

SANDIA NATIONAL LABORATORIES

# Partnerships

ANNUAL REPORT FY2014

A Safe Disinfectant  
for a Dangerous World



Sandia  
National  
Laboratories



“Scientific innovation and technology development are vital to national security. It’s critical as well to move technologies to the marketplace to advance U.S. economic competitiveness. Sandia’s strategic partnerships promote mission excellence and strengthen technology transfer.”

— **Dr. Paul J. Hommert**

*President and Laboratories Director  
Sandia National Laboratories*

“Sandia’s strategic investments in research and technology development have resulted in an impressive year of technology transitions, enabled by the successful partnerships showcased in this report.”

— **Dan Sanchez**

*DOE Technology Partnerships Manager  
NNSA Sandia Field Office*



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#### About the cover:

The Sandia Decon Formulation, which can be applied in many scenarios, being used to clean up a contaminated home where methamphetamine was illegally manufactured.

See story on page 18.



“As a federally funded research and development center, Sandia is responsible for developing creative, cost-effective solutions to complex national problems. Our partners help bring many of these technologies to the marketplace so that millions of Americans can benefit directly from our innovations.”

— Dr. Julia M. Phillips

*Vice President and  
Chief Technology Officer (Retired)  
Sandia National Laboratories*

“Building on a strong history of partnerships, Sandia has reenergized its efforts, as reflected in recent increases in patent applications and technology licenses. An exciting new concept, the Center for Commercialization and Collaboration (C3), is creating an environment ripe for even more partnership activity.”

— Dr. Peter R. Atherton

*Senior Manager  
Industry Partnerships  
Sandia National Laboratories*

# Partners Gain from Access to Lab Expertise, IP, and Facilities

Sandia National Laboratories needs dynamic partners to carry out its national security, research, and technology transfer missions. Each year, Sandia works with hundreds of companies, universities, and government agencies to develop and deploy new technologies. That tradition continued in FY2014, as witnessed by the many successes highlighted in this report. These vignettes show how, together, we are making a significant difference in both meeting national security challenges and benefiting the public good.

Stories in this year's report include:

- ▶ Licensing of a nontoxic, noncorrosive aqueous formulation that can decontaminate office buildings, remediate mold, and disinfect for agricultural and human health pathogens
- ▶ Creating printed circuit heat exchangers for highly efficient power conversion for solar, biomass, fossil, nuclear, and geothermal applications
- ▶ Licensing of a small reactor concept to produce molybdenum-99, a key radioactive isotope used for diagnostic imaging in nuclear medicine
- ▶ Providing electrical power from portable, self-contained hydrogen fuel cell units
- ▶ Developing predictive simulation models for engine design with a university whose students have gone on to become technical leaders in the field

Companies that partner with Sandia often gain a competitive advantage through access to the laboratories' unique capabilities, targeted research, and position as an R&D partner that has no commercial interest. Small businesses get a jumpstart through intellectual property licenses, technical assistance, and the use of specialized facilities they can't afford to build.

Universities amplify their research through R&D funding, peer relationships and collaborations, access to Sandia's unique facilities, and joint appointments.

Government agencies benefit from collaborative work on mission research, development, and delivery of technological solutions to mission needs.

Indeed, Sandia could not fulfill its vital mission without the collaborative work with our many partners in industry, academia, and government. We look forward to strengthening current partnerships and developing new ones as we continue to fulfill our mission to provide "exceptional service in the national interest."

## LDRD Program Benefits Partnerships

Research conducted within the Laboratory Directed Research and Development (LDRD) program is essential to maintaining the vitality of Sandia's mission-critical science, technology, and engineering capabilities. The LDRD program has benefited Sandia's work in all of its national security mission areas, including nuclear security, energy security, and global security.

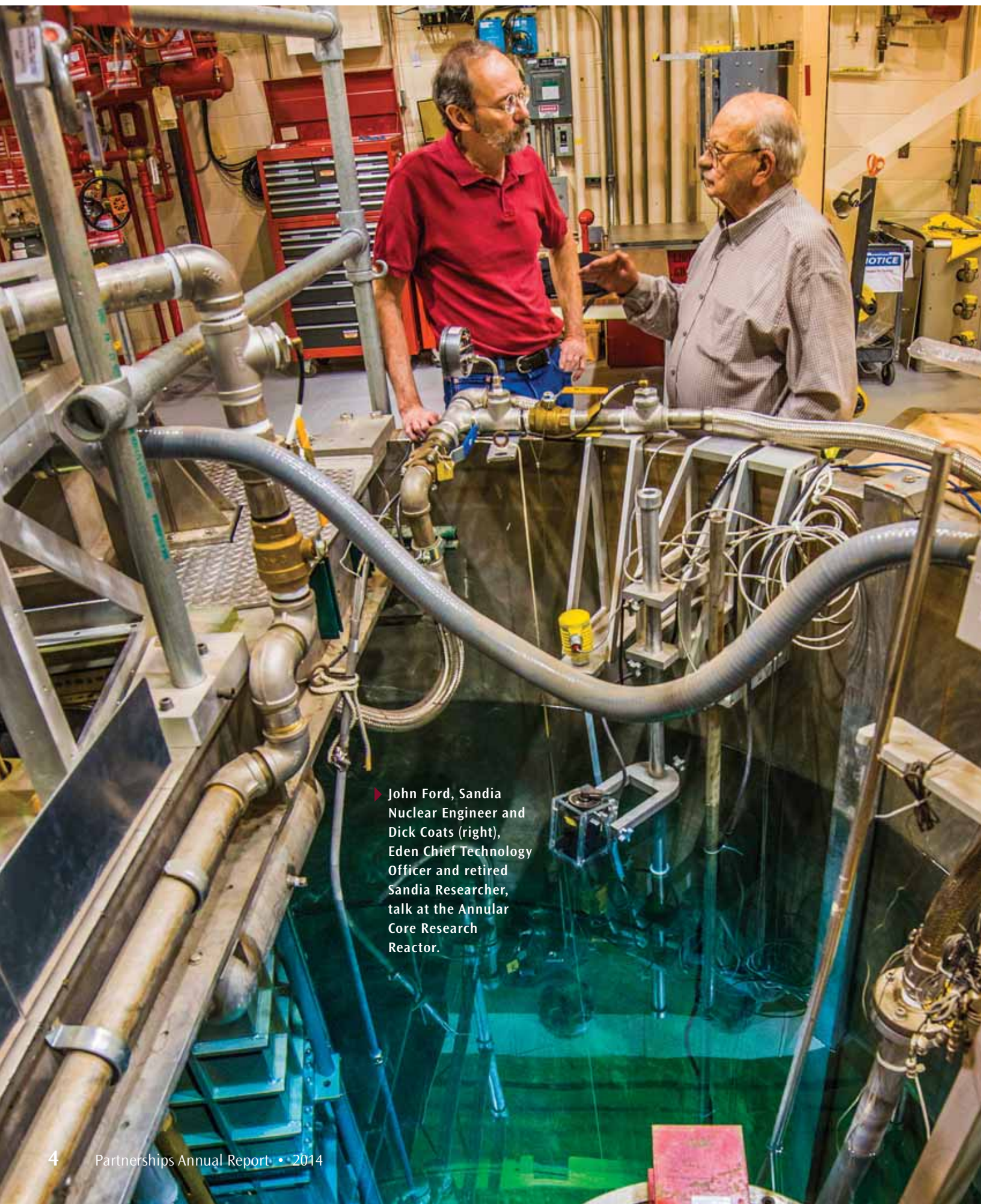
A large number of Sandia LDRD research projects include strategic collaborations with partners in industry, academia, and other government agencies. The Labs and its strategic partners gain from collaborative research results, and many technological breakthroughs developed through the LDRD program are transferred to industry, commercialized under licensing agreements, and brought to market for the U.S. public good.



Look for the LDRD logo in this report to discover which technologies grew out of the LDRD program.

To learn more, visit [www.sandia.gov/ldr](http://www.sandia.gov/ldr)





► John Ford, Sandia Nuclear Engineer and Dick Coats (right), Eden Chief Technology Officer and retired Sandia Researcher, talk at the Annular Core Research Reactor.



# Small Reactor Could Solve Worldwide Medical Isotopes Shortage

“Through use of technology developed by Sandia, Eden Radioisotopes offers the best option to the global nuclear medicine marketplace, as the most robust and reliable supplier of medical isotopes for decades to come.”

— Chris Wagner

Chief Operating Officer  
Eden Radioisotopes, LLC

## ► CHALLENGE

Shortages of molybdenum-99 (Mo-99), a radioactive isotope needed for diagnostic imaging in nuclear medicine, are causing increasing concern. Thirty million nuclear medicine diagnostic procedures are done worldwide each year, and 80% use technetium-99m, a short-lived isotope produced from the decay of Mo-99. The only supplies of Mo-99 are from companies outside the U.S., where the isotope is made in aging nuclear reactors. A search has been on for an efficient, economically viable way to make Mo-99 in the U.S. without using highly enriched uranium.

## ► PARTNERSHIP

Eden Radioisotopes was formed in 2013 by entrepreneur Bennett Lee. He put together a team of knowledgeable people, including retired Sandians Dick Coats and Milton Vernon, and a medical-imaging industry veteran, Chris Wagner. Eden is working with Sandia staff member, Ed Parma. The company licensed patent-pending Sandia technology for a small Mo-99 nuclear reactor and is now seeking funding to build a medical isotopes production facility. Sandia selected Eden as the most qualified to commercialize the technology after evaluating the responses to an advertisement of the opportunity.

## ► SOLUTION

In the 1990s, Sandia’s medical isotope production program developed a small reactor concept tailored to producing Mo-99 in response to a congressional mandate for the U.S. to develop a domestic supply. More recently, the government has pushed for private industry to provide a solution to the shortage, so Sandia’s technology was made available for licensing.

The Sandia Mo-99 nuclear reactor concept is low-power, operating at less than 2 megawatts, and small, close to a foot-and-a-half in diameter and about the same height. This petite design is efficient and cost-effective. Once built, it would be solely focused on Mo-99 production and could produce enough to meet current world demand.

## ► IMPACT

With shortages already an issue, and a Canadian reactor scheduled to shut down in 2016, Eden believes it can very quickly capture a large share of the estimated \$300 million and growing annual world market for Mo-99. In 2020, the U.S. will end imports of Mo-99 produced using highly enriched uranium. Unlike the majority of suppliers in Canada and Europe, the Eden reactor would use low-enriched uranium in its production process.

The company wants to build its facility in Hobbs, located in Lea County, NM, which is also home to Urenco USA’s uranium enrichment facility and other nuclear-related industries and post-secondary school worker training programs. Eden’s reactor would be the first in the U.S. specifically for medical isotope production.

**PARTNERSHIP TYPE:** Exclusive license

**GOAL:** Overcoming worldwide shortage of radioactive isotopes needed for nuclear medicine and diagnostic imaging



► Lori Holmes, 3M Engineering Specialist, and Eric Vandre, 3M Senior Research Engineer, working together to check a composition measurement of a multilayer adhesive sample.



“Predictive nano-particle dispersion modeling differentiates us from potential competitors by providing fundamental understanding of the process.”

— Dr. Kristin Thunhorst

*Lead Product Development Specialist  
3M Aerospace & Commercial Transport Division*

## Precise Predictive Modeling Speeds Product Ideas to Market

### ► CHALLENGE

How can a large corporation continue to grow and remain competitive in the global marketplace? For 3M, an investment in research and development (R&D) helps them create new products to serve existing markets and capitalize on new opportunities.

3M combines myriad technologies to create innovative products for customers around the world. Their products cover a wide range, from adhesives such as industrial and consumer tapes and repositionable notes, to nanotechnology films, including display films to enhance the color and energy efficiency of LCDs and light management coatings for LED lighting.

In order to keep commercializing innovative products, precise predictive modeling and simulation tools, along with specialized knowledge, are essential to ensure ideas can be manufactured cost-effectively and quickly.

### ► PARTNERSHIP

Sandia and 3M have been working together since the mid-'90s, first as part of the Coating and Related Manufacturing Processes Consortium and later the Nanoparticle Flow Processing Consortium. The partnership continues under a one-on-one Umbrella CRADA focused on Multilayer, Structured Film Processing.

3M leverages Sandia production modeling expertise and Sandia benefits from 3M's unique understanding of material-process relationships and know-how in physical modeling requirements. Functional knowledge, from 3M's historical experience or current scientific endeavors, is combined with fast-evolving modeling knowledge from Sandia. Frequent extended working visits between 3M and Sandia strengthen the collaboration.

### ► SOLUTION

Sandia-developed open-source modeling platforms Goma 6.0 and LAMMPS are being used by 3M to improve manufacturing process and product design. Goma 6.0 is an R&D 100 award-winning software for simulating manufacturing processes. LAMMPS is a widely used computer code that models material behavior. These two tools guide 3M's quest to reduce costs and facilitate process improvements.

### ► IMPACT

The collaboration has had a sizable impact in accelerating the production of 3M adhesive tapes and abrasive materials, helping to produce them faster and more uniformly. Examples include multilayer foam tapes and structured abrasives. Composite materials have also benefited from the Sandia collaboration. Critical knowledge for the manufacturing of ceramic reinforced conductors for power lines, as well as for the formulation of nano-particle resins for epoxy composites emerged from multiphysics and nano-particle dispersion modeling in Goma 6.0 and LAMMPS.

3M's expertise in thin-film coating process design has been enhanced by collaboration with Sandia. From the application of liquid films for coatings and subsequent drying/curing processes, to the formulation of nano-particle composites, modeling developments and capabilities garnered through collaboration have been incorporated into standard process development and engineering design practices at 3M.

**PARTNERSHIP TYPE:** Umbrella Cooperative Research and Development Agreement (CRADA)

**GOAL:** Improving product manufacturing processes through predictive modeling



► Co-inventors Helmuth Heneman, NRG President, and Patrick Brady (right), Sandia Senior Scientist, discuss well core analysis.



# Recipes Extract More Oil from Wells While Using Less Water

“Sandia’s timing of this remarkable contribution to the cost competitiveness of America’s oil industry could not be more fortuitous.”

— **Helmuth Heneman**  
President  
NRG Systems, Inc.

## ► CHALLENGE

Although over 3 million barrels of oil per day is being produced from hydraulically fractured “tight” formations (low permeability rocks), this represents only about 6% of the oil in the formations. With the high cost of drilling, the high consumption of water used in the process, and the recent drop in oil prices, new ways of extracting more oil from each well are needed to make these wells economically viable.

## ► PARTNERSHIP

Sandia National Laboratories’ work in enhanced oil recovery attracted NRG Systems ([www.NRGsysinc.com](http://www.NRGsysinc.com)), a small veteran-owned company established in 1989 that provides technology development solutions for the global energy industry.

Working together, Sandia can focus on the science while NRG contributes ideas about how to improve the methods being tested to meet the needs of the market. Refinement and validation of these new ideas continues in the lab while plans are made for field testing and commercial introduction.

A Commercialization Agreement between NRG and Sandia was negotiated up front, securing NRG’s commercial rights to joint intellectual property (IP) developed under a CRADA. In addition to the Commercialization Agreement, NRG has licensed two pieces of Sandia’s IP. And two additional patent applications resulting from collaboration under the CRADA have been filed so far.

## ► SOLUTION

By working out the forces that bind hydrocarbons to tight formations using Sandia-developed surface chemical models, Sandia Senior Scientist, Patrick Brady, developed recipes for modifying the hydraulic fracturing fluid to increase oil production.

The recipes vary from formation to formation and depend on the mineral content of the specific formation, oil chemistry, and groundwater composition. Some recipes permit recycling of existing oilfield waste water, decreasing the amount of valuable fresh water used in the process, and making the approach more environmentally responsible.

## ► IMPACT

Domestic oil drilling enhances U.S. energy independence. Even a 10% increase in productivity resulting from the use of the new extraction methods would have a significant economic impact, increase efficiency of natural resource use, and reduce total extraction costs.

In 2015, oil company partnerships will be developed to field test these advances and move the technology to commercial use.

**PARTNERSHIP TYPE:** Commercialization Agreement, Cooperative Research and Development Agreement (CRADA), and License

**GOAL:** Increasing oil production using new, cost-effective, water-efficient recovery methods



► Bill Kimball, VPE Staff Scientist (retired), prepares a high-capacity vacuum diffusion bonding furnace for pre-production process development.



## Domestic Manufacturing of PCHEs Advances U.S. Competitiveness

“Partnering with Sandia has enabled VPE to rapidly improve our in-house microchannel heat exchanger design capabilities and respond quickly to customer inquiries.”

— Dr. Carl Schalansky

CEO  
Vacuum Process  
Engineering, Inc.

### ► CHALLENGE

Printed circuit heat exchangers (PCHEs) are an enabling technology for higher efficiency power cycles that can be used for emerging and existing power generation applications including solar, biomass, fossil, nuclear, and geothermal. PCHEs lead the field in mechanical performance, thermal performance, and power density, but demand outstrips supply.

Having a larger supply of PCHEs would enable many compact heat exchanger applications ranging from power generation to refrigeration and heat pumps. However, there is a high barrier to enter into PCHE manufacturing. Most manufacturers lack knowledge of the necessary fabrication techniques, design methods, mechanical and thermal optimization, and the American Society of Mechanical Engineering (ASME) certification needed to meet customer requirements. Currently only one company based outside the U.S. has been able to overcome this barrier and achieve large scale production. Sandia National Laboratories saw the demand in the U.S. and the opportunity to partner with a U.S. manufacturer to commercialize the technology.

### ► PARTNERSHIP

A Federal Business Opportunity announcement was used to solicit responses from potential industry partners. Vacuum Process Engineering (VPE), a small business in Sacramento, CA, was selected. The company was uniquely qualified because they have provided thermal processing and bonding services since 1976. In fact, VPE had been searching for a way to enter the PCHE market for years. While the company had extensive fabrication experience building heat exchangers based on provided designs, it lacked the technical expertise and tools to design PCHEs as well as ASME certification of its bonding processes.

### ► SOLUTION

Under the partnership, VPE has used Sandia’s software tool for the Selection, Evaluation, and Rating of Compact Heat exchangers (SEARCH). SEARCH efficiently determines the design of a PCHE based on user-provided process conditions, performance requirements, and manufacturing constraints.

Beyond providing the SEARCH software, Sandia has shared its mechanical and metallographic capabilities and expertise, helping VPE achieve ASME certification in 2014. This is an important step towards large-scale PCHE manufacturing.

### ► IMPACT

By partnering with Sandia, VPE has become the first integrated ASME-certified PCHE manufacturer in the U.S. Their certification has led directly to an increase in manufacturing orders.

Findings from continued testing will be incorporated into the SEARCH design software, enhancing VPE’s response time and accuracy. Further joint investigations with Sandia to advance compact heat exchanger technology will look at how changes to the manufacturing process can cut costs, increase performance, and reduce environmental impact.

**PARTNERSHIP TYPE:** Umbrella Cooperative Research and Development Agreement (CRADA)

**GOAL:** U.S. manufacturing of compact heat exchangers needed for efficient energy production and other applications

- A new fuel cell demonstration project led by Sandia will feature a portable, self-contained hydrogen fuel cell unit currently in the design phase. Once completed, it will be deployed to the Port of Honolulu by Young Brothers.





# Hydrogen Fuel Cells Help Ports Meet Environmental Goals

“Young Brothers is excited to be a part of this collaborative effort with Sandia and all our other partners aimed at helping the maritime industry be less reliant on fossil fuels.”

— Glenn Hong  
President  
Young Brothers, Ltd.

## ► CHALLENGE

Ports need to reduce their impact on the environment by controlling sources of water and air pollution. Major ports can produce daily emissions equal to those of half a million cars or more, so in the U.S., ports have begun to adopt green practices. Hydrogen fuel cells can help port operators and fleets comply with regulations and meet environmental goals.

After conducting a study of various ports, Sandia National Laboratories analyzed operations in more detail at Young Brothers, a subsidiary of Foss Maritime and primary carrier of goods throughout the Hawaiian Islands. Like many operators, the company uses diesel engine generators to provide power to refrigerated containers, but the generators usually operate at part load resulting in higher emissions and lower efficiency. Sandia researchers estimated the cost savings and reductions in emissions that would be realized by converting to fuel cells, primarily because fuel cells do not experience degraded efficiency at part load.

## ► PARTNERSHIP

Ten different partners are contributing to a six-month demonstration project in Hawaii. The Department of Energy’s Fuel Cell Technology Office in collaboration with the Department of Transportation’s Maritime Administration has sponsored the project, Young Brothers will be the end user, while Hydrogenics Corp. is designing and building the prototype that features a self-contained hydrogen fuel cell unit.

## ► SOLUTION

The custom unit will fit inside a 20-foot shipping container and will consist of four 30-kilowatt fuel cells, a hydrogen storage system, and power conversion equipment. After design and fabrication, and training of Young Brothers staff, the unit will initially be deployed in Honolulu in Spring 2015. By being an early adopter of the technology, testing the fuel cells on land and later on its cargo barges, Young Brothers will get a first-hand look at how fuel cells can be an environmentally responsible alternative to conventional diesel units.

Sandia is providing technical expertise in hydrogen and fuel cells, particularly in the areas of codes and standards, system design, safety systems, data collection, and analysis. By analyzing the project’s results, including the operating and cost parameters needed to make a business case at other ports, Sandia can provide advice regarding the use of fuel cells in ports and future applications, such as using fuel cells on ships as permanent power generators.

## ► IMPACT

The demonstration project will provide critical information about the commercial viability of a technology that could be deployed in ports, or for land-based off-grid power needs, while helping to clarify regulations and contribute to the codes being developed for the use of hydrogen fuel cells in a range of maritime applications.

**PARTNERSHIP TYPE:** Memorandum of Understanding (MOU) and Work for Others (WFO)

**GOAL:** Helping ports reduce environmental impact through the use of hydrogen fuel cells





► Rey Rael, Sandia XTK Software Developer, is using the Grid-Aim application within XTK to precisely target an internal component of an IED training device.



## Software Supports Emergency Responders Disabling IEDs

“WMDTech has provided XTK Software training to bomb squads all over the country, and even to U.S. military stationed overseas. This has been an extremely successful collaboration to increase the capabilities of our anti-terrorism forces throughout the world.”

— Christopher Brown

Director of Sales/Training  
WMDTech

### ► CHALLENGE

Emergency responders need to be able to assess and disable Improvised Explosive Devices (IEDs). They often use portable x-ray scanners coupled with specialized image processing software to help them with this task, but it can be difficult to maintain proficiency with the multiple software packages available, especially since most of them were originally developed for medical x-ray applications. Until recently, there was no software specifically designed to support the workflow of explosive ordnance disposal (EOD) technicians.

### ► PARTNERSHIP

Sandia National Laboratories developed X-Ray Toolkit (XTK), an image processing and analysis software solution, for the Department of Energy. XTK's developers worked with end-users, spending hundreds of hours alongside operators in order to understand their workflow. They also made sure that XTK would be compatible with all types of x-ray scanners from different manufacturers.

While it is an easy-to-use tool, the software is feature-rich, with functions to support a wide variety of emergency response scenarios. Sandia isn't able to train the thousands of people who would benefit from using XTK, so they have licensed the technology to a number of companies who provide training services. By requiring that companies be licensed, Sandia ensures training quality. Licensees A-T Solutions, Movalson Consulting Services, Operational Resources International, Tactical Electronics, and WMDTech provide training on XTK to the military, law enforcement, and other emergency responders.

### ► SOLUTION

XTK software was developed to standardize x-ray analysis of IEDs. It is a technological advance, designed to support the natural workflow of the end-user. Making XTK available as a free software package across the entire emergency response community, both military and civilian, ensures that all users can exchange and process field images quickly and effectively.

The software includes unique tools to assist in every aspect of EOD including optimizing x-ray exposures, identifying internal device components, 3D visualization, stitching multiple images together to cover large objects, and compressing images for transmission.

### ► IMPACT

XTK has changed the way x-rays are used by thousands of EOD operators around the world, becoming a standard in the field. The FBI's Hazardous Devices School adopted XTK for its advanced training classes and recertification course beginning in 2012 and in 2015 will be using XTK for all courses to include the Basic Certification Course. Widespread use of this software, which is available for free to EOD teams, has resulted in an estimated to-date savings of \$10M in licensing fees and training costs for the emergency response community.

In addition to significantly improving performance in the time-critical mission of disabling IEDs, XTK is helping to save lives of Emergency Responders and those they serve and protect.

**PARTNERSHIP TYPE:** Licenses

**GOAL:** Standardizing explosive ordnance disposal x-ray software to improve usability and performance, ultimately saving property and lives



► Stephen Busch, Sandia Senior Member of Technical Staff, discusses details of the design of an optical piston bowl with Rolf Reitz, University of Wisconsin-Madison Distinguished Professor.



# Engine Research Informs Automotive Improvements

“Sandia’s unique and highly informative experimental engine data has spurred the development of accurate simulation models at the ERC that are now being used by the industry.”

— Dr. Rolf Reitz

*Distinguished Professor  
and Director  
UW-Madison Engine  
Research Center*

## ► CHALLENGE

U.S. and global vehicle manufacturers need to continue improving their engine designs in order to remain competitive, continue to lower pollutant emissions, and help reduce CO<sub>2</sub> emissions.

## ► PARTNERSHIP

Sandia National Laboratories’ Engine Combustion Department has studied the science of engine combustion for over 30 years. For the last two decades, they’ve worked closely with the University of Wisconsin-Madison’s Engine Research Center (ERC).

The ERC is the largest academic research center focusing on internal combustion engines in the U.S., and has been a leader in advanced combustion research. Graduate students, led by faculty and staff, conduct research to help meet the national goals of reduced emissions and reduced fuel consumption while preparing for careers in industry, government, and academia.

Sandia researchers provide high resolution experimental data that is used to validate computational fluid dynamics models developed by the ERC to study engine combustion processes. Together, their efforts further our understanding of the science and physical processes of combustion, and result in the modeling tools required to refine the design of clean, high-efficiency combustion engines.

## ► SOLUTION

Improving our understanding and ability to predictively simulate engine combustion involves carefully coordinated experimental, modeling, and simulation efforts. Detailed measurements of in-cylinder flows, fuel and pollutant spatial distributions, and other quantities are made in optical engine facilities at Sandia that closely match the combustion and engine-out emissions behavior of traditional, all-metal test engines. These measurements are closely coordinated and compared with the simulation results obtained by partners at the ERC.

Results from the collaboration include the development of more accurate turbulent flow and spray models to describe the details of fuel-air mixing, as well as better models for combustion and pollutant emissions. More predictive simulations enable new, more efficient engine designs for cars and trucks.

## ► IMPACT

The models and understanding developed by the Sandia-ERC collaboration are now in use by the automotive industry. Engine modeling, guided by a better physical understanding, is used by virtually all engine companies to increase the pace of engine concept evaluation, and to reduce the costs of new engine development—ultimately leading directly to improved fuel efficiency, lower emissions, and lower greenhouse gases.

Students who have worked on this research have gone on to become technical leaders in the field. This research has also helped the industry to meet federal emissions mandates and engine fuel efficiency targets.

**PARTNERSHIP TYPE:** Collaborative research effort

**GOAL:** Optimizing high-efficiency, low emissions combustion engines

# Formulas Effectively Tackle a Growing Number of Toxic Threats



“Our partnership with Sandia is a key contributor to our success. Their knowledge and commitment to continued innovation allow us to expand into new global markets that will contribute to humanity and the well-being of the world.”

— Dave Pulver

CEO  
Decon7 Systems



► A healthcare worker (top) disinfects an operating room and mold being cleaned from a roof (bottom) with the Decon Formulation.

## ► CHALLENGE

In a world with increasing numbers of chemical and biological hazards, including clandestine drug labs and emerging infectious diseases, safe, effective, easy-to-use decontamination solutions are needed.

## ► PARTNERSHIP

Sandia National Laboratories developed the Sandia Decon Formulation, a non-toxic, non-corrosive chemistry for neutralization of chemical and biological warfare agents. It was initially used in federal office buildings during the anthrax attacks in 2001, and later was deployed by the military as part of Operation Iraqi Freedom. Since then it has been used by first responders, including at the Dallas Ebola incident and Boston Marathon bombings.

Although the Sandia Decon Formulation was first licensed over 10 years ago, many potential market segments remained unserved. A new strategy to more fully realize the technology's potential has resulted in licensing of the Decon Formulation patent portfolio by eight additional companies in 2013 and 2014.

## ► SOLUTION

By tailoring the chemistry, deployment methods, and packaging, the Sandia Decon Formulation is now available for use in a wide variety of applications. Focused chemistries allow production costs to be reduced for higher volume applications such as agriculture and laundry disinfection. Powder versions reduce shipping costs. New deployment methods such as charged aerosols enable rapid decontamination of spaces such as aircraft and transportation centers.





► Sandians (left to right) Rita Betty, Principal Member of Technical Staff; Bruce Kelley, Chemical and Biological Systems Department Manager; Mark Tucker, Distinguished Member of Technical Staff; and Bianca Thayer, Licensing Executive, present examples of spray apparatus used for various decontamination applications.

Use for mold and meth-lab remediation is ongoing, and greater use as a disinfectant for agricultural (*Salmonella*, *E-coli*, *Listeria*) and human health (influenza, norovirus, MRSA) pathogens is gaining traction. Applications such as bedbug remediation are being developed, and testing against emerging infectious agents such as Ebola continues.

### ► IMPACT

New products incorporating these approaches provide improved ways to disinfect medical facilities, agricultural processing plants, sports facilities, transportation vehicles and hubs, and housing.

One licensee, SpectraShield Technologies, is targeting the healthcare market with a disinfectant product. In testing by Dr. Kelly Reynolds of the University of Arizona's College of Public Health, SpectraKill™ was proven effective against bacteria, viruses, molds, and spores occurring in hospital environments, eradicating these organisms "below detectable levels."

Another licensee, Decon7 Systems, has developed specific chemistries for agricultural processing facilities and clothing decontamination.

High volume markets are now being opened up, enabling broader utilization and reducing costs. With additional licensees and manufacturers, the Decon Formulation is now even more widely available to protect people from the dangers of chemical and biological hazards.



► A cleaning crew worker disinfects a conveyer system in a packing plant with the Decon Formulation.

**PARTNERSHIP TYPE:** Multiple Licenses, Work for Others (WFO) projects, and Cooperative Research and Development Agreements (CRADAs)

**GOAL:** Dealing more effectively with infectious disease outbreaks, disaster recovery, mold, and hazardous chem-bio agents

## Reproducible Nanoparticles Enable Early Cancer Detection



When Senior Scientific founder Edward Flynn invented a new non-invasive technique for early cancer detection, superparamagnetic magnetite nanoparticles were the critical component required to make his method work. However, the properties of commercially available nanoparticles proved to be extremely inconsistent, making reproducible measurements impossible.

To create the nanoparticles he needed, Flynn began working with the Center for Integrated Nanotechnologies (CINT), a DOE Office of Basic Energy Sciences Nanoscale Science Research Center operated as a national user facility by Los Alamos National Laboratory and Sandia National Laboratories. Through a User Facility agreement, he gained access to the synthesis labs at the Core Facility, located in the Sandia Science & Technology Park community. Equally important, the agreement enabled him to collaborate with Sandia experts, including scientist Dale Huber.

As a doctoral student, Erika Vreeland worked with Huber on a novel method for precisely and reproducibly synthesizing the nanoparticles that would become essential for Flynn's work. After completing her PhD, Vreeland joined the Senior Scientific team. The company, which has been acquired by Manhattan Scientifics, Inc., is now advancing their technology, moving from research and development towards FDA approval and clinical use.

The University of Texas MD Anderson Cancer Center is now testing one of the Senior Scientific instruments that detects magnetic nanoparticles specifically bound to cancer cells. One disease of particular interest is ovarian cancer, although the nanoparticles can be tagged with any biomarker, depending on the type of cancer that doctors are trying to detect.

Biomagnetic detection is being explored for other diseases as well, but these applications have also been limited by the lack of nanoparticles with precise properties. This has led Senior Scientific to market their uniform nanoparticles under the product name PrecisionMRX™.

The Senior Scientific–Sandia collaboration has resulted in joint intellectual property, advancement of Senior Scientific products, and progress towards new cancer detection technology.

► **Erika Vreeland, Senior Scientific Nanoparticle Chemist, and Dale Huber, CINT Scientist, monitor the progress of a nanoparticle synthesis reaction.**



## Investigating Hydrogen Fuel for Power Generation

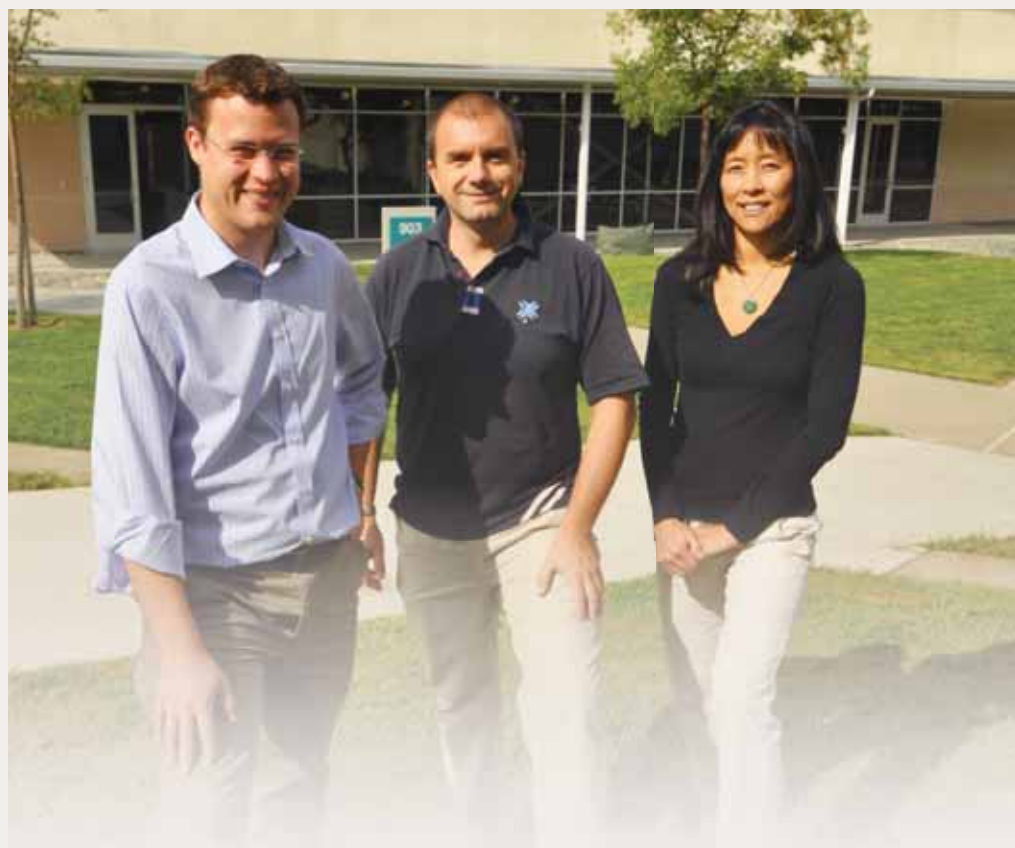
Sandia's Combustion Research Facility (CRF) has focused on investigating the fundamentals of combustion science and applications for over 30 years. New discoveries at the CRF have often resulted from the synthesis of ideas emerging from research partnerships.

In 2014, Andrea Gruber, a Senior Research Scientist at SINTEF Energy Research, completed an extended visit to the CRF. SINTEF is the largest independent research organization in Scandinavia. Gruber's work was performed as part of a Memorandum of Understanding (MOU) that Sandia has with SINTEF for joint combustion research.

Gruber and Sandia's Jackie Chen studied how the use of hydrogen fuel impacts the operation of gas turbines used to generate electricity. Hydrogen can be produced from renewable energy sources and may become an important fuel for gas turbines in the future. However, compared to natural gas, hydrogen diffuses and burns very rapidly, creating challenges in mixing the fuel and air while preventing flame attachment to the fuel injection nozzle and subsequent melting of portions of the turbine.

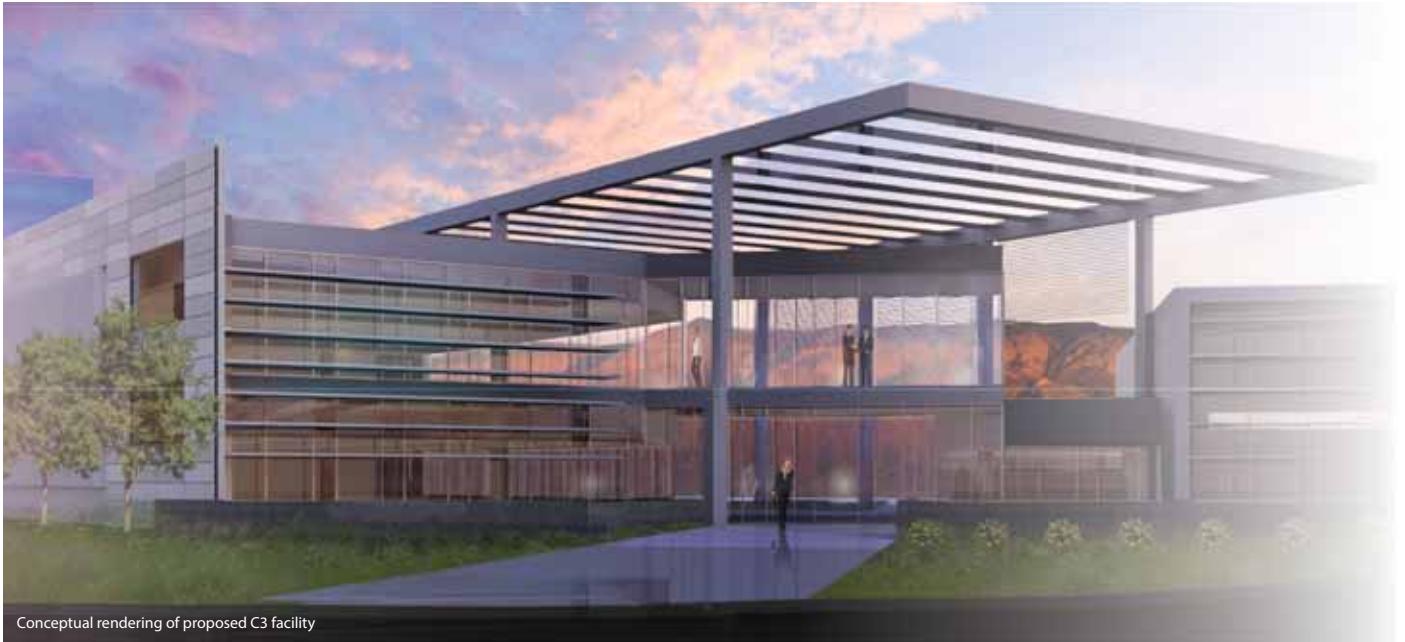
Sandia's three-dimensional direct numerical simulation code, S3D, was used to simulate the fuel-air mixing and flame reaction processes to identify situations that may create the damaging flame "flashback" phenomenon. The simulations were performed on Titan, currently the second fastest supercomputer in the world, and revealed the intricate coupling between turbulent mixing and reaction processes with unprecedented spatial and temporal resolution.

These results revealed that even a small amount of hydrogen in the fuel can have a large impact on flame behavior. Furthermore, the long-held conceptual model of how a flame can propagate upstream against the flow of the fuel-air mixture was shown to be incorrect. This new understanding has led to development of a new conceptual model which will help to enable hydrogen's use as a fuel in power generation.



► Ray Grout, NREL HPC Applications Researcher and former Sandia postdoc (left); Andrea Gruber, SINTEF Energy Research Scientist; and Jackie Chen, Sandia Distinguished Member of Technical Staff.

## C3 to Improve Access to Labs' Technologies and People



"We're looking to expand Sandia's front door," said Paul Hommert, President and Laboratories Director, Sandia National Laboratories, speaking at a news conference announcing the Center for Collaboration and Commercialization. The planned center, known as C3, will be located in the Sandia Science & Technology Park (SS&TP), which is adjacent to Sandia, but publicly accessible.

C3 will be an inspiring and energizing place where Sandians and their industrial, academic, and government partners can interact easily and freely. Beyond just offering spaces for lease, the new multi-tenant C3 facility will also provide programs and services for tenants and partners, all designed to facilitate successful partnerships.

Expanding the Labs' accessibility and presence in the community will increase the private sector's access to technologies, improve interaction with research partners, businesses and investors, and promote technology commercialization. A strong partnership with the private sector will help realize the C3 vision.

C3 ties into the city of Albuquerque's and the University of New Mexico's Innovation District and Innovate ABQ initiatives. At the eastern end of an innovation corridor, the SS&TP is already home to companies and organizations that take advantage of the Park's location to give them easy access to the Labs' technologies, facilities, scientists, and engineers.

A differentiator for Albuquerque, C3 will promote economic development for the region. "Let's amplify all the things that we already do at Sandia by creating a physical presence that brings us together and creates broader linkages to the community," said Hommert. "Sandia is already a leader in technology transfer and economic development through partnerships. C3 is an opportunity to do even more."



► **Richard J. Berry,**  
Albuquerque Mayor; **Paul Hommert,** Sandia President and Laboratories Director; and **Lisa Kuuttila,** STC.UNM CEO & Chief Economic Development Officer.

To learn more about C3, visit [www.sstp.org/C3](http://www.sstp.org/C3)





## Wave Energy Creates Competitive Commercial Power

The pieces of the puzzle are coming together for Atmocean's wave energy technology. After receiving help from Sandia National Laboratories through the New Mexico Small Business Assistance (NMSBA) Program, the company has raised funds and is building its first commercial system. Atmocean found its NMSBA projects added significant value, enabled it to demonstrate their technology's advantages, and provided a way to present those benefits to investors and partners.

Atmocean's technology is cost-effective, in part because it does not generate electricity at sea; instead delivering pressurized seawater onshore for energy generation. After extensive research and development, this wave-driven renewable energy system is now ready for use.

NMSBA allows Sandia to give small businesses in New Mexico access to laboratory experts who assist them with solving technical challenges. A 2012 NMSBA project helped Atmocean and their manufacturing partner, Reytek, model their pump arrays under real wave conditions and determine that the system produces enough pressurized seawater to generate electricity. The model also helped demonstrate that the approach is cost competitive. A second NMSBA project in 2013 optimized the mooring system, showing that it could withstand forces such as big waves and crosscurrents.

With research results in hand, in 2014 Atmocean was able to move toward their first project deployment in Peru. They received a permit from the government and additional funding from investors. Peru's coastline is ideal for Atmocean's technology as it receives steady waves throughout the year. The new wave energy system, which should start running in the second quarter of 2015, can replace energy currently being produced by a coal-fired plant. Besides producing electricity, the system will also supply seawater to the company's local desalination and ice-making plants.



► Phil Kithil, Atmocean CEO, and Phil Fulham, Reytek Chief Engineer (right), inspect parts for the Atmocean wave energy system.

## Sandian Shines at Wearable Device Startup



Joining Avegant, a consumer electronics company developing the Glyph, a headset that combines high-end audio with a virtual retinal display, was a big change for Andrew Gross. He went from working at Sandia National Laboratories to a job at a small, but rapidly growing high tech startup.

Gross is taking part in Sandia's Entrepreneurial Separation to Transfer Technology (ESTT) program, which permits Sandia employees to leave the Labs to start up or expand technology companies. Entrepreneurs are guaranteed reinstatement for up to two years if they choose to return to the Labs.

His position at Sandia as a metal etch process engineer in the MESA facility exposed him to the requirements of a manufacturing environment and broadened his knowledge in microelectronics. This background helped prepare him for his position as Lead Research Engineer at Avegant, where he is assessing technologies and integrating the selected components into a manufacturable product.

One of the tasks Gross is tackling is integrating the inertial measurement unit, a chip that will communicate with the rest of the Glyph system, supplying head tracking information. This will be particularly important for gaming or immersive reality applications.

The Glyph is called a mobile personal theater, as it delivers both high-end audio and video in a wearable device. It looks like over-ear headphones with the addition of a small micromirror projector that flips down in front of the eyes.

Avegant and the Glyph have attracted a lot of attention. From a \$1.5 million Kickstarter campaign and debut at the 2014 Consumer Electronics Show, to a \$9.37 million Series A round of venture funding and plans to begin selling products in 2015, the company is seen as one of the brightest stars in the constellation of wearable device companies.

► **Andrew Gross, Avegant Lead Research Engineer, demonstrates the Glyph, which delivers both high-end audio and video in a wearable device.**



## Tech Showcase is Now Year-Round

The Sandia Technology Showcase changed form this year to become a multi-part series of events in New Mexico and California. Each event in the new format is shorter, focusing on just a few of the myriad Sandia National Laboratories partnership opportunities. The audience is also more targeted, with presentations aimed at investors and entrepreneurs.

The kickoff luncheon on September 25, in partnership with the New Mexico Angels, a group of accredited investors who focus on early-stage companies, featured three Sandia technologies with commercial appeal. They had been selected from a broad field to highlight promising intellectual property (IP) at various lifecycle stages.

The first technology presented involves a gas separation technology that has potential applications for carbon capture and sequestration, filtration, and purification. The second technology presented was embedded fiber optic sensors that can be used for real-time detection of problems with airplane parts and other mechanical systems.

MEPV, or microsystems-enabled photovoltaics, is the technology closest to commercialization of the three presented. These arrays of tiny flexible solar cells have multiple applications, including use on a small pad designed to charge any mobile or wearable device.

“How can we be more effective and achieve our IP objective of deploying technology developed at U.S. taxpayer expense for the benefit of those same taxpayers?” said Julia Phillips, Sandia Vice President and Chief Technology Officer in her remarks at the kickoff event. “We want to create jobs and wealth, and make this a more exciting place to live.”

The change to a year-round format for the Technology Showcase is intended to help achieve the Labs’ IP objective of creating more commercialization, leading to economic development results.



► **Marcus Chavez, Sandia Energetic Materials Engineer, presented embedded fiber optic sensor technology.**

For more information, visit [ssstp.org/showcase](http://ssstp.org/showcase)



## Bomb Squad Competition Fosters Training and Feedback



The Western National Robot Rodeo is a competition like no other. A weeklong competition where bomb squads battle using only their robots to solve complex, challenging scenarios, is all about testing abilities, bragging rights, and ultimately becoming better robot operators.

This annual event, co-hosted by Sandia National Laboratories and Los Alamos National Laboratory, presents state, local, federal, and military bomb squads with ten challenging scenarios designed to test and improve their skills using their bomb disablement robots. Scenarios change each year, and have become increasingly complex. In the past, participants have had to locate and dispose of suspected hazardous materials, locate and move simulated fuel rods from a damaged nuclear reactor, and remove simulated explosives placed by a terrorist in the overhead rack of an airplane.

The Robot Rodeo is a collaborative event, bringing together commercial, international, and government partners within the bomb squad community. Commercial partners bring their latest and greatest technology to the event, which is often incorporated into a scenario, allowing bomb squads to get hands-on experience with the technology. The commercial and government partners get direct feedback on the technology, capability gaps, and end-user needs.

Teams in the competition get hands-on training and a chance to hone their skills in a lively, yet low-risk environment. In 2014, participants included a team from the British Army, two teams from Colorado, and five from New Mexico, including those from Kirtland Air Force Base, the Albuquerque Police Department, and New Mexico State Police.

Sandia's participation allows its researchers to better understand the current state-of-the-art in the field and where future research and development could be useful. Sponsorship of the event through Work for Others agreements has led to the continued growth of the rodeo, now in its ninth year, and opportunities to further expand the event are being considered.

► **Bomb technicians reconfiguring their robots for the next challenging robot rodeo scenario.**



## Variable Transmissions Increase Natural Gas Production

Technology stemming from research done at Sandia National Laboratories years ago has evolved into patented infinitely variable transmission (IVT) products being offered by a company led by two former Sandians.

VeriTran presented its first application area for the IVTs at the 2014 Technology Ventures Corporation (TVC) Deal Stream Summit—increasing natural gas well production.

TVC was formed in 1993 by Lockheed Martin Corporation as part of the management contract for Sandia. Its goals: job creation, business formations, and equity funding. The annual Deal Stream Summit showcases promising technology companies originating from the Department of Energy laboratories and other research institutes.

VeriTran's IVTs have many potential applications, but the company's location in New Mexico, with over 13,000 natural gas wells in the San Juan Basin alone, many in remote, off-grid locations, made oil and gas well pump jacks a good initial market.

With the variable transmission in place, the well operator no longer has to send a technician to manually control pumping at off-grid wells that are powered by internal combustion engines. Optimum pumping rates for each well, considering its flow rate, can be pre-programmed into the unit or remotely managed, helping to prevent expensive pumping problems.

Currently housed in the TEAM Technologies building in the Sandia Science & Technology Park, VeriTran is able to take advantage of TEAM's mechanical engineering and prototyping capabilities. TEAM is VeriTran's strategic partner for product development and also an investor.

While installations on wells to date validate production increases, the IVT technology continues to be refined for this and future applications, in part through New Mexico Small Business Assistance Program projects. This allows experts from Sandia to provide assistance to VeriTran that is not available in the private sector.



► Oil-field workers installing the transmission on a working natural gas well near Farmington, NM. The transmission is hanging on the hoist, and the engine is below and slightly to the left.

## NMSBA Innovation Celebration



Ten New Mexico Small Business Assistance (NMSBA) Program projects were honored at NMSBA's annual Innovation Celebration Awards luncheon, held at the Technology Ventures Corporation 2014 Innovation Summit at the Anderson Abruzzo International Balloon Museum.

Three of the projects received technical assistance from Sandia National Laboratories, including Data Center Transitions. The company's MASS Lift, a device that moves large computer server cabinets, had its power system redesigned to eliminate potential interference with computer electronics. The new system allowed the company to reduce costs by 20% and sell additional units to Microsoft and Facebook.

Retriever Technology wanted to digitize seismograms to get usable information from historical data. Sandia helped solve conversion problems and provided assistance in securing a \$1 million Small Business Innovation Research (SBIR) Phase II award.

Skyndex Leveraged Project got help with a caliper that measures body fat percentage. A team of robotics experts came up with redesign ideas that opened new markets and could lead to \$3 million in increased revenue.

NMSBA assists for-profit small businesses in New Mexico with access to laboratory experts at Los Alamos National Laboratory and Sandia. These experts help them to gain knowledge and solve challenges utilizing the labs' cutting-edge technologies.

► At this year's NMSBA Innovation Celebration, Data Center Transitions received the Honorable Speaker Ben Luján Award for Small Business Excellence as the honoree that demonstrated the most economic impact.

## Innovation and Intellectual Property Celebrations

Events in New Mexico and California recognized Sandia scientists, engineers, and technologists whose work led to intellectual property (IP). This new IP has contributed to Sandia's IP and licensing portfolios, royalty streams, and reputation in innovation and technology transfer.

In New Mexico, the 5th annual event was held at the National Hispanic Cultural Center on the evening of June 12. At the celebration, 123 patent holders, 14 copyright authors, and 29 Up-and-Coming Innovators were recognized. Dan Sanchez, DOE Technology Partnerships Manager, NNSA Sandia Field Office said, "In awarding these innovators, we are continuing the tradition of ingenuity and engineering excellence and keeping Sandia at the forefront of innovation."

In California, the 17th annual event, held at Concannon Vineyards on August 13, was also an opportunity for guests to learn more about the Sandia honorees and their accomplishments. Intellectual property achievements for FY2013 and FY2014 were celebrated, with 58 patent holders, 47 copyright authors, and 5 special award recipients recognized. The Innovation Celebration was preceded by an all-day Entrepreneurship Seminar at Sandia.



Sandia National Laboratories won a number of awards again this year. These awards recognize achievements in technology development, technology transfer, and technology partnerships.

## R&D 100 Awards

Widely recognized as the “Oscars of Invention,” the R&D 100 Awards identify and celebrate the top 100 technology products of the year spanning industry, academia, and government-sponsored research.

### BaDx



BaDx (*Bacillus anthracis* Diagnostics) is a lab-in-a-pocket device that can diagnose bacteria that cause anthrax. It does this with no power, refrigerated storage, or laboratory equipment. BaDx is easy to use and keeps handlers safe. It is a rapidly deployable platform that can be adapted for other emerging biothreats.

### Triplet-Harvesting Plastic Scintillators



Automated sensors screen cargo at ports of entry for controlled radiological materials that could be used to make a nuclear weapon. These new detectors scintillate (glow) when they pick up tell-tale emissions. They also give off more light at less cost, and respond faster than current scintillators.

### Goma 6.0



Open-source software Goma 6.0 helps solve material-processing problems. These could be related to creating plastic wrap, making flat-panel glass, producing reinforced materials for power lines, or drying polymers.

## FLC Awards

The Federal Laboratory Consortium (FLC) Awards Program annually recognizes federal laboratories and their industry partners for outstanding technology transfer efforts.

### FLC National Awards

**Interagency Partnership:** Sandia, SPAWAR Systems Center Pacific (SSC Pacific), and the Department of Homeland Security (DHS) Science and Technology (S&T) Borders and Maritime division (BMD)

The partners researched, developed, tested, evaluated, and transitioned new cargo security technologies to meet specific DHS and Department of the Navy requirements.

## FLC Mid-Continent & Far West Region Awards

**Outstanding State and Local Government Collaboration:** New Mexico Small Business Assistance (NMSBA) Program

Some 352 small businesses in 31 counties participated last year in NMSBA, a public-private partnership created in 2000 among Sandia, Los Alamos National Laboratory, and the state of New Mexico. NMSBA connects small business owners with scientists and engineers who provide technical assistance.

### Excellence in Technology Transfer: Mantevo



A suite of open source software miniapps which improve high-performance computing, Mantevo models the performance of full-scale applications yet requires code a fraction of the size. Mantevo pioneered the miniapp concept and is now used by every major computer vendor and many university researchers.

### Notable Technology Development: Nano-Stabilized Enzymatic Membrane for CO<sub>2</sub> Capture



Electricity-generating plants (especially coal-fired plants), as well as other industrial activities that generate CO<sub>2</sub> emissions, are facing new Environmental Protection Agency (EPA) emission regulations. These membranes provide a more energy-efficient approach to CO<sub>2</sub> capture, forecast to save the U.S. coal industry \$90B/yr.

### Outstanding Partnership: H2FIRST

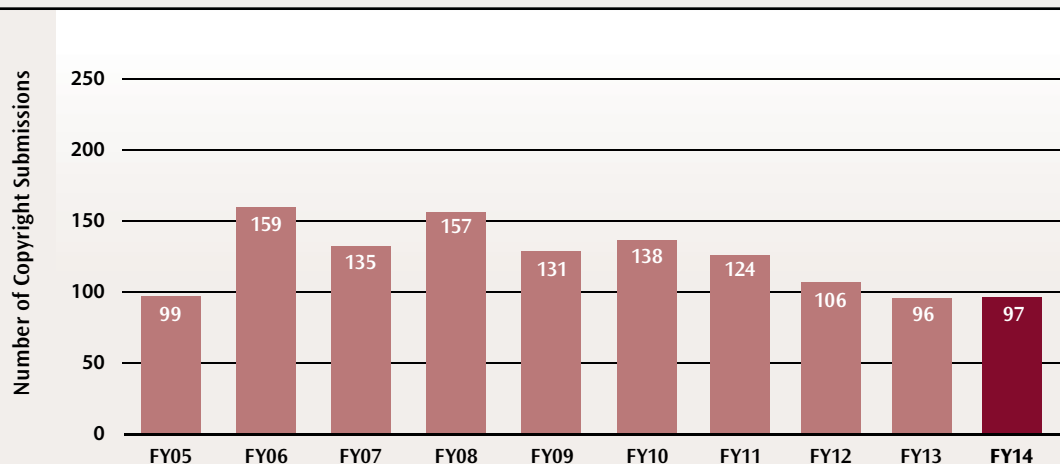
Hydrogen Fueling Infrastructure Research and Station Technology (H2FIRST) is an effort to increase the number of fueling stations for hydrogen fuel cell electric vehicles. H2FIRST involves Sandia and the National Renewable Energy Laboratory, California Fuel Cell Partnership, California Governor's Office of Business and Economic Development, and California Air Resources Board.



► Sandia scientists (from left), Jason Harper, Melissa Finley, and Thayne Edwards with a BaDx anthrax detector.

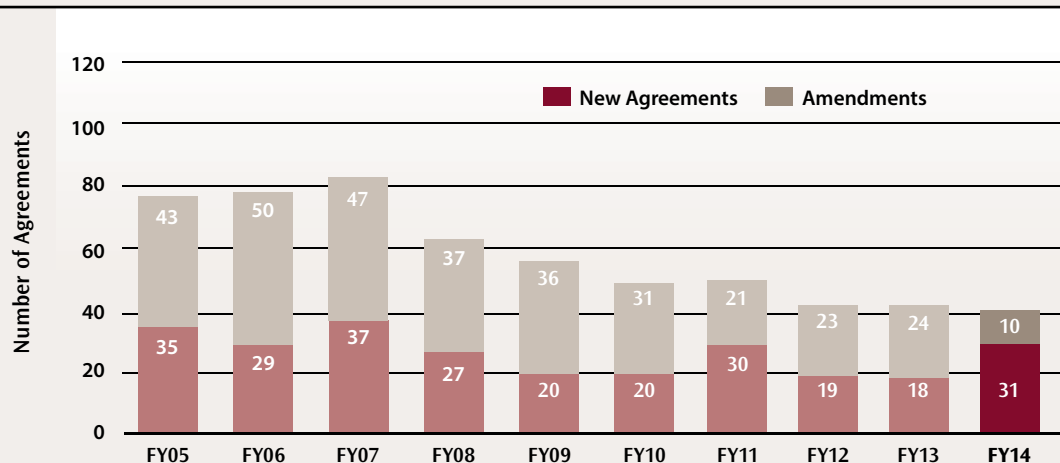
## Copyrights

### Copyright Submissions

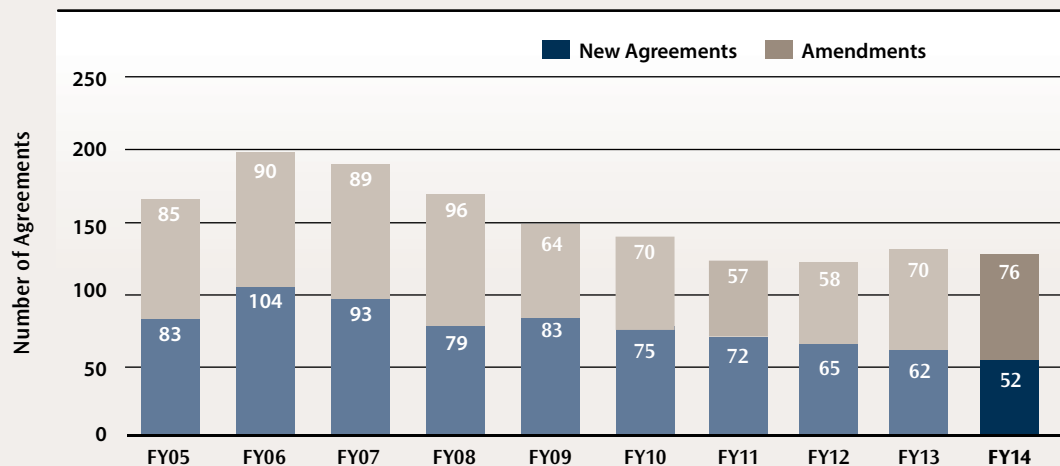


## CRADAs and WFO-Industrial

### Sandia CRADA Program Activity



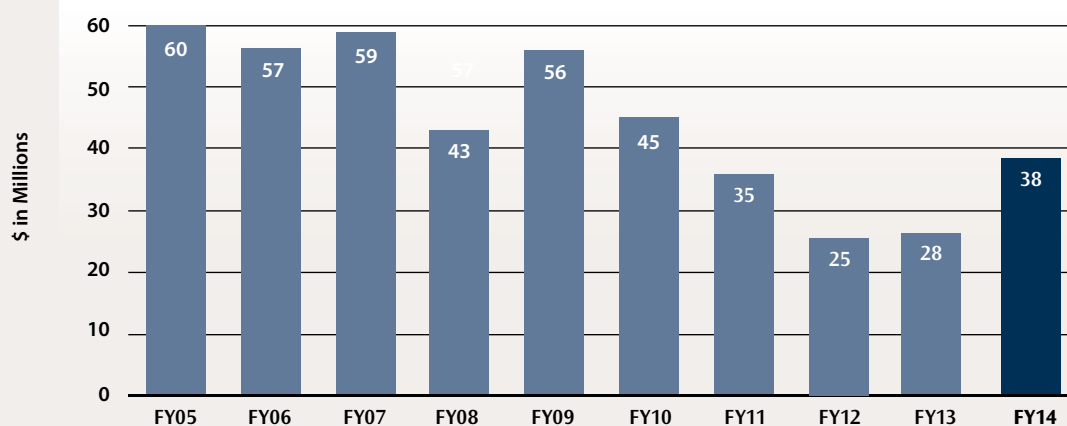
### Sandia WFO-Industrial Partners Activity



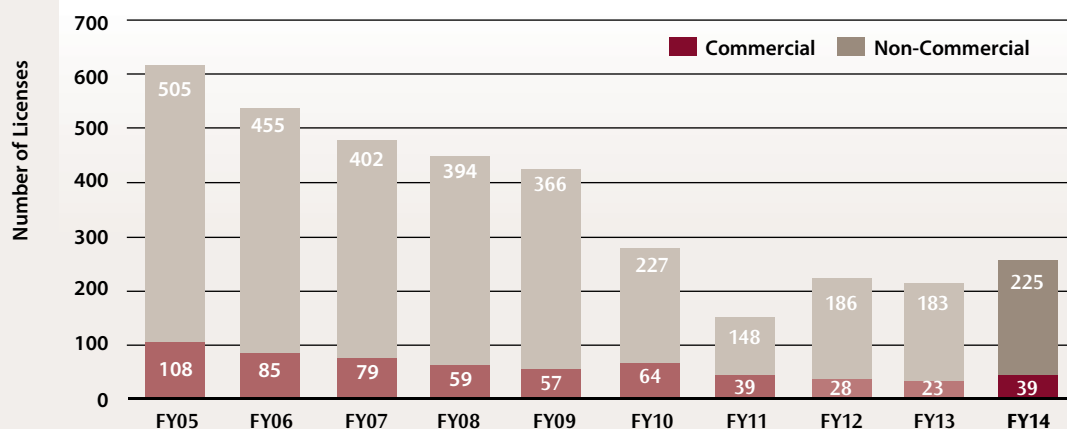


## Industry Funds-In Industry Funds-In to Sandia (\$M)

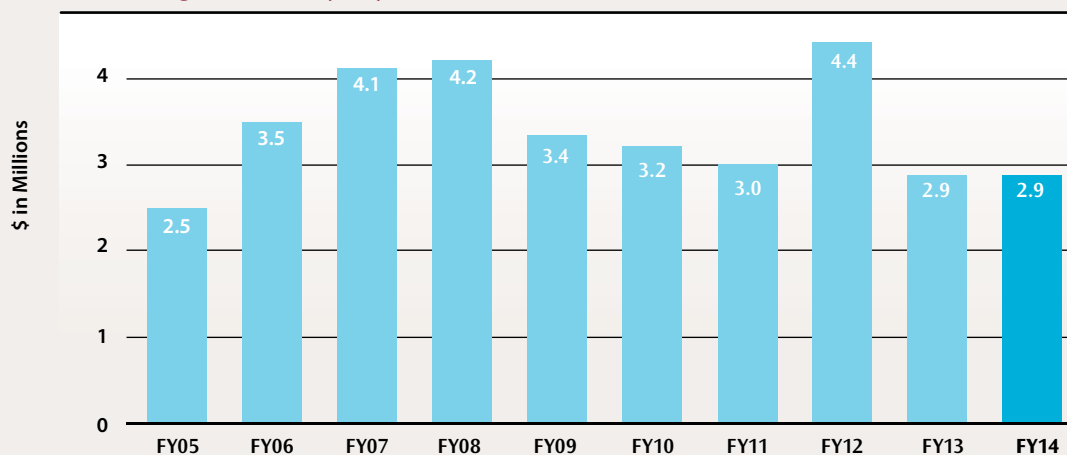
Values represent Funds-In for CRADAs, WFO Non-Federal Entity Agreements, and Licensing Income.



## Licenses Licenses

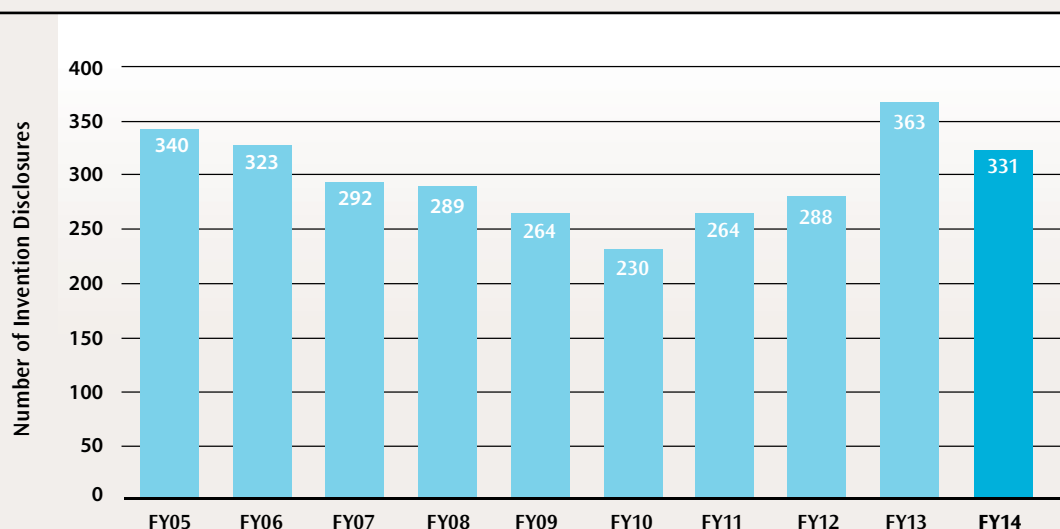


## Licensing Income (\$M)

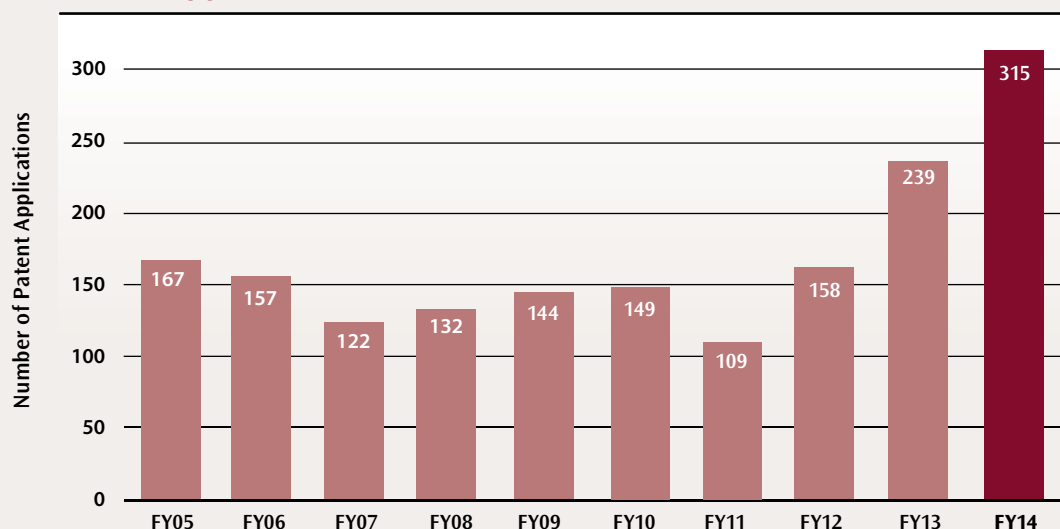


## Patent Activity

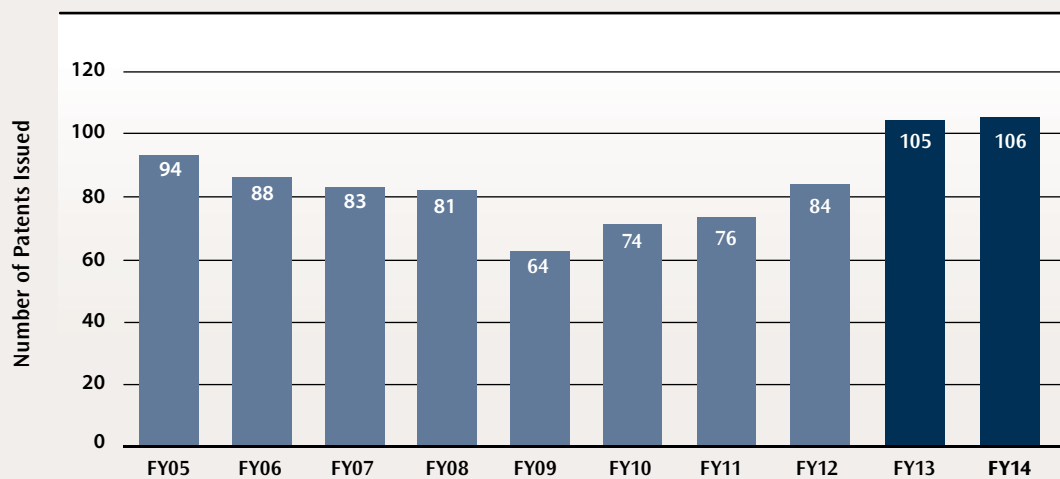
### Invention Disclosures



### Patent Applications



### Patents Issued



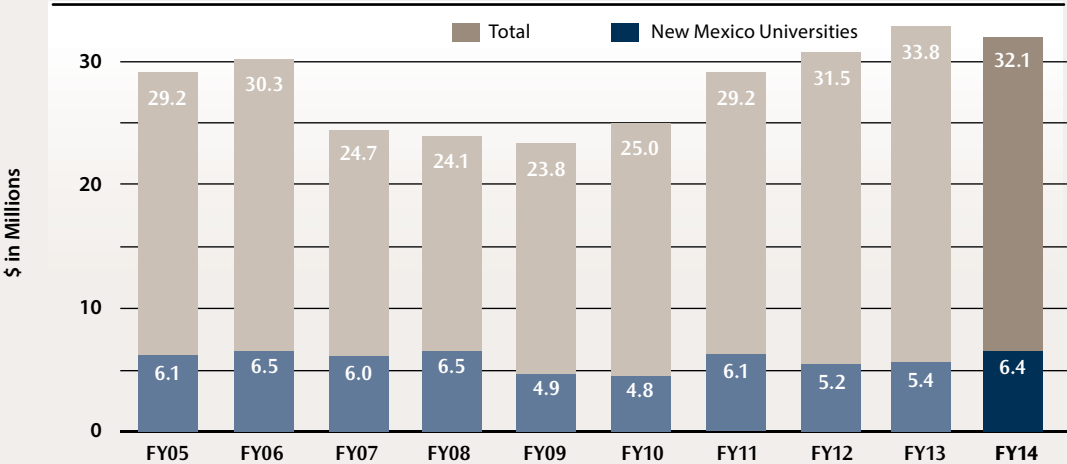


# University Partnerships

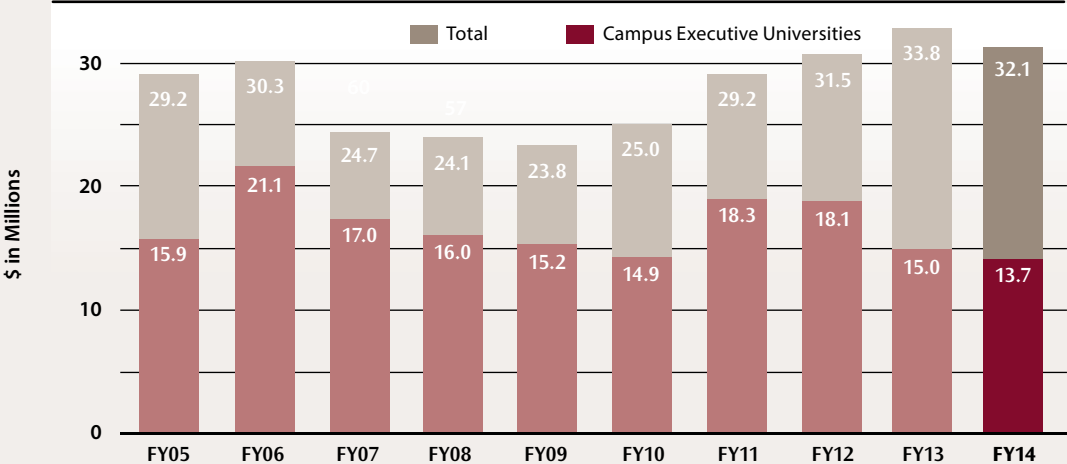
Sandia National Laboratories has traditionally contracted for university research to expand its science and technology base. Both Sandia and universities share a need to accelerate the creation of world-class research, develop scientists and engineers, and grow competencies and new businesses.

Today, Sandia partners with key universities to achieve three major objectives: conduct world-class science, hire world-class scientists and engineers, and develop strategic collaborations in focused research challenge areas. The University Partnerships Office, under the leadership of the Chief Technology Officer, serves as the point of contact for university research issues and implements those processes that enable university partnerships.

## Investments in Research at New Mexico Universities



## Investments in Research at Campus Executive Program Universities



The Campus Executive Program pairs Sandia executives with university officials at schools that share research interests and capabilities.



**2014:** Economic impact analysis showed the SS&TP generated over \$16M in tax revenue to the state of New Mexico, \$2.5M to the city of Albuquerque, and over \$705M in wages and salary disbursements over the past two years.



**2014:** Sandia invested \$2.31M helping 197 small businesses in 27 counties throughout New Mexico.



**2014:** One employee left Sandia on ESTT to help expand a new business, one was granted a third-year ESTT extension, and five Sandians remain out on ESTT.

## Sandia Science & Technology Park (SS&TP)

### Results

Companies and Organizations .....	37
Employees .....	2292
Buildings .....	25
Funds-In to Sandia from Park Companies* .....	\$17.7M
Contracts from Procurement to Park Companies* .....	\$408M
Contracts Between Park Companies* .....	\$10.4M
Public Investment in the Park* .....	\$89M
Private Investment in the Park* .....	\$279M
Total Investment in the Park* .....	\$368M
Average Salary of Full-time Jobs in Park .....	\$83K
Average Salary of Full-time Jobs in Metro Albuquerque .....	\$42K

\*Since Park opened in 1998

## New Mexico Small Business Assistance (NMSBA)

In 2014 the state of New Mexico, along with Los Alamos and Sandia national laboratories, invested nearly **\$4.7M** helping **352** small businesses in **31** counties.

**2000 - 2014**

**New Mexico Small Businesses Assisted** ..... 2341

### Rural vs Urban Businesses

Rural (65%) .....	1532
Urban (35%) .....	809
Combined .....	2341

**Dollar Amount of Assistance** ..... \$43.7M

**2000 - 2013**

**Return on Investment (ROI)** ..... 1.13

*(ROI is Based on Salaries of Jobs Created and Retained)*

### Economic Impact

Small Business Jobs Created and Retained .....	4086
Mean Salary .....	\$38K
Increase in Revenue .....	\$200M
Small Business Decrease in Operating Costs .....	\$85M
Investment in NM Goods/Services .....	\$68M
New Funding/Financing Received .....	\$77M

## Entrepreneurial Separation to Transfer Technology (ESTT)

<b>Companies Affected by ESTT*</b> .....	<b>101</b>
Start-up Companies .....	50
Expansion Companies .....	51
<b>Sandians Who Left on ESTT*</b> .....	<b>149</b>
To Start up a Company .....	65
To Expand a Company .....	84

\*Since ESTT began in 1994



## ► PARTNERSHIP SUCCESS STORY VIDEOS

Sandia National Laboratories has produced a series of videos featuring companies using Sandia technology to create or improve product and services, and solve real-world problems. The stories are told in the words of the Sandia principal investigators, industry partners, and entrepreneurs who worked together to achieve a common goal.

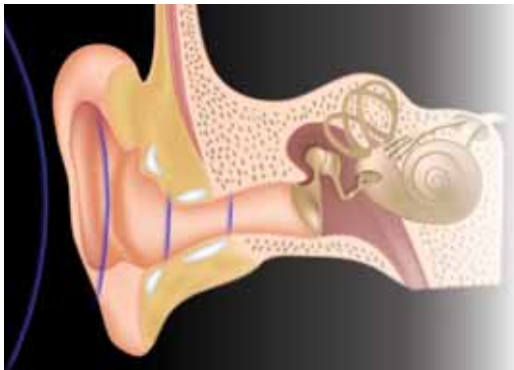


### ► Keeping medicines cool without electricity

The NanoQ container uses ice and nanoporous insulating material to maintain temperatures required for long-term storage of vaccines in remote areas. Yet how can ice be produced without electricity or batteries? With technical assistance from the New Mexico Small Business Assistance (NMSBA) Program, SAVSU Technologies developed an optimal design for a solar thermal ice maker. Now the NanoQ can be a game changer in vaccine storage and distribution in developing countries.



Watch YouTube Video | <http://youtu.be/LKsXnS47rjg>



### ► Entrepreneur grows microswitch company

Todd Christenson took advantage of Sandia's Entrepreneurial Separation to Transfer Technology program to start HT MicroAnalytical (HT Micro) in order to apply his specialized expertise in metal microelectromechanical systems (MEMS) technology gained while at Sandia to the creation of the world's smallest electromechanical switches used in medical, military, and mobile-technology applications. In 2013 HT Micro entered into a partnership with Rosenberger, Inc.



Watch YouTube Video | <http://youtu.be/LJnXl3yyvaM>



### ► Reliable video analysis helps security company grow

Armed Response Team (ART) has grown to become the largest locally owned security company in New Mexico. With technical assistance from Sandia through the NMSBA Program, ART got help so they could quickly bring workable video security solutions to market. By offering a reliable video analytic camera system, they've been able to reduce theft, add hundreds of clients, and increase their number of employees.



Watch YouTube Video | <http://youtu.be/PU6TVTZVcAA>



### ► Portable anthrax testing with lab-in-a-pocket



BaDx (*Bacillus anthracis* Diagnostics) is a device to sample, sense, and diagnose bacteria that cause anthrax. It accomplishes these tasks in environments with no power, refrigerated storage, or laboratory equipment. BaDx was designed to be used with minimal or no training, and to keep handlers safe. The technology has been licensed to Aquila, a New Mexico small woman-owned company.



Watch YouTube Video | <http://youtu.be/aZbJK2jkes0>

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*Founded in 1993 by Lockheed Martin, Technology Ventures Corporation's charter is to facilitate the commercialization of technologies developed at Sandia, other laboratories, and research universities.*



**We want to thank all of  
the partners and Sandians  
who contributed to this report.**



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Regina Valenzuela, *Photographer*

Daniel Strong, *Photographer*

Jake Deuel, *Photographer*

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Norman Johnson, *Photographer*

Dale Kruzic, *Director and Videographer*

Dale Green, *Videographer*

Cindy Barchus, *Video Script Writer*

*Photos courtesy of 3M, VPE,  
Young Brothers, Decon7 Systems, Avegant,  
VeriTran, Jonathan Smith of the Bureau of Land  
Management, the World Health Organization,  
and Sheng Images Photography.  
Conceptual rendering of proposed C3 facility  
by Dekker/Perich/Sabatini.*



To learn more about industry or university partnership opportunities with Sandia, visit [www.sandia.gov/partnerships](http://www.sandia.gov/partnerships) or contact us at [partnerships@sandia.gov](mailto:partnerships@sandia.gov)

To learn more about licensing and technology transfer at Sandia, visit <https://ip.sandia.gov> or contact us at [ip@sandia.gov](mailto:ip@sandia.gov)



Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2015-1582 M