



HOLIDAY TRADITION — The gentle light of farolitos illuminates the University of New Mexico's Alumni Memorial Chapel for the holidays. Farolitos, also called luminarias, are a New Mexico tradition. (Photo by Randy Montoya)

NNSA Defense Programs
AWARDS of EXCELLENCE
 11 teams, 1 individual honored
 Pages 4-5

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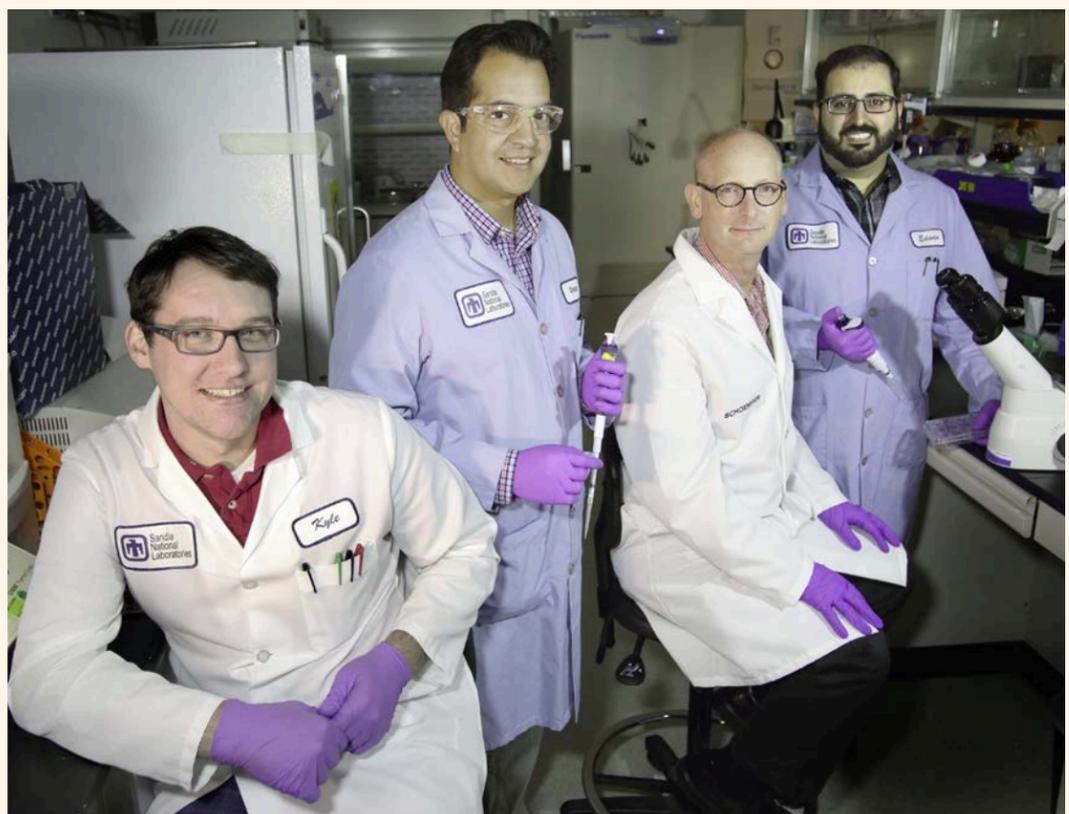
Infectious diseases: CTRL + ALT + Delete

Sandia joins gene editing safety project

By Jules Bernstein

Gene editing is revolutionizing the bioscience research landscape and holds great promise for “deleting” diseases from human bodies. Sandia is working to make this technology safer and to ensure that one day it can be delivered into humans without triggering adverse immune system reactions or causing other undesirable side effects.

(Continued on page 3)



SANDIA'S SAFE GENES PROJECT team, left to right, Kyle Seamon, Oscar Negrete, principal investigator Joe Schoeniger, and Edwin Saada.



Sandia researchers claim 5 R&D 100 awards..... 8

That's that

And so we have come to the end of a consequential year, a year that saw many changes at the Labs but no change – or perhaps even a sharpening of the focus – in our great, enduring purpose: to develop advanced technologies to ensure global peace.

When 2017 began, we were still being managed by Lockheed Martin, but NNSA had announced that come May 1 we'd hang out a sign reading "Under New Management," with new leadership at the top of every division.

The months from January through April were a time of uncertainty. The rumor mill was churning away 24/7 (it seemed), most of the rumors having something to do with various outrages that were to be visited upon our benefits and the general workplace environment. (Have you ever, in the course of your work life, heard rumors about anything good happening? I haven't.)

The months passed and bit by bit, we came to learn more about this new entity that would take over management of our Labs: National Technology and Engineering Solutions of Sandia. The name and the acronym – NTESS – didn't exactly roll off the tongue and I think it's fair to say there was more than a whiff of indignant skepticism in the air. Who were these folks to manage us?

As the May 1 date of the transition approached and as we came to see the Labs from the thoughtful perspective of incoming Labs Director Steve Younger and Deputy Director Dave Douglass – thanks to their blog postings on the external NTESS transition website – a mood that began as trepidation slowly but surely morphed into something approaching eager anticipation.

May 1 – The Day – was a bittersweet one for long-time Sandia hands: In the week leading up to the hand-off we had said goodbye to the members of our old leadership team, folks many of us had worked with for decades and with whom we had accomplished great things. There was certainly disappointment at the top that the contract bid didn't go their way, but at the end of the day every single executive could walk out with her or his head held high – they had done what was asked of them: To ensure over the years that this place remain the nation's indispensable laboratory.

Sandians arrived at work on May 1 to be welcomed by the members of the new management team; each had staked out a position at an entry gate to greet their new colleagues.

It was an inspired move, one that immediately set a tone that fit very well with Sandia's collegial culture. And things only got better from there. The new team's first all-hands, also on May 1, was a refreshing, invigorating, optimistic experience. The personal remarks from each leader were a revelation. We came to see that they felt about their jobs just like we do: that is, becoming a Sandian was the best thing that ever happened in their distinguished careers. But more than that – we understood that they shared our conviction that Sandia is more than a place to work. It is a place where the fate of the nation and the peace of the world may very literally hinge upon what we're able to achieve here.

In that months since that auspicious debut, Steve and his team have been as good as their word. That is, they didn't come here to "fix" Sandia but to take a remarkable institution and make it better and more responsive to the demands of a constantly evolving global security environment.

I've been around for a while; I was there practically at the dawn of the Cold War and saw it through to its end. I watched the Berlin Wall come down and heard the shouts of freedom from the liberated nations of Eastern Europe. I heard the talk about "the peace dividend." I watched, along with scores of millions of others, as the Twin Towers collapsed and the walls of the Pentagon breached. 9/11 marked the end of the "end of history" talk. History, we were reminded, was still very much with us, the arc of the narrative to be determined in some part, maybe a big part, by what we do at Sandia.

As we face this matrix of 21st century challenges, we at the Laboratories look to our new leadership and think "We're in good, steady hands." And I think our leaders look out at us, in all our diversity, our depth of knowledge and experience, our commitment to our core purpose, and our dedication to serve the nation, and think the same thing.

See you next time.

– Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

Sandia senior manager named North Carolina State distinguished engineering alum



SANDIA SENIOR MANAGER Basil Hassan, right, poses with North Carolina State University College of Engineering Dean Louis A. Martin-Vega, center, and Alan Icenhour of Oak Ridge National Laboratory at a banquet recognizing Basil and Icenhour as the college's 2017 Distinguished Engineering Alumni.

(Photo courtesy of North Carolina State University)

By Sue Major Holmes

Sandia Senior Manager Basil Hassan remembers his father, an aerospace engineering professor, taking him as a boy to talks of the American Institute of Aeronautics and Astronautics, the Smithsonian's Air and Space Museum in Washington, D.C., and even to the 75th anniversary celebration of the Wright brothers' flight in Kill Devil Hills, North Carolina.

"I was always fascinated by planes and space so aerospace engineering was the major for me," says Basil, a North Carolina native who earned bachelor's, master's, and doctorate degrees in aerospace engineering from North Carolina State University and immediately afterward joined Sandia.

North Carolina State's College of Engineering named Hassan a 2017 Distinguished Engineering Alumnus. He was recognized Nov. 1 along with the other college's distinguished alumnus winner, Alan S. Icenhour, associate laboratory director for the Nuclear Science and Engineering Directorate at Oak Ridge National Laboratory.

The award honors those whose accomplishments further their field, foster the professional development of young engineers, and bring distinction to the university through engineering achievement.

Basil says he was stunned when he heard he'd been selected for the honor. "I actually thought they called the wrong number on the list," he says. "There are many distinguished graduates and I feel very humbled to be included with them."

He joined Sandia in 1993 as a postdoctoral appointee in the aerosciences department. He became a staff member of the department the next year and its manager in 2002. He subsequently managed other departments and has overseen various aspects of engineering sciences research, development, and applications work. Basil is a senior manager in aerosciences. His career has included helping NASA in determining the cause of the 2003 Space Shuttle Columbia accident.

Basil is a fellow of the American Institute of Aeronautics and Astronautics and served on its board from 2008 to 2017. He also served on review boards for the National Academies, NASA, and the Air Force Office of Scientific Research. He is a member of North Carolina State's Mechanical and Aerospace Engineering Educational Advisory Board, and has served on similar boards for New Mexico State University, Texas A&M University, the University of Texas at Austin, and the University of New Mexico.

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Holiday gift giving the Sandia way



COMMUNITY INVOLVEMENT'S Roberta Rivera poses with a fraction of the 900 toys donated last year in support of Sandia's annual holiday gift-giving collection effort. This year, Sandia seeks to provide gifts for more than 1,000 foster children through New Mexico Kids Matter. Sign up to participate at the Holiday Gift Drive SharePoint site on Sandia's internal website.

(Photo by Randy Montoya)

Safe Genes

(Continued from page 1)

Sandia biochemist Joe Schoeniger explains that gene editing technology is based on a “billion-year-old arms race” between bacteria and the viruses trying to attack them.

Bacteria save bits of invading viral DNA using a system called Clustered Regularly Interspaced Short Palindromic Repeats or CRISPR. This system helps bacteria recognize a virus when it returns for a repeat attack. The CRISPR system produces Cas9, an enzyme that binds to the offending viral DNA, then cuts and destroys it.

ratory at the University of California, Berkeley, in partnership with Sandia and the University of California, San Francisco. Doudna is a pioneer in the development of CRISPR. If the early research is fruitful, DARPA could extend this effort for another two years, bringing the total to four years and \$5 million.

Viruses are skilled at changing their DNA and generating new anti-CRISPR proteins to block the bacterial

your genome.”

Developing safe CRISPR applications

For the Safe Genes project, Sandia will test the RNA-targeting CRISPR technology against a variety of viruses. The Sandia team will deliver the CRISPRs to mammalian cells infected with a variety of RNA viruses, including Ebola and Rift Valley Fever Virus, that cause symptoms

Gene editing technology is based on a ‘billion-year-old arms race’ between bacteria and the viruses trying to attack them.

This bacterial defense system can be programmed. Scientists can send CRISPR-Cas9 to a precise location to alter a specific bit of DNA.

The ability to alter DNA is useful, especially when dealing with genetic diseases, but alterations to DNA are currently irreversible. Using the technology as it is today could cause unintended, dangerous, and permanent side effects. It could cut a genome in the wrong place (i.e. have off-target effects), potentially causing disease.

In addition, CRISPR-Cas9 needs a carrier to be delivered into human cells. Typically, this carrier is a virus linked to the common cold, called adeno associated virus. According to Sandia virologist Oscar Negrete, a majority of people have been exposed to strains of this virus at some point. This means people are quick to manufacture antibodies against it, making it a one-time-use only therapy. Even on that first use, patients are likely to have an immune reaction, Oscar says. New approaches are needed that enable the treatment to be successfully used more than once if necessary.

Controlling CRISPR

To be able to control CRISPR technology and use it without causing permanent DNA changes, the Defense Advanced Research Projects Agency (DARPA) created the Safe Genes program.

One effort being funded under Safe Genes is a \$2.5 million, two-year project led by Jennifer Doudna’s labo-

immune systems. This is the other side of the bacteria-virus “arms race.” These proteins can function as antidotes, allowing gene editors to be turned off if needed.

The Safe Genes team is taking advantage of these proteins to develop inhibitors that can control off-target effects of CRISPR. Joe explains that should a dose of a gene editor need to be administered, it could be followed by a dose of the inhibitor to shut it off, minimizing the amount of time in which off-target effects could take place.

Remaking the cargo

This Safe Genes project builds on work ongoing at Sandia which is also focused on fighting infectious disease using gene editing.

Normally, the CRISPR system targets DNA, but Sandia has been collaborating with Doudna’s team to create a CRISPR system that targets RNA instead. Attacking virus RNA directly is likely to be effective against most pathogens of biosafety concern, says Oscar.

CRISPR systems already exist that target RNA, but these systems result in general RNA degradation. This new RNA-targeting system can affect specific human or animal RNA, including those known to encode proteins that aid viral infection.

“Some proteins are known gateways for invaders,” Oscar says. “If you knock out these proteins via their coding RNAs, the pathogens can’t get into your cells and you haven’t made any permanent changes to

such as hemorrhagic fever. Then they’ll measure the level of virus remaining in the cells after treatment.

“Ideally, we’d like to see the level of virus reduced to zero. If it isn’t, the CRISPR technology would have to be modified,” Oscar says.

In addition, the UCSF team is developing CRISPR-derived technologies to turn genes on and off without editing DNA. For this application, the team is harnessing CRISPR for targeted DNA methylation, a non-destructive mechanism of gene expression regulation that occurs naturally throughout the mammalian life cycle.

Pressing forward

Oscar says he believes this work, if successful, would represent a quantum leap forward for virology because the new CRISPR technologies would attack illnesses in multiple ways. Currently, vaccines target single strains of a virus. Sandia’s Safe Genes project is working toward solutions that target all the strains of a virus, as well as finding ways to repair infected host and human cells.

“It’s cumbersome to create new treatments for each and every bug, and not feasible for quickly responding to emerging threats. One treatment for each and every strain that appears, as well as all the related viruses — it’s a much better strategy,” Oscar says. “It’s like the leap from eliminating one letter with a pencil eraser to hitting control-A and deleting an entire paragraph.”

Chris LaFleur receives Clean Energy Education & Empowerment Award

By Michael Padilla

CHRIS LAFLEUR, PROGRAM LEAD for Hydrogen Safety, Codes, and Standards at Sandia National Laboratories, has received a 2017 Clean Energy Education & Empowerment Award.

Chris was one of 10 recipients recognized at the sixth annual Clean Energy Education & Empowerment Women in Clean Energy Symposium in partnership with the MIT Energy Initiative and Stanford University’s Precourt Institute for Energy.

Chris is responsible for fire risk program activities at Sandia. Her main research involves evaluating fire risks for emerging energy technologies, with her recent work focused on characterizing the risks from traffic incidents involving hydrogen fuel cell vehicles in tunnels for several metropolitan areas on the East Coast. This work also includes evaluating the impacts of hydrogen jet flames on steel and concrete structural material.

Chris says she is honored to be named a recipient.

“This award and the amazing opportunity to network with many other women leading efforts in clean energy will enable more progress towards creative energy solutions that are desperately needed in our world,” she says. “This award represents the work of many talented engineers and scientists here at Sandia working in the hydrogen program. I am honored to work with all of them.”

She has led risk characterization efforts for maintenance facility modifications to allow natural gas- and hydrogen-powered vehicles to be repaired indoors. Additional studies include failure mode analysis for liquefied natural gas-fueled locomotives and other heavy fleet vehicles. These analyses enable the safe implementation of cleaner transportation fuels to reduce the nation’s reliance on fossil fuels and increase the availability of renewable energy solutions. She has represented the country in developing hydrogen codes and standards for maritime applications and has authored peer-reviewed papers on performance-based designs for hydrogen fuel stations.

Before joining Sandia, Chris worked at General Motors, where she managed corporate fire protection standards and was responsible for property insurance and enterprise risk management. She began her career as an environmental engineer for Parsons Engineering Science. She is a licensed professional engineer and serves as a principal member of the sprinkler discharge criteria committee of National Fire Protection Association (NFPA) 13, Standard for the Installation of Sprinkler Systems, and NFPA 2, Hydrogen Technologies Code. She also serves on the U.S. Department of Energy Hydrogen Safety Panel.

She earned a BS in geology and mechanical engineering from the University of Rochester, an MS in fire protection engineering from the University of Maryland, and a doctorate of engineering in manufacturing engineering from the University of Michigan.

Clean Energy Education & Empowerment is an initiative under the auspices of the Clean Energy Ministerial, a forum of 25 major-economy governments, which strives to close the gender gap and increase women’s participation and leadership in clean energy fields.



NNSA Defense Programs AWARDS of EXCELLENCE



Individual honoree

BRANDON TOEPFER distinguished himself by providing excellent leadership for the W76-1 JTA3 design, development, qualification, and production planning process.

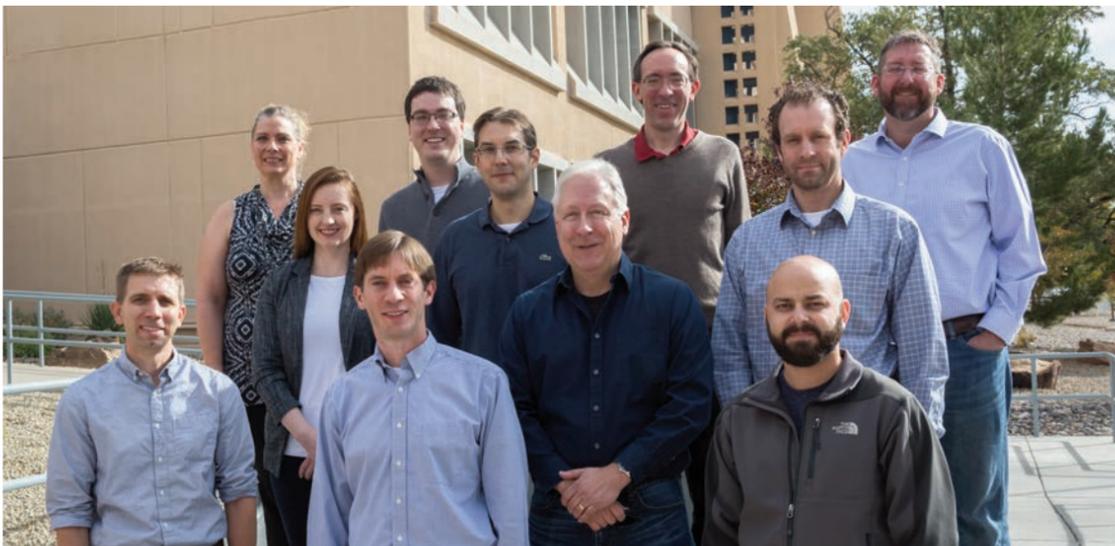
More than 270 Sandia employees and external partners on 11 Sandia-led teams were presented NNSA Defense Programs Awards of Excellence in a Nov. 30 celebration event for their contributions to the Stockpile Stewardship Program (SSP) in 2016. One team, the Z Radiation and Fusion Physics Innovative Engineering and Design team, also received an Exceptional Achievement designation, highlighting “extraordinary SSP accomplishments.”

In addition, Sandia had an individual winner, Brandon Toepfer, who was recognized for “excellent leadership for the W76-1 JTA3 design, development, qualification and production planning process.”

Associate Labs Director for Nuclear Deterrence Steve Girrens said at the celebration, conducted concurrently in New Mexico and California, that a true strength at Sandia is its diversity of knowledge and its ability to assemble multidisciplinary teams to address the country’s most challenging national security problems.

Also on hand at the awards ceremony was Kent Jones, NNSA Defense Programs assistant deputy administrator for systems engineering and integration, representing acting NNSA DP head Phil Calbos.

The annual awards are bestowed for significant achievements in quality, productivity, cost savings, safety, or creativity in support of the nation’s nuclear weapons program.



EXCEPTIONAL AWARD

Z Radiation and Fusion Physics Innovative Engineering and Design Team

A KEY MISSION of the Sandia Z facility is the development of intense X-ray and neutron sources that can produce high flux incident on test objects placed in their vicinity at levels unachievable by other means. Experiments with these test objects are used to develop and validate models, which are in turn used to support uncertainty quantification in weapon assessments. Record outputs were achieved through creative, new target designs that required both novel load hardware engineering and new target fabrication development to implement.

First tritium experiment on Z



New Mexico team



California team

THE Z TRITIUM TEAM executed the first tritium experiment on the Z machine in August 2016. Thermonuclear fusion of deuterium and tritium (DT) in Inertial Confinement Fusion targets on Z can increase the neutron yield ultimately by factors of 50-100, enhancing the impact of Z in neutron radiation effects and High Energy Density science supporting stockpile stewardship. The diverse team conducted thorough planning, from failure mode analysis through development of technical work documents, implemented tritium diagnostics at Z, applied engineered controls for tritium containment, and safely executed the Z experiment. This first trace tritium experiment represents a quantum leap for the Z community toward demonstrating safe tritium handling in larger quantities, with an eye toward high-yield DT fusion in the future of the pulsed power program.

W88-0/Mk5 ALT370 DT-1B Mechanical Test Team



THE DT-1B DEVELOPMENT TEST SERIES was performed in support of the W88-0/Mk5 ALT370 qualification program. It was conducted across seven Sandia facilities over the course of six months to provide valuable data on the ability of the AF&F design to meet requirements in mechanical environments. This test series succeeded in obtaining data to meet objectives due to the careful planning and flexibility of the entire team, including the facility leads. The test data are crucial for qualifying the W88 ALT370 system to meet performance requirements in mechanical environments.

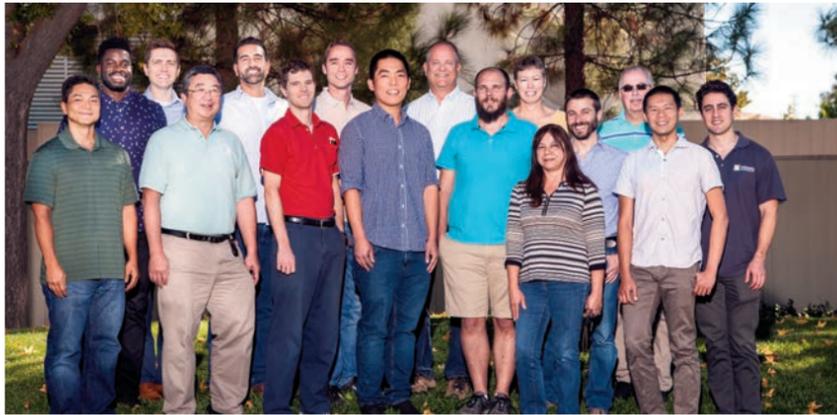
B61-12 Prelim. Design Review & Acceptance Group



THE PRELIMINARY DESIGN REVIEW and Acceptance Group affirmed the B61-12’s baseline design to meet customer requirements and verified an acceptable qualification program plan to assure the final design will function effectively in the stockpile. This affirmation, in combination with a successful System Baseline Design Review and publication of the B61-12 Baseline Cost Report and Preliminary Weapon Development Report, provided the basis for NNSA to successfully approve transition of the B61-12 into Phase 6.4.

NNSA Defense Programs Awards of Excellence

B61-12 Telemetry Product Realization Team



THE B61-12 TELEMETRY MODULE is a crucial part of the Joint Test Assembly flight test program. During the Baseline Design Review for the telemetry, the Product Realization Team (PRT) was challenged by NNSA, Sandia, and KCNSC management to deliver the first flight test unit from Kansas City NSC, not from Sandia, as planned in the baseline schedule. As a result of the dedication and commitment of the PRT in successfully pursuing a highly accelerated schedule and demonstrating effective flexibility, the design and production time was cut approximately in half. The first development flight test unit was delivered on time from NSC and was used successfully in the first B61-12 development flight test.

DICE & STAR Facilities DSW Program Support Team



A MULTI-DISCIPLINARY TEAM from Sandia's DICE and STAR facilities and its nuclear weapons engineering and modeling and simulation groups made key contributions to the scientific basis for certifying major weapon components and systems. The team addressed specific Directed Stockpile Work issues by acquiring data via innovative laboratory and field testing, then applying the results to formulate credible dynamic response models that enable accurate component- and system-level simulations for an expanded range of conditions. These efforts supported NNSA's mission to ensure the safety, security, and reliability of the nation's stockpile.

Thor and Cable-Pulser-Accelerator Team



THE THOR AND CABLE-PULSER-ACCELERATOR Team demonstrated that novel, recently developed and rapidly proven pulsed-power-accelerator architectures are in fact viable, and can be used to support the national-security mission and nuclear-weapons research. These will revolutionize our understanding of subcritical experiments.



Common Authentication Module ASIC Development Team



THE GROUND-BREAKING PROCESSES used for the design of the CAM ASIC, such as requirements traceability, formal verification, and universal verification methodology, greatly contributed to the delivery of fully functional packaged parts within 15 months of the design start. This led to high-yielding (~52%) PPI production lots with first packaged parts delivered on Oct. 20, 2016. Packaged SEP PPI parts have been successfully delivered to Kansas City NSC, fully exercising the Sandia production flow.

Electronic Production Control System Team



TO SUPPORT APPLICATION SPECIFIC INTEGRATED CIRCUIT (ASIC) production rates that are six times higher than for previous programs, Sandia's MESA implemented an Electronic Production Control System (EPCS) that decreases product acceptance times from weeks to two days while also reducing errors. Development of this system allows Sandia to meet stringent production deadlines. EPCS constitutes a significant achievement in providing increased quality, productivity, cost savings, and creativity in the production of MESA ASICs for the current nuclear weapons missions.

Nuclear Weapon Legacy Hardware Team



THE NUCLEAR WEAPON (NW) LEGACY HARDWARE TEAM successfully created and implemented robust processes for the characterization and disposition of legacy NW hardware, while enhancing the knowledge preservation of historically significant NW systems and hardware, providing the foundation for NW engineering education and studies in safety, surety, emergency response, and intelligence analysis and nonproliferation research.

Neutron Tube "-01" Suffix Role



COLLABORATION between the Science and Technology, Design, and Production teams within the Neutron Generator Enterprise yielded an improved screen design for use in Neutron Tubes which increased quality and generated at least \$1.5 million in cost savings.

ETHICS CASE # 15

TRUTHS AND CONSEQUENCES REAL CASES AND OUTCOMES

Ethics Advisory and Investigative Services presents *Truths and Consequences*

Truths and Consequences is based on real cases and outcomes. The purpose is to provide an opportunity for employees to learn and better understand Sandia's values and policies in action. Your management, along with Ethics Advisory and Investigative Services, takes your concerns seriously. Below are case facts and responsive actions taken by Sandia.

ISSUE: MISUSE OF CORPORATE CREDIT CARD

Background:

Approximately 10,000 Sandia employees use a corporate credit card (previously corporate travel card) for business-related travel and other approved business purchases. When applying for a corporate credit card (CCC), each applicant signs an agreement to abide by the policies for its use. In FY17, there was an increase in issues related to the inappropriate use of Sandia's CCC, and the Ethics office was asked to investigate a number of those issues. The following details are based on real cases and outcomes.

Facts:

The Ethics office found that while the investigated employees had some legitimate business travel expenses, they also:

- Used their CCC for personal use (e.g., utility bills, gasoline, and personal expenses)
- Obtained cash advances for personal use
- Failed to make full payment each month as required
- Failed to submit expense reports for CCC charges in an accurate and timely manner

Resolution/Discipline:

Based on the facts and severity of each individual situation, a variety of actions were taken that ranged from coaching and counseling to termination.

Resources:

- Relevant corporate policies and procedures
- Line manager
- Treasury & Travel Quick Links
 - Corporate Credit Card FAQs
 - Travel FAQs
 - Sandia Travel Page
 - Treasury & Travel POCs



Applicable Policies:

Employees violated the following:

CG100.4.1 *Comply with the Code of Ethics and Standards of Conduct and Sandia's Corporate Values:* You are also responsible for properly accounting for labor, travel, material, and other costs, and ensuring these costs are recorded and charged promptly and accurately.

FIN100.1.TNT.1 *Obtain and Use a Corporate Credit Card:* Ensure that personal items are not charged to the CCC; pay the CCC in full each month.

FIN100.1.TNT.2 *Submit an Expense Report:* Submit an expense report as soon as possible after incurring the cost in order to accurately reflect costs to projects.



Sandia National Laboratories

SANDIA CLASSIFIED ADS

Note: Dec. 8 is the final issue of the Lab News for 2017; there will be no Lab News on Dec. 22. The Classified Ad deadline for the Jan. 5, 2018 Lab News will be Tuesday, Dec. 12, at noon.

MISCELLANEOUS

DRUM KIT, black, 7-pc. PDP Jr., \$150; Pearl Percussion bells/drum pad practice set, \$100. Briggs, 505-280-3934.
OBOE, 2010 Yamaha YOB-441, modified conservatoire/grenadilla wood, like new, \$2,500 OBO. Brunt, 505-999-9882.
DAYTONA 500 TICKETS, in the Towers, 4 days of racing, great seats past start/finish line, \$1,300. Ortiz, 450-6608.
KID'S DRESSER, 6-drawer, mustard gold, rustic look, 46"W x 32"H, great condition, text for photos, \$75. Bigney, 505-917-7591.
LEGO PIECES & PARTS, large bin, \$200. Salmon, 505-899-8749.
WI-FI BASE STATIONS, Apple AirPort Express, A1264, \$20/two; Apple AirPort Extreme base station, A1521, \$80. Hall, 280-4344.
iPAD 2, black, 32 GB, Verizon 3G, original box & contents, protective cover, new charger, hardly used, excellent condition, restored to factory settings, \$175. Mann, 505-604-4236, ask for Brandon.
BEDROOM SET, Ethan Allen, solid maple, queen bed, nightstand, corner desk, chair, 2 dressers, \$850. Hughes, 806-676-3584, lindseygloe@gmail.com.
COLLECTIBLE HOLIDAY SNOW VILLAGE PCS., many, just in time for Christmas, varied prices. Gould, 268-9080.
STAND MIXER, KitchenAid Pro, 6-quart, w/attachments, like new, \$300. Ayers, 505-349-1793.
LAMINATE FLOORING, w/underlayment, \$300; abundant scrapbook materials, w/cutters, \$250; antique bench, caning damaged, \$75. Ward, 505-292-1618.
XBOX 360, w/3 wireless remotes, Kinect, 11 games, perfect condition, seldom used, \$100 OBO. Ruiz, 505-292-1113.
CORNER KITCHEN CABINET, solid pine, Lazy Susan shelves, 2 level, ready-to-fit beneath kitchen counter. Rockwell, 505-250-3737.

OXYGEN CONSERVING REGULATORS, 2, Easyplus 5 & Responsive Regulator, \$300/both. Gollan, 323-5317, jeangollan@icould.com.
BAND SAW, drill press, both w/caster wheels, \$200 ea. Bush, 505-281-3773.
CHEST FREEZER, \$75; electric dryer, \$75; 2 end tables, \$25; baker's rack, \$35; nightstand, \$35. Reaves, 331-1061.
HOT TUB, Bull Frog A series, extra interchangeable jet pack, waterfall, great condition, \$7,500. Candelaria, 505-730-5933.
LANDSCAPE ROCKS, 6"-8", some larger/smaller, landscape cobbles, free. Wronosky, 505-296-7265.
BEDROOM DRESSERS, 2, French Provincial, beige, 3-drawers ea., wood, \$75; matching nightstand, \$50; bookcase, \$30; call for photos. Record, 243-5103.
DOLLHOUSE, KidKraft, similar to Amelia dollhouse sold at Costco, great shape, w/furniture, \$50. Valdez, 505-550-1993.
COMPUTER DESK, roll-top, oak, \$399; hunter's folding game cart, 500-lb. capacity, \$75; satellite dish, \$25. Lacy, 974-0456.
GAS DRYER, Maytag Neptune, bisque/light almond color, 1 owner, nice condition, \$150. Ludwig, 856-5111.
INDOOR CYCLE, BH Fitness LK700IC, used 5 times, topline, commercial grade, many features, warranty, \$1,999 retail, asking \$950 OBO. Orndorff, 505-796-2082.
HP OFFICEJET 4630, printer/fax/copy/scan, new; Kenmore personal blender, new, \$125 OBO. Davison, 505-323-9961.
TOOL CHEST & CABINET SET, Husky, 40-in. wide, 10-drawer, Home Depot model #H40CH4TR6, \$300. Knarr, 505-492-0990.
ANTIQUA/VINTAGE CLOCKS, mechanically driven, wall/mantle/floor, working, serviced, excellent condition. Ross, 332-0659.
CAR SPEAKERS, 2 pr., stock from 2008 Ford Explorer, all in working order, \$35/pr. Rule, 505-249-7397.
'QUOTATIONS FROM CHAIRMAN MAO TSE-TUNG,' red book, Chinese/English, 608 pgs., purchased in China, great condition, \$105. Wagner, 505-504-8783.
HANDMADE RAGGEDY ANDY DOLL, 26-in., excellent condition, call for photo, \$10. Colgan, 344-3776.
DINING TABLE, w/8 chairs, square, solid oak, counter-height, \$400. Gonzales, 505-660-3281.

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday.
Submit by one of these methods:
• EMAIL: Michelle Fleming (classads@sandia.gov)
• FAX: 844-0645
• MAIL: MS 1468 (Dept. 3651)
• INTERNAL WEB: From Techweb search for 'NewsCenter', at the bottom of that page choose to submit an ad under, 'Submit an article'. If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

Ad rules

1. Limit 18 words, including last name and home phone (if you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
2. Include organization and full name with the ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

3D PRINTER, MakerGear M2, works perfectly, print PLA, ABS & more, very gently used, <50 hrs., \$1,100. Smith, 505-269-1211.
SONY RECEIVER, JVC cassette player, \$25 ea. Drebing, 505-293-3335.
MONTCLAIR CHINA, Lenox, twelve 5-pc. sets, w/serving plate, all in excellent condition, \$500 OBO. Walker, 505-994-0555.

TRANSPORTATION

'09 BMW 328i, premium, 6-spd. manual, all service records, 72K miles, excellent condition, \$9,000 OBO. Brown, 505-205-5056.
'04 JEEP WRANGLER RUBICON, 5-spd. manual, RE 4.5-in. lift, 35's, 99K miles, \$10,500 OBO. Reinholtz, 818-618-9331.
'86 TOYOTA PICKUP, 4x4, 5-spd., 22R engine (carburetor), 128K original miles; well maintained, \$4,000 OBO. Sanchez, 505-974-1655.
'68 CHEVY C10, 350 5.7L, long bed, turquoise, extremely well maintained, great condition, \$5,000. Sabo, 510-542-7490.
'03 KIA RIO HATCHBACK, new tires, battery, wipers, perfect for new driver or student car, \$1,600 OBO. Seals, 505-292-1367.
'13 SUBARU FORESTER, 5-spd. manual, roof-top bike rack, new tires, 47.5K miles, good condition, \$14,500 OBO. Teague, 505-331-1951.
'99 4RUNNER, 188K miles, well maintained, clean inside/out, great condition, very reliable, \$4,300 OBO. Fricks, 505-410-4413.
'15 NISSAN MURANO SL, pampered, like new, nonsmoker, protective care warranty, white, 24K miles, \$26,900. Clark, 281-1243.
'13 CHEVROLET CAMARO LT, GM certified pre-owned (transferable), black, low miles, excellent condition, NADA \$18,300, asking \$16,500. Varro, 505-228-7292.
'14 HONDA CIVIC, AT, black, 43K miles, clean, \$11,500; '09 Dodge Avenger, AT, loaded, 78K miles, clean, \$5,900. Chavez, 505-203-3110, ask for Michelle.
TOYOTA HIGHLANDER LIMITED, transferable warranty, 77K miles, \$22,900 OBO. Sahlstrom, 541-224-3869.

RECREATION

'12 APEX TRAVEL TRAILER, half-ton towable, 19.3-ft. long, slide out, TV, stereo, electric awning, full kitchen, \$11,500. Simmons, 505-869-8315.
'13 SOMERSET EVOLUTION POP UP CAMPER, off-road lift, heater, AC, toilet, 2 king size beds, excellent condition, \$9,000 OBO. Trujillo, 505-235-1209.
'02 APRILIA FUTURA 1000 MOTORCYCLE, new battery & tires, excellent mechanical shape, ~23K miles, \$3,500 OBO. Lambert, 505-453-2184.

BIANCHI RACE BIKE, carbon fiber technology, 50 cm, added tube riser to handle bars, super light & fast, great condition, valued at \$2,000, asking \$750. Willis, 505-379-5232.
WINDSURFER BOARD, 12-ft., 3 sails (5.3, 6.0, 6.7), 2 masts, & equipment, \$500 OBO. Farr, 379-8913.
STREET-HYBRID SUSPENSION BIKE, large, from Performance Bicycle, 21-spd., ridden twice, many accessories, perfect condition, \$200. Jones, 505-206-1519.

REAL ESTATE

3-BDR. HOME, passive solar, active hot water, 0.6 acre, country living splendor, Zillow, \$205,268. du Mond, 291-5805.
2-BDR. HOME, 2 baths, 1,568-sq. ft., 50 Adobe Ln., on 3 forest acres, Sandia Park, new everything, \$220,000. Anderson, 505-453-5522, ask for Lonnie.
3-BDR. HOME, 1 bath, wood floors, pitched roof, detached large shop/garage, ride your bike to work, \$150,000. Bush, 505-463-5406, ask for Monica.
3-BDR. HOME, 1 bath, 1,039-sq. ft., large back yard, close to base, 10701 Irene NE (Eubank/Lomas area), \$131,000. Blaschke, 505-315-8226.
5-BDR. HOME, 2 living areas, formal dining, 3-car garage, large backyard, \$240,000. Luu, 505-730-3584.
3-BDR. HOME, 1 bath, 1,029-sq. ft., NE Heights, corner lot, re-frigerated air, granite, wood floors, \$156,900. Sanchez, 410-2876.

WANTED

ROOMMATE, Tramway/Indian School, private bath & bdr., shared common space, 10 mins. to Eubank, \$500/mo., Wi-Fi/utilities included. Chavez, 505-550-6608.
ROOMMATE, Eubank/Candelaria, \$375/mo., utilities included. Neely, 900-6737, ask for Joe.
ABACUS, gently used, Hanukkah/Christmas present for grandson. Rockwell, 505-250-3737.



Postdoc events in New Mexico, California showcase research



BIOMEDICAL ENGINEER JUNYU MAI addresses the audience during California's Sandia Postdoctoral Development's Technical Showcase and Panel Session on Nov. 13. As a Sandia postdoc, Mai worked on infectious disease diagnostics using microfluidic devices. She went on to hold several engineering and research positions in the Bay Area, and is now senior research scientist at Fitbit, working on portable diagnostics devices using biosensors. Other former Sandia postdocs on the panel included BioRad senior biomedical scientist Meiye Wu, Climate Corporation research manager Xiaoyuan Yang, BD Biosciences project lead Yanli Liu, Pilot AI Labs senior data scientist Ankit Bhagatwala and Ming Fang. Fang will transition from his Sandia postdoc in December to a new position as software engineer for Suning Company. The panel unanimously felt Sandia postdoc positions helped get them a leg up in building their careers.

THE TECHNICAL SHOWCASE featured a postdoc poster competition judged by panelists and Sandia managers. Posters were assessed on the strength of their content, visual appearance, and organization as well as the presenter's ability to discuss the material. Bioinformaticist Leanne Whitmore, right, came in second place (first place went to Carolyn Fisher and third to Kevin Bergemann). Her poster focused on software she created for identifying optimal metabolic pathways for producing desired compounds. Leanne has been a postdoc at Sandia for the last year and a half. Her work is mainly focused on biofuels and making models of the metabolic pathways that are required to turn feedstocks into fuels.



SANDIA POSTDOCTORAL APPOINTEE Philip Noell, above, explains his poster on his work on the micromechanics of void nucleation during the 11th annual Postdoc Showcase at Sandia's New Mexico campus on Nov. 21. Philip took first place in this year's New Mexico poster competition. Second-place was a three-way tie: Meghan Dailey and Morgann Berg, both of Sandia, and Benjamin Stein of Los Alamos National Laboratory. It was the third year Los Alamos postdocs participated. The Sandia Postdoctoral Development (SPD) Association, which sponsors the showcase, presented its 5th annual Distinguished Mentorship Award to Todd Lane of the biological sciences and engineering group at Sandia/California. He was chosen from among 13 nominations. This year's showcase, for the first time, included a career networking event organized by Sandia's Talent Acquisition Center. SPD holds the annual showcase to highlight postdocs' work, give them opportunities to advance professional skills, and help them move into research careers. (Photo by Lonnie Anderson)



R&D 100

55 Years of Invention

Sandians take home five R&D 100 Awards

The winners of the 55th annual R&D 100 Awards — an international competition that recognizes the 100 most exceptional innovations in science and technology from the past year — were announced Nov. 17.

By Neal Singer

SANDIA RESEARCHERS CAPTURED five R&D 100 Awards for 2017, in the annual international technical competition that includes researchers from universities, corporations, and government labs.

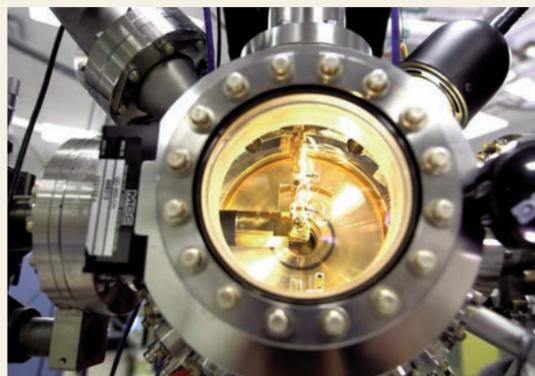
The awards are sponsored by R&D Magazine, which has announced approximately 5,000 winners since 1963. The honors go to researchers deemed by the magazine's editors and judging panels to have developed the year's 100 most outstanding advances in applied technologies.

The awards focus on practical impact rather than pure research and reward entrants on their products' design, development, testing, and production.

The winning applications were announced Nov. 17 in a formal presentation in Orlando, Florida. The Sandia winners were:

- **HADES**, the High-fidelity Adaptive Deception & Emulation System platform, led by Vince Urias, Will Stout, and Caleb Loverro. HADES creates alternative realities that radically improve the way cybersecurity practitioners protect their networks and gain insight about adversaries. The platform enables subtle changes to realistic environments of as many as 10,000 machines, creating a far richer deception than honeypots and other techniques. Because of this, a prolonged deception encourages adversaries to stay long enough to reveal their intent, tools, and tactics. As the process plays out, HADES automatically collects adversarial information and passes it on to network defenders. The work was supported by the Laboratory Directed Research and Development (LDRD) program.

- **Ultra-Wide Bandgap Power Electronic Devices**, led by Bob Kaplar, Andy Armstrong, Andy Allerman, Art Fischer, Mary Crawford, Albert Baca, Jason Neely, Jack Flicker, Olga Spahn, Vipin Gupta, and Jerry Simmons. These aluminum gallium nitride diodes and transistors are first steps in a possible revolution in power electronics, and can be used as building blocks to construct next-generation systems for transferring electrical power more efficiently from a source to a load and for converting voltages, currents, and frequencies from one value to another. The invention may provide switching speeds 10 times faster than the current state-of-the-art, resulting in a commensurate increase in power density by enabling shrinking of passive components in power converters. Ultra-high blocking voltages — the maximum voltage that can



Ultra-Wide Bandgap Power Electronic Devices

be placed across a device and still have it function as intended — are a possibility. The devices can also function at higher operating temperatures than current devices and in high radiation environments such as outer space. The work was supported by an LDRD Grand Challenge.

- **The Microgrid Design Toolkit**, led by John Eddy, Elizabeth Lopez, Jason Stamp, Karina Munoz-Ramos, Jared Gearhart, Bryan Arguello, Katherine Jones, Alisa Bandlow, and Nadine Miner. Microgrids are localized electric grids that can disconnect from the traditional grid to operate autonomously. Interest in microgrids has grown quickly in light of aging electrical infrastructures more prone to outages and for which maintenance costs are steadily rising.

Because microgrids can operate while the main grid is down, they provide a means for orderly recovery from power emergencies that may affect communities, critical infrastructures, and local governments. The independent power-supply units can strengthen grid resilience and help mitigate grid disturbances as well as function as a grid resource for faster system response and recovery. The Sandia decision-support software provides users with the information needed to create preliminary microgrid designs that optimize performance, reliability, and cost. The toolkit, available as a free download from DOE, appears to be a significant advance over other available tools. It helps designers create microgrids that can provide power effectively during times of emergency and emergency recovery. The work was funded by the DOE Office of Electricity and the US Marine Corps.

- **The SolidSense "Gas Analyzer on a Chip,"** led by Fernando Garzon, Lindsey Evans, and University of New Mexico postdoctoral fellows Lok-kun Tsui and Angelica Benadiviez. The robust sensor platform combines electrochemical sensing techniques with neural network machine learning to demonstrate the first small, inexpensive, robust, high temperature, on-vehicle sensor that reliably detects and characterizes all EPA-regulated automobile emissions gases. The device enables the continuous optimization of combustion chemistry, control of catalytic converter chemistry, and monitoring of



The SolidSense "Gas Analyzer on a Chip"

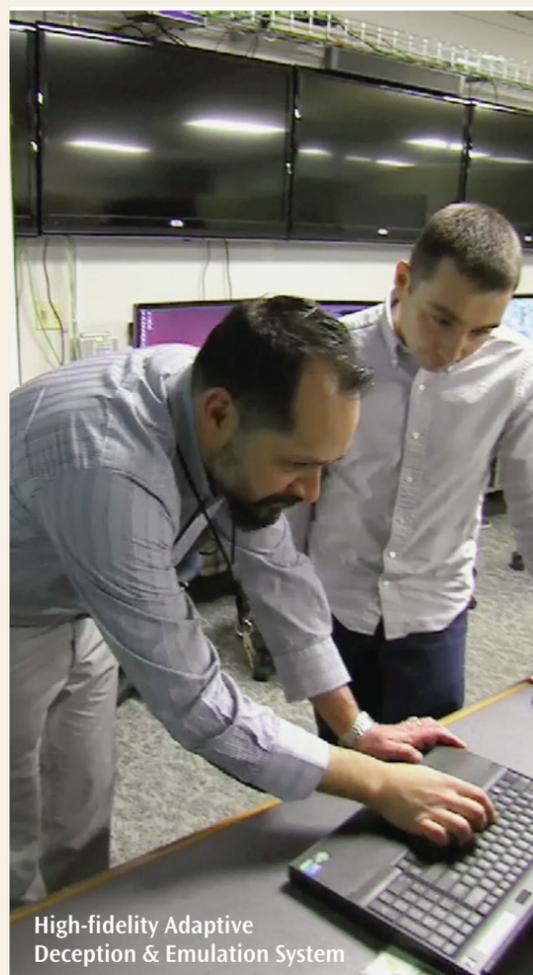
exhaust chemistry at the tailpipe. This could open the door to innovative new engine designs and, potentially, cleaner and more fuel-efficient automobiles. The approach can be modified to monitor ambient air quality, characterize the chemistry of power plant smokestack emissions, detect explosives compounds in shipping containers and luggage, monitor the freshness of spoilable food in a refrigerator, and address numerous other sensing challenges. The sensor is the

first of its kind to operate in hostile high-temperature environments without the need for cooling or filtration. It can be mass produced at low cost. The work was co-funded by the Sandia LDRD and the University of New Mexico.

- **Control System for Active Damping of Inter-Area Oscillations**, joint with Montana Tech University and the Bonneville Power Administration, led by David Schoenwald, Brian Pierre, Felipe Wilches-Bernal, Ryan Elliott, Ray Byrne, Jason Neely; also, Dan Trudnowski (Montana Tech) and Dmitry Kosterev (Bonneville

Power Administration).

Today, many electric power grids operate well below transmission capacity to avoid widespread outages due to inter-area oscillations. The new control system improves electric power grid reliability by continuously damping these oscillations. This promotes greater power transfer. This system is the first successful grid demonstration of feedback control using real-time wide-area measurements, and can transform the existing grid into the future smart grid. The latency problem — the time delay due to the communications network that transmits the measurement data — was solved with an innovative design that minimizes round-trip delay to less than 100 milliseconds, while commanding a range of total power equal to that of twenty 737 jet engines at full throttle, or enough power to satisfy the power consumption of nearly 200,000 homes, roughly the number of households in a city the size of Albuquerque. The work was funded by the Bonneville Power Administration, with matching funds from the DOE Office of Electricity's Transmission Reliability and Energy Storage programs.



High-fidelity Adaptive Deception & Emulation System



The Microgrid Design Toolkit



Control Sys. for Active Damping of Inter-Area Oscillations

The R&D 100 Awards are considered a globally prestigious recognition of invention and innovation.

Here are the five Sandia recipients:

- **HADES: The High-Fidelity Adaptive Deception & Emulation System**
- **Ultra-Wide-Bandgap Power Electronics**
- **The Microgrid Design Toolkit**
- **SolidSense Gas Analyzer (with the University of New Mexico)**
- **Control System for Active Damping of Inter-Area Oscillations (with Montana Tech and the Bonneville Power Administration)**