



Department of Energy
National Nuclear Security Administration
Washington DC 20585

November 28, 2016

OFFICE OF THE ADMINISTRATOR

MEMORANDUM FOR STEVEN J. LAWRENCE
MANAGER
NEVADA FIELD OFFICE

FROM: MADELYN R. CREEDON
PRINCIPAL DEPUTY ASSISTANT

SUBJECT: National Security Technologies, LLC (NSTec), DE-AC52-06NA25946, Fiscal Year 2016 Award Fee Determination

The National Nuclear Security Administration (NNSA) has completed its assessment of National Security Technologies, LLC (NSTec's) performance of the contract requirements for the period of October 1, 2015 through September 30, 2016, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP). Based on assessments provided in the NNSA Performance Evaluation Report, award fee amounts are as follows:

	<u>At Risk</u>	<u>Available</u>	<u>Final</u>	<u>Percent</u>
Goal-1: Manage the Nuclear Weapons Mission	30%	\$7,944,516	\$7,229,510	91%
Goal-2: Reduce Nuclear Security Threats	17%	\$4,501,892	\$4,276,797	95%
Goal-3: DOE & Strategic Partnership Projects Mission Objectives	5%	\$1,324,086	\$1,244,641	94%
Goal-4: Science, Technology & Engineering (ST&E)	4%	\$1,059,269	\$1,038,084	98%
Goal-5: Operations & Infrastructure	34%	\$9,003,785	\$8,103,407	90%
Goal-6: Leadership	10%	\$2,648,172	\$2,489,282	94%
Total		\$26,481,720	\$24,381,721	92%

In addition, the fixed fee and total fee summaries are provided below for your information:

Fixed Fee	\$0	\$0
SPP (Fixed Fee)	\$5,054,271	\$5,054,271
Total Fixed Fee	\$5,054,271	\$5,054,271
Total Summary	\$31,535,991	\$29,435,992





National Nuclear Security
Administration

National Security
Technologies, LLC (NSTec)

Performance Evaluation
Report (PER)

NNSA Nevada Field Office

Evaluation Period:
*October 1, 2015 - September 30,
2016*

November 18, 2016

Executive Summary

This Performance Evaluation Report (PER) provides the National Nuclear Security Administration (NNSA) assessment of National Security Technologies, LLC (NSTec), performance of the contract requirements for the period of October 1, 2015 through September 30, 2016, as evaluated against the Goals defined in the Performance Evaluation and Measurement Plan (PEMP). The NNSA took into consideration all input provided (e.g. Contractor Assurance System (CAS), Program Reviews, etc.) from NNSA Program and Functional Offices both at Headquarters and in the field.

NSTec submitted a Performance Self-Assessment Report that covered the rating period. NSTec is to be commended for the thoroughness of their report which highlighted their major accomplishments. Overall, FY2016 was an excellent year for NSTec, highlighted by significant contributions to the enterprise by effectively performing across all of their mission lines including Stockpile Stewardship, Nuclear Non-proliferation, and Environmental Management.

While the balance of NSTec's performance during the fiscal year was excellent, there were some challenges during this period that did not reflect the operational excellence expected from a Management and Operating (M&O) contractor. Opportunities for improvement still exist in the areas of: nuclear safety basis development and configuration management. As a result of the various issues experienced during FY2014 and early FY2015, NSTec recognized the need for refocusing its management attention on operational excellence. Since that time, it is recognized that this effort has resulted in significant cultural changes including such laudable behaviors including employees pausing work when they observe circumstances that are not expected/planned. Also of note, there has been excellent parent corporation support that has fostered additional self-reflection and improvement.

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

Goal-1: Overall, NSTec's performance exceeded expectations in the management and execution of the Nuclear Weapons Mission for NNSS activities (30% of At-risk fee) with performance rated as EXCELLENT. NSTec completed all and exceeded many of the NNSS Level 2 national milestones in the Milestone Reporting Tool (MRT) and line item project milestones associated with Defense Program activities, as well as assisted the National Security Laboratories in meeting several of their Level 2 national milestones. NSTec successfully executed Stockpile Stewardship experiments, continued the development, implementation and expanded national use of revolutionary diagnostics, integrated and expanded collaboration with the National Security Laboratories on the current and future Stockpile Stewardship experiment programs. NSTec also successfully managed critical nuclear and radiological facilities such as the U1a Complex, Joint Actinide Shock Physics Experimental Research Facility (JASPER), Device Assembly Facility (DAF), National

Criticality Experimental Research Center (NCERC) and the Dense Plasma Focus Facility (DPFF). In addition, NSTec diligently and successfully worked to expand university collaborations to expand potential research collaborations for NNSA and the scientific and engineering workforce pipeline to begin to address skill gaps and projected capabilities losses from future retirements. The combination of all these efforts contributed directly to the enhanced scientific and engineering understanding of weapons materials and physics in support of the nuclear weapons stockpile and in the evolution of future designers and experimentalists. NSTec's self-assessment rating was EXCELLENT.

Goal-2: NSTec successfully executed the global nuclear security mission work (17% of At-risk fee) with performance rated as EXCELLENT. Overall, NSTec exceeded expectations for Defense Nuclear Nonproliferation (DNN), National Incident Response (NIR) and Counterterrorism mission execution. NSTec efforts demonstrated far reaching national and international implications in areas including the nonproliferation in the Global Material Support (GMS) program, the Comprehensive Test Ban Treaty Organization (CTBTO) familiarization activities, the underground nuclear explosion detection, and the Agency's ability to provide a national response to nuclear emergencies. The NSTec Aviation Program received the DOE's Office of Aviation Management Award for the Best Aviation Program. NSTec continued to develop and implement plans, consistent with global security program mission objectives to provide nonproliferation, nuclear incident response, and counterterrorism programs for US national security. NSTec's self-assessment rating was EXCELLENT.

Goal-3: NSTec successfully executed the mission objective of Strategic Partnership Projects (SPP) including Environmental Management (EM) mission objectives (5% of At-risk fee) with performance rated as EXCELLENT. SPP, which increased by almost eight percent in FY2016, demonstrated an integration of this work in a way which leverages and sustains the Nevada National Security Site (NNSS) unique science and engineering capabilities. Efforts included project management, engineering, sensor and diagnostic development and testing, emergency response and consequence management. EM activities were conducted in a manner that both met Federal Facility Agreement and Consent Order (FFACO) milestones and supported the clean-up of legacy and operational low level waste/mixed low level wastes from across the EM and DOE complex. NSTec's self-assessment rating was EXCELLENT.

Goal-4: NSTec successfully managed Site Directed Research and Development (SDRD) and Technology Transfer programs to advance advanced national security missions and advance the frontiers of the Science, Technology & Engineering (ST&E) with performance rated as EXCELLENT. The SDRD program continued its history of significant breakthroughs in key mission technologies, cooperative research and development accomplishments, success in recruiting and hiring early career technical staff and the projects continued to yield more than a 40% return to programs. In addition, NSTec's workforce published the highest number of high-impact journal publications to date across a broad spectrum of science, engineering, and mathematics fields. NSTec's self-assessment rating was EXCELLENT.

Goal-5: Operations and Infrastructure (34% of At-risk fee) was rated as VERY GOOD. Overall, NSTec's performance exceeded expectations meeting the DOE/NNSA mission by ensuring safe, secure and effective execution of program and site operations, as well as infrastructure sustainment and improvements. NSTec demonstrated strong progressive improvements in calling work pauses/safety and security stand downs and conducting management reviews/critiques. NSTec successfully advanced capital projects, demonstrated progress on arresting the declining site infrastructure, laid out a plan to shrink the infrastructure footprint, implemented NNSA infrastructure management system improvements, and achieved their three assigned Infrastructure Level 2 national milestones. NSTec also made significant progress in reducing the growth in deferred maintenance, reducing the maintenance backlog by effectively planning, coordinating, and executing a vast number of infrastructure projects. NSTec continued to exceed expectations in delivering efficient, effective, and responsible business operations, systems and financial management, legal management; and information technology & cyber security. Opportunities for improvement still exist in the areas of nuclear safety basis development, configuration management, and issues management. NSTec's self-assessment rating was EXCELLENT.

Goal-6: Leadership (10% of At-risk fee) was rated as EXCELLENT. Overall, NSTec's performance significantly exceeded expectations in meeting the DOE/NNSA mission by ensuring leadership is effectively managing programmatic mission risk and executing mission and site operations safely and securely. NSTec successfully demonstrated strong leadership in supporting the vision of the overall DOE/NNSA mission. NSTec successfully improved safety culture, increased employee communication and engagement, addressed workforce capabilities, improved integration and responsiveness, and leveraged significant parent company involvement/commitment for the overall success of the Site and the Enterprise. NSTec's self-assessment rating was EXCELLENT.

While the balance of NSTec's performance during the fiscal year was excellent, there were some challenges during this period that did not reflect the operational excellence expected from an M&O contractor. Opportunities for improvement still exist in the areas of nuclear safety basis development, issues management, and configuration management. As a result of the various issues experiences during FY2014 and early FY2015, NSTec recognized the need to refocus its management attention on operational excellence. Since that time, NSTec has recognized that this effort has resulted in significant cultural changes including such laudable behaviors as employees pausing work when they observe circumstances that are not expected/planned. Of note, there has been excellent parent corporation support that has fostered additional self-reflection and improvement.

Overall, FY2016 was an excellent year for NSTec, highlighted by significant contributions to the enterprise, and effectively performing across all of their mission lines including Stockpile Stewardship, Nuclear Non-proliferation, and Environmental Management.

Performance against the Goals summarized below, resulted in an overall rating of

EXCELLENT for NSTec. Specific observations for each of the Goals are provided in the following pages.

Goal 1: Manage the Nuclear Weapons Mission (30%)

Overall, NSTec's performance exceeded expectations in the management and execution of the Nuclear Weapons Mission for NNSS activities through performance in which accomplishments significantly outweighed any issues resulting in a rating of EXCELLENT. NSTec completed all and exceeded many of the NNSS 27 assigned Level 2 national milestones in the Milestone Reporting Tool (MRT) and line item project milestones associated with Defense Program activities, as well as assisted the National Security Laboratories in meeting several of their Level 2 national milestones. NSTec successfully executed Stockpile Stewardship experiments, continued the development, implementation and expanded national use of revolutionary diagnostics, integrated and expanded collaboration with the National Security Laboratories on the current and future Stockpile Stewardship experiment programs, and successfully managed critical nuclear and radiological facilities such as the U1a Complex, JASPER, DAF, NCERC and the DPFF. In addition, NSTec diligently and successfully worked to expand university collaborations to expand potential research collaborations for NNSA and the scientific and engineering workforce pipeline to begin to address skill gaps and projected capabilities losses from future retirements. The combination of all these efforts contributed directly to the enhanced scientific and engineering understanding of weapons materials and physics in support of the nuclear weapons stockpile and in the evolution of future designers and experimentalists.

Successful completion of these milestones required significant integration and teaming with the National Laboratories and Federal HQ Program Managers to assure performance outcomes were understood and achieved. One of these milestones included completing a site for demonstration of the Neutron Diagnosed Subcritical Experiment (NDSE) capability. To meet this challenge, NSTec designed and constructed a new concrete line-of-site at the DPFF. This major design and build effort was completed in time to support required experimental work. A second milestone NSTec completed this year was the successful dismantlement and refurbishment of the Cygnus X-ray machines at U1a that required full machine tear down and rebuild. This refurbishment has and is expanding the useful life of the Cygnus machines by thousands of hours, thereby saving the program the significant cost of a new machine. NSTec also successfully executed additional milestones such as new diagnostic development and implementation for the Red Sage diagnostic integration experiment series, Silverleaf. This co-owned with the National Security Laboratories milestone, validated the feasibility of the integrated diagnostic suite, successfully testing the diagnostic configuration and data quality for the Red Sage Subcritical Experiment (SCE) that used a new and different two shock geometry to assess ejecta and other material effects. NSTec successfully integrated and supported the soft radiography and multiplexed photon Doppler velocimetry diagnostics on the series, qualifying a dual pulse x-ray head along with digital multi-frame recording system for the radiography effort.

Additional milestones achieved also included the U1a Complex Enhancement Project (UCEP) Conceptual Design Summary. This study addressed input from a HQ and national

project team which refined the physical design based upon NNSA requirements. Key to the project's success, a large set of Critical Decision 1 (CD-1) documents was delivered to HQ and the national project team. This action contributed to a national level 2 milestone, and as a result, the UCEP line item project was submitted by NNSA for inclusion in the FY2017 budget. The UCEP project successfully withstood a NNSA HQ independent project review with minor findings to address prior to CD-1.

NSTec also successfully conducted and evaluated a number of experiments for the advancement of nuclear material property understanding. Despite Lawrence Livermore National Laboratory (LLNL) nuclear material shipping container issues that slowed the number of plutonium targets available, NSTec completed eleven experiments during FY2016, surpassing the milestone requirement of ten for the JASPER program. Two were velocity surrogates used to validate projectile velocity and gun performance; four were surrogates testing the integration of the new NSTec developed seven-channel pyrometer; and five other experiments were graded density impactor (GDI) experiments performed on encapsulated Plutonium (Pu) targets. Completing these experiments was critical to improve the understanding of Pu properties under dynamic conditions. NSTec surpassed the milestone stretch goal at JASPER as well by executing 3 additional shots for other NNSA Programs. Tied with the DPF milestone described above, NSTec also successfully continued development and testing of the revolutionary DPFF neutron source proposed for use in future subcritical experiments. Of note, at the DPFF, upward of 50 experiments were conducted in December 2015 alone. NSTec's DPFF team also conducted unique Boron-10 target experiments simulating a realistic k-effective slope. These experimental results were so positive that LANL may request an accelerated set of reactivity SCE experiments addressing Pu aging that would contribute to the W-80-4 certification. With all of these successes, NSTec worked with HQ and the Labs to craft a final report summarizing the viability of the DPF as a neutron source able to meet requirements for a NDSE. This report completed a national level 2 milestone and also satisfied the Defense Program FY2016 Getting the Job Done List item: "Conduct neutron source tests to enhance diagnostics and inform options for Enhanced Capability for Subcritical Experiments (ECSE)".

NSTec continued to excel in implementing and expanding the use of revolutionary diagnostics, increasing the national platforms' sophistication and usefulness to obtain unprecedented data for the stockpile stewardship program. For example, NSTec developed, tested and installed two seven-channel pyrometers at JASPER. This improved JASPER diagnostic capability and allowed for temperature data to be captured and analyzed at different points in time with each experiment. NSTec also delivered two Time Resolved Spot-Size Diagnostic systems to LLNL's Flash X-Ray (FXR) facility for deployment. This system was designed to make measurements of the FXR spot in double pulse configuration to support enhanced radiography for core punch SCEs. In collaboration with LLNL, NSTec also developed a broadband laser ranging (BLR) hydro diagnostic. This new laser ranging diagnostic was successfully fielded for the first time on an LLNL Site-300 dynamic experiment. BLR provides orders of magnitude more distance measurement data than is possible in experiments using electrical pins. This game-changing diagnostic capability is now scheduled to be fielded for the Lyra series (Eurydice, Vega) and future

SCEs. NSTec personnel also installed and trained operators on a 4-channel Modular Photon Doppler Velocimetry (PDV) system at the LLNL High Explosives Application Facility (HEAF). This diagnostic provides a new and enhanced capability for LLNL materials characterization experiments. At U1a, to enhance productivity, screen room 1 was emptied and reconfigured to allow the Cygnus control and monitoring equipment to be moved from screen room 2. Screen room 2 was then reconfigured for Velocity Interferometer System for Any Reflector/ Multiplexed Photon Doppler Velocimeter (VISAR/MPDV) support allowing for expanded capacity of diagnostic channels. The refurbishment will enhance Cygnus in support of the upcoming Lyra Series (Eurydice and Vega) SCEs and future Sierra Nevada and Red Sage Series. NSTec also completed the acquisition process for a new Linear Accelerator (LINAC) diagnostic at the DAF which will provide enhanced capabilities and more reliable operation for various Stockpile Stewardship and Directed Stockpile Work (DSW) experiments and investigations.

Completing milestones, executing experiments and expanding the use of revolutionary diagnostics requires good communication and coordination with infrastructure and nuclear facility management. NSTec provided invaluable facility and safety management program support to the National Security Laboratories in the contractor Certification of Readiness for the DAF Coring Activity Start-up. This support included completing a self-assessment, a Management Readiness Confirmation Board (MRCB), and the resolution of actions to address the Contractor Readiness Assessment Pre-Start findings and development of the Corrective Action Plans (CAPS) for Post-Start findings. This collaborative startup between NSTec, LLNL and Los Alamos National Laboratory (LANL) emphasizes the partnership needed to bring important new mission capabilities to the DAF. NSTec also effectively implemented safety basis changes associated with the U1a.05 Drift Extension Zero Room Hole-Through Addendum to the U1a Complex SCE Documented Safety Analysis (DSA) allowing the breakthrough for an expanded experimental area to be accomplished in early February. In support of this milestone, implementation and an independent verification review of the new hazard controls supporting this construction activity were completed against an aggressive schedule. NSTec continued to maintain and update an integrated, logic-linked schedule for future SCEs and various elements of the ECSE initiative. The schedule is essential both in depicting a program of record and in offering management decision options based upon realistic assessment of critical path. As logic linkages and estimated durations are added to this schedule, there is now a better integration of both experimental objectives, infrastructure and safety basis analysis. For example, NSTec is implementing U1a Complex SCE DSA changes that support the transition from Hazard Category (HC) 3 to HC 2. This initiative is being done in a collaborative/ integrated manner utilizing a broad contributor base. Active and early engagement of the National Security Laboratories and safety management program (SMP) owners have been integral in conduct of this effort. NSTec holds monthly workshops with stakeholders and team building initiatives to foster continued successful collaboration.

NSTec also established a small launcher experimental platform to train the next generation of diagnosticians and engineers for the execution and dynamic analysis of one-off experiments prior to larger-scale facilities and SCEs. This forward thinking approach will

help to consistently train and maintain qualifications of both current and future experimentalists without having to wait 18 months between experiments and will support proof-of-principle dynamic materials properties diagnostic development early in their technology readiness level prior to deployment in larger operations at the National Security Laboratories and at the NNSS.

In addition to the integration and collaboration described above, NSTec fully supported and led the SCE Integrated Project Team (IPT) initiative to try to meet the NNSA goal of two plutonium experiments per year as requested by Congress in the FY2016 National Defense Authorization Act within the constrained Future Year Nuclear Security Plan (FYNSP). The initiative considered scope performed by all stakeholders, overlap of activities, costs, the physics data requirements, and fielding realities for each subcritical experiment and series. NSTec and the National Security Laboratories developed a fully integrated NNSA SCE program that met NNSA requirements and reduced the funding required by \$20M per year to fit the NNSA FYNSP profile. It also ensured that the critical initiatives of the Science Campaigns were not marginalized, and the SCE schedule, although revised to a slightly slower pace, still reached the NNSA goal of two subcritical experiments per year as quickly as possible. As another example of integration, NSTec collaborated with the National Security Laboratories to prioritize and implement a Stockpile Stewardship experiment program that enhances confidence in the predictive capability essential to assess stockpile performance and certifying modernized weapons. NSTec, in collaboration with LANL and the Naval Research Laboratory, pursued a Research and Development (R&D) effort that will optimize Cygnus for low areal mass radiography in order to meet future Red Sage Subcritical Experiment series objectives. This initiative will provide a radiographic dynamic range previously not achievable, yet critical to elements of device performance. This enhanced coordination and planning for the National SCE program is allowing NSTec, the National Security Laboratories, and the NNSA Program Managers to better align the program with the needs of the NNSA, better utilize existing funding, and more accurately project needed funding.

NSTec also assisted the National Security Laboratories in successfully achieving several of their assigned NNSA Level 2 national milestones. NSTec collaborated with Sandia National Laboratory's (SNL) Microsystems and Engineering Sciences Application (MESA) facility personnel to design a solid-state, large-format imaging sensor for major imaging improvements for future experiments and enhanced radiographic imaging applications. NSTec also continued enhancement of the Leapfrog PDV that provided unprecedented data for SNL's dynamic materials program, including uranium and plutonium, by diagnosing cylindrical magnetic compression at ultra-high velocities. In addition, NSTec in collaboration with the National Security Laboratories, acquired double pulse radiographic images on LLNL's FXR accelerator by fielding of a new NSTec 3-Fram camera. This supported a key LLNL national milestone. NSTec provided critical support to the Opacity experiments at the National Ignition Facility (NIF) this year as the lead responsible investigator for continued Hohlraum development shots. This was the first time that the entire opacity platform was tested and high quality data was returned on all experiments.

NSTec actively worked to build a next generation workforce. For example, NSTec hired 22 Science, Technology & Engineering (ST&E) full time employee (10 engineers, 7 Scientists, 5 Technicians – as of September 2016), utilized 35 summer interns and actively used Laboratory retirees as casual labor to help mentor and grow mid-level employees. NSTec also implemented innovative approaches to allow early career employees to continue with educational pursuits resulting in the addition of two Post Doctorates to the workforce. This systems approach or cohesive integration of programs and functional areas also led to successful execution and cross-training of resources in NSTec's Defense Experimentation & Stockpile Stewardship (DE&SS) and Global Security (GS) Directorates during Source Physics Experiment 5 (SPE 5). The successful collaboration between NA-10 and -20 program support personnel increased capability and capacity for future experimental work for NNSA as a whole. As a benefit, NSTec technical subject matter experts (SMEs) were more accepted in the Nuclear Weapons Complex. For example, NSTec SMEs were given credit in Laboratory status reports, included in published papers, and included on Joint Operations Working Groups (JOWOGs) where they are part of the solution team.

NSTec successfully worked to strengthen and build upon university collaborations as potential research partners and a pipeline for potential workforce candidates. For example, within the State of Nevada, NSTec maintained strong research collaborations with both the University of Nevada Las Vegas (UNLV) and the University of Nevada Reno (UNR) to support Gallium Nitride (GaN) materials and device development. The UNR partnership grew significantly, as NSTec served as one of the primary providers of research scope and funding for the Nevada Terawatt Facility (NTF), a pulse power Z pinch nuclear fusion reactor. NSTec's support provided a resource bridge for the NTF, so that UNR may compete for NNSA Center of Excellence funding. This allowed the facility to maintain its operations, to grow its graduate student training in plasma physics, pulse power, and diagnostics, and to focus research portfolio on scientific questions of interest to NSTec and the broader NNSA community. In addition to the NTF, NSTec also worked closely with the Nevada Seismological Laboratory at UNR, providing seismic measurements from the NNSS for their data repository. NSTec also maintained other substantial university research relationships. In FY2016, NSTec successfully continued work with the University of Montana, from which a new postdoctoral staff member was hired, and with Rice University who are world leaders in analysis and are helping NSTec to build algorithmic advances enabling future diagnostic systems. NSTec also established new research contracts with the University of Arizona and the University of Alabama Huntsville (UAH). In both cases, the students, whom NSTec plans to hire as post-doctoral staff, also served NSTec as advanced summer interns, already contributing to the NNSS mission. The collaboration with UAH also expanded to include members of the department of physical chemistry at Massachusetts Institute of Technology (MIT), who joined the collaboration at no cost to NNSA, due to their interest in scientific capabilities. Additionally, to build broader recruitment pipelines, and to establish potential research partnerships, NSTec also took a lead role as an industrial partner in the *Preparation for Industrial Careers* program sponsored by the National Science Foundation and the Mathematical Association of America. In FY2016, NSTec researchers mentored undergraduate students from Lee University, Georgia Southern University, and Elon University, teaching them how to

formulate and solve problems stemming from broadband laser ranging and X-ray radiography, essential diagnostics for the NSTec mission. The NSTec team also served on the program's national review committee and assisted in a faculty workshop at Brigham Young University on how to train undergraduate students to solve real-world scientific problems.

FY2016 marked the first year in which the NNSS Nuclear Materials Management (NMM) Program received funding by NNSA Program sponsors. The NMM program includes the NMM Program Office, the Inventory Management Program, and the Certified Packaging Program. With this new funding stream, NSTec was able to approve hiring of nine new staff positions supporting program implementation (six hired so far), developed a five to ten year program plan, developed a Technical Basis Document for the SAVY 4000 Container, developed ~15 NMM company directives and standard operating procedures, conducted seven Nuclear Material Review Boards designed to facility lifecycle management of nuclear material acquisitions and began a multi-year effort to fully characterize the inventory. These successful activities will position the NNSS to support full implementation of a compliant NMM Program in an accelerated period of time.

However, despite these positive actions, Safety Basis (SB) development continued to underperform throughout the performance period. SB revisions were consistently delayed, review and revision cycles were underestimated, and numerous quality issues resulted in unexpected rework and project delays. For example, the U1a DSA Hole-Through SB Addendum identified above, although effectively implemented after approval, required a two-month delay in the construction start to resolve quality issues and the DSA for U1a HC 2 upgrade to resolve the U1a Potential Inadequacy of the Safety Analysis (PISA) required significant comment resolution.

Although NSTec delivered the 100% Hazard Category 2 U1a DSA/TSR by the end of FY2016, there were significant delays during the DSA development process. NSTec planned to circulate a draft version among stakeholders to allow sufficient time for feedback and improvement before submission of the final 100% version to NNSA NFO, however, because of time constraints, this did not happen so stakeholders had no opportunity to offer improvements before the 100% submission. This lag was one of the contributors to the schedule delay of the next planned Sub-Critical Experiment into FY2018 and is now on the Critical Path for execution. Upon direction from the Field Office, communication between NSTec and the Laboratories has been enhanced with monthly tele-conferences.

Goal 2: Reduce Nuclear Security Threats (17%)

NSTec successfully executed the global nuclear security mission work with performance rated as EXCELLENT with performance resulting in many significant accomplishments with only minor issues during the period. Overall NSTec exceeded expectations for DNN, NIR and Counterterrorism mission execution. NSTec efforts had far reaching national and international implications in areas such as the nonproliferation in the GMS program, the CTBTO familiarization activities, the underground nuclear explosion detection, and the Agency's ability to provide a national response to nuclear emergencies. NSTec continued to develop and implement plans, ensuring products were in line with global security program mission objectives to provide nonproliferation, nuclear incident response, and counterterrorism programs for US national security.

In the area of elimination of proliferation sensitive materials, NSTec successfully supported various DNN Programs including the GMS program for the Office of Radiological Security (ORS). NSTec successfully supported the Phase II and Phase III source recovery efforts in the Russian Federation and the Republic of Armenia. NSTec supported efforts to extend removal capabilities in the Republic of Belarus. NSTec made excellent progress in the Sustainability Program at 20 facilities in Belarus; six of those facilities will be completing their three year cycle at the end of Calendar Year 2016 formally transitioning the security of radiological sources directly to the country/facility. NSTec is also supporting the development of a Diplomatic Note with the Republic of Belarus allowing for the removal of orphaned/disused radiological sources. Completion of the Diplomatic Note is ongoing, and three "remove" sites in Belarus have already been identified. In addition, NSTec is working with Belarus to develop a plan to protect 11 mobile sources and mobile source sites. Additionally, NSTec supported the overall program through low-level-waste disposal of materials at the NNSS.

Another DNN program successfully executed was the 2016 End-to-End (E2E) Warhead Monitoring Campaign. This campaign developed the necessary conduct of operations and system evaluation metrics; executed E2E experiments, exercises and demonstrations; and improved the E2E Test Bed facilities to support emerging requirements that culminated in supporting the systems development for the security of the US stockpile. In the E2E program, Headquarters (HQ) and Laboratory participants identified the NSTec support as exceptional.

Additionally in support of DNN, NSTec provided exceptional support including the planning, logistics, and execution of two very successful "first time" NNSS visits by the Executive Secretary of the CTBTO, the Director of the On Site Inspection (OSI) Division for the CTBTO, and the Chief of the OSI Program with additional participation by members from the NNSA, Department of State, Defense Threat Reduction Agency (DTRA), the US Air Force, US Navy, and Air Force Technical Applications Center (AFTAC). NSTec, in conjunction with NNSA, hosted the "first ever" On-Site Inspection (OSI) Nevada Familiarization Activity (NFA) for inspectors during FY2016, which included four foreign

nationals from the United Kingdom plus 25 additional participants from DOE, Department of State, and Department of Defense organizations. These activities were precedent setting for the international CTBTO community and US national security relations.

Another successful NSTec activity for the DNN program, the underground nuclear explosive detection program, also exceeded expectations. NSTec demonstrated effective leadership of a multi-laboratory team advancing US capabilities to discriminate and characterize low yield nuclear tests, contributing to both scientific expertise and experimental test bed capabilities through the execution of SPE 5. The data returns on the experiment were extraordinary with 96% for the Large N-array, 98% for the on-site arrays and 100% from off-site locations. In preparations for the experiment, NSTec produced a mockup of the SPE 5 test object which revealed that the test object needed to be redesigned. A redesign, while at an additional cost, avoided the expense and time delays the project would have incurred had the original test object design been fabricated. NSTec provided technical and logistical support for the SPE procurement activities (>\$400k of equipment), assembly support for hardware, design support, and on-site support both at LLNL for assembly and vessel qualification and at the NNSS during the dry-run activities. NSTec also provided excellent integration, management and execution of a complimentary data collection effort for DNN, the Seismic Hammer Project. Excellent integration ensured the seismic hammer and seismic array of 1000 geophones met all safety, environmental, and security requirements. The seismic and infrasound objectives were accomplished at 54 different strike points over two weeks. In addition, NSTec procured long range instrumentation for a first time atmospheric propagation effects measurement on the FY17 Forensics Surface Shots that follow SPE 5.

Contributing to the body of knowledge on DNN, NSTec scientific personnel co-authored a Nature Scientific Report paper with LLNL focusing on an experiment to partially reproduce the subsurface conditions following an underground nuclear explosion (UNE). This paper provided inspectors with a better understanding of what to expect when OSI teams are searching for a suspected underground nuclear explosion. The report provided intriguing results that, “suggest paleo magnetic techniques and methods may offer nuclear explosion signatures experiment scientists new tools to detect, locate, and characterize suspect underground nuclear explosions.”

While SPE is focused on prompt seismic and acoustic signals from explosions, the Underground Nuclear Explosions Signatures Experiment (UNESE) is focused on the later arriving signatures from explosions, which could take weeks or months to appear following an event. UNESE is an integrated, physics-based R&D effort addressing the science of short-, intermediate-, and long-term post-underground nuclear explosion detonation signatures. NSTec, in collaboration with its partners, LANL, LLNL, Pacific Northwest National Laboratory (PNNL), and SNL, led the initial development of the test bed in Area 20 in FY2015. During FY2016, the test bed was completed by finishing coring, installing borehole liners for subsurface gas sampling, installing gas sampling systems in three instrumentation boreholes, and installing a gas sampling straddle packer system in a fourth borehole. These instrumented boreholes were vital for the execution of a noble gas

migration experiment at U20az, so that subsurface gas samples could be collected as a function of depth and spatial extent around the legacy underground nuclear explosion chimney following the injection of chemical and radioactive tracer gasses near the working point. In July, NSTec and PNNL successfully injected short-lived radioactive ^{127}Xe and ^{37}Ar gas, SF_6 tracer gas, and liquid perfluorodimethylcyclohexane (PDCH) tracer into the post-shot hole. These tracer gases are currently being monitored for via weekly surface and subsurface gas collections and analyses. This third noble gas migration experiment is providing key data in understanding the physics of subsurface gas transport and the detection of noble gasses. Detection of noble gasses, specifically radioactive isotopes of xenon and argon, has long been considered key to identifying a clandestine nuclear test, and is a pillar of the Nation's nonproliferation treaty verification and nuclear test monitoring program. NSTec also provided valuable expertise to DNN in radiological search knowledge and capability. NSTec served as the lead planner and logistical support for DNN in an R&D project advancing tools and techniques to conduct urban radiological support missions. The project was a collaboration between several organizations (Universities and Laboratories) to characterize background levels at a Military Operations In Urban Terrain Site and followed with successfully integrated radiological search experiments.

In Nuclear Emergency Response, NSTec continued to receive awards and accolades from the DOE Office of Aviation Management and General Services Administration (GSA) for a strong aviation and aviation safety program. Search and emergency response aircraft are hangered and operated out of NSTec Remote Sensing Laboratories (RSL) at Nellis Air Force Base (AFB) and Joint Base Andrews. Using assets and personnel from these locations, NSTec exceeded expectations in supporting two international workshops and numerous training sessions on emergency preparedness and response providing high quality training for the international community. NSTec also conducted a unique training for the NNSA Nuclear Emergency Management System (NEMS) program. The training featured three of the major NNSA detection and response capabilities. This training workshop highlighted technical training courses, instruction on exercise design, and concluded with the attendees designing and then executing a drill. This was a three-week course that not only helped train-the-international trainers, but also demonstrated international cooperation.

NSTec Nuclear Emergency Response teams executed 20 real-world responses, 26 training or exercise events, and 25 international training or outreach events. Consequence Management Drills met or exceeded all evaluation criteria. In addition, NSTec met requirements for maintaining readiness for the Disposition Forensics Evidence Analysis Team (DFEAT) and hosted/supported the DFEAT Drill Diamond Thunder at the NNSS. This drill included operations at Area 12 with approximately 100 participants from HQ, NNSA/Nevada Field Office (NFO), NSTec, LANL, LLNL, SNL, Pantex, Savannah River National Laboratory (SRNL), and the Federal Bureau of Investigation (FBI). Other events supported by the NSTec emergency response personnel included the Presidential State of the Union Address. The event was designated as a National Special Security Event (NSSE) with the FBI Washington Field Office as lead. The Nuclear Radiological Advisory Team (NRAT) was tasked to provide radiological detection, identification and advisement, secure communications, oversight and management of the teams from the FBI/Work for Others

(WFO) All Hazards Center, and Aerial Measuring System (AMS). Another event supported by the NSTec Nuclear Emergency Response teams was a Major Public Event Workshop at the Super Bowl in Santa Clara, CA. The NNSA Office of Nuclear Incident Policy and Cooperation (NA -81) led workshop was attended by representatives from Taiwan, Mali, Gabon, Vietnam, and the International Atomic Energy Agency (IAEA). In addition, NSTec provided assistance to include the International Radiological Assistance Program Training for Emergency Response (IRAPTER) – and subject matter experts for scientific and technical advisory support on radiological emergency response.

NSTec also successfully provided preventative radiological/nuclear detection from requesting agencies in support of other notable events such as July 4th activities in both Washington, D.C. and Boston, two high attendance events in Wyoming, and the 2016 Summer Olympics in Rio, where NSTec teams worked with Brazilian counterparts for more than a year to prepare for the nearly month long deployment to ensure radiological safety through detection and emergency response planning for over 30 different Olympic venue locations.

Additionally, the various NSTec teams participated in exercises that included providing scientific advice to the Marble Challenge exercise held in Long Island, New York to participating in a local exercise that included the Las Vegas Metropolitan Police Department (LVMPD) and the Henderson Special Weapons and Tactics (SWAT) Team. In order to address lessons learned from the FY2015 Southern Exposure exercise, NSTec initiated an aggressive schedule of conducting small monthly proficiency drills to fine tune specific areas of their capability. These drills involved Aerial Measuring Systems and included interactions with the Federal Radiological Monitoring and Assessment Center, other government agency responders, and Law Enforcement and further strengthened the conduct of operations proficiency of the response teams. Participating in the FBI Enhanced Special Weapons and Tactics (ESWAT) training gave NSTec team members an opportunity to demonstrate and execute proper integration into the FBI team established to support the Tactical Radiological Nuclear Search Operations (TRNSO) mission. Building these professional relationships within the broader emergency response community is invaluable to the National Security mission. This training evolution was supported by an integrated team of NRAT members from both RSL Nellis and Andrews, demonstrating the effective integration of the former Search Response Team into the NRAT team construct.

In additional support to NIR, NSTec demonstrated excellence for enhancing international relationships, raising training standards, and increasing the ability of foreign agencies to detect radiological materials. NSTec team members traveled to Iceland, Taiwan, Austria, Armenia, the United Kingdom, the Czech Republic, the Philippines, Taiwan, Vietnam, Brazil, and Jordan to conduct workshops and training events. NSTec hosted and supported the IRAPTOR – Ports & Customs (IRAPTER-PC) course, which included 23 foreign nationals from 12 different countries and the International Atomic Energy Agency (IAEA). Running concurrently, another NSTec team hosted the Advanced Spectral Airborne Radiation Computer System Training in Las Vegas, which included 13 foreign nationals from six different countries and the CTBTO.

Also in support of NIR, the NSTec Aviation Program received the DOE's Office of Aviation Management Award for the Best Aviation Program. This prestigious award is given to the team with the most outstanding and safest flight program within the DOE complex. The NSTec Aviation Program also successfully attained the International Standard for Business Aircraft Operations Stage III Certification. This certification represents the ultimate industry standard and recognition for performance. Less than 0.1% of all North American aviation departments have achieved this level of certification.

Also in support of NIR, NSTec identified an innovative approach to improve the reliability and response of the Emergency Communications Network (ECN). The approach was developed, presented to and approved by NNSA Program. The lease with Switch is now being finalized and equipment procurement is underway. This new approach will significantly increase the band-width of the network and significantly reduce costs. In addition, NSTec successfully migrated the ECN satellite teleport from RSL Nellis to Intelsat facilities at Mountainside, Maryland. The RSL Nellis teleport was approximately thirty years old and the costs to bring the teleport up to current standards and capabilities were significant. This migration avoided the need to repair/upgrade the RSL Nellis teleport, and as well increased the reliability, monitoring and resiliency of the ECN satellite service to the ECN user community. NSTec also upgraded the ECN Mobile Kits in FY2016. Prior to the upgrade, ECN Mobile Kits had a deployment weight of 490 lbs. and were limited to satellite only communications. The Next Gen ECN kits now deploy at weights of less than 70 lbs. (depending on specific communications needs) and can communicate via satellite, cellular data networks and the Internet. The Next Gen Kits have been widely praised by the field and have already been utilized in real world events.

NSTec took possession of seven unmanned aerial systems (UASs) for R&D into small drone usage for national security missions with a focus on emergency response and access to a secured DOE site. As a new technology, strategic research must be employed to develop and integrate suitable systems for national security. In addition to acquiring the UAS platforms, NSTec invested in multiple small radiation detectors, imagery systems, and optical devices to allow for a full suite study of sensors to respond to a complex, unknown hazardous situation. To prepare for UAS flights, NSTec trained existing aviation pilots to be operators of the platforms and RSL along with STL developed compact sensors. Two demonstrations were conducted at the NNSS in April and September 2016 providing awareness of the usage of UAS platforms for national security. Also in support of NIR, NSTec teams planned and participated in the WINGS 2016 Interoperability Exercise. The third iteration of WINGS was held in the New York, New Jersey area and focused on bringing local law enforcement, state entities, federal assets, and military teams together as one team responding to an exercise scenario. Some of the major concentration this year included defining and clarifying response roles, airspace coordination and de-confliction, data acquisition, and final products.

Two real world responses of significance included the potential release of radioactive material from a waste facility in Beatty, Nevada. Following request for support by the State

of Nevada, NSTec response teams, including AMS assets, conducted aerial measurements and provided technical advice, as requested, as the State of Nevada evaluated the release and corrective actions from the Beatty facility. NSTec response teams were also successfully deployed to Astoria, Oregon to assist the US Coast Guard and FBI with radiological security concerns. Of note is that this is the first real-world maritime response for an exclusively NRAT-West team. The concept for training this team was put in place in FY2013, and this inaugural deployment illustrates the success of the stand-up efforts for the NRAT-West maritime capability. This further illustrates the collaboration between the Andrews and Nellis RSL teams that took place to provide this maritime capability to the West Coast. NRAT is currently the only NNSA asset trained to execute a radiological response aboard an at-sea maritime vessel.

Goal 3: DOE and Strategic Partnership Projects Mission Objectives (5%)

NSTec earned a rating of EXCELLENT by successfully executing the mission objectives of Strategic Partnership Projects (SPP) and Environmental Management (EM) through performance that included several significant accomplishments with only one minor issue. SPP, which increased by almost eight percent in FY2016, demonstrated an integration of work in a way which leverages and sustains the NNSS unique science and engineering capabilities. SPP efforts leverage and sustain site skills in project management, engineering, sensor and diagnostic development and testing, emergency response and consequence management. EM activities were conducted in a manner that both met Federal Facility Agreement and Consent Order milestones and supported the clean-up of legacy and operational low level waste/mixed low level wastes from across the EM and DOE complex.

NSTec worked with DTRA at the NNSS on the scope, cost and schedule development of a test bed. This effort required in-depth project management and engineering to meet the customer's technical requirements and budget constraints. NSTec completed all of the project management documentation for the project, including developing the Project Execution Plan, the Work Breakdown Structure Dictionary, the resource-loaded schedule, the risk register, and the requirements document. NSTec also completed initial work control documents and an engineering three-dimensional survey of the test bed area. NSTec also executed a proactive staffing plan to leverage the extensive technical background and experience in supporting the effort. The staffing plan enabled the transition of resources to occur seamlessly by identifying, developing, and qualifying capable resources to serve at the various site. DTRA did not provide the promised funding in the time frame planned, however, NSTec implemented a strategy for managing the delay in funding and has placed the project in an optimal position to re-start operations as soon as the necessary funding arrives. NSTec executed other projects and activities in support of the DTRA mission and has exceeded customer expectations in the development, fabrication, and laboratory testing of a sensor prototype that leveraged NNSS emergency response scientific and technical expertise.

NSTec leveraged and applied SPP-developed Command and Control and Situational Awareness programs (Raptor) for NNSS emergency response capabilities (fire and Emergency Operations Center (EOC)). This site-level initiative will support the development of a custom version of Raptor that can meet the future emergency and consequence management requirements DOE and NNSA sites. NSTec also provided operational support to SPP customers on command and control hardware and software systems (Lost Link).

Facilities and infrastructure at the NNSS were utilized to provide a test bed for customers to develop tactics, training, and support in a real world environment. SPP activities at the NNSS supported, exercised, and enhanced NNSA capabilities and infrastructure while minimizing impact to the NNSA mission. NSTec successfully performed ~\$80M in SPP

work, much of which required the flexibility to test and perform NNSS-located operational exercises and diagnostic field implementation on very short notice.

NSTec continued its collaboration with University of California Santa Barbara to support technical development for analytical capabilities measuring high speed dispersion of chemical materials for both crisis management and emergency response. Also, NSTec continued its outstanding work in Counter Terrorism Operations Support (CTOS) training at the NNSS. In FY2016, CTOS trained upward of 15,000 State, Local, and Tribal First Responders in the prevention and response to terrorist use of radiological or nuclear materials.

NSTec expertly completed a culmination of months-long collaboration between the NSTec Counter Terrorism Operations Support (CTOS) Division, INTERPOL and an FBI Department of Defense (DOD) Liaison supporting INTERPOL, to deliver a Chemical, Biological, Radiological/Nuclear, Explosive (CBRNE) Awareness and Response to Radiological/Nuclear Incidents Pilot Training Course to 36 international first responders. NSTec's planning was exceptional, down to the minute details such as not serving pork in the cafeteria to avoid insulting certain religious sects, translating course materials into Russian and instruction was in Russian using interpreters. INTERPOL was very pleased with this course and is now looking to continue this effort recognizing that this course supports their worldwide efforts in reducing radiological and nuclear threats. This partnership also promoted NSTec worldwide as an All Hazards training organization with a full-capacity venue at the NNSS that can support the full spectrum of CBRNE training.

NSTec successfully worked with multiple SPP and Strategic Intelligence Partnership Projects (SIPP) customers at both the RSL and the Special Technologies Laboratory (STL) to fabricate and develop hardware and software to meet unique challenges faced by the various national security customers. NSTec successfully leveraged the technical capabilities across the NSTec organization to develop quality "one of kind", "lab and field ready" software and hardware to meet customer needs. By leveraging technical expertise, programmatic knowledge, and diverse customer requirements, NSTec laboratory projects significantly contributed to the national security SPP and SIPP customer successes.

NSTec also continued to support for sensor testing and evaluation through multiple technology activities for the Department of Homeland Security (DHS). NSTec was invited by DHS to provide operational testing and evaluation expertise for emerging technologies that include the Wearable Intelligent Nuclear Detection (WIND) system, various stand-off mobile technologies projects, and human-machine interfaces projects for wide area search missions. NSTec also supported DHS/Domestic Nuclear Detection Office (DNDO) for the Vendor Data Collection Event (VDCE) that took place at the Radiological/Nuclear Countermeasures Test and Evaluation Complex (RNCTEC) facility. After some cost estimates that were significantly higher than the customer had expected, NSTec worked very closely with the DHS/DNDO leadership team and science team define the scope that could be accomplished using the targeted funding level. The final design for the test was completed and the VDCE effort was a success for the DHS/DNDO mission and for the NNSS.

Adding additional rigor for non-nuclear high hazard facility hazard evaluation, NSTec developed and implemented a new authorization basis (AB) paradigm for the Nonproliferation Test and Evaluation Complex (NPTEC), Port Gaston, and also the RNC TEC. This new AB and approach will provide an additional defense in depth for ensuring safe operating envelope for facilities to support the conduct of experiments for numerous customers at the NNSS.

NSTec successfully obtained approval for the Center of Security Technology, Analysis, Response, and Testing (CSTART) Unmanned Aerial System (UAS) flight team and Counter UAS (CAUS) to perform UAS and CUAS operations. NSTec, in partnership with SNL, established a baseline flight capability for CAUS testing and evaluation for Small UAS (SUAS) multi-rotor and fixed wing hobbyist level UASs to test CUAS systems as successfully demonstrated in the latter part of FY2016. This creates a new capability for NNSS customers.

Although improved, execution of SPP work at the NNSS struggles in the planning phases. Lack of integration among NSTec directorates often led to misunderstandings by the SPP customers or by NSTec, themselves. NSTec was not speaking with one voice. This led to scope definition issues, high initial cost estimates and slow project execution. NSTec management took action to address these challenges and some evidence of correction is starting to show in limited areas (Global Security), but the integration was not effective across all NSTec organizations.

NSTec continued to provide outstanding support for several ongoing low level waste activities. Supporting varied DOE HQ organizations and the U.S. Department of State (DOS). NSTec provided responsive technical support for the potential restoration and waste disposal of soils contaminated from the 1965 nuclear weapons accident in Palomares Spain. Technical contributions on clean up objectives and approach, including soil remediation criteria, were utilized in policy decision-making by both DOE and DOS in their negotiations with the Kingdom of Spain. Reflecting these ongoing negotiations, a statement of intent was signed by the U.S. and Spain.

NSTec also continued to provide outstanding support for the disposition of high profile wastes from varied EM and DOE sites. Supporting cleanup objectives at the Oak Ridge National Laboratory, NSTec coordinated closely with varied organizations to develop accelerated schedules, provide flexibility in receipt and disposition, including working non-standard shifts to assure that project schedules are maintained. Supporting NNSA NA-20 organization, NSTec contributed to a five year shipment and disposal strategy for cobalt and cesium sealed sources. This strategy developed at the state of Nevada's request, will support the effective disposition of sources that have been accumulating in the NA-20 storage facility in Texas. Shipments have now been initiated under this sealed source shipment and disposal strategy.

Recognizing the critical need to the complex for continued disposition of mixed waste, NSTec provided strong leadership and project management in efforts supporting the development of a new mixed waste disposal unit (cell 25) at the NNSS radioactive waste management complex (RWMC). The existing mixed waste disposal unit (cell 18) which was put into operation in 2011, is over 75% full and will reach capacity in mid-2018. Seamless ability to receive and dispose of mixed waste is critical to the cleanup objectives across the EM and DOE complex. NSTec has subcontracted with a design/build contractor for replacement unit. Interactions by NSTec with the subcontractor have already garnered efficiencies in unit design allowing for disposal of approximately 20% more mixed waste. The project is currently on-schedule.

NSTec continued to maintain the RWMC in a safe and compliant manner. To date, NSTec has received and disposed of a total of 1,045,898 cubic feet of low level waste/mixed low level waste received in 1154 shipments. The total waste packages offloaded and disposed were 8715. No safety or issues arose from NSTec offloading and disposing of this waste volume. Two minor issues associated with the transportation of waste (e.g., failed lifting straps supplied by the offsite waste generator, and shifting of a waste load) were investigated and addressed working cooperatively with the offsite waste generators in the development of final corrective actions.

One issue of concern during the period were the significant cost and schedule variances for EM characterization well drilling and completion at well sites ER-20-12 and ER-2-2. Due to well pad and access road development delay from the previous fiscal year, ER-20-12 started drilling several months late. The final variance analysis showed the well over 114 days behind schedule and completed for approximately \$4.9M over budget. While difficult site conditions contributed to this delay, delay in both pad development (\$1.4M over budget) and drilling (\$3.4M over budget) led to this substantive variance. Of note, with the cost and schedule overruns from ER-20-12 and ER-2-2, NSTec worked iteratively with DOE and other contractors in developing a revision to drilling objectives for the final wells (ER-3-3 and ER-4-1) allowing these remaining wells to be completed within budget and to recover some overall drilling schedule.

Goal 4: Science, Technology, and Engineering (4%)

NSTec earned a rating of EXCELLENT by successfully managing SDRD and Technology Transfer programs to advance advanced national security missions and advance the frontiers of the ST&E through performance that included several significant accomplishments with no issues. The SDRD program continued its history of significant breakthroughs in key mission technologies, cooperative research and development accomplishments, success in recruiting and hiring early career technical staff and the projects continued to yield more than a 40% return to programs. In addition, NSTec workforce published the highest number of high-impact journal publications to date across a broad spectrum of science, engineering, and mathematics fields.

The SDRD program produced significant breakthroughs in key technologies relevant to missions, such as BLR and x-ray doppler velocimetry (XDV), resulting in two patents and one copyright in FY2016. NSTec completed network installation of Raptor at the Western Area Power Administration Sierra Nevada Region facility in Folsom, California to support the DOE/AU-52 Transmission Incident Notification for Critical Asset Protection project, which enhanced DOE and national security goals for physical security at DOE power grid sites. NSTec's collaboration with Johns Hopkins Applied Physics Laboratory resulted in NSTec taking on a greater role in sensor integration to support the DoD effort. The work enables NSTec to engage in state-of-the-art community engineering efforts to develop a futuristic DoD Tactical Operator suit. NSTec provided a successful demonstration of remote sensing infrared detectors for the DHS System Assessment and Validation for Emergency Responders (SAVER) program, which contributed to a "consumer reports" study aimed at the first responder community so that acquisition choices on complex technology can be made with confidence.

In addition, the SDRD program initiated a special technical assessment (deep dive) into driving innovation for global security programs. Based on past successes in stockpile stewardship, SDRD sought to create game-changing technology for emergency response, consequence management, and SPP missions. Key to this effort was a comprehensive exploration of critical needs across the NNSA DNN and NIR, DHS, and the DTRA customer base. Two critical thrust areas chosen to develop for future enhanced capability were dynamic materials testing and unmanned aerial sensor system. For dynamic materials testing, a low-cost small launcher in a North Las Vegas medium-bay building as a platform to perform highly diagnosed dynamic materials properties studies at relatively low but weapon relevant pressure regimes. This platform will enable SDRD and program-based investigations in 1) simple integral experiments; 2) dynamic temperature measurement under extreme conditions; 3) phase transitions. This launcher is distinguished from other platforms in the capability to access niche pressure-phase space with appropriate time-scales for complex loaded dynamic material experiments. This platform will provide NSTec with a unique, low-cost, high-shot reproduction rate, and a resource to train its scientists on advanced applied physics necessary for future weapon relevant requirements. NSTec also has a current SDRD effort exploring coupling the XDV method with advanced

tomographic-based coded aperture imaging to produce never before seen x-ray images with unprecedented short-time resolution. This SDRD work is addressing a critical need for advanced high-temperature plasma measurements to determine fusion energy balance. Another SDRD project in unmanned aerial systems redefined aerial CBRNE detection and will provide a new paradigm for highly hazardous operations and ensure deployable assets can supplement manned platforms.

To enhance the SDRD program and the selection process, NSTec restructured some elements of the SDRD peer-review process to achieve optimal performance. Three new technical review teams (sub-committees) oversaw proposal evaluation formed around key mission focus areas: 1) stockpile stewardship, 2) global security, and 3) emerging science and technology and new strategic ventures. For the fifth year, the NSTec's experiment program sponsored a discretionary collaboration with the UNLV Department of Computer and Electrical Engineering in implementing the Center of Excellence in Security Science and Engineering (CESSE). This collaborative relationship has provided a pipeline of ST&E students including well-qualified interns and casual employees. In Technology Transfer, NSTec has a patent on its Photonic Doppler Velocimetry Lens Array Probe Incorporating Stereo Imaging. A second company, Tactical Electronics, is now producing and selling "JOLT PRO", which was developed using technology that NSTec transferred to the private sector last year. NSTec's Cooperative Research and Development Agreement (CRADA) with Global Medical Isotope Systems, LLC, signed last year is now an unqualified success. This effort demonstrated molybdenum-99 production using an unlimited life neutron generator and non-enriched uranium. An on-demand production system is in development and is expected in late 2016. The completion of this on-demand system will create a U.S. supply of the medically necessary isotope to meet critical medical needs while complying with U.S. non-proliferation objectives. NSTec is also negotiating several new CRADAs and pursuing the transfer of an important technology which involves licensable software and supports the NNSA NA-42 customer and U.S. economic competitiveness.

Additionally, NSTec established new research contracts with the University of Arizona and the UAH. In both cases, the NSTec SDRD program provided funding for graduate students pursuing their doctoral research. The students, whom NSTec plans to hire as postdoctoral staff when they finish their academic programs, also served NSTec as advanced summer interns, already contributing to the NNS mission. The collaboration with UAH also expanded to include members of the department of physical chemistry at MIT, who joined the collaboration at no cost to NNSA, due to their interest in scientific capabilities.

Goal 5: Operations and Infrastructure (34%)

Operations and Infrastructure was rated as VERY GOOD based on performance in which accomplishments greatly outweighed issues. Overall, NSTec's performance exceeded expectations meeting the DOE/NNSA mission by ensuring safe, secure and effective execution of program and site operations, as well as infrastructure sustainment and improvements. NSTec demonstrated strong progressive improvements in calling work pauses/safety and security stand downs and conducting management reviews/critiques. NSTec continued to provide a strong safeguards and security program with a significant operational tempo increase. NSTec successfully advanced capital projects, demonstrated progress on arresting the declining site infrastructure, laid out a plan to shrink the infrastructure footprint, implemented NNSA infrastructure management system improvements, and achieved their three assigned Infrastructure Level 2 national milestones. NSTec also made significant progress in reducing the growth in deferred maintenance, reducing the maintenance backlog by effectively planning, coordinating, and executing infrastructure projects. NSTec continued to exceed expectations in delivering efficient, effective, and responsible business operations, systems and financial management, legal management; and information technology and cyber security. Opportunities for improvement still exist in the areas of nuclear safety basis development and issues management.

NSTec continued to deliver effective, efficient and responsive safety, health and quality (ESH&Q) management and processes and improve the NNSA safety culture. NSTec activities and procedures were executed with worker safety as a first priority as demonstrated by strong improvement in calling work pauses/safety stand downs and conducting management reviews/critiques throughout the year. Workers requested safety pauses when they saw something was not being properly carried out. Several examples include the Stop Work/safety stand downs and corresponding management reviews/critiques, 5kV electrical shock event at the U1a Complex and the hot work incident at the 200 Hill. In the area of worker safety, NSTec's injury/illness rates were below industry averages. NSTec also improved their chemical safety, quality assurance, and contractor assurance programs. The chemical safety program continued to reduce chemical footprint and improve tracking accountability at NNSA and the off-sites without impacting mission execution. The quality assurance program was improved to better support line item projects, address the challenges of NAP 24A, *Weapons Quality Policy*, and address issues in the classified machining arena. For example, NSTec's A-1 Machine Shop implemented process improvements to collect data to be used in newly established metrics that are tracking and trending personnel and machine performance, productivity, and cycle times from conception through completion, and nonconformance report (NCR) compliance in order to better ascertain throughput capacity. In the area of environment, NSTec met expectations for energy reduction and sustainability. Energy intensity, Energy Independence Security Act (EISA) evaluations, High Performance Sustainable Building (HPSB) certification, renewable energy, and water intensity were on target. Accomplishments included: received Headquarters HPSB certification on seven buildings;

completed a refrigerant effort wherein 1,408 lbs. of excess refrigerants were sent off-site for reclamation; excessed old refrigerant-containing appliances which diverted waste from the landfill; re-insulated ducts using Environmental Protection Agency Comprehensive Procurement Guideline-recycled mechanical insulation materials as part of a reroofing project; installed energy efficient thermostat controls on boilers for two facilities; purchased a portable solar-powered electric vehicle charger as a pilot program in an attempt to meet fleet goals in accordance to Executive Order 13693; and developed Comprehensive Asset Management Plans for Critical Site Infrastructure to provide input into the new Integrated System Planning (ISP) process for site-wide infrastructure modernization and management. In the area of contractor assurance, NSTec continued to struggle with overdue issues/actions and an excessively high average age of open issues (over 400 days). The timely and effective evaluation and resolution of higher significance issues was also a concern.

Other NSTec programs and processes such as Radiation Protection, Fire Protection, Criticality Safety, Conduct of Operations (CONOPS), and Configuration Management (CM), successfully supported multiple, simultaneous mission activities without issue. For example, NSTec expanded Radiological Control support to the National Security Laboratories for a series of activities at the NNSS, including the response to the FY2014 Godiva contamination event, preparation for the restart of Godiva Operations, and startup of Coring Operations. NSTec assisted with clarifying radiological control roles and responsibilities, identification and implementation of process improvements, as well as examining options to address staffing challenges. These efforts culminated in a collaborative relationship that directly contributed to a series of successful burst operations to confirm equipment configuration. NSTec further demonstrated the effectiveness of the engineered contamination controls on Godiva during the successful execution of Integral Experiment 148 which was an international dosimetry calibration experiment. In the area of CONOPS, NSTec continued to effectively implement CONOPS at the nuclear facilities and initiated implementation of CONOPS at several of the non-nuclear, high hazard facilities. NSTec completed its review of high hazard, non-nuclear facilities and the development of CONOPS Applicability Matrices for these facilities, which are in the approval process. In the area of CM, NSTec made significant progress in addressing the long standing issues at DAF through the execution of the DAF Technical Validation Project (TVP). The proposed work scope was broken out into two phases. Phase 1, completed in FY2016 identified, collected, and verified the gap closure completion documentation and was completed significantly ahead of schedule and under budget. So much so that the Phase 2 schedule was pulled forward to start in FY2016. Phase 2 addresses the remaining non-drawing gaps and will identify the path to closure for the remaining gaps.

In the area of nuclear and high hazard operations and safety, NSTec successfully operated the NNSS nuclear and high hazard facilities and operations while handling a significant increase in operational tempo as more construction, infrastructure maintenance and repair, and startup activities occurred than in the past fiscal years. The DAF Lead-in Lines have been a known issue for more than 20+ years. In FY2016, NSTec received funding for the Fire Suppression System Lead-in-Lines Upgrade projects and is successfully designing

and executing these projects despite operating in a nuclear facility environment and despite delays due to unexpected conditions. NSTec's management of DAF Recapitalization projects by the Engineering Working Group (EWG) exceeded expectations. The EWG coordinated project activities with all stakeholders including DAF Operations Management, Field Office oversight personnel, and project leads to ensure the best possible outcomes. In addition, NSTec successfully met the nuclear facility requirements for operational startup of the Coring Project and the restart of Godiva, both at DAF.

NSTec placed a significant corporate investment in the Work Management System Improvement Initiative (WMSII) for maintenance that yielded significant benefits to work planning and execution. Maintenance execution cycle time decreased by 11% for priority 3, 60% for priority 4, and 75% for priority 5 work. Overtime work was reduced to 4.1%, with 5% considered a national average "best in class". The number of maintenance work orders completed each month has increased from ~500 to ~880 over the past year. In addition, the WMSII ROI was substantial with a \$1M savings in planning backlog as well as an annual saving of an additional \$2M for reduced work planning efforts, improved maintenance utilization, reduced craft overtime and construction efficiency.

While NSTec made some progress, they continued to struggle with the development and submittal of safety basis documents that are acceptable for approval. For example, NSTec rescinded the construction addendum for the U1a DSA, in early October 2015, after NNSA/NFO identified a number of issues that would have either resulted in Conditions of Approval or disapproval. The resubmittal of this document could not be implemented as written and resulted in additional conditions of approval. The U1a 90 percent DSA submittal provided in June 2016, while improved, still contained significant issues associated with identification of controls. Both of these safety basis issues contributed to impacts of NNSA programs as described in Goal 1.

Another area in nuclear operations that NSTec continued to struggle with is the Cognizant System Engineers (CSE) program. As in previous years, the CSEs did not ensure all system design documents were kept current (i.e., system drawings, configuration management plan, System Design descriptions).

In the area of capital construction, NSTec has two ongoing projects and another project slated to start in FY2019. NSTec met expectations related to advancing the critical decision process and risk mitigation of the Enhanced Capabilities for Subcritical Experiments (ECSE) enhanced experimental infrastructure (UCEP). NSTec was timely in submitting the conceptual design documents, cost estimate, authorization basis documents and other documentation for the independent cost and project reviews. The DOE Office of Project Management Oversight & Assessments performed an Independent Cost Review (ICR) for the UCEP project. Based on the ICR team out briefing, NSTec developed corrective action plans for 17 self-identified issues. The final ICR report consolidated the recommendations down to seven. The seventeen corrective actions identified by NSTec were reviewed and were found to be inclusive of the 7 ICR team recommendations. Sixteen of the ICR corrective actions have been closed. The final action is not scheduled to be closed until the

2nd quarter of FY2017 and does not impact approval of CD-1. Feedback from the ICR team members was that NSTec had provided a comprehensive Conceptual Design Package and associated estimate. The ICR team recommended approval of CD-1 with conditions to complete corrective actions. However, NA/APM performed an independent project review and found that technical issues that have not been monetized will impact the ability to establish a proper range and will delay the CD-1 date by 3 months. This was primarily due to the need for NSTec to complete a mining plan that will inform the project risk and cost range.

For the Argus Project, NSTec led the development of a comprehensive PECOS Replacement Project (PRP) Conceptual Plan as an interim contingency approach to replace PECOS at the DAF. The Argus line item project was authorized and partially funded for FY2016 to replace the PECOS system. As a result, NSTec established the DAF Argus project team and completed a project plan that addresses the greatest risk up-front and ensures the quickest overall project completion date. NSTec successfully completed 90% design for the project on schedule and provided support to the NNSA Acquisition & Program Management monthly project briefings. The quality of these briefings has been steadily improving. For the 138kV Power Transmission project, NSTec began pre-conceptual planning for the proposed FY2019 line item and submitted the Mission Need Statement and Program Requirements ahead of schedule.

Throughout the performance period, NSTec showed outstanding leadership in coordinating safeguards and security and emergency management guidance and planning in support of NNSS and offsite activities. NSTec continued to implement effective and efficient Materials Control and Accountability (MC&A), personnel security, Incidents of Security Concern (IOSC), and Information (Classified Matter Protection and Control and Classification) Security programs with an increased operational tempo that required extensive security coordination in many areas. For example, NSTec provided safeguards and security guidance and planning for the CTBTO, which was executed in an outstanding and professional manner. NSTec provided security coordination and logistical support for the training course and site visit. This effort involved coordination and interaction with representatives from NNSA Headquarters, NNSA/NFO Public Affairs, the local Counterintelligence Office, NSTec Cyber Security, and the NNSS Contractor Protective Force. This security function ensured scientific and technical operations regarding NNSA's science-based Stockpile Stewardship and nuclear nonproliferation missions. The training of 50 participants from 32 different countries will also assist in providing CTBT on-site inspection experts with the ability to better perform their jobs in detecting nuclear explosions under the treaty's monitoring and verification requirements. In addition, NSTec provided security support for the training course and site visit of 50 participants from 32 different countries. In the area of classified material protection, NSTec led an effort to develop an NNSA/NFO-approved process allowing for "analysis" data recovery of information from damaged classified hard drives at the New Mexico Operations Los Alamos Office. All of the drives in the primary array were restored and communication reestablished. The entire structure was reestablished, and all data was recovered ultimately saving the NNSA several million dollars in time to complete reanalysis. Of

particular note for the Safeguards and Security community, NSTec successfully established the first Counter Unmanned Ariel Systems (C-UAS) test bed in concert with SNL's data collection effort to mitigate national security concerns. The test bed hosted several inter-Departmental and Agency visits in addressing the rising concern of unauthorized UAS intrusions over DOE sites.

Overall, NSTec exceeded the expectations of the emergency management requirements and demonstrated excellent execution of the emergency management program. Implementation of an effective Emergency Management program was demonstrated through the Office of Emergency Management Assessments (EA-33) assessment in which NSTec received an overall rating of "satisfactory" and where the program was identified as strong. NSTec conducted challenging and complex exercises that stressed the capabilities and competencies of the emergency response personnel. The ECN fidelity was maintained at a reliability rate of 99%. NSTec also exceeded emergency management requirements by aligning the FY2016 Emergency Readiness Assurance Plan (ERAP) goals to the milestones and commitments outlined in the Implementation Plan (IP) for Recommendation 2014-1. Leadership and subject matter expertise were demonstrated through NSTec's support to NNSA on the DOE O 151.1D, Comprehensive Emergency Management System, Writing Team activities sponsored by NNSA's Office of Emergency Operations (NA-40). The expertise provided was positively recognized and commended by NNSA's Office of Plan and Policy (NA-41). NSTec maintained emergency response organization staffing and training at 100% and provided timely reporting on the number and seniority level of DOE M&O contract employees participating in emergency preparedness exercises to the Office of Emergency Operations as required by the National Defense Authorization Act of 2016 Public Law 114-92 Section 3134. Additionally, NSTec completed installation and testing of the Raptor and Terra Raptor command and control software at the Air and Ground Operations Support (AGOS) lab at the Operations Coordination Center (OCC) for remote access, effectively modernizing Command and Control technology. NSTec developed a proof of concept and successfully conducted several tests of the systems at the NNSS. This initiative will develop a custom version of Raptor that can meet the future Command and Control and Situational Awareness requirements of the NNSS and other DOE sites. NSTec also proactively approached wildland fire season as NNSS Fire and Rescue (F&R) developed strategies and tactics for early detection, rapid response, and aggressive initial attack of wild fires.

FY2016 was a very successful year for NSTec with respect to maintaining, operating and modernizing DOE/NNSA facilities, infrastructure and equipment as the workload and pace of infrastructure projects significantly increased from previous years. With NNSA supporting NNSS modernization with funding, NSTec raised the importance of the infrastructure portfolio by creating an independent directorate to develop efficiencies for infrastructure through an integrated infrastructure portfolio approach that eliminated multiple approaches and stovepipes created by historical funding lines. To do this, NSTec implemented Integrated Systems Planning (ISP) that defined a framework to understand and communicate facility conditions, incorporated emerging mission needs, prioritized and addressed infrastructure deficiencies in order to develop, plan (create a pipeline) and

execute infrastructure projects. Indirect and direct funded infrastructure are now fully linked. NSTec prioritized \$8M in indirect savings from the workforce restructuring to support FY2016 infrastructure investments and has a program planned for the next five years. NNSA's Master Asset Plan (MAP) Deep Dive noted that NSTec contributed significantly to the complex-wide MAP, praised the ISP for integrating direct and indirect funded infrastructure, cited NSTec's G2 system reporting "as best in class", and strong implementation of BUILDER, Mission Dependency Index (MDI) and Asset Management Plans (AMPs).

This integrated planning is producing results especially as the construction program is increasing, for example:

- Three concurrent Line Item Projects:
 - Argus Installation restart,
 - UCEP conceptual design, and
 - The 138kV Power Transmission Project pre-conceptual design;
- Recapitalization, Maintenance and Repair:
 - DAF Back-up Power, U1a and DAF High-Efficiency Particulate Air (HEPA) Ventilation, Hill 200 Power Line Replacement and DAF LINAC replacement are progressing extremely well;
 - U1a Fire Protection and Small Critical Site Infrastructure are being planned and executed well;
 - The Radios Infrastructure Backbone Replacement Project required for NNSC communications completed procurement of all components ahead of schedule; and
 - The Building 06-900 (the Bistro) Heating, Ventilation, and Air Conditioning (HVAC) replacement pilot was accepted and is currently in construction through the new NNSA Acquisition & Project Management (NA-50) Cooling and Heating Asset Management Program (CHAMP). At \$2.5M, the Bistro is the largest, most complex CHAMP pilot, but because of extensive participation by NSTec at the inception of the project, the project bids were below budget and on schedule. NSTec's communication stands as a best practice that poises AMP for success throughout the lifetime of the program.

All of the projects described above are the results of the fully integrated planning process. In addition, NSTec demonstrated detailed integration in other maintenance and construction areas. For example, NSTec proactively supported NNSA HQ initiatives to reduce Deferred Maintenance (DM) across the complex. A new NNSC plan incorporated NA-50 direction and process improvements to drive the site DM moving from projected increases exceeding \$300M, down to \$269M to start the FY, then further reduced to \$252M by January 2016. In addition, NSTec carefully orchestrated the execution of the first phase of the Automatic Transfer Switch (ATS) Project at the DAF with no impact on essential systems. This effort is part of a larger project to upgrade the facility's outdated electrical and back-up power systems. Completion of this effort required an extensive planning

effort, over a six month period, involving close coordination with personnel from the NNSA National Security Laboratories, NSTec/NFO Security and Safety, NSTec Design Engineering, NSTec Operations & Infrastructure (O&I), and other NSTec/NFO subject matter experts. Another example is the CLOS which required a detailed integration to successfully prepare and level the construction site, and assemble over one million pounds of concrete block in order to affect experiments on schedule. Each tunnel, shielding, and collimator block required precise leveling, so the center line was kept at a constant to obtain optimum data. The CLOS tunnel was successfully installed in Area 11 for Dense Plasma Focus operations. In addition, NSTec provided excellent planning integration and support to the NNSS 100-year storm event in October 2015, which caused catastrophic flood damage affecting primary and secondary roads on the NNSS. NSTec assessed the conditions and safety hazards and immediately began clearing critical roadways to minimize disruption to mission essential facilities. Road clearing was prioritized to accommodate the NNSS workforce, tenant organizations, and mission essential facilities. NSTec identified and mitigated immediate safety hazards along Cane Springs, Mercury Highway, and 5-01 Road. Completing the initial response in a timely manner allowed the site to quickly resume all operations (with compensatory measures where necessary). NSTec continued their response and recovery planning efforts throughout FY2016.

Looking to the future, NSTec continued planning for infrastructure consolidation and modernization to shrink the infrastructure footprint of the NNSS and North Las Vegas Complex that will reduce costs and risk, enable the 21st century workforce and enable mission. This included NSTec's ongoing activities in evaluating the need for repurposing and disposing of unneeded facilities. NSTec was responsive to HQ requests for clarification and additional information for future year planning, including the Mercury Consolidation Plan which included a long term plan for excess facilities. Several key activities were completed in FY2016 which included the relocation of personnel and capabilities from the Control Point (CP), improvements in Area 6 with targeted upgrades to facility systems, as well as construction planning and procurement of the Performance Optimized Datacenter (POD) in Area 6 that will eliminate a major existing communication/IT site risk. NSTec also created a 30-year vision, in phased approaches, to consolidate and modernize Mercury that will create a sustainable, renewable energy Consolidated Mercury Campus that supports the workforce, site users, and mission needs of the future rather than the past. NSTec engaged the National Renewable Energy Laboratory (NREL) to support integration of sustainable, renewable energy design and planning for the Consolidated Mercury Campus Project and the Office of Energy Efficiency & Renewable Energy (EERE) in the design of the Mercury Fire Station No. 1 Solar Demonstration Project, to target integration of solar into sustainable facilities at the NNSS.

NSTec exceeded expectations in delivering efficient, effective, and responsible business operations, and systems as follows:

- NSTec's property inventories for sensitive, equipment, database accuracy, and precious metals obtained a rating of "Outstanding". In addition to inventories NSTec achieved "Outstanding" on Items processed for Excess and Excess Sales Revenue generated from sales. Over \$32.0M of excess property was excess during FY2016

which was an increase of almost \$10.0M over the preceding year. In addition, NSTec continued to excel in their Excess Property Initiative bringing in over \$491.0M in revenue for FY2016. Over the five year course of this program, NSTec has generated over \$6.0M in revenue that has been used to offset indirect rates.

- In the procurement area, NSTec significantly exceeded five of the six FY2016 Small Business (SB) goals and fell just short of one of the goals. For the overall SB goal, NSTec achieved 72.27% versus a goal of 59%. For the five SB categories, NSTec performed as follows: the Small-Disadvantaged Business subcategory was 15.25% against a Goal of 6%; the Woman-Owned Small Business subcategory was 10.74% against a goal of 6%; the HUB Zone Small Business subcategory was 1.03% against a goal of 2%; the Veteran-Owned Small Business subcategory was 16.35% against a goal of 10%; and the Service Disabled Veteran-Owned Small Business subcategory was 5.06% against a goal of 2%. In the area of Supply Chain Management, NSTec completed 35 eSourcing events totaling \$35.5 million worth of spend. They drove \$10 million worth of commodity agreement spend, an increase of 102 percent over FY 2015, realizing 10% savings. NSTec also completed 2,829 eStores transactions, 13% year over year growth. This level of tool usage yields \$7.7 million of strategic tool enabled savings to date. NSTec also is reporting strategic site savings of \$1.4 million (achieved 5.3% strategic savings rate vs the DOE 4% rate) and 5% of overall program total) against a total invoice spend of \$163 million. NSTec also met the M&O Subcontract Reporting Capability (MOSRC) milestones.
- NSTec exceeded expectations by successfully completing multi-year labor negotiations of several union contracts. The multi-year nature of the agreements will enable continued efficiencies and eliminate any potential delays in work in light of significant construction growth and demand for craft labor in the Las Vegas area.
- NSTec performed well in the area of Human Resources. The critical hires identified during the FY2015 Workforce Reduction activity were all filled in FY2016. NSTec identified creative ways to enhance their recruitment efforts and implemented a number of new tools to find and contact qualified job candidates in order to deal with a significant number of personnel openings. In addition, NSTec significantly increased their employee engagement activities to strengthen the morale of the existing workforce.

NSTec received an overall rating of “Good” (highest rating available) from NNSA Management and Budget (NA-MB) for FY2016. NSTec passed all of OFFM’s Core Financial Measures. Throughout the year, NSTec responded to numerous short deadline data calls in a timely manner. NSTec’s indirect budget estimates-at-completion (EACs) were at or below planned values. NSTec received recognition for their response regarding the status of aging NSTec management corrective actions and participating in Funds Distribution System 2.0 NNSA/Science Enhanced User Acceptance Testing in support of the project milestones. NSTec was also recognized for identifying and initiating the corrective action for a prior period adjustment (PPA), however, NNSA identified another PPA related to

swipe surveys completed in prior years but not updated until FY2016.

NSTec's Legal Organization exceeded expectations. NSTec provided cost-effective legal management with use of in-house counsel, alternative dispute resolution where appropriate, and diligent oversight of outside counsel. NSTec legal continued to advise senior staff and the Employee Relations Department, particularly in the area of Employment Law, with the intent of achieving better decision-making and reduced risk of liability. NSTec legal also successfully litigated unemployment claims, better organized its litigation reporting structure, and coordinated with NNSA/NFO legal on a wide range of issues.

In the area of information technology (IT) and cyber security, NSTec made improvements to stabilize NSTec networks and systems. Key projects were funded to replace the NNS radio system, the Nevada Secure Network (NvSN), end of life core routers and firewalls at all remote locations, and the optical transport network surrounding the NNS. The DOE Telecommunications Security Program Office conducted seven discrete inspections of NSTec's computer security (COMSEC) resulting in only one IT finding. Critical Cyber vulnerabilities were reduced over 90% across the enterprise and NSTec successfully implemented multifactor authentication to 100% of standard and privileged users. NSTec successfully executed the corrective actions to the findings assigned to them as a result of the DOE's Office of Cyber and Security Assessments inspection in FY2015. One finding remains open and is scheduled to close on the completion of the DAF Argus project. In addition, NSTec's Cyber Security Program underwent programmatic and technical inspections of classified and unclassified IT by DOE's Office of Cyber and Security Assessments (EA-21). No findings or significant deficiencies were received. EA-21 credited NSTec for having demonstrated best practices worthy of consideration by other DOE organizations

Goal 6: Leadership (10%)

NSTec's Leadership was rated as EXCELLENT based on the existence of a number of significant accomplishments that substantially outweighed any issues. Overall, NSTec's performance significantly exceeded expectations in meeting the DOE/NNSA mission by ensuring leadership is effectively managing programmatic mission risk and executing mission and site operations safely and securely. NSTec successfully demonstrated strong leadership in supporting the vision of the overall DOE/NNSA mission. NSTec was successful in improving safety culture, increasing employee communication and engagement, addressing workforce capabilities, improving integration and responsiveness, and leveraging significant parent company involvement/commitment for the overall success of the Site and the Enterprise.

Coming into the final year of the contract, NSTec leadership committed to maintain their entire Key Personnel and Senior Management Team through the existing contract completion. NSTec not only followed through on this commitment, they further committed to retaining this team through the current contract transition period which will result in a follow-on contract.

NSTec leadership significantly enhanced their integration and teaming efforts with the National Laboratories and their associated Field Offices, the NNSA/NFO, NNSA HQ, and other government agencies. Externally, NSTec performed senior leadership customer calls at various SPP customers' home locations. Through these visits, NSTec was able to develop integrated strategies to minimize the risk to the customer's mission success. This effort created better overall customer understanding and increased customer satisfaction with NNSA. Internally, NSTec fully supported and led the NNSA SCE Integrated Project Team (IPT) initiative to meet the NNSA goal of two plutonium experiments per year as requested by Congress in the FY2016 National Defense Authorization Act within the constrained FYNSP. This initiative considered the scope performed by all stakeholders, overlap of activities, costs, physics data requirements, and fielding realities for each subcritical experiment and series. As a fully integrated product, the expected funding needs of the NNSA SCE Program were reduced by \$20M per year to fit the FYNSP profile. In addition, the critical initiatives of the Science Campaigns were not marginalized and the SCE schedule was revised to a slightly slower pace while still reaching the NNSA goal of two subcritical experiments per year as quickly as possible.

NSTec leadership was not only responsive to emergent conditions but also implemented many strategic actions to put the NNSS and the NNSA in a better position to support national security requirements. For example, NSTec installed Raptor and Terra Raptor command and control software at the NNSS, developed by the Special Technologies Laboratory (STL) and in use by many Department of Defense customers. This initiative will significantly improve the Command & Control and Situational Awareness requirements of the NNSS and other DOE sites, as well serve as a product demonstration for other potential users. NSTec also created a 30-year vision to consolidate and modernize Mercury. The

NSTec vision, which can be implemented in a phased approach, creates a sustainable, renewable energy Consolidated Mercury Campus that supports the workforce, site users, and mission needs of the future.

A key factor in mission and operational success was NSTec's leadership in institutionalizing and extensively using NSTec's Enterprise Risk Management (ERM) program to develop risk mitigation strategies that had the potential to significantly impact NNS and NNSA. For example, NSTec recognized the considerable risk of the simultaneous workforce issues of increased demand for essential technical skills, increased retirement eligible employees, and increased competition for retention and attraction of high-quality personnel. As a result, NSTec leadership increased transparency into compensation management, addressed market inequities for technical staff, enhanced leadership talent development and succession planning, strongly endorsed technical representative recruiting at technical symposiums and recruiting venues, and significantly expanded university collaborations across the US to create research partnerships and technical workforce pipelines. Additionally, NSTec successfully teamed with LANL, LLNL and their Field Offices to address concerns with subcritical experiment hazard information and develop an integrated path forward to minimize impact and risk to the national subcritical experiment program. In order to address the inherent contract transition risks, NSTec leadership completed extensive planning to support the up-coming contract transition, including a detailed plan of key activities.

In addition to improving integration with their customers and counterparts, NSTec continued to significantly improve integration between their programmatic and functional areas. NSTec implemented a small, but crucial reorganization that put key personnel in specific roles (rather than acting roles) to empower and hold accountable the individual NSTec Vice Presidents and Directors. As a result, NSTec was better able to set priorities, increase collaboration and sharing of resources, break down stove-piped behaviors, and improve team dynamics to improve safe and secure mission and operations. For example, NSTec leadership raised the importance of the infrastructure portfolio by creating an independent directorate to develop efficiencies for infrastructure through an integrated infrastructure portfolio approach that eliminated multiple approaches and stovepipes created by historical funding lines. Indirect and direct funded infrastructure are now fully linked and efficiencies are being realized. Major programmatic and site-wide infrastructure improvements during the year included: U1a fire barriers and U1a hole-through construction, Area 11 CLOS at DPF, the DAF Coring startup, Godiva restart, LINAC procurement, Lead-in-Line replacement, HEPA replacements, 06-900 HVAC; Radios Infrastructure Backbone Replacement Project; and Area 12 P-Tunnel electrical and restoration of building 12-928.

NSTec leadership was also very responsive to emergent conditions at the NNS this year. In October 2015, a significant rain event caused extensive damage throughout the southern parts of the NNS. NSTec leadership quickly developed and implemented a plan to remediate the damage with immediate and longer term actions that resulted in substantial recovery efforts while ensuring safety was not compromised. In conjunction with recovery

actions, NSTec developed an asset management plan for roads that provided a risk-based prioritization for maintaining and improving roads and grounds.

NSTec's significant corporate involvement this FY was another key leadership factor in mission and operational success. Corporate investment in the WMSII for maintenance yielded significant benefits to work planning and execution. Through this initiative, maintenance execution cycle time and overtime was significantly decreased while the number of maintenance work orders completed each month significantly increased. The WMSII ROI resulted in a \$1.0M savings in planning backlog as well as an annual saving of an additional \$2.0M for reduced work planning efforts, improved maintenance utilization, reduced craft overtime and construction efficiency. This initiative returned more than \$750K to the programs. NSTec leadership also proactively addressed several safety concerns over the year by engaging a corporate partner to review each incident and provide recommendations for an extent of condition review. The NSTec Parent Organizational Oversight Committee conducted a comprehensive Operational Excellence Effectiveness Assessment (OEEA) in April/May 2016. Since implementation of the OEEA recommendations, the OEEA independent review team noted that the NNSS had a "safety first" mentality.

In order to ensure a balanced workforce was attained following the FY2015 Workforce Restructuring action, NSTec implemented a strategic hiring process in which hiring decisions were made as a result of review and approval by a management team.

To support the NNSA culture of "People First", NSTec leadership substantially enhanced engagement with their employees by initiating frequent field visits by the NSTec President and members of the Senior Management Team. This field time was used to both communicate information to the workforce, as well as listen to the workforce successes and concerns. The NSTec Leadership Team visited NNSS and North Las Vegas facilities, and their offsite locations in Albuquerque & Los Alamos, New Mexico; Joint Base Andrews, Maryland; and Livermore and Santa Barbara, California. In order to continue the momentum of employee engagement, NSTec conducted another Gallup Q12 survey in FY2016. The survey results showed that NSTec leadership increased the level of employee engagement by 11% in FY2016 compared to FY2015. The survey participation rate increased from 62% to 80% which also serves as an indication of increased employee engagement.

Several challenges still exist that NSTec leadership needs to address. While making strides forward, nuclear safety basis document quality, timeliness, and configuration management continued to be issues and impacted the NNSS's ability to attract new and execute current work. Although a single incident, lack of management integration within NSTec at STL resulted in a large investment of NNSA and DOE senior management attention to ensure that the entirety of the issue was known (e.g., cost model, schedule implications, etc.) so that the full impacts could be appropriately ascertained for all NNSA and national security mission requirements.

In conclusion, NSTec leadership successfully took on the challenge to improve safe and secure mission and operations execution, and strengthen the NNSS reputation as the location of choice for national security organizations to conduct nuclear and high hazard activities and training.