# 2020 YEAR IN REVIEW

National Nuclear Security Administration

# *ACHIEVEMENTS AND MILESTONES ACROSS THE NUCLEAR SECURITY ENTERPRISE*

*NNSA met all planned major milestones to advance the nuclear security mission while also confronting the COVID pandemic.*
















NNSA 20

# NNSA **20TH ANNIVERSARY**

**Completed Annual Assessment Cycle 24: The three NNSA Laboratory Directors certified that the stockpile remains safe, secure, and effective, and that underground nuclear explosive testing is not required at this time.**

# *Defense Programs*

Met all deliverables in support of Annual Assesment.

The B61-12 LEP and the W88 Alt 370 entered the First Production phase (Phase 6.5) and are on track for their respective system level First Production Unit.

Finalized and documented W87-1 surety architecture down-select, completed Customer Requirements Review, and coordinated flight test requirements with the United States Air Force.

Pit Production: Executed activities to support fulfilling the requirement to produce no less than 80 pits per year during 2030.

Successfully completed all Conceptual Design Reviews for the W80-4 LEP.

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**Tritium: Completed irradiation of 1,584 tritium-producing burnable absorber rods (TPBARs) in Fuel Cycle 16 in May at Watts Bar Unit 1 in Tennessee and commenced irradiation of 1,792 TPBARs in Cycle #17 at Watts Bar Unit 1 in June.**


**Uranium: Y-12 National Security Complex produced the first test "button" using the new electrorefining technology that will replace the current high hazard enriched uranium purification process in the Manhattan Project-era Building 9212.**

**The Exascale Class Computer Cooling Equipment Project at Los Alamos National Laboratory (LANL) reached Critical Decision-4 10 months ahead of schedule and $20 million under budget.**

**Office of Secure Transportation maintained its spotless record of accomplishing 100% of assigned missions safely and securely, with no mission degradation despite the operational challenges inherent during the COVID-19 pandemic.**

# Defense Nuclear Nonproliferation

Finished downblending 2.9 kg of highly enriched uranium from the IGR research reactor, which resulted in the elimination of all unirradiated highly enriched uranium in Kazakhstan.

Developed, tested, and transferred nine nuclear safeguards technologies to the International Atomic Energy Agency (IAEA) and international partners.

Developed counter nuclear smuggling capabilities in over 70 countries to prevent terrorist acquisition of radioactive and nuclear materials.


**In total, DNN has removed or confirmed the disposition of more than 507 MT of highly enriched uranium and plutonium from 48 countries and Taiwan, ridding the world of enough material for approximately 20,000 nuclear weapons.**

**DNN delivered 8 nuclear explosion detectors for hosting on GPS block III satellites in support of the United States' nuclear command, control, and communications system and treaty monitoring missions.**

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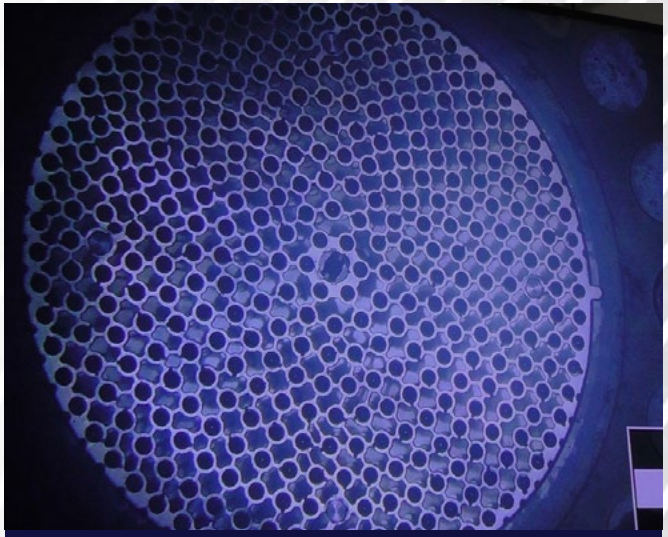
NorthStar Medical Radioisotopes, in partnership with NNSA, began producing the medical isotope molybdenum-99 (Mo-99) without the use of highly enriched uranium. This is the first domestic production of Mo-99 for U.S. patient use in nearly 30 years.



Verified the shutdown of, or converted, 106 civilian research reactors and isotope production facilities around the world from the use of highly enriched uranium to low enriched uranium.

Completed a multi-year campaign to move over 200 kg of spent highly enriched uranium from Canada to the United States.

**Construction officially commenced for the lead ship of the COLUMBIA Class: COLUMBIA (SSBN 826). The COLUMBIA Class remains the Nation's top Department of Defense priority and on-time completion is necessary to ensure a smooth transition as the OHIO Class submarines are retired from the fleet.**

# *Naval Nuclear Propulsion*

Multiple nuclear-powered aircraft carriers set deployment records. These achievements were made possible by the tremendous strength and resolve of our Naval personnel and the flexibility and endurance of nuclear power.

The ABRAHAM LINCOLN Carrier Strike Group arrived at Naval Air Station North Island, California in January 2020, completing an around-the-world, 295-day deployment – the longest carrier deployment in the post-Cold War era.

The United States Navy conducted full-scale testing of prototypical COLUMBIA electric drive components and the full size main propulsion motor. During a full power run, the fully integrated system performed flawlessly under the most stressing conditions expected.

The USS DWIGHT D. EISENHOWER (CVN 69) and its associated carrier strike group returned home in August 2020 following a record-breaking 207 continuous days at sea. As the COVID-19 pandemic spread across the globe, the DWIGHT D. EISENHOWER carrier strike group continued at-sea operations, sailed over 60,000 miles, and completed 10,466 rotary and fixed wing sorties with more than 21,995 flight hours.

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Began construction of the Naval Spent Fuel Handling Facility's massive concrete foundations with over 48,000 cubic yards of concrete placed to-date on bedrock.


Began training nuclear operators for the fleet on Moored Training Ship (MTS) 701 and the Nuclear Power Training Command in Charleston, South Carolina. Together the two new MTSs will replace the existing MTSs (each of which is over 55 years old) and operate for 20 years in support of nuclear operator training.

Contract awarded for dismantlement and disposal of the Surface Ship Support Barge (SSSB). The SSSB successfully supported nuclear-powered ship defueling operations at Newport News Shipbuilding (NNS) for over 50 years.

# *Counterterrorism and Counterproliferation*

As of 2020, NNSA, in partnership with the FBI, has conducted over 100 Silent Thunder tabletop exercises, training more than 10,000 first responders, law enforcement, and emergency managers, and strengthening preparedness and capabilities to respond to radiological or nuclear incidents, accidents, and terrorist threats.

Chaired the first two terms of the International Atomic Energy Agency's (IAEA) newly established Emergency Preparedness and Response Standards Committee to improve the quality, coherence, and consistency of information related to emergency preparedness and response in the IAEA safety standards.

**Nuclear Emergency Support Team (NEST) personnel provided technical and operational support to the National Aeronautics and Space Administration (NASA) for the launch of the Mars 2020 Perseverance Rover to ensure the protection of public health and safety in the event of a launch anomaly.**

In partnership with the FBI, in 2010 NNSA established the Stabilization program to provide specialized technology, equipment, and training to regional FBI teams in 12 major American cities, enabling these teams to identify and mitigate the functioning of a nuclear or radiological device. In 2020, NNSA continued to enhance these regional teams with weapons of mass destruction (WMD) device defeat capabilities and will increase the number of regional counter-WMD FBI teams in major metropolitan areas from 12 to 14 by FY 2022.

# *Safety, Infrastructure and Operations*

Led the DOE effort to procure and inventory available personal protective equipment.

Released the 2020 Real Property Asset Management Guide highlighting new planning and real estate tools that will continue to improve NNSA's day-to-day infrastructure management.

Completed 63 Recapitalization Projects.

Achieved Net-Zero Energy building efficiency (60-90% over energy efficiency baselines) at Nevada National Security Site's (NNSS) Mercury Building 1.

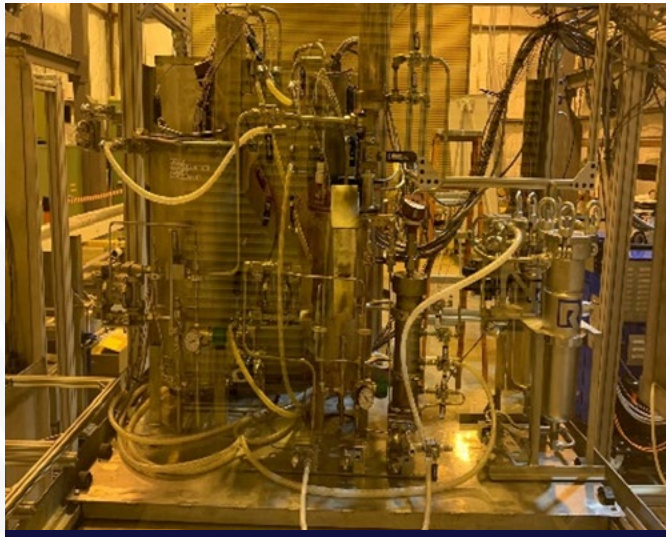
Completed and institutionalized key pillars of the NNSA Safety Roadmap.


**Lawrence Livermore National Laboratory (LLNL) restarted first off-site shipments of Transuranic waste to the world's only operating deep geologic nuclear waste repository, the Waste Isolation Pilot Plant (WIPP) in New Mexico. LLNL's last shipment was over 10 years ago.**

# 2020 YEAR IN REVIEW

Office of Safety, Infrastructure and Operations effectively identified and implemented corrective measures to ensure personal protective equipment (PPE) supply challenges during COVID-19 were resolved across the nuclear security enterprise.

Named the Albuquerque Complex project the John A. Gordon Albuquerque Complex in honor of the NNSA's first Administrator who passed away in April 2020. The complex is scheduled to be occupied in late 2021.



Completed installation of the caustic dissolver assembly which supports the recovery of plutonium 244 at the Savannah River Site.

# Acquisition and Project Management

Performed $1.4 billion in design and construction, completed five line-item capital projects valued at $458 million on budget and on schedule, and awarded $15.8 billion in contract actions.

Implemented Economic Security CARES Act legislation for NNSA's contractors to minimize the impact of COVID-19 on NNSA operations, protect workers who were unable to perform their duties due to health restrictions, and swiftly procure protective material for all employees.

Established a new mentor-protégé program agreement to help prepare Pueblo businesses and make them more competitive candidates for contracts with Los Alamos National Laboratory.

NSE Workforce Strategy Team hosted the first ever virtual panel for summer interns, where experts from across the NSE shared their experiences.

**Uranium Processing Facility project: NNSA celebrated the placement of the last piece of structural steel for the Salvage and Accountability Building.**

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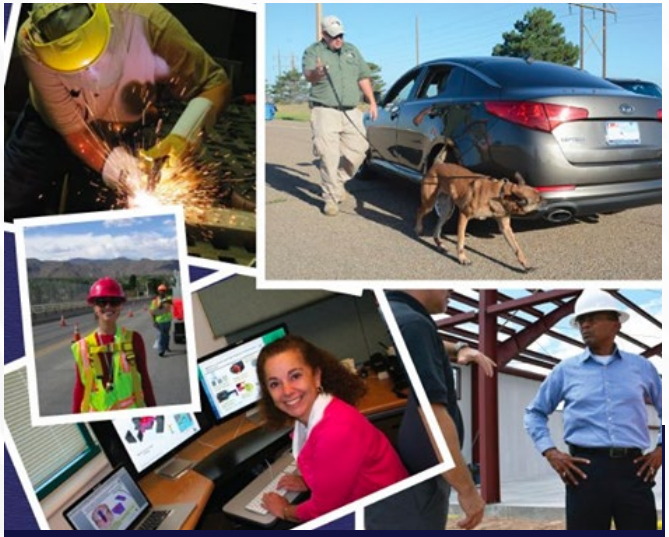
Phase 1 work within the Chemistry and Metallurgy Research Replacement Facility at Los Alamos National Laboratory was completed. The project came in under budget and ten months early.

The Lithium Processing Facility Project achieved CD-1 in January. It will relocate lithium operations from an aged legacy building to a new, safe, and reliable facility located at Y-12.



A virtual career fair was hosted with over 1,700 candidates attending; recruiting and retaining the next generation of talent remains a top priority for NNSA.

# Defense Nuclear Security

Completed the Device Assembly Facility Argus Installation Project at the Nevada National Security Site ahead of schedule and under budget.

Launched the fully developed Center for Security Technology, Analysis, Response, and Testing (CSTART) portal designed to better integrate the security community.

Reduced the personnel security clearance inventory by over 75%, from more than 5,000 clearance actions down to a daily average of approximately 1,300 clearance actions in less than 6 months; this was accomplished while implementing 100% telework operations due to the COVID-19 pandemic.

Developed and deployed COVID friendly processes to electronically deliver and receive personnel security information, including personnel security hearings.

**Sustained operations of counter unmanned aircraft system (CUAS) at Los Alamos National Laboratory for the year and completed the design for CUAS implementation at the remaining sites possessing Category 0/I quantities of special nuclear material.**

## Emergency Operations

Directed the coordinated DOE response to the COVID-19 pandemic, overseeing critical information management across the enterprise.

Institutionalized the Emergency Management Readiness Assurance Program.

Integrated Federal Mission Resilience Strategy into Continuity Program.

## Information Management

Developed and implemented services and solutions to provide operational connectivity during the maximized telework posture of COVID-19.

## General Counsel

Guided and advised the nuclear security enterprise through the COVID-19 pandemic, ensuring the federal and contractor workforce complied with any laws or regulations both pre-and-post CARES Act.

Orchestrated a series of integrated National Environmental Protection Act documents and decisions necessary to further the complex-wide Plutonium Pit Production effort.

## Cost Estimating and Program Evaluation

Completed Independent Cost Estimates on B61-12 Life Extension Program and W88 Alteration 370.

Conducted an enterprise-wide review of federal staffing requirements to meet NNSA's current program of record which led to a requirement of 2,391 federal staff to execute the Future Years Nuclear Security Program.

# *Office of Policy and Strategic Planning*

Improved the 2020 Labs, Plants, and Sites Strategic Planning cycle, which resulted in better mission integration and alignment, and increased collaboration across the enterprise.

Introduced an automated policy review and comment tool, RevCom, which streamlined the directives review lifecycle by decreasing process time, enhancing transparency, and increasing senior leadership involvement.

Identified and executed a series of governance and management (G&M) improvements based on focus group discussions with both federal and management and operations (M&O) partners across the nuclear security enterprise.


**Conducted a series of governance and management (G&M) focus groups with both federal and management & operations partners at locations across the enterprise to gather information and generate ideas supporting G&M improvements across the NSE.**

**Despite the on-going pandemic, the Minority Serving Institutions Partnership Program (MSIPP) continued to foster a sustainable STEM pipeline for the nuclear security enterprise. During the summer, MSIPP placed 106 students at an NNSA lab or plant (virtual and/or in person) and 20 of the students received offers for permanent employment.**

# *Management and Budget*

Successfully met the first requirements-driven budget request recommendation to the DOE.

Transformed NNSA's recruiting strategy to an innovative virtual approach, with a plan to hire more than 200 additional federal personnel.

Implemented team-based service delivery model resulting in an overall improvement in the effectiveness and efficiency of human resource's staffing and classification function.

NNSA hired over 5,500 new employees across the nuclear security enterprise.

# Labs, Plants, and Sites

Savannah River Site (SRS) and Los Alamos National Laboratory (LANL) worked collaboratively to advance NNSA's plutonium pit mission, to include the establishment of the Knowledge Transfer Program which sends SRS personnel on two-year rotational assignments to work side-by-side with LANL personnel.

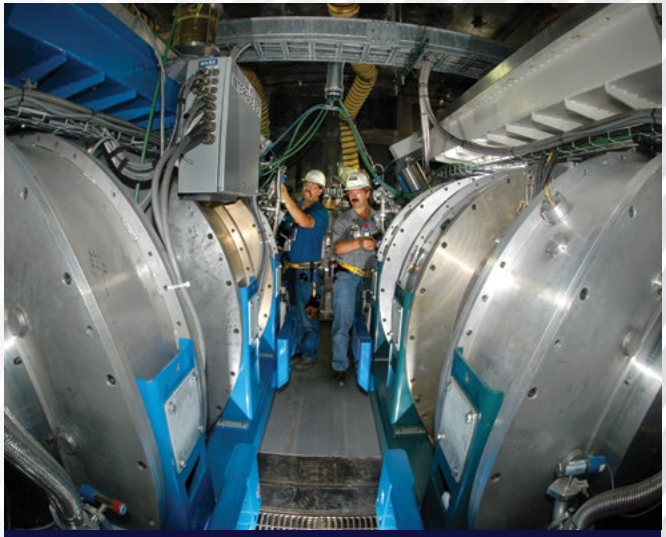
Pantex Plant developed recommendations that will improve the execution of the Pantex Safety Basis to enable more efficient nuclear explosive operations. Pantex did this by assembling a 26-member team across the nuclear security enterprise that encompassed federal and M&O partners that supported this effort.

**Lawrence Livermore National Laboratory reached a cooperative research and development agreement to develop innovative compact and robust telescopes for nanosatellites with a private company. In the future, the advanced optical imaging payloads may be employed to collect information for remote sensing data users.**

**Optimized the downblend process in the Savannah River Site's K-Area Interim Surveillance glovebox and resumed critical downblend operations with increased efficiency and safety to workers.**

# 2020 YEAR IN REVIEW

Sandia National Laboratories' quality engineer Dulce Barrera, left, and team lead Kylen Johns worked with managers and other team members to face the challenges caused by COVID-19 while working on the Mobile Guardian Transporter Prototype 1 test vehicle.



Shot 4,000 was achieved by Sandia National Laboratories' Cygnus Dual Axis Radiographic Source at Nevada National Security Site. Cygnus, a key diagnostic capability for subcritical experiments was originally expected to be used for just a few hundred shots.


The Supply Chain Management Center in Kansas City, MO, reached the $1 billion savings mark for NNSA and DOE Environmental Management sites across the country.

**November 10th marked the fifth anniversary of the official establishment of the Manhattan Project National Historical Park, which spans Los Alamos National Laboratory, the Y-12 National Security Complex, and the Hanford Site. Jointly managed through a partnership between the National Park Service and DOE, the park opened three sites on Lab property to 12 public tours per year. Since the first tours began in 2018, more than 300 people have participated.**

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Applied Lawrence Livermore National Laboratory computing expertise to accelerate scientific discovery related to the COVID-19 virus; developed rapid, accurate diagnostic technologies; and supported rapid discovery of potential medical countermeasures.

Completed tenant improvements for a 275,000 square foot facility which will help Kansas City National Security Campus meet mission demand and be more strategic with its manufacturing space.

Continued to make significant progress in advancing Y-12's Lithium Strategy including the development of lithium production technologies, processes, and equipment.

Conducted B61-12 flight tests at Sandia National Laboratories' Tonopah Test Range in Nevada.

**Sandia National Laboratories provided design and fabrication for a March 19 hypersonic flight test conducted by the U.S. military in Kauai, Hawaii. The hypersonic glide body flew at hypersonic speed to a designated impact point, an important technology development milestone.**


**NNSS delivered Mercury Bldg. 1, the first new construction net-zero energy facility within the NNSA complex, on schedule and under budget. Mercury is serving as a prototype for the NNSA's Standardized Acquisition and Recapitalization (STAR) initiative. The NNSS successfully implemented a model for future infrastructure that can be replicated to enable consolidation, reduce risk and safety concerns, reduce operating costs, save energy, enable current and future missions, and properly support a 21st century workforce.**

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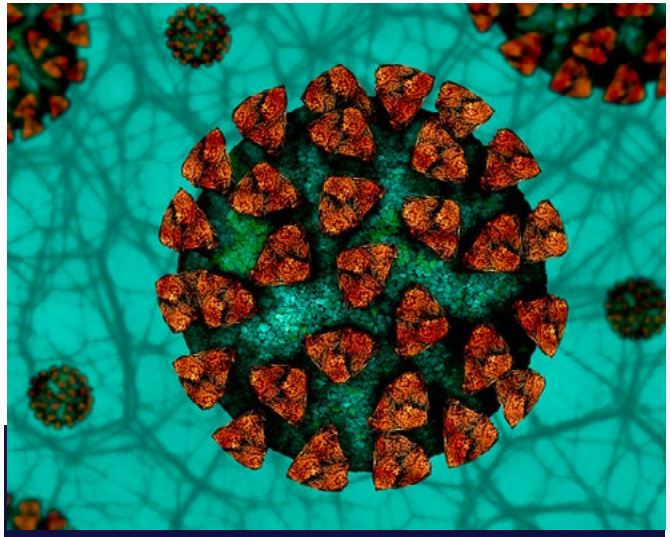
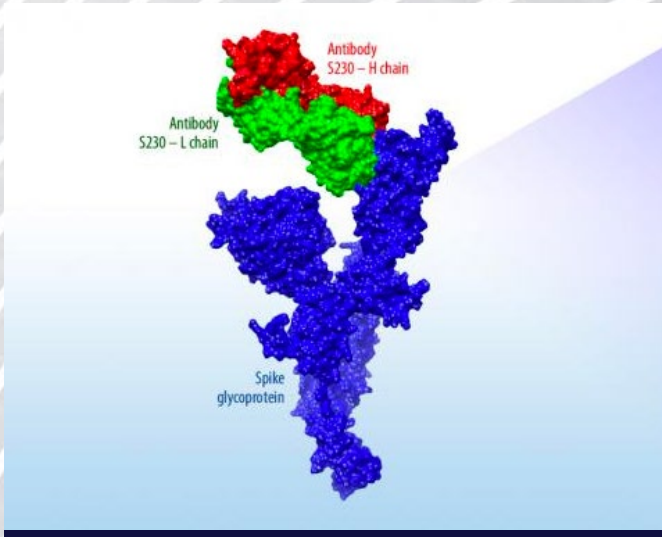


COVID-related R&D work at Los Alamos National Laboratory included a team that studied the virus's genetic sequence found that it originated from animals.

Sandia National Laboratories funded dozens of rapid R&D projects that are making a difference in the national effort to fight COVID-19. Sandia staff also donated more than $100,000, plus many hours of volunteer time, to food banks, as well as $250,000 to help tribal areas struggling during the pandemic.




Lawrence Livermore National Laboratory released predicted structures of a key COVID-19 viral protein, identified an initial set of therapeutic antibody sequences, and developed a prototype of a simple ventilator system.

**R&D Magazine named 13 NNSA projects led by Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Sandia National Laboratories, and the Nevada National Security Site as winners in the annual R&D 100 Awards, which honor the 100 most innovative technologies and services of the past year.**


National Nuclear Security Administration