Research challenges

‘Power on Demand’ is 11th challenge

By Sue Major Holmes

Sandia has launched the eleventh in a series of high-stakes research challenges, “Power on Demand.”

Like the previously announced challenges, it focuses on an important national security question. The civilian world needs a secure and sustainable energy future for everything from transportation to large-scale storage and power generation facilities, while the defense realm has power needs ranging from electric ships to satellites.

The research done under the challenges is critical for Sandia’s missions, now and for decades to come, and advances the frontiers of science and engineering, acting Div. 7000 VP and Chief Technology Officer Julia Phillips told a March 13 session that introduced the latest topic.

The challenges draw on a cross section of disciplines at the Labs and span the gamut from fundamental discoveries to technology development. Julia said they’re

(Continued on page 4)

Core nuclear weapons mission is ‘enormous’

Executive VP for National Security Programs Jerry McDowell gives perspective on nuclear weapons mission

By Sue Major Holmes

Deputy Labs Director and Executive VP for National Security Programs Jerry McDowell says Sandia’s core nuclear weapons mission is enormous but his job boils down to three things: taking care of today’s stockpile, sustaining the stockpile into the future, and addressing the long-term stewardship of capabilities, operations, and infrastructure.

Jerry discussed Sandia’s nuclear weapons mission in an April 2 presentation, offering his perspective on the program’s future and the challenges of balancing short-term and long-term stockpile stewardship obligations. His talk in New Mexico’s CNSAC auditorium was webcast to Sandians at all sites.

“Taking care of the stockpile we have today is all about making sure that the legacy commitment we made to safety and security endures today and forever,” Jerry told the full auditorium. “It’s an incredible responsibility.”

Headlines about nuclear weapons work tend to focus on sustaining the stockpile into the future. “It’s what most people want to talk about,” he said, outlining examples of stockpile programs and successes in a series of slides featuring charts and photos, including a recent wind tunnel test for the B61.

The B61 “is hugely important in the national scene and a litmus test of whether Sandia can deliver on its commitments,” Jerry said. While the ups and downs of sequestration and the ebbs and flows of budgets affect the program’s pace, “if we don’t do this, we don’t get to do much of anything else,” he said.

He also discussed the “amazing results” of plutonium work at the Z machine, modernizing the arming, fuzing, and firing system for the W88 Alt 370; and the modernization programs and the strong ties between the nuclear weapons mission and other key national security missions. He also assessed the Obama administration’s fiscal year 2015 budget request to Congress in light of the modernization programs. His testimony was an update to the presentation he made last October to the subcommittee.

To view the full subcommittee testimony, submitted into the subcommittee record, can be downloaded as a PDF file at http://tinyurl.com/ldtbcw6. (Photo by Charles Votaw)

(Continued on page 3)
That’s that

In late March, Labs Director Paul Hommert sent an email to members of the workforce Labs-wide taking note of the passing of Sandia Corp. Board of Directors member James Schlesinger. Paul’s heartfelt and substantive letter got me thinking about my first “encounter” with Dr. Schlesinger. Not that I ever met him, of course, but it must have been when I was still in my 20s — we’re talking a while ago here, folks — I read an essay by Schlesinger in The Atlantic or Harper’s about the state of America’s post-Vietnam defenses and the changes that would be needed to address the security issues for the remainder of the 20th century.

The essay was so smart, so tightly reasoned, so compelling that here I am, 40-something years later, still remembering it (at least in its essence). Schlesinger spent a consequential life in public service — Director of Central Intelligence, Secretary of Defense for two presidents (Nixon and Ford), and the first Secretary of Energy for a third (Garten). After leaving government, he continued to be engaged in the public policy arena through his writing and in advisory and consulting capacities. In 2001, when I heard that Dr. Schlesinger had been named to the Sandia Corp. board, I took it as one more affirmation that we’re not just another workplace. It says something about us that a man of Schlesinger’s stature and reputation chose to show his fierce intelligence and his lifetime of experience and wisdom with us for more than a decade. I sure we’re a better place for it.

One of the real pleasures of my job is hearing from fellow Sandians and retirees who want to pass along a funny, clever, interesting, or provocative story, or even a story about a memorable character. “When I came to the Labs many years ago,” she wrote, “I was the only Penny. It stayed that way for a long time. A friend of mine was up for reinvestigation last December. She’d used me as reference and emailed to let me know the investigator was going to call me. It never came, but it’s been my experience that these things take time. I didn’t think anything more of it until one day my friend called to ask why I told the investigator ‘I don’t know about the woman and I’ve never seen her before.’ "Well, of course, I’d never said any such thing, so I started digging around and found that we now have four Pennys. That was surprising enough, but it turns out my phone number is 843-xxxx and another Penny’s number is 843-xxxx. I ask you: What are the odds?"

I don’t know about the “odds,” but I’d say it is pretty odd, at least. In corresponding with Penny, I couldn’t help but ask if she got teased by kids a lot because of her name. Did they taunt her with calls of “A Penny for your thoughts?” Oh, yes, Penny says, “and a lot worse.”

I asked her, “What is your name? I’m the Penny nazi.”

One more thing: In the course of our email exchange, Penny passed along another funny tidbit: When she and her husband were married, there were seven James Jones at the Labs, four of whom were named James F. Jones. Back in the days before the directory used nicknames, Penny says, when she wanted to call him, “I figured out which one he was by process of elimination. He wasn’t a Penny, or a Penny.”

I heartily appreciate a good yarn, a good joke, anything that tweaks my brain, and they have gleaned, after reading my column over the past several years, that I have a soft spot for a good story, a good joke, anything that tweaks my brain, tugs at my heartstrings, or tickles my funny bone.

It was in this spirit that I read with great delight a recent email from Penny Jones (2216). “When I came to the Labs many years ago,” she wrote, “I was the only Penny. It stayed that way for a long time. A friend of mine was up for reinvestigation last December. She’d used me as reference and emailed to let me know the investigator was going to call me. It never came, but it’s been my experience that these things take time. I didn’t think anything more of it until one day my friend called to ask why I told the investigator ‘I don’t know about the woman and I’ve never seen her before.’ "Well, of course, I’d never said any such thing, so I started digging around and found that we now have four Pennys. That was surprising enough, but it turns out my phone number is 843-xxxx and another Penny’s number is 843-xxxx. I ask you: What are the odds?"

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Sandia hosts Cleantech Open networking event

By Patti Koning

On Tuesday, March 18, in partnership with Lawrence Livermore National Laboratory (LLNL) and the i-GATE Innovation Hub, the first Cleantech Open networking event took place in the Tri-Valley area. Sandia hosts the Cleantech Open, a nonprofit organization that runs the world’s largest accelerator for clean-technology startups.

“We are delighted to partner with LLNL and i-GATE to host this event to bring together entrepreneurs and innovators to discuss the goal of bringing more clean technology to the marketplace,” said Div. 8000 VP Steve Rottler.

A total of 121 people — primarily from the Silicon Valley — participated in the event at the Livermore Valley Open Campus (LVOC). Attendees included clean-technology entrepreneurs, industry and lab researchers, and investors.

“The mission of Cleantech Open is to find, fund, and foster entrepreneurs in the clean tech space,” said Yuet Lee, the chair of Cleantech Open’s National Marketing Program. “Forming a company is difficult. What we offer is networks of resources to help companies get started.”

He noted that more than 800 entrepreneurs have been mentored during the program’s nine-year history and that about 60 percent of these entrepreneurs are still in business.

Companies that participate in Cleantech Open have the opportunity to win cash prizes. Each of the eight regions awards $20,000 in cash and services to the regional winner of the sustainability award. The national winner, chosen from the eight regional finalists, receives a grand prize package worth up to $200,000 in cash and additional services.

Congressman Eric Swalwell (Calif.-15th) started off the event with a fireside chat exploring the impact of angel investing. The panel discussion featured venture investors Larry Kelly, managing director of Kelly Ventures and a member of the Band of Angels, and Peter Freeman, co-founder and chief executive officer (CEO) of Global Renewable Energy Engine (GREEN) and co-chair of the Clean-Techno subcommittee for the Keiretsu Forum.

“Right now, we are having a national debate about the role of the federal government in federally funded research,” said Swalwell. “The federal government must continue to be at the table when it comes to federally funded research. If it weren’t for us, we would double LDRD funding. We’d actually bring it up to 20 percent to match the majority of tech companies in the Bay Area.”

The Cleantech Open also featured a lab to market panel discussion led by Brandon Cardwell, i-GATE’s vice president of strategy and business development. The panelists included Elizabeth Cantwell, LLNL director of economic development, Rob Lamkin, CEO of Cool Earth Solar, Andy McIlroy, Sandia senior manager for LVOC development, and Brian Steel, co-director of the Cleantech to Market program at UC Berkeley’s Haas School of Business.

“One challenge with the Labs is a scale mismatch,” said Andy. “We are large institutions, governmental in nature. So we work on timelines and project scales that are quite different from the entrepreneur community. Companies want to move on the scale of hours to days while we are used to working in months to years.”

Lamkin pointed to a gap in willingness to take risks, illustrated by the nearly two years that it took to finalize Sandia’s partnership with Cool Earth Solar on a clean-energy demonstration field in the LVOC. “As entrepreneurs, we are willing to take risks. We have to do it every day,” he said. “We saw the advantages in this partnership and thought it would take weeks to get the deal done. Being able to bridge that divide was key to our success. It wasn’t for the faint of heart, but we got it done, in large part because there were people at Sandia like Andy who stood up for us.”

In response to an audience question, Lamkin said he would go through the whole experience again, even if he knew from the start that it would take two years. “Cool Earth Solar suffered from a bit of trailblazing,” said Andy. “Their project is quite innovative because it’s an installation they run on the LVOC as part of their own business. I think this has broken down barriers and demonstrated that the LVOC provides an opportunity to take risks and innovate.”

Cantwell noted that LLNL has successfully brokered many deals with small companies in a shorter timeframe — less than six months. “I would love to see federal oversight of tech transfer focused regionally,” she added. “I think regional networks are incredibly powerful, more powerful than broad country-oversewing networks.”

As another means for collaborating with the labs and the public sector, Cardwell pointed to the DOE’s Advanced Research Projects Agency-Energy (ARPA-E) program, which promotes and funds R&D projects for advanced energy technologies.

“We usually have two to three ARPA-E funded projects each year,” said Steel. “It’s a wonderful program that funds things that wouldn’t otherwise be funded. But it’s also interesting because the milestones are quite rigid, maybe as a backlash against Solyndra. That doesn’t allow as easily for the natural pivoting you see with startup companies.”

The event concluded with a networking reception and a showcase of clean-technology programs at various companies, such as Sandia’s solar, algal pond monitoring, and hydrogen fuel cells efforts and LLNL’s pursuit of statistical analysis and modeling for wind and other renewable energy sources. Other companies featured in the technology showcase included Safe H2O, KalpTree Energy, and GREEN.
Research challenges

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The past several months.
Demand, the latest in a series of Research Challenges laid out over the past several months.

CENTER 1100 DIRECTOR Charles Barbour discusses Power on Demand, the latest in a series of Research Challenges laid out over the past several months.

(Continued from page 1)

designed to have long but finite lives and must show progress over the entire span, rather than just at the end. In addition, she said, they leave behind a legacy.

Workshops allow Sandians to engage a challenge as it takes shape, and Julia invited researchers to help the challenges mature and evolve. She pointed out that while many of the titles are very broad, Sandia will emphasize areas where it can have a significant impact.

Each challenge must define a goal and the critical steps to take along the way, and decide what other institutions could be its partners, where it can find resources, and how to publish what it learns while at the same time protecting intellectual property.

Physical, Chemical, and Nano Sciences Center 1100 Director Charles Barbour said power needs are ubiquitous. “Power on Demand” will focus on electrical power, aiming to develop systems with the smallest size and weight can be transferred to different power levels, he said.

Charles urged researchers from all over the Labs to sign up for the challenge. “This is your chance to really make a difference for Sandia and for the world,” he told the introductory forum. “This is a big deal. Everybody has power needs.”

“Power on Demand” will look at generation, storage, and transmission grid, aiming to develop systems with the smallest size and weight can be transferred to different power levels, for different customers; and novel approaches to power generation and harnessing from high in the atmosphere. Charles said it will work in three different power-level categories, ranging from single, low-power applications to the grid scale, that have common scientific questions and engineering needs, he says.

Sandia is the right place for the work because of its leadership in compound semiconductor materials and device research, its expertise in battery materials and devices; its strong partnerships with industries, universities, and other national laboratories; and its incomparable facilities, including the Battery Abuse Testing Lab, the Microsystems & Engineering Sciences semiconductor fabrication complex, and the Center for Integrated Nanotechnologies operated by Sandia and Los Alamos national laboratories, Charles said. In addition, he said, Sandia has power needs. “Power on Demand” will look at generation, storage, and transmission grid, aiming to develop systems with the smallest size and weight can be transferred to different power levels, for different customers; and novel approaches to power generation and harnessing from high in the atmosphere. Charles said it will work in three different power-level categories, ranging from single, low-power applications to the grid scale, that have common scientific questions and engineering needs, he says.

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Research Quality Standards: Case studies

How to get funded without sacrificing your integrity

Note: Sandia recently published a new Research Quality Standards document that, rather than providing a step-by-step set of requirements, focuses on case studies to define best practices in the world of research. Here is one case study drawn from the 50 in the document. From time to time the Lab News will publish others.

A

Sandia team was performing on a reimbursable R&D project. The customer imposed very stringent performance requirements for the next phase. Multiple bidders proposed approaches to achieve the desired performance without adequately acknowledging the significant risks and challenges that would have to be overcome for success.

In contrast, the Sandia proposal included a detailed analysis of the approach, identifying and assessing risks, and weighing performance impacts that those risks would incur. This process identified that the performance requirements could only be met if all three of the new technology components achieved their theoretically optimal performance, which was unrealistic.

As a result, the customer developed a strong appreciation for the scientific and engineering thoroughness and integrity of the Sandia team, which, in turn, resulted in a deep trust that the Sandia team had the customer’s best interests in mind. The project was awarded to Sandia, with acknowledgment of the risks, and it grew into a significant program for Sandia.

Moral of the story:

It is important to fully describe the value and benefits of your proposal followed by a full description of the threats, risks, and costs. If you describe only the value and benefits you become a “yes man” and customers may not be as interested in your risk analysis. If you describe only the threats, risks, and costs no one will fund you; it is too hard to accept emotionally (the same is true if you describe the threats, risks, and costs before describing value and benefits — the order is important). The ideal approach is to first explain the value and benefits of the proposal to create a vision in the mind of the customer why this is important and then follow it with a detailed explanation of the threats, risks, and costs so the decision maker can make a well-informed decision. This keeps emotions in proper balance while also providing a true picture of the decision they are about to make.

Customers may not always decide to fund you but often they will. More importantly, their level of trust in you will be extremely high, which positions you in your minds as a valuable strategic partner. They will come to with their future problems.

Author talks about continuing challenges of controlling nuclear weapon systems

INVESTIGATIVE JOURNALIST AND BEST-SELLING AUTHOR Eric Schlosser, speaking at a recent National Security Speakers event, discussed his book, Command and Control: Nuclear Weapons, the Damascus Accident and the Illusion of Safety, which examines the history of attempts to control the safety, security, and reliability of nuclear weapons since the 1940s.

Schlosser’s book features an account of the near disaster in Damascus, Ark., in 1980 when a Titan missile exploded, sending its undetonated nuclear warhead into a ditch 200 yards away. His account of the accident includes a discussion of Sandia’s leadership role in successfully and dramatically improving the safety and security paradigm for the entire US nuclear arsenal.

Schlosser made clear in his remarks at Sandia that he deeply respects the talents, skills, and courage of Sandia scientists and engineers who have worked for decades to ensure that nuclear weapons always work and when they are needed and will never work under any other circumstances. He said he felt the stockpile today is safer than it was 20, 30, or 40 years ago, thanks in no small part to the efforts of Sandians.

However, he cautioned that in his view, “So long as nuclear weapons exist in a world of unstable and uncertain leadership, there is no degree of safety high enough.”

At left, Schlosser addresses an audience of Sandians at the National Security Speaker Series.

In the photo below, Schlosser meets with Sandian Dan Summers, who has been a leader in Sandia’s nuclear weapon safety and use control work for many years. (Photos by Randy Montoya)
Smallest stockpile since Eisenhower era

The tests on the mock-ups were done to establish the configuration that will deliver the necessary spin motion of the bomb during freefall and are an important milestone in the Life Extension Program to deliver a new version of the aging system, the B61-12.

The B61 must spin during flight — spin that is controlled by a combination of rocket motors and canted fins on the tail. Engineers determined from flight tests in the 1990s that plumes from the rocket motors worked against the fin performance, counteracting the force from the motors and reducing the vehicle spin rate. Sandia engineers termed that phenomenon “counter torque.”

But data from a 2002 wind tunnel test to characterize counter torque were not fully applicable since the B61-12 uses a significantly different tail design than earlier versions. Engineers needed another series of wind tunnel tests to characterize counter torque on the new configuration to give them confidence the new system will meet the required spin environment in flight, says Vicki Ragsdale (2159).

Although Sandia has its own wind tunnels, the complex test required a wind tunnel big enough for a full-size mock B61. Most wind tunnel tests use models smaller than the actual flight hardware, but the physics of the B61 rocket motors cannot be replicated on a reduced scale. Sandia turned to the US Air Force’s Arnold Engineering Development Center on Arnold Air Force Base in Tennessee, which has the nation’s largest wind tunnel capable of the required air speeds, as well as considerable expertise testing jet interactions similar to those on the B61. The 2002 test was conducted in the same wind tunnel.

The new test, which took three years to plan, was designed to explore the chaotic behavior of the counter torque and its implications for B61 aerodynamics.

Test improves understanding of previously uncharacterized phenomenon

When the data began rolling up on computer screens in the wind tunnel control room during February’s test, Sandians were on hand to analyze the information immediately. They crunched numbers and debated physics for several days, and determined the test had uncovered a previously uncharacterized physical phenomenon that Sandia researchers believe arises uniquely because of the unusual shape of the rocket motors and from other features. The theory they had been using was based on a simpler configuration.

The Sandia team revised the remainder of the wind tunnel tests to provide fresh data to unravel the complex physics of the behavior observed at near-sonic flow conditions. The improved understanding will inform the design of the B61-12 and provide an additional technical basis for the well-characterized performance of the versions of the B61-4 in the current US stockpile.

Jerry McDowell

Director Paul Hommert to President Barack Obama, through the secretaries of Defense and Energy and the chairman of the Nuclear Weapons Council. He assured the audience Paul would say that signing the document

Sue Major Holmes

Wind tunnel tests support improved aerodynamic design of B61-12 bomb

Sandia has finished eight days of testing a full-scale mock unit representing the aerodynamic characteristics of the B61-12 gravity bomb in a wind tunnel.

The tests on the mock-ups were done to establish the configuration that will deliver the necessary spin motion of the bomb during freefall and are an important milestone in the Life Extension Program to deliver a new version of the aging system, the B61-12.

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“We were able to come up with a theory for where this effect is coming from,” Vicki says. “It’s not a wind tunnel effect and it is something we will see in flight, so we have to account for it.”

Jerry McDowell

(Continued from page 1)

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Jerry also said the US stockpile — “unquestionably the world’s safest and most effective” — faces a changing world, and what works for stockpile surveillance now may not in the future. Surveillance today is based on sound statistics for a stockpile of a given size, but Jerry wonders what happens if it becomes significantly smaller. “Would you still use this statistical approach to surveillance? Would you capitalize on modeling capabilities? Instead of being retrospective, ‘I’ll catch what has already happened,’ would you try to be prospective, ‘I’ll try to predict when a problem might arise.’”

Sandia must think about such questions to keep from becoming complacent, he said. “So don’t forget you must always exercise your talent, you must always renew your capability, you must always be open to change and to getting better,” he said. “That’s fundamental.”

To see the webinar (available only on Sandia’s internet website), go to http://tiny.sandia.gov/3pyfh.
They are with us every moment of every day, controlling every action we make, from the breath we breathe to the words we speak, and yet, there is still a lot we don’t know about the cells that make up our nervous systems. When things go awry and nerve cells don’t communicate as they should, the consequences can be devastating. Speech can be slurred, muscles stop working on command, and memories can be lost forever.

Better understanding of brain function could lead to new prevention, diagnostic, and treatment techniques, but the brain is complex and difficult to study. If you were to hold it in your hand, you would likely marvel at how much your brain feels and moves like Jell-O. But the brain is complex and difficult to study. If you were to hold it in your hand, you would likely marvel at how much your brain feels and moves like Jell-O. Yet, there is still a lot we don’t know about the cells that make up our nervous systems.

**Working to develop intelligent neural interfaces**

That challenge led Jit Muthuswamy, an associate professor of biomedical engineering at Arizona State University (Tempe, ASU) to pursue a robotic electrode system that would seek and maintain contact with neurons of interest in a subject going through normal behavioral routines. “We are working to develop a system that would seek and maintain contact with neurons of interest in a subject going through normal behavioral routines. The microscale actuators and microelectrode are critical to addressing both of these issues and interacting with individual nerve cells with minimal damage to surrounding tissue. The microscale actuators and associated packaging system developed at ASU and Sandia enable the probe to move autonomously in and out of the areas surrounding the cell collecting measurements while compensating for any movement in the neuron or brain tissue.”

About the size of a thumbnail, the self-contained unit has three microelectrodes and associated micro actuators. When a current runs through the thermal actuator, it expands, and pushes the microelectrodes out over the edge of the unit, which is flat to fit outward over the edge of the unit, which is flat to fit against the tissue. Because the actuator is so small, it can be heated to several hundred degrees Celsius and cooled again 1,000 times per second. It takes 540 cycles to fully extend the probe, but that can be done quickly — in a second or less.

**Scale of this system is unique**

Thermal actuators have been used for years at Sandia and elsewhere, but the scale of this system is unique. “The idea that we could build this system to achieve multiple millimeters of total displacement out of a micron-scaled device was a significant milestone,” says Michael Baker (1719), who designed the actuator. “We used electrostatic actuators in the past, but the thermal actuator provides much higher force, which is needed to move the probe in tissue.”

The microelectrodes are made of highly doped polysilicon, which the team discovered has a number of advantages. It is almost metal-like in its conductivity, but durable enough for millions of cycles and provides a high signal-to-noise ratio, which is much greater than previous wire probes, and provides high-quality measurement signals.

Muthuswamy and Murat are currently developing the capability to produce richer data with resolution in the sub-micron range to be able to go inside cells and take measurements there. They are also working on stacking the existing chips and decreasing the space between probes. Muthuswamy’s Neural Microsystems lab at ASU has developed a unique stacking approach for creating a three-dimensional array of actuated microelectrodes. “By building a three-dimensional array, we would have access to significantly more information, rather than just a slice,” Murat says. “We’re very encouraged by the progress we have made, and are looking forward to building on that progress.”
Resilient cities focus of new Sandia, Rockefeller Foundation pact to help 100 communities worldwide

By Heather Clark • Photo by Randy Montoya

S andia will bring decades of experience solving problems with practical engineering and modeling complex systems to cities around the world under a new agreement to support the 100 Resilient Cities Centennial Challenge, pioneered by the Rockefeller Foundation.

The challenge, which will help 33 cities in its first year, seeks to make communities more resilient — better prepared to withstand natural or manmade disasters, recover more quickly, and emerge stronger.

“We are eager to partner with the 100 Resilient Cities Centennial Challenge,” says Jill Hruby, VP of International, Homeland, and Nuclear Security, who signed the memorandum of understanding. “We see this as an opportunity to bring the best minds in science and engineering to help people around the world recover from the shocks and stresses of modern threats and times.”

Michael Berkowitz, managing director of 100 Resilient Cities at the Rockefeller Foundation and the CEO of the 100 Resilient Cities Centennial Challenge, says, “We’re excited to welcome Sandia National Laboratories as the newest partner to the 100 Resilient Cities platform, and for them to begin offering 100 Resilient Cities network members Sandia’s technical expertise in developing risk assessments, modeling complex systems, and finding innovative engineering solutions that can help cities build resilience.”

Five-year partnership to bring framework of best practices to cities

Sandia has developed resilience methodologies, models, and other tools that could be used to create a resiliency framework based on best practices worldwide, but adapted to cities’ individual needs, project lead Charles Kath (6921) says.

“The ultimate goal is to improve global stability by kick-starting a worldwide resiliency movement,” he says. “We want to use this experience to develop models and best practices that can be shared with cities across the world.”

Under the five-year memorandum, Sandia will supply cities with a toolkit of infrastructure and socio-economic models that will help local leaders better assess specific resilience challenges, set priorities, and select the most cost-effective way to address them.

“Sandia’s experts have deep knowledge in how to address nearly every challenge a city might face — everything from how to make its energy grid more resilient to how to build a more clean and sustainable water supply,” Charles says.

Among Sandia’s experts who will work with cities:

- **Systems risk analyses define threats, vulnerabilities, and consequences**
  
  Trisha Miller (8116), a systems risk analyst, helps cities think about threats facing them, how a city might be vulnerable to those threats, and what the consequences are.
  
  To define a city’s risk, Trisha taps experts across the Lab to look at the likelihood of natural or manmade disasters. In the case of terrorist attacks, she tries to understand how someone who wants to harm a city would be motivated, make decisions, and act.
  
  To assess a city’s vulnerabilities, Trisha ties together threats and consequences to uncover potential weaknesses. The analyses also identify critical infrastructure, such as transportation, electricity, communications, hospitals, and other facilities that would be vulnerable.
  
  Finally, the analyses identify potential consequences, such as how many people would be injured in a natural disaster or how many buildings would have to be closed, to help cities prioritize how to become more resilient, she says.

- **We’re a systems engineering lab. That means we look at processes from end to end, defining the problem, identifying the needs, defining the requirements, engineering a solution, and making it happen,”** Trisha says.

- **Looking at complex systems — in this case, cities — also encourages municipal developers to address multiple risks, rather than create a separate plan for each hazard, she says.**

- **This process “helps cities prioritize and have an explanation of why they’re investing in one thing versus another,” she adds. “It helps build consensus.”**

**Electrical grid experts at Sandia bring resiliency to power supply**

Abraham Ellis (6112), an electrical grid expert, works with a team on infrastructure resiliency to prevent the kind of damage suffered in New York and New Jersey after 2012’s Superstorm Sandy.

Sandia researchers are using the Labs’ Energy Surety Design Methodology, which has a successful track record at military facilities, for two projects in New Jersey funded by DOE.

Sandia is working with the city of Hoboken, N.J., to assess and develop designs for improving the resiliency of the city’s electrical grid after the storm.

Sandia also is working on a study with New Jersey’s Transit Corporation, NJ TRANSIT, to provide a resilient energy supply system to trains running between New York and New Jersey during power disruptions.

Sandia is providing NJ TRANSIT with a design concept for a microgrid, if built it could be the largest microgrid by capacity and geographical footprint in the US, Abe says. A microgrid is connected to a utility electrical grid, but can operate on its own, allowing for a system that self-sufficiently produces power when there is a disruption in the main grid.

The power system is being planned with resiliency in mind. For example, the generation plant and transmission and distribution lines will be protected from wind and storm surges, he says.

Resiliency requires planning ahead for disasters that may happen one-to-one hundred years apart. There are cost millions of dollars up front, but can reduce a city’s exposure to billions of dollars in economic impact and repairs afterward, he says.

“Abe is excited about working with city governments and believes resiliency can become an attribute of cities, just like quality schools and clean water.”

“Resiliency should contribute to the economic vitality of a city,” he says.

**Clean water a human right, integral to resilient cities**

Hydrologist Vince Tudwell (6926) believes access to clean water is a human right and works toward that end in his profession and as a volunteer traveling to South America and Africa to provide technical know-how.

“It’s always been in my heart. I’m trying to give back a little bit of what we take for granted in the US by recognizing that a lot of people don’t have access to good, clean water,” Vince says.

In the US, helping cities with water issues has expanded in recent years from a focus on natural disasters or malfunctions that affect water supplies to include more chronic issues of population growth and climate change and their impact on water resources.

Like many Labs researchers, Vince can work with cities to study their entire systems by taking into account water issues along with other concerns. “We’re really bringing together the energy, the water, the land, the food, environmental issues, looking across the board in trying to fashion a more holistic view of how these work together,” he says.

For example, Sandia can help explore the interplay between water and energy, water and food supply, or other trade-offs; the laboratory can help developing cities provide safe drinking water, sanitation, or build needed infrastructure in a cost-effective and efficient manner through the use of technology; or perhaps identify specific technologies to produce clean drinking water.

Vince recognizes that many cities already have high-caliber water experts. He envisions a collaborative approach with cities to understand water-related issues, perhaps running scenarios and see how different solutions affect outcomes.

**Mark Ehlen** (6924), co-project lead, says citizens in resilient cities should notice the benefits of resiliency not just like quality schools and clean water.

“A resilient city is livable and workable. There’s clean air, a good standard of living, not too much congestion, housing and education are affordable, and there’s a sense of community,” he says. “Resilient cities can evolve over time to accommodate an increase in population, increased disparities in income so that in the long-term, social mobility is preserved.”
By Stephanie Holinka

A few recent events acknowledged the hard work and generous spirit of Sandians and their many volunteers. At the annual Sandia Serves Volunteer Breakfast on April 10, Sandia honored the many employees, contractors, and retirees who selflessly donate their time and talents to better the community. Approximately 250 volunteers attended the event.

Nearly 1,000 Sandians logged more than 105,000 volunteer hours in 2013 in activities ranging from mentoring children and rescuing animals to building computer labs and houses. “Sanids are generous with their time and talent,” says Patty Zamora (3652), coordinator for the breakfast. “The event recognizes their service and lets them know we’re grateful for all they do.”

Community Involvement Dept. 3652 Manager Amy Tapia served as the event host and master of ceremonies.

Human Resources Center 3500 Director Karen Gardner opened the breakfast by discussing the generosity of Sandia employees, not only in terms of time and service but also monetarily, pointing out that Sandia contributed over $6 million to United Way and more than $13,000 to Shoes for Kids. Karen noted that L Luckheed Martin Corp., New Mexico, thanked the employees for their service. She challenged them to participate in the Mentor2.0 program (see details in the story below), which uses technology to partner students in two schools with a mentor.

Using technology for much of the interaction between the mentor and mentor allows more time-stretched volunteers to participate.

Last week, Community Involvement Dept. 3652 also accepted the “Corporate Star Award” on behalf of Sandia at the Mayor’s Day of Recognition. The award was given to the Labs for excellence in volunteering. More than 280 Sandia employees were also recognized with the President’s Volunteer Service Award, given to individuals, families, and groups that logged more than 100 volunteer hours in a year. The award was established by executive order in 2003 to encourage Americans to donate more than 4,000 hours, or two years of their lives, to community service.

Note: Community Involvement Dept. 3652 Manager Amy Tapia wrote this first-person account of her experience as a volunteer mentor for a high school student.

Dear Sandia Serves volunteers,

High school graduation can be a stepping stone, a final milestone, or sometimes a stone wall. As a result, many New Mexico students do not see college on their horizon. I hope to help Mary (not her real name), a freshman at South Valley Academy, have the skills she needs to navigate the path to college graduation.

I am Mary’s mentor through the Big Brothers Big Sisters’ technology-enriched mentoring program Mentor2.0. More than 30 of us from Sandia are completing our first school year with students at South Valley Academy and Amy Biehl charter schools. I signed up because it sounded like a pretty easy way to mentor a student. I went to a short interview and training, subscribed information about myself, and waited for my “match.” In the fall, I received my first email from Mary. I was pleased to learn that we had a lot in common, and the online platform guided me through my responses. I have to admit: In my first email to Mary, it took me more than an hour to compose two paragraphs! I found myself reflecting about my own experiences as a freshman, and thinking about some of the differences between Mary’s life and my own. During the year, we have enjoyed many guided emails focused on non-cognitive skills like perseverance, resilience, and self-advocacy, and we get together at the school once a month. Mary is a good student, but she is very shy. Her grades are lower than they might be because she is uncomfortable participating in class. We have set goals for her, and this week she shared that she successfully completed a classroom presentation. It was a joy to see the pride in her face as she told me that her heart did stop pounding by the end of the presentation.

The challenges these students face include academic, family responsibilities, peer pressure, and social challenges. One of the unique aspects of the program is that the students are participating in a Mentor2.0 class. A Big Brothers Big Sisters staff person teaches the class and gets to know the students. She reads the emails and checks in regularly with the mentors, providing invaluable advice. I also appreciate the community atmosphere at the monthly gatherings with mentors and students. Being Mary’s mentor is very rewarding and I am looking forward to seeing her graduate in 2017. I want to help her build her self-confidence, seek educational options, and explore career opportunities. I am excited to be a part of her journey.

The Mentor2.0 program is recruiting mentors for the 2014-2015 school year. Find out more by visiting www.bbs-csm.org/mentor2.0, by calling 505-837-9223, or by emailing mentor2.0@bbs-csm.org. Apply by going to https://bbs-csm.mentorinteractive.org/.

Sincerely,
Amy Tapia
Here's a little story: Jim Keagy and a colleague used to have so much fun in each other's company that their project leads decided to move them to separate offices. Far from putting a damper on it, they would often have a laugh over the situation. "We'll work hard, but we'll have fun, too," Jim said.

Jim, a radiological control technologist in Dept. 4128, died in late March at age 61 after a tough year of medical challenges. But to workmates, Jim was — on that everyone agrees — and the quiet type. Quiet, but not retiring. He knew his stuff at work and within the early service group of humor was great at work, and his colleagues laugh out loud. It was just fun working with the guy.

He was a father, too, and who had very clear priorities in his life: faith, family, friends, and work. He was a man who who found a deep Christian faith, was a devoted husband, father, and grandfather, a great friend, and, at work, totally committed to Sandia's values, not least of which reveals the deeply generous nature of Jim, who passed away at age 61 in late March, was based in Albuquerque but participated, directly or indirectly, as a radiological control technologist in every Joint Test Assembly test at TTR for more than 10 years. Jim loved being part of the TTR community and the feeling was mutual. (Photo by Bill Murphy)

And Jim brought more than a strong technical bent to the task at hand. Says Ted Simmons (4128): "Jim had the perfect combination of technical and soft skills for his work. When screening spectators at major events, for example, he could gently get someone aside, determine they were a nuclear medicine patient, and then send them on their way without threatening them or degrading their experience. He was a model Sandia technologist." As good as Jim was at his job, as dedicated as he was to it, it is not so much the crackerjack RTC that his colleagues remember, the man, the friend. Bob Morrison (2930) recalls the three years he spent as Jim's offiiceman in F City. "He was a great and godly man," Bob says, "and I'm proud to say, friend. We enjoyed many a lunchtime together listening to Rush Limbaugh and Dr. Laura — wondering who would ever want to call into her — until we just got fed up and had to change the station. I look forward to seeing Jim again.

And Al Horvath (6634) remembers of Jim, "He would always be the one to go out of his way to help others. Sandia is better for the time that he was here and we miss him."

Eric Staab (5403), who worked with Jim for many years, says, "He was the big brother I never had." The two, Eric and Jim, loved to walk at Harding Field.

"We often spent time together walking under the trees, talking and listening to the cicadas chatter. During those walks, he'd sometimes talk about his wild and free days in the distant past, in the days before he found his faith. Jim loved to eat and I often met him for lunch at the bowling alley on base for green chile stew and then dessert at DQ. More than anything else, I would like the time to have one more lunch with Jim to say goodbye.

Jim, a longtime resident of Pampa, Texas, before moving to Albuquerque in 1992, is survived by his wife Connie, to whom he was married for 36 years, a daughter, Jane McKeen and husband Chris of Albuquerque; a son, David Keagy and wife Christine of Dallas, his mother, Marilyn Keagy of Pampa; three sisters, four grandchildren, and several nephews.

— Bill Murphy
PIANO, Acrosonic Baldwin, $300.

MATTRESS, queen, box spring, $200.

HIGH CHAIRS, 2, Fischer-Price

LED TV, 32-in., Insigna D310, $430/both.

CABINET VANITY, wood, double $430/both.

SECTIONAL, 3-pc., w/2 recliners, $2,200.

LEATHER COUCH, white, Natuzzi, $1,700.

GUITAR AMP, Fender, 1967 Sun-Swamp

5-ft. beaver tail, 3 loading axles, dual wheels, 24K GVW, $2,400. Endres, 263-3468.

lens, 200E flash, Spacemaster Buy, $150. Wong, 515-4087.

new in box, w/warranty, Best $125. Ramos, 972-951-0290.

$430/both. Banks, 293-5248.

drawers, 9 cubbies, heavy excellent condition, photos available, $600. Darien, 715-7430.

VT100, 100-Watt, 2-12-in. $250. Hernandez, 505-200-2520.

$1,500 OBO. Basiliere, 505-515-4462.

$3,500. Basiliere, 505-515-4462.

27-ft., sleeps 6, lots of extras, $3,000. Roche, 505-366-3884.


$1,500 OBO. Verley, 410-9885.

$1,500, $2,200. Willmas, 379-1709.


$250. Meinelt, 350-3255.


1 yr. old, like new, $75.00 OBO. Schuster, 521-2500.


$50, $40. Stubblefield, 505-681-7785.


$600. Endres, 263-3468.

$600. Endres, 263-3468.

$40. Stubblefield, 505-681-7785.

$1,900. Espinosa, 505-550-1632.

$13,740. 741-7639.

BEDROOM SET, full-size mattress, $600. Endres, 263-3468.


ELLIPTICAL, Pro-Form 6.0 ZE $250. Caldwell, 859-358-4553, ask Robert.

TREADMILL, 4.0-chp motor, ProForm 855 Z, $250. Stubblefield, 505-681-7785.

HOT TUB, 7' x 7', seats 5-6 people, $600. Leave a message, will return call.

DEADLINE: Friday noon before week

5. We will not run the same ad more than twice.


2. Include organization and full name of advertiser.

4. Type or print ad legibly; use double spacing.

1. Include contact information (phone, e-mail).

1. Include length of the address.

Send your ad to Lab News, click on News Center, read guidelines, fill out the form, and submit your ad.

MAIL: MS 1468 (Dept. 3651) 505-232-2626.

Lab News

5. One ad per issue.


2. Include organization and full name of advertiser.

4. Type or print ad legibly; use double spacing.

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Scientists help entrepreneurs make business dreams come true

By Nancy Salem

Bill Watts knows a thing or two about big data-center computers. One is that they’re dangerous to move. “A server cabinet is eight feet tall with 3,500 pounds of equipment,” he says. “If it starts to tip over, you can’t stop it.”

Watts designed a swivel lift that could safely move large cabinets, a common requirement in data centers. “The servers are replaced every 18 months in places like Google and Microsoft. It was something in my industry that needed a solution,” he says. “I decided I could do this.”

But he needed help. He couldn’t find all the parts for the lift, and its starter-type motor could interfere with sensitive electronics stored in the cabinets.

Last November Watts reached out to the New Mexico Small Business Assistance (NMSBA) program and was teamed with Sandra mechanical engineer Jeff Dailing (2614), who worked with colleagues to redesign the lift’s power system, which included the motor, clutch, electronic brake, and controller. “They came up with the answers to all my questions,” Watts says.

Watts’ company, Data Center Transitions Inc. of Albuquerque, was among 354 small businesses in 29 counties that participated during 2013 in NMSBA, a public-private partnership among Sandia, Los Alamos National Laboratory and the state of New Mexico that connects small business owners with scientists and engineers who provide technical assistance. The program also contracts with the New Mexico Manufactur- ing Extension Partnership, University of New Mexico Management of Technology program, and the Ander School of Management, Arrowhead Center at New Mexico State University, and the New Mexico Tech Department of Technology.

Since its inception, the program has provided 2,195 consultations, 3,510 New Mexico jobs at an average salary of $38,735, and decrease their operating costs by $79 million.

Another NMSBA success story involved a skin-fold caliper for measuring body fat percentage. “Sandia was critical to the success of this,” he says. “It’s beyond belief that something like that is available when you can’t stop it.”

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Watts was a construction manager for business development at New Mexico Small Business Assistance program on the design of a lift that reduced costs and manufacture the lift for such clients as Microsoft and Dell.

The collaboration helped him attract funding. “NMSBA has been bringing small businesses together with scientists and engineers from national laboratories for 14 years. We are grateful to the principal investigators who work with New Mexico small businesses,” says Jackie Kerby Mooney, manager of the Manufacturing Extension Partnership Dept. 7935. “Together they are implementing innovative ideas and stim- ulating our state’s economic development.”

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