imaging (MRMI):** This technology images materials flowing through microfluidic "lab-on-a-chip" devices, and zooms in on microscopic objects of particular interest (such as medical, environmental or industrial fluids) with unprecedented spatial and time resolutions. It can quickly capture the results of hundreds or thousands of parallel assays on a single microfluidic chip.
- **Nanostructured Antifogging Coatings:** This technology is designed to provide a durable, nontoxic, antifogging and self-cleaning coating for architectural glass, windshields, eyewear and solar panels. Tests have shown it to be more transparent, last much longer (years compared to months) and cost less than competing antifogging technologies.

Read more about these projects at: <http://newscenter.lbl.gov/>

Lawrence Livermore National Laboratory

- **Serrated Light Illumination for Deflection-Encoded Recording (SLIDER):** This device is the world's fastest light deflector, deflecting a beam of light at the rate of one resolvable

spot per trillionth of a second. In conjunction with an ordinary camera, the device can be used to record ultrafast events at timescales that have been largely unattainable in the past.

- Stack Trace Analysis Tool: This technology is a debugging tool for identifying errors in computer code running on supercomputers of a hundred thousand processor cores and more. It allows users to quickly locate in their code the most challenging bugs that emerge only at extreme scales and to get critical applications back up and running.

Read more about these projects at: <https://www.llnl.gov/news/newsreleases/>

Los Alamos National Laboratory

- TAPSS, or Trapped Annular Pressure Shrinking Spacer: TAPSS is a spacer fluid developed to help prevent catastrophes in offshore oil-well drilling. This new spacer is not difficult to use, does not greatly change the cost of production, is self-functioning and requires minimal time to install. LANL developed the fluid in collaboration with Chevron Energy Technology Company and Baker Hughes's Drilling Fluids Unit.
- Th-ING, Thorium Is Now Green: This technology is a straightforward, cost-effective, and safe method to produce thorium that may help make thorium become a practical and reliable source of energy for the future.
- NanoCluster Beacons: The Beacons are superior probes for detecting diseases such as cancers or sickle cell anemia. Inexpensive and easy to use, they allow for personalized medication, and can also be used in quantitative biology applications, such as counting individual molecules inside a cell.

Read more about these projects at: www.lanl.gov

National Energy Technology Laboratory

- APECS v2.0 with ANSYS® DesignXplorer™ and ROM Builder: This versatile, innovative, and powerful software toolkit makes it easier, faster, and cheaper to design next-generation power production and chemical processing plants with a high degree of confidence using advanced process/equipment co-simulation and comprehensive design optimization. Developed jointly by NETL and ANSYS Inc.
- Mn-Co Coating for Solid Oxide Fuel Cell Interconnects—This manganese-cobalt coating was specifically tailored for interconnects of solid oxide fuel cells. The coating was designed to prevent the “poisoning” of the fuel cells from evaporating chromium and is a step towards making these fuel cells commercially viable power source. Co-developed by NETL and West Virginia University.
- Novel Platinum/Chromium Alloy for the Manufacture of Improved Coronary Stents—This alloy is the first stainless steel formulation with significant concentration of a highly “radiopaque” element to be produced for the stent industry. By increasing the x-ray visibility of the stent inside a patient, the alloy solves a longstanding problem of poor visibility when using standard stainless steel stents. This better visibility means greater ease and precision of placement of the stent inside the patient's artery and less chance of damage to the artery. Jointly developed by NETL and Boston Scientific Corporation Inc.

Read more about these projects at: http://www.netl.doe.gov/publications/press/2011/110622-NETL_Earns_2011_R&D_100_Awards.html

National Renewable Energy Laboratory

- Flash Quantum Efficiency System (NREL's Real-Time Quantum Efficiency Technique/ Tau Science's FlashQE™): This technology is a new way to assess the quality of solar cells at about 1,000 times faster than previous methods.
- Optical Cavity Furnace: This technology could revolutionize the solar cell manufacturing industry in the U.S. by producing higher quality and higher efficiency solar cells at a fraction of the cost of conventional, thermal ovens.
- Innovalight Silicon Ink for High-Efficiency Solar Cells: This is the first time that silicon has been sold in the marketplace as a liquid. It can improve the bottom line of a typical solar production plant by 20 percent, while boosting the efficiency of the cells by about 6 percent.

Oak Ridge National Laboratory

- NextAire Packaged Gas Heat Pump: The gas heat pump technology is used to heat and cool small and medium sized buildings using fuel (typically natural gas) instead of electricity to power the compressor. It also significantly reduces greenhouse gas emissions.
- Ultra-high Storage Density, Self-assembled, Magnetic Media: This technology demonstrated an ultrahigh density information storage approaching or exceeding one terabit (trillion bits) per square inch, which can be self-assembled at a low cost.
- Mesoporous carbon electrode for desalination: This novel technology makes it possible to desalinate large quantities of water more effectively than conventional technologies. It could make it possible for large numbers of the world's population to produce safe drinking water at a relatively low cost.
- Hydrogen safety sensor with nanostructured palladium cantilevers: This technology uses palladium particles to more efficiently detect hydrogen levels at a lower cost than the competition. Unlike sensors that use electricity to monitor for hydrogen, this new sensor does not pose a fire hazard and so can be used to monitor activities such as industrial building and rechargeable battery manufacturing.
- MADNESS software tool: the Multiresolution Adaptive Numerical Environment for Scientific Simulations, is a powerful computer platform that permits scientists and engineers to take on a variety of complex real-world problems, with assurance in the exactness of their results.
- CermaClad™: This technology quickly and cheaply fuses materials onto the internal and external surfaces of steel pipes and tubes as well as plates, sheets and bars in thin, strong cladding layers, producing casings that are resistant to chemical corrosion and can endure extreme pressure. This project was jointly submitted by MesoCoat Inc., EMTEC and ORNL
- New Stainless Steel Alloy Tooling For High Temperature Presses that Form Aircraft Components: This stainless steel alloy can be used to mold new commercial and military aircraft components, able to withstand higher temperatures than many of its competitors while still retaining its structural integrity during casting. This project was jointly submitted by Duraloy Technologies, Inc. and ORNL.

Read more about these projects at: http://www.ornl.gov/info/press_releases/newsroom.cfm

Pacific Northwest National Laboratory

- Array Detection Technology for Mass Spectrometry (ADT-MS): This adaptation to mass spectrometers allows them to sample a wide range of masses simultaneously, rather than just one at a time. This saves time, simplifies analysis and significantly updates the detection capabilities of mass spectrometers.
- Dynaforge – A Solid-State Dynamic Powder Compaction Process for Production of High-Performance Tools and Dies: This technology eliminates a step in forming a manufacturing die into its desired shape, which makes the die stronger and reduces metal manufacturing costs.

Read more about these projects at: <http://www.pnl.gov/news/release.aspx?id=871>

Sandia National Laboratories

- Ultra-high-voltage Silicon Carbide Thyristor: This semiconductor device allows next-generation “smart grid” power electronics system to be built up to ten times smaller and lighter than current silicon-based technologies. These packaged-power devices are the world’s first commercially available, high-voltage, high-frequency, high-current, high-temperature, single-chip Silicon-Carbide based thyristors.
- Microresonator Filters and Frequency References: This Microresonator technology allows hundreds of acoustic filters and oscillators to be manufactured on a single integrated circuit chip and integrated with radio frequency (RF) transistor circuits. They will perform RF filtering and frequency synthesis functions in next-generation wireless handsets, cell phones, and other wireless devices, offering higher performance and frequency diversity in a smaller package and at a lower price than current technologies.
- Biomimetic Membranes for Water Purification: Biomimetic membranes are designed for water purification using reverse osmosis technology, which removes impurities from water with applied pressure powered by electrical energy. These membranes reject salts and larger solution components, thus creating drinkable water. The nanoporous biomimetic design enables high salt rejection and faster water flow at lower driving pressures than competing membranes, thus reducing the energy cost of desalination.
- Demand Response Inverter (DRI): The inverter is designed to reduce the leveled cost of energy from photovoltaic power by being more efficient, more reliable, and more cost-effective than currently available inverters in the market. This project was jointly submitted with Princeton Power Systems, Inc. and Sandia.

Read more about these projects at: https://share.sandia.gov/news/resources/news_releases/

Savannah River National Laboratory

- Porous Walled, Hollow Glass Microspheres: These microspheres are able to hold and release gases and other materials. Because they provide a protective environment for their contents, they can be used to hold reactive or flammable absorbents or stored materials, including solids, liquids or gases. This has the potential to provide a safe method of handling, storing or transporting a variety of difficult materials.

Read more about this project at: <http://srnl.doe.gov/>

Y-12 National Security Complex

- RonJohn: RonJohn is a versatile, environmentally safe solvent that easily strips acrylic sealer from concrete floors, turns urethane foam to slush and softens powder coating to gel.

Read more about this project at: <http://www.y12.doe.gov/news/>

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By Brad Bugger