2021 Year In Review

INNOVATE. COLLABORATE. DELIVER.

National Nuclear Security Administration

NNSA 2021 Year in Review

For 21 years, NNSA's vital nuclear security mission has leveraged innovative science and technology capabilities from across the enterprise to achieve success. Led by a world-class workforce, NNSA overcame the many challenges of operating during a pandemic and executed its largest program ever in 2021. This past year, NNSA delivered on its mission by taking an innovative approach to each of the following eight objectives:

- Modernizing the Nation's Stockpile
- Achieving Amazing Scientific Successes
- Making Our World a Safer Place
- Supporting Our World Class Navy
- Building Better Infrastructure
- Combating the Pandemic
- Hiring Next-Gen Workforce
- Bringing the Enterprise Together

INNOVATE COLLABORATE DELIVER

Modernizing the Nation's Stockpile

DEFENSE PROGRAMS

Achieved system-level First Production Unit for the W88 Alt 370 and the B61-12 Life Extension Programs (LEP). The updated W88, which can be launched on missiles from Ohio-class submarines, will gradually replace older W88 warheads in the stockpile. The B61-12 LEP will consolidate and replace three of the B61 variants (3, 4, and 7), and will be certified for delivery on strategic and dual capable aircraft.

INNOVATE COLLABORATE DELIVER





DEFENSE PROGRAMS

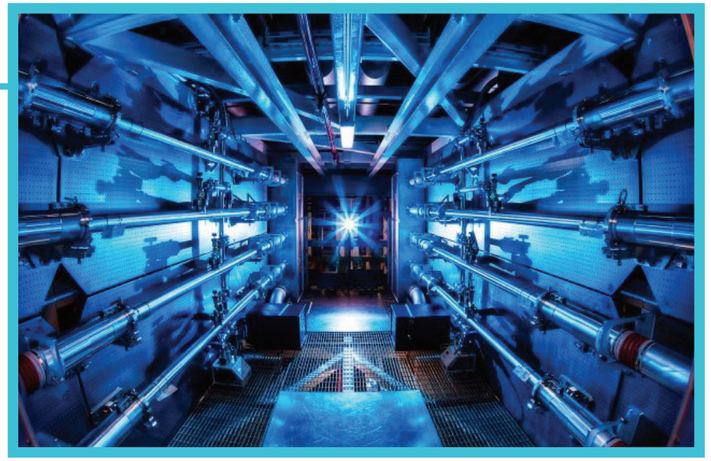
Maintained a spotless record of accomplishing 100% of assigned secure transportation missions safely and securely, with no mission degradation despite the ongoing operational challenges during the COVID-19 pandemic.

INNOVATE COLLABORATE DELIVER

DEFENSE PROGRAMS

Completed Annual Assessment Cycle 25: The three NNSA Laboratory Directors certified that the stockpile remains safe, secure, and effective, and that underground nuclear testing is not required at this time.

INNOVATE COLLABORATE DELIVER





SAVANNAH RIVER SITE

Completed seven tritium extractions at the Savannah River Site's Tritium Extraction Facility, more than doubling previous records and meeting Department of Defense requirements.

INNOVATE COLLABORATE DELIVER

SANDIA NATIONAL LABORATORIES

Delivered two next-generation computational simulation capabilities to support environmental specification, design, and qualification for future weapon systems. These code suites (SPARC and EMPIRE) simulate re-entry into the atmosphere and weapon response to hostile environments. Both capabilities have been designed to effectively use the full power of NNSA's current and next-generation supercomputers including the NNSA exascale system, El Capitan.

INNOVATE COLLABORATE DELIVER

Modernizing the Nation's Stockpile

NEVADA NATIONAL SECURITY SITE

Executed a record three subcritical experiments (SCE) in a single year in collaboration with Los Alamos National Laboratory while planning and preparing for three additional SCE series to be executed in support of stockpile certification needs.

INNOVATE COLLABORATE DELIVER





SAVANNAH RIVER SITE

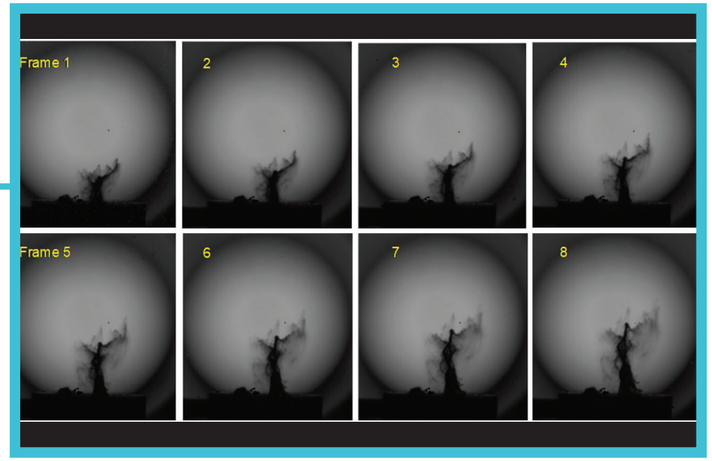
Moved Plutonium Downblending operations (also known as Dilute & Dispose) to multi-shift operations. The Surplus Plutonium Disposition (SPD) Project is underway to expand the existing downblending capability to meet NNSA's commitment to remove materials from South Carolina in accordance with a legal settlement.

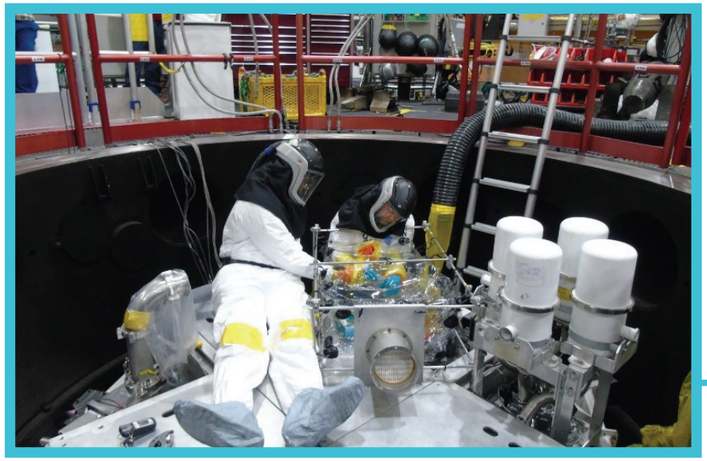
INNOVATE COLLABORATE DELIVER

NEVADA NATIONAL SECURITY SITE

Advanced stockpile certification diagnostic development, vastly improving the quantity, quality, and recovery of data for the Nuclear Security Enterprise National Laboratories including visual imaging, radiographic imaging, plutonium resonance measurements, and ejecta properties.

INNOVATE COLLABORATE DELIVER





SANDIA NATIONAL LABORATORIES

Performed two consecutive experiments using the Z-Machine to measure the dynamic response of aged plutonium. These were the first back-to-back plutonium experiments on Z, which resulted in operational efficiencies and returned valuable data for stockpile stewardship.

INNOVATE COLLABORATE DELIVER

NEVADA NATIONAL SECURITY SITE

Achieved major milestones on the $1B plus Enhanced Capabilities for Subcritical Experiments (ECSE) line item project in collaboration with all three weapons laboratories. ECSE will allow the laboratories to execute experiments in support of stockpile stewardship, certification, and modernization for many decades to come.

INNOVATE COLLABORATE DELIVER

Modernizing the Nation's Stockpile

SAVANNAH RIVER SITE

Developed the Savannah River Plutonium Processing Facility 50 Pits per year (PPY) plan - which provides NNSA with a comprehensive overview of the approach, resources, and actions necessary to establish the capability to produce at least 50 PPY at the Savannah River Site.

INNOVATE COLLABORATE DELIVER



KANSAS CITY NATIONAL SECURITY CAMPUS

Introduced Curie, Kansas City National Security Campus's latest high-powered computer, which doubled the site's computing capacity and supports advanced simulations needed to help solve some of the Nation's most complex national security challenges.

INNOVATE COLLABORATE DELIVER





LAWRENCE LIVERMORE NATIONAL LABORATORY

Awarded a subcontract to Dell Technologies for additional supercomputing systems to support NNSA's nuclear deterrent mission. The contract will provide at least $40M for more than 40 petaFLOPs of expanded computing capacity delivered to the NNSA's three labs (LLNL, LANL, and SNL). Initial system deliveries are scheduled to begin in mid-2022 and will continue through 2025.

INNOVATE COLLABORATE DELIVER



SANDIA NATIONAL LABORATORIES

Launched the largest missile ever (60 feet tall X 6-foot base diameter) from Sandia National Laboratories Kauai Test Facility which showed the test range is still growing to meet the testing needs of advanced weapons systems. The missile sailed over the Pacific Ocean as a medium-range ballistic missile-like target for Flight Test Aegis Weapon System 31 Event 1, a test coordinated by the Missile Defense Agency and the U.S. Navy.

INNOVATE COLLABORATE DELIVER

Achieving Amazing Scientific Successes

LAWRENCE LIVERMORE NATIONAL LABORATORY

For the first time, Lawrence Livermore National Laboratory's National Ignition Facility achieved a yield of more than 1.3 megajoules (MJ) from fusion reactions. This record-breaking accomplishment is a major advancement in capability for Stockpile Stewardship applications.

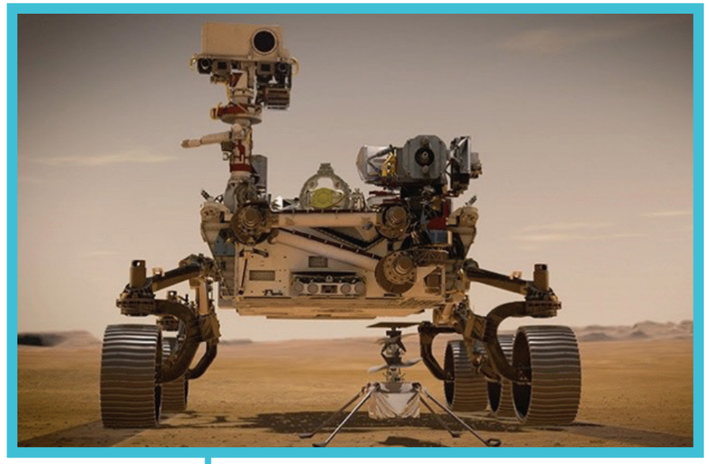
INNOVATE COLLABORATE DELIVER



LOS ALAMOS NATIONAL LABORATORY

Finished remediating breached cesium-137 source at a research facility at the University of Washington in Seattle; personnel from the University of Washington have now reoccupied the building after two years.

INNOVATE COLLABORATE DELIVER



LOS ALAMOS NATIONAL LABORATORY

NASA's Perseverance rover started zapping rocks on Mars with the SuperCam instrument to study rock composition. SuperCam, whose design and build were led by Los Alamos National Laboratory, also features the first scientific microphone to ever operate on Mars.

INNOVATE COLLABORATE DELIVER



SANDIA NATIONAL LABORATORIES

Led a major upgrade to the NNSA's High Operational Tempo Shot (HOT Shot) sounding rocket program, culminating in a successful launch at the NASA Wallops Flight Facility in Virginia. HOT Shot collects scientific data that benefits aerospace research and informs future weapon designs for the U.S. nuclear enterprise.

INNOVATE COLLABORATE DELIVER



SANDIA NATIONAL LABORATORIES

Demonstrated the potential for falling particle receiver technology to advance concentrating solar power (CSP) and was subsequently selected by DOE to expand its R&D capabilities with a new pilot tower that has an integrated supercritical carbon dioxide power conversion loop. Particle-based systems have potential scalability and cost advantages over other CSP systems.

INNOVATE COLLABORATE DELIVER

Making Our World a Safer Place

DEFENSE NUCLEAR NONPROLIFERATION

Converted a cumulative total of 1,164.4 kg of plutonium to an oxide form in preparation for final disposition and completed construction of a characterization and storage pad for the first shipment of downblended plutonium to the Waste Isolation Pilot Plant in 2022.

INNOVATE COLLABORATE DELIVER





DEFENSE NUCLEAR NONPROLIFERATION

Issued millions of dollars in cooperative agreements to U.S. companies to support the commercial production of molybdenum-99 (Mo-99), a critical isotope used in more than 40,000 medical procedures in the United States each day, including the diagnosis of heart disease and cancer. This effort led to the end of highly enriched uranium exports.

INNOVATE COLLABORATE DELIVER

NEVADA NATIONAL SECURITY SITE

Achieved operating capability to conduct Unmanned Aerial Vehicle experiments and safely and securely executed sustainable test range activities in support of federal, national laboratory, and industry missions.

INNOVATE COLLABORATE DELIVER





DEFENSE NUCLEAR NONPROLIFERATION

Developed counter nuclear smuggling capabilities in over 80 countries, including with six new partner agencies, to prevent terrorist acquisition of radioactive and nuclear materials.

INNOVATE COLLABORATE DELIVER

SAFETY, INFRASTRUCTURE, AND OPERATIONS

Completed removal of 50 samples of unneeded radioactive materials from the Lovelace Biomedical Research Institute (LBRI) located on Kirtland Air Force Base in Albuquerque, New Mexico. LBRI, a former DOE-contract facility, requested assistance in dispositioning the legacy materials that had no commercial disposition pathway.

INNOVATE COLLABORATE DELIVER

COUNTERTERRORISM AND COUNTERPROLIFERATION

Conducted 50 virtual workshops with U.S. public information officers, law enforcement, first responders, and technical experts concerning radiological counterterrorism to build radiological response capacity and improve crisis and risk communication among the U.S. incident response community.

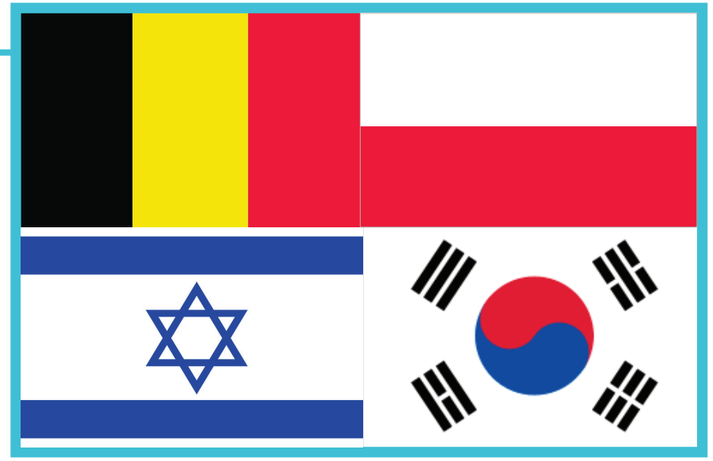
INNOVATE COLLABORATE DELIVER

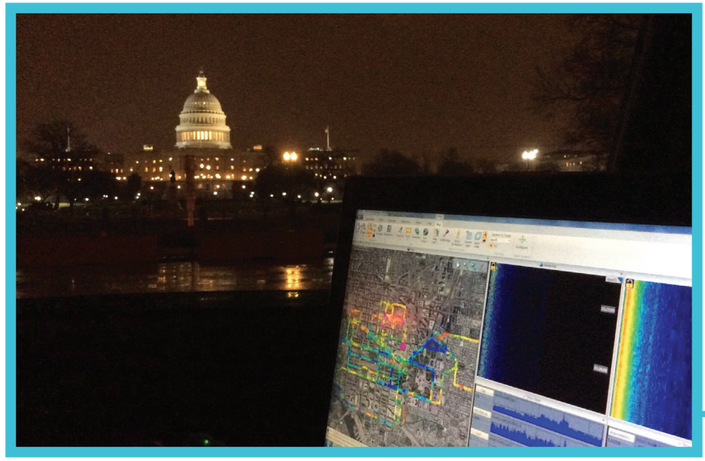
Making Our World a Safer Place

MANAGEMENT AND BUDGET

Established DOE's overseas presence in the United States' diplomatic missions in Belgium, Israel, Poland, and South Korea.

INNOVATE COLLABORATE DELIVER





COUNTERTERRORISM AND COUNTERPROLIFERATION

Completed the provision of advanced equipment and training to regional Federal Bureau of Investigation counter-weapons of mass destruction teams as part of the "Capability Forward" initiative. As a result of this initiative, responses to nuclear and radiological threats in the United States will be accelerated, potentially saving large numbers of American lives.

INNOVATE COLLABORATE DELIVER

NEVADA NATIONAL SECURITY SITE

Executed Low Yield Nuclear Monitoring experiments including new capabilities to distinguish low- to no-yield weapons development activities from natural occurrences. These experiments included first time collaborations with the Subcritical Experimentation Program.

INNOVATE COLLABORATE DELIVER





DEFENSE NUCLEAR NONPROLIFERATION

Integrated two nuclear detonation detection sensor suites on GPS Block III satellites that were launched by the U.S. Space Force on two SpaceX rockets. Each satellite hosts a Global Burst Detector III payload with X-ray, radiofrequency, and optical sensors designed to help detect above-ground nuclear explosions.

INNOVATE COLLABORATE DELIVER

COUNTERTERRORISM AND COUNTERPROLIFERATION

Conducted 23 engagements with foreign partners and international organizations to advance U.S. nuclear threat reduction and emergency preparedness objectives, including Israel, Taiwan, Japan, Canada, the Arctic Council, and the International Atomic Energy Agency.

INNOVATE COLLABORATE DELIVER

DEFENSE NUCLEAR NONPROLIFERATION

Engaged with over 100 countries on international nuclear safeguards issues and transferred seven new technologies to international safeguard partners including the International Atomic Energy Agency.

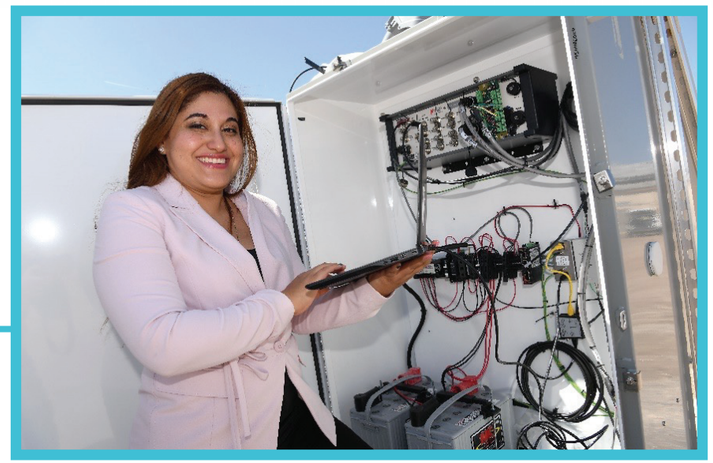
INNOVATE COLLABORATE DELIVER

Making Our World a Safer Place

PANTEX

Installed the Seismic-Acoustic Network, allowing for continuous collection of meteorological, seismic, and infrasound signals, contributing to the development of domestic and international explosive monitoring capabilities.

INNOVATE COLLABORATE DELIVER



Y-12

Advanced global nuclear security by providing uranium-molybdenum castings for U.S. high performance reactors, completing Distance Alarm Response Training courses and a new Dispatcher Training course, and executing the Relentless Rook exercise for the Mobile Uranium Facility.

INNOVATE COLLABORATE DELIVER



COUNTERTERRORISM AND COUNTERPROLIFERATION

Conducted preventative radiological/nuclear detection activities for several National Special Security Events, including the 59th Presidential Inauguration and Super Bowl LV, in coordination with the Federal Bureau of Investigation and other partners.

INNOVATE COLLABORATE DELIVER



DEFENSE NUCLEAR NONPROLIFERATION

Completed a full-scale exercise of the Mobile Uranium Facility and the Mobile Plutonium Facility, systems NNSA maintains to expeditiously characterize, stabilize, package, and remove weapons-usable nuclear materials.

INNOVATE COLLABORATE DELIVER

COUNTERTERRORISM AND COUNTERPROLIFERATION

Partnered with the Federal Bureau of Investigation to plan, execute, and evaluate the Marble Challenge 21 (MC-21) full-scale exercise in Washington, D.C. MC-21 exercised interagency counter-weapons of mass destruction capabilities, including new authorities under a National Security Presidential Memorandum governing the interagency response to a terrorist incident.

INNOVATE COLLABORATE DELIVER

Supporting Our World Class Navy

NAVAL NUCLEAR PROPULSION

Christened the 22nd VIRGINIA Class submarine, USS HYMAN G. RICKOVER (SSN 795).

INNOVATE COLLABORATE DELIVER





NAVAL NUCLEAR PROPULSION

Poured over 135,000 cubic yards of concrete (13,500 truck loads) for the Naval Spent Fuel Handling Facility in Idaho.

INNOVATE COLLABORATE DELIVER

NAVAL NUCLEAR PROPULSION

USS GERALD R FORD (CVN 78) safely executed Full Ship Shock Trials between June and August 2021, the first on a nuclear aircraft carrier since 1987.

INNOVATE COLLABORATE DELIVER





NAVAL NUCLEAR PROPULSION

Continued construction of COLUMBIA (SSBN 826), the lead ship of the COLUMBIA class, 16 VIRGINIA Class Submarines, and aircraft carriers JOHN F. KENNEDY (CVN 79) and ENTERPRISE (CVN 80).

INNOVATE COLLABORATE DELIVER

NAVAL NUCLEAR PROPULSION

Installed the power unit and completed the refueling work at the S8G Prototype in New York.

INNOVATE COLLABORATE DELIVER

Building Better Infrastructure

DEFENSE PROGRAMS

Approved Critical Decision 1 milestones for both the Plutonium Facility-4 (PF-4) at Los Alamos National Laboratory and the Savannah River Plutonium Processing Facility project at the Savannah River Site (SRPPF). The PF-4 project will repurpose existing spaces within the LANL Plutonium Facility to produce 30 pits per year in 2026. SRPPF will establish the Department's capability to fabricate at least 50 war reserve pits per year at the Savannah River Site.

INNOVATE COLLABORATE DELIVER



DEFENSE NUCLEAR SECURITY

Broke ground on the West End Protected Area Reduction Project (WEPAR) at Y-12. WEPAR reduces the size of the protected area by approximately 50%, which reduces the risk of catastrophic security system failure and decreases costs for decontamination and decommissioning process-contaminated facilities.

INNOVATE COLLABORATE DELIVER



PANTEX

Exceeded the FY 2021 planned infrastructure dispositions requirement. While the goal was 14, Pantex completed 17 building dispositions.

INNOVATE COLLABORATE DELIVER



SAFETY, INFRASTRUCTURE, AND OPERATIONS

Placed lease orders with the General Services Administration to replace gasoline engine vehicles with approximately 50 Zero Emission Vehicles (ZEV) nearly doubling the number of ZEVs in NNSA's fleet from 61 to 111. NNSA also allocated $1.9M to Electric Vehicle (EV) charging infrastructure to install 40 EV charging stations in FY 2022.

INNOVATE COLLABORATE DELIVER



ACQUISITION AND PROJECT MANAGEMENT

Completed construction of the new John A. Gordon Albuquerque Complex which remains on budget and on schedule for move-in to occur in June 2022.

INNOVATE COLLABORATE DELIVER

Building Better Infrastructure

Y-12

Achieved exterior construction completion milestones at the Uranium Processing Facility (UPF) on the Main Process Building, the Salvage and Accountability Building, and the Process Support Facility, while energizing the Mechanical Electrical Building. UPF also completed the delivery of all structural steel and all multi-commodity pipe rack modules for the project.

INNOVATE COLLABORATE DELIVER



ACQUISITION AND PROJECT MANAGEMENT

Completed Phase 2 of the Radiological Laboratory Utility Office Building Equipment Installation (REI-2) two months ahead of schedule and $120M under budget. REI-2 enhances analytical chemistry and material characterization capabilities that support plutonium missions at Los Alamos National Laboratory and the NNSA complex.

INNOVATE COLLABORATE DELIVER



KANSAS CITY NATIONAL SECURITY CAMPUS

Commemorated the successful completion of a new light manufacturing facility close to the main campus. The 275,000 square-foot facility expands manufacturing capabilities and is home to a state-of-the-art advanced manufacturing training center.

INNOVATE COLLABORATE DELIVER



LAWRENCE LIVERMORE NATIONAL LABORATORY

Achieved beneficial occupancy at a Livermore National Laboratory polymer enclave facility and began classified operations. This enclave established a partnership with Kansas City National Security Campus to reduce polymer development timelines with a more seamless transition from the development phase to production phase.

INNOVATE COLLABORATE DELIVER



ACQUISITION AND PROJECT MANAGEMENT

Completed construction and turnover items for the Plutonium Facility Equipment Installation Phase 1 Project at Los Alamos National Laboratory 15 months ahead of schedule and $110M under budget.

INNOVATE COLLABORATE DELIVER

Building Better Infrastructure

Y-12

Began site preparation work on the Oak Ridge Enhanced Technology and Training Center, a unique federal- and state-funded concept to provide first responder training and technology demonstrations.

INNOVATE COLLABORATE DELIVER



ACQUISITION AND PROJECT MANAGEMENT

Awarded NNSA's first fixed-price contract line item under a management and operating contract for the 138kV Power Transmission System Replacement project at the Nevada National Security Site for approximately $39M.

INNOVATE COLLABORATE DELIVER



SAFETY, INFRASTRUCTURE, AND OPERATIONS

Acquired the LeMond Carbon Facility in Oak Ridge, Tennessee, near the Y-12 National Security Complex. The acquisition marks NNSA's successful conclusion of a first-ever Option to Purchase Agreement, which gives NNSA the opportunity to modernize infrastructure without the need for new construction. With this novel approach, NNSA was able to secure the needed development space early and then perform required due diligence during the option period.

INNOVATE COLLABORATE DELIVER



LOS ALAMOS NATIONAL LABORATORY

Transformed infrastructure to create a state-of-the-art training center for new hires, repurposed more than 300 workspaces for Weapons Production, leased buildings in Santa Fe for the first time in over 60 years, remodeled 180,000 sq. ft. for teleworkers, and built two new parking garages.

INNOVATE COLLABORATE DELIVER

LAWRENCE LIVERMORE NATIONAL LABORATORY

Completed construction of a new Small Firearms Training Facility. The building replaced aging infrastructure and made improvements to other co-located structures, removed non-permanent trailers that were onsite past their intended date. The project was completed ahead of schedule and under budget.

INNOVATE COLLABORATE DELIVER

SAFETY, INFRASTRUCTURE, AND OPERATIONS

Accelerated NNSA's infrastructure recapitalization by mobilizing four Enhanced Minor Construction and Commercial Practices pilot projects, completing three new minor construction buildings to meet urgent mission needs, and demolishing 19 assets (a total of 28,569 sqft), including nine process-contaminated facilities.

INNOVATE COLLABORATE DELIVER

Combating the Pandemic

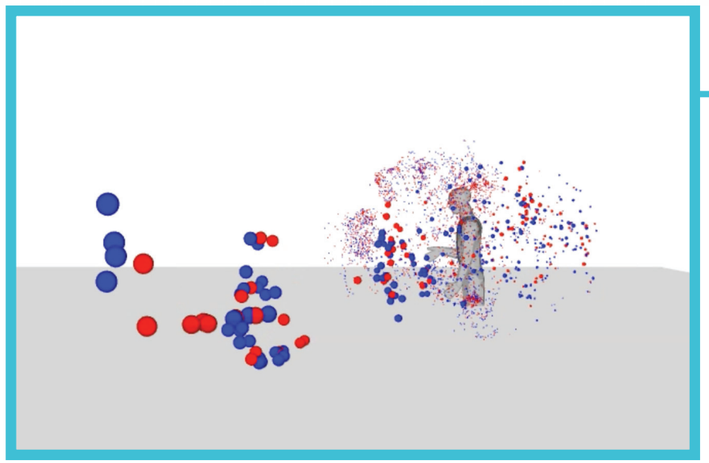
LOS ALAMOS NATIONAL LABORATORY

Made a number of important contributions at the state and federal level during the COVID-19 pandemic:

- Led a global effort to successfully decode the delta variant.
- COVID-19 model used by CDC and New Mexico.
- Website with freely available data for all states.
- Laboratory modelers worked with Department of Health to project disease transmission and school reopenings.
- Science capabilities to help understand viruses, predict spread, and quantify the impact of vaccine strategies.
- Led COVID-19 Testing Team for the DOE's National Virtual Biotechnology Lab.
- Invested more than $24M in R&D since the pandemic began.

INNOVATE COLLABORATE DELIVER

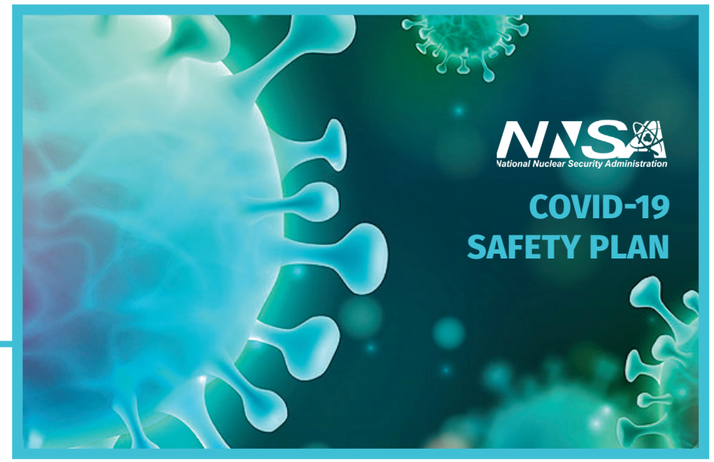




SANDIA NATIONAL LABORATORIES

Supercomputers simulated sneezes to help researchers understand how far coughs and sneeze droplets can travel to spread COVID-19. Their findings reinforced the importance of wearing masks, maintaining social distancing, avoiding poorly ventilated indoor spaces and washing hands frequently.

INNOVATE COLLABORATE DELIVER



SAFETY, INFRASTRUCTURE, AND OPERATIONS

Developed and updated COVID Safety Plans in collaboration with the NNSA Enterprise to establish guidance aligned with DOE policy supporting the safe execution of NNSA work during the pandemic.

INNOVATE COLLABORATE DELIVER

INFORMATION MANAGEMENT

Collaborated with DOE to ensure software and hardware resources were supplied to employees during the COVID-19 pandemic and coordinated efforts to deploy equipment to the Federal workforce, which included the purchasing of equipment and facilitating pickup.

INNOVATE COLLABORATE DELIVER



EMERGENCY OPERATIONS

Established and led an NNSA COVID-19 Recovery Working Group and authored the COVID-19 Interim Events Reconstruction Report.

INNOVATE COLLABORATE DELIVER

SAFETY, INFRASTRUCTURE, AND OPERATIONS

Collaborated with field offices to create an inventory of available and needed Personal Protective Equipment (PPE) and consumable cleaning supplies. Created a web-based system to collect and track the data and facilitated PPE transfers between sites to ensure necessary PPE was available to continue operations.

INNOVATE COLLABORATE DELIVER

Hiring Next-Gen Workforce

MANAGEMENT AND BUDGET

Awarded 13 Minority Serving Institution Partnership Program grants for a total of 24 consortia grants to better serve tens of thousands of students and Minority-Serving Institutions in STEM disciplines.

INNOVATE COLLABORATE DELIVER



MANAGEMENT AND BUDGET

Achieved the highest Federal workforce level for NNSA since 2013 with a total 1,825 Federal employees onboard.

INNOVATE COLLABORATE DELIVER

GENERAL COUNSEL

Collaborated with Emory University to implement a first-of-its-kind tech-transfer market research program that also introduced business and legal students to our national labs – a potential recruitment path for the next-generation workforce.

INNOVATE COLLABORATE DELIVER

EMORY UNIVERSITY

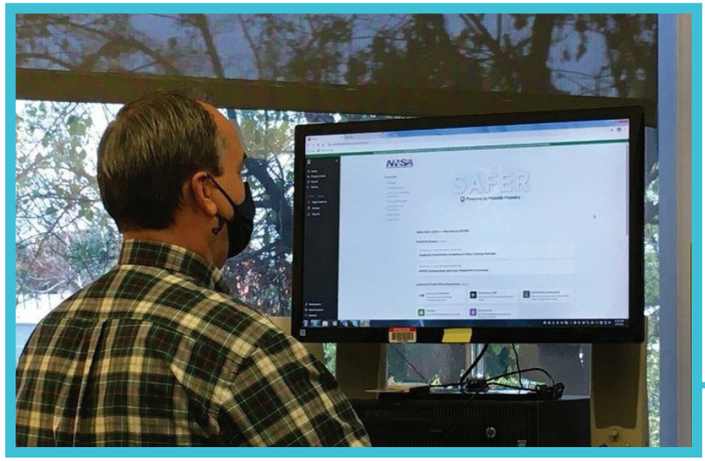
NNSA National Nuclear Security Administration

COST ESTIMATING AND PROGRAM EVALUATION

Conducted an enterprise-wide review of staffing to understand NNSA's future federal staffing level required to execute its mission.

INNOVATE COLLABORATE DELIVER

Bringing the Enterprise Together



LAWRENCE LIVERMORE NATIONAL LABORATORY

Executed the Safety, Analytics, Forecasting, Evaluation, and Reporting (SAFER) software tool to connect with any NSE database and extract information for users in a simple and secure web browser. This innovative resource will help bridge gaps that arise when using a variety of systems to address complex tasks.

INNOVATE COLLABORATE DELIVER

POLICY AND STRATEGIC PLANNING

Launched the Strategic Outlook Initiative, NNSA's first enterprise-wide analysis that looks over the horizon to identify emerging risks and opportunities with the potential to shape the NNSA mission space over 5 to 20 years.

INNOVATE COLLABORATE DELIVER



SAFETY, INFRASTRUCTURE, AND OPERATIONS

Led an enterprise partnership to develop recommendations and performance measures to improve formality of operations and enhance NNSA mission execution.

INNOVATE COLLABORATE DELIVER

KANSAS CITY NATIONAL SECURITY CAMPUS

Through the Supply Chain Management Center (SCMC), the National Security Enterprise achieved the highest total annual strategic savings in the 15-year history of the SCMC, saving more than $415M in taxpayer dollars in FY 2021. The SCMC worked with DOE and NNSA contractors to combine their purchasing power to award multi-site commodity agreements for operating supplies, information technology, and services.

INNOVATE COLLABORATE DELIVER

NNSA 2021 Year in Review

Congratulations to NNSA's Nuclear Security Enterprise for another great year of accomplishments.

National Nuclear Security Administration