



National Nuclear Security
Administration

Lawrence Livermore
National Security, LLC

Performance Evaluation
Report (PER)

NNSA Livermore Field Office

Evaluation Period:
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2020

November 25, 2020

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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, 2019 through September 30, 2020, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP). The NNSA took into consideration all input provided (e.g. CAS, Program Reviews, etc.) from NNSA Program and Functional Offices at Headquarters and in the field.

LLNS overcame significant challenges and earned a Very Good Rating on Goal 1, exceeding expectations on many Objectives and Key Outcomes. Despite the impacts of COVID-19, 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 of stockpile stewardship. LLNS earned Excellent ratings on Goals 2-4, exceeding expectations on nearly all Objectives and Key Outcomes. 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 DOE and Strategic Partnership Project (SPP) programs. The 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 expectations on nearly all Objectives and Key Outcomes through its strong partnership with NNSA and effective leadership in overcoming historic challenges.

Performance against the Goals summarized below, resulted in an overall rating of Excellent for LLNS. Specific observations for each Goal are provided in the following pages

Goal 1: Mission Execution: Nuclear Weapons **LLNS Total Fee Allocation: \$13.14M**

LLNS earned a rating of Very Good and 90% of the award fee allocated to this Goal. Despite the impacts of COVID-19, LLNS exceeded many of the Objectives and Key Outcomes and met the overall cost, schedule, and technical performance requirements with many accomplishments that greatly outweigh issues. No significant issues in performance exist. Contractor is generally meeting performance expectations within expected costs.

LLNS scored "Blue" in all 142 milestones relating to the management of the nuclear weapons mission. Two Defense Program (DP) Level 1 milestones: Assessment of ATDM Codes on Next-Generation Platforms and SCDS Pegpost – 2020 Hostile Survivability Baseline Capability were moved to FY 2021 due to COVID-19 impacts. Overall, LLNS did a commendable job reacting to the COVID-19 pandemic by instituting strong precautions to protect the workforce while utilizing innovative strategies to ensure that DP's highest

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priority missions remained on schedule.

The National Ignition Facility (NIF) was one of the first large, scientific facilities in the nation to restart operations after onset of the COVID-19 pandemic. LLNS did an outstanding job of weighing the available information regarding the virus and developed and implemented a restart plan that allowed the workforce to safely resume operations in a phased approach. This allowed the facility to resume critical HED experiments in support of the stockpile. All milestones were “Blue” at the end of the FY. NIF executed 327 total shots in FY 2020, including 133 shots in support of the High Energy Density (HED) program, and 8 shots in support of the Inertial Confinement Fusion (ICF) program. NIF supported LEP experiments requiring tailored X-ray effects, System Generated Electromagnetic Pulse (SGEMP), post shot sample recovery and unique 14MeV neutron effects testing. The highest hot spot energy and yield to date was achieved in a DT experiment that attained an energy of ~9 kJ and slightly exceeded the neutron yield record totaling 2×10^{16} neutrons. NIF executed the highest-pressure plutonium X-ray diffraction experiment to date to better understand the phase diagram of plutonium. NIF also executed U strength measurements using simplified Rayleigh-Taylor (RT) instability platform. The first 3-D NIF implosion simulation run on Sierra resulted in contributing to the understanding of NIF implosion performance and further underpin the results presented in the 2020 NNSA Report on Laser Indirect Drive. LLNS participated in the ICF 2020 Goal, providing robust support to HQ ICF 2020 review and JASON review of ICF. It delivered a credible and sophisticated multi-year assessment of Laser Indirect Drive proximity to ignition, energy scaling, and capability requirements, coordinated with stakeholders across national program.

LLNS advanced the technology readiness level of the Special Materials project by innovative use of current equipment, successful collaboration with commercial vendors, and detailed technical program execution resulting in a well understood and defined engineered material development that enables replacement legacy materials. LLNS continued to efficiently shepherd the procurement and installation of new capital equipment to finalize technology maturation efforts.

LLNS successfully met 11 of its 13 L2 High Performance Computing (HPC) deliverables on schedule, and 2 were moved to FY21 due to COVID-19 impacts, a clear demonstration of successful leadership during an unprecedented pandemic and completed the initial migration to the Next-Generation HPC Network architecture. This accomplishment simplifies network administration, improves flexibility and ability to respond to user requirements along with reducing overall costs

LLNS fully supported Nuclear Explosive Safety (NES) activities and continued to rebuild its subject matter expertise in that area. LLNS provided voting NESSG members to support B61 NESS Validations, W78 OSR, and all required NES Change Evaluations, and successfully met stockpile system surveillance activities. LLNS supported W80 ALT 369 production activities and expedited the release of numerous engineering authorizations. Additionally, LLNS managed the process to meet all deliverables of the Interlaboratory Nuclear Weapons Assessment Program (INWAP) assessing the B61, W76, W78, and W88.

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LLNS supported all W87-1 6.2 activities and tasks and proactively addressed several high-risk component areas, executed design trades and studies, supported key material supply and demand challenges, and worked collaboratively with SNL and all production agencies. LLNS increased program staffing from 40 to 100 FTEs, stood up 7 Product realization teams,

(b)(4)

LLNS continued to support all Ground-Based Strategic Deterrent (GBSD) related activities and provided regular input to NNSA and Air Force on GBSD programmatic planning documents. While there were some minor delays due to COVID-19, LLNS has been successful in achieving all priority deliverables for the W87-1.

LLNS fully supported NNSA's COVID-19 mitigation response and requirement to resume W80-4 mission essential status. LLNS showed commitment to the success of this program by noting internal limitations and asking SNL and LANL for assistance with engineering and drafting support in the limited COVID-19 operating environment. LLNS is commended for seeking out subject matter expert consultation in production methods and process qualification activities. LLNS met overall W80-4 Phase 6.3 cost and technical performance requirements in and met deliverables or addressed schedule recovery in the Monthly Site Status Report. LLNS hiring rate was less than planned and in order to avoid future impacts LLNS needs to improve hiring rates in several disciplines.

LLNS made very good progress on Dynamic Materials Properties and Secondary Assessments Technology in spite of COVID impacts. LLNS tested the material strength of He-doped Lead in the HED regime on NIF. Ramp compression experiments on tantalum in support of hydro tests reached almost 1000 GPa peak pressure. Opacity analysis of high Z material and NIF platform development continued. Room temperature Equation of State (EOS) of the High Explosive LLM-105 was determined up to 40+ Gpa, and advanced Quantum Simulations are guiding the development of novel poly-CO energetics under the DoD Joint Munitions Program. The LLNS team conducted an 8 shot Omega-EP tin RT (Raleigh Taylor) campaign. JASPER executed a shock experiment on accelerated aged Pu that was 270 yrs. in equivalent age. In Primary Assessment Technologies, the Fission TPC experimental campaign aimed at improving ^{239}Pu fission cross section is nearing completion but has been moved to FY21 due to COVID impacts. Delays continued in installing equipment at the Superblock facility that is needed for plutonium target fabrication. The completion of this capability has been delayed from the end of FY 2020 to mid FY 2021. Both COVID-19 and delays in certifying the glovebox equipment have been the limiting issues. LLNS established a team to prioritize and deconflict work in Superblock to rectify this. LLNS also identified risks to accomplishing program scope in Superblock in FY 2021. LLNS will need to continue to work with stakeholders to develop options for the Superblock security configuration to avoid impacts in FY 2021.

LLNL performed good work with its partners (LANL, SNL, and NNSS) on the Advanced Sources and Detectors project. However, the project is over budget by \$8.5M and has only ten days of contingency remaining to meet the submittal commitment of 12/31/21. The project continues to fall further behind schedule each month. The schedule delays are due primarily to (i) delays in design and testing for the U1a-compatible pulsers, (ii) delays in

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Injector Design/Technology Maturation, and (iii) Technology Maturation results that have resulted in redesign efforts of the injector.

Goal 2: Mission Execution: Global Nuclear Security
LLNS Total Fee Allocation: \$1.88M

LLNS earned a rating of Excellent and 95% of the award fee allocated to this Goal. Despite the impacts of COVID-19, LLNS exceeded nearly all of the Objectives and Key Outcomes and met the overall cost, schedule, and technical performance requirements with accomplishments that significantly outweigh very minor issues, if any. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS provided outstanding expertise in implementing nuclear security engagements in critical technical support areas with partners worldwide, including the Middle East and North Africa regions. LLNS played a principal role in supporting capacity building programs and conducting peer-to-peer laboratory analytical studies intended to extend capabilities and assess existing capabilities of partner countries with notable recent advances in Kazakhstan. LLNS provided the Office of Radiological Security with excellent technical support, including training development in Africa, the Middle East, and Europe.

LLNS provided effective scientific and program management leadership in the establishment of the Advanced Instrumentation Testbed and related research experiments proposed by DOE laboratories, U.S. universities, and the United Kingdom. LLNS exceeded expectations in alternative manufacturing and other emerging technologies, resulting in a new multi-lab venture studying weaponization pathways from manufacturing to high explosive testing. LLNS demonstrated the use of artificial intelligence technologies to improve characterization of activities related to the illicit production of special nuclear material, enabling earlier detection of nuclear proliferation. LLNS effectively synchronized the Vulcan Venture between seven National Laboratories, sites, and plants and continued to provide world-class scientific leadership in nuclear physics oriented efforts directed toward nonproliferation applications. Additionally, LLNS continued to set the standard within the DOE laboratory complex on radiation detection materials for nonproliferation. LLNS conducted innovative research in ground-based nuclear detonation detection, particularly in developing algorithms to help discriminate between underground shockwaves of natural versus explosive origins. LLNS forensics scientists made substantive advances in understanding and accuracy of its methods by developing technical tools that incorporate the results of years of research in precision nuclear data parameters.

LLNS Subject Matter Experts (SME) provided excellent support to the International Nonproliferation Export Control Program (INECP), including modifying the Technical Risk Assessment for Dual-Use Exports workshop for remote delivery and developing the strategic trade control system gap analysis to inform INECP's engagement strategies. LLNS provided excellent support to the Export Control Review and Compliance/Interdiction team

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by preparing high quality analyses in support of dual-use license reviews within required timelines.

LLNS provided essential contributions for several Office of Nuclear Verification Warhead Verification Program activities including maintaining certification as a U.S. Designated Laboratory for Chemical Weapons Convention (CWC) analyses, representing DOE/NNSA on CWC implementation matters, and supporting the preparatory commission for the Comprehensive Nuclear-Test-Ban Treaty Organization's International Monitoring System and Data Centre. LLNS provided excellent support to NNSA as part of the USG effort to begin negotiations on a new arms control agreement with Russia. LLNS also provided creative and high-quality support for state-level safeguards studies and international engagement efforts in North Africa for safeguards applications.

LLNS successfully provided critical planning for nuclear incident response exercises and maintained demanding watch bill support for Nuclear Emergency Support Team response capabilities and national level exercises. LLNS continued to successfully meet technology integration deliverables, manage nuclear incident response efforts according to national policy, and support special requests for information and assistance throughout the ongoing COVID-19 pandemic. LLNS provided SME support to major Nuclear Threat Reduction collaborations with foreign partners, including science & technology and blind challenge after action exchanges, furthering the USG's understanding of nuclear threats and nuclear device defeat capabilities. LLNS continued to provide on-call, responsive, and value-added information analysis to inform counterterrorism and counterproliferation policy; to make recommendations to NNSA leadership; and to integrate new elements and tools into the larger nuclear incident response mission.

Goal 3: DOE and Strategic Partnership Project Mission Objectives **LLNS Total Fee Allocation: \$5.79M (\$1.87M FF + \$3.92M AF)**

LLNS earned a rating of Excellent and 95% of the award fee allocated to this Goal. Despite the impacts of COVID-19, LLNS exceeded nearly all of the Objectives and Key Outcomes and meeting the overall cost, schedule, and technical performance requirements with many accomplishments that significantly outweigh very minor issues, if any. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS successfully executed high-impact work in support of the DOE and SPP sponsors. This work is strategically integrated with the DOE/NNSA mission and leverages, sustains, and strengthens many of the laboratory's unique capabilities, facilities, and skills as demonstrated with accomplishments in the areas of computations, advanced manufacturing, laser science and technology, and bioengineering. LLNS earned numerous prestigious awards from professional societies and U.S. Government sponsors demonstrating the quality of work and its strategic value. Two scientists were recipients of DOE's Office of Science Early Career Research Program.

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LLNS directed considerable research infrastructure, capabilities, and teams of scientists and engineers to support the fight against COVID-19. LLNS participated in a White House initiative to provide researchers worldwide access to the most powerful high-performance computing (HPC) resources to advance the pace of scientific discovery; the Corona supercomputing cluster is undergoing upgrades to nearly double the system's peak compute power. LLNS research teams continued to help identify top anti-viral drug candidates and validate the efficacy of computationally designed antibodies through experimental work. These efforts sped the development of life-saving therapeutics. LLNS engineers developed an FDA-approved emergency ventilator dubbed, "Novel Emergency Response Ventilator" (NERVe), with design derived from proven concepts and assembled using off-the-shelf parts. LLNS created a COVID-19 data portal to expedite access to Laboratory modeling results and numerous other projects.

LLNS made significant strides in advancing the transformative energy technologies supported by DOE. A Critical Materials Institute team led by an LLNS scientist developed a scalable biosorbent material technology to recover rare earth elements (REEs) from consumer electronic waste. The technology improves the domestic supply of REE essential for American competitiveness in the clean energy industry. LLNS researchers developed innovative methods for controlling the structure and properties of two-dimensional materials, with potential to impact flexible electronics and energy storage. LLNS detailed the first quantitative measurements of the magnetic field structure of plasma filamentation. This novel technique opens a new way to directly probe electromagnetic plasma instabilities, relevant to a wide range of problems including inertial confinement fusion.

In recognition of its leadership in high performance computing, a multi-institutional team, led by LLNS computer scientists and funded by DOE, received the Best Paper award at the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19) for a first-of-its-kind multiscale simulation of cancer-causing protein interaction with human cell membranes. Also in the field of human health, LLNS researchers made discoveries in the space station's environmental microbial profile that are essential in designing preventive measures needed for long-term space travel.

LLNS researchers reported predictive kinetic models that describe the fate and transport of radioactive materials in the atmosphere following a nuclear incident. The work provides the first detailed experimental insights to help explain the long-standing problem of why uranium can exhibit variations in volatile behavior during nuclear fireball condensation. LLNS researchers also completed in-depth investigation into how a nuclear impulse could deflect a massive asteroid. The study presents a deflection technology that could be effective in deflecting a massive asteroid and protecting life on Earth.

LLNS scientists identified a robust suite of technologies to help California clear the last hurdle in becoming carbon neutral and ultimately carbon negative by 2045. This groundbreaking study, "Getting to Neutral: Options for Negative Carbon Emissions in California," was conducted as part of LLNS' expansive energy programs work and the Laboratory's Carbon Initiative and funded by the Livermore Lab Foundation and

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Climateworks Foundation.

Goal 4: Mission Execution: Science, Technology, and Engineering
LLNS Total Fee Allocation: \$19.85M (\$16.09 FF + \$3.76M AF)

LLNS earned a rating of Excellent and 95% of the award fee allocated to this Goal. Despite the impacts of COVID-19, LLNS exceeded nearly all of the Objectives and Key Outcomes and met the overall cost, schedule, and technical performance requirements with accomplishments that significantly outweigh very minor issues, if any. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS' research strategy and investments, including the Laboratory Directed Research and Development (LDRD) program, successfully advanced the frontiers of science while maintaining a strong foundational expertise in core competencies, and developing the skills of the workforce. LLNS' research developed excellence in core capabilities that affected DOE/NNSA missions; produced new intellectual property resulting in high profile publications; enabled workforce development and staff retention; and expanded the frontiers of ST&E.

LLNS research team designed a new generation of compressor gratings that could provide a 20 percent performance boost for ultrafast high-power laser systems, which is an increase of 10,000 times compared to common industrial technologies. Combining ultrahigh-speed x-ray imaging with high-fidelity computer simulations, LLNS researchers discovered a process to eliminate defects in laser-based metal 3D-printing processes. LLNS' smart materials scientists have developed an artificial intelligence (AI) method for designing future materials and predicting long-term age-induced change in the performance of stockpile-relevant materials. LLNS developed a machine learning framework, which accelerates high-performance materials development and reduces bottlenecks in conventional materials development to support a variety of national security mission needs.

LLNS scientists developed a chip-based device that mimics the blood-brain barrier. This development could enable recapitulating the effects of drugs or chemical agents on the central nervous system, which will help advance chem-bio countermeasure development. LLNS is pushing forward toward a carbon-neutral energy system as scientists have laid the groundwork for developing accurate theory-based assays to screen electrolytes for electrochemical conversion of carbon dioxide (CO₂) into chemical fuels and other commodity products. LLNS researchers achieved the highest-ever-resolution quake simulations using the Sierra supercomputer. Understanding high-frequency shaking is critical for evaluating seismic hazards and the risk of damage to buildings, transportation, and utility lifelines.

LLNS continued to invest in developing its ST&E workforce and was able to attract, develop, and retain high-caliber employees. LLNS, already a 2019 Glassdoor Employees' Choice

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Award winner, jumped 18 spots for 2020, ranking 6 out of 100 on Glassdoor's "Best Places to Work U.S Large." LLNS staff received numerous notable awards and fellowships from ST&E communities, including a Kavli Fellow of the U.S. National Academy of Sciences, 2019 Fellows of the American Physical Society a Fellow of The American Astronomical Society, the "Outstanding Early Career Achievement in Forensic Science Award" by the American Academy of Forensic Sciences, and the California Air Resources Board Haagen-Smit Clean Air Award for 2019.

LLNS performed well in innovation and technology transfer to industry through partnerships that include both Cooperative Research and Development Agreements (CRADAs) and licensing agreements. LLNS researchers received four Research & Development 100 awards. This year's winners include Spack, IMPEDE, the Scalable Checkpoint/Restart Framework 2.0, and the MC-15 Portable Neutron Multiplicity Detector. Two of these technologies also won technology transfer awards from the Federal Laboratory Consortium. Three LLNS employees won the "best in class" award from the Department of Energy's Technology Transfer Working Group for the category of economic development for its work on the Advanced Manufacturing Laboratory

Goal 5: Mission Enablement

LLNS Total Fee Allocation: \$11.27M

LLNS earned a rating of Very Good and 90% of the award fee allocated to this Goal. Despite the impacts of COVID-19, LLNS exceeded many of the Objectives and Key Outcomes and 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.

Overall, the Environment, Safety, Health, and Quality (ESH&Q) programs at LLNS continued to support mission execution in an effective, efficient, and responsive manner. ES&H and Occupational Medicine programs provided outstanding support to LLNS' COVID-19 pandemic response, which included providing technical support at the Emergency Operations Center, implementing the Pandemic Flu Response Plan, overseeing case management, assembling a rapid response team, conducting contact tracing when needed, developing training for all site employees, facilitating regular communications to management and staff, and providing outreach support. LLNS is working to ensure an explosives safety site plan is approved for each facility requiring one. Environmental Functional Area personnel have streamlined processes for collaboration with external environmental regulatory agencies, while addressing issues in response to unexpected environmental concerns. LLNS successfully recertified: ISO 9001, 14001; Certified 45001; and is making strong progress in revitalizing its process for identification, prevention and reporting of Suspect/Counterfeit Items. However, LLNS lacks a plan for major updates of the fire protection systems with many fire sprinklers, alarms, and fire department vehicles nearing the end of their service life.

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LLNS exceeded expectation in the number of TRU waste containers characterized and certified as shipments to the Waste Isolating Pilot Plant have commenced. In addition, certification of the TRU Waste Enduring Program was successfully obtained. Although deployment of the new L Waste software slipped into FY 2021, LLNS met all of the program goals, including the establishment of a Special Project Group for D&D project wastes and the disposal stretch goal for more complex waste streams. LLNS continued to meet its environmental cleanup regulatory commitments as well as the onsite vapor intrusion sampling obligations and the coordination requirements under the Soils Sampling and Management Plan.

A DOE EA assessment completed in February 2020 identified LLNS' Work Planning and Control (WP&C) program a best practice model for other DOE laboratories. However, WP&C for hazardous energy safety and the flow-down of DOE safety requirements for subcontracted construction work remain as concerns. LLNS is implementing a plan to address institutional electrical safety events identified in FY 2019 but has been unsuccessful at curtailing the trend. Additional site-wide action is warranted to prevent reoccurrence as LLNS resumes full operations.

The LLNS Safety Basis (SB) Program successfully implemented the safety basis safe harbor standards and requirement. However, LLNS' response to the WSF Review Comment Records (RCRs) and the Documented Safety Analysis re-submittal were performed with minimal collaboration and without LFO agreement, which caused LLNS to withdraw the submittal. The B332 annual update comment resolution had initial collaboration but ultimately 23 of the comment resolutions were submitted without agreement, resulting in 15 open comments. Senior LFO and LLNS engagement was required to realign laboratory expectations. Performance in this area needs to improve to ensure the underlying assumptions supporting annual updates are contained in submittals with adequate basis, accident scenarios are properly derived and defensible, and LFO comments are adequately addressed. LLNS response times need to be improved. The COVID-19 pandemic significantly delayed several Vital Safety System projects for upgrade and replacement to aging systems, including the iCAM upgrade, Emergency Diesel Generator replacement, LN2 Vaporizer upgrade, and programmatic gloveboxes.

LLNS continued to build productive relationships with LFO, NA-50, NA-19, and NA-10 by extensive cooperation and deftly executing capital projects. LLNS completed two of the three Applied Material and Engineering (AME) on time and on budget with the third AME building progressing well on schedule and on budget. The LLNS project management office (PMO) greatly enhanced LLNS' ability to safely execute a variety of GPP, IGPP, and line item projects on schedule and on budget. LLNS revised many processes and stood up a baseline change control board to further ensure rigor and consistency on its execution of projects. LLNS doubled on time completion of minor construction projects. LLNS' restart strategy due to the pandemic was successfully executed, minimizing risk to mission need. LLNS continues to build effective and productive relationships with NA-IM and other NNSA sites to develop and implement a classified mission network infrastructure that supports the NNSA mission goals and objectives. This secure infrastructure will support weapon activities and non-weapon activities goals and objectives.

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LLNS excelled in addressing NA-50's FY20 Make It Happen List by initiating Microsoft PowerBi and connecting BUILDER, G2 project data, Mission Dependency Index (MDI), and capability data for the first-of-its-kind analytics, thereby creating models that monitor and define LLNS's Deferred Maintenance, Repair Needs, and Replacement Plant Value. LLNS addressed deferred maintenance and provided excellent leadership in the completion of the Safety Analytics Forecasting Evaluation Reporting (SAFER) pilot for maintenance for the NNSA Complex. LLNS continues to develop Area Plans that address infrastructure and utilization needs in support of mission requirements, such as addressing the immediate need for additional office space (three new office buildings are in design/construction) and programmatic space (e.g., AME). However, EM demolition projects as well as the quality, timeliness, and overall responsiveness to multiple NNSA deliverables and information requests were problematic due to poor planning. LLNS is pursuing sustainable design and US Green Building Leadership in Energy and Environmental Design Certification to support the goal of energy and water efficient infrastructure and operations. Continuing performance issues were noted in the electric metering infrastructure, which is in major need of maintenance and repair.

LLNS performed above expectations on one line-item project, met expectations on three projects, and was below expectations on one project. The Expand Electrical Distribution System (EEDS) project achieved CD-4 Project Completion on August 26, four months ahead of schedule and approximately \$1.1M below the \$33.8M cost estimate. The Exascale Computing Facility Modernization (ECFM) project achieved CD-2/3 in December 2019, and met expectations on cost and schedule with CD-2/3 metrics of CPI=1.01 and SPI=1.03, at 34% complete with work progressing safely. The final COVID impact was \$22K with no schedule impact. The Digital Infrastructure Capability Enhancement (DICE) project achieved CD-0 Approval of Mission Need in July 2020. An Analysis of Alternatives is underway to determine the scope of DICE. The Emergency Operations Center completed civil design and issued a Notice to Proceed for early site construction. The building design is expected to be completed in December 2020.

LLNS delivered efficient, effective, and responsible business operations, systems, and financial management. LLNS' Office of the Chief Financial Officer (OCFO) received an Overall Rating of "Excellent" from NA-MB, a "Pass" on all measures, and a significant accomplishment was noted for LLNS' COVID-19 financial reporting. Furthermore, OCFO provided thorough and effective responses to NNSA's COVID-19 leave charging inquiries. OCFO's responses were instrumental in supporting MB's recommendations on COVID-19 cost charging methods to NNSA's senior leadership. Supply Chain Management (SCM) completed 52 eSourcing events totaling \$695 million, a ten-fold increase over FY 2019. SCM awarded one of the Department's largest Small Business (SB) and Small Disadvantaged Business (SDB) subcontracts valued at \$521M and achieved \$31.5 million in Strategic Sourcing Savings. Property Management was rated "Excellent" with all three physical inventories accomplished on time. Independent Audit and Ethics Department (IAED) provided excellent support during the Office of Inspector General's \$4.7B Cost Allowability Audit and continued to execute the Cooperative Audit Strategy at a very high level. The Environmental Protection Agency recognized LLNS as a winner of the Federal Green

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Challenge for its efforts to provide a sustainable charging infrastructure. Of the six challenging small business goals, LLNS exceeded in two categories (WOSB and VSOB) and did not fully achieve in four other categories (Small Business, HUBZone, SDVOSB, and SDB).

The Office of General Counsel (OGC) exercised sound judgment and effectively represented the Laboratory in challenging legal matters this year, such as successfully defeating a subpoena request for production of LLNL equipment at the criminal trial of a former LLNS CRADA participant and secured P.L. 85-804 legal protections for a high-profile CRADA for the design, development, production, and distribution of a novel ventilator.

LLNS achieved baseline security requirements for the site's overall security posture and demonstrated overall effective protection of classified matter, especially in light of changing operating conditions due to COVID-19. LLNS proactively adjusted its officers' schedules into two rotating shifts to limit close interaction between officers and the workforce to protect them against the spread of COVID-19 and maintained appropriate staffing levels while successfully providing physical access and protection to the site. LLNS' FY 2020 T2 Annual Operating Plan and Protective Force Supplemental submissions were the most accurate, comprehensive, and detailed deliverables that Office of Defense Nuclear Security (DNS) received from any site. With each recurring submission, LLNS consistently demonstrated a commitment to balancing resources with risk. LLNS' performance is the best in the complex, exceeding expectations.

LLNS participated at the Security & Protection (S&P) 2020 Technical Interchange Meeting, which was an overall success. S&P assisted with several enterprise programming solutions dealing with the Argus Program. These solutions allowed the system to maintain the proper tracking of tasks for program development. In addition, the LLNS S&P staffing rebounded to maintain core Argus competencies in support of current operational needs while adding staff to support the development of the new Argus/Caerus effort. The S&P leadership team established requirements and deliverables for a future plug-in capability (Universal Messaging Gateway), which will allow for integration of current Argus field processors with future "off the shelf" field processors in support of a seamless transition to Caerus.

LLNS exceeded expectations in cybersecurity, despite the challenges of executing in a maximum telework posture due to the COVID-19 pandemic. LLNS developed and supported enterprise supporting capabilities in classified computing and centralized enterprise identity management in the OneID service. In addition to advancing the governance of information systems, LLNS actively implemented Risk Management Framework within a constrained funding environment and increased use of cloud services by FEDRamp-approved products and processes. The Security Operations Center incorporated a COTS product to enhance the effectiveness and improve operational efficiencies in pursuit of reducing response times to information security incidents.

LLNS effectively and efficiently implemented its Emergency Management (EM) processes and operations in support of the site's COVID-19 response, which included a 15-week activation of its Emergency Operations Center (EOC). While never envisioned to be functioning in this virtual operating mode for a prolonged period of time, LLNS successfully

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adapted its EM activities to seamlessly support EOC operations, which included ongoing communications and notifications to DOE/NNSA Headquarters, LFO, and local stakeholders, as well as its workforce, for situational awareness purposes. LLNS established EOC Operational Periods with defined key objectives to drive response planning and execution; over 130 critical actions necessary to affect the response were identified and closed. A major deliverable completed during EOC activation was sourcing, purchasing, receiving, and distributing supplies essential to managing risks created by the pandemic.

Goal 6: Mission Leadership
LLNS Total Fee Allocation: \$7.51M

LLNS earned a rating of Excellent and 91% of the award fee allocated to this Goal. Despite the impact of COVID-19, LLNS exceeded nearly all of the Objectives and Key Outcomes and meeting the overall cost, schedule, and technical performance requirements with many accomplishments that significantly outweigh very minor issues. No significant issues in performance exist. Contractor is meeting performance expectations within expected costs.

LLNS leadership continued to demonstrate its strong commitment partnership as it worked very closely with NNSA to meet program priorities and overcome historic challenges. Senior Management acted promptly and decisively in responding to the COVID-19 pandemic and recent wildfires in close coordination with senior NNSA leadership. LLNS was the first NNSA site to reduce operations in response to the emerging local COVID-19 conditions. LLNS transitioned to a telework posture safely and securely in advance of DOE/NNSA guidance and provided timely responses to a myriad of urgent data calls. LLNS planned and executed a living re-start plan and worked across the enterprise to support other M&O partners in order to meet NNSA enterprise needs and protect the workforce, all while successfully executing NNSA program priorities.

LLNS leadership strengthened construction management and acquisition as evidenced by completion of the EEDS project ahead of schedule and under budget (with added scope) and the Applied Materials and Engineering (AME) Complex Buildings 223 and 224 on schedule and budget.

LLNS demonstrated strong leadership in adding and pivoting existing research activities to address a broad range of scientific challenges associated with COVID-19 medical treatments and response options. LLNS leadership coordinated world-class research infrastructure, unique research capabilities and a dedicated team of scientists and engineers to support the fight against the COVID-19 pandemic as detailed under Goal 3.

LLNS developed an informative Strategic Plan and was an active participant in developing the enterprise planning guidance, including serving on the Capabilities Working Group and partnering with other NNSA laboratories and sites to identify cross-cutting challenges and opportunities that would benefit from collaboration across the nuclear security enterprise. LLNS responded to the new national emphases on accelerating production and

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certification/ qualification timelines. To support milestones for the W80-4 Life Extension Program and W87-1 Modification Program, LLNS developed a new paradigm for component production: a joint Polymer Production Enclave in partnership with Kansas City National Security Complex. LLNS also initiated an internal strategic planning effort to create a long-range vision for the Laboratory over a 30- to 50-year horizon.

LLNS continued to demonstrate performance results through effective utilization of and improvements to the Site Governance System. LLNS successfully completed assessments of the implementation and effectiveness of the Contractor Assurance System (CAS) and planning for FY 2021 as agreed to by LFO. The Integrated Health of the Program (IHOP) process was refined and improved through the addition of a risk element and the DOE Office of Enterprise Assessments (EA-32) Work Planning and Control Assessment Report identified the IHOP process as a best practice. LLNS leadership and partnership with LFO was instrumental in the successful development and implementation of a new integrated issues management system consisting of seven management assurance system tools in a single platform resulting in improved efficiency, transparency, and oversight. The Directors Office led efforts to implement more robust work control and transitioned roughly 1,100 work control products into a new work planning and control system; this approach was deemed a model for the complex by the DOE EA-32.

The Laboratory Director and leadership team, including the General Counsel and Chief Financial Officer, worked collaboratively with NNSA to fund the first multi-million dollar installment of a long-term NNSA liability resulting from the settlement of major litigation against UC (Requa).

While the U1A Complex Enhancement Project (UCEP) and Advanced Sources and Detectors (ASD) projects are behind schedule and over budget, all organizations worked together to improve performance. Following the identification of significant increases in requirements/costs on UCEP Subproject 020, personnel participated in multiple activities to define, refine, and control requirements and scope within the UCEP project. The ASD APR (May 2020) identified that ASD and UCEP are adequately integrated and all four sites are effectively integrating on the ASD project.

LLNS exhibited sustained professional excellence as illustrated by multiple national-level recognitions, which included three team Secretary of Energy Achievement Awards, four R&D100 awards, an EPA Federal Green Challenge Award, and multiple examples of national-level professional society recognition of individual staff members for high quality science over sustained periods and engagement within the broader scientific and technical communities. LLNS hosted the first Employee Resource Group Leadership Summit in the San Francisco Bay Area with participation from LLNL, LBNL, SLAC, SNL, NASA, and DOE.

LLNS' overall working environment was positive as shown by a recent Glassdoor Employees' Choice Award (second year in a row), recognizing the laboratory as one of the top 10 best places to work nationwide in 2020. LLNS was the top laboratory employer in the US and finished as the second highest large employer in the San Francisco Bay Area ahead of well-known companies such as Facebook, Google, and Apple. LLNS proceeded with

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hiring and onboarding of new employees with interviews conducted remotely and virtual new employee orientation. Through the innovative work of the LLNS summer student program office and the dedication of mentor scientists across the Laboratory, LLNS also proceeded with a fully virtual summer program for nearly 500 students, approximately half the size of the regular program.

LLNS continued leadership engagement is needed to continue to address several concerns going forward including improved alignment of the compensation system, ongoing staffing shortages on the W80-4 and W87-1 to prevent impacts to future deliverables, and tight coordination of Department of Defense interactions with NNSA in the Strategic Communications, and improvements to minimize the risk of unauthorized access or compromise of classified information as programmatic work increases.

LLNS has responded to the new national emphases on accelerating production and certification/qualification timelines. In SRP LLNS has proposed and is executing effective partnerships with the production sites on high impact manufacturing processes that could provide the ability to respond to future requirements in a much more timely manner, specifically for HE fabrication and case production and broaden pit reuse options to respond to emerging needs.

LLNS has provided a number of innovative approaches for meeting NWC priorities for examining future deterrence challenges that are under consideration for further exploration. LLNS is also developing in partnership with the production sites technologies and approaches that can reduce the cost and schedule for qualification and acceptance testing of components.