This Performance Evaluation Report replaces and supersedes the previous report dated December 15, 2022.

National Nuclear Security Administration

Lawrence Livermore National Security, LLC

Performance Evaluation Report (PER)

NNSA Livermore Field Office

Evaluation Period:
October 1, 2021-September 30, 2022

January 20, 2023

Executive Summary

This Performance Evaluation Report (PER) provides the National Nuclear Security Administration (NNSA) assessment of Lawrence Livermore National Security, LLC (LLNS), performance of the contract requirements for the period of October 1, 2021, through September 30, 2022, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP). The NNSA took into consideration all input (e.g., CAS, Program reviews, etc.) obtained from NNSA Program and Functional Offices both at Headquarters and in the field.

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.

LLNS earned an overall rating of excellent during this performance period. LLNS earned Excellent ratings on Goal 1-4, exceeding expectations on nearly all Objectives and Key Outcomes. LLNS successfully executed NNSA program priorities, continuing 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 Non-Proliferation, Emergency Management, Incident Response, and Nuclear Counterterrorism while effectively supporting Department of Energy (DOE) and Strategic Partnership Project (SPP) programs. NNSA's national security missions were successfully executed by leveraging and advancing the frontiers of Science, Technology, and Engineering (ST&E). LLNS earned a Very Good rating on Goal 5, exceeding expectations on many Objectives and Key outcomes with relatively few issues. On Goal 6, LLNS earned an Excellent rating as it exceeded nearly all Objectives and Key Outcomes through its strong partnership with NNSA and effective leadership in overcoming labor and supply chain challenges. Specific observations for each Goal are provided in the following pages.

Goal 1: Mission Execution: Nuclear Weapons
LLNS Total Fee Allocation: $15,937,440

Under this goal, LLNS earned a rating of Excellent and 91 percent of the award fee allocated to this goal. LLNS exceeded almost all of the Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements with accomplishments that significantly outweigh minor issues. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS consistently and effectively executed science and stockpile deliverables through cross-laboratory engagements. LLNS avoided any significant schedule delays to Defense Programs work scope despite COVID impacts on the workforce as it kept all high-hazard facilities fully operational. The LLNS W87-1 team continued to meet programmatic expectations and completed Weapon Design and Cost Report and is now prepared for entry into Phase 6.3. LLNS forged commendable relationships with production agencies via Product Realization Teams. LLNS continued to push the bounds of science and technology for the future stockpile. LLNS overcame significant infrastructure, technical, and regulatory hurdles, enabling the procurement of NNSA's first Exascale computer, El Capitan, with expected delivery in 2023. LLNS's advancements in policy and infrastructure have paved the way for improved supercomputer procurements across DOE/NNSA.

LLNS improved energetic materials production and accelerated future modernization programs by advancing how development transitions into production using the enclave model. LLNS used its new slurry coater to successfully synthesize two batches of energetic material. LLNS delivered on-time results from its Level 2 (L2) milestone effort to demonstrate a prototype microwave imaging diagnostic on a dynamic experiment, which will benefit numerous classes of high explosives experiments, particularly corner-turning experiments designed to investigate detonation front transition out of boosters. This effort took the diagnostic from a technology readiness level (TRL) 3 to a TRL 6 in less than 9 months. LLNS enabled the production and qualification of the specific designs, including Qualification Engineering Releases (QER), facility startup activities, and sample testing.

LLNS, alongside Consolidated Nuclear Security, LLC (CNS) Y-12 National Security Complex, actively engaged in the development of Cold Hearth Melting (CHM) technology. The CHM team is developing CHM ahead of the TRL schedule and produced items that continue to support other technology development activities. The CHM team was awarded the Defense Programs Award of Excellence for calendar year 2021 for Demonstration of Binary Recycling via Electron Beam Cold Hearth Melting. LLNS continued to face delays in commissioning specialized equipment, impacting multiple milestones and overall budget execution for the Depleted Uranium modernization program. LLNS's Polymer Enclave successfully began part production at scale in support of the modernization programs. LLNS rapidly removed legacy machine tools to ensure it has adequate space to site manufacturing equipment that is in the process of being procured.

The LLNS weapon survivability team developed new capabilities to certify and qualify components in hostile environments, including a new capability at the National Ignition Facility (NIF) and the first experiments on the White Sands Missile Range Fast Burst Reactor. LLNS advanced technologies needed to enable options to perform many-pulsed radiography through

development of bipolar solid state pulsed power, development of laser-driven x-ray radiography, and through development of high-intensity neutron pulse dense plasma focus machines. LLNS demonstrated that the solid-state pulsed power sub-system for Advanced Sources and Detectors (ASD) project achieved TRL6 and will be the first accelerator that relies completely on solid state pulsed power. LLNS successfully completed FY 2022 Stewardship Capability Delivery Schedule Pegposts "Special Materials," "Assess lifetimes and Mitigate Aging, Thrust 2," and a milestone summarizing its Fission Product Yield measurement campaigns.

LLNS executed its first NIF shot with increased laser energy a 7 percent increase being delivered to the target. Further analysis of the data disclosed the shot was record breaking. In support of the goal to increase maximum energy, LLNS successfully demonstrated optics-damage mitigation, overcoming a major limiting factor. Using scaled-equivalent pulses, LLNS completed NIF tests with resounding success and no observed damage.

LLNS measured the first successful tantalum (Ta) Extended X-ray Absorption Fine Structure signals from a compressed sample ramp at the NIF. The data will be used to fill a key information gap in the Equation of State for materials of interest to stockpile stewardship. LLNS successfully performed the first measurements of an ion acoustic wave feature of the Thomson scatting spectrum. LLNS obtained the first physics data using a new time resolved Continuum spectrometer coupled to a hardened X-ray streak camera, supporting improved understanding of the burn process.

LLNS consistently exceeded many of its Studies and Assessments including Next Generation Reentry Vehicle (NGRV) 60-Day Feasibility Study schedule objectives and technical requirements of the contract. LLNS completed its evaluation of the Next Generation Reentry Vehicle 60-Day Feasibility Study on-time building upon the Year One Technical Study.

LLNS successfully completed Cycle 27 Annual Assessment and excelled in future focused activities. LLNS efforts were key to the success of resuming B83 operations at Pantex. LLNS's continued expedited responses to readiness activities at Pantex and provided the team expert opinions and related Design Agency engineering authorizations to resume work after an extended period of downtime. Nuclear Explosive Safety Study Group (NESSG) members at LLNS supported activities allowing for continued safe operations at Pantex. LLNS performed a high quality and comprehensive independent review of National Technology & Engineering Solutions of Sandia (NTESS) corrective actions to components for the B61-12. This review was a key element in the NNSA and NTESS decision to complete the Delta Final Design Review for the gate arm change.

LLNS made outstanding progress on the W80-4 in preparations for Phase 6.4 entry, completing System Baseline Design Review (BDR) and preparation schedule, and communicating to all relevant stakeholders (management, presenters, panel members, etc.). LLNS, along with NTESS, and NNSA completed the dry run with presentation material and associated evidence submitted to the BDR panel two weeks later. LLNS successfully sent the final draft of the Preliminary Weapon Development Report to the Department of Defense (DoD) for Preliminary Design Review and Acceptance. LLNS performed the previous BDR in April, which was a predecessor to the System BDR, in order to ensure no delays.

Significant efforts by LLNS in the W80-4 program resulted in significant improvement in Milestone Alignment Tool scores. LLNS made a small schedule recovery in the W80-4 program.

Production agency delays created a shortage of hardware available to meet LLNS's test requirements. LLNS is the design agency for the component, which currently has a yield of 0 percent. Although this product is still in development, progress on solutions with the Honeywell Federal Manufacturing & Technologies (FM&T) production has been very slow and needs to be accelerated. LLNS management took corrective actions regarding this component, and first production unit (FPU) is projected two years ahead of need date based upon FY 2027 system FPU. The LLNS W80-4 physics team maintained the program schedule despite the Contained Firing Facility shutdown. LLNS executed key tests required prior to BDR and supported joint tests with hardware and personnel.

LLNS is on schedule for the W87-1 Modification Program to reach development engineering (Phase 6.3) and begin earned value in FY 2023. LLNS completed its Weapon Design and Cost Report deliverables on time to the Federal Program Office (FPO) and reduced its total program cost by $250 million. The program experienced negligible staffing growth and has a shortage of staff, predominantly in project controls and engineering. LLNS made a first release of certification plan and of the surveillance plan for New Material and Stockpile Evaluation Plan. LLNS provided its final input into the Major Impact Report, the Project Officers Groups 6.2/6.2A report, and input into the W87-1 classification guide. LLNS also greatly expanded its risk register over the year. LLNS successfully completed all 14 of its Component Feasibility and Cost Gates (CFCGs) and completed the first CFCG (for the Nuclear Explosive Package Product Realization Team for the W87-1 program. LLNS developed a highly detailed full-system model and subjected it to a wide variety of the most stressing stockpile-to-target sequence conditions required for warhead survival. LLNS used this approach to successfully study the interactions between LLNL and Sandia National Laboratories (SNL)/DoD components and motivated design changes.

Miramar, which was a critical precursor to the next subcritical experiment, Twin Peaks, was successfully fired. Prioritization of materials through the Superblock continued to be a challenge for the subcritical experiments (SCE) and Dynamic Material Properties (DMP) programs resulting in a missed FY 2022 SCE milestone that supports the Nimble campaign, which could delay execution of the Twin Peaks experiment. Superblock failed to staff work for the Great Basin campaign that resulted in a canceled FY 2022 milestone. DMP samples awaiting shipment delayed execution in support of additional experiments. DMP continues to evaluate the value proposition of experimental facilities considering poor sample production rates.

LLNS made continuous and extensive use of its code capabilities in support of the full range of stockpile stewardship capabilities, with particular emphasis on supporting the stockpile modernization programs, the W80-4 LEP, and the W87-1 MOD. The use of the codes' 3D capabilities continued to grow significantly. Computational Physics L2 milestones were defined to enable complex workflows and test machine learning algorithms, which will improve efficiency in certification and assessment. LLNS made progress demonstrating algorithmic speedups for Graphics Processor Unit-based architectures.

LLNS deployed the Advanced Technology System-4/El-Capitan Early Access System-3 nodes in three environments and completed initial deployment of a prototype user programming environment for the systems. LLNS made good progress on the El Capitan project as the major subcontractors, Hewlett Packard Enterprise (HPE) and Advanced Micro Devices, Inc. (AMD), achieved significant technical milestones.

LLNS Advanced Simulation and Computing (ASC) code teams heavily used the new EAS3 (early access) systems for application porting and to shake out new HPE/AMD programing environment software under the El Capitan non-recurring engineering contract's Center of Excellence project. LLNS took delivery of the first Rabbit, which is expected to speed up simulations and reduce the costs.

LLNS collaborated with LANL in support of aging and production science by applying cutting edge capabilities to current and future stockpile assessments. LLNS improved plutonium aging models and evaluations as part of the FY 2022 Stewardship Capability Delivery Schedule Pegpost. LLNS built new models of compressibility for plutonium as a function of age that formally bound the changes to compressibility due to the natural decay of plutonium to uranium and helium. Those bounds were verified through experiments on accelerated aged plutonium that had reached an equivalent age of greater than 300 years.

Goal 2: Mission Execution: Global Nuclear Security
LLNS Total Fee Allocation: $2,276,777

Under this goal, LLNS earned a rating of Excellent and 95 percent of the allocated award fee. LLNS exceeded almost all of the Objectives and Key Outcomes and generally met the overall cost, schedule, and technical performance requirements with accomplishments that significantly outweigh issues, if any. No significant issues in performance exist. Contractor exceeded performance expectations within planned costs.

LLNS supported nuclear security engagements with partners worldwide and led engagements in the Middle East and North Africa. LLNS provided outstanding support to the Office of International Nuclear Security (INS) Insider Threat Mitigation (ITM) Team, particularly with coordination of the International Atomic Energy Agency (IAEA) Focus Group, and to the INS Regulations and Inspections team. LLNS led the Office of Radiological Security Annual Meeting with partners in the Middle East, provided outstanding technical support for activities in Africa, Middle East, East Asia, and Europe. LLNS provided technical expertise d on the use of a machine learning algorithm for reducing detector nuisance alarm rates. LLNS led technical and policy advances in the nuclear forensics community to include the IAEA Technical Meeting on Nuclear Forensics.

LLNS significantly exceeded expectations across the Research and Development (R&D) mission space while meeting overall cost, schedule, and technical performance requirements. LLNS exerted leadership in arms control R&D, strengthening U.S. nonproliferation and nuclear security capabilities by overcoming manufacturing challenges and successfully executing the high-explosive hydrodynamic test campaign. LLNS significantly advanced U.S. nuclear detonation detection capabilities leading development of the Low Yield Nuclear Monitoring test bed by implementing outstanding management practices, executing electromagnetic experiments, and completing the borehole drilling campaign. LLNS stewarded nonproliferation competencies, establishing hybrid-computing data centers ahead of schedule. LLNS exceeded expectations in nuclear forensics by leading arms control monitoring and verification R&D and planning for a warhead verification venture that resulted in a concept and scope for improving technology for application in future treaties and agreements. LLNS conducted innovative research into new techniques for detecting and imaging special nuclear materials.

LLNS provided high-quality consultations and safeguards policy studies, safeguards human capital development initiatives, advanced reactor vendor engagement, engagements in North Africa, training materials, and technology analysis and development projects for international safeguards applications. LLNS demonstrated significant advances in the investigation of the Fast Neutron Coincidence Collar and completed a field test of its radio frequency communications test, setting a new record distance. LLNS demonstrated very high accuracy for mixed uranium samples with the microcalorimeter.

LLNS exceeded expectations in Nuclear Compliance Verification (NCV) through its outstanding leadership and support as evidenced by its strong leadership of NCV's Health and Safety (H&S) Program, the H&S deployment Team, the Warhead Development Verification project, the Uranium Sourcing Project, and by ensuring Graphite Isotope Ratio Method Secondary Ion Mass Spectrometry measurement technique readiness.

LLNS effectively maintained its certification as an Organization for the Prohibition of Chemical Weapons Designated Laboratory for Chemical Weapons Convention (CWC) analyses and delivered high quality essential technical assessments to the Warhead Verification Program in its role representing DOE/NNSA on CWC implementation matters.

LLNS went above and beyond with its Nuclear Emergency Support Teams' response to Russia's war in Eastern Europe. LLNS delivered high quality expertise in the coordination and execution of technical readiness assessments for national response teams. LLNS completed notable improvements to a dynamic interaction modeling suite and shock sensitivity test series at the High Explosives Applications Facility. LLNS was instrumental in a successful high visibility nuclear forensics/Nuclear Threat Reduction foreign exchange by providing device assessment expertise and significantly contributing in key meetings and presentations. LLNS successfully participated in nuclear forensics operational exercises and training events. National Nuclear Material Archive identification, nominations, analysis, and evaluations are on schedule with task plans. Deliverables are meeting or exceeding expectations. Bulk Special Nuclear Material Analysis Program (BSAP) deliverables are meeting requirements and scheduled timelines. LLNS successfully participated in the first NNSA-sponsored BSAP exercise, which evaluated completion of material analysis against IAEA timelines. LLNS successfully maintained the National Atmospheric Release Advisory Center International Exchange Program and other international reach-back mechanisms.

Goal 3: DOE and Strategic Partnership Project Mission Objectives
LLNS Total Fee Allocation: SPP Fixed Fee $8,800,000

Under this goal, LLNS earned a rating of Excellent and 100 percent of the allocated award fee. LLNS exceeded almost all of the Objectives and met the overall cost, schedule, and technical performance requirements with accomplishments that significantly outweigh issues, if any. No significant issues in performance exist. Contractor exceeded performance expectations within planned costs.

LLNS consistently pursued and executed high-impact work for DOE and Strategic Partnership Project (SPP) sponsors. By demonstrating progress in advancing the state-of-the-art, LLNS

strengthened its science and engineering capabilities, facilities, and essential skills in support of the DOE/NNSA mission. LLNS engaged in projects that included basic and applied R&D in areas of critical importance to national security. These projects strengthened LLNS's robust science and engineering core competencies and enhanced the development of its skilled workforce, with three LLNS scientists earning DOE's Office of Science Early Career Research Program award.

LLNS made discoveries in rare earth elements that are essential for the expansion of affordable clean energy technologies. LLNS scientists developed a bio-based, environmentally friendly method to extract and separate rare earth elements. LLNS also addressed the critical need for energy storage by developing lightweight solid materials for high-energy-density hydrogen storage media and a new type of nanoconfined composite materials for real-world hydrogen storage vessels.

LLNS exceled in advancing the state-of-the-art in high-performance computing (HPC), cognitive simulation, and data science. LLNS's concerted efforts at HPC development enhanced LLNS's understanding and prediction of the behavior of complex systems through advanced computing. Using the Energy Exascale Earth System Model (E3SM) as a template. LLNS-led team developed a powerful, high-resolution new global atmosphere model, the Simple Cloud-Resolving E3SM Atmosphere Model. This high-resolution model is 30 times finer than the typical resolution for global climate models.

LLNS made significant steps in building transformative capabilities at the intersection of biology, engineering, and the physical sciences to effectively respond to national challenges in biodefense, chemical security, and human health. LLNS researchers and collaborators demonstrated a highly versatile, multi-pathogen vaccine against bacterial biothreat pathogens. By applying a machine-learning multiscale model, a LLNS-led team developed a new technology Multiscale Machine-Learned Modeling Infrastructure in computational biology that provides detailed understanding of RAS–lipid interactions, a process with strong links to numerous cancers.

LLNS played an important role in supporting NASA's successful Double Asteroid Redirection Test (DART) mission to crash a spacecraft into asteroid Dimorphos. Scientists conducted over 300 3-D simulations in Spheral, LLNS's meshless Adaptive Smoothed Particle Hydrodynamics code, that sampled over seven different potential Dimorphos' material parameters. Applying machine learning to select parameter combinations, LLNS advanced some of the best practices for impact modeling of DART. The success of the first-ever asteroid-deflection test by a DART mission has huge implication in planetary defense against a potential life-threatening asteroid.

Goal 4: Mission Execution: Science, Technology, and Engineering
LLNS Total Fee Allocation: $24,068,787 (19,515,233 FF + $4,553,554 AF)

Under this goal, LLNS earned a rating of Excellent and 100 percent of the allocated award fee. LLNS exceeded almost all of the Objectives and met the overall cost, schedule, and technical performance requirements with accomplishments that significantly outweigh issues, if any. No significant issues in performance exist. Contractor exceeded performance expectations within planned costs.

LLNS' institutional investments, including Laboratory Directed Research and Development (LDRD), produced high-impact, innovative results and capabilities that are well aligned with LLNS and DOE/NNSA missions and elevate the caliber of the workforce. LLNS's research enhanced core capabilities in support of DOE/NNSA missions; produced new intellectual property that yielded high-impact publications; enabled workforce development and staff retention; and expanded the frontiers of ST&E.

LLNS made significant advancements in advanced manufacturing with collaborations in fine tuning and maturing the "direct-ink-writing" 3D printing process for silicone materials and modifying a new non-destructive evaluation method that is more practical and user-friendly. LLNS advanced the frontiers of accelerated materials and manufacturing, fostering an integrated development environment. LLNS made several notable advances in 3D printing including a new multiscale simulation framework that guides metal additive manufacturing processes with tailored microstructure formation control, a real-time diagnostic tool that uses a millimeter-wave detection method of monitoring liquid metal jetting 3D print process, a powerful non-invasive diagnostic technology that is useful in a production environment, and an all-optical ultrasound technique enabling on-demand characterization of formation of defects during the 3D printing process.

LLNS made several cutting-edge discoveries across the broad spectrum of scientific disciplines. Applying a combined experimental and computational approach, LLNS developed a unique technique to investigate the properties of superheavy elements. The technique lays out a recipe for studying the chemical properties of other superheavy elements and can be applied to environmental remediation.

LLNS pushed the boundaries of lasers and optical science through advancing fundamental understanding and state-of-the-art applications. LLNS reported a significant advance in broadband antireflective (AR) coatings applied to optics using nanostructure meta surface technology. Using a new laser-based Volumetric Additive Manufacturing approach, an emerging technology in near-instant 3D printing, LLNS demonstrated the ability to 3D-print microscopic objects in silica glass as part of an effort to produce delicate, layer-less optics that can be built in seconds or minutes.

LLNS exceled in maintaining an inclusive and vibrant research environment while nurturing a healthy workforce pipeline. A LLNS scientist won the 2021 American Nuclear Society Mark Mills. Three LLNS physicists were selected as 2021 fellows of the American Physical Society. The new fellows represent a selection of physics expertise, ranging from intense laser–matter interactions and inertial fusion energy science to leading the development of edge simulation models and codes and pioneering new regimes of warm dense matter experimental science. The Chief Scientist for the ICF program was the recipient of the 2021 Edward Teller Award, presented by the Fusion Energy Division of the American Nuclear Society. A LLNS thin film engineer was elected as a fellow of SPIE, the international society for optics and photonics.

LLNS demonstrated innovative and effective technology transfer to industry through partnerships that include both Cooperative Research and Development Agreement (CRADA) and licensing agreements. LLNS researchers earned three R&D 100 awards based on the top 100 industrial

inventions worldwide. LLNS was awarded five technology commercialization grants through the DOE's Technology Commercialization Fund.

Goal 5: Mission Enablement
LLNS Total Fee Allocation: $13,660,663

Under this goal, LLNS earned a rating of Very Good and 88 percent 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 with accomplishments that greatly outweigh issues. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS' Environment, Safety and Health programs supported mission execution in an effective, efficient, and responsive manner. LLNS identified construction subcontractors striking or discovering subsurface utility lines and put into place appropriate preventative/mitigative measures in a timely manner. LLNS leadership consistently engaged in Worker Safety and Health programs and oversight. LLNS established robust biosafety metrics and an exposure assessment webpage that provides access to industrial hygiene reports, data, and assessment tools.

LLNS Safety Basis Program improved safety basis submittals but with some timeliness issues. LLNS execution of Readiness Activities experienced some schedule delays; however, senior management was engaged on readiness planning and there were no programmatic impacts. The Centralized Waste Processing Line Readiness Assessment activities had several schedule slips. B332 seismic upgrades and Waste Storage Facilities seismic switch design and installation will require continued management engagement.   A few incidents involving DOE certified packaging containers resulted in damaged containers or experiment delays by not following packaging procedures.

LLNS exceeded performance expectations in project execution. LLNS successfully implemented new processes to effectively closeout projects, built productive relationships across NNSA organizations in support of project management activities, and addressed supply-chain issues by creating the Supply Chain Impact Resiliency team. LLNS successfully executed the demolition of B175 and B280 reactor removal projects. LLNS supported the DOE Environmental Management in planning for and executing demolition projects.

LLNS made limited progress on resolving previously identified findings and deficiencies in the Nuclear Material Control and Accountability (NMC&A) program. Additional issues were identified involving standing order implementation, measurements, and physical inventory, all of which impact the overall effectiveness of the NMC&A program. Some issues in measurements were related to a lack of measurement equipment readiness and life-cycle management, which were shared NMC&A and programmatic responsibilities. LLNS implemented immediate changes and set conditions that are expected to improve its measurements and physical inventory processes.

LLNS made significant updates to its Site Security Plan reflecting necessary upgrades to protection strategies in response to issues identified during DOE's FY 2021 multi-topic assessment. LLNS made substantial progress towards utilizing its Incidents of Security

Concern trending data to design an effective Security Awareness campaign.

LLNS successfully completed all scheduled transuranic waste shipments and met six of eight waste management programmatic goals. LLNS's Utility Master Plan is being updated to address resiliency at Site 300 and to incorporate the Energy Resilient Infrastructure and Climate Adaptation initiative.

LLNS facility maintenance management program exceeded expectations and directly supported NNSA's goal to expand Safety, Analytics, Forecasting, Evaluation, and Reporting. LLNS reduced the work order backlog by 32 percent. The goal to define the backlog was not achieved; however, LLNS began to develop analytics and a business-based backlog metric, as well as mapping and reengineering processes. LLNS support of the BUILDER program significantly improved the quality of the data and the metrics used for decision making and reporting requirements.

LLNS completed the Vulnerability Assessment and Resilience Plan and provided input to the Carbon Pollution-Free Electricity Implementation Plan. LLNS made little progress to improve the viability of the electric metering program. LLNS successfully supported NNSA on the Site-Wide Environmental Impact Statement.

LLNS completed its A/123 Data Analytics Pilot Transition Project, developing numerous efficiencies in financial systems and controls and received accolades from DOE Office of the Chief Financial Officer and NNSA Office of Management and Budget. LLNS received three complex-wide best practices from a recent Procurement Evaluation and Reengineering Team (PERT) review. Of the six small business goals, LLNS exceeded expectations on Veteran-Owned Small Business (VOSB) and is below expectations in Small Business, Small Disadvantaged Business (SDB), Woman-Owned Small Business (WOSB), and HUBZONE. LLNS Strategic Sourcing savings were $32,890,000 and achieved a 4.40 percent savings goal versus the target of 4 percent.

LLNS's Office of General Counsel (OGC) exercised sound judgment and effectively represented the Laboratory in challenging legal matters this year

LLNS continued vigilance to increased attempts at intrusion from advanced persistent threat actors and mitigated vendor vulnerabilities. LLNS increased use of cloud services by FEDRamp-approved products and processes to support the security of teleworking employees through advanced endpoint protection.

LLNS effectively managed its emergency management program to ensure an acceptable level of readiness and response, and successfully completed complex and interdependent Transition to Operations tasks for the new Emergency Operations Center (EOC) that were pivotal in achieving new EOC building acceptance and project completion

LLNS effectively executed the Exascale Computing Facility Modernization (ECFM) project, which achieved CD-4 approval 11 months ahead of schedule and $9 million under budget. The EOC project was completed 18 months ahead of the original completion date in the FY 2020 President's Budget Request and was expected to be about $1.2 million under budget. LLNS successfully issued the Request for Proposals for the Digital Infrastructure Capability Expansion project.

LLNS met its Caerus deliverables and demonstrated its progress on the Universal Data Exchange,

which met all deliverables and will allow for a seamless transition to Caerus.

ASD-Enhanced Capabilities for Subcritical Experiments Project cost growth of over 50 percent, to which LLNS contributed significantly, forced reaffirmation prior to CD-2. LLNS's cost underestimation was responsible for approximately $182 million of the $305 million of growth on the LLNS portion of work and schedule growth of four years.

LLNS created a blended value-add vision for LLNS's long-term strategic disposition plan, which outlines templates for required activities needed for non-process contaminated, process-contaminated and risk reduction efforts. But ultimately, LLNS did not deliver on Key Outcome 5.5.

LLNS initiated efforts to determine a baseline inventory of material that is in process hold-up. The material holdup program initiative required prioritization and included necessary visits to LANL and Y-12 to assess their programs' feasibility at LLNL. LLNS developed corrective action plans, completed several open actions and, implemented immediate changes to bring the entire processing material inventory to a measured state at time of inventory to facilitate accurate reporting of inventory difference.

Goal 6: Mission Leadership
LLNS Total Fee Allocation: $9,107,109

Under this goal, LLNS earned a rating of Excellent and 91 percent of the award fee allocated to this goal. LLNS exceeded almost all of the Objectives and generally met the overall cost, schedule, and technical performance requirements with many accomplishments that significantly outweigh issues. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS fully supported key enterprise initiatives including the NNSA Laboratory, Plant, Site, Strategic Planning Summit, the Strategic Outlook Initiative, and Enhanced Mission Delivery Initiative efforts that helped drive the complex work of the nuclear security enterprise. LLNS supported the Enduring Organizational Improvement Initiative Team of Teams with multiple employees leading cross-complex sub-teams in the areas of Adapting Training, Information Technology Capability and Capacity, and Risk Management. DOE's Office of Science selected LLNS as the lead on its seven-year, $350 million "next Enriched Xenon Observatory" project.

LLNS's effective implementation of the Integrated Health of the Program (IHOP) process is an NNSA best practice. Institutional staffing shortages continue to impact environment, safety, and health functional areas. Effectiveness of the Contractor Assurance System (CAS) continued to be validated through sixteen functional area self-assessments using the IHOP process. LLNS made some improvements in post-event communication, but more is needed in the identification and documentation of Site Reportable events and timely completion of fact finding. LLNS took action to improve and mature enterprise risk management processes, including benchmarking with other NNSA sites to ensure that issues management processes are effective.

LLNS effectively responded to the national emphasis on accelerating production and certification/qualification timelines. It established strategic partnerships through cultural change

that enable design with production in mind. LLNS collaborated with KCNSC and NA-194 to modernize the development and production of polymers. The Polymer Enclave is fully operational and producing parts in parallel with the Kansas City National Security Campus (KCNSC). LLNS led the work with KCNSC, Y-12, and Sandia National Laboratories on accelerating the complex toward a five-year timetable from concept to first production unit. LLNS leadership executed effective partnerships with the production sites, enabling them to respond to future requirements in a timely manner for high explosive fabrication and case production, and to broaden pit reuse options for response to emerging needs. LLNS demonstrated leadership in implementing directed changes to the High Energy Density Council model. LLNS actively engaged in the development of Cold Hearth Melting technology at the off-site MSC in Oak Ridge and officially transferred the capability to Y-12. The ECSE/ASD project partners (NTESS, Triad, LLNS, and MSTS) demonstrated strong collaboration.

LLNS Center of Global Security Research (CGSR) leadership contributed to the new Nuclear Posture Review, arms control discussions, and supported NA-243 on warhead verification. CGSR published Stockpile Stewardship in an Era of Renewed Strategic Competition, an effort chartered by the Commander of USSTRATCOM and endorsed by the NNSA Administrator. CGSR leadership provided analysis, bearing on the current crisis in Europe, by assessing the status of NATO's nuclear deterrent, which were presented to political and military leadership in numerous European capitals. CGSR led in building strategic war-gaming capability for NNSA and DoD in a partnership with Strand Analytica.

LLNS leadership completed a new Science and Technology Investment Strategy and pursued leading-edge work in biosecurity and climate. Senior LLNS leadership supported NNSA in defining a bio-assurance program and reviving an international memorandum of understanding between NNSA and Israel's Atomic Energy Commission.

LLNS leadership was highly effective as it acted promptly and decisively in response to the COVID-19 pandemic in coordination with senior NNSA leadership on safety protocols, evolving national and local vaccinations requirements, and transitioning to the New Normal.

LLNS' overall working environment was positive, as shown by a recent Glassdoor Employees' Choice Award (fourth year in a row), recognizing the laboratory as one of best places to work in 2022. LLNL ranked 37 out of 100, with work-life balance as the highest-rated workplace factor followed by career opportunities. LLNL is ranked 14 on the list of large employers in the San Francisco Bay Area. LLNS leadership took steps to improve recruiting and retention in order to fully support the missions of the Laboratory and DOE/NNSA with a tight labor market, increased local competition for top talent, and rising cost of living. LLNS supported program outreach through the Neurodiversity Intern Program and Summer Internships providing for future generation workforce. LLNS leadership established a new collaboration with the Colorado School of Mines, in part to provide a pipeline of new employment candidates and focused in the energetic materials area.

LLNS management responded to the FY 2021 Contained Firing Facility over-pressurization event and facility shutdown, dedicating significant resources to make necessary repairs and upgrades and implement a recovery plan that restarted the facility operations in June, while minimizing

programmatic impacts. LLNS participated in the NNSA Enhanced Minor Construction and Commercial Practices pilot and completed the first project.