



National Nuclear Security
Administration

Sandia Corporation

Fiscal Year 2017
Performance Evaluation
Report (PER)

NNSA Sandia Field Office

Performance Period:
October 1, 2016 –
April 30, 2017

June 2, 2017

Executive Summary

This Performance Evaluation Report (PER) provides the assessment of Sandia Corporation's (Sandia) performance under the Management and Operating (M&O) Contract for the Sandia National Laboratories (SNL). The Department of Energy's (DOE) National Nuclear Security Administration (NNSA) evaluated Sandia's performance from October 1, 2016 through April 30, 2017, against the objectives defined in the Fiscal Year 2017 (FY17) Strategic Performance Evaluation and Measurement Plan (PEMP). The NNSA considered all input provided (e.g., Contractor Assurance System (CAS), Program Reviews, peer reviews, external reviews, and customer reviews) from NNSA Program and Functional Offices. Sandia's self-assessment report, the FY17 Performance Evaluation and Assurance Report (PEAR), was also considered for this evaluation.

For each goal in the PEMP, NNSA assessed the objectives and key outcomes in the aggregate to determine an adjectival performance rating. NNSA determined the performance ratings (Excellent, Very Good, Good, Satisfactory, and Unsatisfactory) in accordance with the criteria defined in the Federal Acquisition Regulation (FAR) 16.401(e) (3).

Sandia earned an overall Excellent rating during this performance period. Sandia exceeded expectations in its leadership and in all four critical mission areas. Sandia earned Excellent performance ratings in Goal 1 (Nuclear Weapons Mission), Goal 2 (Reducing Nuclear Security Threats), Goal 3 (DOE and Strategic Partnership Projects Mission), Goal 4 (Science, Technology, and Engineering), and Goal 6 (Leadership). Sandia earned a Very Good performance rating in Goal 5 (Operations and Infrastructure). The Very Good rating for infrastructure and operations acknowledges Sandia's positive progress in these areas.

In Goal 1, Sandia earned an overall Excellent rating by successfully executing the Nuclear Weapons (NW) Mission work in a safe and secure manner in accordance with DOE/NNSA priorities, Program Control Document and deliverables, program implementation plans, and weapon quality assurance requirements (25% at risk fee). Sandia effectively integrated a historically large NW workload across SNL to achieve a greater impact on strategic national security priorities. Sandia's NW leadership exceeded expectations during the contract transition, empowering the laboratory to conduct operations effectively, safely, and securely while maintaining its high volume of commitments to a wide range of customers. Sandia management displayed outstanding performance with regard to coordinating and communicating with stakeholders and the NNSA leadership team on key programs. During this challenging period, Sandia effectively managed issues across a broad portfolio of weapons activities.

Sandia's significant efforts to design and produce NW components and integrate NW systems were crucial to the successful demonstration of all three legs of the nuclear triad within a four-week period. This substantial effort was achieved through effective integration and partnership across Sandia, the Department of Defense (DoD), NNSA, and Nuclear Security Enterprise (NSE) stakeholders. Sandia's numerous exceptional weapon science and technology achievements, including attaining record warm x-ray and neutron yields, contributed to higher fidelity testing and modeling capabilities that enhanced the scientific understanding of the stockpile.

In Goal 2, Sandia earned an Excellent rating by exceeding expectations in meeting the mission to Reduce Nuclear Security Threats (15% at risk fee). Sandia provided critical subject matter expertise to secure, account for, and interdict the illicit movement, both domestic and global, of nuclear weapons, weapons-usable nuclear materials, and radiological materials. Sandia designed, developed, and delivered NNSA space-based nuclear detection capabilities to support the U.S. Nuclear Detonation Detection System. Sandia successfully provided strong technical and programmatic support, and safely and securely executed authorized global nuclear security work for the Defense Nuclear Nonproliferation, Nuclear Counterterrorism, and Counterproliferation and Incident Response missions. Sandia supported NNSA's mission to identify, protect, and secure nuclear material, and prevent the spread of nuclear and radiological material or other Weapons of Mass Destruction (WMD) technology. Sandia's management and staff remained highly professional and focused throughout the M&O Contract transition and demonstrated exceptional commitment in performing exceptional nonproliferation and counterterrorism work despite budget uncertainties.

In Goal 3, Sandia earned an excellent rating by successfully executing high impact work for DOE and Strategic Partnership Projects (SPP) safely and securely (20% at risk fee). Sandia exceeded expectations in the DOE and SPP mission work and demonstrated the value of the work in addressing strategic national security needs. Sandia successfully performed the work within scope, cost, and schedule to ensure mission critical deliverables were met. Sandia strategically integrated science and energy technology programs to address the most demanding energy challenges, and effectively leveraged its NW science and engineering capabilities in conducting SPP work in support of national security requirements.

In Goal 4, Sandia earned an Excellent rating by successfully advancing Science, Technology, and Engineering capabilities to enable national security missions (10% at risk fee). Sandia exceeded expectations in various areas of Science, Technology, and Engineering (ST&E), demonstrating impactful results for national security mission priorities. Sandia's ongoing focus to strategically align research investments with mission needs resulted in bold innovative outcomes that have enabled mission success. During a challenging time of research budget uncertainties and Sandia Contract transition changes, Sandia successfully achieved numerous science and engineering breakthroughs and developed several technology advancements that directly support nuclear security mission execution and the broader national security missions of DOE and other federal agencies.

In Goal 5, Sandia earned a Very Good rating by effectively and efficiently managing the laboratories while maintaining an NNSA enterprise-wide focus (20% at risk fee). Sandia demonstrated accountability for mission performance and management controls, assured mission commitments were met with high-quality products and services, and maintained excellence as a 21st century government-owned, contractor-operated facility.

Though Sandia met, rather than exceeded expectations in most areas, Sandia was rated as Very Good in Goal 5 for the following reasons: Sandia met or exceeded every area of performance in mission deliverables (Goals 1 through 4) with no major security or safety issues detracting from the high level of performance; and, the minor performance detractors in Goal 5 are heavily outweighed by the higher than normal effort required for the execution of work during the contract transition.

In Goal 6, Sandia earned an Excellent rating by demonstrating exceptional leadership in supporting the direction of the overall DOE/NNSA mission (10% at risk fee). The excellent rating for Goal 6 is based on

the positive role of the leadership team in navigating through extremely challenging transition issues. This factor overrides Key Outcome 6.2: incidents of security concern (IOSCs). IOSCs are still an issue, but the negative trend has leveled and leadership has taken actions to address security incidents, although the efforts have yet to realize positive results.

Sandia's leadership team exceeded expectations during the contract transition. Despite a high volume of unknowns and an increased workload related to transition activities, laboratory leadership remained professional and focused. Through strong leadership, the laboratory was able to conduct operations effectively, safely, and securely while maintaining its high volume of commitments to a wide range of customers.

Sandia did not meet expectations in reducing the rate of major IOSCs. Sandia's leadership continued to focus on improvement activities, though the results of these efforts have yet to be realized.

Goal 1: Manage the Nuclear Weapons Mission

Sandia earned an overall Excellent rating by successfully executing the Nuclear Weapons (NW) Mission work in a safe and secure manner in accordance with DOE/NNSA priorities, Program Control Document and deliverables, program implementation plans, and weapon quality assurance requirements (25% at risk fee). Sandia effectively integrated a historically large NW workload across SNL to achieve a greater impact on strategic national security priorities. Sandia's NW leadership exceeded expectations during the contract transition, empowering the laboratory to conduct operations effectively, safely, and securely while maintaining its high volume of commitments to a wide range of customers. Sandia management displayed outstanding performance with regard to coordinating and communicating with stakeholders and the NNSA leadership team on key programs.

During this challenging period, Sandia effectively managed issues across a broad portfolio of weapons activities. Sandia's key NW stockpile modernization achievements include: performing B61-12 Life Extension Program (LEP) testing and qualification in support of component production; achieving W88 ALT 370 Phase 6.4 authorization; and completing the W80-4 LEP Requirements Gate Review.

Sandia's significant efforts to design and produce NW components and integrate NW systems were crucial to the successful demonstration of all three legs of the nuclear triad. This substantial effort was achieved through effective integration and partnership across Sandia, the Department of Defense (DoD), NNSA, and Nuclear Security Enterprise (NSE) stakeholders.

Sandia further advanced its unique weapon science facilities and capabilities to support the Stockpile Stewardship Program, including achieving record neutron and X-ray yields at the Z Pulsed Power Facility (Z Facility). Sandia conducted High Energy Density (HED) experiments on numerous stockpile relevant materials, refined warm x-ray sources for radiation effects testing of weapon components, conducted radiation physics experiments, further investigated the efficacy of magnetic direct drive experiments for fusion, provided outstanding support for the Enhanced Capabilities for Subcritical Experiments (ECSE) efforts, and advanced NNSA's Tri-Lab Exascale supercomputing capabilities. Sandia provided excellent support to NNSA in the strategic planning for the next generation stockpile stewardship initiative to improve the efficiency of the Stockpile Stewardship Program to sustain the Nation's nuclear deterrent.

Objective 1.1: Sandia overall exceeded expectations in accomplishing work as negotiated with program sponsors and partners. Sandia successfully performed NW work within scope, cost, schedule, and technical requirements to ensure mission critical deliverables were met. Sandia exceeded NNSA expectations for nearly all mission critical performance areas, and completed, or made significant progress towards 134 of 135 NNSA Level 2 milestones. The only missed milestone was in executing the enhanced capability for subcritical experiments program, which resulted from delays outside of Sandia's control.

Sandia overall met performance expectations in its Weapon Quality Assurance (WQA) program and made favorable progress in implementing NNSA Policy (NAP 24A), Weapon Quality Policy. Sandia integrated quality requirements into an effective Quality and Nuclear Enterprise Assurance program at its sites and through its suppliers that enabled the design, production, and delivery of safe, secure, and

reliable weapon products. While it is noteworthy that Sandia identified a quality issue during an extent-of-condition review at a component supplier, Sandia did not ensure that nonconforming components identified during the review were properly isolated and controlled. NNSA discovered one of these nonconforming units in a next level assembly.

Sandia successfully managed DOE/NNSA Nuclear Enterprise Assurance (NEA) program activities, which include updating an NEA Implementation Plan, leading implementation efforts through the Trust Engineers Working Group, and completing a third annual assessment cycle with NEA considerations.

Sandia successfully completed Nuclear Explosive Safety Studies (NESS) and NESS Change Evaluations (NCEs), including the W80 reauthorization of legacy operations and the completion of the B83 Operations Safety Review to facilitate timely production delivery. Sandia operated, maintained, and upgraded several weapon product realization information systems as demonstrated by the redesigned PDMLink file structure and the Enterprise Component Information System (eCIS), which resulted in improved weapons data handling. In addition, Sandia completed the development and implementation of Product Realization Information Management and Exchange (PRIME) software, achieving a 36% cycle time improvement for authorization, release, and exchange of product definition documentation, modernizing the NW information management system.

Objective 1.2: Sandia overall met expectations for maintaining knowledge of the state of the NW stockpile. Sandia successfully executed the stockpile surveillance program and maintained a robust scientific and engineering understanding for the delivery of the annual stockpile assessment. Sandia provided excellent leadership and technical expertise in support of several NSE efforts, including NNSA's Stockpile Responsiveness Program, the NNSA Predictive Capability Framework, and the Integrated Stockpile Evaluation Plan.

Sandia's robust scientific and engineering understanding for delivering tools and data required to support the annual stockpile assessment culminated in the successful completion of the Cycle 21 Annual Assessment, which included a briefing for the Secretary of Energy and the United States Strategic Command's Stockpile Assessment Team. Sandia made significant progress on the Cycle 22 Annual Assessment by providing deliverables on schedule. Sandia assessed the W76-0 and W76-1 non-nuclear components as part of the Independent Nuclear Weapon Assessment Process.

Sandia successfully executed the stockpile surveillance program for all weapon systems and completed the Weapons Evaluation Test Laboratory (WETL) centrifuge testing backlog. Sandia's W76-1 Joint Test Assembly (JTA) Product Realization Team (PRT) efforts were vital to successfully completing the Feasibility and Cost Gate Reviews. Sandia adequately addressed Significant Finding Investigations and entered monthly Quality Evaluation Requirements Tracking System (QERTS) surveillance data.

Sandia adjusted resources to support the life extension programs, causing delays in several of the B61 weapons surveillance activities. Specifically, the B61-11 cable pull-down test date was rescheduled and a number of QERTS requirements have not been dispositioned.

Objective 1.3: Sandia met expectations in delivering stockpile system maintenance, production, limited-life component exchanges, weapon containers, and dismantlements. Sandia successfully executed the limited-life component exchange program for all weapons systems. Sandia delivered the

updated Weapons Dismantlement and Disposition Project Plan on schedule. Sandia met the W80 Alt 369 Neutron Generator (NG) First Production Unit (FPU) date and provided excellent support to resume legacy W80 operations. Sandia's efforts on the W80 Hazards of Electromagnetic Radiation to Ordnance (HERO) safety testing resulted in early DoD certification. Sandia conducted the W87 Alt 360 Gas Transfer System (GTS) Production Readiness Review and proactively initiated the Life Storage Plan ahead of schedule.

Objective 1.4: Sandia exceeded expectations in demonstrating the application of new strategies, technologies, and scientific understanding to support current and future stockpile needs. Sandia provided exceptional engineering for NNSA's Integrated Surety Architecture (ISA) Program, responding to time-sensitive requests to enhance transportation security measures. Sandia facilitated the delivery of an integrated multi-site cost estimate and schedule for the additional scope on W88 Alt 940 Block Approach and supported extensive reviews and integration activities that enabled NNSA to make an informed decision to include the ISA interface in the Mobile Guardian Transporter (MGT). Sandia submitted an integrated complex-wide schedule and cost estimate that supported full scale engineering development for the Multi-application Transportation Attachment Device (MTAD) for the W80 and B61-12.

Sandia made excellent progress in the Enhanced Surety Program. Sandia down-selected the initial Next Generation (Next Gen) design that is cost effective and reduces risk. Sandia took the initiative to work on a Surety stretch goal, testing and evaluating the integrated surety system for the Weapons Storage and Security System (WS3) in a representative environment. Sandia increased by tenfold the life of a critical component of the Advanced Switch through redesign and assembly improvements.

Sandia achieved record results at the Z facility. For example, power flow experiments attained a 20% increase in power delivery from a low-inductance load on a Magnetized Liner Inertial Fusion (MagLIF) experiment, and an integrated MagLIF experiment produced record neutron yields 50% higher than previously attained. Sandia is also leading a Tri-Lab cross-platform evaluation of tantalum strength and provided outstanding technical support for the development of the Advanced Radiographic Strategic Plan.

Sandia's Enhanced Surveillance (ES) program supported Stockpile Modernization by developing and validating a refractory metal barrier coating that prevents diffusion and electrical contact degradation, which has a broad range of nuclear weapon applications. Sandia ES also developed a new computational modeling capability to predict the reliability of complex electrical solder joint contacts exposed to vibration and temperature cycling, thus enabling the insertion of new technologies in numerous weapon components. Sandia made exceptional progress advancing design concepts and component maturation for the Joint Technology Demonstrator.

Sandia made excellent progress in the Component Manufacturing Development (CMD) Program by documenting the Process Prove-In (PPI) and Qualification Evaluation Release (QER) three months ahead of schedule. Sandia completed the capacity modeling capability ahead of schedule and initiated synthesis work on the pre-cursor material for Magnesium Oxide (MgO).

Objective 1.5: Sandia met expectations in the areas of science and engineering capabilities, facilities, and essential skills necessary to meet current and future NW mission requirements. Sandia effectively

managed Infrastructure and Operations (I&O) programs to sustain facility operations ensuring mission requirements were met. Despite aging facilities and equipment, Sandia successfully managed Operations of Facilities programs to support increased weapon component production and testing activities. Sandia continued to make steady progress in modernizing the Silicon Fabrication Facility (SiFab) through the installation of newer tools and equipment funded by the Sandia Silicon Fabrication Revitalization (SSiFR) project. Sandia reduced risk by the early completion of process cooling water renovations and the replacement of aging polyvinyl process piping.

Sandia successfully supported critical weapon modernization activities by completing the mission essential building addition and renovation to the Explosive Components Facility, relieving severe office overcrowding and restoring laboratory space back to its original function.

Sandia's release of the Xyce parallel circuit simulation software provided improved optimization and quantification capabilities for system circuit design and qualification. Sandia's release of the PLATO software enabled innovative designs for additively manufactured parts and components that cannot be manufactured by traditional processes, allowing the designs to be optimized for specific performance characteristics. Sandia successfully executed the Inertial Confinement Fusion National Diagnostics Plan, which included delivering a high-speed hybrid complementary metal oxide semiconductor imager for a prototype single line-of-sight diagnostic. Sandia continued to provide technical peer-review for the National Ignition Facility opacity platform development. Sandia's operational support of the Cygnus dual-axis radiographic sources resulted in excellent quality radiographs of the Eurydice Sub-critical Experiment.

Sandia's Weapon Systems Engineering Assessment Technologies (WSEAT) program demonstrated plenoptic imaging techniques on a complex flow field to image shock waves in a wind tunnel, and analyzed transonic pressure sensitive paint. Sandia's Nuclear Survivability program developed a Quantifications of Margins and Uncertainties (QMU) strategy for a precision voltage reference circuit, demonstrated sealed cassettes for measuring radiation-driven shock waves in environmentally sensitive materials, and investigated the effects of high energy neutrons on various electronic devices for NSE stakeholders. In the Qualification Alternatives to the Sandia Pulsed Reactor (QASPR) project, Sandia completed a new calibration for the HBT circuit neutron response model to provide threat environment characterization and qualification evidence for the W88 ALT 370.

Objective 1.6: Sandia exceeded expectations in executing Phase 6.X and product realization processes and activities in support of nuclear weapon LEPs, Modifications, and Alterations. Sandia achieved several major W88 ALT 370 program accomplishments, including receiving authorization to proceed to Phase 6.4 Production Engineering, conducting the Blast Tube Test, and supporting DoD's successful Follow-on Commander's Evaluation Test (FCET)-53. Sandia closely coordinated with DoD to navigate the difficult task of obtaining approval of flight test bodies on missile tests. Sandia succeeded in preparing for FPU production by coordinating the Risk Review Board, actively managing program risks, and optimizing management reserve. Sandia completed several successful Final Design Reviews on schedule, including Lightning Arrestor Connector (LAC), Re-entry Thermal Body, and Capacitor reviews. Sandia demonstrated excellent management of the Sandia External Production (SEP) product portfolio and leadership of system-level and War Reserve integration activities, including integration of ALT 940 and NG replacement coincident activities, as well as the development of an integrated programmatic milestone schedule. Sandia coordinated closely with Los Alamos National Laboratory

(LANL) to integrate the leveraged system qualification program between the W88 ALT 370 baseline and the additional Conventional High Explosive (CHE) Refresh scope. Sandia made progress in addressing the trend of increases in schedule variance (SV) based on the use of earned value (EV) metrics. Sandia's limited improvement has not fully addressed all of NNSA's concerns regarding coordination with the Kansas City National Security Campus (KCNSC) on the W88 ALT 370, which continued to impact the component design, requirement changes, manufacturing, PRT communication, and program schedule.

Sandia effectively managed the increasing W80-4 LEP workload, meeting all deliverables. Sandia successfully completed the Requirements Gate Review affirming that initial technical and programmatic requirements have been analyzed, including preliminary design options, production needs, program management plans, and Phase 6.2/6.2A schedules. Sandia's analysis and recommendation resulted in an early decision from the Nuclear Weapons Council, enabling a critical design selection two years early that meets DoD requirements and reduces cost and schedule risk for the Phase 6.2/6.2A study. Sandia developed and conducted EV training on Work Breakdown Structure (WBS) and schedule development, which improved the quality of WBS products. Sandia continued to make good progress on staffing the W80-4 program through internal transfers and new hires.

Sandia accomplished outstanding work in supporting integration efforts with DoD to ensure system interface requirements for the B61-12 are adequately addressed. Sandia performed outstanding work in upgrading Version 2 component hardware for Compatibility Test Units and conducting aircraft compatibility testing to support Joint Flight Tests as well as certification effort for DoD aircraft software updates. As part of the B61-12 LEP Phase 6.4 Production Engineering, Sandia PRTs finalized and released non-nuclear component designs and worked with the cognizant production agencies to conduct component process prove-in and qualification evaluation activities. Sandia led system integration of the B61-12 All Up Round (AUR) including planning and conducting system-level qualification testing, qualification system assembly and disassembly process, and design of DoD and NNSA trainers. Sandia made progress on significant program milestones to support the B-61 FPU to include testing a qualification of the B-61 despite initial delays with component deliveries.

Sandia made progress on Final Design Reviews, completing 20 of 48 with 5 being delayed more than 90 days due to design changes and component testing delays. Sandia External Production is maintaining the production schedule. Sandia accommodated late design changes for several components which consumed margin and added risk to FPU for these parts. Sandia's delayed submissions of updated drawings with the required stamping (Pentagon "/S/") are also increasing risk at the production agency.

Sandia provided excellent support in meeting the B61-12 Federal Program Office (FPO) project control requirements and utilizing the integrated site schedules and earned value management data to identify and resolve issues and ensure Sandia's scope meets schedule and cost commitments. Sandia also provided support to the B61-12 FPO to resolve NNSA integrated schedule issues and performed well in supporting the integrated risk management program.

Sandia successfully executed the Fusilli recovery plan to assure the B61-12 FPU schedule was not impacted. Sandia collaborated with the KCNSC to prioritize engineering resources to accommodate changing procurement timelines. Sandia conducted a key mechanical test to provide qualification

evidence for critical flight tests. Sandia improved timeliness of movement requests to the NNSA Office of Secure Transportation (OST) by providing additional resources for shipping analysis and documentation.

Sandia met expectations for the W76-1 program as evidenced by its accomplishments that include non-arming fusing and firing (AF&F) component production and delivery. Sandia resolved issues associated with the actuator production and other AF&F production issues, such as the LAC, and the SEP JTA reentry battery lot test failure. Sandia met the W76-1 AF&F production requirement and successfully accomplished scheduled Retrofit Evaluation System Test surveillance activities.

Sandia met expectations for the Mk21 Fuze Modernization Program, executing to schedule and meeting customer requirements. Component Baseline Design Reviews (BDRs) and environmental development tests were completed in support of the upcoming Arming and Fuzing Assembly (AFA) BDR. Sandia received DoD approval to proceed with Reentry Vehicle level testing following successful completion of the Light Initiated High Explosive (LIHE) aft proof-of-capability test.

Key Outcome 1.1: Sandia exceeded expectations with numerous accomplishments that demonstrated its exceptional and effective application of existing experimental capabilities and development and implementation of new capabilities to support stockpile stewardship. Sandia leveraged diagnostics developed for high-precision experiments at the Dynamic Integrated Compression Experimental (DICE) Facility to enhance Rocket Sled Track (RST) diagnostics to achieve a ten-fold improvement in timing resolution. Sandia, in collaboration with LANL, conducted the 21st plutonium (Pu) experiment at the Z facility, which evaluated the material properties of one of the oldest Pu samples from the stockpile to-date in support of pit aging analysis by LANL. Sandia also collaborated with LANL to conduct a Uranium shock-ramp experiment at the Z facility in support of code validation. Sandia conducted several impactful HED experiments to gain a greater understanding of stockpile relevant materials, including surrogates, additively manufactured samples, safety-related materials, and high explosives.

Sandia's radiation effects science program achieved a ten percent increase in the warm X-ray yield for a refined z-pinch source that enhances capabilities for system-generated electromagnetic pulse and thermo-mechanical shock hostile assessments. Sandia achieved a factor of seven increase in the energy that the proof-of-principle Thor-48 intermediate scale pulsed-power accelerator can deliver to the load. Thor-48 experiments successfully demonstrated extensive pulse shaping flexibility and achieved increased currents and pressures.

Sandia provided significant technical expertise and contributed information to NNSA, enabling approval of the Trusted Microsystems Capability (TMC) Critical Decision-0 and facilitating the NNSA TMC Analysis of Alternatives (AoA) process. Sandia provided outstanding support to NNSA for the ECSE efforts. Sandia completed the design and made progress on the assembly of a 300 kV pulsed power driver for evaluating Scorpius Linear Induction Accelerator (LIA) technologies in support of the ECSE project. Sandia advanced the pulsed power driver from Technology Readiness Level (TRL) 2 to TRL 4 in only 18 months. Sandia contributed to the NNSA ECSE AoA study to evaluate seven LIA technology options. Sandia made excellent progress commissioning the Pulsed Power Advanced Development Laboratory to further advance radiographic technologies.

Key Outcome 1.2: Sandia met expectations for effectively executing the Mobile Guardian Transport (MGT) Project in accordance with the requirements articulated within task agreements with the OST. Sandia successfully accomplished work as negotiated with the OST. Sandia made significant progress towards the MGT crash unit manufacturing readiness review. Sandia successfully completed the safety in abnormal thermal environment analysis, and made satisfactory progress on other MGT deliverables.

Key Outcome 1.3: Sandia exceeded expectations in demonstrating the effective application of existing high-performance computing capabilities and the development of new capabilities. Sandia demonstrated outstanding integration with and responsiveness to the Directed Stockpile Work (DSW) user community. Sandia demonstrated thread scalability for a critical engineering code on Trinity, and demonstrated the effective coupling of particle and radiation transport codes. Sandia reduced the risk that current production codes may not adequately perform on the next-generation class of computers by demonstrating performance for some key solvers on the next-generation Knights Landing processor. Sandia advanced NNSA's Tri-Lab Exascale supercomputing capabilities through work conducted on critical advanced power management for the Trinity Platform. Sandia completed excellent work on the verification and validation of advanced simulation codes related to safety in abnormal thermal environments and high explosives codes, and modeled the lifecycle of GTS reservoirs. Sandia was exceptionally responsive to NNSA information requests, providing siting option proposals and information supporting the AoA for the Advanced Simulation and Computing (ASC) Advanced Technology System (ATS-4) platform.

Key Outcome 1.4: Sandia exceeded expectations in demonstrating effective application of existing capabilities to meet the build plan specified in the approved Neutron Generator Implementation Program Plan (NIPP). Sandia exceeded NIPP production goals while managing a more diverse product line, met all product deliveries to customers, and effectively controlled costs within an austere budget. Sandia increased the yields for NGs and timers, and also the production of the NG kit packaging. Sandia improved NG Enterprise infrastructure by completing 19 Equipment Lifecycle Management projects, increasing equipment operational availability to greater than 90%, and completing a recapitalization project to upgrade critical building systems and improve utility reliability.

Goal 2: Reduce Nuclear Security Threats

Sandia earned an Excellent rating by exceeding expectations in meeting the mission to Reduce Nuclear Security Threats (15% at risk fee). Sandia provided critical subject matter expertise to secure, account for, and interdict the illicit movement, both domestic and global, of nuclear weapons, weapons-usable nuclear materials, and radiological materials. Sandia designed, developed, and delivered NNSA space-based nuclear detection capabilities to support the U.S. Nuclear Detonation Detection System. Sandia successfully provided strong technical and programmatic support, and safely and securely executed authorized global nuclear security work for the Defense Nuclear Nonproliferation, Nuclear Counterterrorism, and Counterproliferation and Incident Response missions. Sandia supported NNSA's mission to identify, protect, and secure nuclear material, and prevent the spread of nuclear and radiological material or other Weapons of Mass Destruction (WMD) technology. Sandia's management and staff remained highly professional and focused throughout the M&O Contract transition and demonstrated exceptional commitment in performing exceptional nonproliferation and counterterrorism work despite budget uncertainties.

Objective 2.1: Sandia exceeded expectations in its global security efforts to secure nuclear material. Sandia conducted its global signature course and trained nuclear security professionals from 30 nations at the 26th International Training Course (ITC) on physical protection of nuclear material and nuclear facilities to promote nuclear nonproliferation. Sandia demonstrated professionalism and expertise in its nuclear security work for the International Atomic Energy Agency (IAEA) in research reactors, vulnerability assessments, and international physical protection assessments. Sandia's Global Material Security (GMS) program demonstrated success in radiological security threat and risk communication tools to strengthen global security, such as the development of a prioritization model for radiological security engagement. Sandia's Integrated Detection and Delay (IDD) program is a model program that is expanding its efforts internationally to foster public-private partnerships and achieve real risk reduction. Sandia supported significant efforts to revise the Office of Nuclear Smuggling Detection and Deterrence training curriculum and exceeded expectations in communication and network maintenance elements. Sandia delivered high quality analytical products that provided the scientific basis for radiological security projects, enabling innovative ways for the program to save costs. As a result of a cost overrun, Sandia took corrective action to apply internal controls to enable future improvements in cost data reporting.

Objective 2.2: Sandia exceeded expectations in reducing nuclear security threats. Sandia greatly advanced the Nation's technical capabilities for proliferation detection across a broad spectrum of technologies. These accomplishments included applied spectroscopic analysis software for directional systems; ground-breaking arms control modeling and novel synthetic aperture radar capabilities; improved travel time predictions for seismic waves through more accurate geophysical earth modeling; and advanced neutron imaging and nuclear forensics technologies. Sandia advanced detection systems and technologies through innovative research and development to satisfy the requirements of the Defense Nuclear Nonproliferation program. These capabilities include: detection of illicit foreign nuclear materials production and weapons development; presence, movement, and diversion of special nuclear materials; and global nuclear explosions through space-based sensor systems.

Objective 2.3: This objective was not evaluated as NNSA did not issue any requirements for Sandia in this area.

Objective 2.4: Sandia exceeded expectations in support of Nonproliferation and Arms Control (N&AC) activities. Sandia provided excellent technical and logistical support for six DOE/NNSA-led U.S. Bilateral Physical Protection Assessment visits to foreign sites holding U.S.-obligated nuclear material, and in leading a multi-lab knowledge management pilot funded by the Human Capital Development subprogram. Sandia was the lead lab for International Nonproliferation Export Control Program (INECP) activities in seven countries and led engagements with three countries. Sandia's exceptional and timely export control technical reviews for the Department of Commerce provided high quality reach-back support for U.S. enforcement agencies on compliance and law enforcement. Sandia provided high quality technical expertise on semiconductor manufacturing for the NNSA Semiconductor Working Group. Sandia provided outstanding support to the international arms control simulation initiative, playing a key role in the development of technical products for the working group by providing high quality technical feedback for the implementation of technologies in the development of treaty monitoring exercise activities. Sandia's key role and involvement was critical to the continued operations of the International Data Center.

Objective 2.5: Sandia exceeded expectations in sustaining and improving nuclear counterterrorism and counterproliferation science and technology expertise. Sandia's leadership, coordination efforts, and mission analysis of the Render Safe program were exceptional. Sandia led the revamping of the Accident Response Group (ARG) and was instrumental in developing the ARG improvement plan. Sandia applied exceptional technical capabilities in leading the updates of the Portable Integrated Video System that were incorporated into operations for both ARG and the Joint Technical Operation Team (JTOT). Sandia provided excellent planning and execution support for two operational exercises, the Nuclear Weapon Accident/Incident Exercise (NUWAIX) and Vital Archer Exercise. Sandia provided excellent support in maintaining and advancing the Stabilization Spectral Analyst skill set and home team support to the crisis response stabilization operations. Sandia met Technology Integration expectations by completing most deliverables on time.

Key Outcome 2.1: Sandia exceeded expectations by delivering all satellite payloads ahead of schedule to NNSA, meeting on time delivery in accordance with the DoD performance and schedule requirements for the Space Nuclear Detonation Detection mission. Sandia reduced fabrication risk through the refinement of the optical sensor design in the payload. Sandia led a team to resolve a radiofrequency electromagnetic interference noise issue and identified lessons learned from the technical activities associated with integrating Global Burst Detector III-1 onto the Global Position System satellite.

Key Outcome 2.2: Sandia met expectations in completing physical security upgrades both domestically and internationally. Sandia promptly addressed domestic partner site concerns and communicated with new sites for possible partnerships. Sandia was not as effective in communicating with several international partners.

Sandia made progress on radiological security upgrades to include completion of 12 domestic site upgrades, 23 sustainability assessments, 19 site transitions, 6 international security upgrades, and the installation of 14 IDD kits. Sandia is on track to meet the required security upgrades by the end of the

fiscal year. Sandia coordinated with DOE's Pacific Northwest National Laboratory (PNNL) to develop international response training material to support radiological security efforts.

Key Outcome 2.3: Sandia exceeded expectations in fully supporting counterterrorism, counterproliferation, and incident response. Sandia's exemplary leadership and cooperation with other National Laboratories and interagency partners in planning and execution of the first NNSA Technical Capability Assessment of device destruct approaches directly supports the overall focused strategy of substantially enhancing render safe capabilities. Sandia continued to be a key leader in the assessment of open source nuclear threat device information for the render safe mission. Sandia's ongoing and strong participation in interagency Device Destruct and Disablement Sub-Working Group activities significantly enhanced standoff disablement capabilities and strengthened relationships with the DoD. Sandia provided excellent support to the Directed Energy level V taskings, exceeding almost all of the requirements for preparation, training facility support, testing, and training. Sandia exceeded expectations in fire set design and planning activities for a Render safe exercise known as OPSIS. Sandia provided excellent management of the Radiological Assistance Program (RAP) which supported several high profile events and maintained the state of readiness of equipment and personnel. Sandia provided outstanding planning support for the Radiological Assistance Program Training for Emergency Response (RAPTER) including the preparation of two courses and flawless execution of a training venue change. Sandia also maintained operational readiness for the Disposition Forensics Analysis Team.

Goal 3: DOE and Strategic Partnership Projects Mission Objective

Sandia earned an excellent rating by successfully executing high impact work for DOE and Strategic Partnership Projects (SPP) safely and securely (20% at risk fee). Sandia exceeded expectations in the DOE and SPP mission work and demonstrated the value of the work in addressing strategic national security needs. Sandia successfully performed the work within scope, cost, and schedule to ensure mission critical deliverables were met. Sandia strategically integrated science and energy technology programs to address the most demanding energy challenges, and effectively leveraged its nuclear weapons (NW) science and engineering capabilities in conducting SPP work in support of national security requirements.

Objective 3.1: Sandia exceeded expectations in various DOE-sponsored science and energy program areas, which directly support DOE strategic goals and objectives to help create and sustain leadership in the transition to a global clean energy economy. Sandia strategically integrated science and energy technology research in a number of cross-cutting technology areas to address the most demanding energy challenges. Integration of basic research, applied energy research and development, advanced modeling and simulation, and technology commercialization ensured continued economic competitiveness for our Nation. Sandia demonstrated leadership in various program areas that help to further strengthen our Nation's energy security posture as evidenced by the following:

Sandia successfully led the multi-national laboratory effort to finalize the 10-year strategic plan for the DOE-sponsored Co-Optimization (Co-Optima) of Fuels and Engines Initiative. This initiative provides the framework necessary to advance research collaboration efforts focused on reducing petroleum consumption and improving engine efficiencies in support of the Nation's energy security goals.

Sandia Transportation Energy and Systems researchers advanced the science of diesel engine combustion by discovering a cool-flame diesel autoignition wave. This discovery revolutionizes engineering modeling and simulation of the physics of turbulence-chemistry interactions in combustion engines and promotes greater economic, environmental, and energy security.

Sandia completed a four-year study that will guide future power plant location siting decisions based on water availability in the Western United States. The results of the study provides valuable information and insight to help manage and locate new power-plant energy-generation sites with areas having sufficient water resources.

Sandia demonstrated various advances in quantum research and is staging five new projects to advance software technologies and components to enable efficient, scalable, exascale computing environments, which have the potential to advance computer systems capable of performing computations that are at least fifty times faster than the most powerful supercomputers. These research advancements resulted in Sandia being selected by DOE to co-design one of four exascale centers funded under a \$48M award by the DOE's Exascale Computing Project (ECP).

Objective 3.2: Sandia exceeded expectations in performing high-impact Strategic Partnership Projects (SPP) work valued at over \$500M through this evaluation period. Sandia's unique science and engineering capabilities were used to perform work that addresses national security threats for a

broad-range of non-DOE customers. Technologies associated with these projects leverage, sustain, and strengthen DOE/NNSA capabilities and core competencies to meet DOE/NNSA mission requirements, as well as enhance the U.S. broader national security mission. Through extensive coordination as the project system integrator, Sandia effectively managed and re-baselined several major, high-visibility, multi-million dollar projects to accommodate changing customer needs. By leveraging its NW science, technology, and engineering legacy, Sandia successfully supported various SPP, which help sustain NW capabilities. Several examples of significant activities and accomplishments are provided below.

Leveraging Radio Frequency (RF) capabilities from Sandia's long-standing NW radar work, Sandia demonstrated that Synthetic Aperture Radar (SAR) technology could supplement existing border security techniques by providing new insights concerning border crossings and patterns of life.

Sandia configured and installed a new advanced satellite ground system, which supports U.S. national security missions and strengthens the ground processing capabilities at Sandia that support NNSA missions.

Sandia applied expertise from the International Biological and Chemical Threat Reduction (IBCTR) program to evaluate and counter global threats posed by dual-use chemicals in several key regions of the world, using numerous Sandia capabilities and skills that support DOE in the areas of chemical and biological defense and safety.

Sandia demonstrated a proof-of-concept Bitcoin financial forensics tool called NeoNode. NeoNode analyzes Bitcoin financial transactions to identify potential illicit activities. This effort will strengthen the security of the financial sector and enhance Sandia's cybersecurity capability.

Key Outcome 3.1: Sandia exceeded expectations by making substantial contributions to support the DOE cross-cut initiative in Grid Modernization goals and objectives that enhance national grid resiliency and modernization efforts. Sandia was recognized by DOE leadership for outstanding support of the Grid Modernization Lab Consortium (GMLC) Program and for significant contributions to GMLC Security and Resilience projects. All Sandia projects were granted approval for continuation based on impactful results and positive contributions towards Grid Modernization goals and objectives.

Sandia successfully conducted various education and training forums including the joint DoD/DOE training course held at the Pentagon, titled "Energy Security Assessment and Microgrid Conceptual Design" and a major stakeholder's forum titled, "Energy Storage Safety Forum." These training forums have received very positive feedback and are providing the technical basis for national security microgrid installations, contingency bases, and expeditionary operations.

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

Sandia earned an Excellent rating by successfully advancing Science, Technology, and Engineering capabilities to enable national security missions (10% at risk fee). Sandia exceeded expectations in various areas of Science, Technology, and Engineering (ST&E), demonstrating impactful results for national security mission priorities. Sandia's ongoing focus to strategically align research investments with mission needs resulted in bold innovative outcomes that have enabled mission success. During a challenging time of research budget uncertainties and Sandia Contract transition changes, Sandia successfully achieved numerous science and engineering breakthroughs and developed several technology advancements that directly support nuclear security mission execution and the broader national security missions of DOE and other federal agencies.

Sandia made substantial strategic investments in key research foundations to help advance the state of technical readiness levels and achieved an overall stronger science, technology, and engineering base for the Laboratory. Success in this mission area was enabled by a strong portfolio of Laboratory Directed Research and Development (LDRD) and Technology Partnerships Transfer programs. The LDRD discovery science is strengthening Laboratory foundational science capabilities through development of the next generation of scientific instrumentation and tools. These capabilities were also made available to industry, academia, National Laboratories, federal agencies, and state and local governments to help advance the DOE/NNSA technology transfer mission, address current and emerging issues, and accelerate technology innovation. Sandia's research and development (R&D) results have earned national recognition through numerous awards and commendations, including R&D 100 awards, patents, and publications.

Objective 4.1: Sandia exceeded expectations by executing strategic plans for seven core research foundations that directly align with the DOE/NNSA's mission. The Sandia Research Leadership Team implemented the strategic plans with an increased emphasis on mission impact and transformational results. Significant improvements in the execution of strategic plans were observed, with an increased emphasis on bold innovative outcomes that address current and future mission needs. The LDRD Grand Challenge External Advisory Boards continued to commend Sandia's efforts in emerging multidisciplinary work that is expanding the frontiers of science and engineering in areas that are directly aligned with important mission needs in support of national security. Sandia's Technology Partnerships Program was improved with the implementation of the Academic Alliance program, generating increased cooperative research and development opportunities that attract new personnel with critical skills that sustain and enhance capabilities. External independent reviewers have validated that Sandia's approach to transformative research is on the right path towards success. Sandia effectively managed the LDRD program, continuing to push the frontiers of science and engineering, and providing transformational results that enable mission success.

Objective 4.2: Sandia exceeded expectations with mission-enabling research that benefited DOE/NNSA and the Nation. Sandia's work in high fidelity modeling and advanced computing architectures capabilities continues to be sought out by national programs. Sandia's Structural Simulation Toolkit (SST) has proven to be the preeminent open source tool for advanced computational science applications and is expected to be used in the new Exascale Computing Program. Sandia developed a new multiphysics capability to predict residual stress in Gas Transfer Systems (GTS) reservoirs. This

new capability predicts residual stress evolution during the manufacturing process in a manner that was not possible before, and has broad application to a variety of other components and processes. Sandia's material scientists developed two new improved adhesives for use in two important weapon modernization programs. Sandia developed the technical basis and methodology for training Federal Aviation Administration officials to address aircraft Composite Nondestructive Inspections. One project focused on structural health monitoring of composite materials and the other on development of sensor network systems to assess damage in transportation infrastructure.

Objective 4.3: Sandia exceeded expectations in conducting transformative, innovative, leading edge, and high quality science that benefited the national security mission. Sandia discovered a new degradation pathway for lithium ion batteries. This breakthrough will improve energy storage device performance for numerous applications. Through strong partnerships with other Laboratories, industry, and academia, Sandia earned five R&D 100 awards for exceptional achievements: 1) *The Falling Particle Receiver for Concentrated Solar Energy*, for enabling concentrated solar energy with thermal storage for on-demand, more efficient, and lower cost production of electricity; 2) *Ultra-Fast X-ray Imager (UXI)*, for development of the world's fastest multi-frame digital X-ray camera, with applications ranging from imaging plasmas, electric discharges, and shock waves to visualize intracellular biochemical processes; 3) *Transceiver for Quantum Keys and Encryption (T-Quake)*, for development of an on-chip quantum transceiver capable of encoding, sending, receiving and decoding quantum cryptographic signals for secure communications, networking, or anti-tamper applications; 4) *Pyomo 4.1*, open-source software for rapidly developing the next generation of powerful-optimization-based strategies to solve complex, real-world problems; and, 5) *Stress-Induced Fabrication of Functionally Designed Nanomaterials*, for the development of an innovative process to enable the synthesis of nanomaterials that are not attainable using current methods.

Objective 4.4: Sandia met expectations in maintaining a healthy and vibrant research environment. Sandia earned several awards and commendations, validating Sandia as a premier laboratory of researchers and capabilities to advance science, technology, and engineering. Sandia's institutional standing is highly regarded amongst Federally Funded Research Centers and is attracting exceptional talent that strengthens the science, technology, and engineering base. Sandia's efforts to build external partnerships helped to attract and retain critical skills and enduring talent. For example, Sandia's formation of the Spray Combustion Consortium with industrial and academic partners facilitated the advancement of fuel injection and combustion engine designs, resulting in new modeling tools and increased portfolio of technologies available for licensing and commercialization. New programs such as the Sandia staff-led peer mentoring program is helping staff members to integrate across the Laboratory, strengthening competencies and enabling mission success. Sandia's investments in facilities, equipment, tools, computational and informational technologies, and overall improvements in research environments have proven to be beneficial to attracting new talent.

Objective 4.5: Sandia exceeded expectations in transitioning high-impact technologies for commercialization by industrial partners in support of the DOE Technology Transfer mission that promotes economic development. Sandia's Technology Partnerships program received an excellent NNSA review for best practices and various program improvements, demonstrating numerous showcase technology transfers that are enabling regional and national economic competitiveness. The Sandia Science and Technology Park experienced noteworthy growth, and was recognized by the New Mexico Mid-Region Council of Governments as a model DOE Technology Transfer Program that

leveraged federal research to create jobs and promote positive economic impact valued at \$315M over the last two years. Sandia won two 2017 Federal Laboratory Consortium Awards, including Excellence in Technology Transfer for heat-exchanger technology that makes power generation more efficient, and a State and Local Economic Development Recognition award for TRANSITGRID, a revolutionary microgrid for transportation infrastructure that can supply high reliable power during power outages. Sandia provided technical assistance to 198 small businesses in New Mexico through the New Mexico Small Business Assistance Program, leveraging \$2.4 million in tax credits from the State of New Mexico.

During this rating period, Sandia produced 138 technical advances, filed 130 patent applications, created 63 copyright works, issued 100 government use notices, signed 16 commercial licenses, and executed 11 new Cooperative Research and Development Agreements. Sandia continued to improve reporting submissions for the DOE Office of Scientific and Technical Information.

Goal 5: Operations and Infrastructure

Sandia earned a Very Good rating by effectively and efficiently managing the laboratories while maintaining an NNSA enterprise-wide focus (20% at risk fee). Sandia demonstrated accountability for mission performance and management controls, assured mission commitments were met with high-quality products and services, and maintained excellence as a 21st century government-owned, contractor-operated facility.

Though Sandia met, rather than exceeded expectations in most areas, Sandia was rated as Very Good in Goal 5 for the following reasons: Sandia met or exceeded every area of performance in mission deliverables (Goals 1 through 4) with no major security or safety issues detracting from the high level of performance; and, the minor performance detractors in Goal 5 are heavily outweighed by the higher than normal effort required for the execution of work during the contract transition.

Objective 5.1: Sandia overall met expectations for delivering effective, efficient, and responsive environment, safety and health (ES&H) management and processes. The met expectations rating is based on the assessment that every area of this objective met expectations with the exception of the fact finding activities.

Sandia's Fire Protection personnel conducted a collaborative review to establish a baseline for Sandia's implementation of DOE Directive, DOE O 420.1C, identifying areas for improvement related to determining adequacy of water supply for existing facilities, inspection, testing, and maintenance of fire protection systems. Recognizing a rise in electrical safety events during FY16, Sandia took action to develop an action plan to address the common causes. With increased management engagement, Sandia effectively responded to safety events, some of which were due to workers being inattentive of workplace hazards. Sandia management changed organizational interfaces to clarify operational roles and responsibilities in response to the Annual Core Research Reactor (ACRR) roof incident. Additionally, Sandia management reviewed organizational interfaces and took corrective actions in response to a Tech-Area-V (TA-V) Personnel Contamination Monitor issue and a cut propane line incident at Tonopah Test Range.

Sandia was not consistent in conducting fact finding activities in response to events. The initial fact finding Occurrence Reporting and Processing System (ORPS) report and causal analysis for a roofing event at the ACRR facility did not contain adequate facts and details for assigning and evaluating corrective actions. Sandia experienced an increase in the number of minor equipment issues at TA-V that included: pulse timing discrepancies, rod alignment issues, spurious shutdowns, and incorrect calibration activities. For these issues, Sandia did not consistently or effectively determine key details of the event to prevent recurrence.

Sandia's Explosive Centers of Excellence (COE) concept continued to mature. Sandia established a process to include more check points during the development or revision of an explosive site plan (ESP), which helped expedite the approval process.

Sandia sustained its improved Quality Assurance (QA) program by raising awareness of the corporate documents and records program, communicating the Suspect/Counterfeit Items program

requirements, enhancing current assessment processes, and upgrading Sandia QA corporate documentation. In addition, Sandia identified areas for improvement related to software quality assurance (SQA).

Sandia demonstrated effective management of the water quality area by consistently providing deliverables to NNSA for review well in advance of regulatory deadlines. The storm water team made significant progress on a project to reclassify the Tijeras Arroyo as an ephemeral water body, which will reduce NNSA's reporting requirements.

Sandia's Nuclear Criticality Safety (NCS) Program team effectively developed and implemented a resource-loaded schedule, enabling the team to complete three Criticality Safety Assessments (CSAs), two of which were completed ten weeks ahead of schedule. In addition, Sandia's Contractor Training & Qualification (CTQ) Program team supported the nuclear security mission by increasing the number of NCS-qualified personnel and completing nuclear facility operator training four months ahead of schedule.

The Sandia National Environmental Policy Act (NEPA) team was successful in meeting the environmental program requirements. Through effective resource and project planning, Sandia demonstrated proactive support and flexibility to meet the New Mexico Site Wide Environmental Impact Statement (SWEIS) schedule.

Objective 5.2: Sandia met expectations managing the minor construction project portfolio and delivering monthly performance reports that tracked project health, issues, and risks. Sandia supported the development of the NNSA Analysis of Alternatives (AoA) report for Sandia's Emergency Operations Center line item project. Sandia's work on the Collaboration in Research and Engineering for Advanced Technology and Education (CREATE) facility remains on hold while NNSA determines a path forward with respect to the Alternative Finance Proposal.

Objective 5.3: Sandia's Safeguards and Security program met expectations in most areas while addressing the additional demands associated with the Contract transition. The security staff met all program objectives while processing hundreds of additional clearances for the incoming contractor, submitting several thousand security clearance transfers, and assisting the transition team with a comprehensive review of all security program areas in addition to performing its regular duties. Sandia's efforts laid the foundation for a seamless Contract transition while assuring the protection of our nation's most vital security assets.

Sandia prioritized its resources to provide continued operational excellence for the entire security program while addressing NNSA-identified concerns regarding a lack of consistent implementation across all operating locations. Sandia's security management leadership has begun to address these concerns by working with remote site security personnel and implementing initiatives to eliminate redundancies, improve performance, and streamline operations.

Sandia met expectations regarding the implementation and effective execution of the DOE emergency management requirements. Sandia worked with several offsite mutual support agencies to develop and execute an effective drill and exercise program that included scenarios for catastrophic events such as

the active shooter scenario, which challenged and tested the coordinated response of multiple government agencies.

Objective 5.4: Sandia met expectations to maintain, operate, and modernize DOE/NNSA facilities, infrastructure, and equipment. Sandia managed the Roof Asset Management Program (RAMP) and Cooling and Heating Asset Management Program (CHAMP) in alignment with the respective program plans.

Sandia exceeded expectations in maintaining real property assets (RPAs), ensuring a greater than 99 percent availability of key mission facilities, and reducing maintenance backlog. Sandia developed a corrective action plan to capture annual actual maintenance costs for all RPAs in order to correct maintenance costs for two remote locations in the Facilities Information Management System.

Sandia supported the NNSA goal to implement a more robust infrastructure planning process with the Master Asset Plan (MAP). Sandia is meeting expectations on implementing Phase IV of the Sustainment Management System to improve NNSA's infrastructure management (BUILDER) and agreed to serve as a pilot site for Computerized Maintenance Management System (CMMS) integration.

Sandia significantly improved its management and documentation of real estate. For example, Sandia developed a Preliminary Real Estate Plan (PREP) lease template that enhanced product quality.

Sandia provided support throughout the design phase of the NNSA Albuquerque Complex Project (NACP). This included coordinating site visits for the design team and participating in the design reviews.

Sandia met most of the sustainability goals with strategies to achieve all the goals, and continued to support sustainability initiatives through the Contract transition and budget constraints. Sandia worked closely with NNSA and DoD to evaluate the feasibility of a joint renewable energy project that included developing a draft Request for Information. Sandia also investigated potential energy savings performance contracts (ESPCs).

Sandia was successful in the disposition of unneeded infrastructure by preparing five high quality requests for disposition (RFDs) that were approved by DOE. Sandia proactively worked on the transfer of assets at Mt. Haleakala to DoD. Sandia effectively converted real property to personal property to ease disposition.

Objective 5.5: Sandia met expectations by delivering efficient and effective business operations, financial management, financial transparency, budgeting formulation and execution, and internal controls. Sandia continued to address Cost Accounting Standards (CAS) issues and a systemic deficiency in characterizing and recording capital assets. Sandia made progress in addressing deficiencies with tracking service center costs and retroactively distributing variances at the rate level. Sandia created a common work breakdown structure for all service centers and conducted a three-day Structured Improvement Activity. Sandia developed a corrective action plan to address improper Property, Plant, and Equipment (PP&E) characterization and recording. Sandia routinely updated NNSA on the status of these corrective actions.

Sandia met expectations in procurement and supply chain operations. Sandia achieved \$28 million in cost savings through the NNSA Supply Chain Management Center. Sandia's property management system is sound as evidenced by the excellent inventory results for attractive and equipment assets, firearms, and precious metals. Sandia partnered with NNSA to improve the quality of subcontract packages over \$20M as well as reduce development and approval cycle times. The first subcontract package developed under the improved process was approved in four weeks, compared to the previous average of 41 weeks. In addition, Sandia improved its wage determination request documentation, resulting in reduced cycle time from over 20 days to three days. Sandia successfully achieved its small business goal, attaining 50% of procurement obligations to small businesses, exceeding the target of 48%. Sandia also achieved four out of five of its socioeconomic sub-category goals, only missing the HubZone goal. Sandia hosted open houses for over 175 companies to help inform the supplier community of Sandia's business opportunities.

Sandia met expectations in providing efficient and effective human resources and continues to increase the level of transparency and partnership with NNSA. Sandia implemented a proactive and formal approach to transfer knowledge through the use of the Knowledge Transfer Toolkit. Sandia developed an on-campus recruiting strategy to enhance its ability to recruit hard-to-fill-positions. Sandia did not adhere to Contracting Officer letters of direction regarding compensation practices. Sandia is making a concerted effort to correct these issues, which impact employee position to market for the compensation increase plan analysis. During the early phase of the contract transition, Sandia was slow to respond to the National Technology & Engineering Solutions of Sandia, LLC (NTESS) requests for human resources information while systems were setup to securely transfer protected information. Sandia eventually improved the flow of information, enabling NTESS to meet its human resources deliverable requirements.

Objective 5.6: Sandia met expectations by delivering efficient and effective management of legal risk and incorporation of best legal practices. Sandia continued steps to improve its performance in areas such as export control and standardizing legal operations. Sandia provided cooperative support of contract transition activities.

Sandia addressed issues with its management of outside counsel under 10 CFR Part 719, through a significant revision to its Legal Management Plan. Sandia is making progress on fully implementing its improved procedures.

Sandia continued a comprehensive process improvement activity to address Freedom of Information Act (FOIA) requests, demonstrating a commitment to improving both the cycle time and accuracy of FOIA responses. Sandia was not prompt in responding to one FOIA request and its response did not conform to clearly communicated expectations. Sandia was non-responsive to Contracting Officer direction to prepare a plan to ensure non-recurrence.

Objective 5.7: Sandia met expectations to deliver effective and responsive cyber security and information technology systems. Sandia successfully met all Cyber Security Annual Operating Plan milestones and 10 of 14 NNSA Program Execution Guidance Implementation Factor (IF) objectives. Sandia submitted plans of action and milestones (POA&Ms) for three of the four IF objectives not met and is developing a POA&M for the remaining IF objective.

In its role as the NNSA Center of Excellence for cyber threat intelligence, Sandia published an analysis report of the Kovter malware family for promulgation by the NNSA Information Assurance Resource Center and the DOE Joint Cybersecurity Coordination Center. This report helped all DOE and NNSA sites to defend against a damaging, widespread attack currently faced in the unclassified environment. Sandia also developed a framework used to help identify and eliminate critical vulnerabilities in six web applications, and crafted specialized training for 25 Sandia software developers on how to avoid common vulnerabilities in future development efforts.

Sandia made progress on the NNSA-identified concern regarding the need to update and retest its Enterprise Control Libraries (ECLs) associated with the Sandia Enterprise Unclassified Environment and the Sandia Classified Network (SCN). By meeting two critical ECL milestones, Sandia provided sufficient assurance to enable NNSA to issue one-year authorizations to operate for the Sandia Enterprise Unclassified Environment and the SCN. Overall, the lengthy effort to update ECLs impacts requirements for collecting continuous monitoring (CM) data on Sandia assessments, as the CM requirements cannot be fully satisfied until all ECLs have been updated and tested.

Sandia demonstrated sustained progress with developing action plans to increase line awareness and accountability for assessment results. These efforts resulted in timely actions by the responsible line manager to resolve assigned findings in Sandia's Assurance Information System. NNSA has yet to determine if the categorization of issues is appropriate.

Sandia remediated, disconnected, or granted approved exceptions for all systems containing four categories of vulnerable obsolete software formally identified by NNSA in August 2015. NNSA verified the basis for all exceptions granted.

Although there was no evidence of compromise, Sandia reported an incident involving the transmission of unclassified information without appropriate encryption protections. The transmission of data occurred while troubleshooting system issues and occurred multiple times over a three year period. Sandia proactively applied the lessons learned from this incident to seek out and improve procedures in other work centers and prevent a similar reoccurrence. Sandia was also cooperative in supporting NNSA in collecting the information needed to determine the necessary reporting requirements.

Sandia successfully met or is on track to meet all 21 NNSA Information Technology Guidance IF objectives.

Sandia was professional, expedient, and helpful in its support of the NTESS contract transition team. Sandia created 143 user accounts and provided onsite help desk assistance, crypto cards, network access, and Desktop as a Service (DaaS) accounts to allow NTESS access to information needed for the transition.

Key Outcome 5.1: Sandia exceeded expectations for lifecycle management of hazardous and nuclear materials and demonstrated a strong commitment for further improvements. Sandia proactively collected regulated and non-regulated waste and shipped 274K lbs. for disposal. Sandia proactively collected 8K lbs. of explosive waste and disposed of 6K lbs., with a plan for final disposal of the remaining amount. Sandia collected 40K lbs. of classified, radioactive, mixed, and transuranic waste and disposed of the majority of the waste. Sandia placed Radio Frequency Identification Device (RFID) tags on every new chemical received to reduce the chemical inventory reconciliation time and eliminate

the need to handle each container. Sandia made significant progress on two repackaging campaigns to remove legacy material from TA-V, achieving a significant reduction in Material at Risk.

Key Outcome 5.2: Sandia met expectations in the implementation and effective execution of the DOE emergency management requirements. Sandia completed technical planning documents, including the Emergency Planning Hazard Assessments for multi-facility, catastrophic events, in accordance with the Technical Planning Basis requirements. In addition, Sandia executed an effective drill and exercise program that challenged and tested the overall response capabilities at both the NM and CA sites. Both sites demonstrated improvement in issues management related to documenting, tracking, and completing corrective action plans in a timely manner.

Goal 6: Leadership

Sandia earned an Excellent rating by demonstrating exceptional leadership in supporting the direction of the overall DOE/NNSA mission (10% at risk fee). The excellent rating for Goal 6 is based on the positive role of the leadership team in navigating through extremely challenging transition issues. This factor overrides Key Outcome 6.2: incidents of security concern (IOSCs). IOSCs are still an issue, but the negative trend has leveled and leadership has taken actions to address security incidents, although the efforts have yet to realize positive results.

Sandia's leadership team exceeded expectations during the contract transition. Despite a high volume of unknowns and an increased workload related to transition activities, laboratory leadership remained professional and focused. Through strong leadership, the laboratory was able to conduct operations effectively, safely, and securely while maintaining its high volume of commitments to a wide range of customers.

Sandia demonstrated leadership in stockpile stewardship, weapons response, explosive safety, prime Contract transition, Strategic Partnership Projects, and Integrated Surety Architecture. Sandia participated extensively in strategic planning efforts by collaborating with NSE partners and participating in multiple DOE and NNSA councils, committees, and boards. Sandia proactively shared best practices across the NSE to facilitate achievement of mission goals.

Sandia did not meet expectations in reducing the rate of major Incidents of Security Concern. Sandia's leadership continued to focus on improvement activities, though the results of these efforts have yet to be realized.

Objective 6.1: Sandia exceeded expectations in its extensive participation and leadership with multiple DOE and NNSA councils, committees, and boards. Sandia continued to foster the high level of collaboration and sharing of best practices needed to enhance mission goals. Sandia's President actively participated in the NNSA Council and as the Vice Chair of the DOE National Laboratories Directors Council. Sandia's Executive Vice President for Mission Support was co-chair of the NNSA Operations Board and served on the DOE Laboratory Operations Board. In addition, Sandia's extensive collaboration and partnership efforts supported strategic efforts across the broader Nuclear Security Enterprise, such as the DoD's Defense Innovation Board, Air Force Civic Leader Program, Energy Sciences Leadership Group, Center for Strategic and International Studies Project on Nuclear Issues Conference, and the Nuclear Weapons Stockpile Management Budget Summit. Sandia's leadership supported multiple efforts addressing priorities with the new Administration. Sandia made strategic investments to accomplish critical facility repairs and purchase new equipment to improve operations.

Sandia continued implementing a realistic vision for the Laboratories in alignment with the NNSA strategic vision. Sandia's FY16-FY20 Strategic Plan demonstrated alignment with the Mission Pillars and Crosscuts described in NNSA's Enterprise Strategic Vision. Sandia made progress on implementing a risk-based stockpile surveillance program. Sandia also aligned its research strategy with the strategic plan to ensure Laboratory Directed Research and Development (LDRD) investments support long-term national security requirements.

Objective 6.2: Sandia met expectations in the area of contractor assurance. Sandia continued to use its contractor assurance system to engage in critical self-assessment, as evidenced by its robust use of quantifiable results and impacts as part of its annual Performance Evaluation and Assurance Report. Sandia continued making enhancements to its use of measures and metrics across the Laboratories to assess performance at multiple levels of the organization, further identify strengths and weaknesses, and enhance data trending to manage issues more systemically. Sandia made improvements to its risk management efforts by leveraging best practices and integrating Enterprise Risk Management processes with strategic planning activities, executive management reviews, and board of director engagement. Sandia continued enhancing its quarterly measures and metrics report to analyze data available from its Assurance Information System, and summarized the identified improvement opportunities for creating action plans. Sandia continued monitoring the quality of its planned self-assessments and causal analyses and identified areas for improvement, with the ultimate goal of enhancing the line implementation of assurance processes. Sandia's extensive monitoring of issues management implementation, combined with performance monitoring input from its Board of Directors, resulted in reducing corrective action cycle times, and creating a risk-based corrective action approach.

Objective 6.3: Sandia exceeded expectations in leadership engagement with integrating NSE activities. Sandia quickly responded to help resolve key weapons response issues identified by Pantex. Sandia addressed Pantex training needs and led a project team through a nuclear explosive safety change evaluation effort to allow the use of DoD units at Pantex. Sandia continued its leadership of the Strategic Partnership Projects (SPP) Task Force and implemented a blanket SPP agreement to eliminate duplicative efforts and reduce overall processing time. Sandia also partnered with other NNSA laboratories and plants to support efforts such as improving supply chain risk management, developing an integrated cost and schedule for inserting Integrated Surety Architecture (ISA) into the B61-12 Life Extension Program (LEP) and W80-1, and publishing a guide for creating better partnerships with DOE.

Sandia's Corporate and TA-V Safety Basis groups hosted the Energy Facility Contractors Group (EFCOG) Nuclear Facility & Safety Workshop and led several steering committee meetings during the workshop. This workshop included representatives from all DOE sites to discuss emerging issues and develop a plan to address accident analysis, criticality safety, safety basis, nuclear safety research and development, and unreviewed safety questions.

Objective 6.4: Sandia exceeded expectations in demonstrating professional excellence and continuous learning. Sandia demonstrated exceptional professionalism in engaging in multiple efforts supporting the Contract transition from the Sandia Corporation to the National Technology & Engineering Solutions of Sandia, LLC (NTESS). Sandia's executive leadership effectively communicated throughout the transition period, most notably through its engagements with directors and senior managers and listening sessions with the members of the workforce. Sandia also provided support for the technical needs of the transition, such as physical access to the site and electronic access to information. Sandia's security and information technology staffs demonstrated exceptional problem solving skills and customer service support throughout the transition. Sandia's support for NTESS' facility walk-downs, program briefings, deep dives, and regular communications with NTESS and NNSA transition teams also helped ensure an effective transition.

Key Outcome 6.1: Sandia met expectations in continuing its commitment to improve safety through Engineered Safety and Safety Culture awareness activities. Sandia continued to promote cross-division peer reviews of safety cases to share best practices. Sandia implemented a Work-fit program to reduce injuries of workers with physically demanding jobs. Sandia established a cross-functional team to improve the integration of Safety Basis and Work Planning & Controls (WP&C) to eliminate duplicative requirements and streamline the work planning process. In addition, Sandia continued to implement recommendations from the WP&C External Advisory Board.

Key Outcome 6.2: Sandia did not meet expectations in the area of information protection. There continued to be a high number of Category A incidents of security concern (IOSC) at the Laboratories. Sandia identified the most common causes to be a failure to follow established corporate policy for classification reviews, an insufficient number of derivative classifiers, and inadequate classification guidance training. Although enhanced management attention and increased emphasis on security incidents is clearly visible, these efforts have not yet yielded positive results in reducing security incidents.