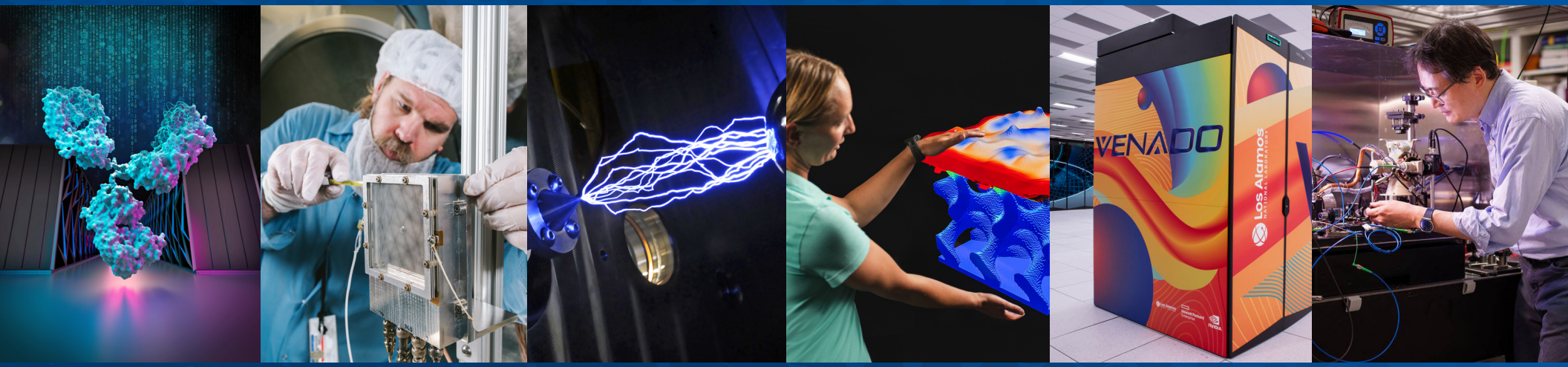
Technology Transfer at NNSA



2025

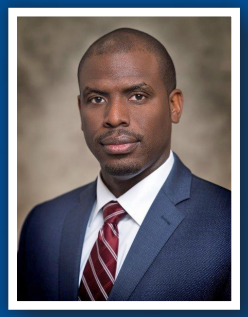
CALENDAR

National Nuclear Security Administration

NNSA Technology Transfer Program

The National Nuclear Security Administration (NNSA) is a semi-autonomous agency responsible for carrying out the nuclear security responsibilities of the Department of Energy (DOE), including (1) the maintenance of a safe, secure, and reliable stockpile of nuclear weapons and associated special nuclear materials, capabilities, and technologies; (2) defense nuclear nonproliferation; and (3) naval nuclear propulsion. NNSA's enterprise consists of its headquarters (HQ), field offices, and national security laboratories, plants, and sites (LP&S). NNSA is run from HQ buildings spread over three sites (Forrestal, Germantown, and the Albuquerque Complex) and conducts its critical missions at field offices and LP&S nationwide. As shown in the national map (Figure 1), NNSA conducts research, development, and technology transfer programs at the national laboratories: Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratories (SNL), as well as plants and sites within the NNSA nuclear security enterprise: Nevada National Security Sites (NNSS), Pantex Plant (Pantex), Kansas City National Security Campus (KCNSC), Y-12 National Security Complex (Y-12), and the Savannah River Site (SRS). Under the NNSA Act, the NNSA Administrator is given authority over all programs, activities, and contract administration duties for our Nation's nuclear security organizations.

Within the NNSA, one of the key mechanisms by which knowledge, intellectual property, and capabilities developed at NNSA LP&S are transferred to other entities, such as external Federal agencies, private industry, academia, and state/local governments, is technology transfer. Since the passing of the Stevenson-Wydler Technology Innovation Act of 1980, Federal LP&S have been able to participate in, and budget for, technology transfer activities. Over the years, LP&S activities have yielded tens of billions of dollars in return-on-investment by leveraging NNSA-sponsored technology, capabilities, and expertise and has led to a multitude of patents, agreements, companies, and awards. At NNSA HQ, the intersectionality of the technology transfer mission – involving science and technology development, intellectual property law, and business practices – has brought together a myriad of organizations across DOE/NNSA to ensure that the United States and the international community fully realize the benefits of technology transfer and commercialization.



"One of the key missions of the NNSA, as established in the NNSA Act, is to support United States' leadership in science and technology. A notable mission priority of the agency is to leverage transformative technologies to address emerging challenges. This mission priority is nearly the very definition of technology transfer. The NNSA operates under the mantra of "Innovate. Collaborate. Deliver.", and this is precisely what the Technology Transfer program does. The Technology Transfer teams of the NNSA laboratories, plants, and sites (LPS) do an outstanding job of identifying innovative technologies developed at the LPS, collaborating with industry partners to commercialize these technologies, and delivering these technologies to the market to benefit the lives and livelihood of the American taxpayers. Incredible products have emerged from these efforts that impact the lives of Americans in ways that are seemingly unimaginable – except that the LPS Technology Transfer experts do imagine them and bring them to life for our benefit."

- Jahleel Hudson
Director, Technology and Partnerships Office, NNSA

As a point of reference, the NNSA laboratories–LANL, LLNL, and SNL–account for the largest accumulation of patents issued to the Federal Government. The associated technologies have revolutionized the lives of the American people and have provided great impact to the global community. Several groundbreaking technologies developed within the nuclear security enterprise are highlighted in this calendar.

NNSA Technology and Partnerships Office (TPO) has the primary responsibility for Federal oversight of technology transfer activities. TPO ensures that the NNSA LP&S are able to deliver back to the American people the benefits of taxpayer-funded work in cutting-edge science and technology research and development. Management, oversight, and reporting requirements for Technology Transfer Program priorities are guided by a Strategic Framework composed of three pillars and six strategic actions that support the pillars. The three pillars are (1) technology transfer for mission, (2) data analysis in support of commercialization, and (3) commitment to community outreach and providing accessibility to all Americans in the technology transfer and commercialization landscape. The six strategic actions are (i) advancement, commercialization, and refinement of technology; (ii) development, recruitment, and retention of workforce; (iii) economic growth; (iv) establishing public recognition and brand awareness; (v) engaging in outreach and establishing collaborative partnerships; and (vi) safeguarding U.S. technological innovations.

National Security Laboratories, Plants, and Sites

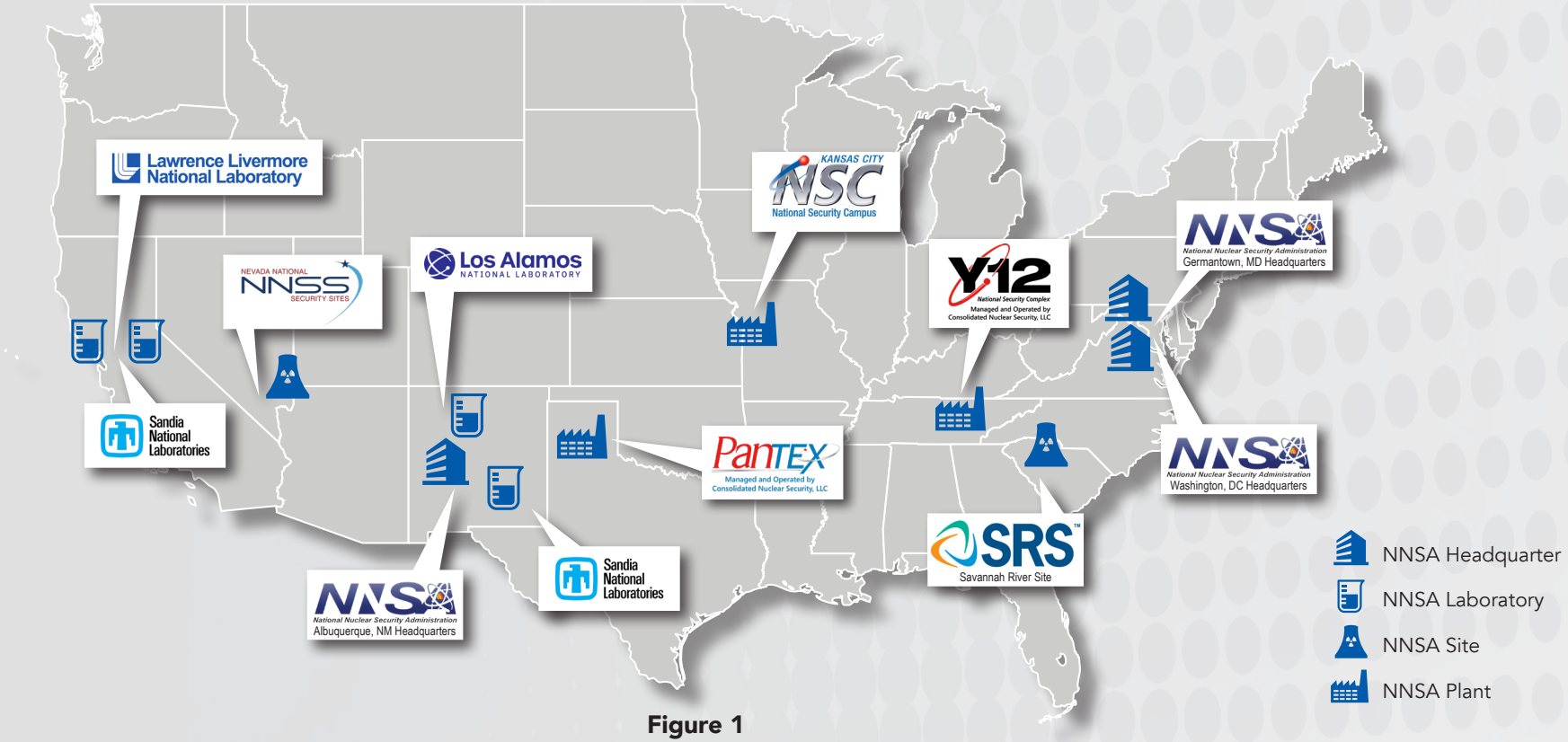


Figure 1

Success Story

NNSA Innovation Day

The National Nuclear Security Administration (NNSA) successfully hosted its inaugural NNSA Innovation Day on October 8, 2024. This landmark event served as a platform for technological growth and collaboration, and offered an opportunity for small business owners, industry leaders, and technological innovators to engage directly with one another and explore potential partnerships with the NNSA. NNSA's Technology and Partnerships Office facilitated this event with FedTech LLC., a company that specializes in deep technology commercialization and venture development to facilitate the transition of technology from Federal and university laboratories to deployment in the commercial market. This partnership leveraged an extensive network of industry experts, investors, and entrepreneurs, providing vital resources, mentorship, and funding to promising startup ventures.

The NNSA sought insights into emerging technology trends and leveraged their rigorous Technology Maturation process to unveil and highlight key breakthrough capabilities, including Renewable Energy, Integrated Sensing & Cybersecurity, and Human-Machine Interfaces. Six groundbreaking technologies were featured:

- Cognitive Hybrid Radio Waveform for High-Reliability, Secure Wireless Communications
- Photonic Encryption and Network Interconnect for Quantum Computing
- The Nano-satellite Atmospheric Chemistry Hyperspectral Observation System (NACHOS)
- Multi-Cationic Aluminate Catalysts for the Conversion of Natural Gas
- High Silicon Electrical Steel Alloys using Directed Energy Deposition
- Neural Implants

By participating, industry experts were able to impact the direction of these technologies, ensuring that NNSA's collaborative efforts aligned with market demands and contributed to the development of resilient, future-proof solutions. "This is part of a wider initiative to expand NNSA's technology maturation program, which aims to foster a collaborative environment with the Department

of Defense and industry partners such as small businesses to deeply understand their specific needs and challenges in technology adoption," said Jahleel Hudson, Director of NNSA's Technology and Partnerships Office.

> **"This is part of a wider initiative to expand NNSA's technology maturation program, which aims to foster a collaborative environment with the Department of Defense and industry partners..."**

The event fostered introductions, allowing attendees to engage with NNSA laboratory partners and establish valuable connections. Participants had the opportunity to lay the groundwork for partnerships that could enhance their strategic positioning within the industry. The event featured NNSA's Executive Principal Assistant Deputy Administrator for Defense Programs, David Hoagland, who delivered the keynote speech emphasizing the critical importance of innovation in advancing national security and NNSA's Director of the Technology and Partnerships Office Jahleel Hudson, who introduced the mission of NNSA and highlighted the impact that NNSA's technology transfer program has had on the Nation. Their insights inspired transformative thinking to assist in tackling emerging challenges and leveraging technological advancements, encouraging participants to consider the broader implications of their work. An industry-led panel discussion featuring Roopa Vasan, Chief AI Architect at Leidos; Ravi Raghava, CTO of the Civilian Business Group at SAIC; and Erika Bahr, Founder and CEO of Daxe, provided a forum for thought leaders to share their perspectives on the latest trends and challenges in the artificial intelligence sphere. This dialogue allowed panelists to address key issues affecting the sector and offered practical advice on navigating the complexities of technology adoption.

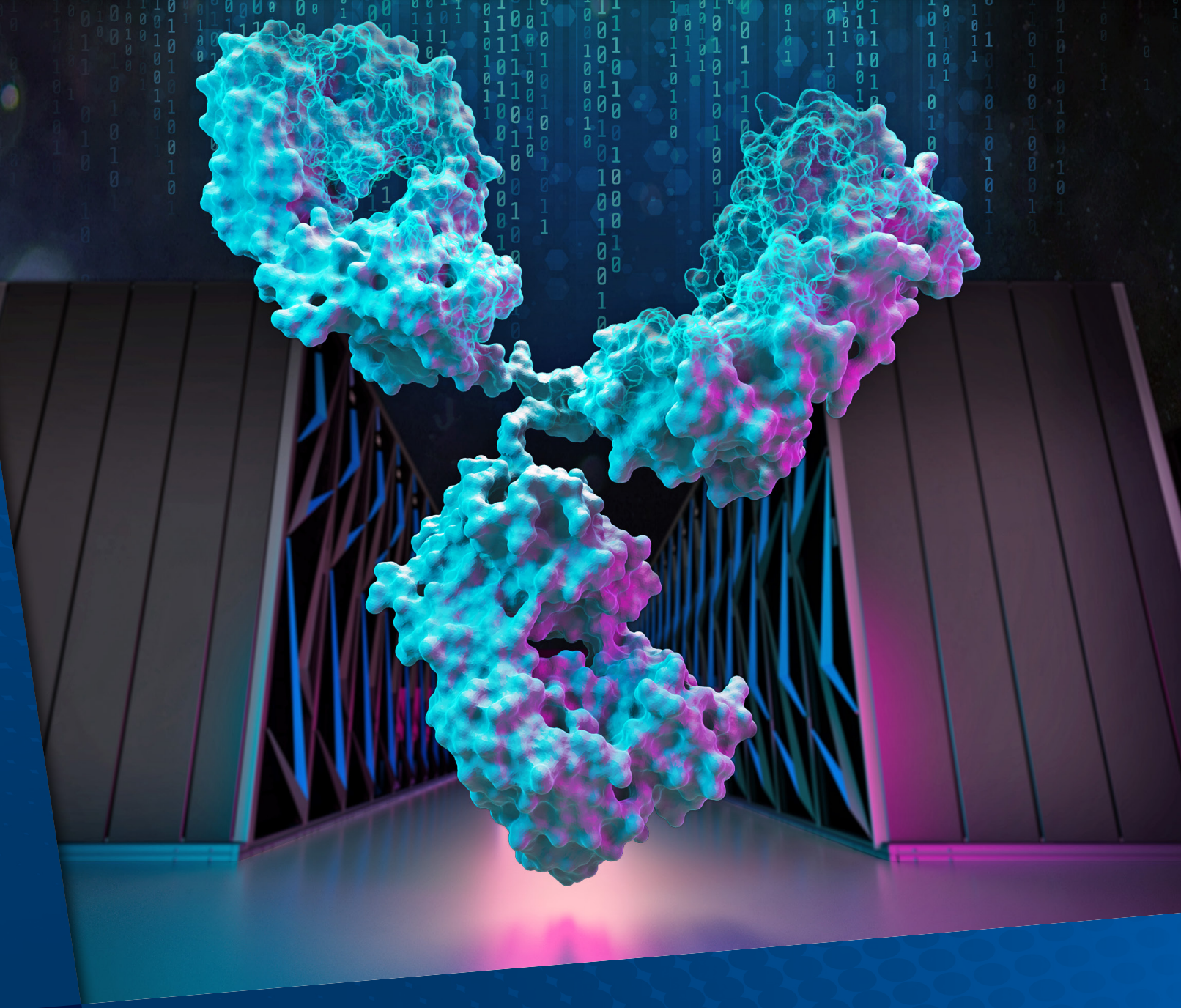
Open networking sessions and inventor presentations from industry and NNSA-supported laboratories throughout the day facilitated meaningful connections among attendees, encouraging industry professionals to engage in dialogue and explore collaborative opportunities. Participants had the opportunity to ask questions and explore potential partnerships with the inventors, further enhancing the spirit of innovation.

The innovative spirit of the day resonated with all who attended, reinforcing NNSA's commitment to advancing technology and enhancing national security through strategic partnerships. The collaborative environment established during NNSA Innovation Day promised to be a catalyst for ongoing dialogue and future initiatives aimed at addressing the complex challenges faced by the Nation in the realm of technology and security. The NNSA plans to host NNSA Innovation Day again next year to continue the work of fostering technological advancement and securing a sustainable future for the Nation.

A-Alpha

A-Alpha Bio, a biotechnology company harnessing synthetic biology and machine learning to measure, predict, and engineer protein-protein interactions, received $14.5 million in additional funding from the Department of Defense (DoD) Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense's (JPEO-CBRND's) Generative Unconstrained Intelligent Drug Engineering (GUIDE) program to further expand its partnership with LLNL.

Image Credit: Adam Connell/LLNL



Lawrence Livermore National Laboratory

January 2025

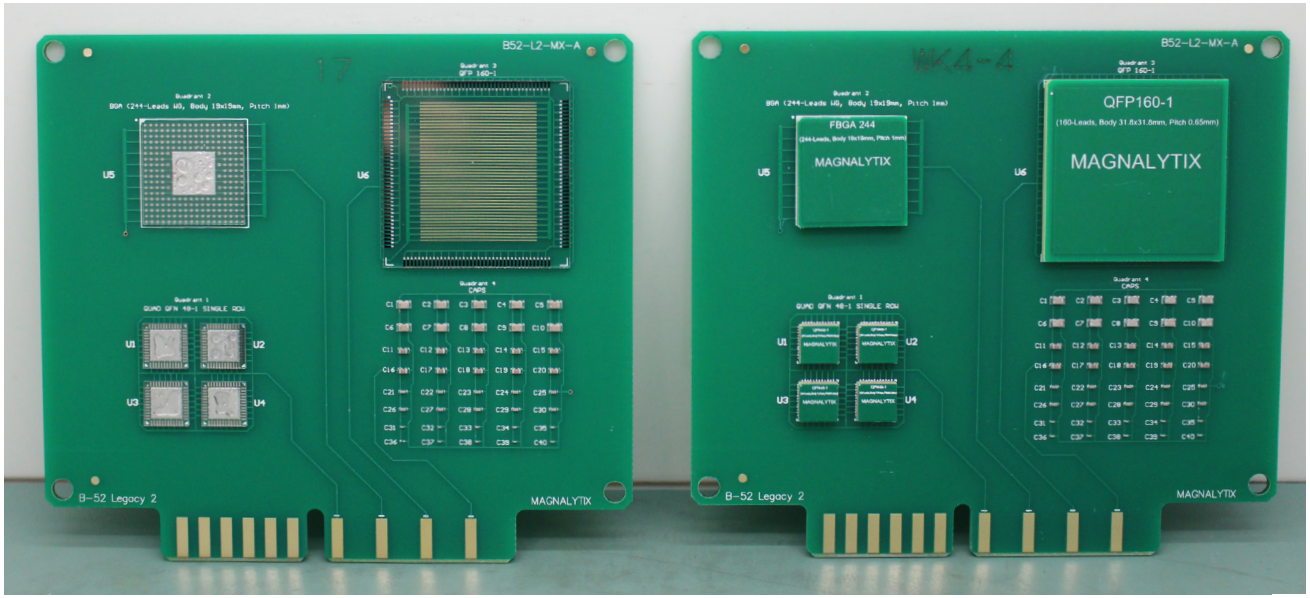
National Nuclear Security Administration

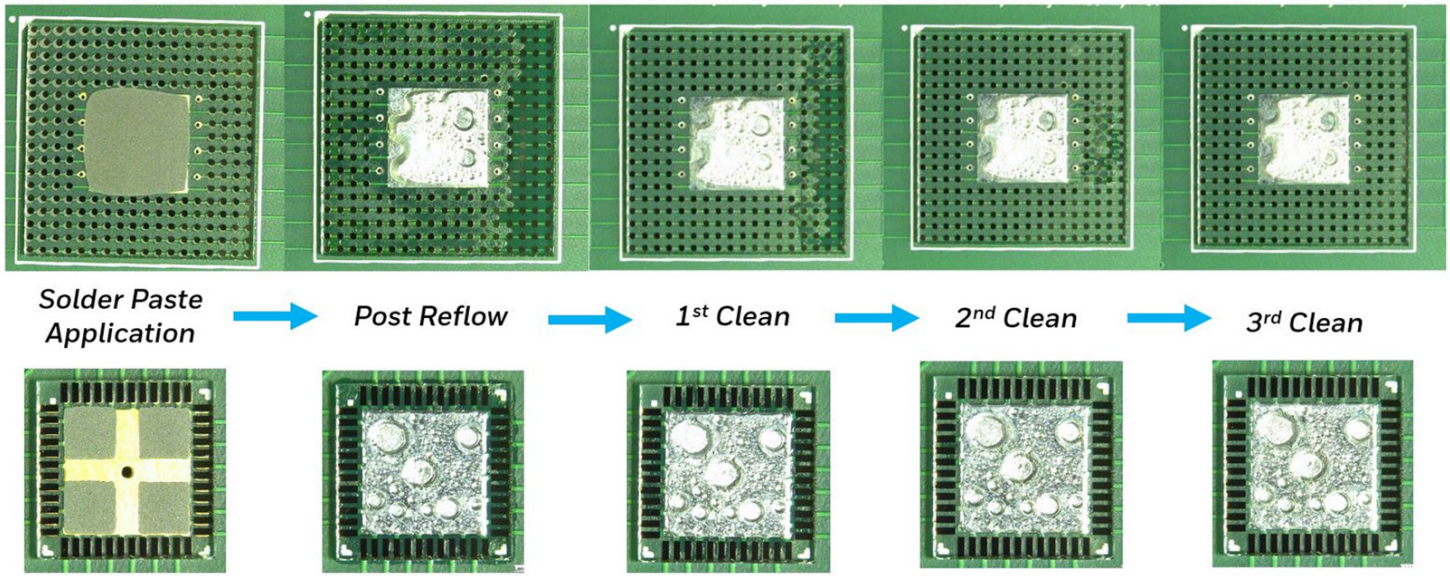
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
December 2024 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	February 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28		1 New Year's Day	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20 Martin Luther King Jr. Holiday Inauguration Day	21	22	23	24	25
26	27	28	29	30	31	

Transparent Packages For Use With Printed Circuit Boards (PCB)

Cleanliness is a critical factor for long-term printed circuit board reliability; failure to remove residual manufacturing solder joint and flux residue can result in both immediate and latent functional failures. Kansas City National Security Campus (KCNSC) designed transparent components to allow for visual, non-destructive characterization of PCBs during production and cleaning. Able to withstand adverse thermal and caustic manufacturing environments, the clear package enables process development and evaluation in an easy and non-destructive way. To date, over 10,000 packages have been delivered in support of KCNSC process characterization and qualification activities. (Patent Pending)

Image Credit: Kansas City National Security Campus, Communications





KANSAS CITY NSC National Security Campus

February 2025

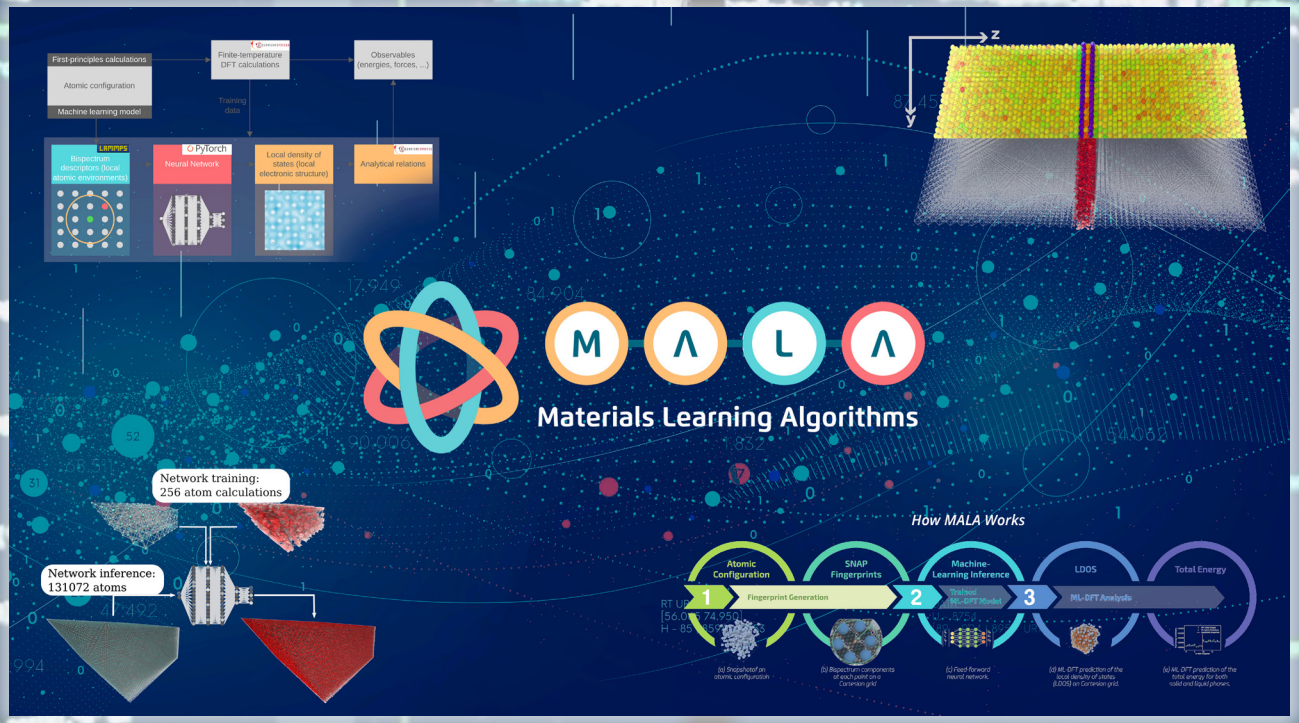
National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January 2025 1 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	March 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24/31 25 26 27 28 29					1
2	3	4	5	6	7	8
9	10	11	12	13	14 KANSAS CITY NSC National Security Campus 1949	15
16	17 Presidents' Day	18	19	20	21	22
23	24	25	26	27	28 Ramadan begins at sundown	

Materials Learning Algorithms (MALA)

Electronic structure is fundamental for understanding virtually all molecular and material properties. Until now, density functional theory has been the primary method for predicting electronic structures. However, the method is complex, expensive, and limited to small scales because the amount of data increases exponentially with the number of chemical elements, thermodynamic states, phases, and interfaces. MALA is a framework developed at Sandia National Laboratories (SNL) to overcome these computational limitations using machine learning. The software enables electronic structure calculations at length and time scales that were previously unfeasible. With the same level of accuracy as density functional theory at a fraction of the cost, this software allows researchers to explore a wider range of materials and make predictions about how those materials will behave in a variety of applications.

Graphic courtesy of SNL



Sandia National Laboratories

March 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	April 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30					1
2	3	4	5 Non-Proliferation Treaty (1970)	6	7	8
9 Daylight Saving Time begins	10	11	12	13	14	15
16	17	18	19	20 Spring begins	21	22
23 30	24 31	25	26	27	28	29

Success Story

BridgeBio Oncology

In a substantial milestone for supercomputing-aided drug design, Lawrence Livermore National Laboratory (LLNL) and Theras, a subsidiary of BridgeBio now spun out as BridgeBio Oncology Therapeutics (BBOT), announced Phase I clinical trials for a first-in-class medication that targets specific genetic mutations implicated in many types of cancer.

The development of the new drug–BBO-8520–is the result of collaboration among LLNL, BBOT and the National Cancer Institute (NCI)'s RAS Initiative at the Frederick National Laboratory for Cancer Research (FNL). In a first for a Department of Energy (DOE) national laboratory, the drug was discovered through DOE's leadership in high performance computing (HPC) for mission applications, combined with an LLNL-developed platform integrating artificial intelligence (AI) and traditional physics-based drug discovery, and effective partnership with BBOT and FNL.

The drug candidate has shown promise in laboratory testing for inhibiting mutations of KRAS proteins linked to about 30 percent of all cancers–targets long considered "undruggable" by cancer researchers. The achievement provides hope for broad impact on cancer patients whose tumors harbor susceptible KRAS mutations. This

Figure 1 The drug discovery work was powered by LLNL supercomputers Ruby (shown), Quartz and Lassen. Graphic by Amanda Levasseur/LLNL.

indicates that a computational/AI drug design approach could unlock new insights into the disease and the future of cancer treatment.

"For the DOE complex, this is the first true example that high performance computing can accelerate drug discovery, which is reinforced by making it to human trials," said LLNL Biochemical and Biophysical Systems Group Leader Felice Lightstone, principal investigator for the project.

The milestone leverages computational drug design capabilities originally motivated by a longstanding DOE-NCI partnership under the Cancer Moonshot, which aims to apply world-class computing resources at LLNL and other DOE national laboratories to advance cancer research and treatment for the public good. Researchers on the project said the partnership's success in developing a tangible drug candidate underscores the value of uniting expertise from the DOE national laboratories, biomedical research institutions, and innovative companies to solve difficult challenges such as cancer. It also indicates the computational approach could save millions of dollars and valuable time–perhaps years–over the traditional drug discovery process.

> **"...this is the first true example that high performance computing can accelerate drug discovery, which is reinforced by making it to human trials..."**

Initial research and funding for the work came from the RAS Initiative, established by NCI to explore novel approaches to attack proteins encoded by mutant forms of RAS genes and to ultimately create effective, new therapies for RAS-related cancers.

The joint effort stems from separate Cooperative Research and Development Agreements (CRADAs) between LLNL and BBOT and between FNL and BBOT, aimed at advancing discovery of novel RAS inhibitors for the treatment of cancer. The CRADAs brought the three institutions together to tackle the most challenging aspects of cancer therapy: the long timeframe to bring a drug to market and the high rate of failure for promising drug candidates. LLNL also saw the problem as an important use case for advanced computing.

In the coming years, LLNL and BBOT will continue to seek new compounds for other targets identified by the RAS Initiative, experimentally testing and validating these compounds, analyzing interactions between compounds and targets and optimizing existing compounds.

LLNL Innovation and Partnerships Office (IPO) Business Development Executive Yash Vaishnav negotiated the CRADA, as well as the license agreement for the drug candidate with BBOT.

2024 R&D 100 WINNER

PHOENIX

Portable, High-efficiency, Orthovoltage ENergy, Imaging X-ray source (PHOENIX) is the first portable x-ray source delivering the orthovoltage (500 keV – 1 MeV) energy range, which is significantly more penetrating than medical x-rays. Los Alamos National Laboratory's patented technology supplies high-energy photons to image thick metal objects and lower energy photons for high contrast on thin objects. PHOENIX produces high-resolution images for remote inspection of stationary structures, bridges, pipeline welds, oil wells, and threat objects. Its unique x-ray pulse formats provide capability for flash radiography. Golden Engineering was a partner on the R&D 100 Award.

Image Credit: Scott Watson, David Woodfin, and Allen Hopkins (Los Alamos National Laboratory)

Los Alamos NATIONAL LABORATORY

April 2025

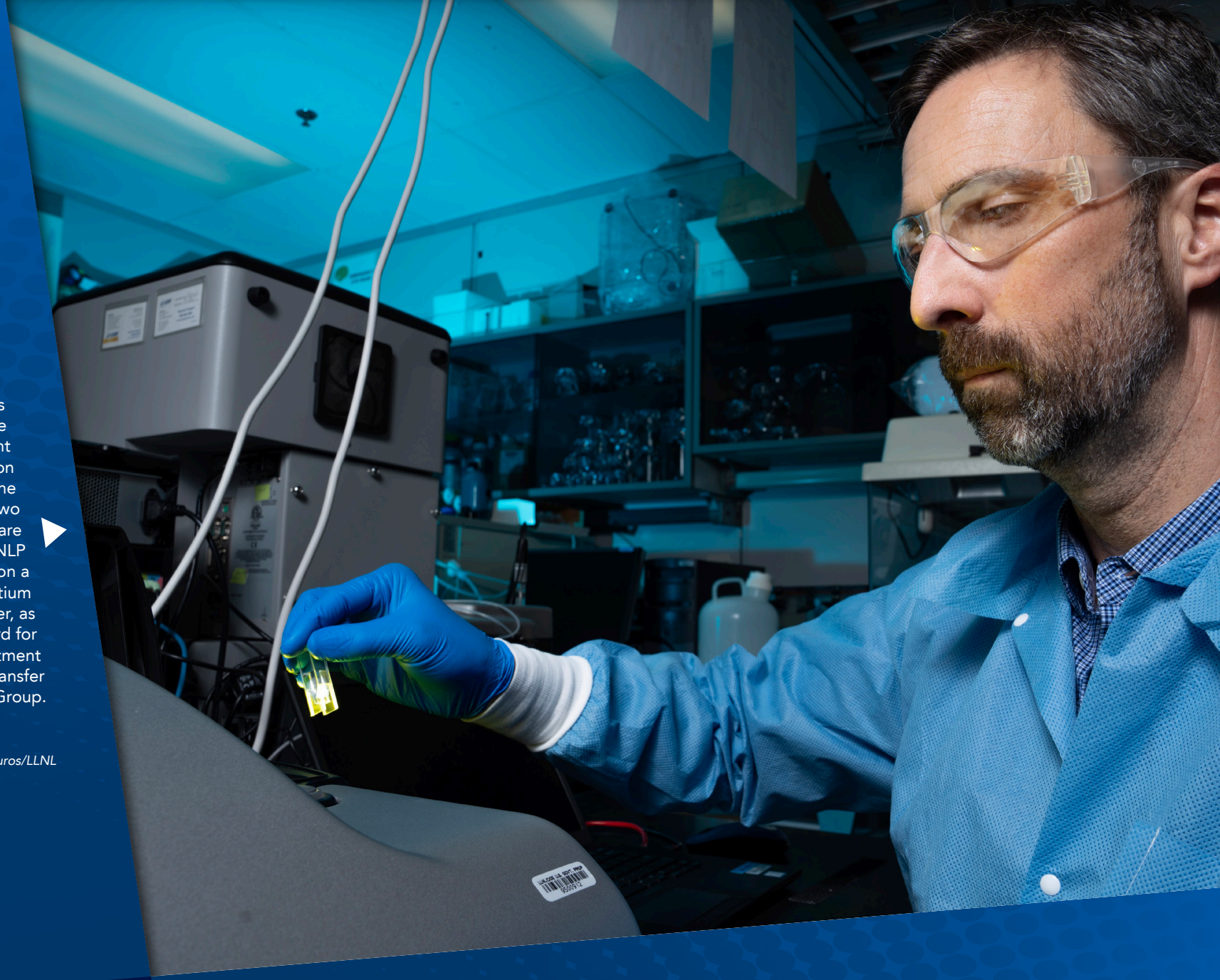
National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12 Passover begins at sundown
13	14	15	16	17	18	19
20 Los Alamos NATIONAL LABORATORY 1943 Easter	21	22	23	24	25	26
27	28	29	30		March 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24/31 25 26 27 28 29	May 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Nanolipoprotein Particles (NLPs)

LLNL biologist Nicholas Fischer is analyzing the size of the NLPs by dynamic light scattering in preparation for their use in vaccine applications. Fischer and two former LLNL researchers are key developers of the NLP technology, which has won a Federal Laboratory Consortium award for technology transfer, as well as a Best in Class award for licensing from the Department of Energy's Technology Transfer Working Group.

Image Credit: Blaise Douros/LLNL



Lawrence Livermore National Laboratory

May 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
April 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	June 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30			1	2	3
4	5	6	7	8	9	10
11 Mother's Day	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26 Memorial Day	27	28	29	30	31

Readiness Certification Assurance Process Tracking System (RCAPTS) Commercial License Agreement from Y-12 to Weatherly Consulting

RCAPTS is a web-based multi-user system designed to manage certain Readiness tasks. This system replaces or supplements several paper-based administrative tasks performed by personnel from the Readiness department and other organizations. RCAPTS helps manage issues and affirmations pertaining to projects and startups requiring readiness reviews per DOE Order 425.1D, Verification of Readiness to Start up or Restart Nuclear Facilities. The software is currently supporting the Uranium Processing Facility (UPF) project at the Y-12 National Security Complex. Weatherly Consulting has successfully supplied this software to the Savannah River Site, Waste Isolation Pilot Plant, and Nevada National Security Sites as a commercial form of government-use licensing. Supporting services for software setup are also provided to give entities the ability to effectively integrate this software into their site while decreasing software integration burden on sites.

Image Credit: Y-12 Photography

Y-12 National Security Complex
Managed and Operated by
Consolidated Nuclear Security, LLC

June 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15 Father's Day	16	17	18	19 Juneteenth	20	21 Summer begins
22	23	24	25	26	27	28
29	30					

May 2025

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

July 2025

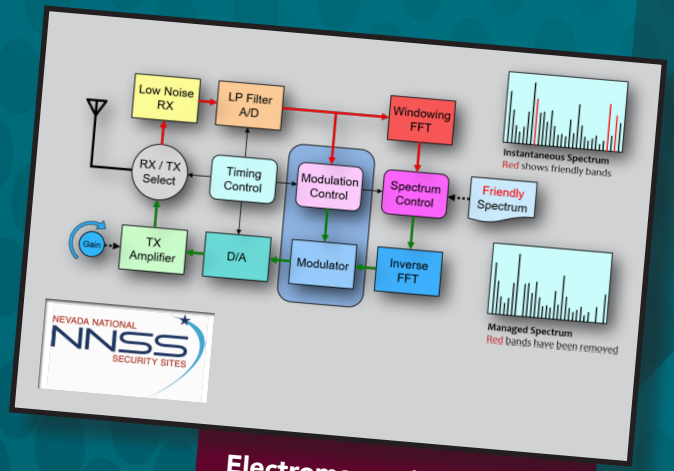
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

2024 R&D 100 WINNER

Congratulations to the 2024 R&D 100 Award winners! There were 14 from LANL, LLNL, NNSS, and SNL. NNSA's national security laboratories account for the largest accumulation of patents that have been issued to the Federal Government.

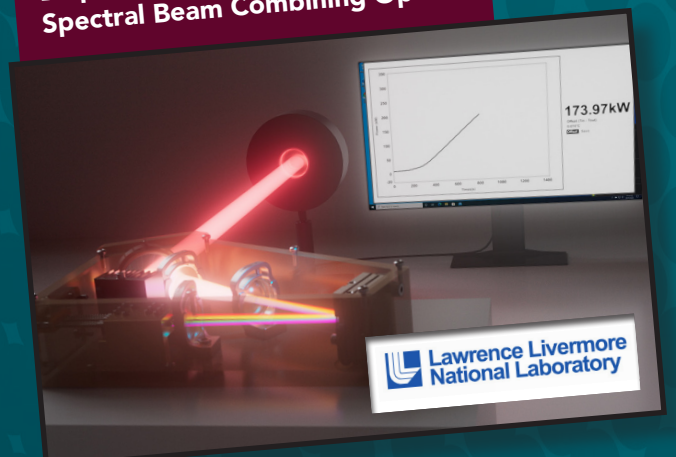
MENDS: Modular Electrochemical Nuclear Decontamination System

NNSA LABS RECEIVED **14** AWARDS FOR 2024



Electromagnetic Spectrum Management System

Extreme-power, Ultra-low-loss, Dispersive Element (EXUDE) Elite Spectral Beam Combining Optic



Low-cost Direct Air Capture of CO_2 with Clay Nano-interlayers (LDAC3)

14 AWARDS FOR 2024

2024 R&D 100 WINNER

Analytical/ Test Category

Compact Space Plasma Analyzer
Los Alamos National Laboratory
United States Air Force Academy, i2 Strategic Services, LLC

PHOENIX (Portable, High-efficiency, Orthovoltage Energy, Imaging X-rays)
Los Alamos National Laboratory
Golden Engineering

QUIC-DEPDOSE: Software tools to prepare for and respond to nuclear emergencies
Los Alamos National Laboratory

IT/Electrical Category

Ion Pair™ Membrane Electrode Assemblies
Los Alamos National Laboratory
Advent Technologies Holdings, Inc.

SAFE: Secure Automatic Failsafe Eraser
Los Alamos National Laboratory

Electromagnetic Spectrum Management System
Nevada National Security Sites

Process/ Prototyping Category

EXUDE Elite Spectral Beam Combining Optic
Lawrence Livermore National Laboratory

Modular Electrochemical Nuclear Decontamination System (MENDS)
Los Alamos National Laboratory

Machinable, Larger-Scale, Self-Healing Refractory High-Entropy Alloys (RHEA) for Energy and Aerospace Applications
Sandia National Laboratories
Pennsylvania State, Dynetics, and the University of New Mexico

Low-cost Direct Air Capture of CO2 with Clay Nano-interlayers (LDAC3)
Sandia National Laboratories
Purdue University

Software/Services Category

UMap
Lawrence Livermore National Laboratory

UnifyFS
Lawrence Livermore National Laboratory

Fierro Computational Mechanics and Materials Science Software
Los Alamos National Laboratory

NDα: Nondestructive Alpha Spectrometer
Los Alamos National Laboratory

2024 R&D 100 GOLD

Special Recognition: Green Tech

GOLD
Modular Electrochemical Nuclear Decontamination System (MENDS)
Los Alamos National Laboratory

2024 R&D 100 SILVER

Special Recognition: Corporate Social Responsibility

SILVER
QUIC-DEPDOSE: Software tools to prepare for and respond to nuclear emergencies
Los Alamos National Laboratory

Special Recognition: Market Disruptor

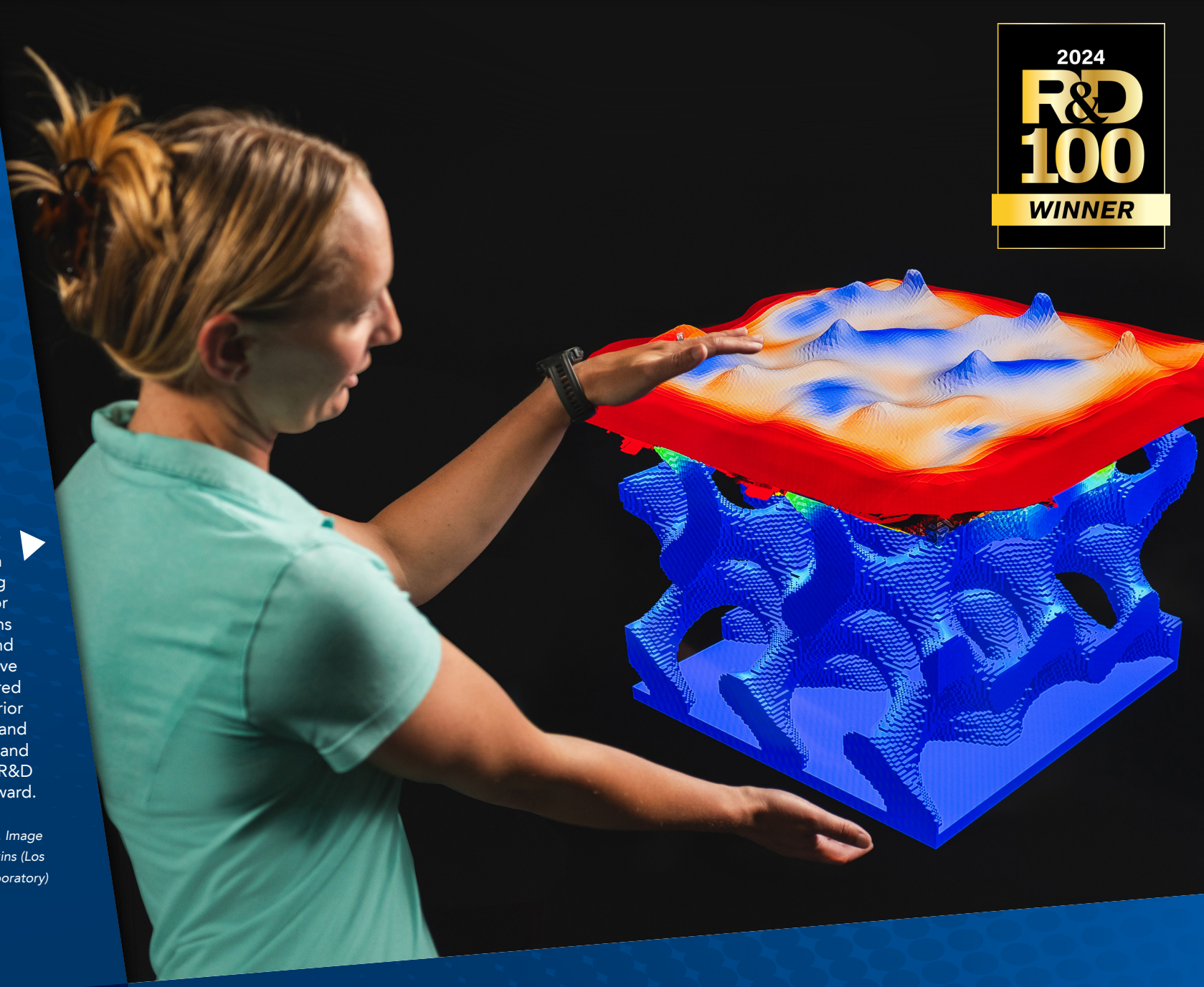
SILVER
NDα: Nondestructive Alpha Spectrometer
Los Alamos National Laboratory

3 SPECIAL RECOGNITION AWARDS
GOLD • SILVER

FIERRO

LANL has developed the Fierro open-source computational mechanics and materials science software package to achieve the potential of advanced manufacturing. Multiscale physics solvers simulate how fine-scale material properties and topology control bulk-scale performance under various conditions. Fierro autonomously designs the part topology, such as lattices in energy-absorbing materials. AI capabilities search for the optimal design among millions of possible design choices and leverage the flexibility of additive manufacturing for engineered systems. This results in superior products designed more rapidly and at less cost for diverse industries and applications. Fierro won a 2024 R&D 100 Award.

Photo showing a lattice simulation result. Image Credit: David Woodfin and Allen Hopkins (Los Alamos National Laboratory)



Los Alamos
NATIONAL LABORATORY

July 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4 Independence Day	5
6	7	8	9	10	11	12
13	14	15	16 Trinity Test Day (1945)	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

June 2025

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

August 2025

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30

Quantum Sensors for GPS-free navigation

For the first time, researchers from SNL have used silicon photonic microchip components to perform a quantum sensing technique called atom interferometry, an ultra-precise way of measuring acceleration. It is the latest milestone toward developing a kind of quantum compass for navigation when GPS signals are unavailable. The team has successfully miniaturized the technology—which traditionally required a large setup—into a compact, rugged, and cost-effective form.

A key innovation is a new high-performance silicon photonic modulator that significantly reduces unwanted sidebands, enhancing the sensor's accuracy. This modulator is also small enough to fit hundreds on a single 8-inch wafer and can be manufactured using the same process as virtually all computer chips, making the technology more affordable. As the technology gets closer to field deployment, the team is exploring other uses beyond navigation. Researchers are investigating whether it could help locate underground cavities and resources by detecting the tiny changes these make to Earth's gravitational force. They also see potential for the optical components they invented, including the modulator, in LIDAR, quantum computing, and optical communications.

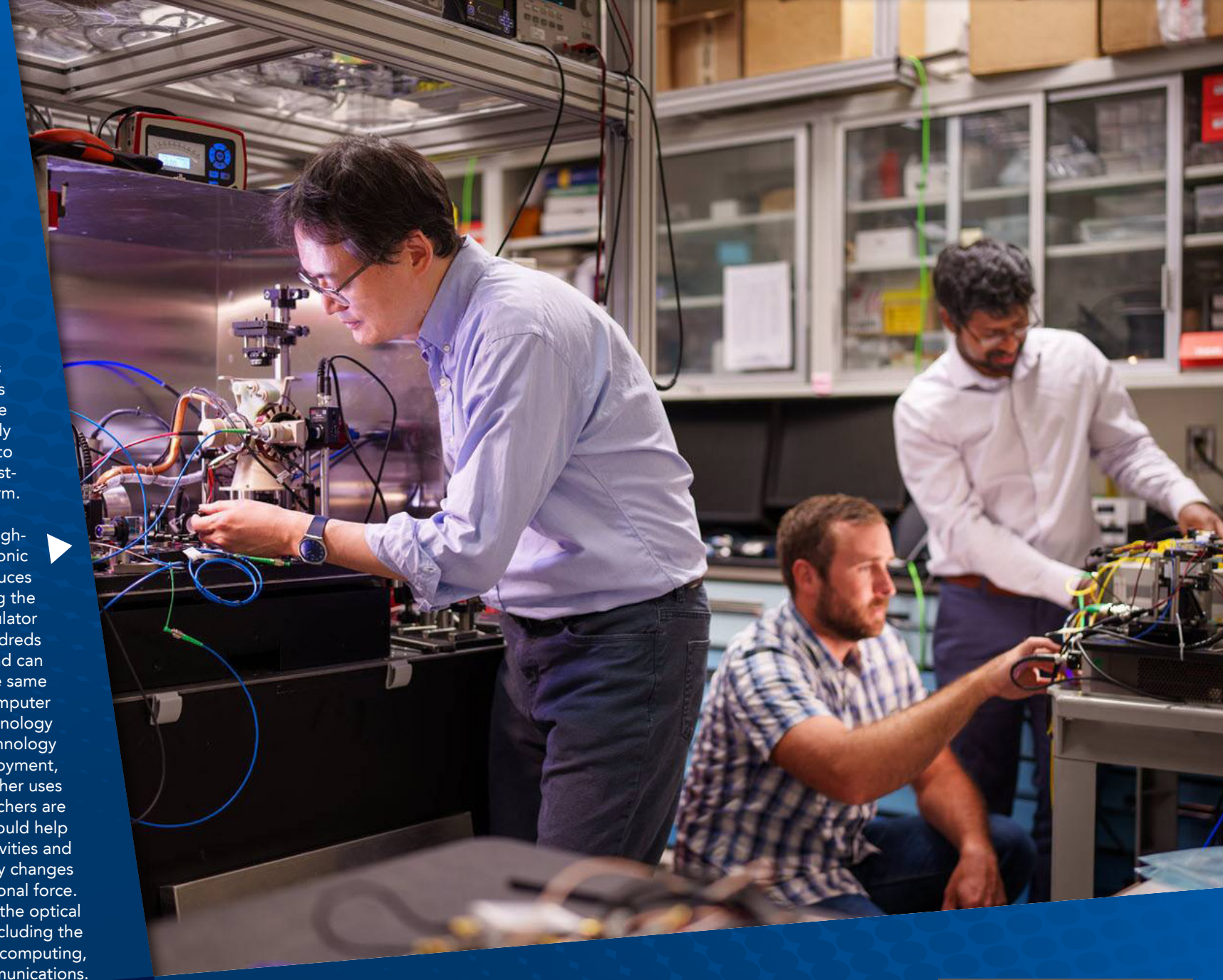


Image Credit: Craig Fritz/SNL

Sandia National Laboratories

August 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
July 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	September 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30				1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 31	25	26	27	28	29	30

Verne

Researchers from LLNL and Verne, a San Francisco-based start-up, have demonstrated a hydrogen storage system that can support heavy-duty vehicles, such as semi-trucks.

The researchers, from left to right, are Kara Zhang, a Verne process engineer; LLNL mechanical engineer Nick Killingsworth; Ted McKlveen, Bav Roy and David Jaramillo, all co-founders of Verne; and Verne mechanical engineer Harry Clarke.

The researchers are standing next to Verne's cryo-compressed hydrogen storage system, which has an internal volume of 445 liters or about 117 gallons. LLNL's cryogenic hydrogen fueling facility is in the background. A liquid hydrogen Dewar is to the right and the white transportainer to the left houses a Linde liquid hydrogen pump that can dispense cryogenic compressed hydrogen gas up to 875 bar at up to 100 kilograms per hour.

Image Credit: Garry McLeod/LLNL

Lawrence Livermore National Laboratory

September 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 Labor Day	2 Lawrence Livermore National Laboratory 1952	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17 Pantex 1942	18	19	20
21	22 Fall begins	23	24	25	26	27
28	29	30			August 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24/31 25 26 27 28 29 30	October 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

VENADO Artificial Intelligence Computer

Los Alamos National Laboratory, Hewlett Packard Enterprise (HPE), and NVIDIA have developed Venado, the first large-scale supercomputer using NVIDIA Grace Hopper superchips in the U.S. The superchips combine Arm®-based NVIDIA CPUs with NVIDIA Hopper GPUs for high-performance computing and giant-scale artificial intelligence (AI) applications. The codesign process focused on computing, memory, and software technologies to produce the energy-efficient heterogeneous architecture. Venado delivers a dramatic boost to high performance computing and AI applications for complex science, including materials science, energy, national security, and astrophysics. The supercomputer can solve complicated computing problems in minutes that previously took months.

Image Credit: Sarah Jacobs and Allen Hopkins (Los Alamos National Laboratory)

Los Alamos
NATIONAL LABORATORY

October 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
September 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	November 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24 25 26 27 28 29		1	2	3	4
5 NNSA National Nuclear Security Administration 1999	6	7	8	9	10	11
12	13 Columbus Day	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Neuromorphic computing for nuclear deterrence solutions: A partnership with SpiNNcloud

Sandia National Laboratories is partnering with AI and neuromorphic computing company SpiNNcloud to advance neuromorphic architecture. Its next generation system, SpiNNaker2 (a contraction of 'Spiking Neural Network Architecture'), is a neuromorphic computer for large-scale, real-time modeling of brain-like applications. This technology can simulate large brain-like networks to enhance researchers' understanding of the brain and provide a framework to test the boundaries of current computing capabilities. As an emerging technology, it has unexplored potential applications, including the acceleration of new algorithms such as event-based machine learning. SpiNNaker2 is unique in its reconfigurability, scalability, and native support for advanced neural computation techniques. Researchers at Sandia hope to explore its applications in data analysis from scientific instruments, neural networks for remote sensing inference, enabling physical security processing at the sensor, performing scientific computing workloads, and physics-informed neural networks.

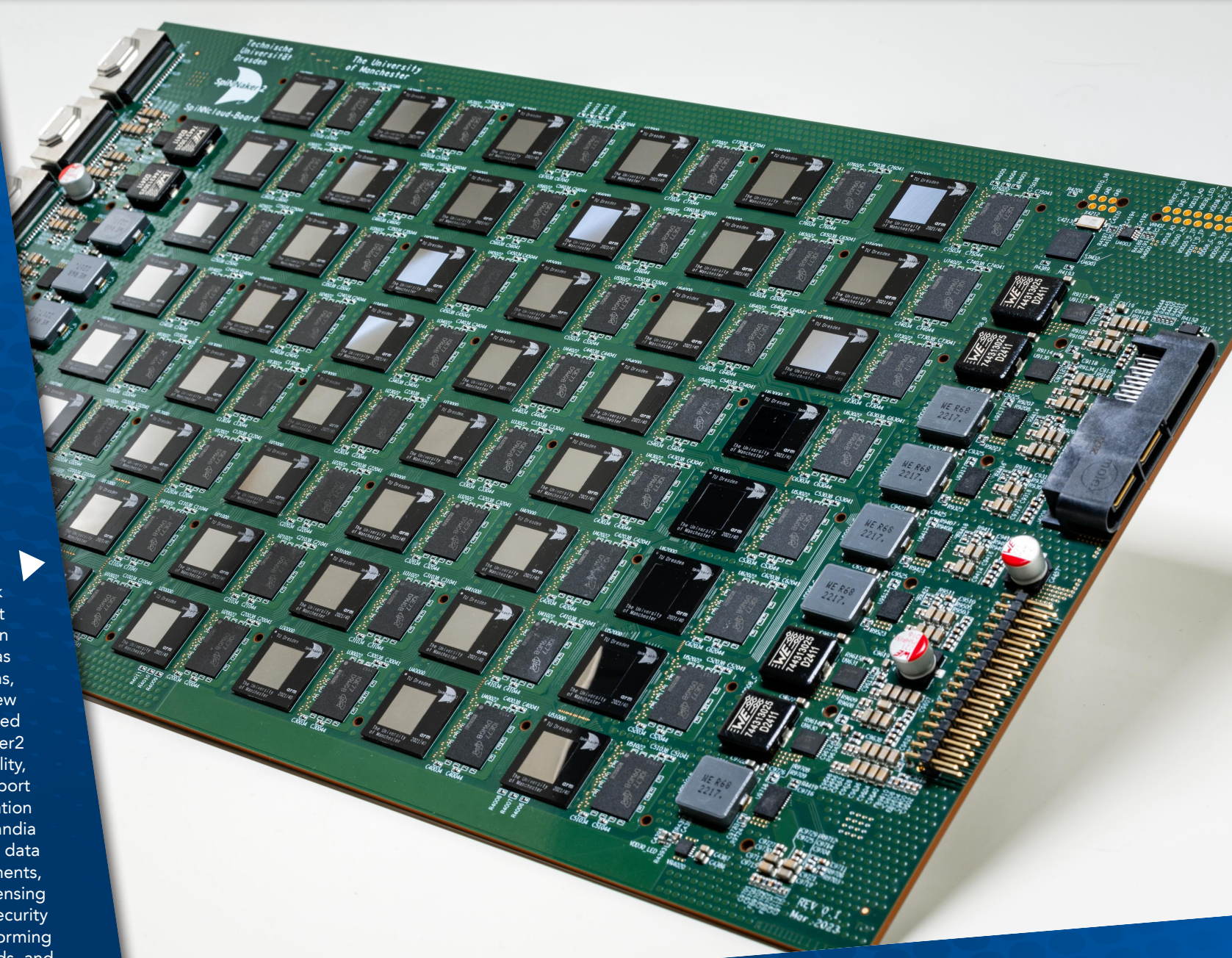


Image courtesy of SpiNNcloud

Sandia National Laboratories

November 2025

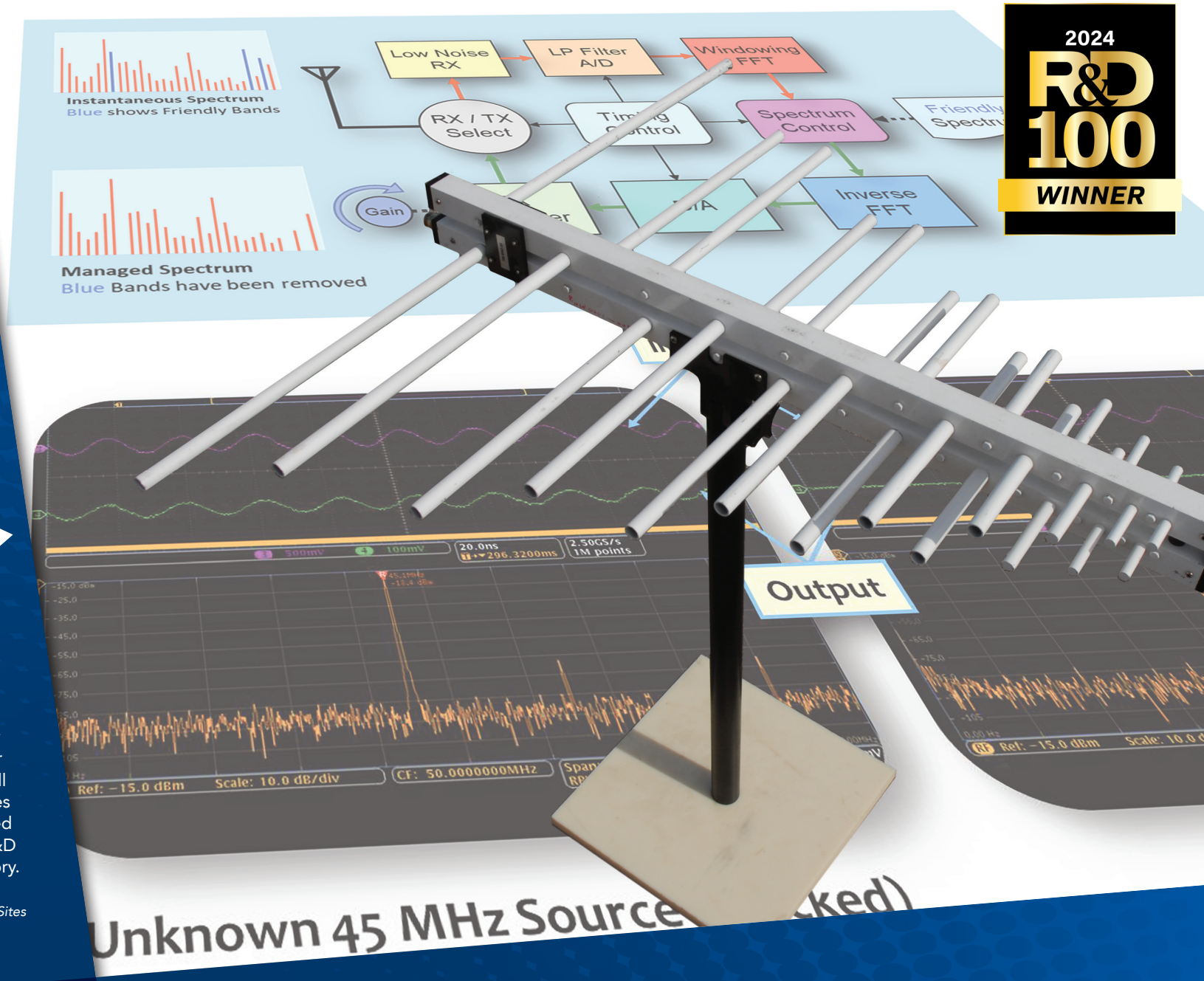
National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
October 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	December 2025 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31					1 Sandia National Laboratories 1949
2 Daylight Saving Time ends	3	4 Y-12 National Security Complex 1943 Election Day	5	6	7	8
9	10	11 Veterans Day	12	13	14	15
16	17	18	19	20	21	22
23 30	24	25	26	27 Thanksgiving Day	28	29

Electromagnetic Spectrum Management System (ESMS)

The Nevada National Security Site's (NNSS) Electromagnetic Spectrum Management System (ESMS) provides a revolutionary approach to controlling radiofrequency (RF) signals, removing all modulation from every RF signal that is not designated as "friendly" and optionally replacing it with new modulation—thus preventing (or jamming) and controlling all RF communications. The ESMS system selectively allows friendly RF signals to pass without being jammed—including frequency hopping and spread-spectrum communication systems. Conventional jamming techniques have high power requirements, but the ESMS efficiently tailors each RF carrier output amplitude relative to the signal strength of its received carrier, and the user can selectively tailor the area of influence to further limit power. ESMS inherently works will all modulation techniques and requires no foreknowledge of the unwanted carrier frequencies. ESMS won an R&D 100 Award in the IT/Electrical category.

Image Credit: Nevada National Security Sites



2024 R&D 100 WINNER

NEVADA NATIONAL NNSS SECURITY SITES

December 2025

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14 Hanukkah begins at sundown	15	16	17	18 NNSS 1950	19	20
21 Winter begins	22	23	24	25 Christmas Day	26 Kwanzaa begins	27
28	29	30	31			

November 2025

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24	25	26	27	28	29

January 2026

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Success Story

Material Data Driven Design (MAD^3)

A machine-learning algorithm developed at SNL could provide auto manufacturing, aerospace, and other industries a faster and more cost-efficient way to test bulk materials.

Production stoppages are costly. So, manufacturers screen materials like sheet metal for formability before using them to make sure the material will not crack when it is stamped, stretched, and strained as it's formed into different parts. Companies often use commercial simulation software calibrated to the results of various mechanical tests; however, these tests can take months to complete. And while certain high-fidelity computer simulations can assess formability in only a few weeks, companies need access to a supercomputer and specialized expertise to run them.

SNL has shown machine learning can dramatically cut time and resources to calibrate commercial software because the algorithm does not need information from mechanical tests. Nor does the method need a supercomputer. Additionally, it opens a new path to perform faster research and development.

The machine-learning algorithm named MAD^3, pronounced "mad cubed", works because metal alloys are made of microscopic, so-called "crystallographic" grains. Collectively, these grains form a texture that makes the metal stronger in some directions than others, a phenomenon that researchers call mechanical anisotropy.

The software uses state-of-the-art data-driven and machine-learning techniques to first extract a unique fingerprint descriptor of the metal alloy's internal structure, then subsequently uses these descriptors to predict the plastic anisotropy parameters in an accurate and efficient manner.

These anisotropy parameters can be used to perform forming and stamping simulations with unprecedented accuracy since they incorporate the effect of the polycrystalline grain structure.

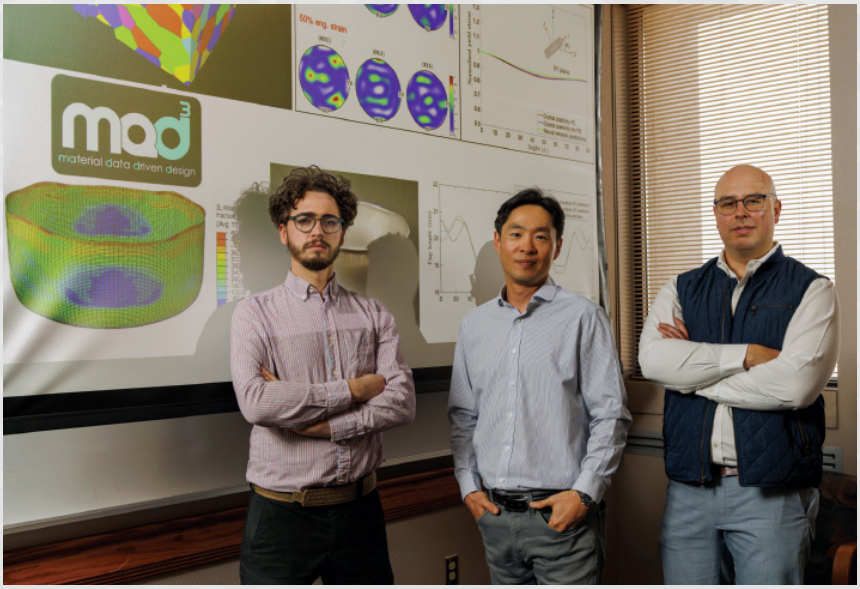
Teaming with The Ohio State University, SNL trained the algorithm on the results of 54,000 simulated materials tests using a technique called a feed-forward neural network. The SNL team then presented the algorithm with 20,000 new microstructures to test its accuracy, comparing the algorithm's calculations with data gathered from experiments and supercomputer-based simulations.

Competitive Advantage

MAD^3 stands out as a powerful simulation software that combines accuracy and speed by leveraging machine learning and materials science techniques. Its scalability and user-friendly interface make it suitable for a wide range of materials science problems, providing a competitive advantage over existing commercial products.

A machine-learning algorithm could provide a faster and more cost-efficient way to test bulk materials.

Sandia National Laboratories



The Sandia team behind the development of MAD3. Pictured left to right - Benjamin Greene, Hojun Lim, David Montes de Oca Zapiain. *Image Credit: Creative Services/SNL*

"MAD^3 stands out as a powerful simulation software that combines accuracy and speed..."

Benefits

- **Simple to operate:** MAD^3 has an easy-to-use graphic user interface (GUI) that makes it accessible to users who do not have extensive technical knowledge or computer expertise.
- **Fast performance:** It predicts the parameters that characterize the directional mechanical behavior of a metal alloy 1,000 times faster than existing solutions. Fast and accurate simulations allow staff to efficiently account for the internal structure of materials, reducing the time associated with traditional methods.
- **Cost-effective:** This technology offers significant savings for manufacturing companies by eliminating the need for costly experiments and reducing computational requirements.

Next Steps

SNL is conducting further research to explore whether the algorithm can shorten quality assurance processes for the U.S. nuclear stockpile, where materials must meet rigorous standards before being accepted for production use. SNL is also seeking partners to develop and commercialize this technology. Collaborating with SNL can enable further refinement and implementation of the testing protocol.

Awards

- 2023 R&D100 Special Recognition: Market Disruptor / Services (Silver medal).
- 2022 Sandia Technology Maturation (STM) royalty funding awarded to support development for commercial applications.

Timeline

National Security Laboratories, Plants, and Sites

The desperate need for munitions to fight World War II led to the creation of the **Pantex Plant** (Pantex), built on 16,000 acres of land east of Amarillo, Texas. Operations began on September 17, 1942, only 9 months after the commencement of construction. Pantex continues its key role of ensuring the safety, security and reliability of the Nation's nuclear stockpile by dismantlement of excess weapons, conducting surveillance on the stockpile, and maintaining aging weapons through Life Extension Programs.

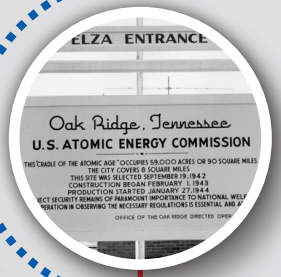
September 17

1942

The first week of April, the **Los Alamos National Laboratory (LANL)** hosted its first major technical conference: The Los Alamos Primer Conference. The proceedings were transcribed and became LA-1, the Lab's first report. On April 20, 1943, the University of California signed the contract to operate the Los Alamos Laboratory with a single mission: to design and build an atomic bomb. Today, different research programs at the Lab directly and indirectly support the current mission: maintaining the safety, security and reliability of the Nation's nuclear deterrent without the need to return to underground testing.

April 20

1943



In the midst of the second World War, ground was broken in rural East Tennessee for the first production building at the **Y-12** Electromagnetic Separation Plant and operations began on November 4, 1943. The plant's job was to make enough enriched uranium for a new kind of bomb, an atomic bomb. Thirty months later, the success of Y-12's mission was announced to the world when two atomic weapons were detonated, the Empire of Japan surrendered, and World War II ended. Today, Y-12 processes and stores special materials vital to our national security and contributes to the prevention of the spread of weapons of mass destruction.

November 4

1943

The Kansas City Division became a reality on February 14, 1949, after the Bendix Corporation, a subsidiary of Honeywell International Inc., was selected by the Atomic Energy Commission to perform "certain operations; the exact details of which are classified." The employees guarded the nature of the mission so well that, for many years, the community assumed the plant made washing machines. Today the **Kansas City National Security Complex's (KCNSC)** primary focus is manufacturing 85 percent of non-nuclear components that go into the nuclear stockpile and developing advanced solutions for complex national security issues, ranging from prototype simulations to production to quality.

February 14

1949

Sandia National Laboratories (SNL) began in July 1945 as the "Z Division" of Los Alamos National Laboratory (LANL). On November 1, 1949, Sandia Corporation took over its management as it separated from Los Alamos. A second site was opened in California's Livermore Valley in 1956. Although Sandia originated as a single-mission engineering organization for nonnuclear components of nuclear weapons, today, under National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., it is a multiprogram laboratory engaging in research supporting a broad spectrum national security issues.

November 1
1949

On December 18, 1950, President Harry Truman authorized a 680-square mile section of the Nellis Air Force Gunnery and Bombing Range in Southern Nevada as the Nevada Proving Grounds, and on January 27, 1951, the first atmospheric nuclear test was detonated at the Proving Grounds. Following a few name changes and an international ban on nuclear testing, the **Nevada National Security Sites (NNSS)** reflects a current mission of science-based stockpile stewardship and global nuclear threat reduction and incident response.

December 18
1950

On September 2, 1952, the Atomic Energy Commission granted the request of LANL scientist, Edward Teller, to establish a laboratory as a branch of the Berkeley-based University of California's Radiation Laboratory (UCRL). Located at a deactivated naval air station, **Lawrence Livermore National Laboratory (LLNL)** addressed urgent national security needs by advancing nuclear weapons science and technology at the height of the Cold War. Over its history, LLNL has strengthened national security by developing and applying world-class science, technology and engineering that enhances the Nation's defense, reduces the global threat from terrorism and weapons of mass destruction, and responds to scientific issues of national importance.

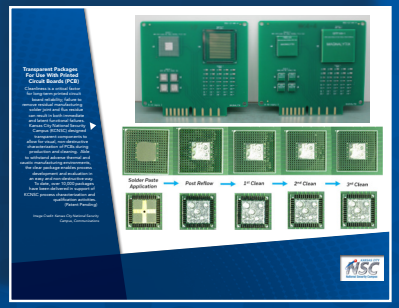
September 2
1952

On October 5, 1999, President Bill Clinton signed the National Defense Authorization Act, bringing the **National Nuclear Security Administration (NNSA)** into existence. The NNSA operates as a semi-autonomous agency within the U.S. Department of Energy (DOE) and is responsible for the management and security of the nation's nuclear weapons, nuclear nonproliferation, and naval reactor programs. It also responds to nuclear and radiological emergencies in the United States and abroad and provides safe and secure transportation of nuclear weapons and components and special nuclear materials.

NNSA
National Nuclear Security Administration

October 5
1999

January



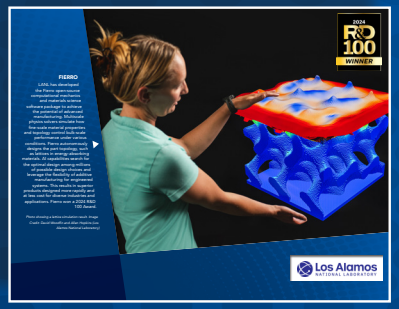
February

March

April

May

June



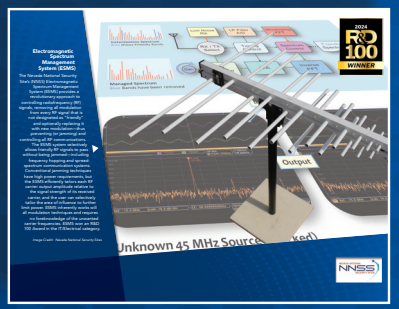
July

August

September

October

November



December

National Nuclear Security Administration