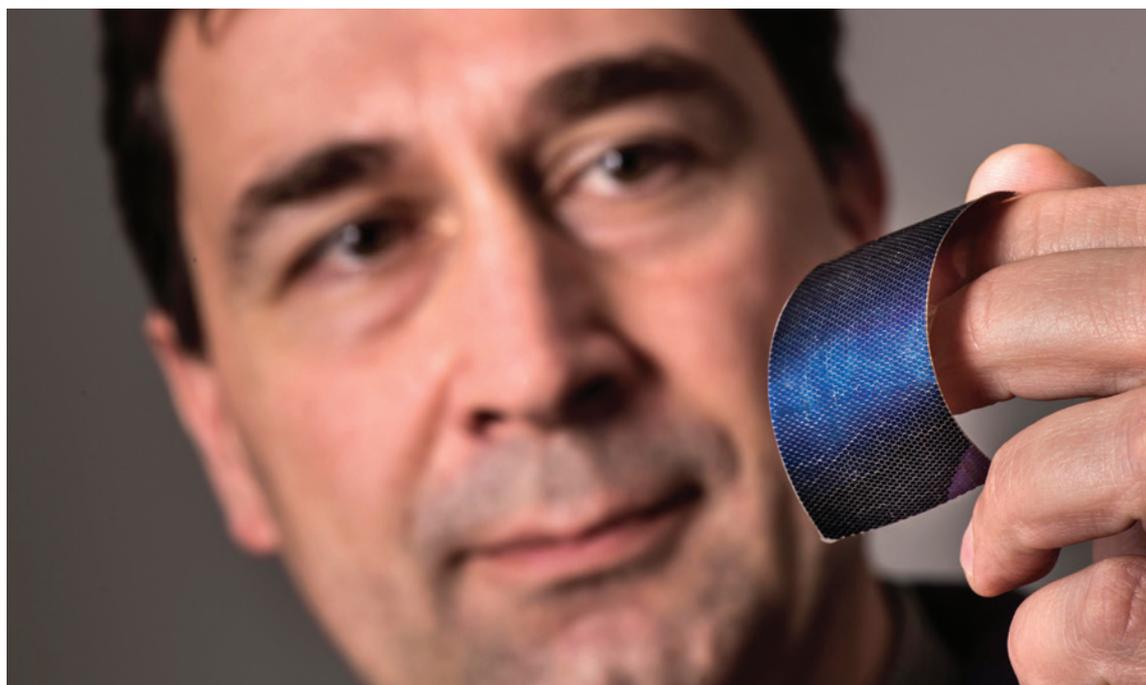




# From innovation to industry

New program enables Sandia, Los Alamos labs to help companies mature technologies



**TECHNICAL ASSISTANCE** — Scientist Murat Okandan, chief technology officer and founder of mPower Technology, shows a prototype of Dragon SCALEs, a technology licensed from Sandia. The Technology Readiness Gross Receipts Tax Credit enables Sandia and Los Alamos national laboratories to help companies that want to commercialize labs technologies.

Photo by Randy Montoya

By **Manette Newbold Fisher**

A recently signed New Mexico law enables Sandia and Los Alamos national laboratories to assist in turning transferred technology into viable products and services, which could boost innovation and create jobs, according to Sandia business development experts.

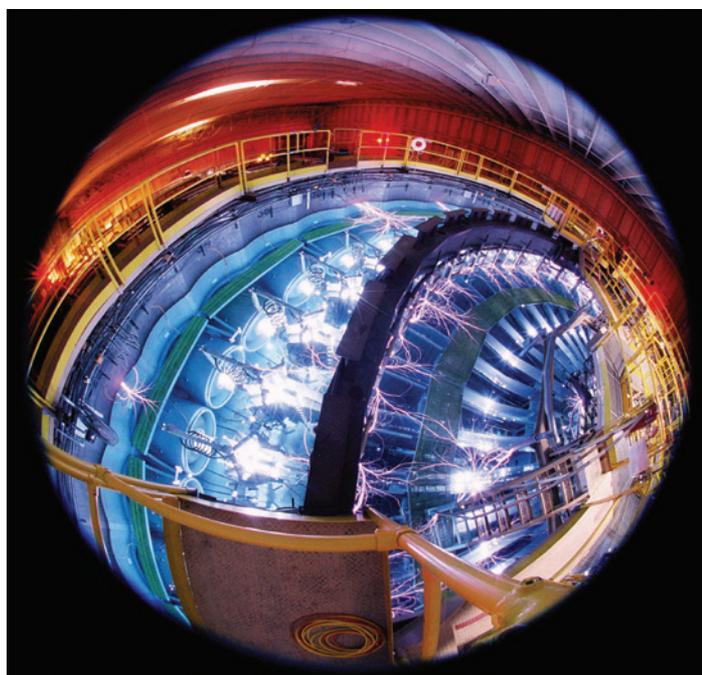
The Technology Readiness Gross Receipts Tax Credit is a three-year pilot technology maturation program that helps address a critical stage between technology development and commercialization, when many companies need additional funding to ready products and services for the marketplace.

New Mexico companies that obtain a license from Sandia or Los Alamos national labs or have a **Cooperative Research and Development Agreement** will be able to apply for up to \$150,000 in direct technical assistance per year for prototyping, proof-of-concept, field demonstrations, technical validation, testing and development or other activities.

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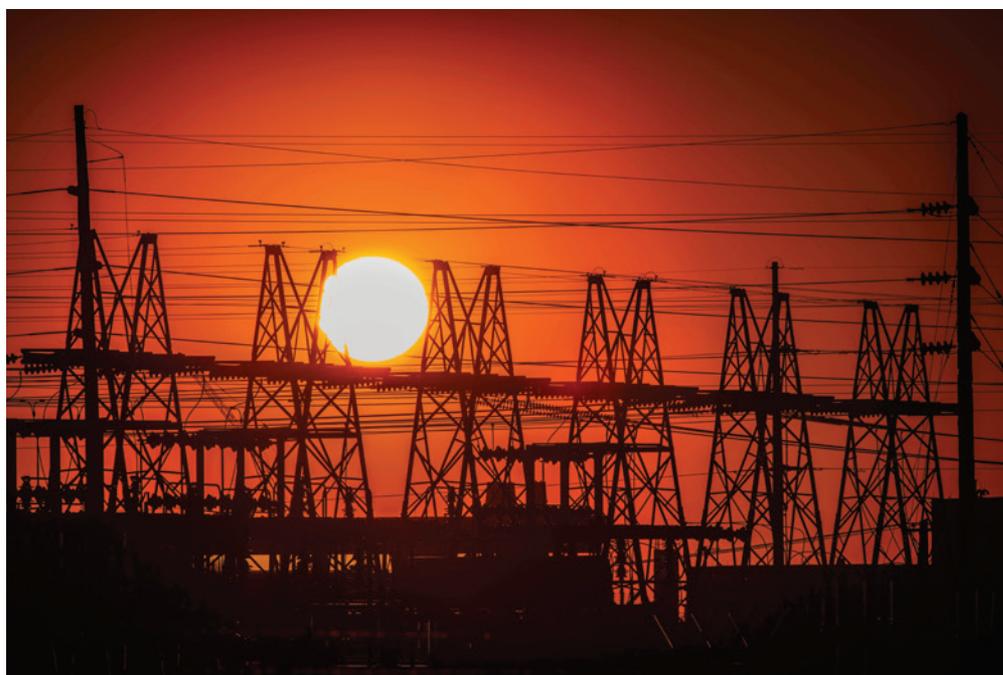
# Two campaigns expand Labs' research portfolios

Sandia creates initiatives to protect US energy grid and nuclear weapon systems



**X-RAY SHIELD** — Sandia's Saturn accelerator, viewed through an artistic lens, tests countermeasures used to protect electronics against X-ray radiation from nuclear weapons.

Photo by Randy Montoya



**GRID RESILIENCE** — Sandia has begun multiyear missions to strengthen U.S. electrical utilities and to defend U.S. nuclear weapon systems from evolving technological threats.

Photo by Randy Montoya

By **Neal Singer**

To deter attempts to disable U.S. electrical utilities and to defend U.S. nuclear weapon systems from evolving technological threats, Sandia has begun two multiyear initiatives to strengthen U.S. responses.

One campaign is focused on defending large U.S. electrical utility systems from potential attacks by hostile nations, as well as from damage inflicted by extreme natural disasters like hurricanes and solar flares.

The Resilient Energy Systems campaign, a multiyear research portfolio with up to \$40 million in total funding, is supported by Sandia's **Laboratory Directed Research and Development** program, which funds exploratory work in science and technology.

"The original electric grid was not designed with security in mind against cyberhacks, or protection from electromagnetic disturbances or natural

disasters such as hurricanes or geomagnetic solar storms," said portfolio manager Craig Lawton.

"The primary objective of our mission portfolio is to mitigate vulnerabilities caused by antiquated technology in transformers and other components. Solutions require research, and we're looking for collective inputs of ideas from researchers in industry, utility companies, universities, other labs and, of course, Sandia."

The second research campaign is developing enabling technical capabilities to help the U.S. maintain its strategic nuclear deterrent.

The Assured Survivability and Agility with Pulsed Power research campaign is a multiyear portfolio with up to \$40 million in total funding, again by Sandia's LDRD program. The mission portfolio is intended to explore technologies that use brief but powerful bursts of electrical energy to simulate nuclear explosions — without resorting to actual nuclear tests — to better understand their impact on electronics and materials.

"Our nuclear weapons systems have been relatively static, while the capabilities and technologies used by our potential adversaries are evolving at a rapid pace," said Sandia physicist Kyle Peterson, who developed and leads the mission. "We must be more agile in identifying potential threats to maintain an effective deterrent against hostile military actions.

"We're open to, and hope for, input from researchers in industry, universities and other national labs, as well as Sandia, to contribute ideas and work in this effort."

Additional benefits from both mission portfolios are expected to include more efficient electrical generation, more accurate data for astrophysicists and a closer approach to break-even and even high-yield fusion, which can generate electrical energy by fusing atoms — a goal physicists have been working on for 70 years.

— CONTINUED ON PAGE 6

 LABNEWS Notes

## MY SANDIA STORY

# Heroes waiting to be discovered

*Finding a way out of a pandemic*

By **Vipin P. Gupta** and **Kenneth R. Miller**

Since the beginnings of Sandia National Laboratories, Sandians have made the unthinkable not only thinkable, but also plannable and doable. Over time, we've tempered ourselves, studying and devising an assortment of ways to deter, defend against and blunt all manner of threats.

Now, we are living in a situation that some of our fellow Sandians have imagined, pondered, anticipated and tackled — a pandemic.

In response to the spread of COVID-19, Sandians have dispersed and congregated into three interconnected camps: those who are determined to carry on with the work they were tasked to do before the pandemic hit; those who are doggedly mustering and redirecting their skills, abilities and energies to bring this crisis to an end; and those who are in fight-or-flight mode because this virus is pushing them to their personal limits.

From these three camps (which some of us migrate in and out of on a daily, hourly or even minute-by-minute basis), we make our individual and collective attempts to hold it together and do our work.

While much about this situation is beyond our control, we are anything but helpless. Each of us has specialized powers and influence that can be brought to bear on the big and small parts of this gnarly problem.

Since before the beginnings of this outbreak, people worldwide have been purchasing a Sandia-developed decontaminant from several commercial suppliers, and using Sandia's non-toxic, non-corrosive chemistry to kill and wipe



Vipin Gupta, left, and Ken Miller.



Photos courtesy of Vipin Gupta

away all trace of this new virus in hospital rooms, on ships, in subway cars, in offices and factories and emergency vehicles.

With the chance to make another significant contribution, we are starting to see the formation, multiplication and spread of anti-viral cells inside our labs and across Sandia's national network of facilities. Some of these efforts include:

- Posting activity on wiki sites where rookies, veterans and even non-technical Sandians are cross-fertilizing and actively exchanging good, bad and ugly ideas without fear of embarrassment or ostracism.
- Responses to our leaders' calls for research and development ideas and projects.
- Special leadership assignments and rapid formation of response teams.
- Identification and recruitment of active and retired Sandians with proven track records in invention and technology adoption outside Sandia.
- Brainstorming on multiple concepts: how advanced manufacturing and rapid prototyping could be used to produce low-cost autonomous ventilators; how sunlight could be used to disinfect facemasks; how robots could be used to reduce loneliness as well as viral exposure; how materials could be made to put anti-viral protective coatings on door knobs, gloves and countertops and more.
- Consideration of new ways to do, group, fund and track applied R&D.
- Continuation of crucial Sandia national security work, protecting our R&D flanks as more are affected by and take on the pandemic.
- Resurrection of ideas and timeless wisdom in lab and personal archives from Sandians who are no longer with us (like Ken R. Miller's

drawings that pertain to today's pandemic).

From all of these Sandia groups and activities, there are heroes waiting to be discovered. These words were inspired by Jamshid Gharajedaghi's book, *Systems Thinking: Managing Chaos and Complexity*. This brilliant Iranian American came to Sandia 20 years ago and taught us how to overcome crises like the one we're in. He is now reportedly 80 years old and sheltering in place in Berkeley, California.

Let's learn from this virus, find these would-be heroes wherever they are in our labs, communities, country or world, and help them make their silver bullet and duct tape solutions go anti-viral.

In the end, that may be the only way we're going to dispel our mass fears, rebuild our upended lives and reflect on exactly what we were so worried about before this crisis began. 

Vipin P. Gupta is part of two nascent anti-viral cells at Sandia. To his sheltered-in-place, 80-year-old tiger mother's delight, he is finally putting his applied physics doctorate from Imperial College London to use on something that is almost akin to being a physician.

Kenneth R. Miller (1939-2019) was an artist in Sandia's advanced concepts group. He was a quiet listener who expressed futuristic ideas in the form of drawings. His 82-year-old wife is sheltered in place in Albuquerque, New Mexico, where her two daughters call her every day.

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 LABNEWS Notes

**EDITOR'S NOTE:** Lab News welcomes guest columnists who wish to tell their own "Sandia story" or offer their observations on life at the Labs or on science and technology in the news. If you have a column (500-800 words) or an idea to submit, contact Lab News editor Tim Deshler at [tadeshl@sandia.gov](mailto:tadeshl@sandia.gov).

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# Sandia supports hypersonic flight test

By **Troy Rumler**

Sandia employees and contractors saw their work culminate in a hypersonic flight test conducted by the U.S. Navy and U.S. Army on March 19 at the Kauai Test Facility in Hawaii.

The Navy and Army executed the launch of a common hypersonic glide body, which flew at hypersonic speed to a designated impact point. Sandia provided design and fabrication of the flight vehicle; pre-flight modeling, simulation and analysis; **ground testing** of common hypersonic glide body components; and launch support at the test range.

Information gathered from this and future experiments will further inform U.S. Department of Defense hypersonic technology development.

“Sandia is continuing its legacy of excellence in the national interest by providing advanced technology to ensure the protection of our nation and its war fighters,” said Associate Labs Director Mike Burns, who oversees national security programs at Sandia. “I’m very proud of the contributions made by our team leading to this flight and thank the DoD and the National Nuclear Security Administration for the opportunity to make continuing contributions to the national hypersonic systems team.”

Hypersonic flight is defined as air travel at least five times the speed of sound. Other vehicles, including ballistic missiles, can reach these speeds, but hypersonic missiles follow less predictable flight paths and are harder to detect by interceptors.



**NOT SO COMMON** — A common hypersonic glide body launches during a Defense Department flight experiment at the rocket launch range operated by Sandia in Kauai, Hawaii, March 19. **Photo courtesy of U.S. Navy**

Sandia has been conducting hypersonic flight research for about 40 years, including the first successful flight test of a non-ballistic hypersonic glide vehicle in 1985. In 2018, a memorandum of agreement signed by multiple DoD agencies established a Sandia-developed design as the common hypersonic glide body that is now being further developed and produced by industry contractors.

Since 2018, Sandia also has committed \$40 million of its **Laboratory Directed Research and Development**

funds to explore **autonomy and machine learning** technology for hypersonic flight vehicles.

The **Kauai Test Facility** is a rocket launch range operated by Sandia for DOE. It is located on the U.S. Navy Pacific Missile Range Facility, the world’s largest test range. The facilities and personnel support a variety of missions, including research and development, operational training and test and evaluation. Operational since 1961, KTF has supported more than 460 missions. **fb**

## Innovate New Mexico features two Sandia inventors

By **Manette Newbold Fisher**

The seventh annual Innovate New Mexico Technology Showcase gave researchers from institutions across the state the opportunity to pitch technologies to industry representatives and investors. Sandia sponsored the event this year, and two Labs researchers presented along with 10 scientists from six additional organizations. The showcase took place March 3 at the Sandia Golf Club.

“The purpose of this annual event is to highlight New Mexico researchers who are creating scientific solutions to meet and solve current challenges,” said Mary Monson, senior manager of business development. “They also have the chance to network with other labs and companies, get to know investors, and potentially create relationships that could lead to funding or partnerships.”

### Cloud platform forensics

Sandia cyber security initiatives scientist Vince Urias presented about his team’s **Cloud Hypervisor Forensics and Incident Response Platform**, or CHIRP, a cloud-based platform that would enable analysts to collect evidence when adversaries attempt to gain access to unauthorized information through malicious online activity. The platform could provide information to incident responders in real time without disturbing the user environment or alerting the intruder.

One issue with cloud-based platforms is that there hasn’t been an established platform that can reduce security risks, Vince said. With CHIRP, analysts would be able to pinpoint suspicious activities, track and record attacker actions for forensic analysis and retrieve materials from the targeted machines automatically or on-demand. The features of the platform may also be leveraged to disrupt malicious copying, deleting, encrypting and relocating of data in a cloud-based environment.

Vince said CHIRP could increase cost savings for defense and industry users and improve intellectual property protection. Research for the platform was funded by the **Laboratory Directed Research and Development** program, and the project won a **2019 R&D 100 Award**. A proof-of-concept has been developed, a patent has been filed, and a pilot of the platform has been tested. The technology is available for licensing, Vince said.

### Making inductors 10x smaller

Electrical engineer Eric Langlois said **nanoscale-enabled microinductors** could benefit the defense, power electronics and aerospace industries and others. Inductors are components in electric or electronic circuits that store energy in a magnetic field when current flows through them. The microinductor would use nanoscale-enabled magnetic material, and be 10 times smaller than inductors made with current technology.

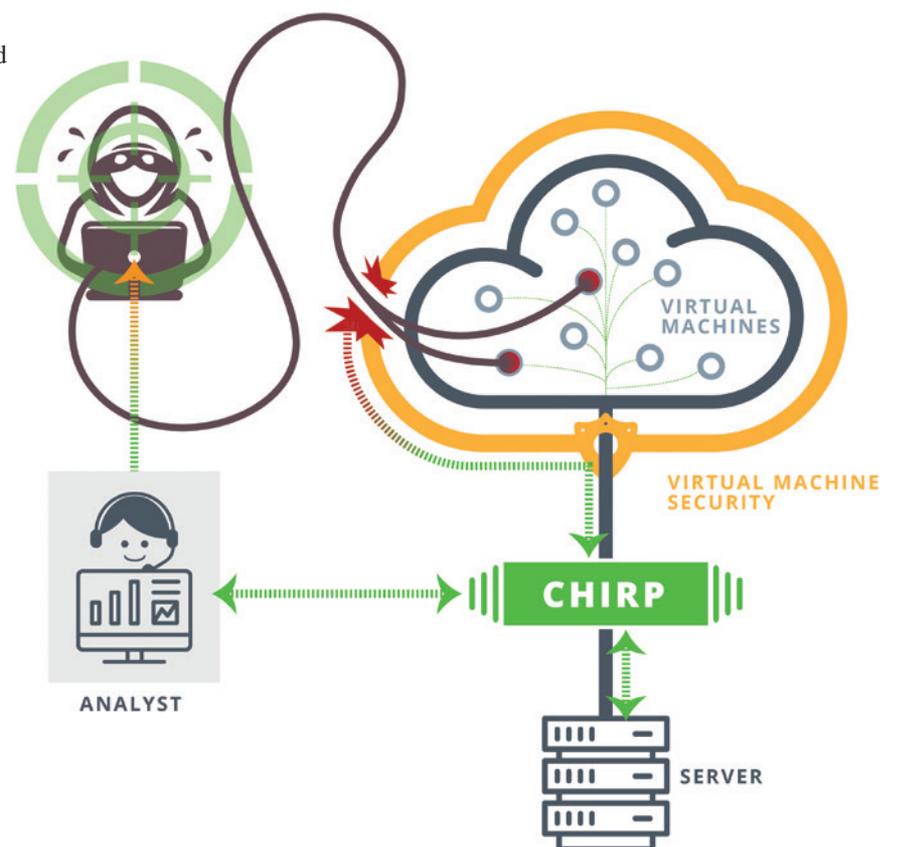
Both the microinductor and technologies, developed at Sandia, will be combined in an advanced integration scheme and enable performance improvements afforded by scaling to smaller dimensions, Eric said.

Active devices, or devices requiring an external power source for operation, have made tremendous strides in both performance and scaling, he said. In contrast, passive devices, like inductors and capacitors, have not kept up. Sandia technologies would help inductors catch up to other active devices.

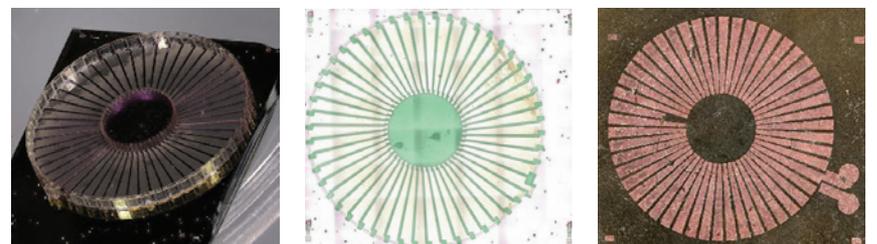
Eric said the research was funded by the Laboratory Directed Research and Development program. His team created the proof-of-concept, filed intellectual property in the form of technical advances for 3D printing the microinductor molds and the novel material, and filed a patent for integrating the microinductor with the material to further improve performance. His team is looking for commercial partners, as well as

internal and external funding to move the technology to the prototype stage.

Other Innovate New Mexico participants included inventors from the University of New Mexico, the Air Force Research Laboratory, Los Alamos National Laboratory, NASA-White Sands Test Facility and Johnson Space Center, New Mexico Tech and New Mexico State University. **fb**



**CAUGHT IN THEIR TRACKS** — The Cloud Hypervisor Forensics and Incident Response Platform introduces a novel, first-of-its-kind approach to cyber defense, providing intelligence and forensics from active virtual machines in cloud systems. Using CHIRP, attackers cannot erase their tracks, and their actions are captured in real time for analysts. **Graphic by Eric Lundin**



**SMALL SCALE, BIG ADVANTAGES** — From left, a 3D-printed mold of a nanoscale-enabled microinductor and images of the bottom and top layers of a microinductor. Scaling down inductors will help them catch up to advances in scaling of electronics. **Photo and images courtesy of Eric Langlois**

# Excellence in action

Laboratory Operating System program, executives recognize top three lean projects

Story by **Manette Newbold Fisher**  
Photos by **Lonnie Anderson**

Sandia's Laboratory Operating System program honored three teams that demonstrated lean thinking and behavior, improved operations and saved the Labs time and money in fiscal year 2019.

Labs Director James S. Peery, Deputy Labs Director Dori Ellis and Business Excellence Director Joan Tafoya honored the teams at a ceremony in February, highlighting their innovations and how the teams challenged the status quo.

"We want to reinforce a culture of continuous improvement and problem solving by recognizing projects that boil to the top as being the best, from our lens," said LOS manager Meghan Estochen. Her team reviewed projects reported in the [Continuous Sandia Improvements tool](#) and the Performance Evaluation Assurance Report to determine the top three lean improvements for the year.

"We look at it from the perspective of what projects are saving money, reducing cycle time or demonstrating cross-division collaboration and partnerships," Meghan said.

The three top projects selected accelerated the NNSA diamond stamp delegation process, established standardized hardware and software options and replaced nearly obsolete generators with new backup natural-gas-fired power generators.

## Saving production time, money

When a product is procured or manufactured by Sandia, it is verified to ensure it meets all requirements for use by NNSA and the U.S. military. If the product meets all requirements, it receives a diamond stamp, meaning it is worthy of use in the nation's stockpile.

Prior to Sandia receiving diamond stamp delegation from NNSA, it took a week for each part to be inspected and approved by Sandia's weapon quality assurance department, and an additional week for the Sandia Field Office to inspect and approve each part, said manager Scott Lager.

In order to receive diamond stamp delegation and speed up this process, Scott said Sandia went through audits by NNSA to prove the Labs could inspect and approve almost all parts. Now, Sandia diamond stamps about 75% of all parts, reducing a week of inspection time for those products.

"This will save the Labs nearly \$5 million over three years," Scott said, adding that this is a conservative estimate. "This also enables us to meet production demand. If we didn't get the delegation, we wouldn't have been able to meet scheduled demands from NNSA to get the products out the door."

## Standardizing hardware, software packages

A team led by IT architecture strategy manager John Miner evaluated Sandia hardware and software packages to determine how to standardize many of them. The team determined which packages were under-utilized or not used at all, and those options were eliminated.

The team's evaluations increased standardization, reduced unused devices and identified unnecessary duplicate software requests, leading to a 42% increase in hardware standardization, a 33% increase in upgraded software and identification of 100 unused devices that were disconnected. In addition, John said duplicate software requests have been avoided and the Labs is now developing standards to make software and hardware solutions obvious and available.

## Optimizing backup generators

Generators that back up many buildings in Tech Area 1 were becoming obsolete, so the facilities engineering team evaluated several options to solve that problem. They looked at several bid



**DIAMOND STAMP DELEGATION** — Sandia leadership team members honored the Diamond Stamp delegation team for helping Sandia become qualified to inspect and approve almost all products procured or manufactured by the Labs.



**SETTING THE STANDARD** — Sandia leadership team members honored the IT architecture strategy team for evaluating Sandia hardware and software packages to determine how to standardize many of them.



**POWERING UP** — Sandia leadership team members honored the facilities engineering team for identifying and installing backup generators that produce fewer emissions and increase overall system capacity and reliability, among other benefits.

proposals and selected one that would work for the Labs, reduce emissions and cost \$1.78 million less than other proposals. Facilities engineering project manager Emily Kowalchuk said four old generators were removed and two new natural-gas-fired power generators were installed over a year-long project.

"I am proud to provide reliable backup energy to the buildings and systems in Tech Area 1 that need

to stay operational if the primary power systems were to go down," Emily said.

"The new generators also produce fewer emissions and increase overall system capacity, as well as reliability. We removed an underground diesel fuel tank as part of this project, and this reduces future environmental risk. The project was completed under the approved budget by \$818,000, or roughly 10% of the final cost." 

## Using the Continuous Sandia Improvements tool

Teams are encouraged to submit their improvement projects using Sandia's internal Continuous Sandia Improvements tool at [csia.sandia.gov](https://csia.sandia.gov). The projects will be evaluated by the Laboratory Operating System program team at the end of the fiscal year.

The top three improvements for fiscal year 2020 will be recognized in November. Employees can contact LOS manager Meghan Estochen.

# Tele-connecting while telecommuting

Sandia groups offer ways to connect, stay healthy while working from home

By **Manette Newbold Fisher**

**W**ith a significant portion of Sandia employees telecommuting in response to the COVID-19 pandemic, many internal organizations are working hard to keep people healthy and connected while supporting the Labs' mission.

Health educator Jenn Perea said the Employee Health Services team continues to make sure employees have access to programs, classes and coaching, many of which are available virtually.

"During uncertain times, your health is more important than ever," Jenn said. "A lot has changed recently, but your health doesn't have to. Our team is still here to help you adapt to changing work situations and manage your wellbeing."

## Counselors, health programs available online

Employees are encouraged to talk with a counselor through Sandia's Employee Assistance Program if they are feeling overwhelmed or anxious due to the spread of COVID-19, Jenn said. Counselors can help employees navigate through anxiety, depression, grief, family issues, substance abuse and more, over the phone or on Skype.

Employees can also earn Virgin Pulse points and \$50 in their health reimbursement accounts by joining a special Health Action Plan called Be Mindful, Be Safe, designed to help address stress from many sources, including COVID-19 concerns, she said. Employees will be assigned a health coach who will talk on the phone and share online resources to help staff stay healthy, resilient and safe while adapting during this unprecedented time.

Other one-on-one coaching sessions unrelated to HAPs continue to be available virtually as well. A member of the fitness team can design a home exercise program or review needed changes; dietitians can help with meal planning and cooking; and the stress and sleep team is available to help employees establish better sleep hygiene and resiliency while managing change and stress. Many support groups are also still taking place virtually. Check the Sandia Daily News announcements for details.

To schedule counseling sessions or coaching, employees can call 505-844-4237 and follow directions for either New Mexico or California. Employees can also find more information about HAPs, events and insurance resources at [hr.sandia.gov](http://hr.sandia.gov).

## Social connections, gratitude

Connecting with coworkers and friends throughout the Labs is another way to remain mentally healthy during this time. Jenn suggested using Thunderbird Kudos to recognize individuals and teams working hard to keep the Labs running as smoothly as possible. She specifically highlighted the information technology groups and the Corporate Computing Help Desk teams who

have been working hard to make sure most employees can telecommute.

Thunderbird Kudos can be given for any reason, and acknowledgements can be filled out easily on Sandia's internal Thunderbird Kudos webpage. They are sent to the person or team being recognized and to their managers.

"Practicing recognition and gratitude really helps people in times of stress and times of change," Jenn said.

Ana-Lisa Montoya-Torres said the assurance management department has been implementing other ways to help team members remain clued into each other's needs and better communicate virtually.

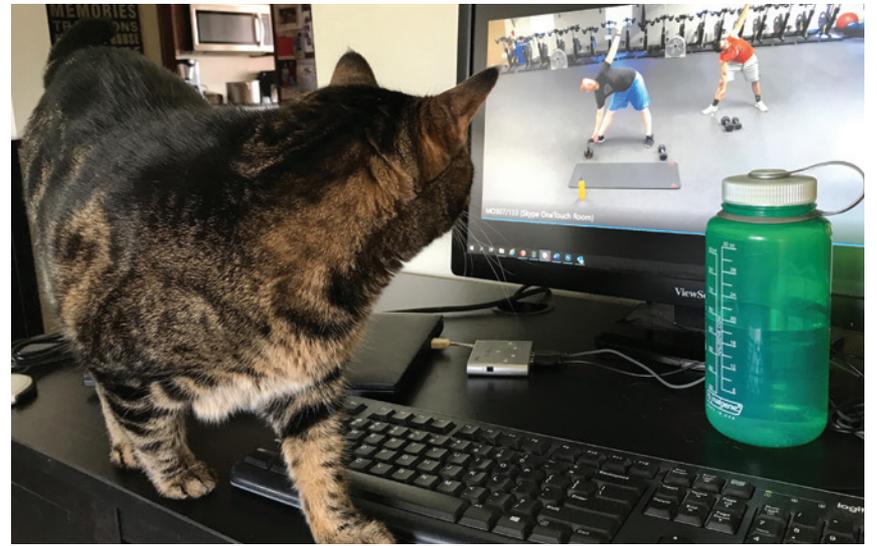
Employees might find it helpful to update email signature lines to include the best ways to reach them while telecommuting, Ana-Lisa said. This might mean eliminating office phone numbers or creating automatic reply messages letting others know they may not be able to check email as often.

Teams that have participated in training involving personality quizzes and communication styles could revisit results and share them with their team members. Ana-Lisa suggested asking coworkers how they prefer to work in a telecommuting environment. For some, that might mean instant messages or emails are preferred over phone calls. Others might opt for video chats that feel more like in-person conversations because participants can see body language and facial expressions.

Teams could also set weekly goals that are pertinent to both work and personal life, Ana-Lisa said. Suggestions include taking walking breaks, checking in on health goals and making sure all team members have a path to complete work, especially parents who are now caring for their children all day and helping with homeschooling. Ana-Lisa has children at home, so some days she logs in earlier or stays late, depending on the needs of her children.

"We should find out what is reasonable for each team member — what we need to be online for, and what we can step away from," she said. "We should think about how we can give each other grace and honor each other in the new world we are living in."

Planning virtual or phone-based coffee breaks off Sandia's network might work for some teams, or for employees who have friends in other groups throughout the Labs. Ana-Lisa, who read about the coffee break idea online, said it gives employees time and space to have conversations like they normally would in the office or lab.



**DOWNWARD CAT** — Stella the cat checked out the action when Sandia communications specialist Manette Fisher logged into one of the Labs' online fitness classes while working from home. **Photo by Manette Newbold Fisher**



**FITNESS FROM AFAR** — Sandia's fitness instructors are offering virtual exercise classes to help employees stay in shape, both physically and mentally. **Photo by Randy Montoya**

## Connecting Sandians

A cross-organizational internal website has been created to connect Sandia employees and contractors while many people work from home. The site hosts links to Sandia resources, including COVID-19 information, tips for working from home, news, volunteer opportunities and health offerings such as virtual fitness, education and coaching. Employees can visit the site at [tiny.sandia.gov/ah5m8](http://tiny.sandia.gov/ah5m8).

Working with management, employees could include additional discussion points such as birthdays or significant events in Tier board meetings as a way to check in, or set up group emails or chats that allow team members to quickly touch base and stay connected in personal, inclusive ways.

"It doesn't have to be all business all the time, because it's not like that in real life," Ana-Lisa said. 

## Expanding horizons

Volunteers from the Sandia Women's Action Network and the Labs' global security division provided engaging workshops at Expanding Your Horizons, an event that introduces young women to STEM careers. 



**STEM START** — Circulating among the students, Sandia volunteers Jessica Rivas, left, and Caroline Lesch demonstrated the importance of access delay technologies.



**EXPERIMENTING WITH SCIENCE** — Sandia engineer Whitney Ingram, left, and a SWAN volunteer helped students explore the science of surface tension.

**Photos courtesy of Expanding Your Horizons**

# More than \$80K raised for food bank during 15-day campaign

Employees meet first donation goal in less than a day

By **Manette Newbold Fisher**

Sandia employees were given 15 days, but it only took an hour and a half on April 1 to raise \$15,000, the amount the Labs pledged to match from its corporate contribution program for a [donation to the Roadrunner Food Bank](#) in Albuquerque, New Mexico.

Inspired by the generosity of the workforce and the speed with which the initial goal was met, the Community Involvement team upped the match to \$25,000 that afternoon. The second goal was reached by April 2, and employees continued. At the time of printing, employees had donated more than \$57,000, meaning more than \$82,000 will help families across the state through food pantries, soup kitchens and shelters.

"I'm in awe of the people who work at the Labs," said Katrina Wagner, who works in Sandia's Community Involvement department and helped plan the campaign. "The email announcements combined with communicators pushing the message resulted in incredible results from our generous employees."

An initial announcement about the campaign hit email boxes around 12:11 p.m. on April 1, letting employees know that the food bank has seen more than a 400% increase in web traffic for people seeking food assistance in recent weeks. Employees were invited to donate through April 15, and every dollar up to \$15,000 would be doubled. By 1:38 p.m., the goal was met, and contributions continued to roll in. By the end of business that day, employees had contributed nearly \$19,000 for the food bank.

Without further communications, the \$25,000 donation goal was met the next morning.

Due to the COVID-19 pandemic, the food bank is seeing an unprecedented demand from people who are newly in need of assistance at the same time as grocery store donations have decreased, said Community Involvement manager Amy Tapia. This is a result of people purchasing excess food

from local stores that would otherwise have made its way to the food bank.

Amy said Sandia has a long-standing partnership with New Mexico's Roadrunner, for volunteer opportunities and financial donations. Roadrunner has a network of 500 partners throughout New Mexico and is well positioned to respond to emergencies.

## Tradition of generosity, volunteering

For many years, Sandia employees have taken frozen turkeys to work to donate before Thanksgiving. They have also volunteered to help sort food at Roadrunner for Stamp Out Hunger, the largest single-day food drive in the United States, and they have participated in virtual food drives during summer months.

Volunteer events often fill up lightning fast, said Katrina, who arranged for a group of 35 Sandia employees to sort food at Roadrunner on March 28. She said the spots filled up in minutes. Now the Labs will have groups volunteering at the food bank every Friday in April. Pre-registration is required.

Even though the initial goals have been met, employees can still contribute to the Roadrunner Food Bank fundraiser until April 15. Visit [bit.ly/2UQbg4i](https://bit.ly/2UQbg4i) to donate.

Additional donation and volunteer opportunities can be found on the [Community Involvement website](#). 



**SANDIA GIVES** — Sandia has a long-standing relationship with the Roadrunner Food Bank and chose to support it this month as communities across the state face an unprecedented need for food.



Linda Gallagher, left, and Tracy Flynn sort protein bars during a Sandia volunteer event at the Roadrunner Food Bank. Employees can check the Community Involvement website for information on volunteer opportunities. **Photo by Katrina Wagner**

## Labs' research portfolios

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### Improving resilience of US utilities

There's room for improvement in the protection of the U.S. energy system, Craig said.

"Our electrical generating systems may be more vulnerable than we would like," he said. "Many of these were built in simpler times, some around the early 20th century. Though remarkably durable, since then they have been overlaid with complex computer control systems to assist in responding to the complicated demands of today."

These computer systems, he said, are vulnerable to cyber hacking that could alter or disable them, potentially disrupting power to large geographic areas.

"Electricity runs almost everything in modern society," Craig said. "Without it, food goes bad, hospitals can't function, credit cards don't work. Dams let out prescribed amounts of water, and gas pipelines operate autonomously through codes."

In addition to maliciously created computer problems, "damage from naturally occurring threats, like hurricanes, can cause problems that may stretch out for long periods of time if replacement parts aren't readily available," he said.

While large utilities already have lightning surge arrestors to mitigate lightning strikes, as well as highly efficient lightning rods, "they don't operate fast enough to catch a nanosecond electromagnetic wave from a nuclear weapon exploded high in the atmosphere." The electromagnetic pulse could fry unprotected circuits, he said.

While utility companies are required to have contingency plans in place to provide power if one generator in a large system goes out, there's no

prepared response if they lose many generators at once, he said.

"These are some of the problems that we expect our upcoming work to mitigate," Craig said. "We believe that ideas proposed to increase our electrical security will come from Sandia and other national labs, universities and the utility companies themselves."

### The intense realm of ASAP

Among the military problems that an adversary might present are more capable weapon systems, as well as technology intended to confuse a U.S. missile and deflect it from reaching its target. The Assured Survivability and Agility with Pulsed Power, or ASAP, campaign will invest in science and technology needed to ensure that "U.S. military objectives will be met, in the event that deterrence fails," Kyle said.

Further study of brief strong pulses of electrical power are needed to help meet that goal. Pulsed-power accelerators store energy and release it in powerful bursts. Those can be converted into X-rays and neutrons to be used as a laboratory version of an actual bomb blast to assess how nuclear and conventional weapon systems would respond if subjected to those environments.

Sandia uses pulsed power technology in a number of different facilities — Saturn, Hermes and Z — and is currently developing proposals to enhance some of these capabilities.

One proposal is directed-energy weapon systems, Kyle said. Pulses of pure energy could deter platoons of advancing soldiers by making them uncomfortably warm. Focused to a narrower beam, they could be used to shoot down incoming missiles near-instantaneously.

Another proposal is for a dramatically improved successor to the Z facility that would deliver 10

times the energy output that Z currently produces: a petawatt (quadrillion watts) electrical pulse.

"This would create unprecedented levels of X-rays and neutrons, as much as tens of thousands more neutrons than currently generated by Z today," Kyle said. Z is already the world's most powerful generator of X-rays.

"We have seen petawatt lasers for many years," he said. "This would be the first accelerator to deliver a petawatt of electrical power, and with much larger energies than lasers can generate."

However, to realize such a facility and other advances, the ASAP research campaign is needed to develop better understanding of basic support issues like high voltages and current delivery, electrical breakdowns and how to prevent them, more efficient and reliable capacitors and switches, and new materials for delivering petawatts of electrical power.

Such basic engineering research will do a lot for science, Kyle said. "It would enable better astrophysics experiments, create higher temperatures and pressures for material science, and higher fidelity environments for radiation effects testing on electronics and materials."

Also significant would be creating tools to manage the debris from repeated experiments from an improved Z that each would generate the energy equivalent of more than 20 sticks of dynamite exploding in nanoseconds in a tiny enclosed space.

"If a Z successor were built without improvements in its underlying support structure, its first firing would be a lot easier to achieve than its second," Kyle said.

He is looking for ideas from qualified researchers to help the mission succeed in its aim of improving national security. 

# Mileposts



New Mexico photos by Michelle Fleming  
California photos by Randy Wong



Martha Campiotti 45



Greg Christiansen 40



Dorth Carr 35



Marc Polosky 35



Laura Draelos 30



Marty Shaneyfelt 30



Howard Walther 30



Whitney Wolf 30



Cecily Glissman 25



Edith Hendrix 25



Darren Hoke 25



Lupe Barraza-Medina 20



Darren Branch 20



Steve Highland 20



Robin Brunt 15



Brian Carnes 15



Ray Collins 15



Lynn Fondren 15



Peter Heald 15



Stephanie Kelly-Johnson 15



Ryan Law 15



Yvette Montoya 15

## Innovation to industry

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“We are thrilled that the state of New Mexico created a new program that allows companies to partner with national lab researchers to advance a technology past the invention stage into a matured technology,” said Jackie Kerby Moore, manager of technology and economic development at Sandia.

### Closing the funding gap

When technology is transferred out of the laboratories, often significant capital investment and development are required to mature the technology and make it market ready. Frequently, there is a void in funding to develop it further into a minimum viable product for commercial applications.

While Sandia and Los Alamos can help further mature previously transferred technologies, there wasn’t a program in place that allowed them to easily engage with New Mexico companies in this way.

“We’re bridging the R&D gap for New Mexico businesses,” said Duncan McBranch, program director of Entrepreneurship for Mission Innovation at Los Alamos National Laboratory. “This matters because 99% of New Mexico businesses are small businesses with limited budgets. Access to the expertise and technology offered at Sandia and Los Alamos national laboratories makes this extensive and expensive process more affordable.”

The new program, which goes into effect July 1, places labs technologies on a smoother path toward commercialization.

“We plan to help companies develop their products to a point where a customer will buy or an investor will invest,” Jackie said.

Both laboratories will be able to claim tax credits against their gross receipts tax liabilities for their work with businesses. Each lab can claim up to \$500,000 the first year, \$750,000 the second year, and \$1 million the third year. In total, the labs will be able to provide up to \$4.5 million in time, technical assistance and resources over three years.

“The new program is an essential and exciting mechanism that provides much-needed expertise from the labs to mature technologies for market readiness,” said Mary Monson, senior manager of business development at Sandia. “We are confident that this could lead to increased innovation and jobs that benefit New Mexico’s growing tech industry.”

### Tax credit model

The Technology Readiness Gross Receipts Tax Credit is modeled after the [New Mexico Small Business Assistance Program](#), which has successfully paired Sandia and Los Alamos with small companies facing technical problems for 20 years.

However, there are a few significant differences between the NMSBA program and the tax credit. While the new program helps New Mexico companies that apply for assistance after obtaining a license from one of the labs or a Cooperative Research and Development Agreement, the NMSBA program helps small businesses in the state that apply for help with a technical problem, regardless of whether they licensed technology from the labs or have a CRADA.

The new program also provides a higher dollar amount of technical assistance per company, up to \$150,000 per year. Through the NMSBA program, eligible rural companies may receive up to \$40,000 in research and development from the labs or \$20,000 for eligible companies located in Bernalillo and Santa Fe counties.

“The NMSBA program helps businesses with a wide variety of technical challenges, whereas the goal of the new program is to really focus on taking an idea all the way through to commercialization,” said Genaro Montoya, who leads the NMSBA program for Sandia. “We hope this significantly accelerates technology development in the state and creates jobs.”

# Recent Retirees



New Mexico photos by Michelle Fleming  
California photos by Randy Wong



Steve Wagner 35



Su-Ellen Lierz 15

# Girls get world-class STEM experience, inspiration

Story by **Michael Ellis Langley**  
Photos by **Dino Vournas**

**D**ozens of middle school girls from the **Techbridge Girls** program in Oakland visited Sandia's California campus March 4 during STEM Day for Girls.

The girls were welcomed by Energy and Homeland Security Program Management Director Marcey Hoover.

"I chose to become a doctor of math because I loved puzzles growing up," Marcey said, while talking about what inspired her at their age to seek a doctorate in mathematics. "Those kinds of things got me super excited about math. I also really liked music. I played a brass instrument, and what I found was that my love for music was related to math, because music had a lot of counting and beats."

After an icebreaker of charades, the girls asked questions of a panel of professional women, including Marcey, **Stanford Assistant Professor Debbie Senesky** and **Techbridge role model and patent attorney Josetta Jones**.

The panel was moderated by Sandia community relations specialist Kayla Norris, who organized the event. The panelists answered questions about nuclear power, how the women apply science in their work and the education they needed to get where they are.

"To be a patent attorney, you have to have a science degree," Jones, who works for Chevron, said. "Either an engineering degree, a chemistry degree, a biology degree. But you have to have something rooted in science."

The group then toured labs on campus to experience science in action. Following the tour, the girls were split into six groups, each of which was tasked with solving part of a problem that required them to communicate and provide resources for the other groups, to complete the activity.



A student from the Techbridge Girls program in Oakland smiles as a thermal camera takes her image during STEM Day for Girls at Sandia/California March 4.

Senesky gave a keynote address, drawing upon her upbringing as the first in her family to attend college and her current work at Stanford, testing materials for NASA, to make spacecraft.

"We need your voice in the STEM fields," she said. "There aren't many women in the field of engineering. Most rooms that I'm in aren't filled with women, like this room."

Senesky told the girls that their choices for the future may have an impact beyond their own lives.

"I want you guys, if you're thinking about engineering, to talk to people around you and understand that if you do pursue this field, you are being a role model for other women who might pursue this line of work," she said.

Kayla called STEM Day for Girls a success. "It is so important that we show girls what is possible and how they can serve their community and their nation with their mind," she said. "These girls came from underserved communities and all walks of life. Giving them exposure to the lab and the incredible work we do here shows them all what is possible and the opportunities available to them."

"I am so grateful to Marcey, Josetta and Debbie for spending time trying to reach and inspire these girls — who may someday grow up to make their own contributions to science and technology," she said.

Kayla also thanked the Sandia volunteers who helped with the event: Tatiana Del Cid, Gaby Bran Anleu, Evercita Eugenio, Patricia Hernandez, Chen Wang and Teresa Zieminski-Myers. 



Sandia Energy and Homeland Security Program Management Director Marcey Hoover poses for a photo with one of the students from the Techbridge Girls program.



From left, Marcey Hoover, Debbie Senesky and Josetta Jones listen to a question, posed by Kayla Norris during a panel discussion.



Students enjoy a quick lunch during their visit to the Sandia/California campus.



Students explain their solutions to a problem posed during a group activity.



Students tour a lab space at the Sandia/California campus during STEM Day for Girls.



Students from the Techbridge Girls program pose with Sandians and guest speakers from Stanford University and Chevron during STEM Day for Girls.



Stanford University Assistant Professor Debbie Senesky gives the keynote address at STEM Day for Girls.