



# Eight Los Alamos innovations win R&D 100 Awards

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## “Oscars of Invention” honor the latest and best innovations of the past year

LOS ALAMOS, N.M., Nov. 20, 2017—Eight Los Alamos National Laboratory technologies won R&D 100 Awards last week at R&D Magazine’s annual ceremony in Orlando, Florida.

“The R&D 100 Awards represent the breadth, depth and innovation of the science and engineering at our Laboratory. They also reflect our partnerships with other government laboratories, universities and private industry,” said Los Alamos National Laboratory Director Charlie McMillan. “These innovations continue the Laboratory’s tradition of scientific excellence in support of our national security mission and to the broader scientific community. I congratulate the teams on their outstanding achievements.”

The Los Alamos projects selected as winners are:

- Clean-Energy Catalysts Without Precious Metals: Making next-generation fuel cells cost effective
- Discrete Fracture Network Modeling Suite ([dfnWorks](#)): Transforming simulations of flow and transport through fractured rock
- EDGE Bioinformatics: Making genomics accessible to everyone
- High-Temperature Electric Submersible Pump Motor (HT-ESP): Keeping pump motors cool in deeper, extremely hot environments
- National Risk Assessment Partnership Toolset (NRAP): A set of computational tools to inform decision making for geological carbon storage sites amidst uncertainty
- [SHIELDS](#) Space Weather Platform: Predicting hazards that result from solar storms
- WikiEpiCast: Using Wikipedia to perform real-time disease monitoring and forecasting
- Zirconia Electrochemical Hydrogen Safety Sensor: Ready to protect the new-energy economy

“The R&D 100 Winners demonstrate the products made possible by the innovative science and technology that Los Alamos and its partners bring to bear in support of the missions of NNSA and the Department of Energy,” said Carol Burns deputy principal associate director of the Laboratory’s Science, Technology and Engineering directorate. “These diverse inventions include applications for clean energy technology and several of these technologies, developed through partnerships, are already available to the public.”

## About the winners

Clean-Energy Catalysts Without Precious Metals uses inexpensive, Earth-abundant and easily sourced precursor materials for the synthesis of electrocatalysts for hydrogen-based fuel cells. The fuel cells produce electrical energy and emit one byproduct: water. Conventional fuel cells rely on costly precious metal catalysts, such as platinum. The new precious-metal-free electrocatalysts generate performance approaching that of precious metal catalysts but at a fraction of the cost.

Los Alamos submitted the joint entry with Pajarito Powder, LLC based on technology that Pajarito Powder licensed from the Lab. Piotr Zelenay led the Los Alamos team of Hoon Taek Chung, Edward Holby and Ulises Martinez. Pajarito Powder collaborators include Barr Zulevi, Alia Lubers, Geoff McCool and Sam McKinney.

Discrete Fracture Network Modeling Suite ([dfnWorks](#)) is a computational suite that simulates and predicts the flow and transport of fluids through underground fractured rock. It covers length scales that range from millimeters to kilometers, can run on computers as small as a laptop and as large as a supercomputer and requires minimal effort to create representative models. Applications for [dfnWorks](#) include helping catch rogue nations performing underground nuclear tests and maximizing the extraction of natural gas, oil and geothermal wells while minimizing environmental impacts.

Los Alamos submitted the joint entry with Oak Ridge National Laboratory. Carl Gable led the Los Alamos team of Jeffrey Hyman, Satish Karra, Nataliia Makedonska and Hari Viswanathan; with Oak Ridge collaborator Scott Painter.

Empowering the Development of Genomics Expertise (EDGE) Bioinformatics “democratizes” the genomics revolution by enabling any researcher or physician to

analyze complex genomics data quickly and easily. The intuitive, web-based platform, which can be applied to a wide variety of genome-sequencing samples, addresses the problem of handling big data, without requiring users to possess bioinformatics expertise. EDGE brings the power of complex, big-data sequencing analysis to smaller research laboratories, including clinics, hospitals, universities and remote sites.

Los Alamos submitted EDGE as a joint entry with the Naval Medical Research Center. Patrick Chain led the Los Alamos team of Po-E Li, Chien-Chi Lo, Karen Davenport, Yan Xu, Pavel Senin, and Migun Shakya. Collaborators at the Naval Medical Center include Theron Hamilton, Kimberly Bishop-Lilly, Joseph Anderson, Logan Voegtly and Casandra Philipson.

In addition to their R&D 100 win, the EDGE team received a second, [special recognition award](#), an "R&D 100 Special Recognition Award for a Market Disruptor Product."

High-Temperature Electric Submersible Pump Motor (HT-ESP) is rugged and reliable, offering improved thermal performance compared to conventional submersible pumps used in deep underground and extremely hot environments. Whether electric submersible pump motors are used in drilling deeper for oil and gas reservoirs or tapping into geothermal resources of energy, they must operate in harsh, extremely hot environments. Current pump motors overheat and must be replaced often. To solve this, the Los Alamos and the Chevron Energy Technology Company research team developed two technologies for HT-ESP to lower the internal operating temperature of the motor.

Los Alamos submitted the HT-ESP as a joint entry with Chevron. Todd Jankowski led a Los Alamos team of Dallas Hill, Britton Lambson, James Stewart, Robert Bourque and Coyne Prenger. Chevron collaborators include Jose Gamboa, Daniel Hunt, Max Bough and Yamila Orrego.

National Risk Assessment Partnership (NRAP) Toolset is a set of 10 science-based computational tools developed to assess long-term environmental risks of geologic carbon dioxide (CO<sub>2</sub>) storage sites. This novel toolset is the only product suite that allows rapid, site-specific quantitative and probabilistic risk performance evaluation of the whole geological CO<sub>2</sub> storage system – from storage reservoir to overlying groundwater and the atmosphere. These tools support industry and regulatory stakeholders as they design and implement safe and effective geological CO<sub>2</sub> storage projects to sequester large volumes of human-made CO<sub>2</sub>.

The National Energy Technology Laboratory submitted the joint entry with Los Alamos National Laboratory, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory and Pacific Northwest National Laboratory. Rajesh Pawar led the Los Alamos team of Chris Bradley, Elizabeth Keating, Phil Stauffer, Shaoping Chu, Dylan Harp, Richard Lee, Bill Carey and George Guthrie.

Space Hazards Induced near Earth by Large, Dynamic Storms (SHIELDS) protects communication, navigation and scientific satellites orbiting Earth's magnetosphere by predicting hazards resulting from solar storms that cause space weather. Space weather could damage onboard electronics in satellites and thus interrupt radio and television reception, disrupt the operation of cellphones and GPS, shut down the Internet and endanger military and civilian operations. Researchers developed the software platform to understand, model and predict this weather about an hour before it hits satellites, enabling instruments to be placed in a safe mode.

Los Alamos submitted SHIELDS as a joint entry with the University of Michigan. Vania Jordanova led the Los Alamos team of Gian Luca Delzanno, Humberto Godinez, J. David Moulton, Daniil Svyatsky, Michael Henderson, Steve Morley, Jesse Woodroffe, Thiago Brito, Christopher Jeffery, Alin-Daniel Panaitescu, Collin Meierbachtol, Earl Lawrence and Louis Vernon. University of Michigan collaborators included Gabor Toth, Daniel Welling, Yuxi Chen and John Haiducek.

WikiEpiCast framework combines mathematical models with clinical surveillance data and readership traffic from Wikipedia to forecast the spread and severity of diseases around the world. Successfully demonstrated on forecasting influenza in the United States, WikiEpiCast's framework can be applied to any communicable disease. The tools being developed within WikiEpiCast present probabilistic forecasts, similar to how nightly newscasts present weather updates. As a result, such forecasts are easy for nonscientist decision makers to digest and in turn make informed decisions that could save lives and potentially mitigate the potential impacts of an epidemic or pandemic of a burgeoning communicable disease.

Los Alamos submitted the WikiEpiCast entry. Sara Del Valle led the team of Nicholas Generous, Geoffrey Fairchild, Kyle Hickmann, Reid Priedhorsky and David Osthus.

Zirconia Electrochemical Hydrogen Safety Sensor makes filling up hydrogen-fueled vehicles a lot safer. Hydrogen gas is highly flammable, colorless and odorless and propagates very quickly if released into the air. The Hydrogen Safety Sensor is made of safe, durable and long-lasting ceramic sensor elements of the type used in automotive oxygen sensor technology. The safety sensors can be placed anywhere in the hydrogen supply chain, from hydrogen production and distributions to a critical component of the hydrogen pump at a filling station to a functioning safety component of the consumer product itself.

Los Alamos submitted the Hydrogen Safety Sensor as a joint entry with Lawrence Livermore National Laboratory and Hydrogen Frontier, Inc. Eric Brosha led the Los Alamos team of Christopher Romero, Rangachary Mukundan and Cortney Kreller. Collaborators include Amanda Wu and Robert Glass of Lawrence Livermore National Laboratory and Daniel A. Poppe of Hydrogen Frontier, Inc.

## The R&D 100 Awards

The prestigious "Oscars of Invention" honor the latest and best innovations and identify the top technology products of the past year. The R&D 100 Awards span industry, academia and government-sponsored research organizations.

Since 1978 Los Alamos has won more than 145 of the prestigious R&D 100 Awards. The Laboratory's discoveries, developments, advancements and inventions make the world a better and safer place, bolster national security and enhance national competitiveness.

See all of the 2017 [R&D Award Winners](#). Read more about the [Laboratory's past R&D 100 Awards](#).

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