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National Nuclear Security  
Administration

Lawrence Livermore  
National Security, LLC  
Performance Evaluation  
Report

Fiscal Year 2014  
Performance Evaluation  
Report (PER)

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NNSA Livermore Field Office

Performance Period:  
October 2013 – September 2014

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November 14, 2014

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## Executive Summary

The Department of Energy/National Nuclear Security Administration (DOE/NNSA), Livermore Field Office (LFO) in accordance with guidance from the DOE/NNSA Office of Infrastructure and Operations (NA-00), prepared this Performance Evaluation Report (PER). The purpose of this report is to provide a performance evaluation for Lawrence Livermore National Security, LLC (LLNS) in meeting all requirements under contract DE-AC52-07NA27344 and the DOE/NNSA Strategic Performance Evaluation Plan (PEP). The evaluation period for this report is from October 1, 2013 through September 30, 2014.

The PER evaluated each Performance Objectives (PO) defined in the Fiscal Year (FY) 2014 Strategic PEP and is based on the results of the LFO's oversight and DOE/NNSA Program and Functional Office programmatic input. DOE/NNSA also considered LLNS' self-assessment, which was provided per the terms and conditions of this contract, and is overall in agreement with the information provided in that assessment. This report includes adjectival ratings per the Federal Acquisition Regulation (FAR) Subpart 16.4, Table 16-1, for each PO based on LLNS' performance against the Contributing Factors, Site Specific Outcomes, and other criteria as set forth in the Strategic PEP. The evaluation of performance considers unanticipated barriers (e.g., budget restrictions, rule changes, circumstances outside Contractor's control), accomplishments, and other events. The degree of difficulty is considered when determining whether these outcomes meet or exceed expectations.

LLNS' performance under PO-1: *Manage the Nuclear Weapons Mission* is rated as 'Excellent'. LLNS earned an excellent rating based largely on its performance in the Advanced Scientific Computing (ASC) program and the National Ignition Facility (NIF). LLNS achieved significant operational efficiencies in NIF, improving the shot rate, and executed challenging experiments in support of the Stockpile Stewardship Program (SSP) and other national priorities, improving the scientific value of the data. In the ASC Program, LLNS continued to successfully develop codes and perform groundbreaking simulations in support of the SSP and Nuclear Weapons Mission across the enterprise. LLNS also successfully executed all Level 2 milestones funded by Defense Programs, exceeding many technically challenging performance expectations, in a safe and secure manner. While LLNS excelled in most areas in this PO, there is room for improvement with the Advanced Radiographic Capability (ARC) effort.

LLNS' performance under PO-2: *Broader National Security Mission* is rated as 'Very Good'. Overall, LLNS successfully executed the Broader National Security Mission work, exceeding many expectations in non-proliferation, emergency operations, and counterterrorism. LLNS continued to provide support related to safeguards engagement in North Africa and Southeast Asia in spite of the challenges posed by political and security issues. LLNS also provided world-class technical expertise across the spectrum of Confidence Building Measures bilateral engagements and provided outstanding support to the Warhead and Fissile Material Transparency Program in developing and evaluating future monitoring approaches. LLNS developed the first alternative to He-3 using pulse-shaped discriminating plastics, increasing effectiveness and reducing costs of neutron detectors, and also developed a secure and reliable means to track warheads and nuclear materials through passive Radio Frequency tags. LLNS effectively performed work in support of national security for strategic sponsors including counter-proliferation analysis for Department of Defense; chemical security for the Department of State; and emerging chemical, biological and radiological threats for the

Department of Homeland Security. LLNS also remains a leader in performing critical national security work for the U.S. intelligence community.

LLNS' performance under PO-3: *Science, Technology & Engineering (ST&E) and Other DOE Mission Objectives* is rated as 'Excellent.' Overall, LLNS exceeded expectations in effectively advancing the frontiers of Science, Technology, and Engineering (ST&E), including successfully executing other DOE mission as well as the Laboratory Directed Research and Development (LDRD) program. For example, LLNS provided leadership in additive manufacturing, developing new materials to cushion shock and absorb energies for both weapons and commercial applications and developed a technology that certifies pit reuse design resulting in significant cost savings. Research at LLNS consistently remains transformative, innovative, of high quality, recognized by the ST&E community, and validated through peer review. LLNS maintained a research environment that enhanced technical workforce competencies and research capabilities, which was strengthened through continuing education opportunities afforded to its employees. Staff at LLNS received numerous awards in FY2014 to include the Presidential Early Career Award for Science and Engineering (PECASE) and four R&D 100 Awards. LLNS was also recognized as "The World's Most Influential Scientific Minds," and contributions from LLNS' helped earn a Nobel Peace Prize for the Organization for the Prohibition of Chemical Weapons.

LLNS' performance under PO-4: *Operations & Infrastructure* is rated as 'Very Good'. Overall, LLNS exceeded many expectations in managing the safe and secure operations of the Laboratory and its infrastructure. Despite budget challenges, LLNS maintained effective and efficient quality, security, and environment, safety, and health programs. LLNS continued to implement long-term work planning and control improvements as well as improvements in both its nuclear safety and construction safety programs to ensure safe work execution. LLNS is maintaining focus on subcontractor work planning and control weaknesses and is addressing continuing challenges in corrective maintenance and deferred maintenance work order backlog. LLNS continued to deliver efficient and effective business systems, exceeding the overall goal for small business and produced outstanding personal property inventory results. LLNS provided outstanding technical support to the Waste Isolation Pilot Plant (WIPP) after a radiological release and developed a systematic safeguards and security risk management process, balancing the needs of security with operational efficiency and cost effectiveness.

LLNS' performance under PO-5: *Leadership* is rated as 'Very Good.' Overall, LLNS demonstrated significant improvement in leadership supporting the DOE/NNSA mission. LLNS displayed a commitment to the success of the laboratory and DOE/NNSA through enterprise solutions, such as collaboration with DOE/NNSA the Personal Property Management Program, as well as through its leadership in the Oak Ridge, Argonne, and Livermore National Laboratory (CORAL) procurement. LLNS made several key leadership changes and permanently filled critical vacancies with highly qualified individuals in close coordination with senior DOE/NNSA leadership. These changes resulted in a much greater level of transparency, customer focus, and better alignment of Laboratory and DOE/NNSA priorities, especially with respect to work performed by the NIF organization.

## Performance Objective 1: Manage the Nuclear Weapons Mission

### Summary

Lawrence Livermore National Security (LLNS) executed the Nuclear Weapons Mission work at an extremely high level, earning an excellent rating based largely on its performance in the Advanced Scientific Computing (ASC) program, and management of the National Ignition Facility (NIF). LLNS met or exceeded expectations in all areas and Program Implementation Plan work scope (Level 2 milestones) funded through Defense Programs. DOE/NNSA reviewed the LLNS Self-Assessment and agreed with the overall assessment of 'Excellent'. LLNS made substantial progress in improving efficiencies at NIF, significantly improving the shot rate, and made significant contributions to High-Energy Density (HED) science support of the stockpile. LLNS displayed outstanding leadership and performance in all areas of the ASC program. Specific observations follow.

**Excellent**

LLNS completed a major upgrade to its universal secondary aging model that incorporates real-life temporal variations in temperature for fielded weapons, updated models of three major materials, and probability distribution functions of initial materials conditions derived from as-built surveillance. LLNS developed a constitutive model for a specific polymer, which is the basis for replacement materials slated for use in LRSO (W80-4) and/or W78 LEP that included the interplay between Mullins softening and radiation hardening. LLNS met expectations in providing continuous maintenance and operations activities for packaging reconditioning, procuring spare parts, performing maintenance and certification activities.

While LLNS demonstrated improvements in the Corporate Software Quality Assurance Program and provided adequate Nuclear Explosive Safety Study Group (NESSG) membership support, some problems remain with inconsistency and timeliness of quality assurance metric submissions and inconsistency of quality assurance monitoring of weapon activities to ensure compliance with NAP-24.

LLNS performed above expectations by increasing knowledge of the state of the stockpile. LLNS kept the high priority surveillance program on track for the W78, B83, W80 and W87 by meeting directive documents schedule requirements and supporting the Integrated Weapons Evaluation Team meetings and planning. Specifically, LLNS coordinated closure of one remaining W80 Significant Finding Investigation and completed all W78 Glory Trip activities. LLNS conducted the first W87 modern core punch hydro at the Dual Axis Radiographic Hydrotest (DARHT) facility. LLNS completed the W87 detonator surveillance time and within budget. LLNS identified, investigated, tested and closed a W87 Significant Finding Notification (SFN) associated with Mechanical Safe Arming Detonator (MSAD) debris; completed 3 series of W87 tests to better quantify safety margins of MSADs in abnormal thermal environments; and issued W87 Qualification Evaluation Release (QER) to restart snowball testing at Pantex with significant improvements to the test protocol.

LLNS delivered stockpile work that met limited-life component exchanges (LLCE) and dismantlement requirements. LLNS coordinated W80 Neutron Generator extensions with Sandia National Laboratories (SNL) in support of Air Force logistics mitigation planning. LLNS provided excellent support with project personnel and weapons responders to complete the SS-21 Project Plan, Baseline

schedule, and conduct Conceptual HATT Walk-down consistent with requirements and schedule. LLNS led production and acceptance of W87 new corks and mock corks and met eight-month turnaround time from conception to delivery in conjunction with the Kansas City Plant (KCP). LLNS conducted several Engineering Evaluations (EE) and issued QERs to re-establish W87 production operations at the new National Security Campus (NSC); updated basic W87 documents for weapon response at Pantex to support and allow future operations; supported the response and resolution of a W87 priority Unsatisfactory Report (UR) relating to site J7; supported activities for the delivery of the W87 Small Ferroelectric Neutron Generator (SFENG) First Production Unit (FPU) delivered in accordance with Project Plan; executed W87 Alteration 360 and provided all physics Design Agency requirements for the replacement gas transfer system. LLNS successfully worked with the Production Agency (PA) to improve the DP-1 PCC manufacturing capabilities and correct the PCC manufacturing issues that were identified in previous procurements. LLNS made changes to the DPP-1 PCC design that will potentially correct some of the previous design and manufacturing issues.

LLNS executed an excellent program of work with the cooperation of the National Indirect Drive working group to plan and execute a challenging program of experiments to understand failure mechanisms in the point design executed in the National Ignition Campaign and to develop alternative approaches. Included in this is the completion of two key workshops, the first being the ignition data review and the second being the HED Science workshop for stockpile stewardship. Both conferences had broad national and international community participation to develop a national strategy. The former has resulted in better understanding of issues that must be addressed on the path to ignition and a clear overall strategy for approaching that work. The latter has identified a broad range of experimental opportunities to improve understanding and validate codes and models used for stockpile stewardship. Additionally, NIF continues to execute experiments in the "high foot" effort as well as efforts to pursue High Density Carbon ablaters. Continued diagnostics improvements led to increased insights regarding the impact of asymmetries on capsule performance. Yields, while marginally demonstrating some alpha-heating effects, are sufficient to begin stockpile stewardship experiments to explore the impact of plasma conditions on thermonuclear burn. NIF executed the first shot using a beryllium ablator in a campaign that is in support of a Los Alamos National Laboratory (LANL) effort.

LLNS exceeded expectations by completing all work on schedule including the execution of a hydrotest at the Contained Firing Facility (CFF) to study materials manufacturing options for future LEPs, performing essential dynamic materials properties work related to the study and characterization of insensitive high explosives (IHE), and completing essential work on plutonium aging and pit reuse including the execution of a pit reuse hydrotest. LLNS' noteworthy performance in Plutonium aging and additive manufacturing for enabling future stockpile options is exemplary. In addition, LLNS not only chaired the Predictive Capability Framework (PCF) Council but also demonstrated effective management of the group and its efforts by responding to shifting priorities. LLNS' effective management of these programs was exceptional.

LLNS performed above expectations in the ASC Program. LLNS completed the Stockpile Stewardship item on the Defense Programs' Getting the Job Done List for FY2014 through performance of a "shock through foam" calculation, a full-system proxy simulation for a weapon material. This is a significant achievement due to the substantial complexity of machine load balancing for this type of problem (foam with voids). LLNS performed classical molecular dynamics simulations of shock compression of a metal foam under high energy density conditions, which are relevant for NIF target applications.

These simulations allow for characterization of the variation of equation of state and wave front propagation with pore size and foam structure.

LLNS exceeded expectations by successfully applying ASC codes to output calculations that have typically been provided by legacy codes. LLNS developed transport packages that examine scalability for petascale and exascale applications and investigated code improvements in the areas of concurrency, complex network interconnect and efficient use of memory.

LLNS met expectations to demonstrate the application of new strategies, technologies, and scientific understanding to support stewardship of the existing stockpile and future stockpile needs. Specifically, LLNS performed remarkable work on Multi-Point Surety, maturing what may prove to be the ultimate solution to this problem. LLNS' proposal for Intrinsic Surety won the competition for Surety Transformation Initiative. In the competition of Enhanced Stronglink, LLNS has been assigned the majority of the future work. There is room for improvement in LLNS' timely responsiveness to short-notice requirements. In the area of research and development (R&D) Certification and Safety, performance improved significantly over the year and the quality of the input and feedback from LLNS was noteworthy as some of the work provided was used as a model for LANL and SNL to adopt. In the area of R&D support, LLNS has maintained a strong level of support for enduring stockpile work scope and activities.

LLNS has done an excellent job of developing new platforms and capabilities at NIF to support the Stockpile Stewardship Program (SSP). Remarkable successes include the development and demonstrating materials strength platforms and x-ray diffraction platforms for looking at the evolution of material phases in materials at high pressures. These efforts support national priorities established through the HED Council and LLNS has done an excellent job of integrating its overall efforts into these priorities.

LLNS exceeded expectations by completing all work on schedule including cooperative participation in the national decision on advanced radiography at the U1a facility, progressing efforts to obtain essential nuclear physics data through the Chi-Nu and Time Projection Chamber (TPC) efforts, and building a proof-of-principle High Z target and completing readiness steps for FY2015 High Z NIF experiments. Of particular merit were LLNS' cooperative and thorough efforts in working with the Nevada National Security Site (NNSS), LANL, and SNL to provide proposals, analyses, and operational information needed to arrive at the national decision on advanced radiography at U1a. Other work of particular merit was co-authoring (with LANL) the Congressional report on the potential reuse of nuclear weapon secondaries. LLNS updated the e-Redbook with additional technical content and distributed it to the Department of Energy and the Department of Defense.

LLNS fully met expectations in supporting the DOE/NNSA and LANL in its Independent Peer Review (IPR) role. LLNS also fully met the expectations of the W78/88-1 LEP by coordinating with LANL to successfully complete their critical design work in order to close out the Phase 6.2 study. Monthly reports met expectations and deadlines, and their budget conforms to the spend plan.

LLNS invited a team of experts to review NIF operations and propose improved efficiencies resulting in the Congressional Report, *Plan to Increase the Shot Rate on the National Ignition Facility*. LLNS simultaneously developed and executed an approved implementation plan that resulted in continuously improving shot rates over the course of the year as demonstrated in now published shot rate metrics. This demonstrates that LLNS has done an outstanding job in meeting the challenges of

both increasing shot throughput and providing improved scientific value to the program while achieving cost and operating efficiencies with reduced operating budgets. LLNS also participated in and led an effort to develop a national diagnostics development plan to maintain the experimental capabilities of DOE/NNSA's HED facilities, which is at the forefront of being technologically feasible.

There is room for improvement regarding a carryover issue from the previous leadership practices at LLNS. During the final quarter of FY2013, LLNS revealed a significant cost and delay to a capability that has been on the critical path to enabling key stockpile stewardship experiments despite several years of representations that the Advanced Radiographic Capability (ARC) effort was on track for completion with no technical issues. It is acknowledged that the current LLNS management promptly notified DOE/NNSA, and proposed a path forward for resolution. While DOE/NNSA recognizes that ARC is a challenging development project, open review of proposed approaches, and thorough development and acceptance testing should have discovered these development issues long ago, but indications are that LLNS management attention was focused on priorities that were not concurred on by DOE/NNSA. Again this appears to be an issue related to prior management practices.

LLNS exceeded expectations by providing essential experiments on the NIF supporting HED Science. This included building a proof-of-principle target and completing readiness steps for the FY2015 High Z Campaign on NIF. Essential work also was done on the Toto Campaign. Compared to previous years, LLNS' support of HED experiments on NIF that are crucial to stockpile stewardship was exceptional.

LLNS has done an excellent job of developing new platforms and capabilities at NIF to support the SSP. Remarkable successes include the development and demonstration materials strength platforms and x-ray diffraction platforms for looking at the evolution of material phases in materials at high pressures. LLNS is on track to execute high-pressure experiments on the equation of state of high-Z materials of interest to the stockpile stewardship program.

LLNS exceeded expectations in this area by performing ten JASPER shots including 4 plutonium shots, when only seven JASPER shots were required, and by performing two hydrotests in support of pit reuse. The JASPER work was exceptional in that not only did LLNS exceed the required number of experiments (in support of a Level 2 milestone), but the JASPER program also was affected by the quality pause and the pause in high explosive operations at NNSA. These NNSA pauses affected the execution of JASPER experiments and impacted schedule. Yet planning, preparation, and effective management by LLNS allowed the JASPER program to exceed expectations by executing more than the required number of experiments. Of particular merit were the plutonium shots on JASPER, which had increased importance due to the difficulty in executing plutonium experiments at other facilities as a result of the operational challenges at Technical Area-55 (TA-55) at LANL. Another area of exceptional work was the execution of two hydrotests – one at the DARHT Facility and one at the CFF – in support of reuse concepts for the stockpile. These hydrotests were executed in October 2013 following the government shutdown. These hydrotests also exceeded the Getting the Job Done List requirement for FY2014, which required LLNS to execute one reuse hydrotest.

LLNS performed above expectations developing advanced computational platforms and software. LLNS improved the user tools and services needed for the tri-lab codes to run on Sequoia via the Capability Computing Campaign (CCC) process. LLNS improved and supported the Trilab Operating System Software (TOSS) stack for the current Tri-lab Linux Capacity Cluster (TLCC) environment and already proactively made strategic plans for the next Commodity Technology System (CTS)

deployment scheduled for FY2015. LLNS deployed and supported use of proxy apps by the Fast/Design Forward vendors who are trying to understand the unique ASC application programming requirements. Also, LLNS deployed the Catalyst System, which is a data-intensive computing system to investigate leveraging opportunities with the Big Data market.

LLNS performed above expectations managing the Collaboration of Oak Ridge, Argonne, and Lawrence Livermore National Laboratories (CORAL) acquisition. LLNS has remained on schedule and course for CORAL procurement with the other two DOE Office of Science (DOE SC) laboratories. LLNS successfully served as procurement and negotiation lead for the LLNS and Oak Ridge National Laboratory (ORNL) non-recurring engineering (NRE) contract and LLNS' build contracts. LLNS participated actively in the various DOE SC procurement and project Design Reviews, even though it's not required but because LLNS is the CORAL procurement lead and had to answer to procedural questions by the DOE SC offices.



## Performance Objective 2: Broader National Security Mission

### Summary

Lawrence Livermore National Security (LLNS) executed its Broader National Security Mission work, exceeding many expectations in Non-Proliferation, Emergency Operations, and Counterterrorism, despite a number of challenges beyond its control. LLNS effectively pursued and performed numerous high impact interagency projects that strategically integrate with the DOE/NNSA mission and leverage the Laboratory's unique capabilities in support of national security. Specific observations follow.

**Very Good**

LLNS met expectations in its supports of the removal, elimination, and minimization of the use of proliferation-sensitive materials considering the international issues with the Russian Federation and the Ebola outbreak. Despite these challenges, LLNS had several successful activities on the African continent by providing radiological training, security expertise, security upgrade assessments, and negotiating new security contracts. LLNS also provided support for the review of the International Atomic Energy Agency (IAEA) International Atomic Energy Agency Information Circular (INFCIRC) 225/Rev 5 Implementation Guide and participated in IAEA Consultancy Meetings on the Nuclear Security Enhancement Document. Additionally, LLNS provided technical expertise to the International Nuclear Security (INS) program and supports INS efforts related to nuclear material attractiveness.

The work performed on behalf of the Office of Nuclear Safeguards and Security exceeded expectations. For the International Nuclear Security Program, LLNS supported three bilateral physical protection-training workshops in Libya, Morocco, and Taiwan, for approximately 60 foreign officials. LLNS provided very good support across the Warhead and Fissile Material Transparency (WFMT) program, including technical initiatives to develop and evaluate future warhead monitoring approaches. Specifically, the on-site support LLNS provided to the WFMT Team was outstanding, and essential for accomplishing the program objectives during the year. LLNS met expectations with respect to cost, schedule, and technical requirements. LLNS provided excellent support to safeguard and secure materials, technologies and facilities as demonstrated by LLNS' support in the Materials Protection Controls and Accountability (MPC&A) program despite ongoing political issues in Russia.

LLNS developed pulse-shape-discriminating plastics (PSD) that are the first real and inexpensive alternative to He-3. PSD in plastics was previously thought technically impossible. Additionally, plastics offer the possibility of producing much larger-volume neutron detectors at significantly less cost, both increasing effectiveness of screening and reducing the financial burden and hazard. LLNS developed a secure, reliable and authenticated means to track warheads and nuclear materials to mitigate the risk of loss or diversion for International Safeguards and Arms Controls Program through a new generation of highly secure, data authenticated, passive radio frequency (RF) tags. This technology is being deployed in nuclear emergency response operations and is also used for tracking radiological sources, demonstrating the broad impact to DOE/NNSA missions.

LLNS continued to provide outstanding support related to safeguards engagement in North Africa and Southeast Asia in spite of the challenges posed by political and security issues in several countries. LLNS also provided strong technical input and program support for nuclear safeguards engagement

with Japan and Republic of Korea and exceeded many of the cost, schedule, and technical requirements. For Safeguards Policy, LLNS exceeded some of the cost, schedule, and technical requirements, while achieving a good level of quality. For Safeguards Technology, LLNS met the cost, schedule, and technical requirements for seven technology development projects.

The Office of Nuclear Controls work exceeded expectations. LLNS served as the primary implementer for nuclear forensics, providing world class technical expertise across the spectrum of Confidence Building Measures (CBM) bilateral engagements and advancing key goals such as providing technical training to international partners and supporting states developing national nuclear forensics libraries. CBM and LLNS developed more routinized reporting and communication procedures, particularly in projections of expenditures and projections of carryover. The quality of technical expertise at LLNS is unmatched, and the overall level of support moved from good to excellent during the course of this fiscal year.

LLNS exceeded expectations in its support for Export Control Review and Compliance (ECRC)/Interdiction, through its export control technical reviews and completing thousands of end-user reviews for Department of Commerce (DOC) and State export license applications, as well as Department of Energy (DOE) 810 cases and nuclear software codes. LLNS continued to provide excellent software development support in teaming with ORNL software developers to enable Nonproliferation Policy Analysis and Interdiction Resource (NPAIR) capability to perform commodity analysis and identification analysis. LLNS also continued to provide excellent analysis in support of Weapons of Mass Destruction (WMD) interdiction activities.

In Nonproliferation Policy and the Research and Development Program, LLNS exceeded expectations. LLNS exceeded some of the cost, schedule, and technical requirements, while achieving a good level of quality. For example, work exceeded planned technical delivery in some cases, such as with test monitoring capabilities development.

LLNS met all expectations with the support provided to the Radiological Assistance Program (RAP) including maintaining equipment, personnel training and readiness, and willingness to support all operational tasks. LLNS participated in numerous exercises and activities with several agencies. All external agencies gave LLNS positive feedback after interactions with its RAP personnel. While LLNS had limited involvement in program activities, LLNS met expectations supporting the Stabilization Operations Program. For example, LLNS supported the Tempest Wind field training exercise (FTX) and technical drills and Joint Drill (JD).

LLNS exceeded performance expectations and maintained operational readiness for the National Atmospheric Release Advisory Center (NARAC) and Consequence Management (CM), and International Exchange Programs. LLNS' efforts in providing modeling products for exercises and drills have been exceptional, specifically for the Vibrant Response Exercise. LLNS also provided scientific expertise and emergency response personnel in support of numerous Preventative Radiological/Nuclear Detection (PRND) and response deployments. LLNS met performance expectations in technology integration as LLNS completed 92% of the deliverables with 87% completed on time.

LLNS exceeded expectations in implementing International Exchange Program (IXP) requirements and providing IXP modeling products and capabilities for international exercises and drills. LLNS' support provided to Global Initiative to Combat Nuclear Terrorism (GICNT), World Cup, International

Atomic Energy Agency (IAEA) Response and Assistance Network (RANET), and other international support activities was exceptional.

LLNS met expectations in the areas of Nuclear Forensics (post and pre-detonation) and bulk special nuclear material analysis. LLNS performed tasks in accordance with written guidance, and the overall schedule and budget for all tasks were on track. LLNS maintained operational readiness in support of the DOE Forensics Operations team (DFO) and the Disposition and Forensic Evidence Analysis Team (DFEAT).

LLNS exceeded expectations in counterterrorism and counter-proliferation science. This was demonstrated by proactively contributing to the tri-lab Nuclear Counterterrorism (NCT) High Explosives and Nuclear Materials roadmaps, which are being used to guide national programs. International support for the NA-80 mission was well coordinated and executed, with special recognition for support of and participation in the Tier Threat Modeling Archive-Validation (TTMA-V) Type 5 test, a milestone experiment in the ongoing effort to predictively model disablement actions. Additionally, special recognition for participation in and leadership of Rodeo Moment, a large-scale proof-of-concept experiment in support of standoff disablement efforts, as well as supporting Block 8, a render safe training course for emergency responders.

LLNS exceeded expectations in pursuing and performing high impact interagency work that strategically integrates with the DOE/NNSA mission. LLNS effectively managed hundreds of projects in support of national security requirements, providing valuable expertise to solve complex policy and technical challenges. Specifically, LLNS provided excellent support to the Department of Defense with the Counter Proliferation Analysis and Planning System (CAPS), providing world-class expertise when responding to multiple requests for information, and delivering core knowledge products. LLNS also provided a depth of expertise and resources to mitigate and prevent emerging threats including chemical, biological, and radioactive emergencies for the Department of Homeland Security. For the Department of State, LLNS is the lead laboratory supporting the Chemical Security Program and providing forensic training in the Middle East, conducting field exercises on chemical detection and screening. LLNS also leveraged its high performance computing and modeling expertise and facilities to assist other federal and private entities to solve problems that would otherwise be cost prohibitive to address. LLNS remains a leading laboratory in providing critical services for the intelligence community in support of the national security mission.

The work performed by LLNS for the Office of Nuclear Verification exceeded expectations, particularly with the design and execution of the IAEA enrichment verification course which they jointly ran with ORNL. LLNS continues to provide high quality work in all projects. For Global Initiatives for Proliferation Prevention (GIPP), LLNS provided very good technical oversight for the closeout of collaborative research and development (R&D) projects.

LLNS exceeded expectations by providing strong support in preparation for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) Integrated Field Exercise 2014 (IFE14), with several LLNS experts preparing for key roles in the IFE14 exercise. A LLNS expert also received the prestigious E.O. Lawrence Award for efforts in leading the development and implementation of a computer model to greatly improve location accuracy for seismic events. LLNS staff continued to perform a diverse and complex range of seismic outreach, training, and capacity building tasks in the Middle East and Central Asia. In addition, LLNS has been essential to fund workshops and projects in these regions.

LLNS provided excellent technical support conducting special highly enriched uranium transparency monitoring visits, maintaining and operating non-destructive assay equipment in Russia, data assessment, and data management. Moreover, LLNS did an excellent job of focusing on program closeout tasks and preparation for the shutdown of the program's online, analytical database, Data Archive and Retrieval System (DARTS) and Strategic Management and Results Tracking (SMART).

LLNS exceeded expectations in Material Consolidation and Civilian Sites (MCCS). LLNS consistently provides a high level of support through subject matter experts and project support on key Russian nuclear security engagements, as well as providing nuclear security best practices engagement with China. Responses to tasks, budget reporting, travel and project logistics, and contracts management have all been timely and of high quality.

Overall LLNS exceeded expectations in cost, schedule, and quality of work. This is supported through the LLNS Project Reporting System (PRS) data (through August 2014) that indicated less than 1% of reportable projects reported serious issues with scope, budget, and schedule for FY2014. The PRS provided a snapshot to LLNS senior management of the health of the reportable projects, and was reported to senior management monthly. Projects that were reported to have either serious issues (i.e., projects that would put important milestones or the entire project at risk), or those projects that have elevated risks were reviewed and management actions were taken in a timely manner to address the deficiencies. Despite a 17-day government shutdown during the first quarter, which imposed additional constraints on already tight budgets, LLNS recovered to meet its obligations.

LLNS' performance met or exceeded expectations under each Site Specific Outcome. For example, LLNS quantified new ideas for worldwide reactor monitoring, with overall work proceeding on time and within cost. LLNS received positive feedback from a DOE/NNSA-sponsored external peer review panel for its WATCHMAN project.

LLNS exceeded expectations by demonstrating excellent performance and response ahead of schedule for almost all expected research on NCT's "task list" items, with the completion of the assessment of specific nuclear threat devices. Strong leadership for the first phase of developing a standoff disablement experimental program by integrating laboratory expertise and executing Rodeo Moment, a large-scale proof-of-concept experiment in a time and budget constrained environment. Support for the NCT mission was also demonstrated by the contribution of Nuclear Assessment Operations (NAO) to aid NCT in managing the assessment of open source nuclear threat device information. Excellent progress was also made in preparing test-plans, safety basis, and experimental design for Rodeo Moment large-scale standoff disablement test.

LLNS successfully completed the planning and execution of assets for Nuclear Weapons Accident and Incident Exercise (NUWAIX 14) for the DOE/NNSA-led nuclear weapons accident/incident exercise.

## Performance Objective 3: Science, Technology, and Engineering and Other DOE Mission Objectives

### Summary

Lawrence Livermore National Security (LLNS) exceeded expectations in effectively advancing the frontiers of Science, Technology, and Engineering (ST&E), including the successful execution of other DOE mission objectives as well as the Laboratory Directed Research and Development (LDRD) program.

**Excellent**

Research at LLNS consistently remains transformative, innovative, of high quality, recognized by the ST&E community, and validated through peer review. LLNS maintained a research environment that enhanced technical workforce competencies and research capabilities, which was strengthened through continuing education opportunities afforded to its employees. Specific observations follow.

LLNS exceeded expectations in implementing a research strategy that is clear and supports DOE/NNSA priorities. LLNS' institutional investment strategy supports key goals identified in the NNSA Strategic Plan, including reducing nuclear dangers, managing the nuclear stockpile, modernizing DOE/NNSA's infrastructure, and strengthening the ST&E base. LLNS empaneled an external group of high-level experts to assess LLNS' strategic plan, evaluate the success of institutional investments (LDRD) in meeting strategic goals, and provide effective feedback to update the strategic investment document. LLNS' FY2015 program plan was complete and included 164 proposed LDRD projects with an approximately funding of \$103M, which is 120% of the expected approved FY2015 LDRD program plan funding.

LLNS exceeded expectations in ensuring that research was relevant and enabled mission performance. This was evidenced through development of a technology that certifies pit reuse design that resulted in significant cost savings as well as through high performance computing to model plasma physics in support of the stockpile stewardship program. There have also been major advances in weapons and the NIF performance through other modeling efforts to improve implosion results by closely linking observations to model improvements. LLNS developed new materials through its leadership in additive manufacturing, which modify properties to cushion shock and absorb energies not possible through traditional materials. This technology may be applied to the manufacture weapons parts and result in significant cost savings to DOE/NNSA. LLNS implemented fusion model enhancements and testing improvements beyond efficiency increases that open up new avenues of target development, fast ignition avenues and new knowledge base in weapons and high energy density science and applications. Improvements in scientific biology have resulted in substantial new program efforts developed from National Institutes of Health (NIH) relationship in medical accelerator test platforms and artificial organs. Other bioscience and biomedicine accomplishments consist of developing a way to quickly detect for anthrax (with the potential to expand this capability to other viruses), improvements in artificial retina and accelerator mass spec analysis of cancer treatment, as well as drug residence time in human in vivo assessments. Additional initiatives in fossil energy, electrical energy, carbon management, climate analysis, and underground and wind modeling are considered world-class, establishing LLNL as an important contributor to national security and the nation.

Research at LLNL is above expectations as it was transformative, innovative, and of consistent high quality. LLNS publication rate continues to climb with increased patents and records of invention stemming from research and development (R&D) activities documenting the level of state-of-the-art

improvements in multiple fields of scientific and engineering work. External awards, prizes, and recognition for ST&E accomplishments provide external validation of activities that advanced the frontiers of science and engineering. For example, two of LLNS researchers were named in the Thomson Reuters list of "The World's Most Influential Scientific Minds," one researcher was awarded a Presidential Early Career Award for Science and Engineering (PECASE), and contributions by the LLNS' Forensic Science Center were significant elements of the Nobel Peace Prize granted to the Organization for the Prohibition of Chemical Weapons. Investments in network mapping, cyber activity analysis, and large-scale data analytics provided capabilities that have become operational and are helping to protect our troops, and are increasing the efficiency of human analysts in high-priority national security applications.

LLNS performed above expectations in maintaining a vibrant research environment that enhances technical workforce competencies and research capabilities, strengthened through the continuing education opportunities afforded to its employees. Currently, LLNS has more than 120 employees enrolled in approved continuing education courses ranging from technical certification to PhD programs, and maintains a vigorous postdoc program of scientists and engineers selected from among the nation's most prestigious universities. This program continues to serve as an extremely important element of the Laboratory's ST&E pipeline, with greater than 55% of the postdocs converted to staff positions at the conclusion of their postdoc positions. Additionally, most LDRD projects have external collaborators to connect LLNS researchers to university collaborators.

LLNS performed above expectations in its research to accomplish multi-year strategic objectives, advance ST&E, and develop technologies for the public good through technology transfer. This was demonstrated through the Cooperative Research and Development Agreement (CRADA) with Intel for the high performance computing software/tools as well as the micro impulse radar technology. Additionally, efforts to commercialize the electromechanical battery (flywheel energy storage) technology were revitalized with a CRADA with INSTA, a Polish technology incubator.

LLNS performed above expectations in pursuing and performing high impact work that strategically integrated with the DOE/NNSA mission and strengthened engineering capabilities. LLNS continued to support DOE sponsors as well as other federal agencies. This work leveraged existing capabilities and supported future national security missions by enhancing ST&E competencies at LLNL. Noteworthy accomplishments include the development of an efficient approach to print three-dimensional high-density metal parts and simulations of design performance of carbon capture technologies on China's Shindongkou power plant that were described by DOE as a "simulation masterpiece." LLNS also completed a major smart grid study for the California Energy Commission as well as analyzed field observations, and simulated plume movement and seismic signals at the joint DOE-British Petroleum large-scale demonstration, which was instrumental to DOE's goals of assessing CO<sub>2</sub> storage limits at commercial scale.

LLNS continues to track cost schedule and milestone accomplishments in accordance with work plans established in conjunction with sponsors. LLNS is performing above expectations as demonstrated by the success of its science programs, which is performing so successfully that new efforts are being established in climate, fossil energy, energy programs, advanced computations and big data, fusion advancements, biology and biosecurity, and geothermal energy.

LLNS made progress on developing new partnerships to support innovation and technology transfer effectively using the Livermore Valley Open Campus (LVOC). LLNS effectively used the High

Performance Computing Innovation Center (HPCIC) at LVOC and hosted almost 3,000 events and over 20,000 users. LVOC supported the expanded relationships with external entities, such as, RAND, Quantal, Princeton, Voss, Bosch, and Cymers.

LLNS demonstrated that institutional investments are being effectively used to assure the successful execution of LLNS' strategic ST&E plan. LLNS' strategic investment plan is aligned with the national security mission and FY2014 LDRD investments continued to provide results that support existing capabilities as well as build new ones. LDRD continued to strengthen DOE/NNSA's National Security Mission with award winning science, publications, scientific leadership, and collaboration's. For example:

- Received four R&D 100 Awards this year. Two of the four awards had roots to LDRD projects.
- Two FY2014 E.O. Lawrence Award winners; both researchers received LDRD support for projects within their cited research fields.
- Three of the six newly elected APS fellows in FY2014 were Principal Investigators on LDRD projects that were related to the work that led to their election.
- LDRD-derived patents represent over 40% of all the LLNL patents.
- LDRD-derived copyrights/articles represent over 20% of all the LLNL copyrights/articles.

## Performance Objective 4: Operations and Infrastructure

### Summary

Overall, Lawrence Livermore National Security (LLNS) exceeded many expectations in managing the safe and secure operations of the Laboratory and its infrastructure. Despite budget challenges, LLNS maintained effective and efficient environment, safety, and health (ES&H), quality and security programs. It continued to implement long-term work control improvements and proactively began implementing improvements in both its nuclear safety and construction safety programs. LLNS provided world-class technical support to the Waste Isolation Pilot Plant (WIPP) after a radiological release and developed a systematic safeguards and security (S&S) risk management process, balancing the needs of security with operational efficiency and cost effectiveness. LLNS also continued to deliver efficient and effective business systems. DOE/NNSA reviewed the LLNS Self-Assessment and agreed with the overall assessment of Very Good. Specific observations follow:

**Very Good**

LLNS met expectations in delivering effective, efficient, and responsive environmental, safety and health (ES&H) programs and processes, including nuclear safety and emergency management, exceeding expectations in some areas. It is noted that while there were opportunities for improvement in both construction safety and nuclear safety, LLNS has taken the initiative to implement corrective actions and program improvements to resolve these issues.

Environmental projects were implemented effectively and in a timely manner in accordance with regulatory environmental requirements. LLNS provided a high level of transparency through regular meetings with DOE/NNSA and continual program status updates. Transparency with community stakeholders is also excellent as demonstrated by LLNS' timely response and quality reporting to Federal, State, County and local regulatory agencies. Findings from hazardous waste inspections were promptly addressed and are being tracked and documented in the Issues Tracking System.

While LLNS experienced several construction safety incidents and self-identified weaknesses in its program, it promptly took action to address these findings. For example, LLNS stopped all work under its supplemental labor agreement for construction services, improved the work authorization method, increased oversight of work, and corrected inconsistencies between departmental and institutional procedures. LLNS' performance in the Nuclear Safety Program continues to improve as all identified issues and reportable occurrences were appropriately resolved. Additionally, the safety basis operations, submittals, and processes are considered adequate and nuclear operations continue to operate safely. There is room for improvement in the way in which LLNS planned and prioritized its Facility Justification for Continued Operation (JCO) of the Building 332 plutonium facility safety-class building structure ventilation system.

LLNS' unreviewed safety question process is well developed and when appropriately applied, continues to perform properly and meets expectations. The Criticality Safety program and controls are effectively implemented, with no criticality safety violations. However, some safety basis and operational concerns have been identified during this year from occurrences, reviews, and observations. LLNS should continue to monitor the change control process and the configuration management program

LLNS exceed expectations in proactively strengthening its Industrial Hygiene and Industrial Safety program through numerous continuous improvement initiatives. Specifically, the implementation of



the Risk Assessment and Control database; establishing consistent Industrial Hygiene procedures in "Field Operation Manuals"; exposure monitoring samples below occupational exposure limits; site-wide Lock-out/Tag-out procedures; and a revised fall protection document. There were no significant Industrial Safety events or incidents, and the 12-month moving averages for both electrical frequency and severity rates were below the established goal ceiling.

The Fire Protection, Biosafety and Occupational Medicine programs continue to perform effectively. The Fire Protection Program achieved an average performance index rating of 95% and provided advice and support to other sites. For example, LLNS provided advice on fire protection system inspection, testing, maintenance that would be more efficient and more responsive to code requirements at Los Alamos National Laboratory and provided alternatives to Lawrence Berkeley National Laboratory for alarm system monitoring and system reliability. In the Biosafety Program, select agent inventory reviews were completed with full accountability and no biological etiologic agent spills, animal bites, needle-sticks or exposures were experienced. A finding was identified for one inventory discrepancy of a non-regulated select agent. Prior to and since this single inventory discrepancy, no other instances of inventory discrepancies or findings have been reported. This level of accountability is exceptional given the overall size of the inventory collection at LLNL. The Occupational Medicine program continues to meet all metrics in the customer satisfaction surveys, workstation evaluation visits, early ergonomic intervention program and the "Get Active" program.

LLNS met expectations in implementing its Radiation Protection program. The number of Unexpected Events, including area/equipment contamination events, airborne events, radiological work control issues, personnel monitoring, loss of material, etc., improved through the performance. Sample analyses Turn-Around-Times from the Radiological Measurements Laboratory and the Bioassay Laboratory continue to decrease by greater than five percent year over year. In addition, the number of samples falling into the greater than acceptable or overdue has decreased.

The Explosive Safety program met expectation and has an active inspection and self-assessment program. LLNS appropriately addressed the controls surrounding a de-minimis amount of explosive debris found in a parking lot next to a test site and a power strip used without proper approval, and continues to maintain explosive safety administrative and training programs. An area for continued improvement is the development of meaningful safety metrics.

The Laser Safety program LLNS implemented received national recognition for its newsletter, provided laser safety technical assistance to Stanford Linear Accelerator Center (SLAC), hosted a DOE Laser Safety Officers workshop, and experienced no laser safety issues.

LLNS provided outstanding technical support to the Waste Isolation Pilot Plant (WIPP) after a radiological release, leveraging the Laboratory's world-class expertise. LLNS completed four institutional exercises in response to a natural phenomenon event in support of the Office of Enterprise Assessments (EA) Operating Experience Level 1, *Improving Department of Energy Capabilities for Mitigating Beyond Design Basis Events*. The number of unexpected events, including area/equipment contamination events, airborne events, radiological work control issues, personnel monitoring, and loss of material continue to be in an acceptable range.

Good progress was made on developing an improved work planning and control (WP&C) process that integrates enhanced training, qualifications and disciplined operations to enable more streamlined work planning and safe work execution in accordance with expectations. The core framework for the

new WP&C process is nearing completion. The business process for programmatic/fixed facility work was finalized and is being coded into a new information technology (IT) tool and the General Worker Safety Qualification, Work Planner Qualification, and Competent Worker Qualification programs are on track to support phased implementation. Senior management commitment to the effort remained strong in FY2014 by serving as Champions and meeting regularly on project progress, as well as establishing committees to facilitate decision-making at key points in the project. Additionally, the project team co-chairs continued to provide exceptional leadership managing the improvement initiative and reached out to a number of laboratories/sites to leverage best practices from across the complex. Corrective actions from the WP&C Joint FAM-Line Assessment, sulfuric acid event extent of condition review, and work control noncompliance report were closed and/or remained on schedule. In the near term, LLNS is engaged and committed to addressing issues identified with the existing WP&C process as LLNS transitions to the new process. This was particularly evident this past quarter following the chiller event that identified weaknesses in subcontractor WP&C. LLNS completed extensive follow-up reviews and analysis of subcontractor WP&C weaknesses and a corrective action strategy that is integrated with the improvement project is under development.

The performance of the Quality Assurance (QA)/Software QA Programs is above expectations. A significant accomplishment this year was the successful closure of a Noncompliance Tracking System Correction Action Plan (NTS CAP) by the Office of Enforcement that has been open since contract transition (2007) with 47 corrective actions. One of the actions was the completion of an effectiveness review that determined the Institutional QA Program to be fully integrated. Other program accomplishments include the reinstating the Quality Management Council and initiation of a Quality Rebranding and Communication Campaign, although efforts in this area have been slower than originally planned. LLNS developed a risk-based methodology for assessing the Institutional QA Program and its flow down, which is included in the Management Assessment System (MAS) functional area FY2015 assessment planning process. Additionally, LLNS implemented an approved institutional Software QA (iSQA) program to include a Risk Grading Application and successfully completed an ISO 9001 surveillance audit of the LLNS Quality Management System.

LLNS continues to meet expectations in accomplishing capital projects in accordance with scope, cost and schedule baselines. LLNS supported two proposed line item projects that are anticipated to receive funding in FY2015 and FY2016. LLNS continues to support the Federal Project Director in Critical Decision (CD)-1 document preparation and has supported on site reviews for both potential line items. Additionally, LLNS conducted a comprehensive Functional Management Review to evaluate processes, procedures and personnel necessary to execute large General Plant Projects and line item projects.

LLNS' security program management provided a stable operating environment, enabling mission execution, and is performing above expectations. LLNS provided effective, efficient, and responsive security management and processes despite major budget challenges resulting from the continuing resolution and government shutdown.

LLNS developed an integrated and systematic security risk management process that balances the needs of security with operational efficiency and cost effectiveness. This risk management process will be implemented through five key elements: development of protection strategies, conduct of threat based risk assessments, identification and testing of essential security elements, conduct of formal risk assessments, and development of security budgets that ensure the site security posture remains at an acceptable level of risk.

LLNS expanded the scope of its Risk Management Framework (RMF) to include national security systems. Results from the DOE security program inspections and audits indicate effective performance, which was also supported by the fact that there were no security events that resulted in significant negative impact on site operations.

For both the S&S and Cyber programs, all LLNS security milestones were implemented on or ahead of schedule. LLNS effectively managed its Institutional Assessment Plan by completing all scheduled self-assessments in all security topical areas, and reported quarterly performance ratings. Deficiencies and observations were self-identified as a result of these assessments and corrective actions were identified to address the root cause and are being managed in the Institutional Tracking System.

In the S&S Program, LLNS implemented the new DOE security Orders, which required comprehensive revisions to the Site Security Plan (SSP), and to dozens of supporting policy and procedure documents. Enhancements were also made to the Conduct of Security Program, designed to strengthen LLNS' formal governance of security operations, and revamping the Incidents of Security Concern Procedure to meet new DOE security incident categorization and reporting requirements.

LLNS filled key security vacancies, including 15 Security Police Officers (SPO), eight of which were already qualified and will be ready for duty in early FY2015. These positions will enhance security patrol and response, and reduce overtime. LLNS provided enhanced training to SPOs on Protective Force authorities, upgraded SPO training facilities, and initiated a project to replace their antiquated armory with a more modern facility. In support of the DOE/NNSA initiative to consolidate security operations with Sandia National Laboratories' California site (SNL/CA), LLNS continues to provide essential services to SNL/CA in the areas of locks and keys support and nuclear materials control and accountability measurement.

EA reviewed LLNS' protective force response by conducting Limited-Notice Performance Tests that confirmed effective protective force response and reflected an appropriate level of training and adherence to site security policies. EA also reviewed LLNS' Information Security Program (ISP). The draft EA inspection report noted that the ISP provides for an overall effective protection scheme, and identified two potential findings related to compliance.

The cyber security program was subject to several comprehensive cyber security reviews by EA, the Office of Inspector General (OIG), and the DOE/NNSA Chief Information Officer (CIO). EA concluded that LLNS implemented many components of an effective cyber program, several of which are to protect against the insider threat. EA identified two compliance issues resulting in findings. As part of its FY2014 Financial Statement Audit, the OIG reviewed the unclassified cyber program, which revealed some issues in the areas of configuration management and access control. Five findings were issued and corrective action plans have been developed for these findings. DOE/NNSA CIO conducted a cyber site assistance visit and a Pre Command Cyber Readiness Inspection (CCRI), both of which resulted in no findings, and LLNS earned a passing score in the Pre CCRI.

LLNS is meeting overall expectations in maintaining, operating, and modernizing DOE facilities, infrastructure, and equipment in an effective and energy efficient manner. Specifically, LLNS performed at a very high level in the areas of maintenance recapitalization projects, preventative maintenance, reliability for electricity and water, quality and timeliness of most reports, Total

Recordable Cases (TRC) Accident Rate for maintenance work, utility availability, and Facility Condition Index (FCI) for Mission Critical facilities. LLNS also made excellent progress in executing a four-year Capabilities Based Investment project, titled "Life Extension Program and Warhead Assessment Revitalization Project." LLNS performed at a high level in several complex-wide infrastructure initiatives including the DOE Ten-Year Infrastructure Plan, identification of Mission Unique Facilities, Knowledge-Based Condition Assessment, the Laboratory Operation Board Infrastructure Assessment Study, and support of the NA-00 BUILDER maintenance modeling effort. LLNL has gone above and beyond in assisting in the development of the work breakdown structure, an independent government cost estimate, and the technical evaluation for use during DOE/NNSA's market research stage for a knowledge-based condition assessment infrastructure management system.

LLNS performed adequately in the Nuclear Maintenance Management Program and FCI for Mission Dependent Not Critical facilities. It is noted that there are opportunities for improvement in the corrective maintenance and deferred maintenance work order backlog as well as with meeting the goal to invest more than 2% in real property maintenance of the facilities replacement plant value (RPV). To address these shortfalls and ensure continuous improvement, LLNS is implementing improved maintenance management efficiencies through Enterprise Asset Management (EAM) system development, work planning and control (WP&C), preventative maintenance procedures, deployed maintenance teams, and key self-assessments.

LLNS met or exceeded its sustainability goals. It exceeded the DOE/NNSA greenhouse gas reduction targets primarily due to past reduction in SF6 usage, purchase of renewable energy certificates, and purchase of federal hydropower. LLNS is also on schedule to meet the DOE/NNSA renewable energy target of 20% by 2020. LLNS continues to support an on-site solar generating project covering 10 acres and plans to purchase 80% of the power produced by the project. LLNS performed satisfactorily in both fleet management and pollution prevention. LLNS reduced the amount of turf irrigated, met the 10% water use reduction, and is close to on track to meet the 2015 DOE water use intensity goal. LLNS achieved a cumulative reduced energy intensity of 17.8%, but did not meet the DOE/NNSA FY2014 cumulative energy intensity reduction target of 27%. LLNS need to focus on proceeding with the server consolidation/closure, adjusting the associated HVAC systems upon closure, and planning for additional reduction in irrigation of turf if the drought continues into 2015. Additionally, previous building energy and water audits have identified the need for repairs, onsite re-commissioning, and small equipment upgrades that require additional implementation.

LLNS exceeded expectations in delivering effective and efficient business operations and systems. The LLNS procurement system is performing above expectations as measured by the FY2014 Procurement Objective Matrix Report (scoring 980 points out of 1,000). LLNS is exceeding overall small business goals (60.4% actual versus 54% goal) and is expected to exceed all Supply Chain Management socioeconomic goals (except for HUBZone and Small Disadvantaged Veteran Owned). The Strategic Human Resources department completed several notable accomplishments, including phasing-out direct employment of retirees in order to comply with the Affordable Care Act, managing planning efforts for a Laboratory shutdown as directed by DOE/NNSA in October 2013, and partnering with Los Alamos National Laboratory (LANL) to issue a joint Benefits Administration request for proposal. The personal property system continues to perform above expectations based on strong metrics performance, excellent inventory results, and the execution of efforts in support of DOE/NNSA initiatives. LLNS achieved excellent ratings on the Property Performance Assessment Model and on its annual statistical sample inventory of attractive (controlled) and equipment

personal property assets. LLNS accounted for 100% of its firearms and 100% of its precious metals. LLNS effectively supported the enterprise in taking the lead to draft and coordinate a re-write of the DOE Personal Property Order (580.1A), which if implemented without revision would have resulted in significant cost and operational impacts. LLNS also established DOE/NNSA's first electric vehicle charging program (reimbursable) for employees in support of DOE's sustainability policy.

LLNS utilizes the DOE/NNSA Office of Field Financial Management (OFFM) Integrated Contractor performance measures to assess its performance. This year LLNS is rate as "good", the highest possible rating. Noteworthy accomplishments include its role in facilitating the Lab Closure Days during the government shutdown, which was accomplished with minimal impact to employees while managing a budget within very tight thresholds. Additionally, the LLNS Chief Financial Officer's office supported the National Defense Authorization Act (NDAA) cost model definition effort as requested by DOE/NNSA, and it made significant progress in efforts to identify organization-specific requirements for an institutional financial planning system.

LLNS exceeded expectations in managing its legal affairs by continuing to successfully manage and vigorously defend major complex employment litigation and consistently and transparently communicating with Field Office Counsel and DOE/NNSA General Counsel's office directly, when necessary. LLNS effectively and efficiently managed smaller litigation consistent with regulatory and contractual requirements. Additionally, LLNS Office of General Counsel (OGC) provides extensive advice and counsel to its clients on difficult and long-standing human resources issues as well as new, complex ones such as those raised by the Affordable Care Act and Affirmative Action requirements. OGC took the lead in developing and obtaining the approval for an employee debt recovery program, which has been a long-standing issue that needed attention. Additionally, OGC maintains a cooperative and professional relationship with DOE/NNSA lawyers that facilitate resolution of difficult issues of all types, including those associated with OIG reports, allowable costs, employee misconduct, and other highly sensitive and controversial topics.

## Performance Objective 5: Leadership

### Summary

Overall, Lawrence Livermore National Security (LLNS) demonstrated significant improvement in leadership supporting the DOE/NNSA mission. LLNS made several key leadership changes and permanently filled several critical vacancies with highly qualified individuals in close coordination with senior DOE/NNSA leadership. These changes resulted in a much greater level of transparency, customer focus, and better alignment of Laboratory and enterprise priorities.

**Very Good**

Senior leadership changes, including the Laboratory Director and a Principal Associate Director, led to better alignment of Laboratory goals and objectives with those of the National Security Enterprise. LLNS defined and implemented a realistic strategic vision for the laboratory by effectively aligning its Multi-Year Performance Strategy with the NNSA Strategic Plan. LLNS demonstrated a high level of enterprise leadership and effective collaboration across the enterprise to enable DOE/NNSA success through its active involvement with the National Laboratory Directors Council (NLDC), the Lab Operating Board (LOB), the Energy Facility Contractors Group (EFCOG), the Cost Assessment and Program Evaluation (CAPE), and through the working group to improve and integrate the financial management of the enterprise. Program collaboration continued with the Kansas City Plant on applications of additive manufacturing, a key initiative for the future. LLNS established a strong governance model for National Ignition Facility (NIF) to ensure a balanced portfolio for experiments, and worked collaboratively with Los Alamos National Laboratory (LANL) to evaluate potential integrated operations for the two laboratories.

LLNS' transparency to DOE/NNSA significantly improved with the senior leadership changes and realignment of personnel, resulting in much more productive communications with DOE/NNSA and a markedly improved relationship. These improvements are especially apparent in the work performed by LLNS for DOE/NNSA Defense Programs, most notably with the NIF. LLNS also demonstrated a culture of critical self-assessment, as evidenced by the numerous reviews and evaluations it conducted, including seven Functional Management reviews and 12 external review committee studies to improve Laboratory performance. In addition, LLNS' six-sigma group had a very active year, completing 28 projects. Changes in content and format of the Director's Management Performance Reviews also better facilitated insight into laboratory performance and challenges. While there are many notable positives in this area, there is room for improvement in LLNS' self-identified non-compliances for safety and security. While LLNS' rate is better than most, its rate is still trending lower than the DOE Office of Enforcement's goal (53% versus 67%).

LLNS is improving its Management Assurance System (MAS) by strengthening the analysis tools, leveraging parent company resources, and through its Parent Function Management Reviews. These improvements have increased institutional utilization with the net effect of improved definition and handling of beryllium articles, improved waste characterization for transuranic waster, and identification and correction of security issues.

LLNS worked as a leader within the DOE/NNSA complex to develop, integrate, and implement enterprise solutions that maximize program outputs at best value to the government and identify innovative business and management solutions that greatly improve enterprise-wide efficiencies. For example, LLNS led the development of an enterprise solution that avoided significant cost and

operational impacts resulting from the implementation of DOE Order 580.1A, Personal Property Management Program. LLNS worked collaboratively with the DOE/NNSA Organizational Property Management Officer (OPMO) and Management and Operating (M&O) Property Council to draft a risk-based and cost effective Supplemental Directive that will avoid several million dollars in cost impacts and mitigate DOE/NNSA's audit risk. LLNS continues to serve as the lead laboratory in implementing the DOE Office of Science and DOE/NNSA joint High Performance Computing procurement strategy for Livermore, Oak Ridge and Argonne National Laboratories. LLNS submitted the Collaboration with Oak Ridge, Argonne, and Livermore Laboratory (CORAL) solicitation for the design and build of the next generation supercomputer for all three sites to better leverage program dollars. LLNS awarded one research and development (R&D) subcontract and began the process of awarding a second R&D subcontract as well as the build subcontract for Sierra, which is to be sited at LLNS in FY2018. LLNS continues to be the only DOE/NNSA laboratory participating in the DOE Agreements for Commercializing Technology Pilot Program is actively managing a very large and state-of-the-art laser development project in partnership with the Czech Republic.

LLNS continues to exhibit professional excellence while pursuing opportunities for continuous learning. LLNS earned four R&D 100 Awards for developing cutting-edge scientific and engineering technologies with commercial potential and was recognized for its professional excellence and innovation in science, technology and engineering. The LLNS BLU-129 Team was selected for the 2014 William J Perry Award; the cavitation simulation won the Gordon Bell Prize; and the artificial retina team was awarded the invention of the year. LLNS also partnered with Las Positas College, and the Alameda County Workforce Investment Board to develop a new Mechanical Technology Program for veterans and other students.