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National Nuclear Security  
Administration

Lawrence Livermore National  
Security, LLC

Performance Evaluation  
Report

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NNSA Livermore Field Office

Evaluation Period:  
October 1, 2022, through  
September 30, 2023

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December 15, 2023

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Controlled by: National Nuclear Security Administration, (b)(6),  
Livermore Field Office, (b)(6) @nnsa.doe.gov

## Executive Summary

This Performance Evaluation Report (PER) provides the National Nuclear Security Administration (NNSA) assessment of performing entity, Lawrence Livermore National Security, LLC (LLNS), performance of the contract requirements for the period of October 1, 2022, through September 30, 2023, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP).

Pursuant to the terms and conditions of the Contract, the PEMP sets forth the criteria by which NNSA evaluates LLNS' performance, as required by Federal Acquisition Regulation (FAR) Part 16.4, which outlines expectations for administering award-fee type incentive contracts. This is the type of contract in place between NNSA and its management and operating (M&O) partners. A key requirement of FAR Part 16 is to establish a plan that identifies award-fee evaluation criteria and "how they are linked to acquisition objectives which shall be defined in terms of contract cost, schedule, and technical performance."

In accordance with the regulation, the PER assesses LLNS' performance against the PEMP and provides the basis for determining the amount of award fee earned by LLNS. NNSA took into consideration (e.g., contractor assurance system, program reviews) obtained from NNSA Program and Functional Offices both at Headquarters and in the field.

LLNS earned an overall rating of Excellent and 94 percent of the award fee during this performance period. LLNS earned an Excellent rating for Goals 1, 2, 3, and 5, exceeding expectations on nearly all Objectives and Key Outcomes. LLNS effectively executed NNSA program priorities, successfully achieved multiple fusion ignitions, continues to successfully deliver on our nation's challenging stockpile requirements and lead the Weapons Laboratories in strengthening the underpinning and future stockpile stewardship. LLNS continued to successfully deliver at a very high level across the balance of the NNSA mission portfolio including Nonproliferation, Emergency Management, Incident Response, and Nuclear Counterterrorism while effectively supporting Department of Energy (DOE) and Strategic Partnership Project programs. The National Security missions were successfully executed by leveraging and advancing the frontiers of Science, Technology, and Engineering. LLNS earned a Very Good rating on Goal 4, exceeding expectations on many Objectives and Key Outcomes with relatively few issues. Specific observations for each Goal are provided in the following pages.

**Goal 1: Mission Delivery: Nuclear Weapons**  
**LLNS At-Risk Fee Allocation: \$19,352,890**

Under this goal, LLNS earned a rating of Excellent (95 percent), and \$18,385,246 of the award fee allocated to this goal. LLNS exceeded almost all Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements of the contract under this Goal in the aggregate. Accomplishments significantly outweighed any issues. No significant issues in performance existed and Contractor is meeting performance expectations within expected costs.

LLNS successfully achieved fusion ignition in the National Ignition Facility (NIF) (3 megajoules (MJ) of yield from 2 MJ drive to the capsule), receiving very positive media attention and high accolades from the scientific community world-wide for this historic accomplishment, opening an entirely new energy regime with important implications to stockpile stewardship and clean energy production.

LLNS effectively executed stockpile modernization deliverables through cross-site engagements. LLNS made excellent progress on the W80-4 and entered into Phase 6.4. LLNS executed W80-4 baseline replan per requirements to support new First Production Unit date of fiscal year (FY) 2027 and demonstrated significant technical progress at numerous design and gate reviews as well as increasing producibility, significantly improving W80-4 Polymer creeper/crawler yield projections.

The Main Charge Product Review Team (PRT) worked with Holston and Pantex to add diagnostic capability to improve formulation of PBX 9502 and is pursuing strategies to minimize use of and find alternatives for FK-800 binder. LLNS completed several integrated engineering tests including the first Full System Engineering Test and supported one CTM-2 Long Range Stand Off flight test. The W80-4 materials compatibility team completed canned secondary assembly core stack accelerated aging studies.

W80-4 Pellet Can Assembly development experienced delays in shipping in part due to late identification of inspection requirements and challenges in resourcing and qualifying inspection equipment and personnel. LLNS' component development is behind, jeopardizing overall program schedule. LLNS and Los Alamos National Laboratory (LANL) implemented a recovery plan to identify options to ensure component delivery and restore the baseline schedule. LLNS is utilizing a Rapid-Detonator Cable Assembly hardware strategy to accelerate the development design.

Under the W87-1, LLNS continued to meet programmatic expectations, completing the Weapon Design and Cost Report and completed a key program milestone, the Systems Conceptual Design Gate. LLNS forged commendable relationships with production agencies via PRT, particularly in the areas of pit production, polymer production, cold hearth melt, and high explosives. LLNS continued significant efforts to enable the production and qualification of certain pits, including Quality Evaluation Releases (QERs), facility startup activities, and sample testing. LLNS executed its third W87-1 hydrodynamic test and noted the Nuclear Explosive Package design was shown to be sound, and easier to produce version of a key component that

would meet requirements. However, LLNS is behind schedule on System Test and Qualification execution and has not yet been able to produce a Schedule of Uncertainty and Risk Analysis to the FPO that meets W87-1 PCRs.

LLNS successfully completed surveillance activities and assessments for multiple programs while negotiating cross program reprioritizations. LLNS assessed the safety and reliability of the B83-1 system and supported closure of a Preliminary Significant Finding Notification prior to promotion. Additionally, LLNS delivered pit Disassembly and Inspection activities for S/N 8260. LLNS's W80-1 system team aided the Production Agencies including adjustments to acceptance requirements, resolution of component concerns, and coordination of cross-site testing needs. LLNS supported two Joint Test assembly units for the W87-0 and completed Detonator Surveillance Program Cycle 35 and Cycle 36.

LLNS continued support of production capability and qualification efforts for certain pits. 24 of 42 QERs have been released to support production activities at LANL and 10 of 14 QERs have been released to support production at the Kansas City National Security Campus. LLNS began test article fabrication after receiving a second set of certification samples and developed an equipment lifecycle plan for qualification and production of certain pits.

LLNS delivered all dense inert parts for use in high-speed tests and continued realizing Direct Ink Write parts for the W87-0. LLNS worked in partnership with LANL and Pantex to produce a joint FK requirement and testing methodology framework to assess new FK material produced by alternate vendors LLNS produced the first LLM based main charge explosive and transferred the technology to Pantex under the Agile Processes and Technologies demonstrator. LLNS and Y-12 partnered to successfully forge two ingots on the Cold Hearth Melter as part of Depleted Uranium Modernization. LLNS commissioned the Facility for Additive Manufacturing of Energetics in collaboration with Pantex, including the Energetic Materials Development Enclave Campus, which is integral to High Explosives (HE) capability sustainment and modernization.

LLNS successfully repeated ignition in NIF experiment N230729 and obtained a record fusion yield, which was verified by the NIF Nuclear Values Authorization group to be  $3.88 \pm 0.31$  MJ or a target gain of 1.9. LLNS provided plans to upgrade NIF up to a 3.0 MJ laser drive and developed a new detector system using hybridized complementary metal-oxide semiconductor technology, which is designed to achieve multiple x-ray diffraction frames per experiment while surviving high debris loads and background levels, and successfully demonstrated it in two NIF shots. The Extended X-ray Absorption Fine Structure team successfully completed a driven Tantalum shot at NIF to extend the pressure from 2Mbar to 4Mbar with significantly improved signal level. LLNS successfully executed the first cryo-layered deuterium-tritium doped high-density carbon capsule experiment to study reaction on the NIF. The Pushed Single Shell Team fielded the first symmetry measurement at full laser drive for the Layered Pseudo-Steady-State implosions with preliminary data showing a significantly rounder implosion shape. LLNS completed very significant system upgrades by installing High Fidelity Pulse-Shaping Systems, a refurbished Target Alignment System (TAS), and an upgraded TAS Shielding drive motor as well as installed infrastructure for classified operations for the Direct Laser Impulse system.

LLNS continued to make progress towards the execution of the Nimble campaign's Twin Peaks

subcritical experiment that is relevant to obtaining data for developing predictive models for improving production, assessing the current stockpile, and certifying the future stockpile in accordance with milestone schedules. LLNS participated in the National Volume Burn Workshop series as well as discussions and simulation efforts to support the Level II Milestone 8768 “Conduct tri-lab assessment of high-yield MDD designs and scaling paths.” LLNS participated in the FY 2023 “Enabling Efficient and Flexible Pit Production” Level-1 Stewardship Capability Delivery Schedule pegpost final review and has also made several collaborative gas gun shots in support of Office of Engineering and Technology Maturation Advanced Certification and Qualification Shallow Bubble Collapse at Specialized Technology Laboratory.

LLNS successfully completed the level-2 milestone “Uncertainties for radiochemical cross sections” and as part of the tri-lab team that completed the level 2 milestone on The National Opacity effort involving Z and NIF. LLNS also worked with the other NNSA labs and the federal Program Manager to update the Secondary Assessment Technology Strategy Plan, fulfilling a level-2 milestone. LLNS consistently exceeded expectations in Studies and Assessments and completed its level 2 milestone 6 months in advance of its due date.

LLNS effort on the W80-4 LEP continues in Phase 6.4, production engineering. The replan effort was completed and several PRTs have made progress as demonstrated at design and gate reviews as well as increasing producibility with the Production Agencies.

The W87-1 entered Phase 6.3, making excellent technical progress, and implementing earned value management. LLNS provided significant support working with production agencies on the W87-1 Pit, secondary component manufacturing, and HE production issues. LLNS successfully passed the System Conceptual Design Gate and LLNS-led PRTs successfully held all but a few Component Conceptual Design Reviews. However, LLNS only met a portion of the deliverables for the W87-1, with some baseline schedule deliverables missed. LLNS continued to support the development and updating of the NNSA Integrated Master Schedule.

LLNS installed the first batch of hardware for El Capitan and successfully demonstrated Next-Generation Software Readiness. Specifically, LLNS demonstrated impressive breadth of multiphysics capabilities through numerous test problems and noted 2x performance improvements on EAS-3 as compared to ATS-2.

## **Goal 2: Mission Delivery: Global Nuclear Security**

LLNS At-Risk Fee Allocation: \$4,838,223

Under this goal, LLNS earned a rating of Excellent (95 percent), and \$4,596,312 of the award fee allocated to this goal. LLNS exceeded almost all Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements of the contract under this Goal in the aggregate. Accomplishments significantly outweighed any issues. No significant issues in performance existed and Contractor is meeting performance expectations within expected costs.

LLNS provided key nuclear and radiological security expertise with international partners, developing, and maintaining radiological security training courses and lending technical expertise on nuclear forensics training and laboratory sample exchanges. LLNS supported several International Atomic Energy Agency engagements, regulation/inspection activities, technical and policy advances in nuclear forensics, and technical consultancies. LLNS also developed the use of a machine learning algorithm to reduce the rate of nuisance alarms and provided advanced modeling and analysis support to evaluate performance of radiation detector equipment in new operational scenarios using synthetic spectra.

LLNS continued to provide excellent advanced capabilities in support of U.S. nuclear nonproliferation and security goals. It delivered outstanding project management performance as the lead for Low Yield Nuclear Monitoring, Testbed for Research Evaluation and Test Integration, Priority Research Objectives for Arms Control Technology Innovation, Verification, and Evaluation, Vulcan, and Tritium multi-lab ventures. LLNS successfully executed a radionuclide tracer release experiment to advance nuclear detonation detection capabilities. It stewarded nonproliferation competencies by establishing hybrid-computing data centers and delivering an optimized modeling and simulation tool. LLNS exceeded expectations on the Vulcan venture by achieving multiple milestones in data science research, completing formal technical review, and executing the Multi-Lab Science Experiment II campaign, which provided collection of signals and observables from an alternative manufacturing process. LLNS also produced lab on a chip, a technique analysis that advances critical emerging technology distributed acoustic sensing methods in support of nuclear explosion monitoring and interagency partner missions. LLNS missed multiple deliverables on the Analysis Techniques for Arms Control in the Context of Integrated Deterrence scoping study throughout the project's lifecycle plan.

LLNS continued to provide integral support to the 10 Code of Federal Regulations (CFR) Part 810 Program in the form of end-user reviews and interagency coordination concerning proposed transfers of unclassified U.S. nuclear technology to foreign entities. LLNS led development of the next generation e810 system, a multi-year effort to fully rebuild the existing system and increase the efficiency of Part 810 interactions with U.S. industry. It prepared important technical elements of Nuclear Proliferation Assessment Statements to support peaceful nuclear cooperation with partner nations. LLNS led development and upkeep of the Nuclear Suppliers Group Information Sharing System, which provides critical support to the Nuclear Suppliers Group by allowing Participating Governments to maintain time-sensitive and substantive developments. In addition, LLNS provided support and analysis to enhance DOE/NNSA contributions to the U.S. adherence to the Treaty on the Non-Proliferation of Nuclear Weapons. LLNS provided important contributions for Office of Nuclear Verification Warhead Verification Program (WVP) activities, including excellent leadership of the Seismic Network Expansion in the Caucasus and Central Asia; contributions toward U.S. support of the International Monitoring System, International Data Centre, and On-site Inspection regime; and support for warhead monitoring and verification capabilities such as development of the Portal Monitor for Authentication and Certification and through engagements with international partners.

LLNS provided high quality work and technical leadership for the WVP on Chemical Weapons Convention (CWC) matters and U.S. interagency coordination. LLNS maintained certification

as a U.S. Designated Laboratory for CWC analyses by earning the highest grade on Organization for the Prohibition of Chemical Weapons environmental and biomedical proficiency tests.

LLNS effectively supported the Nuclear Emergency Support Team (NEST) response to Russia's War on Ukraine. LLNS's expertise proved indispensable in the monitoring of NEST sensor networks deployed in the conflict and surrounding region, and in the presentation of a nuclear forensics concept of operations to conflict-country counterparts. It delivered exceptional support in coordination and execution of technical readiness assessments for national response teams and completed notable improvements to a dynamic interaction modeling suite and shock sensitivity test series. LLNS maintained operational and technical readiness for deployable and fixed-lab nuclear forensics teams for pre- and post-detonation responses, and successfully participated in eight nuclear forensics operational exercises and training events, spanning all mission areas. It provided excellent subject matter expertise during a technical exchange and dialogue on modeling with European partners. LLNS also led a priority assessment in support of key leadership engagement across Defense Programs, Defense Nuclear Nonproliferation, Counterterrorism and Counterproliferation, and DOE Office of Nuclear Energy, ensuring validated technical information was provided to facilitate decision making and risk awareness. LLNS initiated exploration of capabilities in artificial intelligence Large Language Models, adapting key expertise to a new lane of effort with the nuclear threat science program.

LLNS successfully completed a series of material characterizations, diagnostic configurations, program reviews, and performance activities in support of nuclear threat science integrated experiment priorities.

### **Goal 3: Mission Innovation: Advancing Science and Technology**

LLNS At-Risk Fee Allocation: \$7,257,334

Under this goal, LLNS earned a rating of Excellent (100 percent), and \$7,257,334 of the award fee allocated to this goal. LLNS exceeded almost all Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements of the contract under this Goal in the aggregate. Accomplishments significantly outweighed any issues. No significant issues in performance existed and Contractor is meeting performance expectations within expected costs.

LLNS's institutional investments, including Laboratory Directed Research and Development (LDRD), produced high-impact, innovative results, and capabilities that are aligned with LLNS and DOE/NNSA missions. LLNS's research achieved excellence in core capabilities and supported DOE/NNSA missions, produced new intellectual property resulting in high impact publications, enabled workforce development and staff retention, and expanded the frontiers of Science Technology and Engineering. LLNS issued LDRD call for proposals, which focused on five project categories: strategic initiatives, laboratory wide, exploratory research, and feasibility studies, and disruptive research.

LLNS made several cutting-edge discoveries across the broad spectrum of scientific disciplines. LLNS assessed the capability of the large-volume gadolinium-doped water Cherenkov detector

to non-intrusively observe small reactors from tens of kilometers away in the context of nuclear nonproliferation. LLNS researchers evaluated the feasibility of remote monitoring of individual nuclear reactor operations at a significant distance using a scalable water-based technology, which may be a cost-efficient and environmentally friendly alternative compared with more common liquid scintillator-based detectors. This study was published in the *Physical Review Applied* journal. LLNS scientists developed a new approach that allows for the study of radioactive and/or precious elements in a much more efficient way, requiring 1,000 times less materials than previous state-of-the-art methods, without compromising the data quality. The method and its application were reported in *Nature Chemistry*, *Inorganic Chemistry*, and *Nature*. LLNS scientists and collaborators created three to four nanometers ultrathin nanosheets of a metal hydride that increase hydrogen storage capacity. The research appears in the journal *Small* and is expected to motivate future development.

LLNS researchers developed a new method of sintering solid-state electrolyte films with carbon dioxide, which overcomes manufacturing challenges of solid-state batteries. Batteries with high energy density are greatly needed as our demand for energy storage continues to accelerate. These results were published in *ACS Energy Letters* and featured on the cover. LLNS scientists developed and reported a method for significantly scaling-up carbon nanotube production with implications to revolutionize commercial products ranging from rechargeable batteries and automotive parts to water filters, the results of which were published in the journal *Carbon*. LLNS performed a microbial study of the International Space Station and its astronauts that found the International Space Station (ISS) habitat is safe for its residents. This work was the first comprehensive characterization of ISS environmental profile (microbiome) and the first such comparison using metagenomic DNA sequencing techniques; the results were published in the journal *Microbiome* (Lawrence Livermore National Laboratory (LLNL), Jet Propulsion Laboratory, and National Aeronautics and Space Administration (NASA)). Experiments conducted at NIF with multiple collaborators, including NASA, created states of matter at extreme physical conditions resulting in a unique opportunity to explore the universe in a laboratory setting.

LLNS continued to excel in maintaining an inclusive and vibrant research environment while nurturing a healthy workforce pipeline. Two LLNS scientists were recipients of the DOE's Office of Science Early Career Award. Two LLNS scientists were selected as 2022 fellows of the American Physical Society for "leadership in integrated hohlraum design physics leading to the creation of the first laboratory burning and igniting fusion plasma" and for "contributions to understanding High Energy Density plasmas through experiments at short-pulse lasers, for the development of time-resolved diagnostics for these measurements." A LLNS distinguished technical staff member was honored with the American Physical Society's 2023 George E. Duvall Stock Compression Science Award for "pioneering laser-driven high-pressure, solid-state material dynamics in high-energy density regimes." Two LLNS scientists were selected as fellows of Optica based on several factors including distinguished contributions to education, research, engineering, business, and serving the optics and photonics community.

LLNS excelled in innovation and technology transfer to industry through partnerships that include both Cooperative Research and Development Agreement and licensing agreements. LLNS researchers collected three R&D 100 awards for the top 100 industrial inventions



worldwide. LLNS licensed a biomedical technology called nanolipoprotein particles, which can deliver vaccines and drugs inside human cells. Manuscript submissions for FY 2023 are at 84.7 percent and in line with the full compliance target of 85 percent.

LLNS scientists looked at the little-known spatial patterns and dynamics of viral communities in soil and concluded that grassland viral communities “viropheres” are highly spatially stratified, diverse, and active across a single field. Understanding virosphere composition and turnover helped scientists begin to unravel the constraints of host-virus interactions in soil. This research was published in the *Proceedings of the National Academy of Sciences*. LLNS researchers discovered that a famous 100-year-old fluid dynamics relation breaks down completely under strong spatial confinement inside carbon nanotube pores. The team evaluated the validity of the NE relation by investigating potassium ion transport in 0.8-nm-diameter carbon nanotube porins. The research appears in the journal *Nature Nanotechnology*.

#### **Goal 4: Mission Enablement**

LLNS At-Risk Fee Allocation: \$9,676,445

Under this goal, LLNS earned a rating of Very Good (90 percent), and \$8,708,801 of the award fee allocated to this goal. LLNS exceeded many of the Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements of the contract under this Goal in the aggregate. Accomplishments greatly outweighed any issues. No significant issues in performance existed and Contractor is meeting performance expectations within expected costs.

LLNS’s Environment, Safety, and Health programs supported mission execution in an effective, efficient, and responsive manner as demonstrated through strong operating experience, positive performance metrics, and continuous improvement initiatives. LLNS achieved its cumulative goal of 1 million work hours without a construction injury, which spanned several years. LLNS also partnered with the Livermore Field Office (LFO) to streamline the implementation of business and operations requirements in support of EMDI, moving to more risk-based processes. Additionally, LLNS had significant accomplishments in infrastructure and sustainability. Despite progress in the implementation of a Corrective Action Plan (CAP) for the Lock Out Tag Out program, LLNS continued to experience hazardous energy events.

LLNS successfully completed its third-party external audit of International Organization for Standardization (ISO) certifications (ISO 9001 in Quality, 14001 in Environmental Management, and 45001 in Occupational Safety and Health Management) and submitted a variance request of 10 CFR 851 for construction at LLNL in support of EMDI.

While LLNS identified a Potentially Inadequacies in Safety Analysis (PISA) that required LFO involvement, improvement is needed to identify operational restrictions and extent of condition in the PISA process. LLNS also encountered delays and issues submitting the Packaging and Transportation Quality Assurance Plan and did not complete the Packaging Convenience Canister for the Defense Programs Packaging 1 Package.

LLNS continued to meet its waste management program goals, developed a new waste

management software and database, and completed scheduled activities outlined in the closure plan under the LLNL Main Site Hazardous Waste Facility Permit. Additionally, LLNS met all regulatory cleanup requirements and provided crucial planning support to EM-funded demolition projects and other infrastructure projects.

LLNS is addressing nuclear quality assurance issues through focused working groups associated with the Nuclear Quality Assurance-1 gaps in the approved Quality Assurance Plan and procurement of unqualified vendors for items associated with safety significant equipment. LLNS successfully completed a Nuclear Explosive Safety Preliminary Design Review of the W80-4 System and completed implementation of NNSA Policy 401.1A, Weapon Quality Policy.

LLNS effectively planned for infrastructure modernization using several tools in support of EMDI and was the first NNSA site to fully implement BUILDER. LLNS also hosted the Streamlined Project Execution, Acquisition, and Recapitalization Workshop in June. LLNS CHAMP team exceeded expectations, raising capacity output by over 50 percent in FY 2023 compared to previous years due to record costing of CHAMP funds and site funded work. LLNS successfully reduced carryover in Operations and Maintenance (O&M) during FY 2023, decreasing the uncosted carryover down to 15.53 percent. However, as part of the carryover reduction efforts, LLNS did not plan for O&M impacts beyond FY 2023. LLNS made significant progress across multiple facilities and enhanced capabilities in support of mission delivery including execution of a large portfolio of recapitalization and construction projects.

LLNS finalized the Site Sustainability Plan and its progress on sustainability goals trended positively except for potable water and energy use intensity. Additionally, LLNS received the first-ever DOE Green Fleet Award, as it added 27 level-2 charging ports to advance Zero Emission Vehicle acquisition and charging infrastructure.

Overall, LLNS delivered an effective, efficient, and responsive safeguards and security program despite experiencing substantial issues and challenges in its Materials Control and Accountability (MC&A) program. LLNS responded to and tracked its Incidents of Security Concern, met the timeline for initial incident reporting, and initiated an institution-wide security culture campaign to combat upward trending security incidents to avoid mission impacts. LLNS met Office of Defense Nuclear Safety Annual Operating Plan deliverables for Caerus and Argus field deployment. However, MC&A findings remained open and LLNS did not complete all required activities in support of the April 2023 physical inventory, delaying the inventory, negatively impacting operations, and leading to concerns over LLNS's MC&A culture. LLNS is working on a path forward to be successful in its next scheduled inventory with some external assistance.

LLNS completed installation of its own fiber-optic infrastructure at two entry control points, eliminating reliance on Sandia-California's fiber infrastructure. LLNS chaired the complex-wide Operations Security Benchmarking Group and took on the role of Controlled Unclassified Information Point of Contact. LLNS also successfully implemented a novel Narcan program in the NNSA complex that contributes to the safety of Security Police Officers in case of an accidental exposure to deadly opioids while conducting vehicle searches.

LLNS delivered efficient, effective, responsible, and transparent financial management operations and systems. LLNS shared valuable lessons learned with NNSA and DOE financial communities to improve enterprise-wide internal control testing methodologies. Of the six small business goals, LLNS exceeded expectations on Veteran-Owned Small Business and Service-Disabled Veteran-Owned Small Business, although performance was below expectations in Small Business, Small Disadvantage Business, Women-Owned Small Business, and Historically Underutilized Business Zones. LLNS partnered with NNSA to streamline internal purchasing policies and procedures in support of EMDI, the NNSA Consent Pilot Program, and DOE/NNSA small business goals. LLNS took steps to address employee recruitment and retention challenges in support of EMDI by offering enhanced benefits (vacation accrual, 401k) and teaming with NNSA to develop a pilot program for compensation (ancillary pay). LLNS performed a wall-to-wall inventory of its on-site firearms inventory in accordance with the FY 2023 Personal Property Inventory Plan, accounting for all on-site equipment assets with an acquisition value of \$456,191 and 100 percent of its firearms.

The Office of General Counsel exercised sound judgment and effectively represented the Laboratory in challenging legal matters, winning an important summary judgment verdict.

In the area of cybersecurity, LLNS effectively responded to increasing attempts at intrusion from persistent threat actors and mitigated vendor vulnerabilities and excelled in the areas of Vulnerability Management, Operational Technology asset inventory, anti-phishing exercises, increasing the data fidelity of NNSA Enterprise vulnerability scanning, and Endpoint Detection and Response implementation. LLNS played a key role in the success of an Office of Information Management and Chief Information Officer sponsored enterprise cybersecurity exercise and the planning of follow-on activities. Additionally, LLNS partnered with NNSA to streamline the implementation of cybersecurity requirements in support of the NNSA Model Contract Project and EMDI.

LLNS completed a CAP to address four findings identified in a 2022 Office of Emergency Management Assessments report and completed a CAP action to revise the Superblock Emergency Planning Hazards Assessment with a more conservative protective action guide of one rem for radiological releases after earlier schedule slippage. LLNS successfully activated its Emergency Operations Center twice in response to extended winter rainstorms and partnered with NNSA to streamline the implementation of emergency management requirements and move to a greater risk-based model in support of the NNSA Model Contract Project and EMDI.

LLNS successfully achieved Critical Decision (CD) 2/3 for the Digital Infrastructure Capabilities Expansion (DICE) Line-Item project and prepared required documentation for CD-0 for the National Security Innovation Center (NSIC). DICE and NSIC used HQ-driven pilots in support EMDI, resulting in over \$400 thousand savings on DICE alone.

LLNS is on budget (Cost Performance Index 1.02) and ahead of schedule (Schedule Performance Index 1.11) for the Advanced Sources and Detectors project and contributed to CD-2/3 approval. LLNS has all Line Replacement Unit (LRU) 32 pulsers with 24 operating in sync utilizing the control systems, a key milestone for burning down technical risk to the accelerator. LLNS completed radiation testing of the LRU pulser, leading to a timely redesign to incorporate risk

mitigating radiation hardening into the power supply. However, LLNS is behind schedule on issuing the LRU 220 contracts, implementing all mitigations identified in the CAP. LLNS improved assembly instructions identified from receipt of early units with the later LRUs meeting all technical specifications. To maintain schedule, LLNS identified opportunities in the project schedule to perform testing at Issues Tracking System (ITS) in parallel while the LRU procurements remain off the critical path for ITS.

**Goal 5: Mission Leadership**

LLNS At-Risk Fee Allocation: \$7,257,334

Under this goal, LLNS earned a rating of Excellent (91 percent), and \$6,604,174 of the award fee allocated to this goal. LLNS exceeded almost all Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements of the contract under this Goal in the aggregate. Accomplishments significantly outweighed any issues. No significant issues in performance existed and Contractor is meeting performance expectations within expected costs.

LLNS demonstrated steadfast leadership and commitment in successfully achieving the grand scientific challenge of fusion ignition in the National Ignition Facility and demonstrating its repeatability with significantly increased gain. This will provide unprecedented capability in support of future work in the Stockpile Stewardship Program. LLNS planned, coordinated, and executed a celebration of this momentous accomplishment with DOE/NNSA officials, members of Congress, employees, and partners. LLNS demonstrated commitment to NNSA priorities and initiatives by aligning the Laboratory Strategic Plan with the NNSA Strategic Vision and successfully partnering with NNSA on the Model Contract Project and EMDI to achieve outstanding results. LLNS also successfully completed a new Investment Strategy for Science and Technology and pursued leading-edge work in biosecurity and climate.

LLNS completed 14 of the 17 newly approved metrics to the Integrated Health of the Program with noted improvement on the level of qualitative analysis. On contractor assurance, LLNS focused on benchmarking other DOE sites and engaging to share best practices and lessons learned. LLNS innovatively contracted with industry experts to assist with the causal analysis activities for the findings and deficiencies identified during the Enterprise Assessment on issues management and the quality assurance reported in DOE Noncompliance Tracking System.

LLNS provided outstanding leadership and support to the NNSA Model Contract Project and EMDI, partnering with NNSA to streamline contract requirements as well as internal policies and procedures. LLNS continued to support the transformation of relationships between design and production agencies through the Polymer Enclave and collaborated across the Enterprise in support of the maturation of the Special Materials capability and technologies. LLNS initiated efforts on the Production Development enclave and provided leadership in the infrastructure area, working with Pantex, Y-12, and Savannah River on infrastructure modeling. LLNS executed the mission critical High-Performance Computing, Lease-to-Own subcontract for El Capitan, which supports NNSA's goal of deploying the next generation Exascale system capabilities. LLNS hosted Industry Day to provide information resources to those seeking to do

business with LLNS or Sandia National Laboratory/California in support of increasing the capacity to execute mission and pursue innovation, with more than 80 companies attending the event. LLNS hosted two additional events to help share cost estimating methodologies and project execution best practices among peers in government, academia, and industry.

LLNS leadership drove operational rigor through engagement during the NIF safety pause, providing a chance to reset and retrain on optimized safety procedures and emphasize the impact of safety on mission enablement. LLNS proactively responded to a series of severe rainfall events by closing Site 300 and successfully activating the Emergency Operations Center, continuously assessing conditions in coordination with regional partners and effectively communicating the site posture with employees and NNSA. LLNS supported public involvement for the review of the Draft Site-Wide Environment Impact Statement (SWEIS) with two in-person meetings, one virtual meeting, and developed responses to comments in preparation of the Final SWEIS. LLNS was also able to successfully negotiate a new labor agreement with the Security Police Officers Association Union in a timely manner, avoiding labor disruptions.

LLNS leadership took action to attract and retain the workforce needed to achieve the nuclear security enterprise missions by enhancing benefits for new and existing employees, utilizing targeted retention bonuses, implementing a Community Cohorts program for new hires, and making culture changes to improve engagement of new and existing employees. These efforts contributed to improvements in hiring and retention. LLNS also engaged in a Rapid Education and Placement collaboration with local community colleges, a new internship program in collaboration with the Nevada Nuclear Security Site and the University of Las Vegas and continued to expand opportunities for veterans including internships to active-duty personnel, significantly increasing the number of veterans employed at LLNL. LLNS needs to continue to focus on recruitment and retention, particularly for critical, under-resourced and very specialized skill sets.

## APPENDIX A: Acronyms and Definitions

| Acronym | Definition                                            |
|---------|-------------------------------------------------------|
| AOP     | Annual Operating Plan                                 |
| ASD     | Advanced Sources and Detectors                        |
| BUILDER | Software                                              |
| CAP     | Corrective Action Plan                                |
| CD      | Critical Decision                                     |
| CHAMP   | Cooling and Asset Management Program                  |
| CRADA   | Cooperative Research and Development Agreement        |
| CTM     | Powered Cruise Missile Flight                         |
| CWC     | Chemical Weapons Convention                           |
| DCA     | Detonator Cable Assembly                              |
| DICE    | Digital Infrastructure Capabilities Expansion         |
| DOE ESC | Department of Energy Explosive Safety Committee       |
| DPP     | Defense Programs Packaging                            |
| EDR     | Endpoint Detection and Response                       |
| EM      | Emergency Management                                  |
| EMDI    | Enhanced Mission Delivery Initiative                  |
| EOC     | Emergency Operations Center                           |
| ES&H    | Environment, Safety, and Health                       |
| EXAFS   | Extended X-ray Absorption Fine Structure              |
| FPO     | Federal Program Officer                               |
| FK      | Product Name for copolymer of chlorotrifluoroethylene |
| HE      | High Explosive                                        |
| HUBZone | Historically Underutilized Business Zones             |
| IHE     | Insensitive High Explosive                            |
| IOSC    | Incidents of Security Concern                         |
| ISO     | International Organization for Standardization        |
| ISS     | International Space Station                           |
| ITS     | Issues Tracking System                                |
| LDRD    | Laboratory Directed Research and Development          |
| LFO     | Livermore Field Office                                |
| LOTO    | Lock Out Tag Out                                      |
| LRSO    | Long Range Stand Off                                  |

|        |                                               |
|--------|-----------------------------------------------|
| LRU    | Line Replacement Unit                         |
| LTO    | Lease-to-Own                                  |
| LX-21  | Name of Explosive                             |
| MC&A   | Materials Control and Accountability          |
| MJ     | Megajoule                                     |
| NE     | Nuclear Energy                                |
| NEP    | Nuclear Explosive Package                     |
| NIF    | National Ignition Facility                    |
| NSIC   | National Security Innovation Center           |
| NEST   | Nuclear Emergency Support Team                |
| O&M    | Operations and Maintenance                    |
| PARS   | Performance Analysis Report                   |
| PBX    | Plastic Bonded Explosive                      |
| PCA    | Pellet Can Assembly                           |
| PCC    | Packaging Convenience Canister                |
| PCR    | Program Control Requirements                  |
| PISA   | Potentially Inadequacies in Safety Analysis   |
| PRT    | Product Review Team                           |
| QAP    | Quality Assurance Plan                        |
| QER    | Quality Evaluation Releases                   |
| SB     | Small Business                                |
| SDB    | Small Disadvantage Business                   |
| SDVOB  | Service-Disabled Veteran-Owned Small Business |
| SAT    | Secondary Assessment Technology               |
| SNL/CA | Sandia National Laboratory/California         |
| ST&E   | Science Technology and Engineering            |
| SWEIS  | Site-Wide Environment Impact Statement        |
| TAS    | Target Alignment System                       |
| VOSB   | Veteran-Owned Small Business                  |
| WOSB   | Women-Owned Small Business                    |
| WVP    | Warhead Verification Program                  |