



**ENERGETIC AGREEMENT** — Sandia engineer Matthew Reno examines panels at the Distributed Energy Technologies Laboratory, one of the many facilities that could be used for energy research as part of an agreement with PNM.

Photo by Randy Montoya

## PNM, Sandia partner on energy tech development

*Agreement will focus on energy resilience, clean energy, national security*

By **Michael J. Baker**

**S**andia and New Mexico's largest electricity provider, PNM, have teamed up to bring energy resilience, security and stability to the state and country.

"The partnership with PNM will address energy challenges not just in New Mexico but across the United States," said Labs Director James S. Peery. "This agreement provides a pathway for Sandia's advanced technologies to be put to the test in a real-world system, while advancing the goals of electric power system resiliency and safety that are critical to national security."

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## Into the future

*Sandia's goals and objectives look ahead to keep the Labs on track — now and down the road*

By **Nancy Salem**

It's small enough to put in a pocket, but it packs a big-time message.

Sandia has released its Five Year Goals and FY21 Objectives, summarized in a familiar trifold pamphlet, mapping out how the Labs will achieve its long-term strategic direction of anticipating and solving the most challenging problems that threaten security in the 21st century and render exceptional service in the national interest.

"Spending time developing our strategy is one of the most important responsibilities of the Senior Leadership Team because it sets the direction of the Labs," said Labs Director James S. Peery. "As a team, and with input from many, SLT collectively decides and commits to these goals and objectives."

Senior strategist Elizabeth Roll said the core of Sandia's strategy approach is based on the standard industry practice of identifying long-term direction and breaking that into actionable nearer-term pieces.

"The Labs-level strategy is organized into three parts," she said. "At the top level, we have **strategic priorities** that outline the Labs' strategic direction on a 10-year horizon, designed to 'create the future' or shape the Labs to better achieve the mission. Underneath the priorities are five-year goals that are achieved through annual objectives."

### Off the shelf

Like many multimission organizations, Sandia uses a hybrid strategic management approach — planning centrally at the Labs level and extending into the divisions and program portfolios. Sandia's

strategists believe this allows more responsive, innovative planning while elevating cross-cutting needs to higher levels to get the attention and resources they require to be accomplished.

The team rejects the common belief that strategic plans take a lot of time to shape, then sit idly on a shelf. "We bring strategy off the shelf and into the day-to-day work of the Labs," said John Foley, manager of Executive Strategic Planning. "Our objectives are real, tangible activities that look to advance the overall strategy. And we are always making tweaks and improvements to our planning approach to better impact the mission and connect across the organization and into business processes, this year in particular."

Labs strategist Cally Maloney said key changes were made to the FY21 Goals and Objectives. "The four updated Labs-level goals have more detail than in the past and better describe where Sandia wants to be in five years," she said. "And the timeline for producing the goals and objectives was deliberately pushed up a few months, from July to April, to better align with budgeting and performance management processes."

### Where we're headed

Five-year Goal No. 1 is to increase Sandia's value to our sponsors, clients and National Security Enterprise partners while enhancing their trust in us. "This means we deliver on our commitments and also serve our Federally Funded Research and Development Center role of being trusted partners and advisers," Deputy Labs Director Dori Ellis said. "We have to fulfill our missions as the price of entry to do anything else."



**STRATEGIC DIRECTION** — Labs Director James S. Peery says the strategic-planning process that produces Sandia's goals and objectives is "powerful and vital," and rooted in measurability and accountability. "We own these, and we are going to talk about and hold ourselves to them," he said.

Photo by Randy Montoya

The FY21 objectives that will help Sandia achieve the goal include delivering on top programmatic commitments such as the W80-4, B61-12 Life Extension Program and Mobile Guardian Transporter; enhancing partnerships with the Kansas City National Security Campus, Los Alamos National Laboratory and Lawrence Livermore National Laboratory; and deepening sponsor relationships with NNSA Defense Programs (NA-10) and Defense Nuclear Nonproliferation (NA-20).

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# Jackie Chen named DOE fellow

Combustion pioneer is one of eight national distinguished scientist fellows

By **Michael Ellis Langley**

**J**ackie Chen, whose work on fundamental turbulence-chemistry interactions in combustion helped advance the design of automotive, gas turbine and jet engines, has been selected by DOE as a distinguished scientist fellow — one of only eight researchers in the nation to hold the distinction.

Jackie, a senior scientist in the chemistry, combustion and materials division at Sandia's Livermore site, is a pioneer in the field of advanced computational methods to understand combustion and chemical reactions relevant to engines.

The DOE Office of Science recognition honors Jackie's career pushing the limits of supercomputers and applied math research to make engines more efficient while minimizing harmful emissions.

"It's critical that we advance every tool that we can, including the world's fastest high-performance computer, **Summit at Oak Ridge National Laboratory**. This supercomputer is capable of performing high-fidelity simulations that generate huge comprehensive sets of data to help the nation be energy efficient and evolve combustion engines to their maximum potential," Jackie said.

Her achievements include a **cool-flame ignition mechanism discovery** that is important in modern diesel engines with exhaust gas recirculation. One recent discovery also is paving the way

for the next generation of gas turbines for electricity production, focusing on using hydrogen as a fuel to reduce carbon emissions from fossil fuels and to provide flexibility to complement the rising number of renewable energy sources, like solar power, that cannot be switched on or off to fit the needs of consumers.

## Leader and role model

Throughout her career, Jackie has inspired young scientists, mentoring dozens of researchers who have gone on to work in labs, universities and industries across the nation.

She also has brought scientists from different disciplines together to solve the problems of the future, through leadership in DOE's **Exascale Combustion Co-Design Center** and the **Exascale Computing Project** on combustion simulation known as Pele, among others. Through these projects, national lab and university researchers have and are working together to improve the next generation of combustion application software optimized to exascale architectures for high-performance computing.

"Jackie's selection as an Office of Science distinguished scientist fellow is testament to her brilliant intellect, devotion and passion for her work, her strong desire for collaboration and the energy and time she has dedicated to coaching and mentoring postdocs and students who are now trusted colleagues and scientific leaders," said Sarah Allendorf, director of Sandia's chemistry, combustion and materials science center.

As an Office of Science distinguished fellow, Jackie will use her expertise and her worldwide



**HIGH PERFORMANCE** — Sandia combustion researcher Jackie Chen has been selected by the DOE Office of Science as a 2020 distinguished scientist fellow.

Photo by **Randy Wong**

connections to advance machine learning and simulate engine combustion in even greater detail, to make engines cleaner and more efficient. She hopes to connect universities and the DOE labs through a new exascale computational framework that enables machine learning algorithms to be tested as part of combustion research. She will also generate high-fidelity combustion data used to train and validate physics-informed, machine-learned models.

Jackie joined Sandia in 1982. She earned her bachelor's degree from Ohio State University, her master's degree from the University of California Berkeley and her doctorate from Stanford University, all in mechanical engineering. [i](#)



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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).

## Ambassador Billingslea visits Sandia

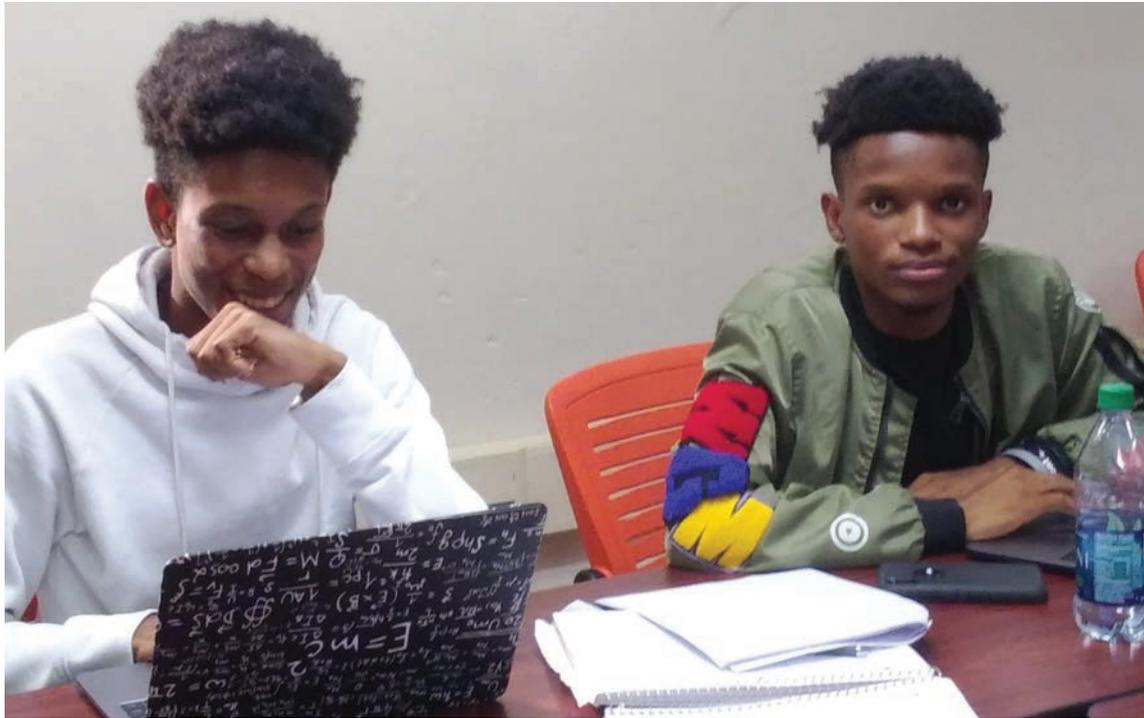


**DISTINGUISHED VISITORS** — Labs Director James S. Peery, left, hosted Under Secretary for Nuclear Security and NNSA Administrator Lisa E. Gordon-Hagerty, center, and Special Presidential Envoy for Arms Control Ambassador Marshall S. Billingslea during a visit to Sandia's Albuquerque campus on Sept. 9. The visitors received briefings related to the U.S. nuclear arms control framework.

Photo by **Lonnie Anderson**



# Cyber programs engage future workforce



**STEM FUTURE** — University of Virgin Islands academic coach Jair Smith, left, and Bashiri Smith participated in a 10-week virtual summer internship at Sandia. Both are recent graduates of UVI. **Photo courtesy of UVI**

By **Amy L. Treece**

The amount of valuable data guarded by the world's networks is immense. At national laboratories, protected information is directly tied to the mission and to the nation's infrastructure, so there's no shortage of adversaries seeking to gain access to the data or bring down the systems.

The growing demand for cybersecurity professionals around the globe puts a premium on those in the industry and makes cybersecurity a critical skills area at Sandia. This situation also emphasizes the importance that Sandia places on helping to grow the number of talented individuals available to enter the cybersecurity pipeline.

## GET SCET: cyber education

Capture the Flag is a game almost everyone knows, but the typical concept was flipped on its head this summer for the Sandia Cyber Educational Training, or GET SCET, Cyber Camp. Through this program, middle and high school participants captured "flags" in a series of cyber challenges that required them to apply knowledge they learned during several days of training.

As a member of the Consortium Enabling Cybersecurity Opportunities & Research Program, Sandia worked with the University of Virgin Islands to host a weeklong cyber camp in July for 41 students, including 16 from Albuquerque and 26 from the U.S. Virgin Islands.

Camp participants competed in the final GET SCET Capture the Flag event and, eventually, the national CyberPatriot competition sponsored by the U.S. Air Force Association. Over the course of four days, the students learned about networks, scripting, the Linux operating system, Windows systems and cryptography. When it was time for the competition, they received material and CTF questions developed by Sandia summer interns.

Casey Haynes, one of the summer interns from New Mexico Tech, provided technical insight into how his work with Sandia's Tracer Forensic and Incident Response Exercise, or Tracer FIRE, Program helped him contribute to the camp. "The GET SCET material that I authored mostly had to do with using and configuring Linux-based operating systems," he said.

"A lot of the Linux infrastructure setup I was involved with in the Tracer FIRE program helped me in writing the GET SCET material, namely in the specific area of configuring Linux security settings (configuring iptables, file and directory permissions, etc.)."

Enter the pandemic. In a normal year, activities like GET SCET would be conducted in a collaborative learning environment, but Sandia and its

partners refused to be thwarted from their educational mission by COVID-19.

Sandia's Research and Engineering Cyber Operations and Intelligence Lab, or RECOIL, and development team partnered with the University of New Mexico and UVI to transform their program into a virtual STEM experience where students could learn and enjoy the thrill of the competition.

UNM's Virtual Reality Lab hosted online virtual machines for participants, and Sandia provided detailed video lectures and electronic lab content so students could learn at their own pace up to the competition. When it was finally time for students to capture the flags, Sandia interns from N.M. Tech, the University of Colorado, Boulder, and UVI manned a live support chat to ensure all participants could ask questions as needed.

"Manning the chat desk was an interesting and rewarding experience," said Shadron Gudmunson, a volunteer from N.M. Tech. "It was challenging at times, since not all of the students knew how to explain what problems they were having, and it usually took some coaxing to figure out what they were actually having issues with. But when they eventually got it figured out, it was great to see them get even more sucked in (to the experience)."

Following the GET SCET cyber camp competition, Jair Smith, an academic coach for UVI, said, "Our territory's very own Mireille Boumedine achieved first place in the competition. Other students also indicated they would love to participate in these programs again."

The students' comprehension of the overall GET SCET content was backed up by data from surveys conducted after the cyber camp. Results showed a 29% growth in the number of students who indicated they understood a lot about general cybersecurity concepts, and a 53% growth in students who said they understood a lot about the importance of cryptography in cybersecurity.

These and other metrics demonstrate that the funding for the **NNSA Consortium Enabling Cybersecurity Opportunities & Research Program** from the **Minority Serving Institutions Partnership Program** is paying real educational dividends.

When presented with obstacles, the development team did what the Sandia workforce always does — they forged a new path along with others who were invested in the same successful outcome. At the end of the camp, the students walked away with a basic understanding of the skills they need to pursue a cybersecurity career.

## Tracer FIRE challenges students

Sandia's Tracer FIRE Program incorporates the competitive thrill of GET SCET, exponentially building on those skills for the university students and industry professionals who take part in the training.

## Cyber education programs

### Minority Serving Institutions Partnership Program

NNSA's Minority Serving Institutions Partnership Program, instituted in 2015, is designed to build a sustainable pipeline between DOE sites and laboratories and minority serving institutions with STEM disciplines. The MSIPP program provides support to historically Black colleges and universities, tribal colleges and universities and Hispanic serving institutions, offering enrichment and development activities to help students succeed and make a smooth transition into a STEM career.

### Consortium Enabling Cybersecurity Opportunities & Research Program

NNSA's Consortium Enabling Cybersecurity Opportunities & Research Program is a cybersecurity education, internship and workforce partnership created in 2015 between Sandia, Lawrence Livermore National Laboratory and 13 HBCUs. It was awarded a five-year, \$25M grant to help NNSA develop a K-20 pipeline of cybersecurity professionals to address a workforce shortage and increase the number of minority students pursuing cybersecurity careers.

The need for cybersecurity professionals is emphasized by projections that anticipate 3.5M cybersecurity job openings worldwide by 2021.

Thousands of students, from kindergarten age to college graduates, have been impacted by the broader consortium through cybersecurity education and training, K-12 programs, summer internships and bootcamps.



**CYBER SUMMER** — New Mexico Tech student Shadron Gudmunson discusses his summer cybersecurity internship experience during a wrap-up Zoom meeting with his peers and N.M. Tech professor Lori Liebrock.

**Photo by Lorie Liebrock**

The Tracer FIRE team works with academic institutions to provide students with realistic experiences so they understand what it takes to be on the front lines of the cyber war. Over the course of three days, Sandia experts on the Tracer FIRE team produce cyber incident response scenarios featuring different advanced persistent threat adversaries.

Participants then have the rest of the time each day to figure out the cyber kill chain by identifying the adversary, how they got into the network, what they wanted, whether they acquired it, and ways to prevent similar incidents from reoccurring.

The Tracer FIRE Program uses narrative-based learning, which provides participants with meaningful context for the training content and helps to further cement the new information and processes in their minds. In the network environments constructed by Sandia, participants can safely interact with live malware while recognizing adversarial tactics within the context of the kill chain. Knowing how to confront these exact types of situations will be critical to the students if they continue in the field.

Tracer FIRE and other events such as GET SCET take Sandia's RECOIL team a lot of time and effort to organize and execute, but it's an investment Sandia believes will pay dividends by fueling the much needed cybersecurity talent pipeline.

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# Turning up the heat on molten salt valves

*\$2.5 million DOE grant to advance critical component for concentrating solar power*

By **Luke Frank**

**S**andia is partnering with Flowserve Corp. and Kairos Power LLC on a \$2.5 million, three-year DOE Advanced Valve Project grant to lower the cost and boost the efficiency of concentrating solar power in the U.S.

Control valves are a critical link in managing the solar energy captured by next-generation concentrating solar power plants. They must safely and reliably collect, store and transfer extremely hot and corrosive chloride salt to be used for generating electricity for public use.

A vastly more reliable, higher-temperature molten salt valve is vital in achieving **DOE SunShot** targets that will significantly lower power-generating costs while increasing production. DOE's SunShot initiative aims to reduce the total costs of solar energy, making it cost competitive at large scale with other forms of energy without subsidies by the end of the decade.

"We're expecting to support significantly bringing down the concentrating solar power leveled cost of energy to 5 cents per kilowatt-hour, per DOE 2030 baseload targets," said Ken Armijo, Sandia's principal investigator on the project.

The project will investigate a newly designed molten salt valve as part of a complete solar energy management system. If successful, these redesigned valves also can be used for energy transfer in other fields, including nuclear energy and petrochemical industries.

## Molten salt valve challenges

Concentrating solar power systems must handle molten chloride salt temperatures that can reach in excess of 750 degrees Celsius, or nearly 1,400 degrees Fahrenheit.

Concentrating solar power and other energy sources super-heat liquid, which is then pumped through a network of pipes and transported to a power station to generate electricity. Molten salt is the preferred liquid for delivering and storing lava-hot liquid energy because it retains its viscosity, as opposed to water, which prematurely converts to steam under such extreme temperatures. Molten salt also provides a more consistent temperature throughout the power plant during energy collection and delivery.

Proportional flow-control valves serve as the piping-system gatekeepers for delivering this harvested energy to the production side of a power plant. These valves are continually confronted with extreme temperatures, pressures and flow rates, and oftentimes, extraordinarily low outdoor temperatures. Valve freezing and thawing due to the vagaries of weather can create expanding and contracting materials resulting in weaknesses in the system, Ken said.

"Molten salt flow valves must maintain constant heat transfer and fluid flow, despite severe temperature variabilities."

As concentrating solar power plants become increasingly larger and more productive, system components like flow-control valves must withstand even more extreme conditions to perform reliably.

"As we go to higher temperatures in these systems, there's a penalty we pay with thermal expansion," he said. "Under extreme heat and pressure, materials and components can swell, bend and warp."

Current molten salt valves require expensive, frequent maintenance, Ken said. But perhaps a bigger challenge is that molten salt valve failures can occur frequently throughout the system, resulting in expensive downtime to repair or replace the valve and repack and replace the seals.

Add the corrosive properties of salt, and you have a recipe for repeated breakdowns. If a valve failure is happening on a monthly basis in systems with between 10 and 15 valves, the system can be inoperable for days, weeks or even months. The associated loss of revenue can render these systems unsustainable.

## New materials, design

Today's molten salt valves are formed with expensive chromium-based materials that are



**EVEN FLOW** — Improper or inadequate thermal management in a concentrating solar power system can cause bellows or packing damage on a molten salt valve, leading to valve failure. **Photo courtesy of Ken Armijo**

susceptible to corrosion, and high nickel-based materials generally do not have the strength at these high temperatures. Sandia will focus on developing less expensive base materials for the valve and adding a durable clad composite overlay to withstand corrosion, increasing durability while significantly reducing manufacturing costs.

In addition to the materials upgrade, innovative trim design elements would automatically buffer pressure surges and pulses as molten salt passes through, while dissipating heat to avoid valve damage. The new design also would enable use of reformulated packing materials to create a modular quick-change system for replacing costly bellows seals, which can rupture if activated with frozen salt present, Ken said.

Another major valve reliability issue is internal salt freezing from low outdoor temperatures, which can cause mechanical stress on valve stems, seals and bonnets. An innovative feature within the valve should address this freezing issue by carrying heat through the valve stem to the packing area, thus maintaining a constant internal temperature and reducing operations and maintenance, he said.

"It's the temperature differences along the valve that can cause leaking problems with gaskets and seals," Ken said.

The self-contained thermal management system is expected to reduce material stress and fatigue that can rupture pipe and valve systems and improve component longevity. "We'll fine-tune controls to keep the valves at a uniform temperature," he said.

The advanced valve design also will employ innovative gaskets, seals and packing to reduce maintenance demands. "And, the new design can include pressure and flow sensors on the valves themselves, which will reduce the cost of having to add pressure and flow sensors throughout the system."

This self-contained, integrated thermal management system should dramatically reduce the leveled cost of electricity — the cost of the system divided by lifetime energy output — which has become increasingly competitive for developers to win solar projects.

These performance upgrades also will address DOE's **Generation 3 Concentrating Solar Power Systems program**, which calls for advancing high-temperature concentrating solar power

components and developing designs with thermal energy storage that can reach high operating temperatures.

## Powerhouse partnership

The partnership, with decades of experience in researching and developing molten salt systems, will examine new control-valve materials, design and modular features to withstand extreme temperatures and pressures associated with costly valve failures.

Sandia has more than 40 years of experience in research and development for advanced concentrating solar power systems and components, particularly for molten salt technology. The Labs will test potential materials using a chloride-salt blend within its chemistry laboratories. The valves will be evaluated for their corrosion resistance, material loss and mechanical strength under several scenarios at Sandia's **National Solar Thermal Test Facility**.

"Sandia Labs has been known for materials research for more than 70 years," Ken said. "We can perform very high-temperature new-material tests for ceramics, metal alloys and composite materials. Very few facilities in the world can do this."

**Flowserve Corp.** has experience in analytical methods for high-temperature and high-pressure fluids, and system evaluation for molten salt applications globally. The company will develop two competing stem-sealing systems, comparing a bellows design with a quick-change packing canister design. Both designs could potentially use the self-contained thermal management system.

**Kairos Power LLC** will construct an isothermal-batch flow-valve test system to investigate valve performance and reliability up to a 750 degrees Celsius operational temperature. Kairos also will perform reliability assessments on the prototype 2-inch valve and lead valve validation experiments at its facility.

Sandia will coordinate all research and development efforts for the project.

Ultimately, this project should help make solar energy generation more affordable by decreasing flow-valve cost using less expensive materials, eliminating the need for multiple sensors on the system and reducing maintenance and repair downtime, Ken said. 

# Recent Patents

Jan.-June 2020

- **Ivan Lizarraga and Katherine M. Simonson:** Apparatus, system and method for highlighting anomalous change in multipass synthetic aperture radar imagery. Patent #10535127
- **Gabriel Carlisle Birch, Jon David Bradley and Amber Lynn Dagle:** Compressive sensing optical design and simulation tool. Patent #10539783
- **Dianna S. Blair, Patrick L. Feng and Heidi A. Smartt:** Fluorescent compositions. Patent #10538701
- **Darryn Fleming and Salvador B. Rodriguez:** Low pressure drop advanced swirl technology gas filter. Patent #10537839
- **Sung Nam Choi, Tam Dang Le and Susan Washburn:** Methods and systems for authenticating identity. Patent #10541996
- **Bryan James Kaehr:** Shape-preserving polymeric replication of biological matter. Patent #10538632
- **Liam D. Claus, Andrew Montoya, Sean Pearson, Gideon Robertson and Marcos O. Sanchez:** Pattern generator circuit for high-speed pulse generation. Patent #10547805
- **Dorina F. Sava Gallis, Jeffery A. Greathouse and Tina M. Nenoff:** Compositions, systems and methods for selective porous material oxygen separation. Patent #10549261
- **James A. Ohlhausen:** Global analysis peak fitting for chemical spectroscopy data. Patent #10551247
- **Andrew A. Allerman, Andrew Armstrong, Albert G. Baca, Erica Ann Douglas, Robert Kaplar and Carlos Anthony Sanchez:** Regrowth method for fabricating wide-bandgap transistors, and devices made thereby. Patent #10553697
- **Marie Yvette Arrieta, Matthew David Carlson and Bobby Middleton:** Cooling systems and methods for thermoelectric power generation. Patent #10563923
- **Steve Xunhu Dai:** Interfacial bonding oxides for glass-ceramic-to-metal seals. Patent #10562815
- **Kurt O. Wessendorf:** Supply-noise-rejecting current source. Patent #10566936
- **Felipe Wilches Bernal, Raymond H. Byrne, Abraham Ellis and Jason C. Neely:** Communication enabled fast-acting imbalance reserve. Patent #10574056
- **David Bruce Burckel, Christopher Dyck, Patrick Sean Finnegan, Timothy N. Lambert, Lee Taylor Massey, Cody M. Washburn and David R. Wheeler:** Fabrication of multilayered carbon mems devices. Patent #10570010
- **Michael McDaniel, Michael B. Sinclair, Heidi A. Smartt and William C. Sweatt:** Non-contact rapid reader system for reflective particle tags. Patent #10572786
- **Eric Allcorn:** Aqueous Na-ion redox flow battery with ceramic nasicon membrane. Patent #10586997
- **Laura Biedermann, Paul Crozier, Brian P. Dwyer and Kevin R. Zavadil:** System and method for cooling using a heat exchanger having a membrane. Patent #10584926
- **Yooli Kim Light and Anup K. Singh:** Method and apparatus for purifying nucleic acids and performing polymerase chain reaction assays using an immiscible fluid. Patent #10590477
- **Jason Hamlet and Mitchell Tyler Martin:** Using wire traces to determine the authenticity of electronic devices. Patent #10594492
- **Bryan James Kaehr:** Battery cell with safety layer. Patent #10608236
- **Bryan James Kaehr:** Cell-based composite materials with programmed structures and functions. Patent #10605705
- **Clinton G. Hobart and Mark J. Monda:** Aiming system. Patent #10613040
- **Eric Nicholas Coker:** Preparation of asymmetric porous materials. Patent #10610822
- **Hung Loui:** Ultra-wideband mutual coupling compensation of active electronically scanned arrays in multi-channel radar systems. Patent #10615495
- **Liam D. Claus, Paul C. Galambos and Randolph R. Kay:** Compact radiation detector. Patent #10620326
- **Todd Bauer, David Bruce Burckel, Michael David Henry and Andrew Pomerene:** Kinematic chip-to-chip bonding. Patent #10620377
- **Tomas Farley Babuska, Rand Garfield and Brendan L. Nation:** Cryogenic heating system. Patent #10627050
- **Mark Richard Claudnic and Anup K. Singh:** Fluid delivery manifolds and microfluidic systems. Patent #10627366
- **Carlton F. Brooks, Amanda B. Dodd, Martin Nemer, Christine Cardinal Roberts and Bart Gustaaf van Bloemen Waanders:** Magnetic sensing to determine material flows. Patent #10627269
- **Brooke Nicole Harmon and Oscar Negrete:** Methods for treating diseases related to the wnt pathway. Patent #10624949
- **Hongyou Fan and David Rosenberg:** Synthesis of energetic material particles with controlled morphology. Patent #10626061
- **Timothy J. Boyle:** Thallium salen fluorescent tracers. Patent #10626127
- **John H. Gauthier and Nadine E. Miner:** Methods, systems and computer program products for determining systems re-tasking. Patent #10635985

*Note: Patents listed here include the names of active Sandians only; former Sandians and non-Sandia inventors are not included.*

*Following the listing for each patent is a patent number, searchable at the U.S. Patent and Trademark Office website (uspto.gov).*

- **Paul C. Galambos, Khalid Mikhiel Hattar, William Mook, Katherine Leigh Jungjohann and Andrew Jay Leenheer:** Active mechanical-environmental-thermal MEMS device for nanoscale characterization. Patent #10641733
- **Nelson S. Bell and Nancy A. Missert:** Lithium battery cathode. Patent #10651461
- **Sapan Agarwal, James Bradley Aimone, Conrad D. James and Tu-Thach Quach:** Memory access system. Patent #10649663
- **Erica Ann Douglas, Michael David Henry and Travis Ryan Young:** Scalm etch mask for highly selective etching. Patent #10651048
- **Moo Y. Lee, Byoung Park, Barry L. Roberts and Steven R. Sobolik:** Systems, methods and computer program products for constructing complex geometries using layered and linked hexahedral element meshes. Patent #10657301
- **Christopher Todd DeRose and Michael Gehl:** Design of high-density optical waveguide using hybrid spiral pattern. Patent #10663662
- **Matt Eichenfield, Thomas A. Friedmann, Andrew Jay Leenheer, Aleem Siddiqui and Anna Tauke-Pedretti:** Hybrid semiconductor-piezoacoustic radiofrequency device. Patent #10666222
- **Steven F. Glover and David G. Wilson:** Nonlinear power flow control for networked AC/DC microgrids. Patent #10666054
- **Ryan Wesley Davis and Mary Bao Tran-Gyamfi:** Biochemical upgrading of high-protein biomass and grain products. Patent #10683519
- **Owen Johns and Sean Simpson:** Photonic-crystal-fiber-delivered laser-triggered high-voltage gas switch. Patent #10687412
- **Jason Hamlet:** Dynamic signature generation from keystroke dynamics. Patent #10693661
- **Katherine M. Simonson:** Apparatus, system and method for highlighting activity-induced change in multi-pass synthetic aperture radar imagery. Patent #10698104
- **Ronald P. Manginell, Matthew W. Moorman and Kent B. Pfeifer:** Miniaturized pulsed discharge ionization detector, non-radioactive ionization sources, and methods thereof. Patent #10697934
- **Todd Bauer and Jason Hamlet:** System for authenticating an additively manufactured object. Patent #10700872



**SIGN OF THE TIMES** — Sandia researcher Willis Whitfield wears a mask, in keeping with the current rules for on-site work. The statue honoring Whitfield, who pioneered the laminar flow cleanroom design, sits in front of the [MESA Complex](#) at Sandia's Albuquerque campus. Several facilities in the complex include cleanrooms based on his designs.

Photo by Perry Molley

## Into the future

CONTINUED FROM PAGE 1

“We are committed to strengthening our partnership with the other labs and plants. It’s crucial to our ability to deliver on our commitments,” Nuclear Deterrence Associate Labs Director Steve Girrens said.

To accomplish that, Goal No. 2 seeks to radically improve how, and how quickly, Sandia delivers the mission. The objectives lay out new approaches to engineering to bolster innovation and speed on weapons programs. “That we have something so specific to accelerating engineering and mission work is a new focus of the Labs strategy,” Steve said. “It will take all of the Labs to achieve.”

National Security Programs ALD Mike Burns added that Sandia must do its most impactful work for national security. “Our work must align with our capabilities and mission as an NNSA laboratory,” he said. “We must find applications of our core capabilities to make significant and unique national security impacts in order to develop those capabilities for NNSA.”

FY21 Objectives include partnering with NA-10 on independent peer reviews, expanded use of modeling and simulation, and advanced portfolio strategies to shape future programs for the Labs.

Goal No. 3 is about people — that Sandia continues to be recognized as a great place to work and have exceptional national impact. Objectives address flexibility in work schedules, telecommuting, benefits and career opportunities. “We want people to enjoy what they do and perform important work with national impact,” Global Security ALD Doug Bruder said.

Human Resources and Communications Senior Director John Myers said the goal “moves us toward a stronger work environment that engages all employees, develops talent throughout employees’ entire career and cultivates impactful, inspiring leaders.”

Advanced Science and Technology ALD Susan Seestrom said Sandia has a well-known and robust research portfolio and set of strong university partnerships. “That helps us ensure we have engaging work and a pipeline of diverse talent,” she said.

Goal No. 4 looks at operations — to effectively and efficiently operate with agility and resilience. Key objectives are to modernize Sandia’s information technology and develop facilities and infrastructure master plans. It includes a continuing effort to streamline processes and reduce the administrative burden on managers so they can focus on supporting staff, developing teams and working with customers and partners.

“We need to ensure our operations are agile, adaptable and responsive to changes in the environment so that we can continue to execute our important work under any circumstance,” Mission Services ALD Scott Aeilts said.

Integrated Security Solutions ALD Andy McIlroy added that it is crucial to improve the integration and efficiency of Sandia’s mission-enabling services. “We plan to innovate by expanding the Integrated Service Delivery approach we’ve practiced in California through targeted pilots in other parts of the Labs,” he said.

### Data, themes and a plan

The FY21 Goals and Objectives were developed over three months. Each SLT member was asked for thoughts on what Sandia should be preparing for over the next five years. Data was collected and the leaders came together in a meeting where themes were developed and a final set of goals took shape. Directors and fellows provided feedback that was incorporated into the goals at a second SLT planning meeting.

The goals were finalized and, in a scoping process, owners of the objectives defined what was achievable and outlined milestones by quarter,

## Get involved

Employees can read Sandia’s [FY21 Goals and Objectives](#), learn more about the Labs’ strategic planning process and find out how to get involved at [strategicplan.sandia.gov](http://strategicplan.sandia.gov).

resources, benchmarking and funding.

“We were able this year to put our money where our mouth is and allocate more than \$1 million specifically to make it possible to achieve those objectives,” Dori said. Sandia’s Portfolio Management Tool will be used to track and report progress on the milestones back to SLT in quarterly check-ins.

“Each goal has a team behind it led by SLT members, directors and staff to help with the reporting,” Elizabeth said. “It’s an exciting, dynamic process as themes arise and take shape.”

In his first set of goals and objectives as Labs director, James emphasized measurability and accountability. “These objectives are going on our (SLT) and directors’ PMFs (performance goals), thanks to the timing change,” he said. “I want SLT to dedicate more time each quarter to discussing each of the objectives. We own these, and we are going to talk about and hold ourselves to them. Accountability is important.

“I’m excited about building on these themes and owning the future of the Labs. All parts of the Labs are touched by them, especially in how we deliver the mission,” he said. “Any organization can look at these and say, ‘How can I contribute? Who are my customers and how am I advancing those relationships? What do I need to do to better deliver the mission? And what am I doing for our people, for our operations?’ People can lean into the goals and align with them. That’s a powerful and vital process.” 

## Future cyber workforce

CONTINUED FROM PAGE 4



**TALENT PIPELINE** — New Mexico Tech student Casey Haynes, left, and University of Colorado, Boulder, student Elijah Aldinger used their cyber skills to contribute to both the GET SCET and Tracer FIRE programs. **Courtesy photos**

### Turning up the Tracer FIRE heat

Over the summer, Sandia’s Tracer FIRE team had multiple opportunities to work with local academic institutions in developing and executing the program, and also in growing the potential impact of Tracer FIRE across the country.

One important lead-in to Tracer FIRE’s summer started in the spring when Linnea Sands, Sandia Academic Alliance technical partnerships development specialist, approached Marcus Chang, director of cybersecurity and mission computing, with a proposal to stand up a Sandia Research Institutes pilot at New Mexico Tech. Marcus immediately saw the merit and helped to facilitate funding and management support.

N.M. Tech Director of Cybersecurity Centers and principal investigator Lorie Liebrock selected the students using criteria offered by the Sandia managers over Computer Systems Security Analysis Research & Development and Cyber Enterprise Security. Liebrock had already arranged for her research group to work remotely, so the transition to Sandia’s Tracer FIRE team was seamless, even in the midst of COVID-19.

“The students worked full-time through mid-August on two projects,” Liebrock said. “They also enhanced existing Tracer FIRE scenarios and created new ones for a Capture the Flag event held this summer.”

The N.M. Tech students also worked with other Sandia interns to create challenges built around four educational areas for the advanced Tracer FIRE 10 program.

“For me, the Tracer FIRE program was a great introduction to working with cybersecurity

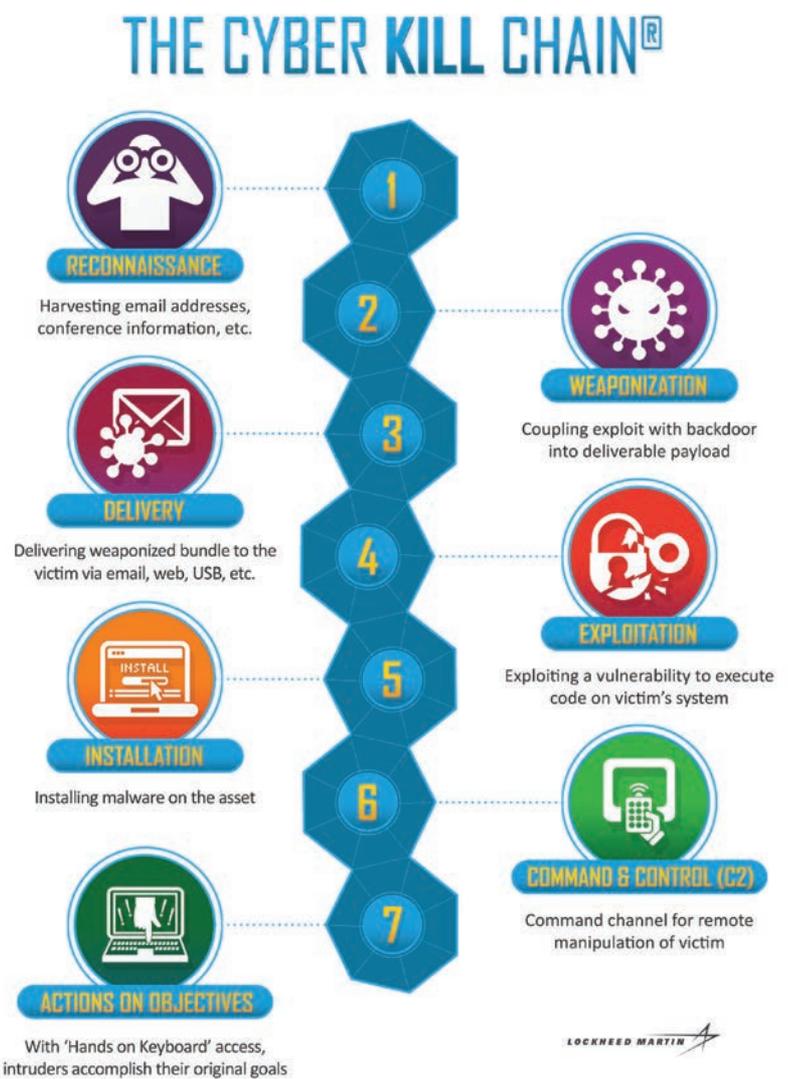
directly for the first time,” said Elijah Aldinger, a participant from UC Boulder. “It was fulfilling to build the individual components for the platform and see them actually run and get used during the simulations.”

The Sandia RECOIL and development teams also met with participating N.M. Tech faculty and provided them with the needed infrastructure, including the virtualization and forensic analyst environments. They discussed how to design attack chains, write narrative storylines, run attack simulations, create Jupyter notebooks to allow for the creation/sharing of live code, and document threat reports.

Linnea, who helped facilitate the pilot, believes the collaboration between Sandia and N.M. Tech was successful in multiple aspects. “Helping students prepare for their future field takes real world application. The interns participating in the Sandia Research Institutes pilot were able to not only develop their own skills by working at the Labs, but able to parlay that experience by crafting content to help other individuals develop their abilities,” she said

The week of August 17, a Tracer FIRE Workshop training was held with a group of academic institutions, including the University of Illinois, Purdue University, North Carolina Agricultural & Technology State University, Norfolk State University, Auburn University, N.M. Tech, University of Maryland Baltimore County and Embry-Riddle Aeronautical University.

The Sandia team laid out the goals, structure and anticipated outcomes of the Tracer FIRE exercise and then highlighted how universities who chose to host an event could magnify the benefits by using a



**NEUTRALIZING THE THREAT** — A diagram of the Cyber Kill Chain shows the detailed steps needed by cybersecurity professionals who are working through cyber incidents. **Image courtesy of Lockheed Martin Corp.**

cascade mentoring strategy where their own students experience the exercise, learn how to plan a Tracer FIRE event, and then assist in teaching other students.

The Sandia team also walked through the logistical intricacies involved with putting on a virtual cyber event, which they had experienced for the first time when running the GET SCET camp in July.

Tommie Kuykendall, Sandia’s CECOR project manager who helped coordinate the workshop, said, “Events like these allow us to spread the word about all of the great things Sandia does and is about. Tracer FIRE, in particular, has been a great tool to connect with minority serving institutions across the country.” 

# Working parents meet virtual challenges

Sandia resources, support networks enable remote work



**MULTITASKING MOM** — Lindsey Gloe Hughes, one of the organizers of the Sandia Parents Group monthly lunch meetings, works remotely with her husband Brice, also a Sandia employee. They have three young children. **Photo by Lindsey Gloe Hughes**



**CHANGING STATIONS** — Megan Greenwald-Yarnell and her family coped with the added challenge of moving across the country during the pandemic when her husband was stationed in Alabama. **Photo by Megan Greenwald-Yarnell**

By Valerie Alba

With school closures, partial reopenings, at-home learning and uncertainty due to the COVID-19 pandemic, Sandia parents are finding ways to meet their work commitments while balancing the unique needs of their family schedules, including taking advantage of Sandia resources, receiving management support and finding outside networks. Sandia parents have shared with Lab News what works for them.

## Finding balance

Supporting Human Resources, program communications specialist Lara Adams is working from home part-time while parenting two sons. As with many other parents, she finds that her schedule has shifted to balance work, school, personal time and housework.

“Both of my sons are attending school online,” she said. “My oldest, ninth grade, is handling online school surprisingly well, although he’d rather be going in person. My seventh grader has autism and needs an educational assistant to keep him on task and help with classwork. His teacher and classroom EAs do their best to keep him engaged virtually, but it falls on me to be his in-person EA.”

Lara tries to find time to take a walk or do yoga during the day and, she said, “I’m incredibly fortunate to be able to do my job from home and grateful that my management supports telecommuting and flexible work hours.

“My core workday and meeting availability has shortened to noon to 6 p.m., so now I have to work evenings and weekends to get everything done on top of housework and finishing up schoolwork, which means I have a hard time finding time to take care of myself. Because I’m working such odd hours, and at home it is so easy to just keep working, to just finish this one last thing, then another last thing, and so on, it’s hard to call it quits for the day.”

## Moving during a pandemic

A systems analyst in Sandia’s Human Factors department, Megan Greenwald-Yarnell has been at Sandia for two years and had just returned from maternity leave in January. Then the COVID-19 pandemic arrived. “I was just getting my feet under me in March when we all started working off-site,” she said. Megan has two children: a 3-year-old and an infant.

“At first, we pulled (the kids) both out of daycare because we didn’t know what to do. My husband and I are both very logical so it was hard to do that risk calculation that quickly. So, we panicked and we decided to keep them at home, and it was so hard. We had them at home for about two weeks. The first week, we tried to do it completely ourselves.”

The children returned briefly to daycare, and then their family had to make an enormous change in the midst of the pandemic.

Megan’s husband is a major in the U.S. Air Force, and they have relocated frequently. Over the summer he was transferred from New Mexico to Maxwell Air Force Base in Alabama. “Relocating during the pandemic was really hard. My husband and I move a lot, and we had moved once before

with a kid. We kind of thought we knew what we were doing, but it’s so much more difficult when you’re trying to adhere to social distancing guidelines and keeping the kids safe and minimize the places that you take them,” she said.

Finding time for herself and occasionally getting out of the house for short outings has helped Megan manage the stress of the transition. She also hired a nanny to provide in-home childcare so she and her husband can focus on work during the day and not risk sending the children to daycare. “There’s a relief in knowing I can shut my office door and do some work and have some peace and quiet.”

## Sandia couple balances remote work, parenting

As a coordinator of the Sandia Parents Group monthly lunch-and-learn series and a mother of three young children, systems engineer Lindsey Gloe Hughes also understands the challenges that parents are facing while working from home. She has been with Sandia for 10 years and recently transitioned to her new role from her previous job as a technologist in the organic materials group. “It’s been an added layer of chaos with the pandemic,” she said. Her husband Brice, a mechanical engineer, also works for Sandia.

Lindsey works part-time to balance work and the needs of her 6-, 4-, and 2-year-old children. Managing the kids’ school schedules, especially for their first grader, has been so hectic that they have chosen to homeschool her to take advantage of a more flexible school schedule.

Lindsey has managed her time by waking up early, shifting her schedule and giving the kids a little bit of screen time so she can focus on work. She and Brice occasionally return to the Sandia site to meet mission deliverables.

“Since my husband and I are both primarily working from home, we try and let each other know when we have meetings that we really need to focus on, and we do our best to try and avoid dueling meetings as much as possible. Both our workspaces are in common areas of the house, so we have easy access during the day, but there are times I’ve retreated upstairs to have a quiet conversation.

“I work early in the mornings, small periods of time in the mornings. I have a stretch after lunch where my little guy naps and I can get work done, then I get back on after they are all in bed and get a few more hours in,” she said.

She added that working remotely also has its advantages. “The biggest benefit for our family is that now that we are primarily home, we are eating all our meals as a family, rather than me getting dinner ready and kids fed while my husband is still at work. We have the chance to get out and go for family walks and bike rides more often during the week.”

## Sandia resources for parents

The Sandia Parents Group has grown steadily to more than 400 members across the Labs, with the goals of helping Sandia parents thrive and connect with others while maintaining balance and giving back to the community. The group has made

available numerous resources for working parents, including lunch-and-learn sessions, seminars for new employees and a comprehensive website.

“Many of us are facing some of the most difficult times in our lives,” SPG Chair Christina Beppler said. “We are wedged between maintaining ‘exceptional service’ to Sandia and our nation while also ensuring our families’ needs are met. Many of us have found that there are no ‘off hours’ anymore and that our personal and professional lives have blended together more than ever.

“I wanted to thank all of our fellow co-workers and leaders who are understanding and adjusting to the needs of working parents, especially as many of us adjust to a school year conducted remotely. I also want to thank all of the Sandians who donated to the vacation donation program. Their generosity is much appreciated! Finally, I want to thank my fellow parents for hanging in there while working and raising their families during extremely uncertain times,” she said.

This year, Sandia also has offered flexible work schedules for parents who are juggling childcare and work commitments, an expanded temporary vacation donation program, extended open enrollment for benefits options, and support for caregivers. Information about those programs is available at [hr.sandia.gov](http://hr.sandia.gov).

“The SPG will continue to deliver support and resources to working parents and raise the needs of working parents to our Labs leaders. If anything, COVID-19 has brought issues that already were affecting working parents (adequate childcare, paid leave and flexible work options) to the forefront and showed why employee parent groups are increasingly a necessity in innovative workplaces,” Christina said.

“In the next few months, we will pilot a mentoring program aimed at engaging and retaining working parents who need additional professional resources to help them over the next year or so.”

## Parent Relief Project

The Parent Relief Project, launched in the spring, has aimed to address the needs of parents who do not have traditional childcare, due to the pandemic. Led by Bianca Thongchua, the team comprises current and former Sandia Parents Group members.

Championed by executive leadership, the team has surveyed Sandia parents and other employees to identify their childcare needs and challenges, and to seek creative solutions. The results showed that most parents are parenting young children (zero to 11 years old), and most are parenting one to two children. The survey identified that parents are most in need of the flexible schedule and remote work options and management support that have been offered to employees throughout the pandemic.

The team’s successes include developing a **SharePoint-based tool** to match parents with potential caregivers and childcare providers and expanding the leave of absence policy to encompass childcare needs.

# Sandia Gives, now more than ever

Labs employees show up for neighbors in times of need

By **Katrina Wagner**

In February, when things seemed normal, the **Alameda County Community Food Bank** in the Bay Area reported that about one in five community members were experiencing hunger. By late March, when the financial implications of the COVID-19 crisis were being felt by so many, the food bank experienced an increase in call volume to their food helpline by 1,000% and were expected to respond to a dramatic increase in need while facing the same uncertainties as everyone else.

Stories like this are not uncommon among agencies that provide community services like food assistance, shelter and education in times of need. The Sandia Gives campaign begins Oct. 5. This annual event provides an opportunity to give back through the United Way organizations of Central New Mexico and the Bay Area, and your participation is needed now more than ever.

According to **IndependentSector.org**, 83% of large and midsize nonprofit organizations have experienced a reduction in revenue, 71% have responded with a reduction in services provided and 53% have experienced a reduction in individual giving as a result of the pandemic.

Nonprofit organizations that provide needed resources like food and housing assistance rely upon contributions from donors to survive. Traditional in-person fundraising events like galas, charity walks and golf tournaments have been canceled to comply with social distancing recommendations, and donors themselves may be experiencing financial hardships that prevent them from contributing.

The Alameda County Community Food Bank partners with more than 290 food pantries, soup kitchens and nonprofit organizations in the Bay Area to provide millions of pounds of fresh food to community members. When the pandemic hit the county, layoffs and furloughs were staggering and there was an incredible surge in demand. In order to provide the increased amount of food to the community, the food bank had to purchase additional food; their costs have more than tripled since 2019.

Juan Francisco Orozco, food bank corporate and foundation relations manager, said “unemployment was at 3% and jumped to 15% when COVID-19 impacted people primarily in the service industry.”

In addition to decreased donations and contributions, some volunteers the food bank relies on were at high risk and were unable to help sort and distribute food, increasing the challenge of getting food assistance to those in need.

The Alameda County Food Bank has a team of researchers who use data like high-interest car loans in the area to determine potential food assistance need. “During this pandemic, having a team of researchers on our staff has been invaluable to our ability to quickly pivot and track emerging need to access food, overlay it with our network’s reach to provide food services, identify gaps and operationalize strategies to cover those gaps,” Orozco said. “Access to food is something everybody needs.”

## Your contributions matter

Sandia makes it easy to support our communities by conveniently giving to the **United Way of Central New Mexico** through payroll deductions. You may choose to allocate your donations to United Way or opt to give to other charities that support our communities.

If you’ve never given before, now is your chance to show up to improve someone’s life during the Sandia Gives campaign. You could help a family in need of shelter, help a single mother learn how to read so she has a better chance of obtaining good employment,



**HOME MATTERS** — Sandia volunteer Rachel Silva puts the finishing touches on the master bedroom in a Saranam apartment as a family experiencing homelessness prepares to move in. **Photo courtesy of Saranam**



**FOOD SERVICE** — A volunteer prepares fresh produce for donation at the Alameda County Community Food Bank. **Photo courtesy of the Alameda County Community Food Bank**

or help a community have access to nourishing food. Now more than ever, your contributions are needed to support the nonprofit organizations that care for the communities where we live and work.

## Organizations offer community support

**New Day** provides shelter and teaches life skills to youth experiencing homelessness in Albuquerque. They have moved to a virtual system for their Life Skills Academy, which teaches youth life skills such as doing laundry, grocery shopping, budgeting, relationship skills, financial literacy and interview skills.

“It’s hard to take a human services program and make it virtual,” New Day Executive Director Steve Johnson said. But they have been successful in using technology to help their clients.

Teaching life skills classes 100% online has given New Day the opportunity to expand services anywhere in the country. “Some youth are in treatment centers in other states but can now participate in the life skills courses virtually. This creates a bridge that never existed before,” says Johnson.

The United Way of Central New Mexico has partnered with New Day for about nine years and helped found the Life Skills Academy with community impact funds.

**Reading Works** is a nonprofit adult literacy program that provides free literacy and English as Second Language tutoring. Acting Executive Director Esodie Geiger said there are about 46 million people in the U.S. who cannot read, and about 21% of the adult population in Albuquerque doesn’t have a high school diploma or speak enough English to thrive economically.

“In our organization alone, 84% of the adults in our program read at or below the 5th grade level. I guarantee you that right now these folks are struggling tremendously. With most services being closed, they’re having to fend for themselves and their children and it’s much harder than even what they’re used to,” Geiger said.

“Having basic literacy skills gives people a chance to navigate the world around them in the best of times, but most importantly during crisis,” she said, adding that low-level readers learn best face to face. About 80% of the readers in their program live below the poverty line and don’t have access to technology or the internet, putting them at a disadvantage for participating in virtual learning opportunities.

**All Faiths Children’s Advocacy Center** is a behavioral health agency specializing in the treatment of families, children and their caregivers who



**LIFE SKILLS** — A tutor and student work on literacy skills at Reading Works. Services are now offered virtually due to the pandemic. **Photo courtesy of Reading Works**

are struggling due to issues of divorce, homelessness, child abuse and family violence. All Faiths also operates the Children’s Safehouse, which provides age-appropriate, legally defensible forensic interviews for children and developmentally disabled adults who have been the alleged victim of sexual or physical abuse or have witnessed a violent crime. The average client is a 9-year-old girl, sexually abused by someone she knows and trusts.

The pandemic has impacted the way All Faiths provides services. Therapy for children and families can no longer be done in person and is conducted virtually, though the Children’s Safehouse is still providing in-person services. Virtual counseling sessions provide the opportunity for therapists to offer real-time parenting help to clients. Donations to All Faiths help provide families with case management that includes practical needs such as bus passes to help a parent get to work, steady shelter and food assistance.

“It is therapy along with case management that helps a family heal. We want families to thrive,” Chief Development and Marketing Officer Yvette Tovar said.

**Saranam** is a two-year housing, education and community-building program for families experiencing homelessness in Albuquerque. “We provide everything a family needs to live for free for up to two years while they increase their education and thus their employability skills,” Executive Director Tracy Weaver said. The families in Saranam’s program did not lose their housing because of COVID-19, but the pandemic certainly created challenges in helping them get back on their feet.

In August, both parents and children in the program returned to school, and most classes were virtual. A challenge they faced was having enough working technology and reliable internet connection to have everyone set up in time to begin school online.

Saranam has received United Way Community Impact funding for many years and has received support from Women United, a United Way philanthropic organization whose membership includes many Sandia employees. Additionally, Sandia supported Saranam’s decorator program, where volunteers created a home atmosphere for new program families.

“When you are homeless, you lose your resources. At Saranam, you’re not alone. You have community and resources and people who show up to help you,” Weaver said.

The annual Sandia Gives campaign starts Oct. 5. Visit Sandia’s Community Involvement website for more details. 

# Women @ Energy features Erika Roesler

Sandia atmospheric and climate scientist recognized by DOE STEM Rising site

By Sarah Jewel Johnson

**S**andia atmospheric and climate scientist Erika Roesler has been recognized by DOE's **Women @ Energy: STEM Rising** website, which honors women in STEM fields throughout the DOE complex.

Erika has been at Sandia for 10 years, where she began as a graduate intern. She graduated from the University of Michigan with a degree in Atmospheric Sciences. During her time at Sandia, Erika has worked in climate modeling, where her research seeks to understand how clouds may vary as a result of climate change.

At Sandia, Erika has grown immensely as a scientist and maintained active mentoring activities for undergraduate, graduate and early career STEM professionals. She also co-chairs a local elementary school science fair and presents polar-related science demonstrations and talks to their classrooms.

Erika was interviewed recently for her feature spot on the DOE Women @ Energy website.

**Q Describe your current role at Sandia. What is the main purpose and mission of your work?**

I am an atmospheric and climate scientist at Sandia. My work's main purpose is to improve the understanding of the Earth's climate under changing conditions. My primary focus is on cloud processes. I am fortunate to be able to work with the excellent people at Sandia National Labs and the broader DOE lab complex to apply state-of-the-art technology like sensors, climate models, software, algorithms and unmanned systems to climate change problems.

**Q What inspired you to work in STEM?**

Growing up, I enjoyed computers, math, writing, reading and especially nature. I knew I wanted to work in a field where I could try to make a difference to improve lives and our planet. Physics and atmospheric science were the perfect fit for me.

Along the way, I discovered I like technology, and I like trying to apply new techniques to old problems. For instance, right now, I am on a project that will use virtual reality to analyze clouds simulated by massive supercomputers. The viewing of clouds in an evolving three-dimensional space is something only birds and pilots have been able to do. This technology might lower the bar for



**SIMULATED ARCTIC SCIENCE** — Sandia atmospheric and climate scientist Erika Roesler tries a virtual reality experience focusing on the Antarctic region at the American Geophysical Union 2019 Fall Meeting. The VR experience can help scientists understand multiple aspects of an environment or simulation in new ways. **Photo courtesy of Erika Roesler**

accessibility and allow more users to understand remote, inaccessible natural processes.

**Q What excites you about your work?**

I am excited about the vision of Sandia's Energy program, and how science-based actions can improve humanity's livelihood and outcome. The focused perspective on trying to understand changes to clouds through climate change motivates and innovates my work.

**Q How can our country engage more women, girls and other underrepresented groups in STEM?**

I think our country can engage more women, girls and other underrepresented groups in STEM by making safe, natural, outdoor spaces more

accessible. Experiencing nature in a safe way has inspired me to enter this field.

**Q Do you have tips you'd recommend for someone looking to enter your field of work?**

To enter this field of work, I would recommend diving into nature. Find what fascinates you, then ask questions and find answers. Remember, your journey is not a rapid sprint; you can backtrack and reset. Take your time to find the rhythm of the ebbs and flows to get where you want.

**Q When you have free time, what are your hobbies?**

I like to run, ski, scrapbook and watch comedies. I love to play with my kids.

## SANDIA CLASSIFIED ADS

**Note: The classified ad deadline for the Oct. 9 Lab News is noon Friday, Oct. 2. Also, please note that the deadline for the Nov. 6 Lab News will be noon Wednesday, Oct. 21.**

### AD SUBMISSION GUIDELINES

**AD SUBMISSION DEADLINE:** Friday noon before the week of publication unless changed by holiday.

Questions to Michelle Fleming at 505-844-4902.

Submit by one of the following methods:

- **EMAIL:** Michelle Fleming (classads@sandia.gov)
- **FAX:** 505-844-0645
- **MAIL:** MS1468 (Dept. 3651)

- **INTERNAL WEB:** Click on the News tab at the top of the TechWeb homepage to visit the News Center, then select Announcements >> Submit Announcement.

Due to space constraints, ads will be printed on a first-come, first-served basis.

### MISCELLANEOUS

**TIRE,** Bridgestone, P245/60R18.104T, fits Highlander, 7/32-in. tread, treadwear 640, traction A, \$20. Barnard, 505-350-1104.

**RECLINER,** \$200; **TV,** \$50; dresser, \$50; nightstand, \$25; queen bed, \$200; platform rocker, \$75; lamps, \$5; request photos. Reaves, gammyandpop@hotmail.com, 505-331-1061.

**WASHER & ELECTRIC DRYER,** Whirlpool, dryer 7.0-cu. ft.; high-efficiency top-load washer, 3.8-cu. ft., \$800/set. Sadler, blumarlon@yahoo.com.

**CAMERA,** Olympus OM-2, w/28 mm & 50 mm Olympus lenses, 35-200 mm Tokina zoom lens, \$50. Eckelmeyer, 505-288-9966 or keckelmeyer@comcast.net.

**DINING TABLE,** Stickley, w/leaves, chairs, china & buffet, fine shape. Schmitt, 505-401-2068.

### TRANSPORTATION

'20 **NISSAN 370Z SPORT,** gun metal, MT, 2K miles, w/car cover & 8 dealership oil changes, \$34,000 OBO. Valerio, 505-228-1509.

'20 **TOYOTA 4RUNNER SR5 PREMIUM,** 4x4, heated seats, 3rd row, nautical blue, 3,600 miles, like new condition, \$42,000. Torres, 505-508-6795.

'19 **INFINITI QX30,** fully loaded essential, front & rear cameras, LDW, BSM, fogs, navigation, Bose sound, white, black leather, clean Carfax, <5K miles, like new condition, \$28,800. Duis, 775-830-6266.

'05 **FORD EXPLORER LIMITED,** V8, 4WD, 104K miles, loaded w/options, good clean condition, \$3,800 OBO, Schindwolf, 505-235-4428.

'08 **JEEP WRANGLER RUBICON ULTD,** see photos on Craigslist, \$22,999. Hibray, 505-269-2361.

### RECREATION

**CABOVER CASCADE CAMPER,** 8-ft. bed, propane stove, refrigerator, heater, needs new roof vent, go fishing, \$549. Marron, 505-345-4006.

**GIRL'S BICYCLE,** Raleigh, full size, 3-spd., may need tires, \$50. Lewis, 505-323-7268, ask for Barbara.

'14 **POWERLITE TOY HAULER,** 29-ft., excellent condition. Byers, 505-554-0884.

### REAL ESTATE

3-BDR. HOME, 2 bath, 1,827-sq. ft., La Cueva district, tinyurl.com/y5ro5uhs. Lappo, 505-331-3382.

### AD RULES

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

# PNM energy tech partner

CONTINUED FROM PAGE 1

The Labs and PNM have signed a **Cooperative Research and Development Agreement** to collaborate in the fields of energy storage, solar photovoltaics, power electronics, energy conversion systems, economic and life-cycle analyses, artificial intelligence and machine learning, computational simulation and sensor technologies. Funding and support for Sandia's work will be provided through the DOE Office of Electricity's **Energy Storage Program**.

A CRADA is a binding agreement between a government agency or federal laboratory and a nonfederal entity to work together on research and development. In this case, the CRADA will allow Sandia and PNM to develop energy projects to meet specific goals and targets.

Sandia will develop and test technologies for resilience and its national security mission, said Charles Hanley, Sandia's senior manager for the Grid Modernization and Energy Storage Program.

The work aligns with the Labs' recently initiated \$40 million, seven-year **Resilient Energy Systems Mission Campaign**. That effort is supported by Sandia's **Laboratory Directed Research and Development** program, which funds exploratory work in science and technology.

"We expect to play a significant role in the work on energy storage and its integration in a modern grid," Charles said. "The analytic capabilities and the tools that we will be developing are focused on the national security aspects of maintaining grid resiliency."

PNM's goal is to meet its stated target of 100% emissions-free generation.

"Our goal for 100% emissions-free energy requires advanced resources to bridge the technological gap," said Pat Vincent-Collawn, PNM chairman, president and CEO. "We are fortunate to have a national laboratory in Albuquerque, and the combination of their

expertise, technologies and resources with our team's industry experience is an ideal collaboration to solve this challenge. We look forward to this opportunity for shared learning and progress."

## Evaluating technology options

The first joint project with PNM, scheduled to last five years, will identify the tools needed to assess current and future energy storage technologies in an integrated, nearly statewide grid, and will conduct computer modeling and simulations and other analytic exercises to identify priorities.

PNM will focus on the more immediate need to meet its emissions-free goal, while Sandia will examine research and development opportunities for the longer term, with a concentration on energy storage technologies and analytics.

"We'll be working with PNM to see how it can meet its clean-energy target," Charles said. "We'll be exploring different types of storage technologies, such as batteries, thermal storage, hydrogen and others that can provide grid resilience on timescales that extend from seconds to seasons."

In subsequent projects, Sandia will look at future technologies that may provide greater flexibility in the electric system and enhance the efficient use of emissions-free generation technologies. Advances may include networked microgrids, virtual power plants, highly efficient distributed and centralized storage systems, and reconfigurable grid architectures that provided added resilience.

To bolster such research, Sandia has a wide breadth of **expertise, technologies and facilities**, including Sandia's **Control and Optimization of Networked Energy Technologies Laboratory**, **Energy Storage Controls and Analysis Lab**, **Advanced Power Electronics and Converters Lab**, **Distributed Energy Technologies Laboratory** and **Battery Abuse Testing Laboratory**, among others.

While initial research will focus on grid technology, Sandia's renewable energy facilities — including the **National Solar Thermal Test Facility**, **Scaled Wind Farm Technology Facility** and **Wave Energy Converter Facility** — could also be used in the future.

## CRADAs allow cooperation

The agreement with PNM is an umbrella CRADA, which allows the Labs and electricity provider to explore research collaborations in several areas. In contrast to a standard CRADA, which involves a single project in one technical area, an umbrella CRADA covers multiple projects and technologies.

So, while the first named project will focus on identifying the tools needed to assess current and future energy storage technologies, future CRADAs could focus on more specific or broader research and development as needed.

"The umbrella CRADA between PNM and Sandia will allow opportunities to spark collaboration related to electric grid modernization with a potential to affect our local community while addressing national energy distribution concerns," Sandia business development specialist Jason Martinez said. "Such agreements allow Sandia to better serve the state and the nation." 

**CLICK HERE**  
TO VIEW A VIDEO OVERVIEW OF SANDIA ENERGY PROGRAMS.



**POWERING INNOVATION** — Battery abuse testing is one of the many programs at Sandia that will facilitate energy research as part of the agreement with PNM. Image courtesy of Sandia National Laboratories

## Mileposts




Brent Meyer 35



Jeff Taso 35



Cindy Acosta 30



Cynthia Blain 30



Daren Davidson 30



Ron Brightwell 25



Steve Coffing 25



Dave Day 25



Dan Small 25



Ben Casados 20



Carly George 20



Tom Hieb 20



Gabe Pacheco 20



Ed Piekos 20



Shane Speas 20



Mark Watkins 20



Vit Babuska 15



John Borchardt 15



Paul Giering 15



Mark Jursich 15



Ron Montoya 15



Ken Stone 15



John Walter 15

# Women @ Energy features Brooke Marshall Garcia

Sandia renewable and distributed systems integration engineer recognized by DOE STEM Rising site



**ENERGY RESILIENCE** — Sandia civil engineer Brooke Marshall Garcia works on a circuit board in the geophysics lab. At Sandia, Brooke researches how to create a more sustainable, secure, modern electric grid. **Photo by Rachid Darbali-Zamora**

By **Sarah Jewel Johnson**

**S**andia civil engineer Brooke Marshall Garcia has been recognized by DOE's **Women @ Energy: STEM Rising** website, which honors women in STEM fields throughout the DOE complex.

As a civil engineer, Brooke has always enjoyed applying her math skills to address water management challenges. After several years as a private consultant in water resource management, she obtained an MBA from the University of New Mexico and began working at Sandia as a technology transfer professional, leveraging intellectual property developed by the Labs to benefit the U.S. economy.

During her time at Sandia, Brooke has been involved in research, including grid resiliency, neutron generator production, mechanical processes and supply chain development.

Embracing lifelong learning and her passion for energy studies, Brooke is studying at Johns Hopkins University for a master's degree in energy policy and climate. She provides her dedication to service through a multifaceted approach to addressing technical problems. Brooke models this approach for other women through her participation in the Sandia Women's Action Network and co-mentoring with a group of women at Sandia.

Brooke was interviewed recently for her feature spot on the DOE Women @ Energy website.

**Q Describe your current role at Sandia. What is the main purpose and mission of your work?**

As an engineer in the Renewable and Distributed Systems Integration team at Sandia, I look at ways to improve the electric grid. This includes addressing a broad range of energy challenges such as integrating renewable energy sources and making communities more energy resilient.

Energy, to me, is the single most important part of our national infrastructure. My mission and purpose in this work is to influence a future that

enjoys reliable, resilient energy without causing climate instability or polluting the environment.

**Q What inspired you to work in STEM?**

Growing up, aptitude-wise, math and science were my best subjects. We moved around a lot and I found stability and continuity in the math curriculum. I have always loved literature and art, languages and culture, but math held a special sturdiness to it. I started my undergraduate degree thinking I would pursue physics, but as I moved through the curriculum, I shifted to mechanical engineering before ultimately becoming a civil engineer. Civil engineering brought the opportunity to analyze and build things, as well as to study and protect the environment.

**Q What excites you about your work?**

There are seemingly infinite opportunities across the DOE laboratory complex to contribute to solving important challenges. I worked in nuclear deterrence prior to joining the RDSI group in January 2020. Before that, I worked in water resources and technology transfer.

The common theme in my career is one of public service motivated by the chance to improve societal stability. At this stage of my life and career, I have come to believe that energy is the single greatest contributor to societal stability. And this reality is only growing in magnitude. Power generation, transmission, distribution and resilience are, collectively, among the most urgent challenges facing humanity today. I am proud of any contribution I can make to a more sustainable, secure, modern electric grid. I get up every day knowing that my efforts may improve the future for my kids and for future generations.

**Q How can our country engage more women, girls and other underrepresented groups in STEM?**

This is an interesting challenge. The current demographics are an inheritance of age-old, systemic inequities that can take generations to recognize, let

alone to overcome. Tenacity in encouraging future scientists of all kinds is key. We must look for biases and stereotypes and actively question the norms we have taken for granted; always remembering to ask why. And we need to continue to remove barriers and dispel misconceptions.

STEM is not one thing; it is many things. The truth is, there are unlimited versions of a STEM career. STEM allows a person to develop into their passions with tools that remain valuable no matter where your career takes you.

If I could tell the young women and other underrepresented people interested in this field one thing, it would be this: STEM means embracing your curiosity, following your interests, and working to further collective understanding. It is not a box into which you must fit yourself. It is not predefined. It is a wide-open field needing smart, passionate, inspired people to define it. Do not be dissuaded by preconceptions; define the profession for yourself.

**Q Do you have tips you'd recommend for someone looking to enter your field of work?**

Work hard. Make it your own. You will be glad you did. There is so much left to discover and understand. If you have the aptitude and curiosity to follow a STEM path, don't allow demographics to dissuade you. The field is open and welcoming to people of all kinds. Keep working until you find your niche. We need women not to fit into something that already exists — we need women to help shape the future.

**Q When you have free time, what are your hobbies?**

I love spending time with my friends and family. I love to read and philosophize. I love music and poetry. I'm a runner and yogini. I ski and golf (badly). I love to cook for others, and I'm a proud mama and wife. I am a dreamer, optimist and adventurer. 