NEVADA NATIONAL
NNSS
SECURITY SITE

FOCUS

A Look at the Accomplishments of the Nevada National Security Site for 2015

MESSAGE FROM STEVE LAWRENCE AND JIM HOLT

Welcome to the first edition of our annual report. Inside are highlights of some of the Nevada National Security Site's most outstanding accomplishments during the 2015 calendar year, as well as stories of employees passionately engaged in our communities and in service to our country.

It's fascinating to imagine how our present compares with our historic beginnings. So much has changed, yet remained the same. The drive to support and strengthen national security was high decades ago, and it still is. This annual report gives us the opportunity to celebrate the Site's 65th anniversary, all the while exploring how we've evolved through science, technology and even conservation.

The Site's history began when President Harry Truman, on Dec. 18, 1950, authorized establishing a 680-square-mile section of the Nellis Air Force Gunnery and Bombing Range as the Nevada Proving Grounds. Our government did this as a response to an emerging Cold War with the Soviet Union. Our mission was clear: To conduct and uphold a national nuclear deterrent to keep our nation safe.

That Cold War, and the Soviet Union, are no more. Today, nations around the world have a cordial, though cautious, working relationship toward the global nonproliferation of nuclear and radiological weapons. However, some countries like India, Pakistan, North Korea and Iran have demonstrated that acquiring a civilian nuclear infrastructure positions them for an eventual nuclear weapons capability, despite international resistance. Because of this reality, the U.S. must maintain its nuclear weapon technology by investing heavily in the Stockpile Stewardship program and creating a completely new paradigm for nuclear weapon certifications, in part through the work conducted at the NNSS.

We believe that the strides we've made this last calendar year support these endeavors. For example, in our Stockpile Stewardship program, our shock physics experiments provide key data for special nuclear material and other actinide materials that certify the national nuclear asset. The subcritical experiments we conduct help scientists model and understand nuclear weapon performance. And our high explosives facilities also support the national labs' programs which include improvised explosive device detection, explosives storage and classified parts sanitation of our weapons stockpile, among many other activities.

But the NNSS is more than experiments. We update our infrastructures, clean up and monitor our environments, aid U.S. municipalities and our foreign partners in their radiological training, and just as importantly, maintain a constant link to the communities to whom we are dedicated.

Our technology and methods in keeping our nation safe have greatly evolved from our yesteryears – but our mission to our country remains unchanged. Global leadership demands demonstrated technical competency. Such leadership will strengthen the safety of our nation for years to come.

During this 65th anniversary, we want to thank all employees of the NNSS, past and present, for your dedication to the mission and all that you do.

Thank you!

Steven J. Lawrence

Steven J. Lawrence
Manager,
National Nuclear Security Administration Nevada Field Office

James L. Holt

James Holt
President,
National Security Technologies, LLC

Published by National Security Technologies, LLC, the management and operating contrator to the Nevada National Security Site
Steve Lawrence, Manager, NNSA Nevada Field Office • James Holt, President, National Security Technologies, LLC
Editor: Jeff Donaldson
Layout and graphics: David Wieand
Contributors: Lory Jones, Kirsten Kellogg, Patty Neese, David Pacheco, Nicole Soto, Tina Vialard

TABLE OF CONTENTS

NEXT GENERATION

New series of subcritical experiments kick off with Orpheus

NON-PROLIFERATION EFFORTS

Experiment aids in treaty verification

FINAL DESTINATION

Classified components find a home at NNSS

CELEBRATING 65 YEARS OF PROTECTING AMERICA'S NATIONAL SECURITY INTERESTS

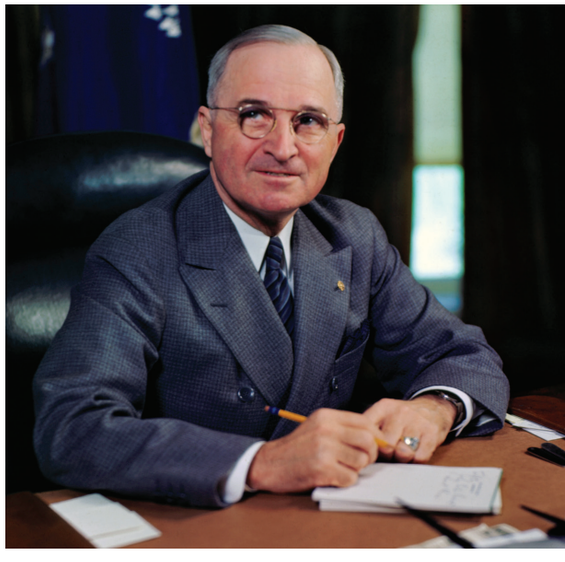
In 1945, the United States and Soviet Union met at the doorstep of Berlin, Germany, in the aftermath of World War II, and set in motion a nuclear arms race that would last some 50 years.

At its height, the Cold War required that the United States achieve extraordinary advancements in the field of nuclear physics. The testing ground for those efforts became a 1,360-square-mile swath of desert, once known as the Nevada Test Site (NTS), outside Las Vegas.

In January 2016, the NNSS celebrates a storied 65-year history that saw the atomic testing era evolve into a period of peace-time science. In addition to a modern stockpile stewardship program, the Site also is home to many new missions that ensure the security of the nation's borders and the readiness of emergency personnel against nuclear terrorism.

President Harry S. Truman in 1951 opened the doors of the Nevada Proving Ground. By 1954, the name had changed back and forth, becoming the NTS – an indicator of a fast-changing, yet important dynamic to American national security.

In 1992, a moratorium was signed ending



the atomic testing era as it was known, instead paving the way for stockpile stewardship in the form of underground subcritical experiments. But the evolution of the mission of the Nevada National Security Site (NNSS) as it became in 2010, was more than just nuclear weapons. The NNSS also serves as a testing ground for homeland security and counterterrorism operations support, such as testing nuclear detection systems at U.S. borders and training first responders in mitigation of loose nukes and dirty bombs.

The Site also serves numerous other agencies, from the Department of Defense to private corporations in evaluating testing programs and training personnel who protect our national security every day. This Annual Accomplishments magazine pays tribute to the men and women, and the programs they serve, that support today's vital national security mission.

NNSS SCIENTISTS SUCCESSFULLY COMPLETE DYNAMIC EXPERIMENT "ORPHEUS"

Los Alamos National Laboratory (LANL) and other national labs rely heavily on facilities at the NNSS to carry out important experiments, and their scientists work closely with NNSS scientists and technical experts to ensure the collection and validation of data. In the absence of underground nuclear explosive testing, the Stockpile Stewardship Program enables weapons experts from the National Laboratories to collect data from experiments that subject materials such as plutonium to extreme states of matter – high pressures and strain rates – without producing any nuclear yield. This data is vital to sustaining the safety, security and effectiveness of the Nation's nuclear weapons stockpile.

In 2015 scientists at the Nevada National Security Site (NNSS) completed an important dynamic experiment in support of NNSA's stockpile stewardship mission. The Lyra series is a set of experiments conducted at the NNSS's U1a facility. Scaled integral experiments provide critical hydrodynamic materials and weapon physics data in support of LANL's

> **"The integration of an effective, mission-focused Site-Directed Research and Development (SDRD) effort that teams with the national laboratories and demonstrates unique diagnostic capability in NNSS testbeds, doing so in record time, is a 'branding feature' that NSTec is most proud of."**
>
> *— Raffi Papazian, director, NSTec Defense Experimentation and Stockpile Stewardship*

certification and pit reuse program.

"We built a state-of-the-art testing laboratory at U1a; a lab that is revolutionizing our ability to understand and assess how nuclear weapons function," says Joseph Martz, technical staff at Los Alamos National Lab. "This type of data is critical for ensuring that our computer simulations can accurately predict performance and thus is critical for continuing our confidence in the safety and effectiveness of the nation's stockpile."

The Lyra series is similar to the previous Gemini series and Leda experiment. The Lyra series includes Orpheus and Eurydice, and Vega. Orpheus was completed with high success in September 2015, and will pave the way for the remaining experiments in the upcoming years (2017 and 2018).

Two new diagnostics also were developed and implemented: high dynamic range Photon Doppler Velocimetry (PDV) and dynamic stereo surface imaging. NSTec's revolutionary multiplexed Photon Doppler Velocimetry (MPDV) has transformed the data richness of dynamic experiments by providing thousands of times of increased data, with minimal sacrifice in quality.

These technology developments demonstrated at U1a, and leveraging efforts at Los Alamos and Sandia, are now driving NNSS program objectives.

NNSA Administrator Frank Klotz (left).

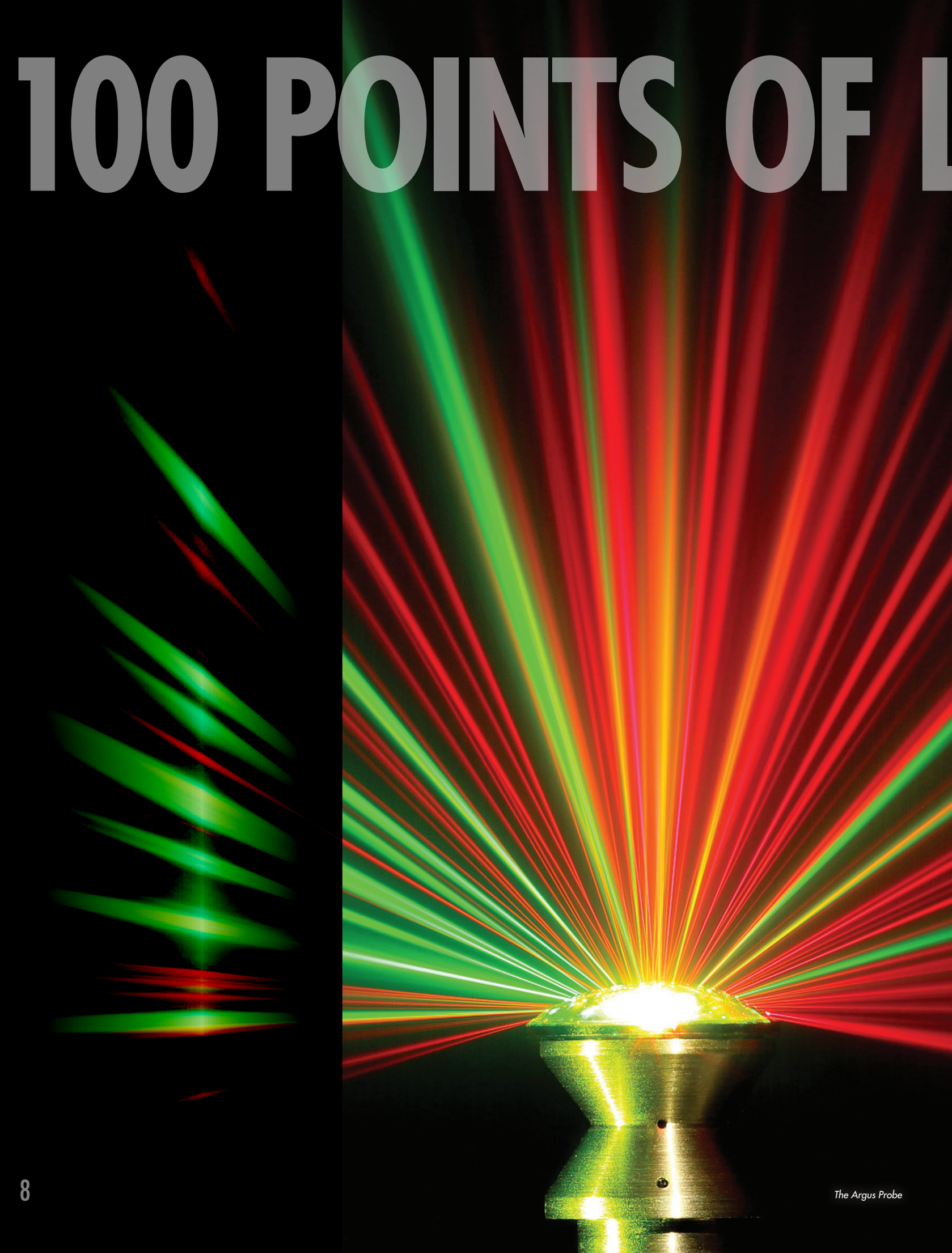
NNSS DRAWS IMPORTANT VISITORS

The award-winning work being conducted at the NNSS has been cited as the primary reason why a number of high-level Department of Energy (DOE) and NNSA visitors stopped by the Site in 2015.

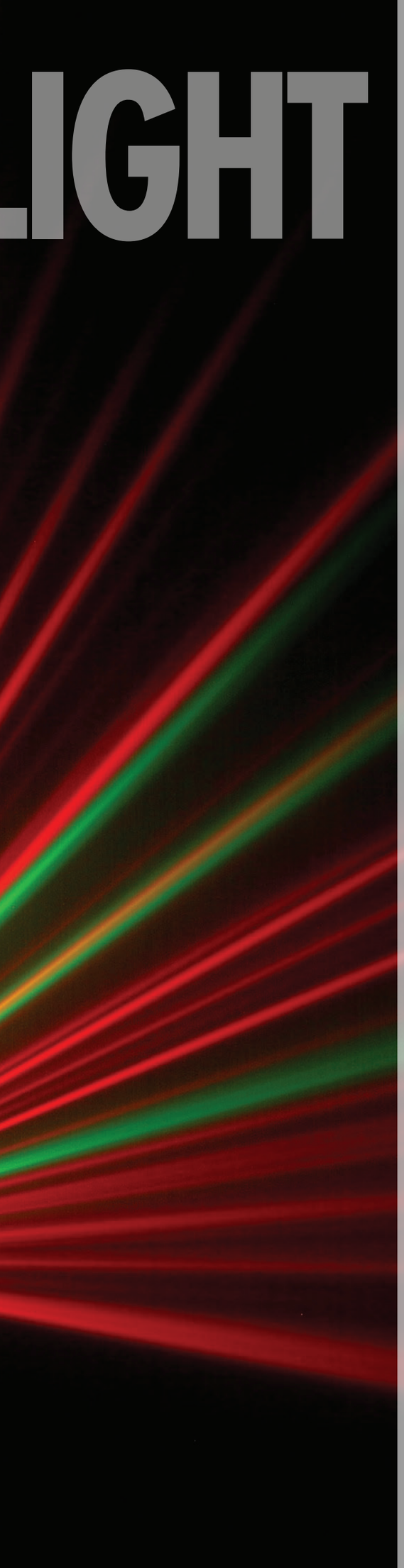
This summer, NNSA Administrator Frank Klotz spent several days engaging employees and touring key facilities at the NNSS, including the Radioactive Waste Management Center (RWMC) in Area 5. Earlier in the year, NNSA Deputy Administrator Madelyn Creedon made her first visit in her NNSA role. She returned with Klotz on his tour. And in June, DOE Deputy Secretary Elizabeth Sherwood-Randall toured the U1a facility.

In July, Klotz and Creedon visited the NNSS to update employees on his impressions and the status of the DOE mission, as well as learn about some of our latest accomplishments at the site. They began their visit at the NNSS, stopping by the Non-Proliferation Test and Evaluation Complex (NPTEC), where they gained a clearer understanding of how it supports NNSA's national security mission, as well as the other federal agencies that use the site's facilities. At RWMC, they focused on the environmental management mission there. Area 5 supports disposing of about five percent of generated low-level waste from around the DOE complex. Klotz also took time at the North Las Vegas Facility, where he presented various NvE awards to outstanding employees from National Security Technologies, the Nevada Field Office and Centerra-Nevada.

100 POINTS OF L



The Argus Probe



LASER PROBE ADVANCES STOCKPILE MISSION

Since 1992, the nuclear deterrent has been maintained through the science-based Stockpile Stewardship Program (SSP). The SSP employs leading-edge scientific, engineering, and technical tools to assess the safety, security, and effectiveness of America's nuclear weapons stockpile.

The Argus probe – recently selected as a R&D 100 Magazine finalist – is being used by scientists to collect velocity data for shock physics experiments as part of the stockpile stewardship science campaign. Optically capturing hundreds of time-resolved velocity records with high fidelity in such a difficult environment requires both the Argus probe and the multiplexing photonic Doppler velocimetry (MPDV) system that also won an R&D 100 award in 2012. Together, they have created new paradigms for experiments critical to national security and enabled data collection. The probe combines an elegant optical design with an innovative fiber-coupling system to meet demanding science-based requirements. The tiny probe offers the potential for revolutionary gains for stockpile stewardship science.

An integrated shock physics experiment involves measuring the shock properties of materials. The Argus fisheye probe, named after the all-seeing hundred-eyed giant from Greek mythology, tackles the challenge of capturing hundreds of velocity channels. This application is demanding: the observed surface is dark and scatters light away from the probe; it may be tilted; it disintegrates during recording; and it accelerates to speeds many times faster than the speed of sound. With the new Argus fisheye probe, up to hundreds of thousands of velocity data points can be collected in one experiment, revolutionizing the value of dynamic experiments in stockpile stewardship science.

"To say the Argus fisheye probe was revolutionary is an understatement! In the world of high speed, intricate diagnostics, the fisheye probe changed the course of data capture systems not only for the Stockpile Stewardship Program, but the entire diagnostics community," said Laura Tomlinson, assistant manager for National Security for the National Nuclear Security Administration (NNSA) Nevada Field Office.

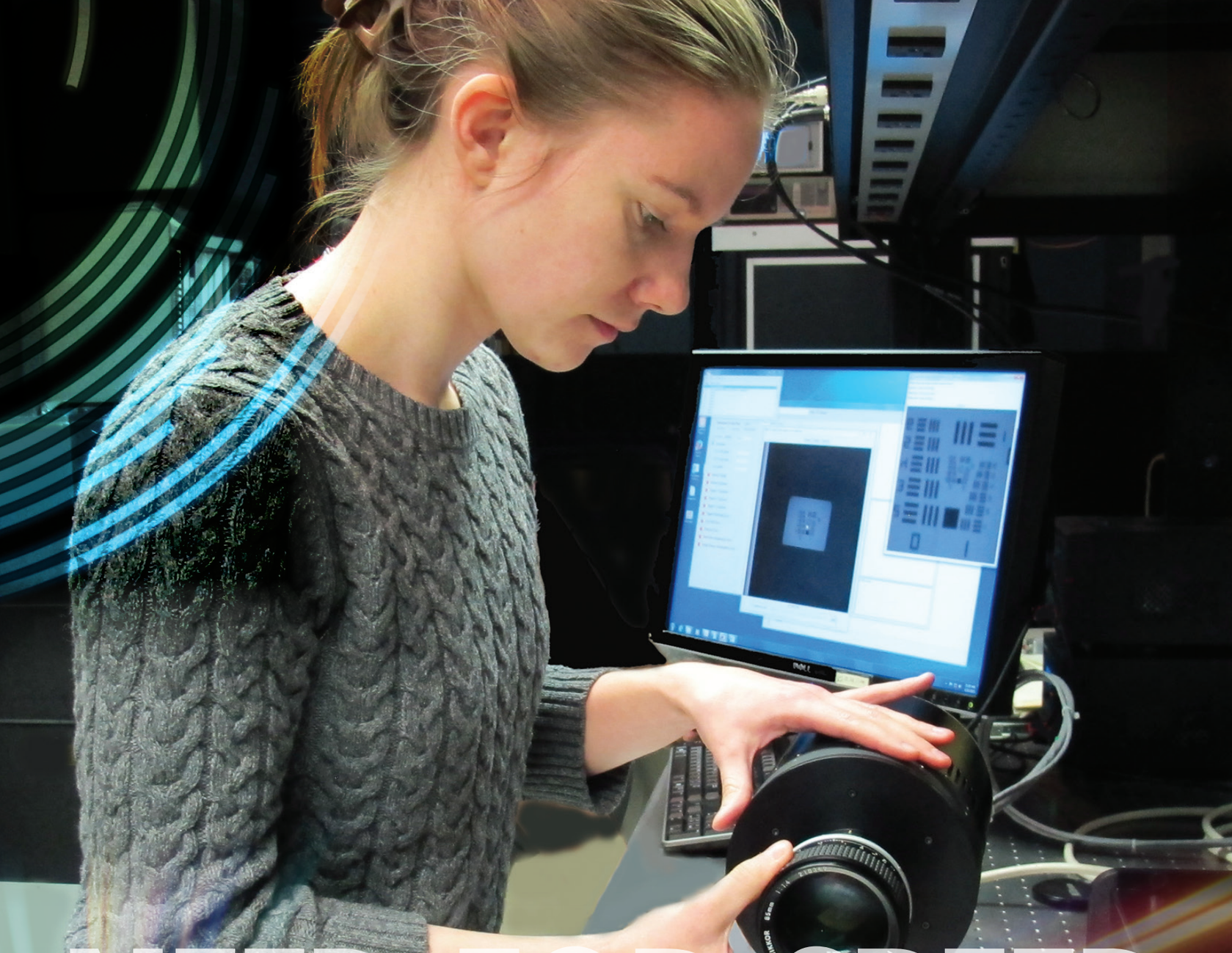
"The NNSA scientific community is energized about being able to capture never before seen phenomena to help certify the U.S. stockpile."

— Laura Tomlinson, assistant manager for National Security for the National Nuclear Security Administration (NNSA) Nevada Field Office.

Argus is a specialized fisheye lens coupled on one end to a polished ceramic mask with precisely mounted optical fibers. Light from each fiber is focused on the inside of the spherical experimental cavity. The surface scatters the light, and the lens collects an amount of the return light and focuses back into the same fiber. The received light is then sent to a fiber-based velocimetry diagnostic and recorded by an MPDV system. The probe is totally non-intrusive to the material being measured.

The Argus probe lenses were designed to physically contact special optical fibers, requiring a very flat surface for precise and accurate drilling of the holes to mount the fibers. Using tiny drills, holes are drilled in the ceramic mount, in many cases smaller in diameter than a human hair.

Despite the challenges, the final design of the Argus probe is an optimal compromise between many difficult and often competing demands of stockpile stewardship science.



NEED FOR SPEED

NEW CAMERA CAPTURES DATA IN SINGLE FRAMES

You buy a new digital video camera from the store and take it out to film your child's soccer game. When you look at it later, all you see is motion. You're likely oblivious to the fact that the camera was shooting the game at roughly 30 frames per second. That means 30 individual photos were taken each second, running together to capture the event as one fluid human activity.

Now imagine instead using a camera that fires off 6.6 million frames a second and captures three key images that are integral to the activity you are filming. What seems almost unfathomable to understand is actually a new technology so advanced that it has revolutionized the stockpile stewardship mission at the NNSS.

Scientists from LANL join those from the NNSS to use the newly developed 3-Frame camera to photograph dynamic experiments. These experiments subject materials to high pressures and strain rates to determine how they would react if needed in today's U.S. nuclear arsenal.

According to John Hollabaugh, manager at NSTec New Mexico Operations, the reaction during some of these experiments is so fast that advanced radiography and photographic devices are essential to capture the required data in the fraction of a second the experiment is concluded. "By predicting when in the event one wants to capture an image, valuable scientific information can be gained about the performance of the materials," Hollabaugh said.

The 3-Frame camera is a collaborative effort between LANL P-23 and NSTec. LANL designed and fabricated the image sensor, which is the heart of the camera system, and NSTec developed the electronics to operate the image sensor and transmit the raw data to a computer for further analysis.

Two additional 3-Frame cameras are being fabricated and have potential use in support of future multi-pulse radiography at the U1a complex. It is one step in the development of an eventual 10-frame camera for enhanced radiography in future projects. All of these new technologies have contributed to some of the largest data returns ever from dynamic experiments.

NEW TECHNOLOGY AT U1A ENHANCES EXPERIMENTAL CAPABILITIES

Deep in the earth, 963 feet below the surface, scientists from the National Laboratories join those from NSTec to carry out advanced experiments in support of the U.S. Stockpile Stewardship mission.

In the sprawling maze of well-lit tunnels that comprise the U1a Complex, these experts engage in high-tech work using advanced camera and diagnostic technology second-to-none in the field of nuclear science. Following notable successes in dynamic experiments, those in the Stockpile Stewardship science campaign at the NNSS recognized that important capabilities were needed at U1a.

Presently, modifications are being made to the U1a. These modifications represent a combination of programmatic and life safety improvements.

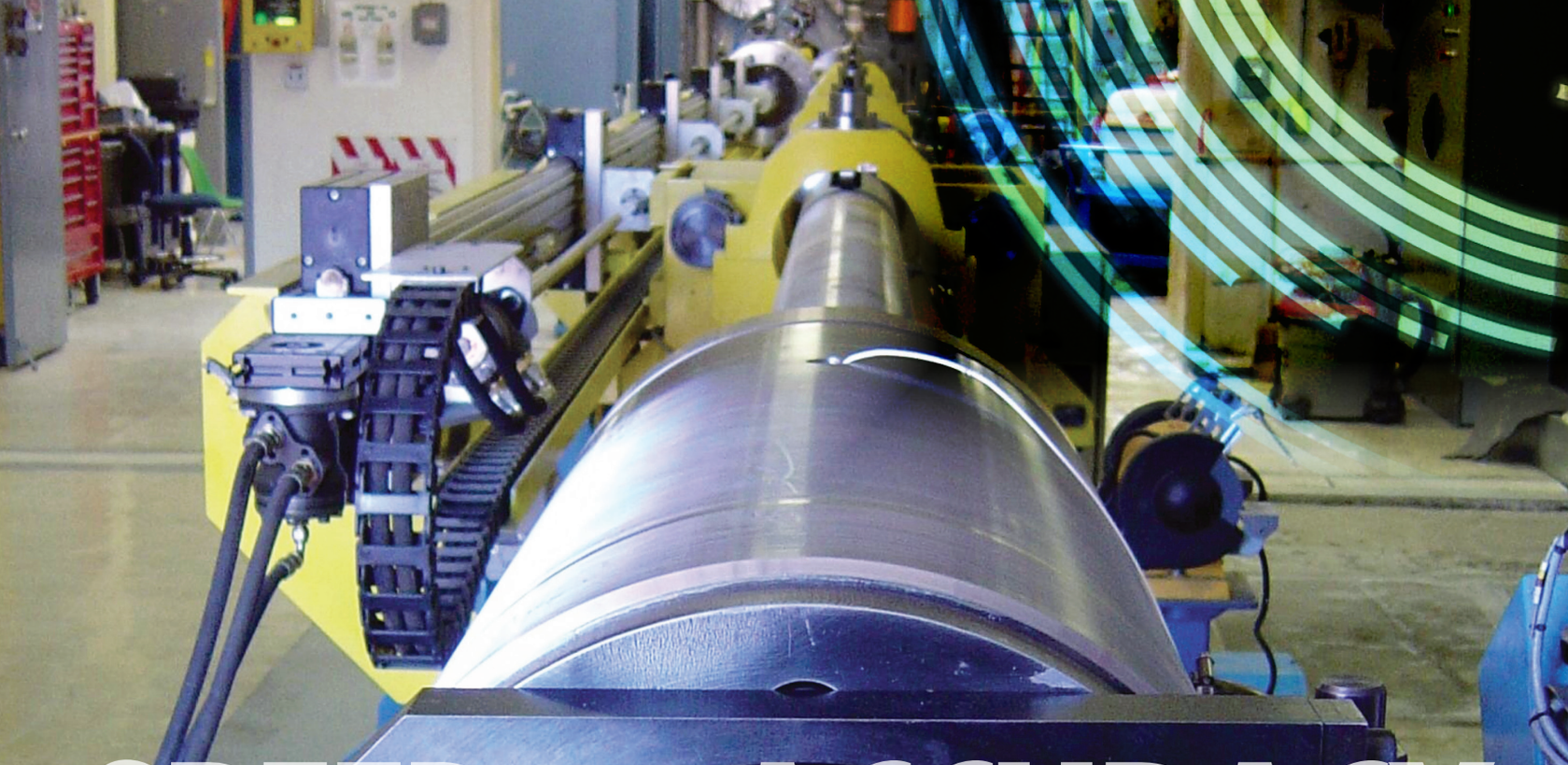
From the programmatic perspective, the capability to do a variety of experiments in support of Stockpile Stewardship is being added. For life safety improvements, a second means of egress from the Zero Room, a fire barrier in the drift, and automatic fire detection and alarm throughout the experimental area are being added.

Future capabilities will define the behavior of materials in dynamic experiments by improving radiography and diagnostics capabilities.

Fifty years ago, atomic energy scientists had to detonate high-yield bombs to test the effects of a nuclear blast. The U.S. conducted it last nuclear explosive test in September 1992, and as a result of SSP, we now know more about how these weapons work today than we did with the underground nuclear explosive testing regime of past decades Today, measurements are taken in dynamic experiments that are far less dramatic but equally as significant. The data from such experiments is vital for maintaining our nuclear weapons stockpile.

"The work being done at U1a has produced unprecedented data return, and the technology represents highly advanced diagnostics ever used in the mission of stockpile stewardship," said Raffi Papazian, director of Defense Experimentation and Stockpile Stewardship. "This along with safety improvements will ensure the U1a Complex remains a valuable aspect of the NNSS mission to maintain the integrity of the U.S. nuclear weapons stockpile."

MINED OVER MATTER



SPEED & ACCURACY
GAS GUN GOES BEYOND MISSION PREDICTIONS

The Joint Actinide Shock Physics Experimental Research (JASPER) facility at the NNSS features more than just one of the most powerful gas guns on the planet – it has quickly become an integral part of the Stockpile Stewardship Program for the data it provides.

Scientists from the National Laboratories use JASPER to conduct experiments, or "shots," that subject materials to extreme pressures and temperatures to see how they react. The data is used to certify the nation's nuclear weapons stockpile.

JASPER successfully executed 10 shots in 2015 - seven actinide and three surrogate material shots – to bring the total for the gun to 132. All of the shots are very important to the program. "This was a fantastic year for JASPER," said Dennis McNabb, associate program director for Primary Enabling Technologies for Lawrence Livermore (LLNL).

The ability to turn around numerous experiments in the same year, and the level of data derived from the experiments, have helped to enhance the facility's reputation as a premiere experimental location, JASPER officials say.

"These experiments prove that JASPER is very efficient and has many more capabilities yet to be uncovered through the integration of newer diagnostics," said Trenton Otteson, JASPER project manager NSTec.

Experiments using the two-stage gas gun at JASPER provide important data on how these materials behave under extreme pressures and temperatures without underground nuclear testing.

Experiments with surrogate materials are used to prepare the gas gun and diagnostics for the actinide experiments. The surrogate shots verify and validate projectile velocity, gun performance and installation of faster data oscilloscopes.

All of these advancements have improved scientists' ability to determine how a material reacts to changes in pressure, density, and temperature. "Working together, NSTec and LLNL finished a landmark experimental Hugoniot series on plutonium this year that achieved accuracies of 99.5 percent in pressure, density and energy which improves our understanding of plutonium thermodynamic properties by several percent," said McNabb said. These results were the culmination of many years of hard work to make JASPER experiments both efficient and extremely well calibrated.

"JASPER, one of our premiere facilities, had a great year this year returning extremely difficult to obtain data on special nuclear materials. The data has already made a huge difference to special nuclear material understanding for the Stockpile Stewardship program," said Laura Tomlinson, assistant manager for National Security for the Nevada Field Office.

RADIOGRAPHIC DIAGNOSTICS PROVIDING VALUABLE EXPERIMENTAL DATA

The Cygnus Dual Axis Radiographic Sources at U1a achieved a milestone in 2015 by completing its 11th year of use. An integrated team of LANL, Sandia National Laboratories (SNL) and NSTec staff has nurtured the sources where today the sources are more reliable, produce a higher dose, and are better collimated.

On August 27, 2015 the Cygnus sources successfully completed another experiment in what has been a remarkable journey from their original mission.

The Cygnus Dual Axis radiographic sources were designed for the Armando Experiment which was performed in May 2004. While the machines were designed to exhibit very high reliability and repeatability, they were only expected to be used for a few hundred shots. In fact, they were deemed to be expendable with no expectation to be used again.

Their success in providing two very high-resolution radiographs on Armando caused the community to rethink the notion of letting them go unused. Armando was followed by the Thermos series in 2006 and 2007, next was Bacchus in 2010, Barolo A and Barolo B in 2010 and 2011, the Gemini series (Castor and Pollux) in 2012, and Leda in 2014.

Both machines underwent a refurbishment in 2012 to bring them back to "like new" status. Then the imaging system was upgraded with new multiple magnification zoom lenses which increased the field of view, resolution, and image contrast. The shielding and collimation was modified to reduce the x-ray scatter background. Cygnus has demonstrated the ability to radiograph materials that range in areal density from 0.1mg/cm2 to just over 100g/cm2. The range is astounding and far surpasses the original expectation of the sources.

That the Cygnus machines just keep going is a tribute to the hard work, dedication, attention to detail and never give up attitude of the operating team which consists of NSTec, LANL, and SNL personnel.

EMPLOYEE PROFILE

SARAH THOMAS

Sarah Thomas is NSTec's first "postdoc" — that is, a newly graduated Ph.D. student. Sarah will work at New Mexico Operations' Los Alamos Office (LAO) and occasionally at the Special Technologies Laboratory (STL) in Santa Barbara, Calif.

"Having a postdoc is significant to NSTec because a postdoc helps support our (research and development) R&D effort, showing its growth and maturity," says Howard Bender, Site-Directed Research & Development (SDRD) program manager at LAO.

After graduating in Physics from the University of Alabama, Birmingham in 2013, Sarah was appointed a postdoctoral fellow at the University of Edinburgh, Scotland. She spent one and a half years there, studying nitrogen-rich explosives under high pressure.

For NSTec, she will be studying materials under dynamic compression, "which fits into my previous studies of high-pressure materials research. My dissertation was on the effects of high pressure on magnetic transitions in heavy rare earth metals," she says.

NON-PROLIFERA

SPE-4 PRIME DATA AIDS IN TREATY COMPLIANCE

One of the greatest threats to the security of the United States is the development of nuclear weapons by countries that might be inclined to use them. Our government focuses key attention on nuclear non-proliferation efforts, and at the center of that is the NNSS. The Source Physics Experiment-4 Prime (SPE-4 Prime), north of Sedan Crater, does this. It was successfully conducted in May 2015.

The experiment was a collaborative effort between NSTec, Lawrence Livermore, Los Alamos & Sandia National Laboratories, the University of Nevada Reno, and the Defense Threat Reduction Agency (DTRA). The location in Area 15 at the NNSS was chosen because of the granite geology and the presence of previous historic nuclear tests conducted in the granite, which permits the comparison of chemical and nuclear explosions.

"The SPE-4 Prime experiment was a phenomenal demonstration of DOE/NNSA Laboratories teaming with the NNSS to further the understanding of seismic science," says Laura Tomlinson, assistant manager for National Security for the Nevada Field Office. "The NNSS is a perfect location for this type of research and the data from SPE-4 Prime and the Source Physics experiment series is instrumental in meeting U.S. national security objectives."

When nations decide to develop a clandestine nuclear weapons program, deterrents are intended to help them reconsider their actions. The fact that even small underground nuclear explosions generate seismic waves that can be detected and recorded at great distances is one deterrent. Unfortunately, industrial chemical explosions and earthquakes also generate seismic waves that can be difficult to distinguish from those produced by nuclear explosions. SPE-4 Prime is one of a series of experiments critical to the U.S. capability to detect low-yield nuclear explosions anywhere in the world.

Data from SPE-4 Prime is essential for developing computer models to help determine whether emerging nuclear powers have attempted an underground nuclear test. The shot was designed to test a hypothesis that the damage above an explosion plays a significant role is shaping the shear and surface waves that are generated and recorded on seismic stations. Information gathered from this experiment included high-resolution accelerometer, infrasound, seismic, explosive performance, electromagnetic, ground-based lidar, and digital photogrammetry data.

The canister for SPE-4 Prime was designed by LLNL, with a new grout formula to protect the canister downhole that was developed by NSTec, explosive operations were conducted by LANL, and a new systems design was engineered by SNL to improve operational success.

The project was managed through Global Security; Defense Experimentation & Stockpile Stewardship provided diagnostics and timing and firing support; and Operations and Infrastructure emplaced and grouted the canister, and stemmed the borehole. Additional support was provided by Nuclear Operations Directorate, Mission Assurance and Safety, and Environmental & Waste Management.

Three more experiments in granite are planned for the current campaign.

"We are very proud of this major accomplishment by a combined, NSTec, Laboratory, University and DTRA team," said Jim Holt, NSTec Acting President. "The data from SPE 4 prime and the future shots will ensure that the international community has the best data to ensure compliance with treaties. It also marks a more integrated, more rigorous approach to complex experimentation at the site."

SAFE-KEEPING

NUCLEAR MATERIAL RECOVERY PROGRAM HELPS REIGN IN TERROR THREATS WORLDWIDE

For years, the U.S. government has been concerned about the clandestine availability of random nuclear and radiological materials and associated technologies throughout the world, seemingly leaving them ripe for taking by the highest bidder. Such concern has prompted cooperative agreements with many nations that share America's desires to control, protect and in some cases, recover radioactive sources before they fall in the hands of someone who might be tempted to use them against us.

At the heart of those protection and recovery efforts is the Department of Energy National Nuclear Security Administration (DOE/NNSA) Global Material Security program, managed by some of the top experts in nuclear science at the NNSS. Since 2002, a team of some 20 employees of National Security Technologies have joined dozens of U.S. and foreign agencies in helping to collect thousands of radioactive material sources.

"The biggest fear from early on was that the Russians didn't keep track of nuclear weapons or radioactive sources and we wanted to prevent them from showing up on our shores," says J.R. Russell, the project manager for four Global Material Security Remove and Protect projects.

The DOE/NNSA Global Material Security Russia Orphan Sources Recovery (OSR) project has conducted operations throughout the Russian Federation since 2002, collecting more than 6,000 sealed radioactive sources typically from a broad variety of sites ranging from commercial food and equipment irradiation facilities to medical clinics that use the material for treatment of cancerous tumors. This year the OSR project recovered more than 509 Cobalt-60 sources containing over 64,000 curies in radiation from four Russian sites.

> **"One single radioactive source exploding in a dirty bomb may not have far-reaching physical effects, but the psychological and economic effects could be devastating."**
>
> *— J.R. Russell, project manager, for Global Material Security Remove and Protect projects*

In 2013, Russell oversaw the development of the Armenia Orphan Source Recovery project, and currently is working to follow up with an OSR project in Belarus. Since 2010, NSTec has been installing enhanced security systems at Belarusian sites that use or store radiological material. The Armenia OSR project this year collected three significant Cobalt-60 sources with a residual effect of 745 curies. These Cobalt-60 units were used in devices approximately the size of X-ray machines, and often left behind either at the end of use or closure of a clinic.

All totaled, the recovery program has collected more than 775,000 curies in material, which is then deposited in regulated storage facilities in the host counties. Russell says the measure rate for calculating a radioactive dispersal device would be about 1,000 curies per bomb – though amounts could vary. That means the program can safely say it has helped prevent the potential for more than 775 "dirty bombs."

"We work with subcontractors who help us with everything from foreign language interpretation and translation to in-country logistics and transportation. We even have a company that helps us with conducting site vulnerability assessment and designing site security upgrades," Russell says. The latter is the core mission of the GMS Protect program, which works with host nations to upgrade security at radiological material facilities and aids in developing and tightening national regulations. "This mission is definitely very unique to the NNSS. There are not many other people involved in this international effort," Russell says.

Russell says the DOE/NNSA Global Material Security program will likely conclude operations in Russia in 2016. But the challenge isn't done.

He says the greatest risk there has been the Russians and other former Soviet nations broadly using gamma radiation sources for cancer therapy, which present higher levels of radiation to irradiate tumors. NNSA/DOE scientists have been working to help other countries explore alternative therapy sources, putting the focus on the longer-term plan of eliminating radioactive sources that could be used in radiological terrorism.

THOR: GLOBAL SECURITY EXPERIMENT TARGETS MONITORING CAPABILITIES

NSTec's Global Security Directorate supported Sandia National Laboratory in the Thor experiment in 2015. The objective of the Thor experiment was to characterize the 2D seismic velocity profile of Yucca Flat in order to improve physics-based models for seismic wave propagation in alluvium (or "soft" rock).

The hammer is a large weight drop that generates seismic waves that travel tens of kilometers and are recorded on sensitive ground motion sensors. The Thor experiment is part of the Source Physics Experiment (SPE) program aimed at improving capabilities for underground nuclear explosion monitoring.

NSTec provided crane operations to support the hammer while striking the ground at least 32 times at each of 157 locations. The repeatability of the source allows the coherent signal data to be stacked while the incoherent noise is cancelled, thus improving the signal-to-noise ratio.

NSTec also provided seismic support in the deployment of as many as 350 ground motion sensors along two linear profiles – one 11 miles long and the other 7 miles long. The data collected are high quality and are allowing Sandia scientists to develop high-resolution geophysical models for Yucca Flat.

The project was funded by the National Nuclear Security Administration, Defense Nuclear Nonproliferation Research and Development.

NEW CUTTING-EDGE TECHNOLOGY, PARTNERSHIP TO AID MEDICAL PATIENTS

A medical patient with a perceived heart condition is sent to the X-ray lab. There, they receive a medical isotope along with an imaging study. This isotope allows the Imaging device to detect the flow of blood through the heart. This nuclear imaging study allows medical professionals to detect for early or active heart disease.

The isotope, known as Technetium-99m (Tc-99m), has low radioactivity and a half-life of about six hours, meaning it is next to impossible to keep an inventory at the hospital. Considering that 80 to 85 percent of the more than 40 million imaging and diagnostic procedures performed worldwide each year use Tc-99m, finding a method to manufacture the material presents a unique challenge.

NNSS management and operating contractor NSTec has taken center stage in this effort. NSTec this year partnered with Henderson, Nevada-based Global Medical Isotope Systems (GMIS) to provide expertise in production of the Tc-99m isotope. The agreement on research and development, known as Cooperative Research and Development Agreement (CRADA), is routinely used by the Department of Energy laboratories to enhance skills while supporting non-laboratory partners.

"We are excited to have our first CRADA, and doubly excited that it's with a hi-tech business right here in southern Nevada," said Dr. Chris Deeney, NSTec's recent vice-president for Program Integration and Chief Technology Officer.

NSTec will provide technical integration, modeling, materials, and design support to GMIS's mission in the development and deployment of a ground-breaking approach in the production of the radioactive isotope - molybdenum-99 (Mo-99), from which Tc-99m is derived.

Of the 40 million imaging procedures done annually, more than 20 million are performed in North America, and about 1.5 million are performed in Canada. Approximately 15,000 imaging and diagnostic procedures are performed in southern Nevada each year.

The United States terminated its domestic Mo-99 production in the 1990s, but continues to import the isotope from Canada and Europe. In addition, U.S. and global demand for Mo-99 has grown substantially in recent years.

The five-year CRADA will utilize the capabilities of NSTec's Remote Sensing Laboratory (RSL), located at Nellis Air Force Base in Las Vegas and at Joint Base Andrews near Washington, D.C. In its national security role, NSTec develops advanced technologies for radiation detection and has substantial radiological emergency response capability. The company brings to the CRADA staff of nuclear and health physicists, skilled physics and electronics technicians, a variety of radiological materials, and an extensive inventory of radiation detection equipment that will greatly benefit the mission of GMIS.

"Our contributions in science and technologies have helped national security for decades, from the Cold War to the war on terror," said Deeney. "We see this agreement as a chance to apply our expertise to improving global security by helping others to improve global health."

MEDICAL BREAKTHROUGH

LESSON LEARNED

RADIOLOGICAL RESPONSE TEAM LEADS CHARGE AT MAJOR NUCLEAR EXERCISE

Following the accident at the Three Mile Island Nuclear Power Plant in March 1979, the President and Congress directed the impacted federal agencies to develop a plan to provide for an integrated federal response to radiological emergencies. Born of that effort was the Federal Radiological Monitoring and Assessment Center (FRMAC), which is positioned at the Remote Sensing Laboratory at Nellis Air Force Base, ready to respond in mere hours of a nuclear disaster.

It is fitting, then, that the FRMAC became an integral part of Southern Exposure-15 (SE-15) in July 2015. Coordinated by Duke Energy in South Carolina, SE-15 was the largest national level exercise at a nuclear power plant conducted since the terrorist attack on the World Trade Center in Sept. 11, 2001. The scenario called for a radioactive release at the H.B. Robinson Nuclear Plant near Hartsville, SC.

More than 60 Federal and contractor employees from NSTec joined state and local emergency officials in responding to the exercise, deploying with detection assets used in monitoring radiological conditions and providing assessment data for use by local, state and Federal response agencies. The exercise was just one of many conducted by emergency management components at the NNSS.

The FRMAC worked directly with the S.C. Division of Emergency Management as well as FEMA, the Environmental Protection Agency, Nuclear Regulatory Commission and other Federal agencies to monitor and assess the incident and provide data to state responders for use in public protection and mitigating the disaster.

FRMAC also was supported by a Public Affairs contingency that worked with public information officers from more than 40 agencies to respond to mock media queries, conduct press conferences and interface with responders to provide the most complete "big picture" look at the event.

"SE-15 was a valuable opportunity to assemble the whole community of federal, state, and local emergency response personnel who would deal with a nuclear power plant accident," said the Department of Energy's Dan Blumenthal, the exercise director for the FRMAC component. "The well-trained teams may keep their basic skills sharp with regular proficiency drills, but rarely do they get a chance to operate in the fast-paced and unpredictable interagency environment. All of the NA-42 consequence management assets performed admirably during SE-15 and received high praise from observers, evaluators, and other players."

The Nevada FRMAC team members first arrived during the first day of the event, during which Duke Energy still was conducting initial response activities associated with a mock cooling system failure at the reactor. The scenario tested local response agencies ability to follow established guidelines for mitigating a radioactive release.

FRMAC monitors were on the ground – and in a separate component of the exercise – aerial assets from the WINGS program were providing aircraft to fly over the region. Hundreds of emergency management personnel – including military assets - from all over the United States worked to provide various levels of support to South Carolina officials.

The FRMAC team provided plume and exposure maps to assist state agencies in determining response. Local emergency officials echoed Blumenthal's comments in saying Southern Exposure – while complex – was a huge benefit in evaluating existing plans and procedures.

MILITARY, RSL TEAM UP TO FOCUS ON NUCLEAR INCIDENT RESPONSE

Air and ground crews from the RSL Aerial Measuring program joined the U.S. Army in February and August 2015 to conduct a major exercise designed to expand RSL's cooperation with other agencies in the post-detonation phase of nuclear and radioactive threats.

The Prominent Hunt was an extensive, real-time exercise response to a nuclear attack on a major city. The Prominent Hunt 15-1 was conducted on the NNSS on February 19-26. The Army's 20th CBRNE (Chemical, Biological, Radiological, Nuclear, Explosives) Command, FBI, Los Alamos National Laboratory and the Air Force's Technical Applications Center conducted radiological post-blast forensics training at the Site. The classroom training and planning was held at Mercury and then the Prominent Hunt team deployed to the Forward Operating Base for field work.

NSTec provided logistics and training for the team. The RSL Aerial Measuring System (AMS) team conducted a No-Notice drill in support of exercise. The AMS team was provided with a National Atmospheric Release Advisory Center plume model of the blast. From the model, the team planned an aerial mission to map the extent and direction of the plume and to provide exposure levels to support the Prominent Hunt ground teams.

The Prominent Hunt 15-1 exercise at the NNSS was a precursor for the Prominent Hunt 15-2 exercise held in August 2015 in Long Beach, CA.

Karen McCall, program manager of the RSL Aerial Measuring System program, said the no-notice exercise there was a first for RSL as three crews were deployed to support consequence management aerial activities. RSL's Bell 412 helicopter and KingAir B200 joined helicopters from the Army 244th and Los Angeles Sheriff's Department in conducting numerous aerial measuring flights during the first few days after detonation.

RSL deployed with their Non-dedicated Aerial Detection System, which can be placed inside almost any aircraft. For Prominent Hunt 15-2, it was placed inside the Army's Blackhawk helicopter. The four aerial teams had to work closely together to cover the city of Long Beach and the plume that reached down to Catalina Island, over 30 miles. Information was provided to the crews as it was learned, adding a level of realism to the scenario, McCall said.

"This exercise allowed us to integrate our assets with the Department of Defense," McCall said, adding that the Army's initial response to the incident is to conduct nuclear forensics at "Ground Zero." RSL's aircraft flew outside the "blast area" to determine which areas were safe for the ground teams.

The joint exercise was another example of the success RSL has had developing relationships with various agencies that trust their capabilities and look forward to participating in exercises and drills. In two and a half days, the teams flew 17 flights among the four aircraft.

"In a real emergency, they'll know who we are and that we're one team," McCall said. "They'll understand more clearly what each asset brings to the incident."

The AMS Prominent Hunt Deployment Team consisted of Jezebel Stampahar, Piotr Wasiolek, Michael Reed, Rajah Mena, Michael Lukens, Tom Stampahar, Christopher Joines, Grant Ebner, Michael Toland, Susan Roberts, Emmanuel Avaro, Shawn Cadwell, Ed Zachman, Karen McCall, and Les Winfield. Jezebel Stampahar and Grant Ebner received outstanding participation awards during the closeout dinner from the Prominent Hunt Exercise Planners.

UAV RESEARCH WILL BOOST RADIATION DETECTION

In December 2013, the Federal Aviation Administration (FAA) named Nevada one of a half-dozen authorized test sites for the commercial development of unmanned aerial vehicles, or UAVs. The NNSS was named as one of the potential host locations due to its remoteness, and its proximity to Creech Air Force Base, where the MQ-1 Predator and MQ-9 Reaper UAV already fly.

It makes sense then, that one of the first groups to jump at the opportunity to develop unmanned aerial systems at the NNSS would be its own RSL. In September 2015, RSL took delivery of its first two UAVs as part of a Site Directed Research and Development (SDRD) effort to develop new technologies.

"This is a huge opportunity – a real game changer for us," says Karen McCall, RSL's Aerial Measuring System and UAS program manager.

Operated out of Nellis Air Force Base, as well as Andrews Air Force Base in Maryland, the NNSA/NSTec-led AMS program maintains helicopters and fixed-wing aircraft equipped with sensors that can detect radiological or nuclear threats on the ground.

Crews fly the aircraft in advance of major activities such as the Super Bowl or the Presidential Inauguration. Such sweeps enable them to characterize the radiological environment and provide maps that can be used during the event to determine if a threat exists.

During an actual nuclear or radiological terrorist attack, the aircraft would fly at a safe distance from Ground Zero to track the plume cloud, and provide data to response agencies to aid in the emergency response. McCall said developing sensor technology for UAVs not only enables scientists to expand capabilities of their systems; flying unmanned aircraft allows for positioning sensors closer to the source.

"We are looking at a multi-modal approach for the data fusion of a variety of sensor technologies from radiological, imagery, and spectral systems," McCall says.

The AMS mission provided support to the Japanese during the Fukushima Nuclear Plant disaster resulting from a 2011 tsunami. During that event, UAVs also were used by response agencies in Japan to track contamination.

The process to acquire the platforms was long and intense. RSL put together a team of scientists, aviators, project managers, technicians and procurement specialists across multiple NSTec divisions. Over six months, the team researched to determine the best platforms to meet SDRD requirements. Afterwards, the finalist conducted a UAV demonstration at the NNSS. The demonstration was used to provide up-close inspection of the platform by the Technical Evaluation Team against the requirements.

In the end, Unmanned Systems, Inc (USI) was the chosen vendor. USI is a local Nevada company from Henderson. The company delivered two new Sandstorm UAVs to RSL in September 2015.

Included in the contract with USI are training, service, and maintenance in the first year. The FAA requires all commercial UAVs be flown by a licensed pilot. McCall said seven RSL team members have been placed in the training, including pilots, engineers, and mechanics.

"The purpose of having the UAV is to provide another vehicle for sensor development and integration. In order to grow, we need a team who knows the ins and outs of the platforms and how to integrate a variety of sensors," McCall says. The expectation is for the team to be ready to conduct SDRD UAV missions testing new technology over the NNSS sometime in 2016.

"The acquisition of the UAV aircraft is awesome," said Chris Deeney, recent vice president of Program Integration for NSTec. "This is a big step forward and in a few years, we will look back and mark this as a day that changed a national mission."

EMPLOYEE PROFILE

KEVIN REMUS

To most who meet him, Kevin Remus is an attorney who assists General Counsel with all matters related to patents and intellectual property at NSTec. But behind the scenes, Remus has a unique military connection that offers much more.

Remus provides pro-bono legal support to a charity called Legacies Alive, a group dedicated to remembering fallen soldiers and helping their families. He knows firsthand about their challenges – he is, after all, a Major in the Nevada Army National Guard.

Kevin led soldiers during combat operations in southern Afghanistan in 2006-2007.

A graduate of West Point, Remus was on active duty from 1998-2004 and from 2006-2007 when he was deployed to Afghanistan. He's been in the National Guard or Reserves since 2007. He has spent time at Fort Leonard Wood, Mo., Fort Irwin, Calif., Fort Benning, Ga., Kuwait at Ground Forces HQ during the invasion of Iraq in 2003, and Afghanistan in 2006-2007. He's also been in the Nevada National Guard since 2012.

Kevin's grandfather was a WWII veteran, so Kevin wanted to follow in his footsteps. He says he's always enjoyed the physical and mental challenges associated with being in the Army. During his military career, he's earned the Bronze Star, Ranger Tab, Sapper Tab and Airborne Qualified recognition.

FINAL DESTINAT

NNSS AREA 5 PROVIDING ALTERNATIVES TO STORAGE OF CLASSIFIED COMPONENTS

A program that allows NSTec to bury excess and legacy classified weapons components at the Area 5 Radioactive Waste Management Complex (RWMC) at the NNSS has helped the Air Force realize unprecedented cost savings.

NSTec's Environmental Management group stepped up in 2012 to pilot a new program, geared toward helping both DOE and Department of Defense (DoD) sites dispose of excess and obsolete classified components – typically comprised of aging weapons parts. The pilot program allowed disposal of classified components without sanitization methods previously required for shipment to commercial disposal facilities and changed the permits at the Area 5 RWMC to allow non-radioactive classified components.

The NNSS maintains a low-level radioactive waste disposal facility mined out of the ground in Area 5, where certain types of materials that meet stringent waste acceptance criteria can be permanently disposed. Jeanne Poling, senior business and technical officer of NSTec's Environmental Management group, said the pilot program that began in 2012 has disposed of more than 186,000 cubic feet of material through August 2015 from both DOE and DoD sites.

"The cost avoidance is coming not only from the method of disposal but from the inventory cost reduction they are seeing." Poling said.

The biggest challenge facing officials charged with disposing of obsolete classified components has been how to meet the sanitization criteria required for disposal at commercial facilities, Poling said. NNSS officials worked with the DOE and NNSA senior leadership to gain formal approval for permanent burial of classified components at the Area 5 RWMC without sanitization. Additionally, by working with state regulators, the NNSS added the capability to dispose of non-radioactive hazardous and non-hazardous classified components.

In 2013, the Hill AFB 414 Supply Chain Management Squadron (SCMS) collaborated with NSTec on the program to dispose of classified components that have been determined to be obsolete.

In the numerous planned disposition campaigns, which included several this year, an integrated project team comprised of NSTec waste generator services personnel and 414 SCMS logistics personnel spent several days characterizing components, verifying serial numbers, and packaging thousands of obsolete classified components. These were some of the largest shipments of classified assets that the SCMS at Hill AFB has ever conducted, both in weight and volume.

"One generator, Hill (Utah) Air Force Base (AFB) has reported a total cost avoidance in the last two years of $218 million on an investment of $1.9 million for disposal of 10,000 ft3 of classified components at NNSS"

— Jeanne Poling, senior business and technical officer of NSTec's Environmental Management group

Similar shipments have been brought to the NNSS from across the DOE complex. Of the 186,000 cubic feet disposed since 2012, the DOE complex can take credit for 175,000 cubic feet since implementing the new process that was piloted through the Kansas City Plant in preparation for their facility move.

As important as it is to help other sites save money, Poling said it was equally important that the new program also creates work for the NNSS. The Environmental Management Waste Generator Services group reaches out to the smaller sites that don't have existing certification programs to ship to the NNSS.

"We don't ship the material or waste, but we can help them meet the stringent program requirements for how it is packaged, certified and delivered," Poling said. "Under our Waste Generator Services group, we have a turn-key process for the generator sites to write the profiles, do the characterization, determine the packaging and inspect and certify the packaging, while each site handles and ships the material. In that way, we're able to help them realize the maximum savings while enhancing our Environmental Management program at the NNSS."

CLEANING UP THE PAST

EXCESS PROPERTY INITIATIVE PAVES THE WAY FOR FUTURE MISSION

For 65 years, the NNSS has been one of the most expansive laboratories in the country. Beginning in the 1950s, it served as the hub for atmospheric testing of nuclear devices. Later the tests were moved underground until a 1992 moratorium all but ended the nuclear testing era.

With all of those endeavors came the need for millions of dollars in equipment, from computers and electronic devices scientists use to collect data to thousands of reels of cable and construction materials to build towers and support structures. As the United States has moved to using subcritical experiments to support the Stockpile Stewardship program, much of that equipment has sat in surplus at various holding yards across the 1,360 square mile NNSS.

Today, an excess property program launched in 2011 has started to change all that.

National Security Technologies' Craig Mercadante, manager, Asset and Material Management Department, said the initiative to recycle and remove unused equipment and materials at the Site has resulted in more than $5.4 million in revenue to date as well as a reduction in the environmental management costs by more than $9 million.

That effort includes this year's recycling of more than 150,000 gallons of oil from the retired ATLAS pulse power machine. The ATLAS machine has been in cold standby for 10 years, and had developed leaks. Disposing of the oil not only reduced the environmental liability – selling it to a recycling company resulted in close to $200,000 in revenue, Mercadante said.

"One of the things this program does is allows us to identify areas that could be of use to potential customers using the Site for their work," Mercadante said. "Not only are we reducing the environmental footprint of the NNSS, we're paving the way for future missions."

Mercadante said the program actually began in July 2011 with the development of an Excess Integrated Project Team with members from NSTec's Radiological Operations, Materials Management and Property Management. Their goal was to improve the disposal process for excess government property, as well as:

- Reduce footprint of government property that no longer has a mission requirement
- Lower non-Environmental Management (EM) liabilities
- Reduce inventory
- Increase sales revenue
- Reduce the amount of material going to the landfill and promote additional Pollution Prevention (P2) recycling
- Enhance NNSS for current and future programs.

The Excess Integrated Project Team used data from the Property Management Walk-though Program to prioritize and identify

> **"Not only are we reducing the environmental footprint of the NNSS, we're paving the way for future missions."**
>
> *— Craig Mercadante, manager, NSTec's Asset and Material Management Department*

areas that would have the biggest impact and that had no funding to dispose of the excess property.

The property was screened through other DOE and government agencies, state agencies and universities for reuse before it was sold on government auctions. More than $3 million of excess material was reused by these agencies saving the government money from purchasing the same product.

The material included 3,226 cable reels located at the Area 2 cable yard; drill pipe and drilling equipment in Area 1; heavy duty equipment such as forklifts and tractors in the Area 6 equipment yard; machine shop equipment from Area 23; and transformers and other miscellaneous materials from the Area 6 Wet 'n Wild yard, among others.

Processing the excess items resulted in $511,000 in revenue in FY12, $2.7 million in FY 13 and $1.2 million in FY14, Mercadante said. Some excess was redeployed to other government agencies, saving another $2.5 million. Disposing of the material also extended the life of the 10C Landfill by over three years at a cost savings of $835,000.

The program has been so successful that earlier this year, Department of Energy (DOE) leadership visited the NNSS to see firsthand the results. The DOE representatives were impressed enough that they said they planned to take word of the project back to Washington, D.C.

"(The representatives) were very impressed with NSTec's management of personal property and their excess property campaign and mentioned the possibility of using NSTec as a role model throughout the department," said Ray Phifer, assistant manager for Safety & Security for the Nevada Field Office. "They also stated that some of the data from the NSTec excess property campaign could be used to represent a major accomplishment in a brief to Congress."

Mercadante said additional sale of ground laid service cable, scrap metal, machine shop equipment, fleet and heavy equipment, and electrical transformers will generate over $1 million in revenue in 2015.

REMNANTS OF OLD TESTS REMOVED FROM NNSS

In the 1950s, the Frenchman Flat area of the NNSS was the location for some of the more dynamic above-ground nuclear tests ever conducted in the United States. Numerous tests were carried out to gauge the effects of nuclear blasts on structures such as railroad trestles, bank vaults, parking garages and more.

Today, the remnants of those tests remain one of the more popular tourist attractions on the monthly NNSS Public Tour. However, recent efforts to clean up and remove unused or surplus equipment and materials at the NNSS have led to the successful clean up and cleaning out of many structures.

In January, NSTec spearheaded by the Global Security Directorate embarked on an extensive cleanup of the Nonproliferation Test and Evaluation Complex (NPTEC) including the East and West Motels, Underground Garage, and surrounding test area. These "mock" structures were originally built to determine how various constructions would withstand pressure from atmospheric testing. In recent years, the structures served as storage for NPTEC, which are also located on Frenchman Flat.

Formerly called the Hazardous Material Spill Center, NPTEC is the world's largest facility for open-air testing of hazardous materials and biological simulants. The facility houses both large and small scale hazardous materials testing and training as well as explosives testing. It provides a secure test-bed, calibrated release systems, weather data, ground truth instrumentation, and logistics in field verification and validation of technology.

During the cleanup effort, all existing bays of the East and West Motels along with the Underground Garage were emptied. Over 425 tons of material, equipment and waste was removed, disposed of, or designated as excess for removal. The sale of excess material has brought in close to $20,000 to date.

This multi-directorate collaboration adhered to rigorous procedures as officials also identified close to 200 chemicals and implemented a phased plan for disposition. The remaining chemicals, which are primarily everyday use chemicals such as paints and cleaning solvents, were inventoried, labeled, and stored in approved locations. "The safety culture we are instilling is vital to the future of NPTEC and other facilities across the NNSS," said Brian B. Brown, Countering Weapons of Mass Destruction Testing Complex deputy manager. "A sustained team-building effort such as the work completed at NPTEC paves the way for that future."

NNSS CHEMICAL MANAGEMENT SYSTEM MIXES SAFETY, EFFICIENCY

From cleaning fluids and paint thinners to high-tech mixtures used to support projects at the NNSS – there are more than 69,000 different chemicals in use from Nevada to the NNSS's outlying locations in Los Alamos, Livermore and Maryland.

So how does NSTec track and manage all of those chemicals?

Initiated in 2014 and gaining speed in 2015, the new Chemical Safety and Lifecycle Management Program (CSLMP) provides a "cradle to grave" capability regarding purchase, use and disposition of chemicals. In support of NNSS efforts regarding process improvements and cost efficiencies, the CSLMP will also be used to reduce costs commonly associated with maintaining chemical inventories, reduce level of effort required for annual assessments, reduce volume of chemical storage across the NNSS, and also provide just in time delivery capabilities.

The implementation of the CSLMP will provide a series of benefits, such as:

- Capability to monitor actual chemical inventory, including expiration (e.g., shelf life);
- Generate cost savings through bulk orders versus individual orders at the facility level;
- Enhance emergency response capabilities (e.g., Fire & Rescue) by providing capability to view current chemical inventory via Facility Data Warehouse software;
- Enhanced delivery time
- Significantly reduce level of effort required to complete annual chemical inventory reporting.

To allow for real-time tracking, a new module was built into Maximo, the company's maintenance management system. The current chemical inventory is being entered into Maximo, and any new chemicals purchased will be entered when they arrive on site. Most chemicals will now be processed only through the NNSS warehouse and every chemical will get a barcode prior to being placed in use. All of this will allow chemicals to be tracked from the moment they arrive on site through disposal. It will also provide an accurate count of chemicals on site at any time and help the company avoid unnecessary purchases.

Currently, 75 percent of chemicals have been inventoried, and 35 percent of chemicals have been assigned chemical ID numbers in Maximo and barcoded. An NSTec directive regarding the program was also recently published and chemical custodians are completing training. The goal was for the CSLMP to be fully implemented by the end of 2015.

"The key to the deployment of the CSLMP is the cross-functional team under the direction of Coby Moke, the NSTec CSLMP manager," says NSTec Occupational Safety and Health Division Manager Mike Kinney. "Personnel from throughout the Nevada Enterprise (NvE) have been actively engaged in the CSLMP initiative, and when fully implemented, it will serve as yet another example of best-in-class and support NSTec's commitment to excellence."

COMMUNICATION SYSTEMS GET HUGE UPGRADE ACROSS VAST NNSS

The NNSS is 1,360 square miles of sprawling, rugged terrain that extends north from the U.S. Highway 95 deep into areas surrounded by the U.S. Air Force bombing ranges. Most facilities in use at the NNSS are connected by hundreds of miles of roadways that date back to the atomic testing era, only recently re-paved or reconfigured to accommodate the current mission.

Communication, on the other hand, is another story. Over the years, landline phones and cellphone towers have helped connect key areas of the Site. But anyone who has traveled to the northern-most regions knows that radio and cellphone connectivity can be challenging.

That could be changing.

Several high-technology innovations announced in 2015 are in the works throughout the NvE. NSTec's Information Technology division is upgrading the NvE's communications' systems – whether on the road at the NNSS or in our own offices at the North Las Vegas facility on Losee Road. The upgrades include trading company BlackBerrys for 4G LTE smartphones.

NSTec Chief Information Officer Robert Hillier calls the vast upgrade "a huge game changer" that will affect cellular phones, tablets and computer systems, mobile radio system, desktop/ video conferencing and "hoteling" for work-at-home employees.

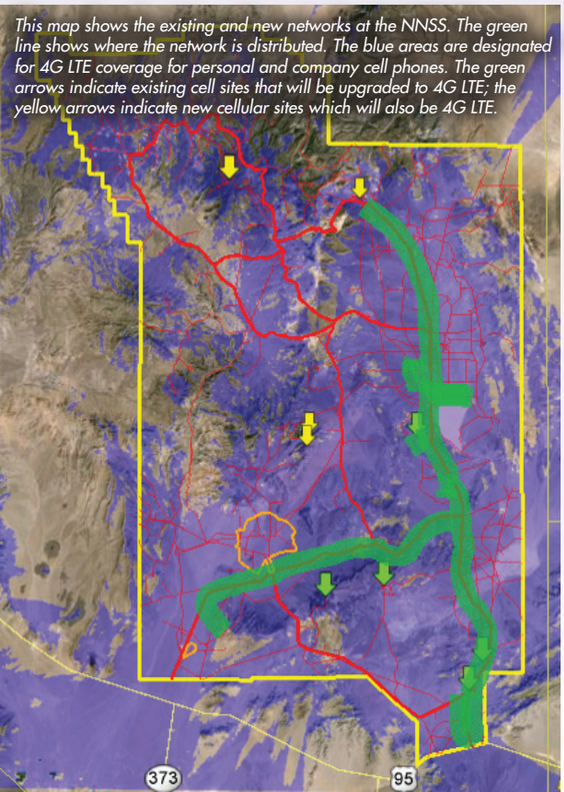
Said Hillier, "Cell coverage will improve from about 40 percent coverage of the Site to close to 90 percent. With 1,360 miles at the Site, it's impossible to provide wired coverage everywhere. But from a productivity and safety perspective, this is a huge improvement."

IT's Other Upgrades include:

Radio - The NvE will get a modern, trunked land mobile radio system that provides highly reliable radio services for enhanced site safety and security. The 15-year-old Motorola radio system in use will be replaced by a Harris P25-based system (international standard for land mobile radio systems). The new radio system is critical for security, emergency response and personnel safety. The project is already underway and should be complete by end of calendar year 2016.

Video conferencing - This project will replace the NvE's aging video conferencing system, as well as all current conferencing rooms with state–of–the–art, Internet-protocol-based, high-resolution video. It will also include desktop-to-desktop conferencing.

Hoteling - The NvE's 21st century workforce will allow the flexibility for certain workers to work from home. Supporting this will be Connect Server, which allows the remote employee to connect to the NSTec network from any device, and "hoteling," which will provide the remote worker a temporary work location to work at NNSS locations, when required. The hoteling pilot program began in March at the North Las Vegas Facility and was completed in June. It will be offered soon across the enterprise, where appropriate.



This map shows the existing and new networks at the NNSS. The green line shows where the network is distributed. The blue areas are designated for 4G LTE coverage for personal and company cell phones. The green arrows indicate existing cell sites that will be upgraded to 4G LTE; the yellow arrows indicate new cellular sites which will also be 4G LTE.

EMPLOYEE PROFILE

MARTHA DEMARRE

If there is anything you need to know about the history of nuclear testing or the NNSS, Martha DeMarre is the first person you'll want to call.

She manages over 386,000 historical documents associated with nuclear testing and has 37 years' of experience in her career.

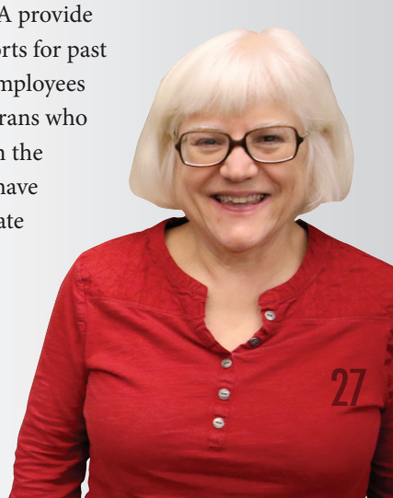
Martha came to Nevada for the summer to work at the Test Site in 1978.

"I fell in love with the Site and all the work there. It was basically a scientific Disneyland," she says.

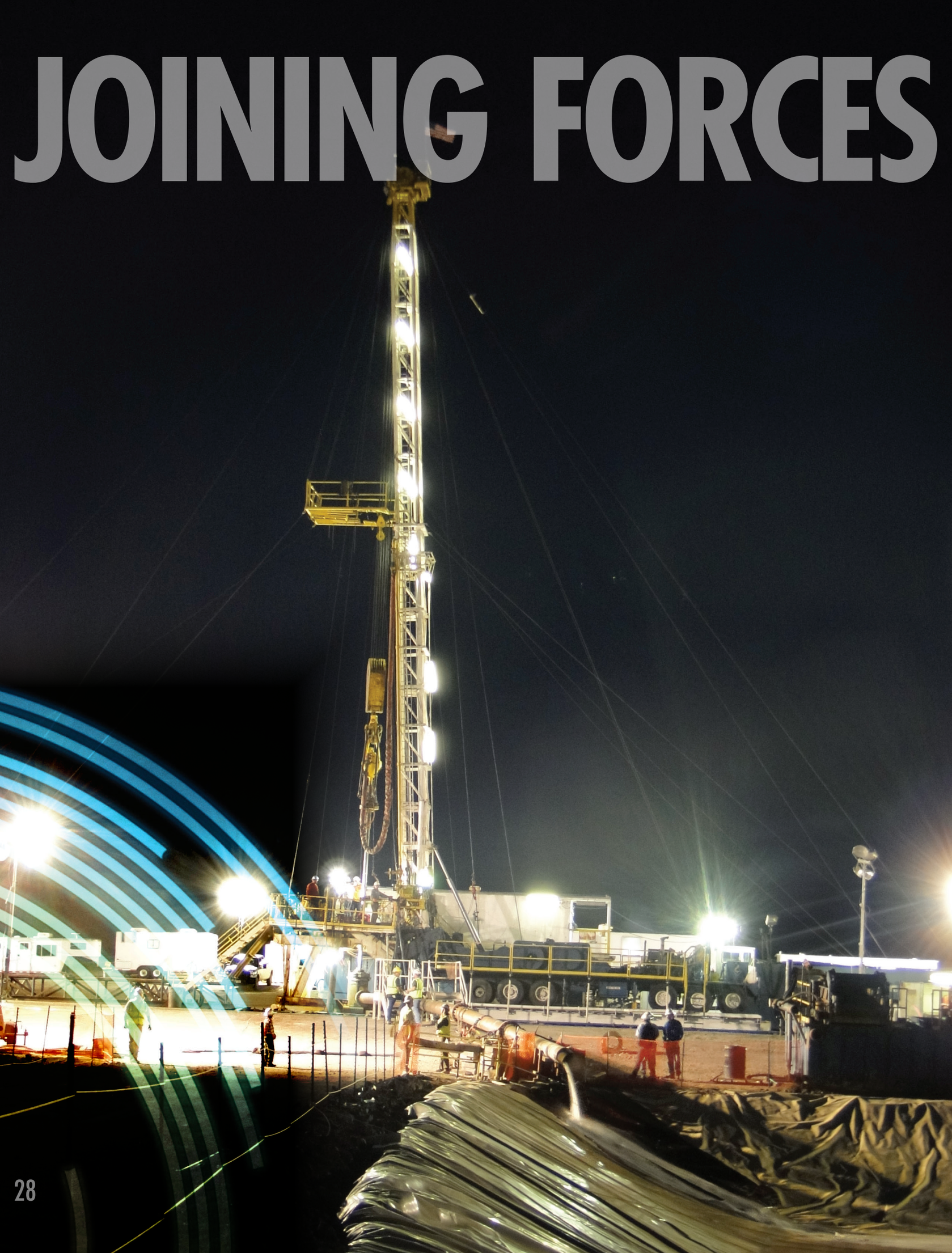
She came back to the Site in the spring of 1979 where she worked for the Coordination of Information Center (CIC), now known as the Nuclear Testing Archive (NTA). Martha has been the manager of NTA since 1989 and manages a small staff to provide information to the public and interested parties.

"I'm very proud that we provide information that, in the past, people would have had to wait a long time and submit a request to get the information. Here, they can just call up and get the information very rapidly. They can also do their own searches on OpenNet and decide which documents they really want to see and find the information for them," DeMarre says.

Along with documents associated with the US nuclear testing program, Martha also helps NTA provide exposure reports for past and current employees as well as veterans who participated in the testing. They have reports that date back to 1945.



JOINING FORCES



NAVARRO EXEMPLIFIES SUCCESSFUL COLLABORATION

Navarro believes that to be a successful organization, the entire team must embrace effective collaboration with others to accomplish a mutual goal.

This "joining of forces" is woven into the daily activities performed by Navarro, which is contracted to perform environmental characterization and remediation services for the U.S. DOE, National Nuclear Security Administration Nevada Field Office (NFO). Environmental investigations, characterization, cleanup and closure of NNSS sites and groundwater impacted by historic nuclear research, development and testing, along with the surveillance and monitoring of those sites, are all part of Navarro's focus for successfully accomplishing the complex missions that serve our nation.

With their scope of work expanded during the second half of the fiscal year, Navarro assumed the first line of defense role to ensure the continued safe, responsible and environmentally sound disposal of low-level/mixed low-level waste at the NNSS. This responsibility falls to the Radioactive Waste Acceptance Program team. They are tasked with enhancing rigor during the review/evaluation of low-level/mixed low-level waste streams proposed for disposal at the NNSS.

The NNSS's low-level waste disposal capability is a national asset for cleaning up legacy DOE sites across the United States. and Navarro is dedicated to assuring the complete compliance of all waste accepted for disposal. This effort extends to conducting all activities in a transparent manner to promote openness, trust and respect to demonstrate accountability to stakeholders.

Collaboratively working with the NFO and NSTec to improve transparency is a vital way Navarro aims to build trust and confidence with stakeholders – to include the public, state and local governments, DOE headquarters and all who support the NNSS. This collaborative effort extends to hosting annual technical workshops, regular educational and community open house events, public tours and in 2015, a high-level technical working group meeting supporting a multi-nation initiative.

Navarro also continues to build a valuable and respected rapport with our NNSS neighbor, the U.S. Air Force (USAF) to ensure effective environmental management at the Nevada Test and Training Range (NTTR).

As part of a two week cooperative joint field effort, personnel from Navarro and the USAF collected both analytical samples and radiological data at the sites of historic nuclear tests Clean Slate I and II. The samples and data were analyzed to determine the path forward and closure methods for these sites.

This cooperative effort provided the opportunity for the DOE and Air Force to learn about the other's radiological programs and accelerate the cleanup at the NTTR. "It is anticipated that the results of these two different characterization methodologies will further validate characterization and the ultimate closure of these sites," said Pat Matthews, Soils Project manager for Navarro.

Navarro is setting objectives to transition many cleanup sites into the closure phase with an emphasis on surveillance and monitoring. This approach will concentrate efforts and allow for more in-depth characterization and analysis at sites with a higher potential risk to the public, workers and environment. The Pahute Mesa groundwater characterization area is one of the sites that will benefit from this adjusted approach.

During the past year, collaboration with NFO and NSTec resulted in a strategy for drilling and groundwater monitoring at Pahute Mesa. Extensive collaborations also included Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Desert Research Institute and United States Geological Survey, to identify the ideal location for drilling a new well. With data analysis, modeling, and drilling criteria reports, scientists forecast what they expect to see in the geology of the well drilling location as well as anticipated depth to groundwater and water flow direction. These organizations will continue to work together throughout the drilling process (which kicked off in October) and subsequent groundwater monitoring activities.

"Through cooperative teamwork, collective knowledge can be used to develop creative solutions that contribute to the accomplishment of essential missions for the safety and security of our communities, our environment and our nation," said Dave Taylor, general manager of Navarro.

EYES AND EARS

SAFEGUARDING AMERICA'S INTERESTS SINCE 1965

Across the vast expanse that is the NNSS, the protection of resources and personnel that help maintain the U.S. nuclear security posture has been not only of the utmost importance – it also represents one of the most significant challenges of any facility in the country.

The NNSS takes up more than 1,360 square miles, bordered on three sides by U.S. military property, and at the south by the U.S. 95 highway corridor. Though numerous barricades separate the Site from the general public, the real job of ensuring the safety of these assets lies with the men and women of Centerra-Nevada – for 50 years, the Site's security contractor.

Formerly WSI-Nevada, the company has served the Nevada Field Office in keeping a watchful eye over the NNSS since January 1965. Throughout these past 50 years, there have been many changes, including the primary mission of the Site, and name changes. Employees also have come and gone, but until recently the one constant has been the WSI or Wackenhut name. The company was built on the ideals of its founder, George R. Wackenhut, and the corporate philosophy of "Professionalism with integrity." Although the name has changed, the company's core values, the commitment to excellence, and its support of the federal mission remains the same. Centerra-Nevada is proud of their history and their employees, past and present, have earned a reputation for security excellence within the DOE and the NNSA security community.

Today, Centerra-Nevada provides a diverse range of products, services and deliverables under the DOE/NNSA contract. Security operations are continuous 24/7, 365 days a year to the NNSS, the NNSA/NFO, and several other facilities located within the Las Vegas area. They serve a community of approximately 2,500 federal and contractor employees supporting the NNSA/NFO mission, and approximately 17,500 visitors annually. The majority of security services are performed at the geographically remote NNSS, one of the largest secured areas in the United States, located approximately 65 miles north of Las Vegas.

The Centerra-Nevada contract mission is the physical protection of national safeguards and security interests to include nuclear explosive devices, special nuclear material, national security operations and vital equipment, classified and sensitive information, government property, facilities and employees. The company provides

> **"Working at the NNSS for over 30 years has been a rewarding and enlightening experience."**
>
> *— Graig Newell, Centerra-Nevada*

several keys services, among them:

- Protective Force services to safeguard Special Nuclear Material, personnel, facilities, information, and equipment.
- Technical security services to develop and maintain cyber security programs, electronic security systems, and related programs in support of national security.
- External support services, including security document control, planning, assessments and other security support to the NNSA/NFO.
- Support services (environment, safety, and health; assessment and oversight; emergency management; training; administration; human resources; financial management; property management; community relations; information classification; and management information systems) in support of contract requirements.

The company's vision is to be recognized as the "Best in Class" provider of integrated security services. The Centerra-Nevada team operates with 257 employees and 39 subcontractor employees that are committed to that vision. Their non-supervisory Protective Force members are a bargaining unit represented by the Independent Guard Association of Nevada (IGAN) Local No. 1 and their relationship with IGAN has existed since 1965. They have forged a strong and productive partnership and this relationship has formed the foundation for outstanding work processes. They have been recognized with numerous awards, including the Energy Quality Achievement Award, the Energy Performance Excellence Achievement Award, the Nevada Governor's Pioneer Award for Performance Excellence, and Voluntary Protection Program (VPP) Star status from 2001 to present.

"I was able to witness underground testing and learn to respect the power of a nuclear weapon. I was fascinated watching how the Reagan Strategic Defense Initiative (SDI) or "Star Wars" helped to end the Cold War. And I've watched our current workforce usher end a new era in national security. I am proud I was a part of and an eyewitness to the history that has made the NNSS," says Centerra-Nevada veteran employee Graig Newell.

EMPLOYEE PROFILE

RAY PHIFER

Ray Phifer believes in leading by example. That could be one reason why the NNSS has set the bar for the security of personnel, resources and the work we do. "We're all in the nuclear weapons business – regardless of who you are or where you work, we all have an active role in protecting and executing the mission," says Phifer, assistant manager of Safety and Security for the NFO. "That's why it's important we get to know the people we work with. We're a human enterprise and everyone plays a part."

Ensuring the security of the NNSS has been the primary focus of Phifer for 11 years – the longest of any security manager in the NNSA complex. Phifer actually came to the NFO in 2000, but took over security in 2004 when the NNSA decided to move special nuclear material from the TA-18 area at Los Alamos to Nevada.

Turning the NNSS into a "possessing" site required a robust increase in security posture and Phifer was just the man to do it. To say he was more than qualified could be an understatement.

The North Carolina native served in the U.S. Army from 1977 to 1998, retiring as a Reconnaissance Sniper Troop Sgt. Major in 1st Special Forces Operational Detachment Delta, or the elite Delta Force. Phifer spent years learning skills in everything from explosives and weapons to diplomatic security. In addition to serving as an instructor, he had a niche in working with agencies such as the Department of State and the Secret Service.

His walls are covered in pictures and certificates of a highly decorated military career that included protecting diplomats on foreign soil and ensuring the safety of U.S. assets in far corners of the globe. NNSA leadership knew he was a good fit to help build a security program that was essential for storing special nuclear materials at the NNSS.

Phifer said his initial focus was ensuring the Site's Protective Force was highly trained, equipped and skilled, with the technical resources to not only protect materials and personnel at the Site, but to serve as ambassadors to those who do business with the NNSA. "The Pro Force is the first the public or anyone will come in contact with. It's important their image reflects the leadership here at the NNSS," Phifer says. The way to do that is continuous self-assessment and a commitment to "leading from the front."

His passion for building role models could stem from his family history – his father and brothers were in the military and he grew up understanding the importance of dedication and service. That effort continues to pay off, including his recent honor of receiving the NNSA Administrator's Silver Medal, the department's second highest honor, for his 14-month tenure as Acting Deputy Manager of the NFO.

Even as the mission of the Site continues to evolve beyond one of just stockpile stewardship, Phifer believes people will be the strength that carries our success. "We evolve as the work evolves and it's not just one person's responsibility," Phifer says. "We work for an enterprise that remains committed to ensuring the safety and security of the entire nation."

NEW ELECTRONIC RECORDS PROGRAMS TARGETING NVE 21ST CENTURY MISSION EFFICIENCIES

A 21st century workforce means incorporating technologies that improve mission efficiency. Efficiency means cost savings while achieving success. Success at the NNSS means workers meet the goal of protecting the national security interests of the United States. That translates into a safer world for you and me.

These modern ideals converge in a new program being launched at the NNSS that will eliminate the need to track records using paper. The program ensures the health and welfare of NNSS workers through a new electronic medical records program.

In 2005, the White House announced support for the development of electronic medical records across the federal government.

Following suit, the DOE in 2006 passed a rule requiring all its medical records be electronically available by 2015. To meet that standard, NSTec turned to an existing Electronic Medical Record system developed at Consolidated Nuclear Security (CNS), formerly Y12, called the Electronic Medical Business Operations System (EMBOS).

EMBOS will provide a comprehensive health tool solution that relies on scheduling, workflow, and data capture from medical surveillance, certification, and qualification examinations as core pieces of the system.

EMBOS is being deployed in phases. When fully deployed the EMBOS

will be a state-of-the-art web-enabled integrated electronic solution providing a complete electronic medical record (EMR). This system could eliminate the overwhelming volume of paper medical records and the inefficiency of having patients recap their medical histories each and every time they go to the doctor.

The NSTec EMBOS team started working on the program in January 2014 and successfully implemented it in February 2015. The implementation of EMBOS will allow the NNSS Occupational Medicine Department to take its first step in becoming completely electronic.

The cost savings of this program will be seen in reduction in storage of medical records. "Operationally, we will be able to pull medical information as needed reducing delays in care and operations," said Dr. Jeff Moon, director of Occupational Medicine at the NNSS. "This program also provides a safety benefit by allowing the providers to have more information on hand when treating employees thus improving care outcomes."

INTERNSHIPS BOOST PARTNERSHIP WITH UNLV

NSTec has partnered with the University of Nevada, Las Vegas (UNLV) to establish several internships and outreach programs designed to promote hiring in science, technology, engineering and mathematics (STEM) at the NNSS.

Derek Constantino was one of the first success stories.

Constantino was hired by NSTec's Defense Experimentation and Stockpile Stewardship (DE&SS) Directorate as a newly-minted electrical engineer. As a student at UNLV, Constantino was an NSTec intern and casual employee from mid-May 2014 to February 2015.

Constantino was recruited by Dr. Kevin Sun for the Center of Excellence for Security Science and Engineering (CESSE) while attending UNLV. CESSE is a UNLV/NSTec collaboration designed to forward the goals of stockpile stewardship. CESSE is one component of NSTec's STEM outreach efforts.

Through the CESSE program, NSTec hopes to develop undergraduate and graduate student's interest in stockpile science by using the latest advances in industry and academic science and technology. CESSE recruits and trains UNLV students to work on research projects with interdisciplinary teams using scientific principles and NSTec-specific applications to guide the student. They also gain experience and benefit from NSTec expertise in safety, security, and procedural adherence.

Projects are developed with both mission and academic significance to produce quality data that builds the Center's credentials for pursuing larger projects. The funding consistency afforded by NSTec allows for fundamental and technical research that requires longer time frames for students to progress through their studies.


Derek Constantino

EMPLOYEE PROFILE

JOE JOHNSTON

Joe Johnston, Navarro classification officer and Strategic Initiatives manager, has been contributing to NNSS missions for 29 years.

He began his career as a Radiation Control Technician supporting underground nuclear tests. Later, Joe leveraged his nuclear testing experience to support the Environmental Management Program.

Today, Joe supports a wide variety of activities because of his vast wealth of knowledge and extensive insight of current and historical activities.

An energetic communicator, Joe is also a highly sought-after tour guide for many high-profile tours of the NNSS.

His most recent crowning achievement is a revision of NV-209, a document detailing all United States Nuclear Tests from July 1945 through September 1992.

Way to go Joe and thanks for your many, many years of dedicated service!

CTOS instructor and students on an exercise.

CTOS FIRST RESPONDER TRAINING SUPPORTS MAJOR U.S. PUBLIC EVENTS

Counter Terrorism Operations Support (CTOS) program

In FY15, CTOS conducted training in over 70 different jurisdictions and trained more than 13,000 state, local, and military responders from the law enforcement, fire service, emergency medical services, emergency management, public health, governmental administrative, public safety communications, hazardous materials, and public works disciplines bringing the total to over 170,000 first responders that CTOS has trained since 1998.

Some of the training events conducted this year provided special focus for upcoming national-level special events. For example, CTOS provided critical training to the Boston Fire Department Special Operations Division in preparation for the 2015 Boston Marathon. Over 120 students attended two courses in a four-day period. Development of two new courses (Radiation Detection and Survey Instrument and Radiation Instrument Deployment) was expedited to meet the schedule of the Boston first responders allowing personnel from various teams and disciplines in Boston to come together and train prior to deployment at the marathon.

New DNDO Training Course

Working with the Domestic Nuclear Detection Office (DNDO) Operations Support Directorate, CTOS developed an advanced course focused on building a capability in the Preventive Radiological/Nuclear Detection (PRND) mission. The course, PRND Team Operations, brings multiple team members together to maximize their equipment capabilities to efficiently and effectively perform the essential tasks to protect and secure critical infrastructure, large venues, and special events as a National Incident Management System typed team.

The National Preparedness Directorate pilot course was conducted at the Los Angeles World Airport (LAX), garnering praise and appreciation from police Lt. Masis Sossikian who said, "After completing this class, we now have the ability to employ these new tactics while conducting surveys throughout the airport. These changes are a direct result of the training we received." NSTec's CTOS Division also conducted the course for the Philadelphia Police Department in preparation for the Papal visit to various venues in Philadelphia.

All-Hazard International Training Center

CTOS is in the early stages of partnering with the International Criminal Police Organization (INTERPOL) CBRNE Sub-Directorate, Lyon France, to develop and deliver chemical, biological, radiological, nuclear, and explosive training for INTERPOL member agencies at the NNSS. INTERPOL representatives visited the NNSS in February 2015 to discuss and observe the many possibilities and capabilities that NSTec and the NNSS offer to support all-hazard training.

The first pilot course is expected to be delivered in May 2016. This partnership will help promote the NNSS worldwide as an all-hazards training organization with a full capacity venue at the Site. INTERPOL is envisioning this as a five-year program, with 54 courses and a budget of $22.5 million.

CTOS Supports the Ebola Crisis

CTOS' timely response and support to the national Ebola crisis demonstrated exceptional responsiveness and NSTec's broad expertise and capability to expand to meet mission scope when needed. In order to optimize the distribution of the Personal Protective Measures for Bio Events training course developed by the Center for Domestic Preparedness, FEMA requested support of the National Domestic Preparedness Consortium (NDPC) training partners to deliver the course nationwide. Although not part of normal mission scope, the request was met quickly and readily by CTOS personnel.

SAFETY INTEGRATED INTO ALL ASPECTS OF MISSION WORK AT NNSS

Many organizations champion the slogans "Safety First" and "Safety is our Business," as a way to highlight their focus on protecting employees in the workplace. But at the NNSS, where some of the most critical work to ensure the protection of national security occurs, safety is more than a phrase… it's a way of life.

Both NSTec, the management and operating contractor, and Centerra-Nevada, the security contractor of the NNSS, have earned multiple, consecutive Voluntary Protection Program (VPP) Star awards over the years, recognized by the U.S. DOE. The program, created in 1994, closely parallels the U.S. Department of Labor's Occupational Safety and Health Administration VPP.

The DOE VPP Star award signifies an organization's superior level of performance in safety. To support the rigorous recertification process for maintaining the VPP status each year, several key safety committees both at the NNSS and the North Las Vegas facility have launched successful efforts to shift focus to those areas where safety is most important to the health and welfare of employees.

These committees include the Labor Alliance and Safety Committee (LASC), which represents workers at the Site, the Downtown Safety Committee (DSC), for those who work in North Las Vegas, and the Continuous Safety Improvement (CSI) Committee, for those non-bargaining employees who fill more administrative duties. To enhance sharing of information, representatives from LASC and DSC also attend CSI Committee Meetings. All of these committees support the efforts of the President's Safety Council, established in late 2014.

According to Mike Kinney, NSTec manager of Occupational Safety and Health, the group of executive managers and employees that make up the President's Safety Council saw a significant increase in 2015 in the number of employee-led safety projects, demonstrating that the focus on building a safety culture is working.

Among the various committees' accomplishments include: the LASC successfully launched a vehicle backing awareness campaign, which includes protective covers for steering wheels reminding drivers to look before the back up; the DSC developed a series of posters and brochures in which the employees themselves starred, using humor and familiarity to increase interest in the campaign; and the CSI continues to assist with the annual children's safety calendar contest, as well development of an annual safety report so detailed and impressive that even DOE Headquarters has recognized the role it plays in awareness, Kinney said.

Safety officials have seen such a positive response to their new campaigns that the DSC was invited to promote their program at this year's VPP awards ceremony in Dallas, Tex, where NSTec received its fifth consecutive VPP Star Award. Centerra-Nevada has been recognized as a VPP Star site for 14 consecutive years.

"We must work safely and compliantly, not just to achieve our mission goals, but to ensure that all NNSS employees make it home safely each night," said Jim Holt, acting president of NSTec. "A culture of safety should permeate everything we do. There is no acceptable alternative."

Like NSTec, Centerra-Nevada's VPP Superior Star award shows the company has demonstrated a consistently superior level of performance in meeting established safety and health goals, conducting outreach and achieving an injury and illness rate significantly below the average for similar operations, said Bobby McGregor, manager of Centerra's Environmental, Safety & Health.

"Centerra-Nevada management team considers employee occupational safety and health as an unmatched organizational value that has a higher, yet balanced priority with other organizational values such as 'production' and 'quality.' This is evident in the mission and vision statements and core values in the company's operating guidance," McGregor said. "We strongly adhere to the concept of 'Safety is everyone's responsibility.'"

DOE-VPP also includes coverage of radiation protection/nuclear safety and emergency management because of the type and complexity of DOE facilities. Much like the OSHA program, DOE-VPP provides several proven benefits to participating sites, including improved labor/management relations, reduced workplace injuries and illnesses, increased employee involvement, improved morale, reduced absenteeism and public recognition.

Contractors that choose to apply to the VPP must develop robust safety and health management systems and demonstrate effective implementation of safety and health procedures. These contractors are subject to frequent DOE reviews.


National Nuclear Security Administration
National Security Technologies LLC
Vision • Service • Partnership