National Nuclear Security Administration

Los Alamos National Laboratory

Fiscal Year 2015

Performance Evaluation Report (PER)

NNSA Los Alamos Field Office

Performance Period:

October 1, 2014 –

September 30, 2015

November 2, 2015

Executive Summary

This Performance Evaluation Report (PER) provides the assessment of Los Alamos National Security, LLC (LANS) performance for the period of October 1, 2014 through September 30, 2015, as evaluated against the objectives defined in the Fiscal Year (FY) 2015 Strategic Performance Evaluation Plan (PEP). The National Nuclear Security Administration (NNSA) took into consideration and consolidated all input provided (e.g. CAS, Program Reviews, etc.) from NNSA Program and Functional Offices both at Headquarters and in the field. The Performance Objectives (POs) in the PEP were graded using adjectival ratings as described in the Federal Acquisition Regulation (FAR). The POs were then considered in the aggregate to provide an overall adjectival rating and percentage of fee earned for the contract. Comments on the performance of each Contributing Factor (CF) and Site Specific Outcomes (SSO) under each PO identified in the PEP are provided as well.

LANS submitted a Performance Self-Assessment Report that covered the rating period, which included both accomplishments and areas for improvement. NNSA reviewed the self-assessment report and considered it in conducting our evaluation. In many cases NNSA agreed with the Laboratory's self-assessment, but noteworthy differences exist.

PO-1: Manage the Nuclear Weapons Mission (30% of At-risk Fee) was rated as Very Good. Overall, Los Alamos National Security, LLC (LANS) performed at the above expectations level in managing the Nuclear Weapons Mission. The Laboratory made important progress in support of the stockpile, including work in Advanced Certification readiness efforts for pit reuse, work on dynamic materials properties for the National Boost Initiative, preparatory work on a future neutron-diagnosed subcritical experiment, along with several other areas. One significant success was the completion of the Leve 1 Pit Reuse Requirements Milestone that will inform future Stockpile Modernization Programs. The Laboratory maintained excellent progress on Trinity Supercomputer acquisition contract activities. The Laboratory is challenged by the continued pause in operations at the Technical Area 55 Plutonium Facility, but demonstrated excellent performance in completing restart activities for the Weapons Engineering Tritium Facility. The Pause which began in Fiscal Year (FY) 2013 substantially continued through the year, impacting nuclear weapon program implementation, and requiring the renegotiation of milestones involving production, research and surveillance activity.

PO-2: Reduce Global Nuclear Security Threats Mission (10% of At-risk Fee) was rated as Very Good. Overall, Los Alamos National Laboratory performance was above expectations in management of the Global Nuclear Security Threats Mission. In FY 2015, the Laboratory continued extensive and successful execution of work supporting the broader national security mission to reduce nuclear threat. The Laboratory achieved significant accomplishments in the areas of Non-proliferation, Emergency Operations, and Counterterrorism. Specific contributions include success in securing proliferation-sensitive materials, support of nuclear export and trade oversight, Research and Development technology solutions for treaty monitoring, support for national level exercises, and support for the Space Nuclear Detection Mission. The Laboratory is challenged by the continued pause in operations at the Technical Area 55 Plutonium Facility resulting in the inability of the Laboratory to support FY 2015 congressionally mandated goals for the Fissile Material Disposition Program.

PO-3: DOE and Strategic Partnership Project Mission Objectives (5% of At-risk Fee) were rated as Excellent. Overall, Laboratory performance was above expectations in executing high-impact work for

DOE and the Strategic Partnership Project Mission Objectives in a safe and secure manner. Achievements included new insight into the complex interplay between frustrated magnetism and superconductivity, groundbreaking work in cosmological simulation, the structure of oxide nanocomposites, quantum information science applications for cyber security, advanced imaging relevant to damaged Fukishima reactors, and greenhouse gas emissions. Additionally, the executed portfolio for the Civilian Nuclear and Applied Energy program offices continued to achieve high impact results to meet the important needs for the nation. The Laboratory demonstrated notable performance and leadership in the Consortium for Advanced Simulation of Light Water Reactors, resulting in the extension of Consortium grant funding for an additional five years. The Laboratory also made key contributions to the impact of energy production and use, collaboratively developing a novel process to grow perovskite films as a low cost solar based clean energy solution for the future, and a new membrane assembly technique for fuel cells, increasing lifetime performance and enabling significant reductions in greenhouse gas emissions. The Laboratory provided impactful, meaningful, effective and efficient Science & Technology program management support to Department of Energy Intelligence priorities, and to the broader Intelligence Community. The Laboratory consistently demonstrated highly innovative approaches and ideas to address the nation's national security mission needs.

PO-4: Science, Technology, and Engineering (ST&E) (15% of At-risk Fee) was rated as Excellent. Overall, Los Alamos National Security, LLC performed above expectations in its ability to manage Science, Technology and Engineering with benefits to National Security Missions. New advances were achieved in a diverse range of areas including the "battlefield" MRI system, traumatic brain injury diagnostic research, methods for nondestructive analysis of valuable or rare samples, development of a 5-Tesla superconducting research magnet, new space-based sensor technologies, new printable resins for use in three dimensional additive manufacturing, a new proton microscope with a 30 micrometer resolution, and simplified autoassembly techniques for Hallbach cylinder arrays used in MRIs and other devices. The Laboratory engaged on 140 Cooperative Research and Development Agreements (CRADAs) with 40 external partners, including efforts for commercialization of fuel cell fabrication technologies, to commercialize an HIV-1 vaccine, and to develop an advanced Thorium oxide nuclear reactor fuel. Laboratory excellence was reflected in a large volume of peer reviewed publications, patents, R&D 100 award success, and other honors and recognitions.

PO-5: Operations and Infrastructure (30% of At-risk Fee) was rated as Satisfactory, overall, with significant challenges noted. The Laboratory resumed several major operations in the Plutonium Facility at Technical Area 55 allowing for resumption of programmatic operations critical to the NNSA mission. Process improvements realized through Plutonium Facility resumption activities were also effectively implemented at the Weapons Engineering Tritium Facility, resulting in a successful Federal readiness assessment at the end of the performance period. Metrics on injuries/illness and days away from work reflect progress in areas of Safety and Health; and many Safety and Health programs were effectively implemented. The Laboratory continued to effectively deliver Safeguards and Security protection. The Laboratory achieved and sustained excellence in many areas of business by achieving vehicle fleet efficiencies, and by leading NNSA in the cost-saving use of the Supply Chain

Management system. The Laboratory exceeded targets for the reduction of unneeded facilities, for site sustainability goals, and for Authenticated Scanning of Classified and Unclassified core IT devices.

The remaining operations that were not resumed in the Plutonium Facility continued to impact programmatic operations. Several additional facilities remained inoperable throughout the year including the Waste Characterization Reduction and Repackaging facility, the Radioactive Assay and Nondestructive Testing facility, Waste Area G, and the Weapons Engineering Tritium Facility. Additional operational concerns include work planning and control and Technical Safety Requirement (TSR) compliance issues. A substantial negative trend in events developed during FY 2015 culminating in a serious Arc Flash event at LANSCE that resulted in, a severe worker injury, unplanned outages, and equipment damage. DOE's Office of Enforcement issued an Enforcement Letter to the Laboratory during FY 2015 related to the significant radiological contamination event at the National Critical Experiments Research Centers (NCERC) facility at the Nevada Nuclear Security Site. Ongoing challenges persist with Criticality Safety program implementation, Project Management, and with the implementation of the Earned Value Management System for projects. A cyber security failure resulted in the compromise of personal identifying information by a malicious attacker on NNSA/LANL publicly accessible web servers. Laboratory programmatic oversight of protective force was inadequate and resulted in a significant failure to safeguard firearms.

PO-6: Leadership (10% of At-risk fee) was rated as Good. Overall, Los Alamos National Security, LLC performed at the "meets expectations" level in ensuring that leadership is effectively managing programmatic concerns. Noteworthy accomplishments include progress on Strategic Planning improvements such as the Laboratory Performance Improvement Plan, collaboration with other Laboratories and stakeholders to achieve both cost savings and mission success, and the continuation of excellence in many areas of Science, Technology and Engineering. Significant challenges in FY 2015 included building unity of purpose and unity of effort among the Laboratory staff to address and resolve the very significant operational challenges identified in Performance Objective 5, and progress against those challenges was uneven.

Specific observations for each of the Performance Objectives are provided in the following pages.

Performance Objective 1: Manage the Nuclear Weapons Mission

Description

Manage the Nuclear Weapons Mission (30% of At-risk Fee) was rated as Very Good. Overall, Los Alamos National Security, LLC (LANS) performed at the above expectations level in managing the Nuclear Weapons Mission. The Laboratory made important progress in support of the stockpile, including work in Advanced Certification readiness efforts for pit reuse, work on dynamic materials properties for the National Boost Initiative, preparatory work on a future neutron-diagnosed subcritical experiment, along with several other areas. One significant success was the completion of the Leve 1 Pit Reuse Requirements Milestone that will inform future Stockpile Modernization Programs. The Laboratory maintained excellent progress on Trinity Supercomputer acquisition contract activities. The Laboratory is challenged by the continued pause in operations at the Technical Area 55 Plutonium Facility, but demonstrated excellent performance in completing restart activities for the Weapons Engineering Tritium Facility. The Pause which began in Fiscal Year (FY) 2013 substantially continued through the year, impacting nuclear weapon program implementation, and requiring the renegotiation of milestones involving production, research and surveillance activity.

CF-1.1 - Meets Expectations - During this fiscal year, the Laboratory exceeded expectations with regard to Advanced Simulation Computing (ASC) Level 2 milestones for Integrated Codes, Verification and Validation, Physics and Engineering Modelling, Computational Systems and Software Environment, Facility Operations and User Support, and Advanced Technology Development and Mitigation. All Test and Evaluation program management tasks are on track. The Laboratory provided input to the FY 2015 Engineering Campaign/Enhanced Surveillance Program Implementation Plan as well as input to the Enterprise Portfolio Analysis Tool and Selected Acquisition Reports. The Laboratory provided the necessary support to resume from Code Blue production interruptions on the B61 and W80 at Pantex, enabling work to re-start on these programs.

The pause in nuclear operations which began in FY 2013 substantially continued, impacting nuclear weapon and Plutonium Sustainment program implementation, and requiring the renegotiation of milestones involving production, research and surveillance activity. The Laboratory renegotiated milestones at Technical Area 55 and met all of these revised milestones, with the exception of one supporting the Nuclear Survivability program. The Laboratory completed scheduled key equipment upgrades and replacement activities and Power Supply development activities for Plutonium Sustainment, which resulted in delivery of components two years ahead of schedule for testing, supporting reduction of component design risks.

The Laboratory met scope, cost, and schedule expectations for Stockpile Services by continuing the Laboratory's PDMLink Continued Operation and Maintenance (O&M) support of WLink, and deploying a new version of PDMLink (version 10.2/M020) on the classified network. PDMLink is now able to collect system and subsystem metadata at document release and pass this information to Need to Know (NTK) Digital Access Control System to prevent unnecessary NTK denials. The

Laboratory continued to perform above expectations in supporting the Scope Comparison of Options, Risks and Excursions by providing significant analysis in support of the Tritium Program.

The Laboratory exceeded expectations for the B61-12-Life-Extension Program (LEP) by delivering all required deliverables according to established schedules, even given late arrival of data from Joint NNSA/DoD tests. The Laboratory Design Agency initiated a series of activities necessary to implement a project management infrastructure to achieve compliance with Earned Value Management System (EVMS) according to the B61-12 LEP Project Management System Description and Project Controls Manual and based on Integrated Baseline Review recommendations.

The Laboratory achieved notable success in the Material Recycle and Recovery Programs. During the year, the Laboratory completed clean-out processing of two legacy experimental vessels and dispositioned 33 legacy items from the Chemistry and Metallurgy Research (CMR) facility; installed the High-Efficiency Neutron Counter (HENC) and received Field Office Safety Authorization and Waste Isolation Pilot Project (WIPP) certification to operate to measure drum content for disposal at WIPP; completed readiness activities related to loading the UC609 shipping container; executed a time-critical shipment of excess tritium to the Savannah River Site; and dispositioned 194 special nuclear material (SNM) containers from the Technical Area 55 Vault and completed a construction project to create twelve new premium storage locations in the Technical Area 55 Vault. The vessel clean-out, Technical Area 55 SNM disposition and vault storage project exceeded NNSA expectations. Additionally, the Laboratory completed 100% of the required annual SNM storage container surveillance to maintain compliance with DOE Manual 441.1-1.

The Laboratory met expectations in identifying potential authorization bases impacts associated with Weapon Response-related changes or potential changes; including revamped Weapons Response processes to enable effective NNSA support action. Timely notifications allowed for coordination of issues with weapon response between the Laboratories and Consolidated Nuclear Security Pantex in an efficient manner.

The Laboratory met expectations for program management and completion of technical projects supporting the Weapons System Engineering Assessment Technologies program, the Nuclear Survivability program, and the Enhanced Surveillance program.

CF-1.2 – Above Expectations - The Laboratory met expectations by completing all requirements in support of Annual Assessment activities for the B61, W76, W78, and W88 weapon systems. The Laboratory hosted the Stockpile Assessment Conference and presented assessment related briefings for all Laboratory systems to the Stockpile Advisory Group/Stockpile Assessment Team (SAGSAT). The Laboratory Director signed his 2015 Annual Assessment Letter on September 18, 2015, transmitting the Annual Assessment Reports to the NNSA. Additionally, the Laboratory met all Independent Nuclear Weapons Assessment Process requirements, in coordination with the Lawrence Livermore National Laboratory.

The Laboratory met all expectations during the fiscal year on scheduled surveillance activities, deliverables, and requirements for all weapons systems as documented in Integrated Weapons Evaluation Team (IWET) plans within budget. For the W76-0, W76-1 and W88, the Laboratory updated the IWET plan to document the pit surveillance backlogs and production recovery schedules.

The Laboratory continued to perform above expectations in support of the Enhanced Surety program by exceeding planned goals in both joint development of Integrated Surety Architecture (ISA) concepts with the U.K. and advanced concepts for new applications to additional US systems. A demonstration of joint U.S. and U.K. components completed at Atomic Weapons Establishment in April and was repeated again at the Second Level meeting in May. Noteworthy progresses on other Advanced ISA concepts developed solid interactions with Nuclear Security Enterprise (NSE) Systems groups and the DoD.

CF-1.3 – Meets Expectations - The Laboratory advanced the state of production readiness supporting Gas Transfer Systems (GTS) by working with the National Security Campus to develop predictive process models for future GTS designs, demonstrated the technical feasibility of a miniaturization effort for application in a future LEP design, and supported re-qualification activities to re-establish GTS production at the National Security Campus.

Throughout the year, the Laboratory continued to meet expectations for stockpile weapon systems maintenance project deliverables and requirements for each weapons program and did so within site budget allotment and in compliance with directives. The Laboratory exceeded expectations on the New Tooling and Authorization Basis for W78 Weapon Repairs by continuing to provide actively engaged weapon responders and participating in walk-through activities at Pantex for these stretch milestones.

The Laboratory continued to meet expectations for the dismantlement program by presenting effective strategies to eliminate unneeded legacy materials and reduce legacy inventories of weapon parts at the Los Alamos Site.

The Laboratory completed the milestone deliverable releasing the W76 System Requirements Document Rev1 for the Defense Programs Product-2 container to the Y-12 Site.

CF-1.4 – Above Expectations - The Laboratory met Advanced Simulation Computing (ASC) expectations with regard to the Level 2 milestones for Integrated Codes, Verification and Validation, Physics and Engineering Modeling, Computational Systems and Software Environment, Facility Operations and User Support, and Advanced Technology Development and Mitigation. In the ASC Physics and Engineering Models subprogram, several new equations of state were developed, including several new multi-phase equations of state for relevant materials and associated alloys. These multi-phase equations of state are being used, in part, to satisfy the FY 2015 Level 1 Milestone on Pit Reuse. Additionally, the Laboratory documented a delivery to the modeling and simulation

community, a nuclear explosive package mesh suitable for radiation transport analysis. The Laboratory also completed a multi-year plan for Neutron Imaging studies.

The Laboratory identified an alternative option for a diagnostic neutron source for Neutron Diagnosed Experiments using in-situ photo-fission from the bremsstrahlung radiation generated by a linear accelerator such as Aria or Dual Axis Radiographic Hydrodynamic Test Facility (DARHT).

The Laboratory continued to expand the use of its R&D 100-award-winning Multiplexed Photonic Doppler Velocimetry (MPDV) diagnostics at DARHT and at other high explosives firing sites. The Laboratory fielded the Generation II version of MPDV in a July 2015 DARHT hydrodynamics experiment that was the most highly-diagnosed DARHT experiment ever conducted; with nearly 200 channels of optical velocimetry data in addition to other High Explosive performance, pressure, temperature, and radiographic data. This system was also fielded for the LYRA ORPHEUS experiment at U1a at the Nevada National Security Site (NNSS). Additionally, the Laboratory executed six full scale hydrodynamic experiments at DARHT, including two experiments exploring Insensitive High Explosives (IHE) pit reuse concepts

The Laboratory delivered an improved Plastic-Bonded Explosive (PBX) 9501 constitutive model to principal Laboratory customers and greatly improved the performance of MPDV through incorporation of an implicit midpoint integrator. Performance of a subroutine for the implicit code for PBX 9501 and PBX 9502 (UMAT) was also improved. Supporting Primary Assessment Technologies (Campaign 2), the Laboratory tested thermal ignition and subsonic burning in PBX 9502 IHE to demonstrate that it will not transition to detonation in abnormal thermal environments. This data will enable the Laboratory to answer questions regarding IHE processing, Weapon Response, and stockpile aging.

Experiments were configured to begin thermal and irradiation exposures of key materials. The Laboratory designed a sample layout for the neutron irradiation cave at the Low Dose Rate Gamma Irradiation Facility to support upcoming experiments. Sample containers were designed to mimic configurations for both intrinsic and radiography/tomography type exposures.

The Laboratory completed the inclusion of ChemPac high resolution sink responses into the ChemPac full system model and adapted associated Model Analysis and Decision Support (MADS) Global Sensitivity Analysis software for use with high performance computing systems. Application of this software to ongoing ChemPac modeling enhanced decision making capabilities for future ChemPac related studies.

Advanced Certification work met expectations, including the completion of an integrated hydrodynamic experiment related to a surety concept, certification readiness efforts related to surety for Life Extension Programs, efforts supporting the Level 1 Predictive Capability Framework peg-post related to pit reuse, and the design of a reuse hydrodynamic test scheduled for FY 2016. Technical work advanced on the Level 1 pit reuse milestone. Uncertainty Quantification is being

applied to a new application of interest. Two pit reuse hydrodynamic experiments were conducted at DARHT during this fiscal year.

As part of its work under Campaign 2, Dynamic Materials Properties, the Laboratory tested thermal ignition and subsonic burning in PBX 9502 Insensitive High Explosives to demonstrate that the material will not transition to detonation in abnormal thermal environments. This type of data enables the Laboratory to answer questions regarding IHE processing, Weapon Response, and stockpile questions.

A joint LANL-LLNL team completed a series of time-resolved, small-angle, x-ray scattering experiments of detonating explosives at the Dynamic Compression Sector at the Advanced Photon Source. Funded by the Primary Assessment Technologies campaign, the Laboratory team studied carbon cluster formation and evolution in PBX 9501, PBX 9502 and Comp B-3. This information enhances existing stockpile assessment and supports future stockpile modernization activities.

The Laboratory met expectations by conducting a series of experiments on Omega as part of the Marble Campaign. In addition, they completed a shock/shear experiment on the National Ignition Facility to test an improved beryllium tube design, and the first Deuterium/Tritium layered implosion with a beryllium capsule.

The Laboratory performed above expectations in Advanced Manufacturing Development work scope. The Laboratory exceeded expectations for FY 2015 in both the expansion of material manufacturing capabilities and in the development of strategies to ensure Integrated Surety Architecture (ISA) responsibilities were met. Specific accomplishments in expanding material manufacturing capabilities included enhanced additive manufacturing activities (three dimensional printing) and process studies on forged materials. The Laboratory continued advancing imaging tests on shock initiation of Pentaerythritotetranitrate (PETN) and continued advancing pendulum testing of PBX. Additionally, the Laboratory manufactured a new lot of Additively Manufactured 316L stainless steel samples from 316L powder. On three of the samples, the Laboratory also conducted thermal recrystallization processing prior to characterization and dynamic testing. For comparison, the Laboratory also characterized and tested three other samples in the as-manufactured state. This work will further enhance understanding of additively manufactured materials and will facilitate future incorporation into nuclear weapons components.

CF-1.5 – Above Expectations - The Laboratory successfully completed the third “Practicum” in the Capabilities for Nuclear Intelligence program, which has been frequently showcased as both an example of support from the core nuclear weapons program and support to the broader intelligence community. It is also an important and effective training tool for developing nuclear weapons design staff.

The Laboratory met Advanced Simulation Computing (ASC) expectations with regard to the Level 2 milestones for Integrated Codes, Verification and Validation, Physics and Engineering Modeling,

Computational Systems and Software Environment, Facility Operations and User Support, and Advanced Technology Development and Mitigation.

The Laboratory conducted 20 high explosive driven proton radiography (pRad) experiments during this fiscal year. The experiments this year contributed to the advancement of nuclear weapons certification, design, nuclear intelligence, and material characterization. One series of experiments were conducted to address the modeling uncertainty for Red Sage drive experiments related to propagation of detonation waves and reflections through High Explosives. The pRad capability provided a unique tool to measure the density waves moving through the system. The experiments also resolved diameter questions on simultaneous free-surface velocimetry.

During this fiscal year, the Laboratory led the Predictive Capability Framework (PCF) Council and drove significant progress in achieving the PCF peg-posts, including completion and closure of a Level 1 milestone on Pit Reuse, as well as leading an analysis of the structure and format of the framework.

Work in the areas of Primary Assessment, Dynamic Materials Properties, and Secondary Assessment proceeded according to expectations, although budget constraints resulted in the deferral of two milestones related to assessing primary anomalies and the deferral in the design of the 6-foot containment vessel for subcritical experiments to FY 2016. There was schedule risk with a milestone related to boost physics experiments supporting the National Boost Initiative. Also, three boost experiments were completed to support the National Boost Initiative. Successes include the completion of an assessment of material damage of tantalum driven by high explosives in relevant geometries, and progress towards the design of the Red Sage subcritical experiments campaign including the completion of drive experiments that will allow for key decision making. In addition, the Laboratory completed an extensive study to determine the scaled pit type to use for a future subcritical campaign at Nevada's U1a.

The Laboratory played a leadership role in the development and project management of the Enhanced Capabilities for Subcritical Experiments project, and made progress on a design concept that will support this project for future neutron-diagnosed Sub-Critical Experiments (SCEs) at the Nevada U1a facility. Challenges were experienced in Advanced Radiography. Due to the decision by NNSA to delay the start of the Line Item Construction Project at the U1a Complex until FY 2018, Critical Decision (CD)-1 was also delayed. Additionally, through the Analysis of Alternatives process and an independent panel review, program requirements were identified as lacking in sufficient detail to drive a technology solution that would support future subcritical experiments.

The Laboratory issued the final data report for the Leda scaled experiment and executed the Orpheus confirmatory and Marble experiments, and also made Shear Campaign experiment advances at the National Ignition Facility. The Laboratory utilized the Time Projection Chamber (TPC) to perform a highly accurate measurement of the Pu 239 fission cross-section.

The Laboratory effectively supported the MaRIE initiative focused on plutonium chemistry and fabrication; funded support for an upgrade of Technical Area 16-301 thermal test facility; and developed technology for Advanced Radiography emphasizing the evaluation of materials for cavity inductive isolation and pre-prototype testing.

The Laboratory met expectations in management of the Readiness in Technical Base and Facilities Program by providing support for Directed Stockpile Work (DSW) with regards to operations, maintenance and recapitalization.

The Laboratory developed a new set of experimental capabilities designed to enable comprehensive characterization of chemical and structural properties of the surfaces of materials of importance by completing modifications to the polarized neutron reflectometer Asterix at the Lujan Center. This new capability will allow the prediction of the aging of bulk materials.

The Laboratory met expectations by executing 499 of 550 Trident laser experiments scheduled for FY 2015; completed both a lower (254 micron pixels) and higher resolution (127 micron) scan of the mid-scale test object for Neutron Imaging Non-Destructive Evaluation studies at the Los Alamos Neutron Science Center (LANSCE); and completed design and test configuration for gas transport studies during irradiation for the Canned Sub-Assembly Response Model. The Laboratory also made progress on key diagnostics, including the first experiment to measure the inflight implosion shape of a beryllium capsule at the National Ignition Facility using two dimensional backlight imaging, the utility of measurements of gamma photons between hydrogen and tritium, and the use of neutron tomography to determine the three dimensional shape of the hot spot and cold fuel in an imploded Inertial Confinement Fusion (ICF) capsule. The Laboratory also conducted performance improvements to the xRAGE code, which enabled the first ICF simulations in three dimensional from time zero on LLNL's Sequoia supercomputer. Previous calculations that were required in initial two dimensional simulations were translated into three dimensional representations. The new three dimensional implosions covered the entire implosion of a direct-drive capsule experiment on the OMEGA laser. This improvement strengthened the stockpile simulation and modeling capabilities and included all relative physics including hydrodynamics, radiation, electron and ion conduction, and thermonuclear burn.

The High Energy Density campaign executed a total of 14 experimental events on the OMEGA laser to quantify the effects of low-mode asymmetries on implosion performance. Monochromatic images were obtained from targets with the mounting stalk located in a different location from previous experiments, providing information on how mounting stalks affect implosion performance.

The Laboratory successfully executed the high explosives operations portion of the Source Physics Experiment 4-prime sponsored by NNSA. This experiment contributed to a long-term NNSA research and development effort intended to advance the nation's ability to detect and discriminate

low-yield nuclear explosions among potential masking by conventional explosions and small earthquake signals.

In response to a Significant Finding Investigation on the W88 program, the Laboratory successfully procured and installed a Centrifuge and Blast Tube at a High Explosive Firing Point. Results of experiments with this new capability will enable weapons engineering to close the investigation.

The Laboratory was above expectations for Enhanced Surety by conducting promising work on material compatibility, laying the groundwork for a well-informed decision on whether to proceed with a new solution for safety and use-denial. The work, which was added scope to the initial fiscal year baseline, resulted in a high-quality system ready design that was shared with the end-user with very positive reception. The Laboratory also finalized interface documents and delivered hardware components for a joint United States - United Kingdom test-bed product.

As part of a W88 Canned Sub-Assembly Refurbishment study, the Laboratory worked with the Y-12 Plant to discuss possible product stream alternatives as well as maintenance of production processes. This effort identified critical skills required for both design qualification and production, should refurbishment be necessary in the future.

CF 1.6 – Above Expectations - The Laboratory met expectations for the W76-1 Life Extension Project in support of the "Getting the Job Done" requirement to deliver W76-1 LEP War-Reserve warheads to the Department of the Navy in accordance with the FY 2015 delivery schedule, ensuring production program completion by FY 2019. The Laboratory continued to collaborate with the National Security Campus (NSC) on successful execution of the APO-BMI requalification for Aft Support production to prevent adverse impacts to W76-1 LEP production. The Laboratory Production Agency (PA) collaborated with Pantex and Sandia National Laboratory to implement a path forward to satisfy W76-1 Life of Program needs through the production of an additional Detonator Cable Assembly lot beyond the current baseline without impact to W76-1 production schedules and budgets.

For the B61-12 LEP, the Laboratory Design Agency (DA) exceeded expectations in adapting the schedule to several issues external to the Laboratory (such as aircraft availability) that delayed joint tests. The Laboratory delivered all required hardware in support of the Material Requirements Schedule. The Laboratory DA successfully completed or aided in the completion of several local and joint tests; including LT61LEP-40, LT61LEP-62, W-14-TR-0166 Heavily Confined High Explosive Investigation, TK1K1309-A-009 JT61NE-ME3, and B-2 VFA/IMV testing. The Laboratory DA also supported preparations for upcoming F-35 and NATO Aircraft VFA/IMV tests, and supported test readiness review and execution preparations for Flight Test Development Unit #1. The Laboratory DA produced the Quick-Look report for local test SST-AE-Impact 1 and LT61LEP-55 HC. The Laboratory successfully shipped 15 GTS assemblies for joint testing, and eight Joint Test Assembly specific GTS assemblies. The Laboratory DA provided support in the TYPE 3C trainer disassembly activities. The Laboratory DA worked collaboratively with NSC and the Laboratory PA to develop a

recovery plan for the 1E40 detonator design; however, the recovery plan adds risks and costs to the overall program. The Laboratory DA successfully completed seven Baseline Design Reviews (BDRs) and three Final Design Reviews. The Laboratory DA actively involved LLNL in Independent Peer Reviews including recently completed subcomponent BDRs. The Laboratory DA has not completed development lot evaluation for PBX 9502 and PBX 9012. Because of an inability of a commercial supplier to deliver consistent PBX 9502, the Laboratory DA and Pantex developed a recovery plan that will deliver main charge assemblies for First Production Unit from the Qualification Engineering Lot. The Laboratory PA provided the required cost estimate information to NNSA for the TYPE 3 trainer builds in March 2015 and successfully installed a prototype XE backfill station in the assembly line. The Laboratory PA worked to address development issues with the 1E40 detonator and proactively identified process improvements to meet increase throughput requirements.

The Laboratory met expectations and performed activities in accordance with the Alteration Management Team (AMT)-approved Joint Integrated Master Schedule (JIMS). The Laboratory advanced the Demonstration and Shakedown Operation 26 flight test unit build, in accordance with the AMT-JIMS. The Laboratory worked closely with the National Security Campus (NSC), and Consolidated National Security (CNS) to fully stand up Product Realization Teams (PRTs), and incorporate Conventional High Explosive (CHE) Refresh scope into the W88 ALT 370 program.

The Laboratory worked diligently and quickly to establish a CHE Refresh at the direction of the Nuclear Weapons Council (NWC). Laboratory personnel were instrumental in assisting with reports and briefings for NNSA leadership, NWC/Safety and Standing Committee, and congressional staff on this issue; supporting CHE Refresh program oversight for the W88 warhead.

SSO-1.1 – Meets Expectations - The Laboratory Director signed the 2015 Annual Assessment Letter on September 18, 2015, completing this objective. The Laboratory improved modeling, simulation, engineering tools, codes, and materials analyses to support stockpile stewardship as demonstrated through timely work to support the Director's Red Team review and the successful conduct of the U. S. Strategic Command Stockpile Assessment Conference that occurred in June 2015.

SSO-1.2 – Above Expectations - The Laboratory and Lawrence Livermore National Laboratory jointly delivered evidence and analysis to close the Pit Reuse Level 1 milestone supporting the Predictive Capability Framework peg-post for Reuse. The External Review Board for this milestone recommended closure to NNSA. The Laboratory provided presentations on key areas of uncertainty that were addressed by the peg-post with the External Review Committee with positive results. Other work of note in this area included progress made in assessing aged plutonium with surface science capabilities that involved small-scale science work at the Target Fabrication Facility.

The Laboratory also strengthened the technical foundation of plutonium characterization with a focus on pit lifespans and associated implications for pit reuse. The Laboratory executed two full

scale hydrodynamic tests of pit reuse concepts at DARHT, as well as an in-depth peer review with LLNL and Strategic Command Senior Advisory Group Science and Technology Panel on the Scaling and Surrogacy Program methodology.

Under its work supporting the Primary Assessment Science Campaign, the Laboratory obtained first-of-its-kind Time-of-Flight Secondary Ion Mass Spectrometer (SIMS) results on 33 year-old delta Plutonium using controlled gas exposures which provided unique information about reaction mechanisms and kinetics occurring on Plutonium surfaces.

The Laboratory conducted neutron surface scattering using the ASTERIX spectrometer at the LANSCE Lujan Center to provide preliminary data of Plutonium Oxide thin films produced by polymer-assisted depositions. This technique contributes information that gives insight into plutonium surface chemistry and reactivity which is relevant to both environmental remediation and pit aging questions in stockpile stewardship.

The Laboratory successfully executed several experiments that will greatly strengthen the technical understanding of Plutonium. Specifically, the Laboratory executed a Richtmyer-Meshkov Instability shape effects trial and two Damaged Surface Hydrodynamics experiments at the Proton Radiography Facility, and a Particle Image Velocimetry/Accelrometry experiment at the Horizontal Shock Tube Facility. Data obtained from these experiments provided valuable insight into drag forces, Hydrodynamic flow and ejecta, which contributes to the knowledge dynamic Plutonium behaviors.

SSO-1.3 – Meets Expectations - The Laboratory supported Advance Simulation Computing initiatives by implementing two new hydrodynamic code models based on Lagrange plus Remap numerical treatment, an improvement over the legacy direct Eulerian treatment, and stood up a new Code Development Team to explore computer science framework options for the next generation of code.

The Laboratory met expectations on the Trinity supercomputer project, with delivery of the first hardware under the Trinity contract. Two Application Regression Testbeds were delivered, one to LANL and one to SNL, as well as a System Development Testbed. As part of the Trinity Center of Excellence work with Cray and Intel, the Laboratory participated in and provided input regarding the Sierra application with SNL. The Laboratory completed a major accomplishment with the installation and post-delivery testing for the Trinity Phase 1 system which consists of the Trinity-Haswell sub-parts which contain 50% of the computer racks, the complete parallel file-system, all of the burst buffer racks, and all of the front ends. The Laboratory actively participated in various exascale planning workshops and document writing. This has advanced DOE's potential contribution to future national exascale computing development.

SSO-1.4 – Meets Expectations - For B61-12 LEP Design Scope, the Laboratory DA met expectations regarding monthly reporting into the NNSA Integrated Master Schedule (NIMS). The Laboratory DA

implemented an EVMS system, but improvements noted in the Integrated Baseline Review (IBR) are required to fully meet B61-12 Project Control requirements. The Laboratory DA identified and managed risks in accordance with the B61-12 LEP Risk & Opportunity Management Plan. The Laboratory DA submitted B61-12 LEP monthly reports, earned value reports, and site schedule updates in the requested format. The Laboratory DA supported cost management boards for the B61-12 LEP in October 2014 and April 2015 and initiated unit cost tracking with PRTs at component reviews.

For B61-12 LEP Production Scope, the Laboratory PA met expectations and successfully completed the IBR of the site project controls system in February 2015. The Laboratory PA also issued a formal and timely response to the IBR recommendations. This response included detailed plans for addressing each issue and a schedule for implementation. The Laboratory PA completed the portion of the NNSA Burn-Down Plan to refine site contributions to the NIMS. The Laboratory PA identified and managed risks in accordance with the B61-12 LEP Risk & Opportunity Management Plan. The Laboratory PA continued to submit monthly reports, earned value reports, and site schedule updates in the requested format. The Laboratory PA supported cost management boards for the B61-12 LEP in October 2014 and April 2015 and initiated unit cost tracking with Product Realization Team at component reviews.

The Laboratory made significant progress toward meeting the requirements issued in the October 17 2014 memorandum, "W88 ALT 370 NNSA Integrated Master Schedule (NIMS) Monthly Data Submission Requirements," that outlined criteria for monthly data submission requirements to generate the NIMS. In addition, the Laboratory provided a plan to implement the Project Controls Administrative Procedures (PCAPs) establishing more detailed requirements beyond the October 17, 2014 memorandum. Though the Laboratory continued to maintain the P6 schedule, the schedule was not on the required unclassified system; but the schedules were submitted on time. Furthermore, the Laboratory procured and trained new project controls staff in order to bring the schedule coding up to a level that meets the NIMS requirements, which helped significantly to reach full compliance with EVMS requirements.

SSO-1.5 – Above Expectations - Laboratory staff continued to provide exemplary support to the development of the plutonium strategy by supporting Chemistry and Metallurgy Research Replacement (CMRR) Radiological Laboratory Equipment Installation Phase II project work elements to achieve planned Departmental critical decisions milestones. In October 2014, the Laboratory conducted an Integrated Planning Workshop at NNSA Headquarters on Plutonium efforts. The Laboratory continued to support frequent briefings with Congressional staff, DoD staff and other stakeholders. In May 2015, the Laboratory provided a technical and business case briefing to NNSA supporting the decision associated with the Plutonium strategy including the analysis of a proposal to operate the Radiological Laboratory Utility Office Building at a 400g of Pu 239 equivalent threshold.

In addition, the Laboratory provided technical support to relatively new efforts associated with the Plutonium strategy including the analysis of a proposal to operate the Radiological Laboratory Utility Office Building at the 400g of Pu 239 equivalent threshold, and the development of Critical Decision Point 0 documentation for the proposed modular extensions to PF-4.

Specific recent accomplishments include:

- Pu Sustainment – Achieved two Level 3 Milestones ahead of schedule in early February to support MRT 5367.
- CD-0 For Modules – The Laboratory approved the Critical Decision Point 0 cost estimate range and supported team efforts to draft the Program Requirements Document and Mission Need Statement.
- RLUOB at 400g – The Laboratory supported two working sessions and a brief to NNSA, and developed the draft Business Case Analysis, Safety Design Strategy and Preliminary Documented Safety Analysis for this change.

Performance Objective 2: Reduce Global Nuclear Security Threats Mission

Description

Reduce Global Nuclear Security Threats Mission (10% of At-risk Fee) was rated as Very Good. Overall, Los Alamos National Laboratory performance was above expectations in management of the Global Nuclear Security Threats Mission. In FY 2015, the Laboratory continued extensive and successful execution of work supporting the broader national security mission to reduce nuclear threat. The Laboratory achieved significant accomplishments in the areas of Non-proliferation, Emergency Operations, and Counterterrorism. Specific contributions include success in securing proliferation-sensitive materials, support of nuclear export and trade oversight, Research and Development technology solutions for treaty monitoring, support for national level exercises, and support for the Space Nuclear Detection Mission. The Laboratory is challenged by the continued pause in operations at the Technical Area 55 Plutonium Facility resulting in the inability of the Laboratory to support FY 2015 congressionally mandated goals for the Fissile Material Disposition Program.

CF 2.1 – Above Expectations - During FY 2015 the Laboratory's support to the NNSA Off-Site Source Recovery Project (OSPR) significantly exceeded expectations. Technical guidance in the management and recovery of disused radiological sealed sources was outstanding. The Laboratory has been instrumental in the implementation of a new pilot initiative to convert to non-radioisotopic based devices. This scope of work was not fully identified until after the beginning of the fiscal year and the Los Alamos team did an excellent job in adapting to the delayed requirements.

The Laboratory exceeded expectations while supporting efforts to secure proliferation-sensitive materials. In FY 2015 the Laboratory recovered 2,305 sealed radioactive sources for the OSRP well over the goal of 1,500. During the review period, NNSA celebrated the recovery of the 1 millionth curie of abandoned radiological sources since program inception. In July, the Laboratory coordinated with United States and Mexico institutions to recover three 3 Husman irradiators (56,000 Ci of 1376Cs) from Southern Mexico.

Laboratory staff continued to make noteworthy contributions to the Mo 99 program; the technical quality of the work continued to be very strong and comprehensive in support of the (γ, n) accelerator and D/T accelerator with low enriched uranium (LEU) fission technology development. Challenges in schedule management earlier in the fiscal year involving experiment apparatus were partially resolved as a result of the Laboratory's flexible and cooperative work with other DOE partners. The Laboratory performed authorized work scope within agreed upon budget profile expectations. Laboratory staff continued to support DNN's goal of reducing the civilian use of highly enriched uranium (HEU) by working with U.S. commercial entities on non-HEU technologies to produce Mo 99.

The Laboratory supported NNSA's Reactor Conversion Program, which advanced the Fuel Fabrication Capability (FFC) pillar of the United States High Performance Research Reactor (USHPRR) by contributing to testing, production and characterization of materials for related irradiation experiments. The Laboratory performed the authorized scope within agreed upon budget profile expectations.

The Laboratory supported NNSA's efforts to develop new fuels and technologies to support conversion of reactors from HEU to LEU. Production of the depleted uranium (DU) master alloys needed for a key project experiment (MP-1) became a major concern earlier in the year when the original entity accountable for the deliverable could not produce or procure the alloys. In February, the Laboratory produced and shipped 50 kg of DU-12.6% Mo master alloy buttons and 50 kg of DU - 23.7% Mo master alloy buttons to the Y-12 Site for this major project milestone. The production of all the DU master alloy buttons to Y-12 for a second shipment was finished in April, completing the campaign of producing this material for the MP-1 test. The MP-1 test is the top FY 2015 priority in NNSA's CONVERT program and an MP-1 manager for the program said that the Laboratory's efforts saved the national schedule.

In July, researchers from the Laboratory and the Japan Atomic Energy Agency (JAEA) completed the first joint criticality experiment at the National Criticality Experiments Research Center (NCERC) in Nevada. These experiments were conducted in support of the agreement made by the U.S. and Japan at the third Nuclear Security Summit at the Hague in March 2014 to ship all HEU and weapons-grade Pu from JAEA's Fast Critical Assembly (FCA) to the U.S. in 2016. This work was conducted in support of DNN's goal of minimizing the civilian use of HEU.

During FY 2015, Laboratory staff showed initiative in identifying unanticipated technical challenges and pursuing solutions in collaboration with colleagues at another National Laboratory. Laboratory staff successfully and smoothly collaborated with another National Laboratory to facilitate a joint irradiation experiment which was completed during the fourth quarter in the face of technical and administrative challenges. The Laboratory performed the authorized scope within agreed upon budget profile expectations.

CF 2.2 – Above Expectations - During FY 2015, the Laboratory supported ongoing national and international efforts to safeguard and secure nuclear material. The Laboratory met expectations for contributions to DOE nuclear and radiological security challenges, to include nuclear trafficking. Laboratory support included key technical participation in the annual International Atomic Energy Agency (IAEA) Safeguard Symposium in Vienna, Austria; and the Laboratory provided multiple key safeguard training sessions to IAEA inspectors. Other Laboratory training activities included the development of a new safeguards training program at the Republic of Korea (ROK) Center of Excellence at as well as leadership for a workshop for the group of established Commodity Identification Training trainers in Jakarta, Indonesia. Additionally, the Laboratory provided technical support to the China Center of Excellence. These efforts advanced the nation's international collaboration for international safeguards.

The Laboratory provided subject matter expertise (SME), foreign partner training, and project support for the China Center of Excellence project. In support of other important nonproliferation activities with China, a Laboratory staff member attended Peaceful Uses of Nuclear Technology (PUNT) meetings and participated as a member of Working Group V (Radioactive Source Security) at the 10th China – United States Joint Coordinating Committee (JCC) meeting under the framework of the China - United States PUNT Agreement meeting held in Chengdu, China in early May 2015. The Laboratory also provided SME support to the Institute for Physics and Power Engineering. For both activities, the Laboratory consistently delivered timely, valuable, and mission critical input that benefitted both projects and worked to ensure successful execution of project activities.

During this fiscal year, the Laboratory made significant contributions to measuring spent fuel from research reactors, age dating UF6 in cylinders, and sourcing Uranium ore concentrates for Nuclear Verification work. There was also high quality support for nuclear safeguards by developing and testing a fast neutron collar to assay spent fuel with the European Atomic Energy Community, by supporting preparations for safeguards engagement activities in Southeast Asia, by providing technical support for cooperation with Japan including activities to address safeguards challenges at Fukushima, and through cooperation with the ROK on the Joint Fuel Cycle Study. In addition, Laboratory staff travelled to Daejeon in the ROK in April under DNN's International Nuclear Safeguards and Engagement Program to support development of a new safeguards training program at the ROK Center of Excellence.

CF 2.3 – Above Expectations - The Laboratory continued to support NNSA in its Nuclear Smuggling Detection and Deterrence (NSDD) mission (formerly called Second-Line-of-Defense) with country visits and training activities related to radiation detection systems at borders. In FY 2015, the Laboratory completed assurance and acceptance testing visits in over 20 countries around the world; conducted operator and maintenance provider training in Lebanon, Spain, Moldova and Portugal; conducted site surveys countries from Bulgaria to Ukraine; made sustainability visits to Sri Lanka, Thailand and Malaysia; and provided strong support in maintaining and enhancing the computer information networks for the Nuclear Suppliers Group and Australia Group multilateral export control regimes. In addition, the Laboratory continued to have a leadership role on the Science Team.

The Laboratory helped lead an effective multi-lab effort on the development of the Nonproliferation Policy Analysis and Interdiction Resource Commodity Analysis and Identification Capability. The Laboratory provided noteworthy technical and project management support for engagements that were designed to build national capacity in the detection and prevention of the illicit trafficking of strategic commodities. Major Laboratory-managed engagements focused on Indonesia and included a Commodity Identification Training (CIT) National Course Development and Instructor Training Workshop for Indonesian Customs in Jakarta.

Additionally, the Laboratory continued to support NSDD mission efforts to detect and prevent illicit trafficking of nuclear/radiological materials by providing skilled support for the installation, calibration, and maintenance of radiation portal monitors. The Laboratory also provided highly effective technical support for the closeout of the Global Initiative for Proliferation Prevention program during the second quarter including the facilitation of necessary export controls and other reviews for project completion. The Laboratory also provided noteworthy technical and project management support for engagements designed to build partner country capacity in the detection and prevention of illicit trafficking in strategic commodities in Iraq, Southeast Asia, and Turkey. Additionally, the Laboratory met expectations for contributions on DOE nuclear and radiological security challenges, to include nuclear trafficking.

Laboratory staff supported NSDD mission nuclear forensics through its participation in an IAEA consultancy to develop requirements for an IAEA technical document on nuclear forensics in January 2015. In addition, during the third quarter, the Laboratory taught gamma-ray spectroscopy measurement techniques in the International Atomic Energy Agency (IAEA)/NNSA International Workshop on Nuclear Forensics Methodologies.

CF 2.4 – Above Expectations - During FY 2015, the Laboratory continued significant support to non-proliferation programs by providing R&D technology solutions for treaty monitoring. The Laboratory delivered geophysical models and datasets that will improve analysis of seismic signal propagation for nuclear explosion monitoring. Additionally, the Laboratory met negotiated delivery schedule for nuclear detonation detection payload production and operational acceptance.

The Laboratory exceeded many expectations, including describing the evolving role of three dimensional modeling in improving the ground-based nuclear explosion monitoring mission. The Laboratory also provided responsive linkage with evolving requirements identified by mission stakeholders.

The Laboratory hosted NNSA R&D's annual review of its Nuclear Weapons Development and Material Production Detection (MPD) program in April 2015. The three-day review was successful with ~250 external visitors from across the DOE/NNSA complex and various other government agencies, as well as participants from universities and industry. The MPD Program Review covered tools, techniques, and methods to detect, locate, and characterize foreign nuclear weapons development activities from special nuclear material production to weaponization.

Laboratory work for Nuclear Verification for two projects was above expectations, including leadership of the joint U.S.-U.K. Portal Monitor for Arms Control project, and the modeling and analytical work completed toward a new concept for warhead verification for arms control. The Laboratory also supported follow-on activities from the Comprehensive Nuclear-Test Ban Treaty large-scale on-site inspection Integrated Field Exercise 2014. The Laboratory's expertise and leadership was an important part of the exercise's success.

During FY 2015, work was completed and leadership was provided for the joint United States (U.S.)/United Kingdom (U.K.) Portal Monitor for Arms Control project remained outstanding. The Laboratory supported follow-on activities from the Comprehensive Nuclear-Test Ban Treaty (CTBT) large-scale on-site inspection (OSI) Integrated Field Exercise 2014, including OSI Workshop meetings in April and June and an OSI training meeting in June.

During FY 2015, a Laboratory employee, was honored with the E.O. Lawrence award for his development of a new generation of exo-atmospheric radiation sensors used to fulfill a critical mission need for satellite-based nuclear explosion monitoring that is crucial to DOE's nonproliferation mission of global nuclear detonation monitoring and verification of the Limited Test Ban Treaty.

The Laboratory met or exceeded many program and technical requirements in advancing U.S. capabilities for monitoring foreign nuclear weapons development activities.

Excellent management response was noted on execution issues in the End-to-End Demonstration Campaign. Nuclear detonation detection R&D was of high quality. There were many impactful peer-reviewed publications produced and impactful technical support occurred, especially in ground-based detection.

Laboratory project management and execution continued to advance U.S. capabilities for detection, location and characterization of foreign proliferation activities. Project milestones and quality of deliverables met or exceeded.

CF 2.5 – Above Expectations - During FY 2015 the Laboratory supported international non-proliferation policy development by support of the Non-Proliferation Treaty Ambassador's Group for informational tours in preparation for the 2015 Non-Proliferation Treaty (NPT) Review Conference. The Laboratory also provided five key experts for the Comprehensive Nuclear-Test Ban Treaty large-scale on-site inspection Integrated Field Exercise in November-December 2014 in Jordan, including the Control Team Lead. The Laboratory's expertise and leadership was important to the exercise's success. Additionally, the Laboratory's leadership of the joint U.S.-U.K. Portal Monitor for Arms Control project and the modeling and analytical work completed toward a new concept for warhead verification for arms control were noteworthy.

The Laboratory continued to support key U.S. nonproliferation policy goals by hosting a March, 2015 meeting of 11 States Parties to the NPT and one representative from the United Nations Office for Disarmament Affairs. This successful visit was one of a several U.S. transparency measures stemming from the 2010 NPT Review Conference Action Plan that encouraged NPT nuclear-weapon States to enhance transparency and build mutual confidence.

In addition, the Laboratory successfully hosted the fifth annual Joint Steering Committee (JSC) meeting in July, 2015. This meeting was established under the 2010 Agreement in Nuclear Materials Safeguards and Security Research and Development between DOE/NNSA and the European Atomic Energy Community represented by the Directorate Generals of Energy and Joint Research Centers.

The Laboratory also supported the U.S. delegation at the fourth and final Group of Governmental Experts meeting on a Fissile Material Cutoff Treaty held at the United Nations (UN) in Geneva, Switzerland. The group was established by the UN Secretary General to make recommendations on aspects of a treaty banning the production of fissile material for nuclear weapons.

CF-2.6 – Above Expectations - During FY 2015, the Laboratory met performance expectations and maintained operational readiness to support the Office of Emergency Management. The Laboratory exceeded expectations for the Render Safe Program by providing highly effective support to the Joint Drill and Capability Exercise training exercises and implementing Top Secret/Sensitive Compartmented Information communication equipment.

For the 19th time, the Laboratory conducted the Annual Hazardous Material Challenge in which twelve teams from around the country participated. The teams responded to demanding scenarios that simulated events involving hazardous materials. The event expanded the footprint from the normal event layout at Technical Area 49 to Technical Area 16 at the Center for Emergency Preparedness and Analysis (CEPA). Shifting scenarios to the CEPA created a realistic laboratory environment where hazardous materials are normally used, while being able to effectively control the exercise play.

The Department of Energy Enterprise Assessment Team conducted an Emergency Operations Center (EOC) functional exercise on September 16, 2015. An extremely demanding set of objectives challenged the Laboratory's ability to respond to a simulated large seismic event involving three simultaneous hazardous material releases at the site. The Laboratory and Los Alamos County incident command structure responded to scenario objectives. The exercise identified areas where the Laboratory's emergency management EOC processes can be improved. NNSA identified several planning documents, supporting Hazards Surveys, and Emergency Planning Hazards Assessments,

which need improvements as required by DOE Order 151.1C, Comprehensive Emergency Management System.

The Laboratory met expectations for the Stabilization Program by supporting radiological dispersal device (RDD) training and Home Team tool development, and for component testing and database support for the Level V tool. Technical Nuclear Forensics Post-Detonation, Pre-Detonation, and Bulk Special Nuclear Material Analysis program requirements were met.

Additionally, as part of the National Center for Nuclear Security (NCNS) program, Laboratory staff participated in operations at the Nevada Test Site in activities that assisted in NCNS research as well as increased the understanding of key diagnostic information from historic events using modern methods and instrumentation.

In FY 2015, Laboratory analysts made significant contributions to the presidentially directed Nuclear Materials Information Program (NMIP). Specifically, Laboratory analysts provided input to numerous NMIP products used to support policymaker preparations for the 2016 Nuclear Security Summit. Laboratory analysts also contributed to the NMIP-led U.S. National Nuclear Forensics Library, which is a critical component of the U.S. nuclear forensics and attribution program supporting law enforcement and intelligence efforts related to nuclear smuggling and related incidents. Laboratory scientists analyzed key nuclear material samples of interest to NMIP and consolidated historical test shot data to mitigate knowledge gaps in the U.S. National Nuclear Forensics Library. Laboratory scientists participated in a statistical study of forensics data, a reactor modeling study of worldwide plutonium production reactors and developed a forensics library data vetting procedure.

CF 2.7 – Above Expectations - In FY 2015, the Laboratory partnered, often in the leadership role, with strategic partners throughout the world to ensure the sustainability of nuclear counterterrorism and counter proliferation science, technology and expertise. The Laboratory exceeded expectations in committing leaders and top scientists in its weapons design program to addressing persistent gaps in U.S. understanding of foreign nuclear weapon technologies and approaches. The Laboratory's participation included leadership, data analysis, observation and issue resolution.

During technical and programmatic discussion with Defense Threat Reduction Agency (DTRA) and NNSA, the Laboratory was awarded several hydro target builds and four Dual-Axis Radiography Hydrodynamic Test Facility (DARHT) shots for FY 2015/16 related to nuclear counter terrorism/counter proliferation. The Laboratory participated in joint NNSA-DoD-DOJ meetings on dynamic tool characterization and on advanced manual tool development and was able to conduct a significant degree of work in nuclear and energetic materials characterization and modeling, in assessments of nuclear threat devices, and in characterizing existing render safe tools and developing new tools, as well as continued effort on the MC-15 diagnostic for FY 2015 production. Expertise in technical nuclear forensics fostered by close coordination among multiple programs at the Laboratory.

The Laboratory participated with Lawrence Livermore National Laboratory to define a unified universe of nuclear yield threats. As a result, this unified space will serve as a resource for NNSA and for other agencies, providing a consistent starting point for analysis under applications which vary widely among agencies depending upon the objectives and needs.

Laboratory personnel participated in multiple training events in preparation for the September ESPIAL event in the U.K. ESPIAL is a test that will evaluate both operational and diagnostic capabilities of U.S., F.R. and U.K. Render Safe teams against high-fidelity threat devices. The Laboratory provided the single persistent observer present during all three country's operations to evaluate and document each country's strengths and weaknesses.

International support of NNSA's counter terrorism and counter proliferation mission was well coordinated and executed, with active participation in multiple international meetings. The Laboratory received special recognition for leadership of the Tiered Threat Modeling Analysis – V (TTMA-V) project, an ongoing experimental effort to predictively model disablement actions, and completion efforts for Campaign 1.

Additionally, the Laboratory demonstrated strong teamwork, in cooperation with the National Security Campus (NSC), in the planning and production of the MC-15 multiplicity counter, a diagnostic tool for specific render safe missions. The NSC and the Laboratory partnered in the development of prototype and pre-production units of this tool and successfully implemented a plan to deliver on-time pre-production models for the Laboratory, and subsequently trained appropriate NSC personnel to produce a larger number of units at NSC for delivery to partnering organizations and agencies.

SSO 2.1 – Meets Expectations - The Advanced Recovery and Integrated Extraction System (ARIES) oxide production program met a milestone to develop and submit the Plutonium Strategy Relocation Plan in December, ahead of schedule. Also ahead of schedule in December, after review of the Laboratory's certification documentation, Mixed Oxide (MOX) Services approved Blend Lot 38M. The ARIES Oxide Production program met its June Level 2 milestone for certification of oxide material, receiving the official notification of acceptance of several Blend Lots from MOX services on May 26, 2015. That brought the total Pu accepted in FY 2015 to 49.8 kg, and 666.7 kg cumulative Pu for the program at the Laboratory.

Because of the extended readiness efforts, the Laboratory did not operate ARIES this fiscal year and therefore did not meet the annual Congressional performance metric for plutonium oxide conversion. The Laboratory is currently tracking approximately 4-6 weeks behind even its BCR-03 schedule, pushing estimated resumption to June 2016.

SSO 2.2 – Meets Expectations - In FY 2015, the Laboratory successfully met the NNSA-Air Force negotiated schedule and performance requirements for delivering Space Nuclear Detonation Mission-related capabilities.

In March, the Laboratory conducted preliminary design reviews (PDRs) for the Electromagnetic Pulse and Hard Radiation Sensor subsystems for the Global Burst Detector III Prime (GBD-III-Prime) payload. The PDR included participants from NNSA, the Laboratory, Sandia National Laboratory, the Air Force Technical Applications Center, the Air Force Space and Missile Center, and other stakeholders. In April, the Laboratory supported the successful activation and early on-orbit testing of the Combined X-ray Dosimeter (CXD) and EMP Sensor (BDV) instruments on the newly launched GPS IIF-9 satellite. The tenth GPS Block IIF satellite was successfully launched into orbit in July. This vehicle carried Laboratory BDV and CXD sensors that were delivered to the Air Force for integration with the satellite in 2012. As a result, these tools will significantly enhance the nation's Space Nuclear Detonation Mission-related capabilities.

SSO 2.3 – Above Expectations - Throughout FY 2015, the Laboratory supported emergency operations in the areas of response team readiness, emergency responder training, technology and capability enhancement, and the development of new or enhanced emergency management policies, procedures and practices.

The Laboratory successfully participated in a National Level Emergency Response exercise, Marble Challenge MC 15-02, which was a simulated improvised nuclear weapon exercise. Laboratory participation included initial diagnostics and assessment, followed by render safe and disassembly. The Laboratory was the lead home team (technical reach back) for this drill.

The Laboratory worked with DOE/IN to obtain approval to field and use TS-SCI communications in an improvised "T-SCIF" (Temporary Sensitive Compartmented Information Facility) aboard a Navy vessel for Tempest Wind for Marble Challenge 15-01. The Laboratory developed and hosted a dedicated technical train-up for personnel supporting the national level counterterrorism exercise Marble Challenge 15-01. The training took place at the Laboratory and included TS-SCI communications between technical personnel staffing a field team, and others at a "working point" and Home Team.

The Laboratory deployed in support of a joint NNSA/FBI training event for the Disposition Forensics Evidence Analysis Team (DFEAT). The Laboratory developed and hosted a dedicated technical train-up at the Device Assembly Facility at the NNSS for personnel supporting the national level counterterrorism exercise Tempest Wind. This training involved taking and interpreting measurements on Category-1 Special Nuclear Material Radiation Test Objects.

The Laboratory's Nuclear Emergency Response Triage team processed one Alpha event, three Emergency Action Level One Events, 55 Drills, and 107 Communications events in December. The Alpha event supported a response in Moldova. 100% of Triage analysts completed qualifications. Additionally, the First Annual Nuclear Counter-Proliferation Director's Assessment was held with a significant amount of input from the Laboratory's Nuclear Emergency Response program.

SSO 2.4 – Above Expectations - During the fiscal year, the Laboratory demonstrated excellent performance and response ahead of schedule for expected research on the Nuclear Counterterrorism "task list" items, with completion of the assessment of specific nuclear threat devices. The Laboratory successfully provided leadership for the national Improvised Nuclear Device (IND) training course and supported the selected Safe to Fire experimental and modeling efforts.

The Laboratory made steady progress on sensitivity studies within the Non-Destructive Testing task list, addressed some short-turn-around requests from NNSA (one on behalf of DoD). Preparations occurred for an early December meeting with NNSA technical personnel to align materials roadmaps, FY 2015 scope, and a nascent overarching strategic plan for associated technical scope. Additional coordination occurred within the Laboratory regarding Nuclear Weapon Program materials scope at the Sandia National Laboratory (SNL) Z-machine and complementary NNSA scope at the Laboratory and SNL. The Laboratory also ran simulations at different dimensionalities to compare results. One of the bi-laboratory test problems was sent out for comment in February. In March, the Laboratory presented several talks at a foreign technical exchange which dealt with some of these simulations.

The Laboratory finalized IND analysis for a March Science & Technology meeting at Lawrence Livermore National Laboratory (LLNL). Additionally, the Laboratory participated in an informal meeting at LLNL on stand-off disablement, and then in a tri-lab meeting at SNL during January on the same topic. These meetings focused on an overarching statistical framework (collaborative with LLNL), further identification and progress on modeling gaps, and synergy between our experimental program and other experimental programs.

The Laboratory demonstrated excellent leadership in hosting Block 8 render safe training curriculum and materials for use by emergency responders. Strong planning and execution included adjustments to the FY 2015 schedule to accommodate budget constraints, changes in location, and additional participants. Excellent progress and proactive engagement were evident in preparing stand-off disablement activities in a time and budget constrained environment.

Performance Objective 3: DOE and Strategic Partnership Project Mission Objective

Description

DOE and Strategic Partnership Project Mission Objectives (5% of At-risk Fee) performance was rated as Excellent. Overall, Laboratory performance was above expectations in executing high-impact work for DOE and the Strategic Partnership Project Mission Objectives in a safe and secure manner. Achievements included new insight into the complex interplay between frustrated magnetism and superconductivity, groundbreaking work in cosmological simulation, the structure of oxide nanocomposites, quantum information science applications for cyber security, advanced imaging relevant to damaged Fukishima reactors, and greenhouse gas emissions. Additionally, the executed portfolio for the Civilian Nuclear and Applied Energy program offices continued to achieve high impact results to meet the important needs for the nation. The Laboratory demonstrated notable performance and leadership in the Consortium for Advanced Simulation of Light Water Reactors, resulting in the extension of Consortium grant funding for an additional five years. The Laboratory also made key contributions to the impact of energy production and use, collaboratively developing a novel process to grow perovskite films as a low cost solar based clean energy solution for the future, and a new membrane assembly technique for fuel cells, increasing lifetime performance and enabling significant reductions in greenhouse gas emissions. The Laboratory provided impactful, meaningful, effective and efficient S&T program management support to Department of Energy Intelligence priorities, and to the broader Intelligence Community. The Laboratory consistently demonstrated highly innovative approaches and ideas to address the nation's national security mission needs.

CF 3.1 – Above Expectations – The Laboratory exceeded expectations by achieving significant results from strategic partnership projects that were successfully integrated with the DOE/NNSA mission and also successfully leveraged a broad range of unique science and engineering capabilities. Examples include capabilities for nuclear targeting analysis, which explores a variety of modeling and experimental approaches that provide a mechanism to illustrate the ability to accurately and efficiently represent important nuclear weapons effects; completion of the first trillion particle cosmological simulation by a team of Laboratory researchers and collaborators from national and international universities supported by DOE by successfully utilizing Oak Ridge National Laboratory (ORNL) supercomputing; the discovery that the interface structure of oxide nanocomposites is sensitive to the chemistry of the interface; the combination of theory and experiment by researchers from the Laboratory and Argonne National Laboratory's Advanced Photon Source (APS) to demonstrate a promising theoretical method for predicting an essential prerequisite to direct the search for new materials; and the use of APS to perform experiments aimed at monitoring grain growth in ceramic nuclear fuels at operating temperatures, resulting in data that are informing microstructural models of nuclear fuel. This work is high impact and addresses national security needs of the U.S. Government. The Laboratory has for the first time uncovered the strength of magnetic interactions in a family of cerium based materials that can be tuned to exhibit superconductivity, which provides new insight into the complex interplay between

frustrated magnetism and superconductivity. Further, the Laboratory made significant advances in the ability to accurately simulate ocean mixing by successfully integrating the new Lagrangian In-Situ Global High-performance particle tracking analysis module into the Model for Prediction Across Scales – Ocean. Additionally, the Laboratory provided support to several DOE initiatives and requirements designed to strengthen, leverage and sustain facilities, including completion of the Fiscal Year 2016 Ten-Year Site Plan, participation in the Laboratory Operations Board, and use of the Mission Dependency Index and the Infrastructure Data Analysis Center. The Laboratory completed the resumption of activities at the National Criticality Experiments Research Center with successful completion of the Federal Readiness Review for Godiva.

Researchers at the National High Magnetic Field Laboratory – Pulsed Field Facility used unique 60-tesla long pulse and 100-tesla nondestructive magnets to determine that magnetic field and pressure are alternative ways to tune the magnetic properties of the compound SrCu2(BO3)2. This method has broad implications beyond this material for making predictions for the highly magnetized states and the effects of applied pressure on materials.

The Laboratory completed work that investigated interactions of actinide 5f electrons with mobile conduction electrons in a solid. These interactions lead to a variety of exotic states of matter. One of these is the "hidden order" phase in the uranium-based intermetallic compound URu2Si2, which has puzzled scientists for over 30 years. The Laboratory made strides in explaining this mystery using sophisticated Raman spectroscopy on ultra-high purity samples and has determined that the hidden order breaks local vertical and diagonal reflection symmetries at the uranium sites. This research has important implications with regard to understanding emergent phenomena studies as part of the Laboratory's pursuit of controlled materials functionality, which is central to the overall Laboratory materials strategy.

A Laboratory scientist was selected for a DOE Early Career Award to investigate a high-precision theory to determine the structure of nucleons in terms of the constituent quarks and gluons and the strength of the force between them.

The Laboratory's Prometheus CubeSat Development team was awarded one of 14 DOE Secretary's Honor Awards for 2014 in connection with operational Prometheus Block 1 Satellite Vehicles. Further development of this technology will enable payload hosting, including payloads of potential benefit to the DOE's counter-proliferation effort.

CF 3.2- Above Expectations – The Laboratory demonstrated excellent performance as it continued and enhanced joint research which leveraged the nation's capabilities in quantum information science and further advanced new cyber security products that can be adapted to strengthen NNSA and DOE national security requirements. In support of a partnership with Toshiba Corporation to image Japan's damaged Fukushima reactor, the Mini Muon Tracker was transported to California for five days of data collection of the near horizontal cosmic ray flux at the seacoast. This work enhanced the Fukushima reactor imaging effort, and has the potential to reduce the Fukushima

cleanup time by up to a decade with savings in cost and human exposure. In addition, the Laboratory successfully supported the High Altitude Water Cherenkov observatory by investigating the science of extreme astronomical sources that accelerate particles to the highest energies known. Similarly, Laboratory researchers supported the international efforts to search for neutrino-less double-beta decay through the involvement with the MAJORANA project. Further, the Laboratory merged two novel nano-technology techniques, the non-blinking "giant" quantum dot and three dimensional molecular tracking microscopy, which when combined resulted in a milestone capability to track an individual molecule over long time scales (minutes) during examination of critical cell biological processes.

The Laboratory progressed toward a set of synthetic immunogen sequences for Foot-and-Mouth Disease Virus (FMDV) vaccines, designed by "mosaic" methods, and based on Serotype A variants of FMDVs. Mosaic proteins are so named because they are constructed from many small protein pieces; scientists manipulate and mimic proteins for use in creating solutions for medicine, sustainable energy, and more. The Laboratory was instrumental in establishing the BioRisk Management and Genomics Training Divisions at the Princess Haya Biotechnology Center at Jordan University of Science and Technology. The new divisions will serve the needs of Jordan and its Middle Eastern and North African neighbors, reducing health threats to the global community.

The Laboratory continued to meet the growing need for medical imaging, building a diverse portfolio for medical applications for the nation. The Laboratory partnered with the Parkview Medical Center School of Medical Laboratory Science to demonstrate the validity of reduced sample DNA sequencing technology that will reduce nucleic acid replication time. The Laboratory also partnered with Zhenjiang University (China), Sungkyunkwan University (Republic of Korea), the Max Planck Institute (Germany), Rice University and the National High Magnetic Field Laboratory at Florida State University to discover two distinct classes of zero-temperature transitions known as quantum critical points, which may lead to new mechanisms for unconventional superconductivity. Lastly, the Laboratory partnered with Cambridge University, Lawrence Berkeley National Laboratory, and the University of California – San Francisco to develop a new method for protein crystallography using sulfur for three-dimensional imaging of proteins. The combined achievement, impact and nature of this work exceeds expectations.

The Laboratory excelled in all categories of its established performance measures pertaining to its interagency intelligence work. The accessibility of the Laboratory's Field Intelligence Element (FIE) leadership, principal investigators, and Security Intelligence Partnership Programs (SIPP) coordinator for addressing SIPP issues was impressive, and demonstrated a dedication that the Laboratory is mission focused, and highly prioritize customer's needs. FIE Operations exceeded expectations and provided valuable input to the future of the Intelligence Enterprise. The Laboratory also provided great strategic planning and program vision of its DOE Counter Intelligence program.

In FY 2015, The Laboratory briefed DOE and NNSA on the potential applications of using CubeSats for various low Earth orbit mission requirements. The Laboratory assisted DOE in developing three incisive analysis white papers for Intelligence Administration Research on data forecasting, bias mitigation, and data fusion. The Laboratory supported DOE National Laboratory S&T capabilities briefings to multiple Intelligence Community partners.

The Laboratory developed a path forward on readiness activities for the Am 241 CLEAR-Line capability, which remained paused throughout FY 2015. The Laboratory has not delivered an updated resource loaded schedule for resumption activities to communicate anticipated production availability to stakeholders.

In support of the U.S. Department of Homeland Security, Domestic Nuclear Detection Office, and the Federal Bureau of Investigation, the Laboratory made progress on identifying signatures associated with uranium materials to determine provenance and history of unknown samples for national security applications. These signature capabilities support a broader range of tools for nuclear forensic analyses. The Laboratory re-characterized high-purity tri-uranium octaoxide (U3O8) and U3O8 materials that contained chemical impurities common to conversion processes.

The Laboratory supported cyber security work through the partnership with Ernst & Young, LLP. The tools developed through this collaboration were delivered to the private sector and are helping to counter cyber threats through early detection, averting deep and lasting damage.

CF 3.3 – Above Expectations – The Laboratory accomplished DOE and Strategic Partnership Project Mission objectives within budget profile, scope, cost, schedule, quality, and risk. External reviews continue to validate that the Laboratory executed high-impact DOE work in a manner that met or exceeded customer cost requirements, schedule, and quality expectations. As an example, the Laboratory delivered success at the High Altitude Water Cherenkov Observatory in Mexico (a joint project between DOE , the National Science Foundation, and the Mexican National Council of Science and Technology) in which the Laboratory was commended for leadership, timeliness, and adherence to budget.

The Laboratory initiated 263 agreements through the Strategic Partnership Projects during the performance period. Additionally, the Laboratory received funding for 19 Applied Energy proposals amounting to $11.2M and nine Funding Opportunity Agreements to conduct high-risk/high-payoff efforts that enable discoveries and the development of new tools to transform understanding of energy and matter and to advance national, economic, and energy security. This portfolio of work is being successfully managed with significant positive feedback from independent customer reviews. Proposal initiation activity continued to be strong with numerous proposals advanced to support a broad range of sponsors representing an extremely relevant scope of NNSA mission.

SSO 3.1 - Above Expectations - The Laboratory produced high impact research on the characterization of greenhouse gas emission rates, the atmospheric effects of aerosols created by

bio-mass combustion, predicted seasonal movement of the Greenland Ice Sheet, discovered an atmospheric "methane bubble" in the Four Corners area of the United States, and made significant advances in the ability to simulate ocean mixing representation of deep ocean heat and carbon fluxes. These advances are critical for understanding the rate of atmospheric warming over the near future and will help to enhance the economic and energy security of the United States. The Laboratory developed a novel process to grow perovskite films with improved photovoltaic response that introduces a new route for low-cost production of solar energy equipment. The Laboratory demonstrated a new approach to detect and control the coupling of electric and magnetic order on ultrafast timescales, which may lead to the ability to engineer artificial multiferroic composites at useful temperatures for applications in data storage, photovoltaics, and magnetic sensing. The Laboratory was also involved in Advanced Analytic Programs focusing on disease situational awareness, with the goal of predicting and preventing disease outbreaks.

The Laboratory patented an ionomer dispersion method for fuel cell electrode fabrication which has been commercialized and which is now being used by Giner, Inc. to develop components for automotive fuel cells in a joint venture with General Motors. This new membrane-electrode assembly technique for polymer electrolyte membrane fuel cells could ultimately lower the cost of hydrogen production and the cost of fuel cell electric vehicles, while increasing fuel cell system lifetime performance; all of which could significantly reduce greenhouse gas emissions.

Using the small-angle neutron scattering Low-Q Diffractometer as the LANSCE facility, a team of Laboratory researchers probed pore structure and water-methane fluid behavior in nanoporous shale rock at reservoir pressure and temperature conditions to maximize unconventional oil and gas recovery. The results revealed information key to understanding how nanopore structure determines the distribution of fluids in reservoirs relevant to oil and gas recovery. The Laboratory collaborated with researchers from the Japan Atomic Energy Agency to conduct experiments on the thermal conductivity of stoichiometric cerium dioxide (CeO2). Initial findings from this series of experiments suggest that CeO2 might make an acceptable surrogate to UO2-based composite material where off-stoichiometry could be controlled. These and other contributions are promoting the transformation of the nation's energy system and the development of clean energy technologies, and reflect the successful application of the Laboratory's capabilities to high-impact work for DOE and Strategic Partnership Project Mission Objectives.

Performance Objective 4: Science, Technology, and Engineering (ST&E)

Description

Science, Technology, and Engineering (ST&E) (15% of At-risk Fee) was rated as Excellent. Overall, Los Alamos National Security, LLC performed above expectations in its ability to manage Science, Technology and Engineering with benefits to National Security Missions. New advances were achieved in a diverse range of areas including the "battlefield" MRI system, traumatic brain injury diagnostic research, methods for nondestructive analysis of valuable or rare samples, development of a 5-Tesla superconducting research magnet, new space-based sensor technologies, new printable resins for use in three dimensional additive manufacturing, a new proton microscope with a 30 micrometer resolution, and simplified autoassembly techniques for Hallbach cylinder arrays used in MRIs and other devices. The Laboratory engaged on 140 Cooperative Research and Development Agreements (CRADAs) with 40 external partners, including efforts for commercialization of fuel cell fabrication technologies, to commercialize an HIV-1 vaccine, and to develop an advanced Thorium oxide nuclear reactor fuel. Laboratory excellence was reflected in a large volume of peer reviewed publications, patents, R&D 100 awards, and other honors and recognitions.

CF 4.1 – Above Expectations -The Laboratory advanced a research strategy that is clear and aligns with NNSA/DOE priorities. One example is support for directed energy payload applications for military platforms ranging from projectiles to Unmanned Aerial Vehicles, applying technologies in which the Laboratory is a world leader. The Laboratory conducted projects in alignment with the Laboratory Directed Research and Development (LDRD) FY 2015 Strategic Investment Plan and success was documented in the FY 2014 LDRD Laboratory Progress Report dated March 30, 2015. Progress was made on the development of the LDRD FY 2016 Strategic Investment Plan, with outreach activities tied to each of the five Directed Research focus areas. A robust LDRD program allows the Laboratory to continuously refine its research strategy to be responsive in adapting to DOE/NNSA priorities. One measure of the success of the LDRD program is the successful outcomes that were achieved through projects that were initially funded by LDRD.

Examples include developing advanced imaging technology for the human brain using ultra-low field magnetic resonance imaging to develop a new prototype "battlefield" MRI system; and the novel noise-based probe demonstrated at the National High Magnetic Field Laboratory to characterize valuable samples non-destructively using novel compositional tomography; modeling mobility of defects at high-temperature regimes; testing of a 5-Tesla superconducting magnet in an effort to determine the origin of nucleon spin; and using doped nanotubes for secure quantum communication. The Laboratory also achieved first measurements of the structure of titanium under dynamic loading conditions. These pioneering dynamic measurements of titanium's structure under pressure are helping researchers develop models that provide a better understanding of this sturdy, corrosion-resistant metal with applications in nuclear weapons simulations. Additionally, Laboratory researchers discovered novel interactions of an endotoxin lipopolysaccharide in work with the New Mexico Consortium and the University of New Mexico. The Laboratory submitted information on a Multi-physics Casting Modeling Code TRUCHAS for a Congressional review on

LDRD effectiveness. This technology was used by Advanced Simulation & Computing (ASC), Directed Stockpile Work, Defense Science Campaigns, Nuclear Counterterrorism and Nuclear Energy related NNSA work; and has been adopted by private Industry. The Laboratory focused LDRD investments towards development of new algorithmic approaches for scientific computing on the forthcoming Trinity ASC Platform which will improve the capability to solve high resolution, three-dimensional problems for the nuclear deterrence mission.

CF 4.2 – Above Expectations – The Laboratory's scientific achievements were extremely relevant and beneficial in supporting Laboratory Science and Technology Pillars, which provide alignment to DOE/NNSA mission priorities. For example, just-concluded projects on multi-scale modeling changed the paradigm for hydrodynamic simulation in the energy weapons program, work on new neutron diagnostics is opening the path to a major new technique for integrated experiments, and preliminary results show promise for a new aging measurement on plutonium by measuring changes in its material properties in less than a month. New sensing techniques (MRI, space surveillance) and big data tools were developed with application to nuclear non-proliferation and DoD mission needs. The commercial applications of the projects include hazardous material cleanup and military/civil biological decontamination systems. During the fiscal year, the project, "Combating Antibiotic Resistance: Targeting Efflux Pump Systems at Multiple Scales," which is aligned with the National Strategy for Combating Antibiotic Resistant Bacteria (White House effort), held an international workshop building new collaborations in support of this important work.

In addition to these important FY 2015 accomplishments, the Laboratory led the first beryllium capsule experiment at the National Ignition Facility in support of the Beryllium Ablator Campaign and in support of stockpile stewardship. The experiment was successful in obtaining backscatter data and in benchmarking first-shock timing data, enabling location of deficiencies in physics models in support of NNSA missions. In response to problems identified in polymer-based materials used in national security applications, Laboratory researchers developed new three dimensional printable resins with improved performance and stability under exposure to harmful environmental conditions by using results from gamma radiation exposure experiments. A highly successful run cycle was achieved at the Laboratory's Los Alamos Neutron Science Center (LANSCE) with over 80% availability following the most complex maintenance and construction outage in two decades; and LANSCE achieved a NNSA Level 2 milestone for 120Hz operation. Results from LANSCE include High Energy Neutron Imaging used to successfully image national security objects; characterization of War Reserve Components for Sandia National Laboratory; and the first testing of semiconductor devices for failures due to thermal neutrons for space and avionics electronics. Laboratory researchers successfully developed new techniques to analyze trace impurities in plutonium materials, resulting in an 87% reduction in the sample volume requirements which significantly reduced material-at-risk, enabling the Laboratory to execute the Plutonium Sustainment program and ongoing nuclear forensic studies for Global Security at lower cost and more safely. The Laboratory also developed new multiphase equations-of-state (EOS) tables for plutonium and associated alloys with simulation results equal to or better than those obtained from legacy EOS tables. The new EOS tables are an important step in the path towards a true science-based

understanding of Stockpile Stewardship. Lastly, as part of a nuclear-astrophysics collaboration with the Massachusetts Institute of Technology, the Laboratory designed, engineered, and fabricated core parts of the newest gas Cherenkov detector (GCD-3) that records gamma reaction history measurements during inertial confinement fusion implosions. The researchers successfully fielded the GCD-3 on the Omega laser at the University of Rochester in support of ongoing stockpile stewardship initiatives.

CF 4.3 – Above Expectations – The Laboratory enhanced and expanded knowledge and capabilities, stretching the boundaries of science and engineering. Among the most noteworthy examples was groundbreaking research into traumatic brain injury, which is a major concern for DoD and for the civilian health care system. As another example, the Laboratory's new Explosives Center integrates and coordinates all explosives work at the Laboratory in support of explosives consolidation and modernization plans. The Laboratory also collaborated successfully with an international group to develop the first proton microscope with a capacity to image objects down to 30 micrometers. In FY 2015, LDRD researchers analyzed fragments from the Chelyabinsk meteor (the largest fireball to strike the Earth in 100 years) nondestructively, work that will ultimately be useful in developing strategies to deflect larger meteoroids in support of the global security mission area, the science of signatures science pillar, and the nuclear and particle futures science pillar. In addition to the above contributions, the Laboratory submitted an example for the Briefing to Congress on the outstanding contributions of LDRD in the Rocky Flats clean-up that saved about $29B and finished the clean-up many years ahead of schedule.

Laboratory researchers developed a novel technique for using carbon nanotubes in secure quantum communication, through incorporation of pristine carbon nanotubes into a silicon dioxide matrix, all requirements for implementation of quantum communication were met. The results associated with this significant advance for carbon nanotube optics were reported in Nature Nanotechnology. Advancing the frontiers of Science, Technology and Engineering (ST&E) research, the Laboratory devised a novel, simpler technique to automatically assemble magnets into a Halbach cylinder array; a device that is used in a variety of applications including nuclear magnetic resonance, magnetic resonance imaging, magnetic refrigeration, and charged particle manipulations. This new technique replaces a complex, manual fabrication method that has been used since the 1980s. Likewise, Laboratory researchers developed a novel compositional tomography technique, establishing a new standard in non-destructive materials analysis. Using this technique, deeper insights were made into the physical structure, chemical composition, and microstructure of samples, providing valuable information while still preserving the samples tested.

Laboratory collaboration with Brookhaven and Ames National Laboratories also successfully demonstrated that new diffractive optics can focus high energy photons (E > 50 keV) efficiently. This work could enable the study of high-density materials that resist other characterization methods with significant national security applications.

One of the most profound challenges in systems biology is deferring phenotype from genotype using sequences. The Laboratory created and validated a hybrid gene neighborhood examination tool for the discovery of biological function of proteins with a special focus on transcription regulators. After sequencing 10,000 bacterial genomes it became clear just how little is known about the functions of a very large fraction of genes. For these genes, biochemistry and physiology cannot be inferred simply by analyzing sequences, and therefore the creation of a systems biology approach for the discovery, prediction, and validation of unknown protein function is a significant leap in our ability to understand living organisms for national security and public health purposes.

CF 4.4 – Above Expectations - The Laboratory tracks the vibrant scientific environment at the institution through metrics covering 1,829 peer reviewed publications, 48 patents, an R&D 100 award, and E. O. Lawrence Award, as well as other awards and recognitions. The breadth and variety of peer recognition and validation supports a conclusion of success in this area. An excellent Laboratory Peer Reviewed publication rate continued to reflect a high level of performance by scientific staff. This year, nine Laboratory LDRD researchers were named as American Physical Society (APS) Fellows. The Laboratory recruited, retained, and supported the research of scientists at the forefront of the fields, and those recognized by prestigious professional societies such as APS. Diversity has been a key issue in recruiting technical staffs, and efforts to increase the number of female candidates resulted in improvement over previous years. This year the Laboratory instituted the Mentor Best Practices Training and to date 95% of current postdoctoral mentors completed this training. In addition to the nine APS fellows, the Laboratory received numerous other awards and distinctions including: two E.O. Lawrence Awards, the 2016 Bau Neutron Award, The American Chemical Society's National Award, and the Rockwell Lifetime Achievement Award from the Radiation Protection and Shielding Division of the American Nuclear Society.

Evidence of a vibrant scientific environment was also demonstrated through the nature of work being done at the laboratory. The Laboratory used a new vacuum plasma spray system, the first of its kind in the United States, with the ability to accommodate large parts at long standoff distances with high plasma power and low processing pressures. This system will accommodate the largest fuel used in any of the high performance research reactors in the U.S., building unique Laboratory expertise in support of the DOE/NNSA Reactor Conversion Program. In terms of biologically derived energy possibilities, Laboratory researchers provided technical input to New Mexico Algae, LLC for the development of a large-scale, multi-stage, continuous culturing process for the growth of algae that produce the nutritional supplement astaxanthin, addressing a broad spectrum of biofuel technical challenges. Additionally, the Laboratory installed a direct metal laser sintering machine for additive manufacturing – invigorating research and technical workforce competencies; and an application of this method reduced the complexity of manufacturing from ten components to four and from six weldments to two. Working with international counterparts, Laboratory scientists collaborated to invent a proton microscope, capturing images of objects and structures down to a size of 30 micrometers using a proton beam accelerated to an energy of GeV (more than 98 percent the speed of light). This research improved the capability of charged particle radiography, providing an exciting ground-breaking research environment.

The Laboratory continued to address evolving national and global security mission needs with its new interdisciplinary Explosives Center. Building on more than 70 years of nuclear weapons energetic materials science, technology, and engineering expertise, the center brought together a powerful set of capabilities and expertise for experiments, and supporting the explosives consolidation and modernization plan.

Five positive Science, Technology, and Engineering (ST&E) Capability Reviews were executed in FY 2015. The Laboratory technical and managerial staff were consistently recognized for high quality, integrated, and excellent science activity. Strategic relationships with Laboratory counterparts, DOE, and external collaborators were noted as reinforcing the health and vibrancy of the Laboratory workforce. Future talent recruitment and retention was noted in all reviews as a high priority as significant growth opportunities loom ahead. The Laboratory hosted the 11th LANSCE School on Neutron Scattering in which early-career scientists examined the influence of surfaces, interfaces and microstructure on the properties of materials and functionalities. Thirty-six selected applicants from over two dozen universities in five countries participated in lectures, tutorials, tours, and hands-on experiments at LANSCE and the Center for Integrated Nanotechnologies.

CF 4.5 – Above Expectations – The Laboratory's Technology Transfer effort achieved notable successes including receipt of DOE Energy Efficiency and Renewable Energy Small Business Innovation Research funding to accelerate commercialization of fuel cell fabrication technology, through a partnership with Giner, Inc. The application under development could significantly lower the production cost of hydrogen fuel cells for electric vehicles, enhancing the economic viability of an emerging industry segment and substantially enhancing our national energy security.

The Laboratory advanced work with Chevron to apply Laboratory capabilities to U.S. deep water oil and gas exploration in areas like the recently discovered Jack field, which has the potential to boost U.S. petroleum reserves. The Laboratory entered into a Cooperative Research and Development Agreement (CRADA) with Superior Completion Services (Superior) under which the Laboratory's insensitive extrudable explosive technology was used in Superior's proprietary downhole delivery system for well-casing puncturing and near-borehole fracturing of the geological structure. The Laboratory also entered into a CRADA with Whitewood Encryption Systems, Inc. to license a suite of quantum encryption and communications patents/applications developed at the Laboratory. Under the CRADA, Whitewood and the Laboratory worked to develop commercial prototypes of an integrated circuit package that could generate true random numbers on demand at rates up to 200 Mbits/s, thus achieving a step towards a commercially viable and cryptographically secure means of producing and distributing key material. This work supports the cyber security capabilities of the Laboratory.

The Laboratory entered a CRADA with TomegaVax, Inc. to develop HIV-1 vaccines. The partners worked on commercializing vaccines developed by the Laboratory through TomegaVax's proprietary approach to genetically modify a cytomegalovirus vector. Another CRADA between the Laboratory and Samitaur Medical Technologies aimed at adapting a Laboratory technology for

detecting tuberculosis into a diagnostic for traumatic brain injury (TBI) by using biomarkers to determine TBI and to guide treatment. The Laboratory also teamed up with Thor Energy of Norway to develop an effective processing strategy to produce high quality Th-MOX fuel ceramics. Thorium oxide (ThO2)-based nuclear fuels have potential applications for use in various reactor systems owing to a number of superior material and neutronic properties. It is noteworthy in terms of reach that the Laboratory had over 140 active CRADA projects with 40 industrial partners during the fiscal year.

Performance Objective 5: Operations and Infrastructure

Description

Operations and Infrastructure (30% of At-risk Fee) was rated as Satisfactory overall, with significant challenges noted. The Laboratory resumed several major operations in the Plutonium Facility at Technical Area 55 allowing for resumption of programmatic operations critical to the NNSA mission. Process improvements realized through Plutonium Facility resumption activities were also effectively implemented at the Weapons Engineering Tritium Facility, resulting in a successful Federal readiness assessment at the end of the performance period. Metrics on injuries/illness and days away from work reflect progress in areas of Safety and Health; and many Safety and Health programs were effectively implemented. The Laboratory continued to effectively deliver Safeguards and Security protection. The Laboratory achieved and sustained excellence in many areas of business by achieving vehicle fleet efficiencies, and by leading NNSA in the cost-saving use of the Supply Chain Management system. The Laboratory exceeded targets for the reduction of unneeded facilities, for site sustainability goals, and for Authenticated Scanning of Classified and Unclassified core IT devices.

The remaining operations that were not resumed in the Plutonium Facility continued to impact programmatic operations. Several additional facilities remained inoperable throughout the year including the Waste Characterization Reduction and Repackaging facility, the Radioactive Assay and Nondestructive Testing facility, Waste Area G, and the Weapons Engineering Tritium Facility. Additional operational concerns include work planning and control and Technical Safety Requirement (TSR) compliance issues. A substantial negative trend in events developed during FY 2015 culminating in a serious Arc Flash event at LANSCE that resulted in a severe worker injury, unplanned outages, and equipment damage. DOE's Office of Enforcement issued an Enforcement Letter to the Laboratory during FY 2015 related to the significant radiological contamination event at the National Critical Experiments Research Centers (NCERC) facility at the Nevada Nuclear Security Site. Ongoing challenges persist with Criticality Safety program implementation, Project Management, and with the implementation of the Earned Value Management System for projects. A cyber security failure resulted in the compromise of personal identifying information by a malicious attacker on NNSA/LANL publicly accessible web servers. Lapses in Laboratory programmatic oversight of protective force resulted in a significant failure to safeguard firearms.

CF 5.1 – Below Expectations - Overall, the Laboratory delivered effective institutional level environment, safety and health management. The Laboratory continued to use and improve Safety & Health program effectiveness metrics to drive continuous improvement. As examples, the metrics for Total Reportable (OSHA injury/illness) Cases and DART (employee days away from work, restricted or transferred) rates remained low, reflecting success. Many ES&H programs were well implemented such as the radiation protection (RP) program, and biosafety and biosecurity programs as validated by internal and external assessments. Explosives and laser safety programs were also well implemented. Laboratory worker participation in safety, health, and wellness activities such as Virgin Pulse and Worker Safety and Security Teams was commendable.

However, in contrast to the accomplishments noted above, on-going challenges existed in work planning and control and in related recurring safety events. The Laboratory Electrical Safety

Program continued to be recognized complex-wide for excellence, with members of the Laboratory electrical safety committee often contributing to national code revisions, best practices and NNSA Electrical Safety leadership. However, implementation of these leading edge practices in facility work control at the Laboratory was not satisfactory. A substantial negative trend in events developed during FY 2015, culminating in a serious arc flash event at LANSCE that resulted in a severe worker injury, unplanned outages, and equipment damage. Four similar electrical events which were evaluated as part of the Arc Flash accident investigation revealed ineffective implementation of corrective actions from previous events. The Arc Flash event was the worst worker accident at the Laboratory since a 1996 fatality at Technical Area 21. Following the noted Arc Flash event, the Laboratory was quick to respond and coordinated with NNSA to convene a joint accident investigation team. Through corporate reach backs, the Laboratory was able to place competent industry experts on this team which resulted in a comprehensive review of the event and in the development of corrective actions. Additionally, Laboratory leadership was actively involved in the investigation. Controls were implemented to improve work management, however, some subsequent jobs were initiated with inadequate work planning and control even after the systems enhancements were made. Specific post-Arc Flash event shortcomings included weaknesses in identification and control of hazards, worker training and qualification requirements, and post maintenance testing. The Laboratory made some progress in developing a revised Work Management System, but the system was not fully implemented in the performance period. The Beryllium Disease Prevention Program had several largely self-identified implementation deficiencies that require resolution.

The Laboratory continued to work with regulatory agencies on an array of environmental permits including groundwater, surface water, Title V Air Operating, and portions of the Hazardous Waste Permit; the Laboratory's performance in permit management resulted in the receipt of an Administrative Order from the United States Environmental Protection Agency containing seven alleged violations of a surface water discharge permit. Most of these alleged violations represent either differences in technical opinions or misinterpretations.

The Laboratory successfully operated within requirements for National Pollution Discharge Elimination Source Permits, Title V Operating Permit, improved performance for Construction General Permit, and maintained ISO 14001 Environmental Management System certification. Environmental compliance activities however, required corrective actions for minor Resource Conservation and Recovery Act Hazardous Waste infractions found during routine State inspections and in an Individual Permit Inspection. The Enduring Waste Plan was not updated to reflect current waste management conditions or to address waste management issues at Technical Area 55.

The Laboratory exceeded expectations by carefully recording 50 archeological sites in connection with the Chromium Project. The recording and determination recommendations for the sites were completed quickly, while under a tight operational schedule. The associated report to the New Mexico State Historic Preservation Officer was well documented and well written. The Laboratory

implemented pollution prevention efforts that were commendable and that realized substantial savings.

CF 5.2 –Below Expectations – The Laboratory performed at the below expectations level in two projects, the Radioactive Liquid Waste Treatment Facility for Low Level Waste (RLWTF-LLW) and the Technical Area-55 Reinvestment Project Phase II (TRP-II). The Transuranic Liquid Waste project, the Technical Area 3 electrical substation project, the Chemistry and Metallurgy Research Replacement PF-4 Equipment Installation (CMRR PEI), and the Radiological Laboratory Equipment Installation Phase 2 (REI-2) projects are rated as meets expectations.

The Technical Area 3 Electrical Substation Project is the first line item infrastructure project at the Laboratory to be executed by the U.S. Army Corps of Engineers (USACE) under their Interagency Agreement with NNSA. The Laboratory is contractually required to fully support/cooperate with other NNSA direct contractors, and Laboratory support for USACE continued to improve in the second half of FY 2015 and is therefore rated as meets expectations, although continued Laboratory integration and cooperation is needed in Design Authority support and other areas.

The Transuranic Liquid Waste project is recovering schedule after a two month delay in awarding the design/safety basis contract. The CMRR PEI project and (REI 2 project are also rated as meeting expectations. For the REI 2 project the Critical Decision Point 3A package was approved and the Critical Decision Point 3B package was revised and submitted to NNSA; and required FY 2015 design activities have been completed to help keep the project on track to meet the Critical Decision Point 2/3 package delivery schedule of March 2016. For the PEI project, required FY 2015 design and D&D activities were completed. The PEI Critical Decision Point 3B package was resubmitted to NNSA in September 2015.

The RLWTF-LLW and TRP-II C Projects are rated as below expectations. These projects are in the construction phase (post CD-3) and are therefore the major factor in determining this overall performance rating. The projects experienced significant issues with Laboratory self-performance, with subcontractor procurements, and with construction activities; and they are both behind on critical path activities. To date, recovery plans for these projects are not achieving the intended results, and the lack of recovery is putting the cost and schedule baseline milestones at high risk. On the TRP-II C project, Laboratory self-perform and construction support costs continue to increase and subcontractor integration and performance issues have been a significant cause of the increased costs and schedule delays. The Contract Budget Base(CBB) cost and schedule parameters are projected to be exceeded, and a significant Laboratory effort and focus will be required to complete the project at budgeted Total Project Cost and on schedule.

For the RLWTF-LLW project, the project has consistently fallen further behind schedule each month during the FY 2015 rating period. The lack of a fully integrated master schedule, inadequate recovery planning and execution, poor Laboratory subcontractor performance and ineffective Laboratory subcontractor oversight and management have been evident throughout the year. The

project is currently forecast to exceed the CBB scheduled completion date by five months. On this project, the Laboratory itself has spent more in management and oversight costs ($3.2M) than the $2.6M in contract work that has been performed, and this Laboratory oversight spending was not effective in recovering the project's schedule and cost variance, now at -$4.5M of work.

The TRU Waste Facility (TWF) project is currently under construction and performance is assessed separately under a target price Subcontract-Contract Line Item Number with the Laboratory.

CF 5.3 - Meets Expectations - The Laboratory continued to provide a safeguards and security program that was responsive, efficient, and effective delivering the protection strategy for the year. During the September 2015 Annual Survey, the Safeguards and Security Program was evaluated satisfactory overall, with all eight topical areas receiving satisfactory ratings. These ratings were supported by a strong physical security program and reasonable assurance that security interests were being maintained and protected. The Laboratory remained on track with a project to replace legacy field panels. Nuclear Materials Control and Accountability (NMCA) performance was another strength; with sound management process providing protection of accountable nuclear materials, meeting control and accounting requirements under a graded approach. NMCA was a functional area evaluated in two Federal Readiness Assessments with all objectives and criteria met, and with no findings. Laboratory Nuclear Material Control and Accountability customer and employee satisfaction, sound management, innovation, and results were recognized through a New Mexico Performance Excellence Pinon Award. The Laboratory Protective Force subcontract Collective Bargaining Agreement was successfully renegotiated and the Laboratory had a strike contingency force plan in place to sustain operations in the event an agreement was not reached. The Laboratory continued to implement DOE Order 473.3, Protection Program Operations, and worked to assess its security deviations against the new requirements. While the Laboratory had 17 open security deficiencies (findings) at the end of the performance period, each has respective corrective actions in progress.

In contrast, Protective Force subcontract management lacked the formality of operations required, resulting in a significant failure to safeguard firearms. On August 31, 2015, after a routine firearms training session, range personnel failed to secure an assigned firearm for four days. A review of this incident found organizational deficiencies, inadequate procedures, and inadequately trained firing range personnel. In a separate event, on September 29, 2015, firing range personnel failed to perform a fundamental assignment, setting alarms in protection of firearms. Although Laboratory leadership took action to correct performance deficiencies, additional comprehensive management and oversight in conduct of critical high risk firearms operations is required to achieve the required organizational proficiency.

The Laboratory was issued a Final Notice of Violation (FNOV) by NNSA for multiple violations of DOE classified information security requirements. The Laboratory failed to recognize the apparent discrepancies between assembled shipping papers and transfer documents relative to a classified shipment, and lacked knowledge of the contents of a shipping container, as well as the physical

characteristics of the contents, which demonstrated a significant shortcoming in the Laboratory's processes for controlling classified matter throughout its lifecycle. Furthermore, the Laboratory's inquiry did not accurately reconstruct this security event and therefore, the basis for its conclusion regarding the possibility for compromise was not adequate.

The Laboratory successfully completed the Protective Force Security Services sub-contract acquisition plan, and the source selection was approved by NNSA in August 2015; establishing a new services contract for Protective Forces until 2020 and providing a multi-million dollar program savings over those five years.

The Laboratory also implemented a Protective Force "right-sizing" plan in December, 2014 that took advantage of efficiencies gained following the successful 2014 launch of the Nuclear Material Safeguards and Security Upgrades Project, Phase II.

CF 5.4 – Meets Expectations –The Laboratory facilities disposition program demolished excess facilities exceeding the target of 20,000 square feet by 6%. The Laboratory met expectations and deadlines for Operations, Maintenance and Recapitalization program areas; provided timely, thorough and accurate information upon request; and proactively communicated issues to NNSA. The Laboratory exhibited a high understanding of and consistent attention to recapitalization priorities; and was attentive to portfolio creation and progress reporting for new programs launched during the reporting year. Additionally, the Laboratory met expectations in support of facilities program management initiatives, including: participating in the newly established Site Portfolio Manager interface meetings; preparation for award of a contract for the Technical Area 3 Substation Replacement project to begin execution in FY 2016; completion of timely real estate transactions and proactive participation in the Facilities Disposition Working Group. The Laboratory met expectations for its support of the BUILDER Sustainment Management System (BSMS) Team. However, the Laboratory was the only NNSA site that did not meet the BUILDER IOC deadline of March 31, 2015. The Laboratory worked with NNSA to develop a path forward to fully support BUILDER implementation phase two, which includes the submission of the IOC data. The Laboratory met expectations for implementation of the NNSA Infrastructure Program Management Plan guidance; provided status updates on monthly milestone reports on time; and managed cost and schedule information in the facilities program management system, G2. Additionally, the Laboratory continued to aggressively pursue site disposition plans.

The Readiness in Technical Base and Facilities budget was utilized with an obligation level of 97% and the Site Support budget was obligated to 98%.

The Laboratory met expectation for FY 2015 sustainability priorities; including specific progress toward Site Sustainability Plan (SSP) goals. The Laboratory reduced potable water intensity by 19%, exceeding the FY 2015 SSP goal of maintaining water use at or below FY 2014 levels; cumulatively reduced energy intensity by 15% compared to the FY 2003 baseline year (relative to the DOE FY 2015 30% energy intensity reduction target); and met or exceeded the pollution prevention,

sustainable acquisition, and renewable energy goals. The Laboratory continued to make progress towards the comprehensive site-wide metering plan installing additional steam and gas meters. The Laboratory developed a Steam Plant Replacement Project Energy Savings Performance Contract (ESPC), which if implemented could significantly reduce greenhouse gas emissions and help the Laboratory efficiently meet future energy demands. The Laboratory collaborated with the National Renewable Energy Laboratory to finalize an updated renewable energy feasibility study supporting a sustainable energy path forward.

Construction of water drainage/collection features at Radioassay and Nondestructive Testing Facility was completed in support of the approved fire protection equivalency project LANL-DOE-ORDER-420.1B-EQ-2012-005. At Building Technical Area 16-410, the fire suppression and fire alarm systems were upgraded in an equipment modernization effort. However, the number of Fire Protection System Impairments institutionally remains high and the overall trend has not improved appreciably.

The NNSA has a 22 year Energy Savings Performance Contract (ESPC) with NORESCO, LLC. Under this contract two Energy Conservation Measures (ECMs) were installed throughout the Laboratory. ECM-1 addressed lighting and ECM-2 addressed Buildings System Controls and Upgrades (i.e. HVACs). After the ESPC project was complete, the Laboratory took ownership of the ECMs. However, the contract stipulates that any removal or addition of energy conservation equipment that may impact the installation and operations of the contractors installed ECMs require the Government to notify the Contractor. The Laboratory made several modifications (i.e. additions and removals) to the ECMs after they obtained ownership without following the proper contract protocols stated above, opening the government to potentially costly claims from the ECM contractor.

The Laboratory received a Notification of Non-compliance from the U.S. Army Corps of Engineers regarding storm water management conditions that existed during the performance period at the weapons training facility at Technical Area 72. This notice resulted from an inspection which found accelerated erosion of the soil-cement embankment caused by small arms fire, new erosion downstream from the site which did not exist previously, and spent ammunition remains in the stream bed. These conditions were cited as violations of Nationwide Permit 38 for Cleanup of Hazardous and Toxic Waste, as well as National Permit General Conditions 9, 12, 14, and 2.

CF 5.5 – Above Expectation –The Laboratory completed a total of 139 eSourcing events (23% increase from FY 2014), totaling $135M. The Laboratory led NNSA commodities spending with $38M in purchases, an annual improvement of 43% with a 7.7% savings rate. Total Supply Chain activity for the year resulted in a $15.8M savings, over a quarter of all NNSA savings under this program. Cost-saving innovations include the collaborative acquisition of employee benefit services with Lawrence Livermore National Laboratory, aggressive payment management to reduce Gross Receipts Tax costs, reorganization of Information Technology (IT) Help Desk services, and negotiation for lower cost banking services and air carrier services. The Chief Financial Officer

(CFO) launched a new career-centric Career Development Institute with monthly sessions focused on technical and control challenge areas; and launched an on-site Project Management certification program. Notable improvements in treasury management functions reduced cash management risk. The Laboratory continued to excel in Property Management activities for a very large, very dispersed inventory of property, achieving very high accuracy in property system tests. The Laboratory also launched an enhanced property tracking system in the Standards and Calibration Laboratory that increased the reliability of inventory for Measuring and Test Equipment. GPS technology was successfully deployed to the vehicle fleet to improve efficiency and operator accountability. Some challenges were present involving the theft of low-value, contaminated items.

The Laboratory continued to achieve gains in vehicle fleet efficiency by reducing the overall number of vehicles in the fleet, and by replacing 61 large older vehicles with smaller, more efficient models. These accomplishments were recognized through both an NNSA Environmental Stewardship Award and a DOE Sustainability Award. The Laboratory consolidated 59 Acquisition Practice policy documents into 27 documents, improving clarity and policy effectiveness. Significant Acquisition achievements include the avoidance of a work stoppage by unionized protective force personnel, but a major physical security subcontract award has been appealed based on procedural issues with potential significant costs to the government.

Business system improvements include success in meeting milestones for development and deployment of an e-Records Management System, and replacement of a legacy Invoice Approval System with a new integrated invoice approval module with improved controls.

The Laboratory met expectations in implementing IT guidance requirements from the NNSA Office of the Chief Information Officer. Given the large number of Cyber and IT data calls (55), audits and reviews (10), progression towards resolving significant Corrective Action Plans and Opportunities for Improvement, the Laboratory has made noteworthy progress within IT areas.

The Laboratory implemented Authenticated Scanning on 100% of the Classified and Unclassified core information technology central infrastructure devices, including Authenticated Scanning on 25% of unclassified Desktops. The Laboratory also developed a pilot project to implement Authenticated Scanning on a classified Weapons Network. Further, the Laboratory implemented Big Data storage capacity with 100 Gigabytes per second Internet access to support high performance computing and large data sets. The Laboratory also addressed a key institutional risk by obtaining final agreement to procure a redundant communications link to augment the Laboratory's current single-line connection to the internet. The Laboratory succeeded in closing five of six findings from a DOE Office of Inspector General IT audit report, completed an assessment inventory of the Telecommunications Security with no discrepancies, and is one of only three sites within the Department of Energy to meet Level 3 Compliance on Multifactor Authentication requirements.

In August 2015, the Laboratory was issued a work pause for installation of Voice over Internet Protocol (VOIP) telephone service due to a potential non-compliance associated with installing non-

Telecommunications Security Group phones in secure areas. The pause was initiated to seek further DOE/NNSA direction on a compliant VOIP path forward.

In last year's audit by the public accounting firm retained to examine the Department of Energy's consolidated financial statements; four of twelve department-wide findings were associated with the Laboratory's financial statements, including a repeat finding. In this year's audit, all four findings were resolved.

External reviews and the Laboratory's own internal reviews of the Contractor Assurance System confirm that challenges in self-discovery, issues management discipline, and trending and analysis which were documented in previous Performance Evaluation Reports and which were associated with serious operational failures in past performance periods and in this performance period persisted. While the Laboratory acknowledged this condition, there was not significant progress toward addressing these longstanding challenges that exist across the institution.

Workforce staffing challenges remain in some Scientific, Technical and Engineering areas. Several key personnel positions were permanently filled with capable executives, but key positions including the Deputy Laboratory Director and three of the four Principal Associate Director positions were filled by interim appointees for more than half of the performance period.

Several contract clauses that were bilaterally incorporated into prime contracts at all other NNSA sites, including clauses for whistleblower protection for Laboratory employees and for conference management requirements, were not accepted by the Laboratory, resulting in atypical unilateral modifications by NNSA.

The Laboratory met expectations in the Human Resources area. Throughout the year, the Laboratory provided timely and adequate responses to NNSA oversight requirements, including the Benefits Metrics Survey and Pension Budget and Post-Retirement Benefits Data calls. The Laboratory implemented a new benefits vendor contract to improve the administration of the Retiree Health & Welfare plan and to reduce costs; and implemented a new HR service delivery model to enhance communication, to provide better training and mentoring, to address inconsistencies, and to develop Knowledge Transfer strategies. The Laboratory deployed a new 5-year staffing plan tool and a Workers Issues Tracking System for Labor Relations management concerns.

NNSA questioned the allowability of costs as a result of several audits that in aggregate amounted to over $16M in FY 2015. All of these costs are currently under review for allowability determination.

NNSA remains concerned with the Laboratory's identification of a shortage of pre-qualified quality related vendors (Institutional Evaluated Suppliers List, IESL); in numerous cases the number of vendors in specific product and service categories are only one deep resulting in risk for quality related performance requirements in support of mission related projects.

CF 5.6 – Meets Expectations – Laboratory Counsel (LC) is well-integrated with Laboratory Subject Matter Groups and Risk Management efforts and was actively engaged in cross-discipline and discipline-specific workgroups. In addition, LC developed targeted training packages for laboratory staffs aimed at reducing errors in day-to-to-day operations. LC continued to suggest and lead implementation of risk management strategies through policy changes, training, and engagement with Laboratory leadership. LC worked to reduce and control costs associated with use of outside counsel and ensured cost-reducing competition among outside firms. LC also demonstrated initiative in improving laboratory operations outside of core legal work through greater efficiency and management of intellectual property, through revised bid protest procedures, and in the effective support of sensitive Human Resources negotiations. Most importantly, LC provided superb legal support and advice on all matters involving the WIPP release. These efforts ranged from managing voluminous amounts of electronic records to critical employee interviews to litigation strategy. LC deliverables met 10 CFR 719 requirements and LC regularly exceeded expectations with regard to communication with and prompt responsiveness to NNSA.

CF 5.7 – Below Expectations – NNSA's Information Assurance Response Center identified an exploitable Laboratory vulnerability which allowed a malicious attacker to access unauthorized Personally Identifiable Information (PII) on NNSA/LANL publicly accessible web servers. Through close collaboration with NNSA, the Laboratory managed remediation efforts to address the identified vulnerability; evaluated all publicly-facing web servers for vulnerabilities, and initiated notifications to individuals affected by the PII Breach. The Laboratory identified that the incident occurred because a developer created a web site which was vulnerable to malicious exploitation. This programmer had not been trained in secure coding requirements and best practices despite the availability of classes on these practices. Additionally, the developer did not follow institutional policy and procedures.

During the performance period, the Laboratory responded to over 55 Programmatic Cyber Security and Information Technology data calls addressing key components of the Federal Information Security Modernization Act to include Vulnerability Management, Continuous Monitoring, Continuous Diagnostics and Mitigations, Key Information Sharing and Safeguarding Indicators, Multifactor Authentication, Procurement and Supply Chain Management. Additionally, the Laboratory received ten external audits and program reviews from the Office of Inspector General (OIG), Office of Cyber and Security Assessments, Enterprise Assessments (EA), Office of the Associate Under Secretary for Environment, Health, Safety and Security, and National Nuclear Security Administration. During the assessments, the Laboratory was recognized for noteworthy advances and for the implementation of industry best practices within the Cyber Security and IT Programs. The Laboratory continued to make significant scientific breakthroughs by leveraging IT investments.

With respect to the Laboratory's Cyber Security Weapons Program Risk Management Framework, the Laboratory failed to apply Operating System Patches to SUSE Linux Enterprise Servers supporting Critical Weapons Mission requirements on a high performance computing cluster since

2012. These patches were needed to provide adequate security and to reduce the vulnerability of classified data. The Laboratory developed a Corrective Action Plan to address this weakness; but even after discovering this failure, the Laboratory issued a new Weapons Information System Security Plan that still failed to address this issue. Subsequent to NNSA review, the Laboratory patched three of four systems involved, and isolated access to the fourth system.

The Laboratory's processes for identification and reporting of external Cyber Security deficiencies were inconsistently applied and ineffective. Specifically, during the Cyber Security Risk Management Framework authorization process, vulnerabilities (e.g., contingency planning, authentication, access control, media protection) were identified that were not yet addressed.

The Laboratory's Annual Cyber Security Self-Assessment provided an in-depth review of various Critical Controls using the Council on Cybersecurity Critical Security Controls Assessment Tool. The Laboratory worked closely with NNSA to pilot and test the tool for adherence to national standards to support future use within the NNSA NSE. The Assessment Tool measured the Laboratory's performance on the adequacy of Cyber Security policy, policy implementation, and control automation reporting. The Assessment Tool also benchmarked institutional IT best business practices and rated the overall health of the Cyber Security Program as "healthy", but noted five Issues and 13 Opportunities for Improvements.

SSO 5.1 – Meets Expectations By the end of FY 2015 and in accordance with the approved schedule, the Laboratory resumed several Technical Area 55 operations that had been in an extended shutdown; however, the remaining operations that were not restarted continued to impact programmatic operations. The operations in extended shutdown required federal readiness reviews prior to resumption of operations. The Laboratory improved the quality of Readiness Plans of Action, the rigor of Contractor Readiness Assessments (CRA), the adequacy of corrective action plans, and readiness to resume operations. The Laboratory instituted effective Management Review Boards to support the review process. Conduct of Operations improvements were noted. CRA processes for both T-Base II and Machining Operations assessments had weaknesses, but improved during the period. The Startup Authorization Authority has approved operations for the T-Base II lathe, Balance of Machining, and Isotope Fuels Impact Tester; and a CRA was completed for Pit Flow Sheet operations on schedule.

SSO 5.2 – Above Expectations - Systemic weakness identified during a contractor readiness assessment (CRA) conducted in October 2014 for the Weapons Engineering Tritium Facility (WETF) reflected formality of operations, radiological, and conduct of maintenance challenges as did numerous Technical Safety Requirement issues. Through active management intervention, this negative trend was reversed and the recent Federal Readiness Assessment (FRA) at WETF identified very strong operational rigor and a readiness to restart operations following resolution of just two prestart findings.

The Laboratory satisfactorily completed the WETF UC609 CRA, which will allow future dispositions of WETF inventory. The Laboratory conducted programmatic assessments of the implementation of conduct of maintenance and engineering programs at WETF. Although these assessments identified significant weaknesses in program implementation the depth, transparency, and critical nature of the assessments were commendable. This level of rigor reflects progress in improving the Contractor Assurance System program at WETF.

The Laboratory utilized WETF CRA information as well as feedback from earlier readiness activities to resolve identified weaknesses and to achieve readiness for operations. The WETF FRA found exceptional rigor and Conduct of Operations and found that WETF the emergency drill and exercise program was among most comprehensive and best implemented in NNSA.

SSO 5.3 – Below Expectations – Overall, implementation of the Laboratory Criticality Safety Program continues to exhibit weaknesses. The recently completed Criticality Safety Program Triennial Assessment at Technical Area 55 identified issues that are similar to issues identified in previous performance periods. Criticality Safety staffing and experience levels improved during the performance period, but Criticality Safety support to address emergent conditions in operating facilities was below expectations. As a result, there was insufficient progress in addressing resident infracted conditions at operating facilities. Excessive rework was initially required on most Criticality Safety evaluation documents (CSEDs), often requiring multiple cycles of review to achieve resolution. Improvements have been made resulting in focused rework and improved CSEDs. Nuclear material labeling deficiencies at the plutonium facility were resolved, but required NNSA intervention to achieve a compliant resolution.

Systemic weaknesses identified during assessments conducted in FY 2014 identified formality of operations challenges that were not addressed during the performance period. Specific examples include multiple Technical Safety Requirement (TSR) violations and some work activities that were paused by oversight personnel. As a further example, after a significant Arc Flash event, controls were implemented to improve work management, but after those controls were put in place some jobs continued to be initiated with inadequate work planning and control, suggesting that additional discipline is required. Specific shortcomings include failures in identification and control of hazards, inadequate worker training and qualification requirements, safety question evaluations that remain unreviewed, and insufficient post-maintenance testing. Lockout/Tagout compliance issues also persisted.

While Conduct of Operations have significantly improved in areas undergoing readiness assessments, corresponding progress has not been made in areas not undergoing readiness reviews.

Challenges also include slow progress on the resolution of longstanding issues and on the adequacy of extent of condition reviews. Examples include Material at Risk Tracker and Waste Compliance and Tracking System issues that were identified in prior periods and which have resurfaced as repeated TSR violations and RCRA noncompliances during the reporting period.

Maintenance of programmatic equipment was not managed effectively in accordance with Laboratory Procedure P950. This issue was not adequately explored through extent of condition analysis.

Early in the year, the Laboratory revisited the Facility Centered Assessment (FCA) program. The FCA program was replaced with Facility Evaluations (FE) that are more narrow in scope but more rigorous. An FE was conducted at the Chemistry and Metallurgy Research (CMR) facility. The FE was conducted effectively. The feedback derived from the completed FE is useful Contractor Assurance System feedback. Restructuring of the FCA process appears to have resulted in more self-critical and transparent reviews. However, only one FE was conducted in the fiscal year, the FE started at LANSCE was not completed. Because only one FE was completed, the FE program as executed was not sufficient to assess nuclear and high hazard operations institutionally.

The number and significance of the deficiencies identified in the FE at CMR suggests a declining trend in operational rigor at CMR, most notably in conduct of operations and conduct of engineering.

In operational readiness, rigor was uneven across facilities but generally improved over the course of the year. As an example, the Laboratory failed a CRA at WETF in October, 2014 and experienced delays in completing corrective actions prior to conducting the follow-on assessment. However, through active management engagement, successful CRA/FRAs subsequently conducted at WETF identified very strong operational rigor. As further examples initial Assessments for T-Base II and Machining Operations found a lack of appropriate rigor; but later Flow Sheet and Isotope Fuels Impact Tester CRAs exhibited improved rigor. The Laboratory's new Management Review Board process delivered better preparedness for readiness reviews.

Progress on the Safety Basis Improvement Plan was slow early in the performance period, however 88% of revised target actions were completed. Inadequate Safety Basis staffing and attrition of senior Safety Basis staff has negatively impacted the quality and timeliness of key safety basis document submittals. While actions were taken to initiate new hiring, lengthy hiring timeframes and long qualification processes impose risk.

In FY 2015, the Laboratory submitted 98 safety basis deliverables and responded to an additional 43 safety basis related requests. The quality of key safety basis submittals was sometimes inadequate, requiring NNSA comments or directed actions and rework to produce acceptable deliverables. Once submittals were approved, implementation of safety basis changes such as Evaluation of the Safety of the Situation documents and Justification for Continued Operations of approved changes was not timely. Because of weaknesses in safety basis documentation, the Area G waste facility and the Radioactive Assay and Nondestructive Test (RANT) facility remain in cold-standby withyout the ability to operate in support of internal Laboratory waste needs. Newly discovered information/changed conditions and weaknesses identified in the Area G safety basis documentation resulted in a pause of all Transuranic Waste shipments to Area G with the potential

to impact operations and project work at Technical Area 55 and CMR. The RANT facility remains inoperable due to an inadequate seismic evaluation in the safety basis.

Subsequent to a significant radiological contamination event at the National Critical Experiments Research Center (NCERC) facility at the Nevada Nuclear Security Site that was the shared responsibility of both the Laboratory and another contractor; the Laboratory performed investigations, causal analyses, dose assessments, corrective actions and readiness activities in FY 2015. DOE's Office of Enforcement issued an Enforcement Letter to the Laboratory during FY 2015. Laboratory performance issues related to operations and readiness resulted in the extended unavailability of both the Flat-Top and Godiva experimental platforms. As of the end of the performance period, both platforms are operational. The Laboratory implemented alternative procedures that enabled FY 2015 programmatic milestones to be met. FY 2015 investigations of the event identified significant formality of operations and technical compliance failures.

Development of a Fire Protection Program (FPP) staffing plan was a positive step, however, overall program improvements did not occur at the desired pace. FPP improvements were hampered by attrition, aging infrastructure which contributed to numerous false fire alarms (66 this year as compared with 57 in FY 2014), and high numbers of impairments. Hiring efforts continued and corporate reach back was utilized to address staffing challenges. FPP resources were heavily involved in readiness activities at Technical Area 55 and WETF, which helped strengthen facility fire program implementation. The Laboratory continued to actively manage Fire Protection deficiencies at legacy facilities, including resolution of several fire alarm panel deficiencies using the Fire Alarm System Replacement in Kind (RIK) process. A new process for evaluating required FPP exemptions and equivalencies has improved efficiency and several outstanding noncompliant conditions were resolved through this approach.

The Laboratory executed DOT-compliant transportation activities and supported the development of Type B packaging for the transportation of radiological materials to meet programmatic requirements.

Laboratory issues management processes did not consistently result in effective and timely resolution of Nuclear and High Hazards Operations issues.

SSO 5.4 – Meets Expectations - There was demonstrated improvement in closing Quality Assurance corrective actions, and new initiatives to address Laboratory production quality issues were launched, but because of production schedule timing the effectiveness of these changes have not yet been demonstrated. The Laboratory submitted a plan for the first phase of a delegation of product acceptance authority by NNSA; a product timeline was baselined and placed under revision control; and new manufacturing techniques were explored which have the potential to accelerate production. Challenges remain in fielding the trained and qualified weapons quality personnel needed to meet upcoming commitments.

SSO 5.5 – Below Expectations – In August 2014, the DOE Project Management Oversight and Assessment (PMOA) office conducted a For-Cause Review of the Laboratory Earned Value Management System (EVMS), resulting in non-compliance findings that led to decertification of the Laboratory EVMS. The Laboratory continued to make preparations for its EVMS certification review, currently scheduled for January 2016. The Laboratory developed and is completing actions according to the Corrective Action Plan to correct the noncompliant findings. The Laboratory submitted two months of EVMS data to DOE for review to assess readiness for a January 2016 EVMS certification review. As a direct result of the DOE decertification of the EVMS, the Laboratory was directed in a November 2014 Contracting Officer letter to provide compensatory performance data to provide alternative means of reporting performance on Laboratory capital asset projects. During this rating period the Federal Project Directors (FPDs) for the Radioactive Liquid Waste Treatment Facility – Low Level Waste and Technical Area 55 Reinvestment Project Phase II projects found the Laboratory's compensatory performance reporting to be deficient, as it did not reliably and accurately report the cost and schedule performance for those two projects, despite frequent meetings between the FPD staffs and the Laboratory to improve such reporting. Reporting deficiencies included unreliable and inaccurate schedules, inadequate oversight of subcontractor time recording, and working to schedules that were not consistent with the baseline schedules. For these reasons, the Laboratory's performance reporting during FY 2015 is determined to not have met DOE expectations or the directions contained in the November 2014 letter from the Contracting Officer.

The Laboratory submitted initial July and August EVMS data on September 29, 2015. While the data that was submitted exhibited improvement, it did not demonstrate adequate compliance for re-certification. NNSA incurred $3.8M in FY 2015 Laboratory EVMS recertification-specific costs, separate from the EVMS corrective actions of Laboratory EVMS staff and distinct from additional federal EVMS costs and efforts, such as costs for NNSA projects to develop and implement tailored EVMS compensatory measures, several of which were inadequate; as well as DOE(PMOA) costs. NNSA estimates that the EVMS recertification-specific incremental costs noted above are dwarfed by the much larger EVMS recertification costs associated with Laboratory, NNSA, and DOE staff time devoted to this effort. As an indicator of expense, the estimated cost for the DOE(PMOA) recertification review conducted by DOE (PMOA) with contracted support was $1.3M.

SSO 5.6 – Meets Expectations - Radiological Laboratory Equipment Installation Phase II is proceeding satisfactorily and further design work is being completed to plan. Long-lead work scope is underway. PF-4 Equipment Installation (PEI) is proceeding satisfactorily with Demolishion & Decommissioning work approved in March; although some risk mitigation actions are needed in the Transuranic Waste generation and waste staging approaches at Technical Area 55. Discussion between the Laboratory Project team and NNSA occurred in August 2015 to align scope elements for the development of long lead requests and development of the Critical Decision (CD)Point 2/3 baseline plan. Progress in the design and early approved work is consistent with Laboratory delivery of the required CD-2/3 baseline information to NNSA on plan in March of 2016. As of the end of the performance period, these projects were below the planned costs and on schedule.

SSO 5.7 – Meets Expectations – The Laboratory provided input for an NNSA briefing to support analysis of the mission need for a site by-pass road, and for the development of a scope of work. As directed, the project has stood down all work activity pending any new NNSA direction.

SSO 5.8 – **Meets Expectations –**The Laboratory responded appropriately to the significant number of Judgement of Needs (JONs) outlined in the WIPP Radiological Release Phase II Accident Investigation Board (AIB) Report. The Laboratory proactively participated with both the management and technical teams to ensure integration with the Carlsbad Field Office, Nuclear Waste Partnership, and DOE Office of Environmental Management Corrective Action Plans (CAPs) to ensure the Laboratory CAPs collectively respond to the JONs. In addition to responding to the AIB Report, the Laboratory has also responded with CAPs to the various additional critiques and reports (OIG, Longenecker Report, OE, and NMED) evaluating the Laboratory's contributions to the radiological release at WIPP.

The Laboratory developed and began implementing a remediation plan for the treatment of nitrate salt wastes. The Laboratory supplemented these plans to include independent and peer reviews, as well as a formal evaluation of the treatment options and an analysis of the facility options in order to ensure the path forward is sound and able to withstand internal and external scrutiny. The Laboratory also continued to safely store and monitor the inventory of nitrate salt waste containers by complying with the nitrate salt bearing waste isolation plan, through the addition of supplemental cooling, and most importantly by continuing the investigation and understanding of a complicated chemical mixture within these drums.

It is noted that an update to the Nitrate Salts Isolation Plan is still in process and should be completed as soon as possible.

On August 31, 2015, the Laboratory and DOE provided a written disclosure to the New Mexico Environment Department (NMED) regarding potential and identified regulatory non-compliances associated with legacy transuranic waste processing dating back to 2005. While the extent of condition review took longer than planned or desired, and the magnitude of disclosures is concerning, the review was extensive and transparent. The Laboratory worked closely with DOE/NNSA in the development of a conservative disclosure that was responsive to concerns of DOE/NNSA and NMED.

A positive NNSS Radioactive Waste Acceptance Program audit (only 1 CAR) indicates continued improvement and preserves an important capability (waste shipments to Nevada). Unfortunately, it was recently learned that a driver identifying himself as a Mexican national transported Low Level Radioactive Waste from Los Alamos to NNSS in violation of the NNSS Low Level Waste Acceptance Criteria, indicating less than adequate flow-down and verification of regulatory requirements in these laboratory subcontracts.

SSO 5.9 – Meets Expectations – The Laboratory did not ship any waste to WIPP due to the consequences of the Laboratory drum breach at WIPP that occurred in 2014. Authorization to resume Low-Level waste shipments to the NNSS has been granted. Support for the Land Conveyance and Transfer Team has improved.

The Laboratory has effectively responded to an extremely large volume of information requests from the State with timely and quality responses. Face-to-face meetings were helpful in responding to NMED requests. Although completion of the Individual Permit (IP) for Storm Water deliverables appropriately addressed concerns, the responses were provided to DOE very late and without the final document quality necessary for obtaining approval signatures, even though a 30 day extension was granted. Response to the Compliance Evaluation Inspection on the Individual Permit (IP) report was insufficient, resulting in an Administrative Compliance Order (ACO) from the EPA based on the NMED Surface Water Quality Bureau report. The Laboratory has been making improvements on those few areas that were identified in the CEI report and the ACO. Environmental drilling activities during the period reflected a better utilization of subcontractors and equipment than in previous years and resulted in acceptable quality well construction and development.

The Lifecycle Baseline for executing the legacy environmental clean-up was halted by the government during the first quarter and removed from Laboratory work scope and is no longer being evaluated for performance.

Consent Order deliverable quality has met expectations during the performance period. Field cleanups including the canyon-side mercury removal were done well and finished early. Demolition of building 286 in Technical Area 21 was completed successfully, however, it encountered a multi-week safety pause.

Performance Objective 6: Leadership

Description

Leadership (10% of At-risk fee) was rated as Good. Overall, Los Alamos National Security, LLC performed at the "meets expectations" level in ensuring that leadership is effectively managing programmatic concerns. Noteworthy accomplishments include progress on Strategic Planning improvements such as the Laboratory Performance Improvement Plan, collaboration with other Laboratories and stakeholders to achieve both cost savings and mission success, and the continuation of excellence in many areas of Science, Technology and Engineering. Significant challenges in FY 2015 included building unity of purpose and unity of effort among the Laboratory staff to address and resolve the very significant operational challenges identified in Performance Objective 5, and progress against those challenges was uneven.

CF 6.1 – Meets Expectations – During the period, the Laboratory produced a required FY 2015 to FY 2019 Performance Improvement Plan that built upon the Laboratory Strategic Plan to identify specific performance objectives for the current and future fiscal years. Earlier sections of this report detail several specific instances of collaboration with Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratory, the other NNSA sites, government partners, institutional partners, and commercial partners in which the Laboratory collaborated to both expand the impact of its own work and to leverage the work of others. These examples range from cost-saving training activities with LLNL to the commercialization of fuel cell fabrication technology with a private sector partner. In addition, the Laboratory continued to excel in fulfilling socio-economic goals for subcontracting. The Laboratory participated in transition activities to support the establishment of a new Office of Environmental Management (EM) Field Office which assumed responsibility for oversight of legacy clean up on the Laboratory campus. These efforts included support for the development and negotiation of a bridge contract with EM for EM-funded legacy cleanup scope for FY 2016 and FY 2017, including robust estimate development and parent company review processes, as well as regulatory-related activities such as the development of a management engagement plan and participation in the Regulatory Integration Steering Committee.

CF 6.2 - Below Expectations - The Laboratory experienced several performance failures in fiscal year 2013 and 2014 that continued to impact fiscal year 2015 operations. While the concerns that arose in 2014 were not substantially resolved, the Laboratory accepted responsibility for those shortcomings and embarked on a targeted program to address them with some success. During this performance period there was an improvement in the disciplined adherence to specific remediation tasks and specific timelines. Key personnel changes/additions were made in Operations and Business and in the Weapons Programs; but several top key personnel positions were filled by acting staff for much of the performance period, impacting the Laboratory's ability to move forcefully on important challenges.

An increased attention to criticality safety compliance over the past year and a half is evident, however criticality safety infractions along with infracted conditions, some in excess of a year,

remaining within the plutonium facility is evidence of a less than adequate culture of programmatic accountability and responsibility for safety.

CF 6.3 – Below Expectations - External and internal reviews of the Contractor Assurance System confirm that challenges in self-discovery, issues management discipline, and trending and analysis persisted. While the Laboratory acknowledged this condition, there was not significant progress toward addressing those longstanding challenges that exist across the institution.

The use of management systems to drive improvements in Criticality Safety and other Safety Management Programs are lagging although parent company resources were provided to support criticality safety program improvements. Corrective action in Environment, Safety & Health has shown improvement with internal trending, monthly program analysis, new metrics, and transparent communication with NNSA.

On a positive note, the Laboratory Ethics and Internal Audit program continued to provide robust, self-critical analysis that supported significant management improvements over the course of the reporting period.

The Laboratory utilized a dashboard to track metrics for different programs. The utility, timeliness and employment of metrics varies widely across the organization. The Laboratory initiated a metrics improvement effort for the safety management program (SMP). This is a positive step towards resolving a longstanding deficiency that has resulted in SMP deterioration and noncompliances, that sometimes halted or postponed operations.

CF 6.4 – Meets Expectations – Across several programmatic and business areas, the Laboratory partnered with others around the complex to solve technical challenges, to deliver required support and service, and to achieve economy and efficiency of operations. Examples include support for weapons Life Extension Programs, the collaborative acquisition and use of supercomputing resources, sophisticated Design Agency work, broad support for the non-proliferation community, and responsive world-class work for other efforts on behalf of key federal stakeholders.

For example, during the performance period the Laboratory led the Predictive Capability Framework (PCF) Council and drove significant progress in achieving the PCF peg-posts, including a Level 1 milestone on Pit Reuse, as well as leading a re-focusing of the PCF goals. Additionally, the Laboratory provided leadership for development and planning on the Enhanced Capabilities for Subcritical Experiments Project, and led the development of a Subcritical Experiments Operational Plan for the U1a facility at the Nevada National Security Site.

The Laboratory assigned staff to fill critical support roles in NNSA and with customer organizations, including the Department of Defense. These staff assignments provide crucial technical expertise to government organizations, furthering the national security mission of the Laboratory and the NNSA.

The Laboratory conducted successful high level engagement to promote NNSA complex-wide effectiveness, including on-site engagement with the Deputy Secretary, the NNSA Administrator and Principal Deputy Administrator, many members of the Senate and House of Representatives, and senior officials from the Department of Defense and other customer agencies. In almost all cases these engagements were effective and productive.

CF 6.5 – Meets Expectations – The Laboratory took several constructive steps to promote organizational growth and improvement. Noteworthy examples include a robust Leadership Development Program for rising mid-level executives and further success in improving the diversity of the Laboratory leadership team. The Laboratory faced critical challenges during the reporting period, including the resumption of Technical Area 55 plutonium operations, Criticality Safety, Safety Basis, Formality of Operations, Project Management and Earned Value Management System Administration (EVMS), Quality Assurance; compliance with environmental permitting requirements and other significant waste stream management challenges. Although Laboratory leadership supported EVMS corrective actions and the recertification process, the Laboratory acknowledges that it cannot meet the December 2015 recertification readiness date. Without EVMS system re-certification, projects will use interim compensatory measures that have not proven successful in measuring and forecasting project performance. During the fiscal year there have been instances of success, such as completion of PF-4 readiness activities for T-base 2 and Balance of Machining Operations and there have been continuing or new challenges including work planning and control events, most notably the LANSCE Arc Flash event and the pause in Transuranic Waste shipments to Area G. Management has not consistently engaged in the "on the floor" leadership which is needed to improve conduct of operations at nuclear facilities. This is a significant weakness in the context of the organizational improvements needed to achieve and sustain safe nuclear operations. While the Laboratory took proactive and conservative steps to implement defense in-depth measures for cold storage of remediated nitrate salts, progress was very slow in developing a comprehensive understanding of the full extent of condition resulting from processing nitrate-salt bearing Transuranic waste in violation of the site-wide Resource Conservation and Recovery Act (RCRA) permit.

SSO 6.1 – Meets Expectations – Los Alamos National Security LLC has continued some of the local and regional community initiative commitments it has previously funded from earned fee. These activities supplement the significant community initiatives that are funded by NNSA on a reimbursable basis. Specific levels of earned fee community commitments are no longer required under the contact and the partial continuation of those commitments is noted. Because of operational challenges, the Laboratory engaged in several high-consequence negotiations with federal and state stakeholders, and has been effective in those interactions.