SANDIA LABNEWS
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Reducing risks from electric vehicle charging infrastructure

CHARGIN' UP — Kaedi Sanchez plugs in her car at a city of Albuquerque electric vehicle charger before heading to work. Sandia researchers have been studying the vulnerabilities of electric vehicle charging infrastructure, including public chargers, to better inform policymakers. **Photo by Craig Fritz**

Review of vulnerabilities helps prioritize grid protections

By **Mollie Rappe**

With electric vehicles becoming more and more common, the risks and hazards of a cyberattack on charging equipment and systems also increases. Fortunately, Jay Johnson, a Sandia electrical engineer, has been studying the varied vulnerabilities of **electric vehicle charging infrastructure** for the past four years.

Jay and his team recently published a summary of known electric vehicle charger vulnerabilities in the scientific journal **Energies**.

"By conducting this survey of electric

— CONTINUED ON PAGE 3

Photovoltaics for extreme conditions

Sandia researchers team up to launch renewable energy research above the Arctic Circle

By **Sarah Jewel Johnson**

Oliktok Point, Alaska, is one of few accessible locations within the United States above the Arctic Circle. The wind chill can plummet to minus 70 degrees Fahrenheit and structures are covered with ice most of the year. These extreme weather conditions make Oliktok Point an ideal location for Sandia researchers to install photovoltaic panels to better understand solar generation in extreme and remote environments, including **north of the Arctic Circle**.

— CONTINUED ON PAGE 4

PV PREDICTIONS — Data collected by photovoltaic panels on storage containers in Oliktok Point, Alaska, track daily energy gains and help develop predictive models of energy performance.

Photo courtesy of Laurie Burnham

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LABNEWS Notes

Lab News may contain photos shot prior to current COVID-19 policies. Individuals in photos followed all social distancing and masking guidelines that were in place when photos were taken.

EDITOR'S NOTE: Please send your comments and suggestions for stories or for improving the paper. If you have a column (500-800 words) or an idea to submit, contact Lab News editor Katherine Beherec at kgbeher@sandia.gov. The last edition of 2022 will be published on Dec. 8. Editions will not be published on Dec. 1 or Dec. 15.

Sandia saluted for hiring, retaining veterans

U.S. Department of Labor platinum award honors businesses that support veterans

By **Luke Frank**

For the second consecutive year, U.S. Secretary of Labor Martin J. Walsh recognized Sandia as a recipient of the HIRE Vets Medallion Award during a virtual award ceremony presented by the Department of Labor. The Honoring Investments in Recruiting and Employing American Military Veterans Act Medallion Program recognizes employers who successfully recruit, hire and retain veterans.

"Sandia Labs respects the sacrifices and contributions made by our service members in advancing our national security mission, and I am proud of our efforts to attract and retain military veterans," said Brian Carter, Sandia's executive champion for the military support committee and chief human resources officer. "We greatly value the professional attributes, technical skills, proven leadership and vast experience that veterans bring to our organization. They are an essential part of our workforce."

Sandia's platinum designation — the highest category of award — honors the value the Labs has exhibited for the contributions of veterans in the workplace through a long-term career and growth plan that uses the diverse skills veterans acquired through their military service.

In 2021, 10% of Sandia hires were veterans retained for at least 12 months.

"The Exceptional Warrior Career Development Program, Sandia's

VAUNTED VETERANS — For the second consecutive year, Sandia Labs is a proud recipient of the HIRE Vets Platinum Medallion Award.
Illustration by Dan Thompson

SkillBridge Program, Sandia's Corporate Veteran Recruiting Strategy and the community of leaders and staff members that supports these programs make this award possible," said Tony Lona, Sandia diversity recruiter who retired from the U.S. Marine Corps in 2014 and joined Sandia that same year. "I know I echo our veteran workforce in saying thank you Sandia both for the years of continued support and advocacy for our nation's transitioning service members and veterans."

According to HIRE Vets, Sandia demonstrated rigorous employment and veteran integration assistance, including veteran hiring and retention percentages, availability of veteran-specific resources, leadership programming for veterans, dedicated human resource efforts, pay compensation and tuition assistance programs for veterans and more.

In addition to recruiting and hiring initiatives, Sandia advocacy examples include onboarding and mentoring programs, veteran network and affinity groups, bridging the cultural gap between veteran and non-veteran employees, recognizing and celebrating military service within the organization and working with veteran service organizations and other community groups.

The HIRE Vets Medallion Award is earned by businesses that demonstrate unparalleled commitment to attracting, hiring and retaining veterans. There are different awards for large, medium and small employers that fit into two award tiers: platinum and gold.

Electric vehicle charging

CONTINUED FROM PAGE 1

vehicle charger vulnerabilities, we can prioritize recommendations to policymakers and notify them of what security improvements are needed by the industry," Jay said. "The Bipartisan Infrastructure Law allocates $7.5 billion to electric vehicle charging infrastructure. As a part of this funding, the federal government is requiring states to **implement physical and cybersecurity strategies**. We hope our review will help prioritize hardening requirements established by the states. Our work will also help the federal government standardize best practices and mandate minimum security levels for electric vehicle chargers in the future."

ZOOM ZOOM — An electric vehicle at a city of Albuquerque electric vehicle charger. Sandia researchers have begun to assess the risks posed by the various electric vehicle charging infrastructure vulnerabilities, to better inform policymakers of which improvements would be the most impactful.

Photo by Craig Fritz

Compiling vulnerabilities

Electric vehicle charging infrastructure has several vulnerabilities ranging from skimming credit card information — just like at conventional gas pumps or ATMs — to using cloud servers to hijack an entire electric vehicle charger network.

The Sandia researchers are working with experts from Argonne, Idaho and Pacific Northwest national laboratories; the National Renewable Energy Laboratory; and others as a national security laboratories team.

"We are focused on larger impacts to critical infrastructure as we electrify more of the transportation industry," Jay said. "We have been studying potential impacts to the power grid. Also, as law enforcement and other government agencies consider switching to electric vehicles, we've been thinking about how the inability to charge vehicles could impact operations."

Brian Wright, a Sandia cybersecurity expert on the project, agreed about the scale of the challenge.

"We don't want bad things to happen to the grid, and we want to keep electric vehicle drivers safe and protect people working on the equipment," Brian said. "Can the grid be affected by electric vehicle charging equipment? Absolutely. Would that be a challenging attack to pull off? Yes. It is within the realm of what bad guys could and would do in the next 10 to 15 years. That's why we need to get ahead of curve in solving these issues."

The team looked at a few entry points, including vehicle-to-charger connections, wireless communications, electric vehicle operator interfaces, cloud services and charger maintenance ports. They looked at conventional AC chargers, DC fast chargers and extreme fast chargers.

The survey noted several vulnerabilities on each interface. For example, vehicle-to-charger communications could be intercepted and charging sessions terminated from more than 50 yards away. Electric vehicle owner interfaces were chiefly vulnerable to skimming of private information or changing charger pricing. Most

electric vehicle chargers use firewalls to keep separate from the internet for protection, but Argonne National Laboratory researchers found some systems did not. Additionally, an Idaho National Laboratory team found some systems were vulnerable to malicious firmware updates.

The multilab team found many reports of charger Wi-Fi, USB or Ethernet maintenance ports allowing reconfiguration of the system. Local access could allow hackers to jump from one charger to the whole charger network through the cloud, Jay said.

Patches and next steps

In the paper, the team proposed several fixes and changes that would make the U.S. electric vehicle charging infrastructure less vulnerable to exploitation.

These proposed fixes include strengthening electric vehicle owner authentication and authorization such as with a Plug-and-Charge public key infrastructure, Jay said. They also recommended removing unused charger access ports and services and adding alarms or alerts to notify charger companies when changes are made to the charger, like if the charger cabinet is opened. For the cloud, they recommended adding network-based intrusion detection systems and code signing firmware updates to prove that an update is authentic and unmodified before being installed. Sandia has produced a **best-practices document** for the charging industry.

Now that this review has been completed, the Sandia team has received follow-on funding to tackle some of these gaps. They are working with Idaho and Pacific Northwest national laboratories to develop a system for electric vehicle chargers. This system will use **cyber-physical data** to prevent bad guys from impacting the electric vehicle charging infrastructure.

The team has another research project that involves evaluating public key infrastructures for electric vehicle charging, providing hardening recommendations for charging infrastructure network owners, developing electric vehicle charging cybersecurity training programs and **assessing the risk of the various vulnerabilities**. Risk analysis looks at both the likelihood of something bad happening and the severity of that bad thing to determine which changes would be the most impactful.

"The government can say 'produce secure electric vehicle chargers,' but budget-oriented companies don't always choose the most cybersecure implementations," Brian said. "Instead, the government can directly support the industry by providing fixes, advisories, standards and best practices. It's impossible to create solutions if you don't understand the state of the industry. That's where our project comes in; we did the research to find where we are and what gaps would be the quickest and most impactful to fix."

This work was supported by the DOE Vehicle Technologies Office and the Office of Cybersecurity, Energy Security and Emergency Response.

Photovoltaics research

CONTINUED FROM PAGE 1

"Establishing that solar can generate energy for most of the year, and determining which system designs produce the most power, matched to time-of-day, should help accelerate the growth of solar in Alaska, reducing the need for costly and carbon-emitting diesel fuel and increasing the energy security of remote communities," explains Laurie Burnham, Sandia's photovoltaics and materials technology project lead.

The Arctic region has limited measurement stations for conducting research; therefore, selecting a testing location that experiences brutal arctic weather and harsh shoreline conditions is vital to understand the wide array of environmental factors the photovoltaic panels will endure.

"[Oliktok Point is] a very environmentally relevant field site — it checks all the boxes. We go from permanent ice through the winter, with permafrost, to the sea ice breaking up, to open water and a melt season where the ground softens and turns to mud," said Andrew Glen, manager of Sandia's atmospheric sciences.

Solar in the Arctic

In September, Sandia installed a small, 4.3-kilowatt photovoltaic system atop a shipping container at Oliktok Point. The new photovoltaic modules are bifacial, or photoactive on both sides. This design allows solar radiation to reach the photovoltaic cells on one side and reflected light to also reach the opposite side of the same cells. As a result of receiving light on both sides, bifacial modules can produce 15% to 50% more power, depending on the amount of reflectivity and the type of solar cell.

Bifacial modules produce the highest energy gains when the surrounding reflection of solar radiation is high, as is typical of a sunny day in snowy environments. Data collected at Oliktok Point will track those daily energy gains and help develop predictive models of energy performance based on the tilt angle and orientation of the solar modules.

"Alaska, and Oliktok in particular, represents an edge case for PV deployment," said Bruce King, director of Sandia's Photovoltaic Systems Evaluation Lab. "Learning about edge cases helps inform conventional system design and may identify opportunities to increase energy harvest that might not otherwise be considered. This can be particularly important for PV deployments in other geographic areas that are also not optimal."

Mark Ivey, senior engineer in the Geoscience Research and Applications Center at Sandia, is excited to partner with Sandia's photovoltaic researchers in the Arctic.

"Not only are you seeing unique science — like the clouds do really different things up there — but also, it's a very tough environment. It's a marine environment. You're going to have salty conditions and corrosion conditions. It's Arctic, of course, so in that regard, it may be a little tougher. This past winter we had high winds with very low temperatures at minus 45 Fahrenheit or so ambient, so the wind chill was minus 70 at times. That's tough on equipment; it's tough on people," Mark said.

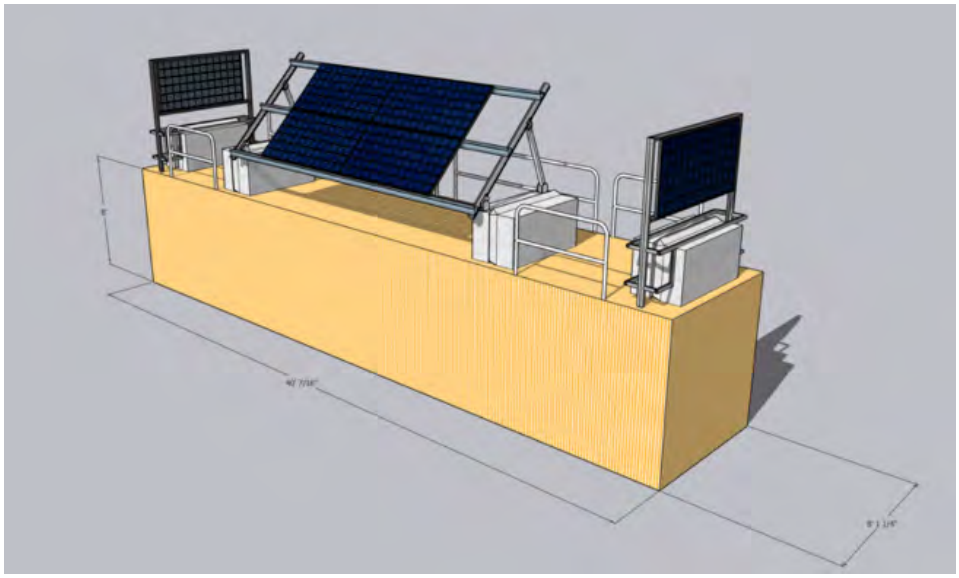
Sandia's solar and arctic expertise in situ

Sandia has more than 50 years of photovoltaic research expertise with work that includes decades of outdoor reliability assessments, performance modeling and developing characterization and validation methodologies for fielded systems and components. Nonetheless, additional research is needed to understand the climatic stresses that impact photovoltaic performance and reliability at high latitudes with extreme weather, where field studies are lacking.

"At Sandia, we have a breadth of knowledge that crosses multiple disciplines. So, we can take the folks who are really experienced with PV, and we can bring our decades of Arctic experience and location to that and try merging this together. Not many institutions can do that," Andrew said. "It allows the PV engineers to test out systems like solar power in Arctic environments, which behave very differently than those deployed in midlatitudes or closer to the equator. We get to test our reliability of instruments in terms of the cold weather exposure; things tend to break a lot more easily when you're next to the coast and you're in minus 70 degrees."

The team hopes that their research will support the growth of solar in Alaska and other northern climates by demonstrating that solar is a viable energy source, even in extreme cold climates with limited or no sun in winter. Equally important, the data from Oliktok Point will quantify which system designs and technologies are most efficient in northern environments, enabling the roll out of climate-optimized photovoltaic systems. These findings will be highly beneficial to remote communities that are now heavily reliant on carbon- and particulate-emitting diesel generators and to U.S. military outposts, for whom energy surety is critical.

Sandia's Arctic team also conducts research on coastal erosion, atmospheric measurements and corrosion conditions. Eroding shorelines and changes in permafrost are just two examples of factors researchers must consider when deploying test equipment above the Arctic Circle.



CAPTURE THE SUN — This graphic depicts the angled photovoltaic panels mounted on the storage container. These photovoltaic panels collect the solar energy, which is then stored in batteries in the container for later use. The panels are tilted at optimal angles for capturing sunlight based on the position of the sun through the day. **Graphic courtesy of Bruce King**

Immediate and long-term impacts

As the effects of climate change continue to impact the world, the Arctic is quickly becoming more strategically important as melting ice opens shipping lanes and increases access to resources.

"This research will accelerate the adaptation of renewable energy technologies for use in high-latitude environments. As early adopters, communities in Alaska are accelerating this technology adaptation. Climate change is rapidly transforming the Arctic, and we need renewable energy technology options to meet energy needs for a growing range of research, commercial and security activities in the region," said Abraham Ellis, senior manager of Sandia's Renewable Energy Technologies group.

Understanding and predicting the reliability of alternative power sources in the Arctic could become vital for national security, ongoing arctic research and as a key resource for energy equity in remote locations.

"The last I checked, we were paying something like $9 a gallon for fuel on the North Slope for diesel. You know the native communities have to pay that too. They depend on all-terrain vehicles and snow machines for their subsistence hunting. So, it's a big deal," Mark said.

"Beyond combating climate change directly, PV can help mitigate the effects of climate change," Bruce said. "Local and community generation can provide power during times of grid disruption due to climate-driven weather events and reduce demand during peak hours that could otherwise lead to brownouts. As this system is also 100% off-grid, it may also help inform community solar, disaster relief and other dispersed power applications."

The new photovoltaic array at Oliktok Point has the potential to inform future photovoltaic deployments in extreme conditions, helping accelerate the deployment of non-carbon emitting energy sources across northern regions of the U.S. It's work that capitalizes on Sandia's diverse and long-standing expertise in renewable energy, climate change research and the commitment to energy equity and development of new tools that could impact communities across the world.

"This research can really make a difference by deploying PV in different environments. The variation is critical," Andrew said. "Local villages in Alaska don't always have reliable power, so bringing PV to test and hopefully deploy in the future could have a huge impact on energy access and energy equity in the Arctic. It's really about improving reliable access to energy in a responsible way, but it doesn't happen overnight."

Answering the call

Sandians support national security mission

Lab News continues to highlight employees and the ways that they contribute to Sandia's national security mission. Read more profiles from previous editions.

Michelle Pang

Human factors engineer
6 years at Sandia

Michelle works with product realization teams, engaging in the design of hardware, tooling and fixtures, and processes to support Nuclear Deterrence. She performs process observations that allow her to understand how hardware is assembled. Talking to the technicians, operators and engineers who build Sandia designs provides insight into how to reduce the risk of human error.

Michelle provides recommendations for hardware designs, product documentation and human-centric tasks. These activities allow her to work collaboratively with the teams to determine and implement appropriate design changes, process modifications and engineering or administrative controls.

Photo by Paul Catlett

"Human factors isn't just ergonomics," she said. "A large portion of the work we do is focused on designing and building robust systems and processes, and how to do it better."

The overarching theme of Michelle's department is understanding and improving how humans and machines and systems interact.

"Throughout a weapon's lifecycle there are a lot of human-centric tasks: assembly, transport, mid- and final-build testing, integration, etc., and at each of these steps the human can make a mistake," she said. "My work aims to proactively identify and address these concerns so the systems we build perform and function the way we expect them to, always."

— Andrea Mackay

Matthew Reno

Principal technical staff member in Electric Power Systems Research Department
15 years at Sandia

Matthew has been working on developing power system protection schemes to improve the reliability of the grid. By working with utilities around the United States, Sandia has been able to decrease the time to detect faults and increase the accuracy for determining exactly where the faulted section of the system is located.

Photo by Craig Fritz

Matthew has also worked with the Institute of Electrical and Electronics Engineers to develop the first standards for microgrid protection. The team received the 2022 IEEE Power and Energy Society Outstanding Standard or Guide Working Group Recognition Award.

While the system is designed to be robust, there are always possible issues that can be seen throughout the entire interconnected grid. For the rest of the grid to continue operating, the faulted section of the system must be isolated and disconnected, generally within a second, so that the blackout does not spread to a larger area.

"The electric grid provides critical power to infrastructure in the United States ranging from residential homes to defense facilities to manufacturing," Matthew said. "The reliability of the grid is important to our national security and prosperity."

— Sarah Jewel Johnson

Photo by Randy Wong

Josh Sugar

Materials scientist
15 years at Sandia

Josh works in the Energy Nanomaterials Department on projects that provide materials science solutions to address problems in a wide range of Sandia mission areas including national security, Nuclear Deterrence and energy and homeland security.

"My job is to use Sandia's modern high-powered microscopes to map out the atomic and electronic structure of components and devices used for energy and national security applications," Josh said. "Through our understanding of these basic building blocks, we are able to guide engineering decisions that lead to reliable and predictable materials performance over long periods of time and in harsh environments."

Josh collaborates with Sandians from different centers and sites, and within the larger NNSA complex. He is passionate about using quantitative electron microscopy as an "arbiter of truth" to address materials science questions and challenges and remains interested in the difficult materials science problems that Sandia faces. Josh is always seeking additional collaborators who share his desire to understand the fundamentals of materials performance.

— Mattie Hensley

Mileposts

Jim Redmond 30

John Mitchell 25

Peter Duran 20

Jason Follingstad 20

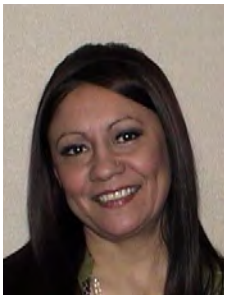
Mark Kumpunen 20

Callie Lovato 20

Karen McDaniel 20

Mark Overberg 20

Chris Romero 20



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Bruce McWatters 15

Tim Webb 15

Small-business success

Sandia and Los Alamos labs help local companies overcome technical hurdles

By **Meagan Brace**

The Saturday after Thanksgiving, known as Small Business Saturday, offers an opportunity every year to celebrate the jobs, helpful products and services, and economic wealth that small businesses bring to our communities. They must learn how to mitigate risk and quickly adapt to change — as witnessed now more than ever — and navigate critical challenges while they maintain or expand their operations. As they face these challenges, small businesses can turn to experts from the national labs for help.

In 2000, the New Mexico Legislature created the Laboratory Partnership with Small Business Tax Credit Act. As a result, Sandia established the New Mexico Small Business Assistance Program to provide technical support to small businesses throughout the state. Los Alamos National Laboratory began participating in 2007. Since the program's inception, NMSBA has provided $76.1 million of technical assistance to over 3,200 businesses.

"For more than two decades, the NMSBA Program has helped New Mexico businesses create jobs, increase revenues, decrease operating costs and attract new funding opportunities," said David Kistin, manager of Sandia's Technology and Economic Development department.

Last year, hundreds of companies were able to test new product ideas, validate their technology or increase operational efficiency with the expertise and resources found at the labs and their contract partners. The top industries served were professional, scientific and technical services (41.5%); manufacturing (37.6%); and agriculture and natural resources (9.8%). The top capabilities used were manufacturing (20.6%), engineering (18.8%) and advanced modeling and simulation (12.8%).

A sampling of success

The NMSBA Perspectives Annual Report highlights ten successful projects from 2021, including three that Sandia supported:

Build With Robots Inc., Painting Bots Inc., FatPipe–Rio Rancho and the BioScience Center joined forces to develop disinfecting robots that could be used in facilities such as airports, schools

PAIN POINT — From left, Ingenuity Software Labs CEO John Mierzwa and Just Health Care front-end designer Jenilee Jao, Internet of Things designer John Valdez, Chief Technology Officer Andru Zeller and machine-learning designer Asher May. Through the NMSBA program, Sandia helped Just Health Care LLC improve technology that helps clinicians quantify and locate a patient's likely pain source. **Photo by Bret Latter**

INNOVATION CELEBRATION — The New Mexico Small Business Assistance Program held the first Innovation Celebration since the onset of COVID-19 at Santa Fe Brewing in Santa Fe on Sept. 29. NMSBA recognized the New Mexico small businesses and laboratory principal investigators from projects in 2020 and 2021.

Photo by Lucas Reigelsperger, Los Alamos National Laboratory

and arenas. They received assistance from Sandia systems engineer Mark Kinnan and technologist Cathryn Mayes to create a testing matrix from which they could select a range of equipment and protocols for disinfecting processes. The Breezy One robot is used across the country to eliminate pathogens, allergens and asthma triggers. Breezy Blue, a similar but smaller disinfecting device, is being launched for situations where the larger robot cannot easily fit. The Disinfecting Robot Leveraged Project received the Honorable Speaker Ben Luján Award for Small Business Excellence for demonstrating the most economic impact, which included securing $5 million in funding and hiring 30 new employees.

Optical Radio Communications Technology, known as ORC Tech, obtained an exclusive license from NASA Johnson Space Center to adapt technology originally designed for lunar missions to improve cell coverage for people on Earth. To help optimize their cellphone antenna's performance, ORC Tech paired with Sandia principal investigators Stephen Neidigk and John McVay, who conducted analytical modeling and fabricated a prototype at Sandia's Sensors and Textiles Innovatively Tailored for Complex, High-efficiency Detection, or STITCHED, lab. With Sandia's technical assistance, the company secured $125,000 in funding and created multiple job opportunities.

Just Health Care LLC, with the professional support of Ingenuity Software Labs and Lynn Technical Services LLC, developed a new technology called PainScan to quantify and map chronic pain patterns. Sandia mechanical engineer Jason Wheeler and his team helped the partners assess the effectiveness of available sensor technologies ideal for a clinical environment. The test results helped secure a $256,000 Small Business Innovation Research award from the National Science Foundation and enabled the companies to hire seven new employees.

Of the $4.36 million in technical assistance provided to 228 small businesses in 2021, Sandia worked with 130 companies across 22 counties and provided $2.4 million worth of assistance — the maximum dollar amount allowed annually for each laboratory. There were 68 Sandia principal investigators across 48 departments who supported the program. Researchers interested in participating can contact NMSBA Program Leader Genaro Montoya. Interested companies can submit a request for assistance through the NMSBA website and learn more about other opportunities to work with Sandia.

ROBOT ROUNDUP — From left, Build With Robots Director of Sales Xavier Lemon, Marketing and Community Engagement specialist Christian Slough, Robotics Engineering intern Lauren Baca, Chief Strategy Officer and co-founder Matthew Ennis, and Marketing associate Tyanne Hawthorne. NMSBA's Disinfecting Robot Leveraged Project received the Honorable Speaker Ben Lujan Award for Small Business Excellence. **Photo by Bret Latter**

STRONGER SIGNAL — Optical Radio Communications Technology Chief Technology Officer Joshua Benavidez holds a passive signal booster that consists of a conductive material woven into fabric. Sandia enabled ORC Tech to achieve product-development milestones much faster than anticipated. **Photo by Bret Latter**

Honoring our veterans

Sandia hosts Veterans Day celebrations in NM and CA

By **Katherine Beherec and Trina West**

Labs leadership expressed gratitude to veterans who work at Sandia during annual Veterans Day celebrations last week in New Mexico and California. Sandia's Military Support Committee organized both events, which were held in person and virtually.

In New Mexico, the ceremony was held on Tuesday, Nov. 9. The event began with a welcome from Mark Murton, chair of the Military Support Committee. He introduced Brian Carter, executive director of human resources and communications and executive champion of the Military Support Committee, who thanked Sandia's veterans for the contributions they make at the Labs. About 1,500 veterans work at Sandia.

The Kirtland Air Force Base Honor Guard presented the colors as the Sandia Singers, a volunteer choral group, sang "The Star-Spangled Banner."

Labs Director James Peery introduced keynote speaker Maj. Gen. John Newberry, commander of the Air Force Nuclear Weapons Center and Air Force program executive officer for strategic systems at Kirtland Air Force Base.

"I will share with you a culture that we share within this center that I call nuclear ethos," Newberry said. "This ethos represents a belief by all of us who are part of this great nuclear enterprise that what we do is critical to our nation. We bring success to the nuclear capability, and our nation depends on it for survival."

Newberry discussed the significance of Veterans Day, which marks the anniversary of the armistice that ended World War I in 1918. He shared the history and military beginnings of Sandia and Los Alamos national laboratories. He commended the workforce for working alongside the DOD to defend the nation.

"We use nuclear weapons every day to deter our adversaries," he said. "Trust me, our adversaries say 'not today' when they're thinking about doing something against the U.S. because of nuclear weapons."

CELEBRATING VETERANS — Sandia hosted Veterans Day celebrations in California and New Mexico last week. At the beginning of the celebration in California, the University of California, Berkeley honor guard presented the colors.

Photo by Spencer Toy

EXCEPTIONAL SERVICE — Maj. Gen. John Newberry, commander of the Air Force Nuclear Weapons Center, right, honors Sandia technologist and Air Force veteran Scott Waddle with a challenge coin at the Veterans Day celebration on Nov. 7 in New Mexico.

Photo by Craig Fritz

Veterans in attendance were asked to stand and be recognized for the wars during which they served, as well as asked to stand while anthem of their U.S. military branch was played. At the end of the ceremony, each veteran was recognized for their service by receiving a commemorative challenge coin.

The ceremony in California was held on Thursday, Nov. 10. It began with Chair of the Military Support Committee David Colón celebrating the establishment of the Marine Corps on that day 247 years ago. He introduced Brian, who announced that for the second year in a row, the U.S. Department of Labor awarded Sandia with the platinum

HIRE Vets Medallion Award — the only federal-level award that recognizes a company or organization's commitment to veteran hiring, retention and professional development.

The University of California, Berkeley ROTC cadets performed the presentation of the colors as the national anthem was sung by Sandia's volunteer choir, the Thundertones.

Labs Director James Peery introduced keynote speaker Gen. Kevin Chilton, who served more than 34 years in the Air Force and 11 years as a NASA astronaut and presented him with a plaque in appreciation for his service to the nation.

Chilton recognized the veterans in attendance and thanked everyone involved in honoring their service. He explained that we celebrate Veterans Day because we are grateful for the men and women who serve our country and that their service includes the support of family, community and Sandians.

"You don't just work at Sandia," he said. "You are serving the nation. The work you do on nuclear deterrence at Sandia underpins all of our armed forces. Without you, we couldn't be as free as we are today."

Tim Shepodd, senior manager for Mission Engineering Sciences, thanked the veterans and active-duty members present.

"Veterans at Sandia are not only part of our rich history, but they are making history by supporting Sandia's goal of Exceptional Service in the National Interest," he said.

The ceremony concluded with each veteran receiving a commemorative challenge coin as a token of appreciation for their dedication to the country.

A quest for STEM

By **Katrina Wagner**

Sandia participated in the Quest Science Center's Science of Engineering event this fall in Livermore. This free outdoor event in Stockmen's Park attracted more than 1,100 children and adults that enjoyed hands-on activities and learned about catapults, 3D printing and underwater robots. Sandia volunteers engaged guests with multiple activities such as pyramid slingshots and a hydrogen vehicle demonstration.

BUILDING WITH STRAWS — Creative designer Jami Butler had as much fun as the kids building a truss bridge with tape and neon straws. Kids learned about the uses of triangles in engineering.

Photo by Michelle Walker-Wade

3-2-1 LAUNCH — Technologist Adam Hoffman built pyramid slingshots to harness the potential energy of stretched rubber bands and the structural strength of combined triangles with a child at the Science of Engineering event. Community Relations specialist Michelle Walker-Wade said, "Our pyramid slingshot was a perfect activity for Quest Science Center engineering day. Kids, teens, adults; we engaged them all."

Photo by Michelle Walker-Wade

In celebration of innovation

Event honors Sandia efforts to advance the science frontier with innovative technologies

By **Paul Rhien**
Photos by **Spencer Toy**

On Oct. 16, Sandia/California hosted a hybrid Innovation Award Celebration to recognize innovators at the Labs. The annual event — which went on hiatus during the COVID-19 pandemic — honors Sandians who have developed innovative technical solutions to the nation's most pressing national security needs, spanning areas across biology, computer science, energy, materials science and more.

The event was an opportunity to celebrate people who received patents and copyrights for the intellectual property they developed at Sandia in 2021. Also honored were new Sandia innovators who received various innovation awards, including R&D 100, Federal Laboratory Consortium, Classified Innovation Recognition awards and the winner of the DOE National Laboratories Pitch Competition.

Michelle Gonzales, manager of the California Partnerships and Innovation organization, served as master of ceremonies and opened the celebration by speaking about the power to create change through innovation.

"Our inventors are rising to the occasion as we collectively evolve to meet the new, post-pandemic economy," Michelle said. "It takes an innovative mindset to create change, and each of you is at the forefront of this wave of innovation at Sandia."

Innovating at Sandia — past and present

As Sandia prepares to commemorate its 75th anniversary in 2024, Michelle noted that the Labs' history has shown creativity alone is not enough.

"While creativity leads to new ideas, the process of seeing an idea through to fruition is innovation," Michelle said. "Creativity is the spark from which new ideas grow. Innovation fans that spark, activating those ideas and putting them into action."

In recorded remarks, Associate Labs Director Andy McIlroy lauded the Sandia innovators for their patents and awards.

"These are tremendous accomplishments, and it is my great privilege to be asked to help honor and recognize all of you today," Andy said. "I hope to convey my deep admiration for each of you and the work you've accomplished. Your groundbreaking research and your commitment to entrepreneurship and technology transfer are the key to advancing the Labs' mission of creating innovative solutions to our nation's most challenging national security problems. We are inspired by each of you, and we encourage you to continue trailblazing by nurturing your creativity and your innovative mindset."

ACTIVATING CREATIVE IDEAS — Michelle Gonzales, manager of the California Partnerships and Innovation organization, served as master of ceremonies at the Innovation Award Celebration. The hybrid recognition event was held in an auditorium at the Livermore site and online.

Accelerating technology transfer at the national labs

Deputy Associate Labs Director Trish Benguerel highlighted several programs designed to accelerate the transition of technology developed at the national labs to the marketplace. These programs help researchers leverage Sandia's entrepreneurial and innovation ecosystem to identify technology gaps and open partnership opportunities.

One such program, the National Lab Accelerator Pitch Competition, took place on Nov. 16 in Palo Alto, California.

Virologist Brooke Harmon was recognized at the celebration for winning the competition last year. Brooke's pitch on partnership opportunities for her antibody therapeutics work was selected as the favorite from among the national labs in 2021.

This year, Mara Schindelholz will represent Sandia, pitching her idea for "nDetect: Tunable Nanoporous-Based Sensors for the Near-Zero Power Detection of Gaseous Pollutants."

Energy I-Corps, a key initiative of DOE's Office of Technology Transitions, is another upcoming opportunity for researchers to connect with industry mentors while learning to define technology value propositions, conduct stakeholder discovery interviews and develop viable market pathways for their technologies.

After an intensive two-month training, researchers return to their home organizations with a framework for industry engagement to guide future research and inform a culture of market awareness within the national labs.

Principal investigators interested in Energy I-Corps can contact technical business development specialist Connor Johnston to learn more about this opportunity.

Honoring innovative mindsets and actions

Susan Altman, deputy for Sandia's Energy and Homeland Security portfolio, traveled to Livermore from Albuquerque to celebrate with the California site honorees. She congratulated and thanked them for demonstrating Sandia's continued commitment to developing innovations and partnerships that help secure our nation's future.

"We look forward to seeing what new innovations you will dream up and bring to fruition," Michelle said at the close of the celebration. "We are always available to partner with you. Let's intentionally choose to chart a path forward to bring Sandia ideas to the marketplace, and let's continue to transform ideas into value propositions that are not only profitable, but deployable for the U.S. public good."

The celebration was followed by a reception to honor Sandians who received patent awards, copyrights, classified innovation recognition awards, Federal Laboratory Consortium technology transfer awards, R&D 100 awards and the DOE National Laboratories Pitch Competition winner.

CELEBRATION AND COMMENDATION — The California Partnerships and Innovation organization hosted a hybrid Innovation Award Celebration at the Livermore site on Oct. 16.

RECEPTION CONGRATULATIONS — From left, Chuck Mueller visits with Tim Shappod and Tim Briggs at the Innovation Award Celebration reception.

REMOTE RECOGNITION — During recent Sandia/California reunion events, a full-size cutout of Associate Labs Director Andy McIlroy was seen making visits across the site, including at the Innovation Award Celebration. In recorded remarks, Andy, who was unavailable to attend the event, praised innovators for their 2021 patents and other innovation awards.

Strength in numbers

New employee group attracts diverse community of soloists

By **Stephanie Holinka**

Around the end of 2020, Communications Director Frederick Bermudez put together a virtual health panel discussing the challenges facing staff during the pandemic.

Panelist Janice Duis discussed the challenges and difficulties faced by staff who were living alone. She highlighted the need to connect with others and the challenges faced by soloists, or people living in single-person households, especially in case of emergencies, and shared her strategies for maintaining resilience in the face of complete isolation at home.

After the talk, manager Carrie Colvin in California connected Site Operations Director Pam McKeever with Janice in New Mexico. Janice and Carrie formed the Living Alone and Thriving Network, with Pam as the director sponsor.

At the group's first meeting in March 2021, about 65 people showed up, which let the organizers know how great a need there was.

Today, more than 200 soloists comprise a diverse community that represents different ages, genders, orientations and personal situations at all Sandia sites. The group includes people who are single, empty nesters, divorced, widowed, married but new to the Labs, and partnered or married but not living with a partner.

"It's kind of drawn its own crowd," Carrie said. "It's so diverse it almost transcends the normal employee resource group categories as defined by the Equal Employment Opportunity Commission."

The group seeks to provide ways for people to connect.

"We don't want anyone to feel isolated or alone, without people to reach out to. It was hard for me to say that I live alone. There's often a stigma associated with living alone," Janice said.

A rising share of adults in the U.S. do not live with a married partner, with men more likely than women to live alone. A 2021 Pew Research Center analysis of census data found that in 2019 about 38% of adults ages 25 to 54 were unmarried or not living with a partner, an increase from 29% in 1990. Only about 18% of households are a nuclear family, which can impact everything from the experience of onboarding new employees to the way employee's access and use their benefits.

"Single people aren't traditionally considered a marginalized group, but there's a lot of stereotyping. It's a diversity issue but not one that's widely recognized," Carrie said.

Janice emphasized how there's a need for more flexible benefits for soloists, such as Sandia's recent Health Savings Account.

Carrie said that there's a traditional definition of family, but soloists' families may be different.

"Soloists can feel excluded. Conversations are often about children or partners. It can feel excluding. You also are the one who isn't taking off for soccer games or to care for sick children. But you might need to have consideration for a special person in your "family" who is ill or has passed or a pet that needs medical attention," Carrie said

"People may not recognize how important these relationships are for soloists. For some people, your family may be somewhere else for lots of reasons or may not look like their family, so it can be hard to talk about," Janice said.

Living Alone and Thriving is open to anyone who would like to connect with others. The group meets virtually from 11 a.m. to noon MT on the first Tuesday and the third Wednesday of each month. Past themed talks include Sandia clinical psychologist Ben Klein discussing resilience, systems engineer Gomez Sy on volunteer opportunities and a speaker from Employee Health Services discussing cooking for one.

BETTER TOGETHER — Members of new employee resource group Living Alone and Thriving meet up with Sandia's hiking club in the Sandia foothills. **Photo by Janice Duis**

NEW FRIENDS — In October, Living Alone and Thriving members met for lunch in the Thunderbird Café. Staff can find more information about upcoming events on the employee resource group's internal website. **Photo courtesy of Janice Duis**

Take a Frozen Turkey to Work Day

By **Stephanie Holinka**

Sandia, in partnership with Sandia Laboratory Federal Credit Union, hosted its annual Take a Frozen Turkey to Work Day on Tuesday to collect food and monetary donations for those less fortunate.

Turkeys were donated at Sandia by employees, and multiple Sandia Laboratory Federal Credit Union locations accepted turkeys from credit union members and the public.

The turkeys were transported to Roadrunner Food Bank and other local food pantries and will be distributed to people experiencing food insecurity.

Sandia's logistics team members dropped off 260 turkeys, and about $5,000 was collected to support Roadrunner Food Bank's work.

"Food insecurity in the state remains high, and inflation and decreased donations have greatly impacted the food bank's operations, so the need is great this year," said Will Tapia, corporate engagement officer from Roadrunner Food Bank.

The turkeys delivered to Roadrunner Food Bank will be distributed during its mobile food pantry next Tuesday, just in time for Thanksgiving preparations.

Hunger in New Mexico

Roadrunner Rood Bank has provided the following data on hunger in New Mexico and the great need faced in the state going into the holiday season.

- **One in eight New Mexicans is experiencing hunger**, or about 12.9% overall, the sixth highest hunger rate in the nation.
- **One in five New Mexico children are experiencing hunger**, or about 20.5% of all children, the second highest in the nation.
- Due to COVID-19, there has been a **62% increase in need for food to tribal communities**, who were heavily impacted by the pandemic.
- Roadrunner Food Bank reported **dramatic increases in food costs** due to inflation and supply chain shortages. Prices on canned soups have increased 124%, pastas have increased 48% and canned vegetables have increased 197%.
- **Fuel and freight costs have doubled** in the past year. Roadrunner's fleet of trucks and refrigerated truck units run on diesel fuel. Every $1 increase in the cost of diesel per gallon costs the food bank an additional $119,000 a year to continue normal operations.

PILED HIGH — Community Relations specialist Michelle Walker-Wade supervises turkeys as they are dropped off near the Steve Schiff Auditorium during Sandia's Take a Frozen Turkey to Work Day on Tuesday. **Photo by Craig Fritz**

TURKEY DROP — Geosciences engineer Lauren Wheeler drops off a frozen turkey at the Labs on Tuesday. **Photo by Katrina Wagner**

TURKEY COLLECTION — Electrical engineer Mario Martinez drops off a turkey near the Steve Schiff Auditorium on Tuesday. **Photo by Craig Fritz**

COOL DONATIONS — Frozen turkeys collected from Sandia Labs and Sandia Laboratory Federal Credit Union are unpacked at Roadrunner Food Bank on Tuesday. **Photo by Craig Fritz**

FEEDING FAMILIES — Frozen turkeys are unpacked at Roadrunner Food Bank, which has received fewer donations this year due to inflation. Donated turkeys will help feed families this holiday season. **Photo by Craig Fritz**

Nuclear Deterrence All Hands highlights achievements in 2022

By **Kristen Meub**

At the November Nuclear Deterrence All Hands meeting, Deputy Labs Director Laura McGill, Associate Labs Director Rita Gonzales and Director Michelle Stevens highlighted accomplishments and discussed current initiatives and priorities.

Laura said the nuclear deterrence mission continues to be the foundation for U.S. national defense strategy, as shown recently in the Nuclear Posture Review and the Military Defense Strategy, and that Sandia's science and technology focus is foundational to success at the Labs.

"We can't ever forget that science and technology are the basis of everything we do," she said. "It underpins our ability to bring new capability and new performance to our systems. We find discoveries and capabilities in ways we never anticipated. It helps the nuclear deterrence mission, and it helps all of Sandia."

ALL HANDS ON DECK — Deputy Labs Director Laura McGill discussed the important of the mission and Sandia's science and technology work during the Nuclear Deterrence All Hands meeting. **Photo by Lonnie Anderson**

Celebrating milestones

Rita and Michelle shared successes from fiscal year 2022, including a last production unit, program milestones, flight tests and more. Some highlights include:

- After 16 years of work, the last production unit for the W76-1 Launch Accelerometer was completed.
- The annual stockpile assessment letter was issued on Sept. 27.
- The Primary Standards Lab qualified a new ultra-high vacuum system that will benefit the nuclear security enterprise by assuring more accurate measurements and simultaneous vacuum gauge calibrations.
- The W80-4 program completed a successful baseline design review and its first integrated powered missile flight test.
- The W93 program successfully moved into Phase 2, which will focus on down selecting options for the system.
- A Minuteman III missile carried the Mk21/W87-0 Flight Test Unit 3 on a recent test that will support qualification of the Mk21 Fuze.
- Collaboration with the Kansas City National Security Campus led to an increase in producibility for W80-4 components, with producibility for 90% of components now rated acceptable or better, compared with 72% in November 2021.
- Sandia produced 50,300 parts spanning 52 components during fiscal year 2022 despite COVID-related supply chain issues, a 26% increase over fiscal year 2021 and the highest volume in Sandia's history, Michelle said.
- Nonnuclear component production for the B61-12 and W88 ALT 370 is underway, with some components for the W88 already completed and ready for assembly.

For more details, milestones and news about aspects of the nuclear deterrence program, watch the recording of the All Hands in the Digital Media Library.

Directors give back during Fall Leadership Forum

The Fall Leadership Forum is an annual opportunity to connect Sandia's leadership through engaging discussion and networking. This year's forum in November featured six service projects where leaders gave back to the community and learned about the work of multiple nonprofits in Albuquerque.

PREPARING FOR SPRING — From left, Directors Bryan Oliver, Josh Parsons and Jennifer Gauduoso work in the urban garden at the Rio Grande Food Project, a nonprofit that provides nutritious food to the community. The team winterized the garden to prepare for spring by pulling weeds and planting vegetables. **Photo by Debra Menke**

HELPING KIDS SUCCEED IN SCHOOL — Director Basil Hassan and Deputy General Counsel Marianne Hill volunteer at Albuquerque Public School Community Clothing Bank and School Supply Barn. They helped fill 218 backpacks with school supplies that will be distributed to 93 elementary schools after winter break. Sandia supports their work with the annual Stuff the Bus and Hearts and Soles campaigns that resulted in $17,000 in employee donations in 2022. **Photo by Katrina Wagner**

OATS FOR ALL — Sandia fellows Keith Matzen, center right, and Bill Miller, right, fill bags of oats at Roadrunner Food Bank during the Fall Leadership Forum on Tuesday. The oats will be included in boxes for Roadrunner clients. **Photo by Craig Fritz**

FUN WITH POWER TOOLS — Associate Labs Director Andy McIlroy drills a screw into a frame while Associate Labs Director Jeff Heath holds it in place at the New Mexico Ramp Project. The New Mexico Ramp Project provides free ramps for low-income older adults and people with mobility issues.

Photo by Michelle Walker-Wade

COZY GIFTS — Deputy Labs Director Laura McGill fills holiday boxes that contain mugs, hot cocoa and a blanket that was made by Sandians during Solve for X Day. Volunteers made 24 cards with positive sentiments for the families receiving services from Cuidando los Ninos.

Photo by Roberta Rivera

FILLING UP — Director Sarah Allendorf weighs a bag of oats at Roadrunner Food Bank while volunteering during the Fall Leadership Forum on Tuesday. The oats will be included in food boxes for local families.

Photo by Craig Fritz