U.S. Department of
ENERGY

National Nuclear Security Administration

FY 2012 Stockpile Stewardship and Management Plan

Report to Congress

April 15, 2011

United States Department of Energy
Washington, DC 20585

Message from the Secretary

This is the second Stockpile Stewardship and Management Plan (SSMP) to be submitted to Congress after the April 2010 release of the Nuclear Posture Review Report. It is aligned with the President's National Security Strategy and conveys the Department of Energy/National Nuclear Security Administration's plan for the nuclear weapons stockpile and the portion of the Nuclear Security Enterprise that assesses and sustains the stockpile. The Plan encompasses the stockpile; the science, technology, and engineering base; the production and laboratory infrastructure; the federal and contractor workforce; and budget resources.

Implementation of the SSMP will ensure the maintenance of a safe, secure, and effective stockpile without the production of new fissile materials or the need to resume underground nuclear tests. It will also ensure progress toward a modern and more efficient physical infrastructure. The Plan identifies the detailed activities by which nuclear weapons are assessed and maintained throughout their life cycle, from current stockpile conditions, through service life extensions, to retirements and dismantlements—in accordance with national security policy.

The SSMP is a single plan and is published this year with two annexes, covering the classified aspects of the stockpile and the technical foundation of the stockpile respectively. It is the consolidated response to several related statutes and recent congressional requests for reports as fully described in the Preface section of this document.

This year's SSMP represents a further refinement of the Plan that was aligned with the Section 1251 Report of the National Defense Authorization Act for FY 2010 (Public Law 111-084), which Congress directed to accompany the President's submission to the Senate of the New Strategic Arms Reduction Treaty for advice and consent to ratification. This Plan is more aggressive in achieving those sustainment and modernization goals and remains aligned with the direction of the 2010 Nuclear Posture Review Report, and the National Defense Authorization Act of FY 2010 Section 1251 Report, which is being submitted in 2011 concurrently with this SSMP.

Together, these documents—the 2010 Nuclear Posture Review Report, the Section 1251 Report, and the FY 2012 Stockpile Stewardship and Management Plan—represent a comprehensive effort to detail the activities to manage the nation's nuclear stockpile in the coming decades. This SSMP is being provided to the following:

- **The Honorable Daniel K. Inouye**
  Chairman, Senate Committee on Appropriations
- **The Honorable Harold Rogers**
  Chairman, House Committee on Appropriations

- **The Honorable Thad Cochran**
  Ranking Member, Senate Committee on Appropriations
- **The Honorable Carl Levin**
  Chairman, Senate Committee on Armed Services
- **The Honorable John S. McCain**
  Ranking Member, Senate Committee on Armed Services
- **The Honorable Dianne Feinstein**
  Chairman, Senate Subcommittee on Energy and Water Development
- **The Honorable Lamar Alexander**
  Ranking Member, Senate Subcommittee on Energy and Water Development
- **The Honorable Ben Nelson**
  Chairman, Senate Subcommittee on Strategic Forces
- **The Honorable Jeff Sessions**
  Ranking Member, Senate Subcommittee on Strategic Forces
- **The Honorable Norman Dicks**
  Ranking Member, House Committee on Appropriations
- **The Honorable Howard P. "Buck" McKeon**
  Chairman, House Committee on Armed Services
- **The Honorable Adam Smith**
  Ranking Member, House Committee on Armed Services
- **The Honorable Rodney P. Frelinghuysen**
  Chairman, House Subcommittee on Energy and Water Development
- **The Honorable Peter J. Visclosky**
  Ranking Member, House Subcommittee on Energy and Water Development
- **The Honorable Michael R. Turner**
  Chairman, House Subcommittee on Strategic Forces
- **The Honorable Loretta Sanchez**
  Ranking Member, House Subcommittee on Strategic Forces

If you have any questions, please contact me or Jeff Lane, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Steven Chu

Executive Summary

The Stockpile Stewardship and Management Plan (SSMP) is the overarching 20-year plan that the National Nuclear Security Administration (NNSA) follows to maintain a safe, secure, and effective U.S. nuclear stockpile without the need for new underground nuclear testing. The Plan relies on the President's National Security Strategy as its basic guidance and starting point. The SSMP then provides an integrated picture that links the wide range of activities required to maintain the nation's nuclear stockpile.

Stewardship and management are the two highly linked, principal activities of the SSMP. Stewardship provides the annual assessment and certification processes and stockpile modernization plans supported through the application and advancement of science, technology, and engineering. Management applies advanced science, technology, and engineering to oversee the specific details by which the U.S. nuclear weapons stockpile is sustained and implements modernization features required for enhancements of weapon safety, security and reliability. The use of science, technology, and engineering resources to validate choices made in the Life Extension Program is an important example of the interconnection of the stewardship and management activities.

The SSMP not only addresses the current state of the stockpile, it also addresses its future state, including aging processes, changes in manufacturing methods, and a host of other factors. It describes the projected future state of the current stockpile, including weapon types and quantities out to 20 years, the strategic rationale for each type, and corresponding life cycle costs. It details plans and processes for extending the effective life of the stockpile through life extensions for the next 20 years. There is also a discussion of the manufacturing, maintenance, surveillance, and assessment mechanisms employed.

To organize and schedule the complex array of science, technology, and engineering activities, the Plan employs two dedicated organizing approaches. The first is the Predictive Capability Framework, a long-term roadmap that integrates science, technology, and engineering and Directed Stockpile Work activities to answer questions that are crucial to deterrence and the continuing assessment and certification of the evolving stockpile. The second organizing approach, the Component Maturation Framework, has recently been instituted as a long-term planning tool to integrate technology and manufacturing development activities that supply the components needed for life extensions or limited life component exchanges.

The Plan describes the pursuit of stewardship and management as an enabler of other national security activities within the larger Nuclear Security Enterprise. It explains the unique science, technology, and engineering nature of the Nuclear Security Enterprise and its three basic components: the workforce, the physical infrastructure, and the processes that make up weapons activities. Maintaining an appropriate, highly technical federal and contractor workforce is a continuing challenge, and projections for this requirement are presented. Major capital infrastructure projects and other critical construction projects will be a very important factor in planning, and the details of these efforts are provided. Finally, the Plan describes the necessary improvements to the business practices and other processes of the Nuclear Security Enterprise and includes a budget requirements estimate out to 2031.

When planning for future requirements for the workforce, the physical infrastructure and the processes of weapons activities, it is important to remember that the entire nuclear deterrence posture is inherently rooted in and inseparable from scientific and technical excellence. Critical decisions ranging from annual assessment of specific systems to changes in manufacturing methods, testing, and deployment are inevitably derived from highly technological methodologies. In order to deal with the changing face of deterrence, including more widely dispersed nuclear knowledge, the U.S. must continue to maintain excellence in nuclear-based science and technology that is second to none.

As is the case with most planning, the SSMP is not without risk. It will have to be updated as studies and designs are completed and requirements change. However, it is currently the best approach to ensure a safe, secure, and effective nuclear deterrent as long as nuclear weapons exist.

FY 2012 STOCKPILE STEWARDSHIP AND MANAGEMENT PLAN

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Preface—Statutory Basis for SSMP ("the Plan")

Each year, the NNSA reports on how it plans to maintain the nuclear weapons stockpile. Specifically, section 4203 of the Atomic Energy Defense Act (Title 50 of the U.S. Code, section 2523) requires that "The Secretary of Energy shall develop and annually update a plan for maintaining the nuclear weapons stockpile. The plan shall cover at a minimum, stockpile stewardship, stockpile management, and program direction..." This document, originated in February 1996, came to be known as the Stockpile Stewardship Plan; a version of this document has been submitted to Congress every year since 1998.

Subsequently, Congress required the inclusion of additional details and the expansion of the scope of the NNSA Plan for maintaining the nuclear weapons stockpile. First, Section 4204 of the Atomic Energy Defense Act (50 U.S. Code section 2524[c] and [d]) directs that, in carrying out the Stockpile Management Program, the Secretary of Energy shall develop a long-term plan to extend the effective life of the weapons in the nuclear weapons stockpile without the use of underground nuclear testing. The Secretary is requested to update the plan annually and submit it to Congress as part of the Stockpile Stewardship Plan. Sections 4202 and 4203 of the Atomic Energy Defense Act (50 U.S. Code sections 2522 and2523) also requests specific information regarding the status of the nuclear weapons stockpile and the approaches used for assessing the stockpile.

Section 4202 of the Atomic Energy Defense Act (50 U.S. Code section 2522) directs that: "In each odd-numbered year, beginning in 2011, the Secretary of Energy shall include in the stockpile stewardship plan a report..." that addresses specific elements on how the funded science, technology, and engineering tools are used to assess the nuclear stockpile and address other national security needs. The legislation requires that the report address assessment criteria that are applied with these tools, capability gaps and plans for improvement, and requirements involving technical competencies and critical skills.

Section 1251 of the National Defense Authorization Act of 2010 required the President of the United States to submit a one-time report on the "Plan for the Nuclear Weapons Stockpile, Nuclear Weapons Complex, and Delivery Platforms" at the time that the New Strategic Arms Reduction Treaty was submitted to the Senate for its advice and consent. This report was submitted in May 2010 and an update to the report was provided to Congress in November 2010 and again in February 2011. The Administration is committed to providing annual updates to the Section 1251 Report.

While the Department of Defense (DoD) is responsible for the delivery platforms and support systems covered in the Section 1251 report(s), the NNSA's SSMP provides much of the information requested by Congress in the report, although at a greater level of detail.

Fiscal Year 2012 SSMP

The Fiscal Year (FY) 2012 SSMP updates the 2011 SSMP. Because many elements of the FY 2011 Plan remain valid and effective, the FY 2012 SSMP refers frequently to the earlier document to provide supporting information. In particular, the FY 2011 SSMP Annex A contains Stockpile Stewardship Program details spanning all Weapons Activities.

The essence of the FY 2012 SSMP is encompassed in a single, top level, unclassified document referred to throughout as "the Plan." In addition, two classified annexes to the SSMP are also being provided. Annex B provides supporting details concerning the U.S. stockpile and stockpile management issues. Annex C describes the science, technology, and engineering base for the stewardship and management of the U.S. nuclear stockpile.

The Plan provides an overview of the 2010 national consensus on the issue of U.S. nuclear security. It then describes the necessary steps to achieve a future posture in three critical areas: (1) the U.S. nuclear stockpile; (2) the essential science, technology, and engineering foundation upon which all stockpile stewardship and management endeavors rest; and (3) the enabling components of the Nuclear Security Enterprise, which are the unique physical infrastructure, the workforce and associated challenges concerning critical skills, and the processes—including estimates for budget requirements—to achieve the future posture. Finally, the Plan summarizes recent key accomplishments.

Several appendices to the Plan provide important supporting information. Appendix A describes significant changes that have occurred in each of the fourteen congressionally-funded NNSA Weapons Activities since the FY 2011 Annex A. This Appendix touches on highlights, issues or challenges, milestones, and future plans for each of the programs and campaigns that constitute Weapons Activities. Appendix B maps the locations in the FY 2012 SSMP that provide responses to congressional requests for information concerning various aspects of Stockpile Stewardship and Management. Appendix C provides detailed financial information for each of the Weapons Activities. Appendix D provides updates concerning the NNSA's physical infrastructure since the FY 2011 Annex D.

Annex B—FY 2012 U.S. Nuclear Stockpile and Stockpile Management Details

This classified (Secret-Restricted Data) document supports the FY 2012 SSMP with detailed information associated with the nation's stockpile and the management of that stockpile. It replaces, in total, the FY 2011 Annex B.

Annex C—FY 2012 Science, Technology, and Engineering Capabilities

This classified (Secret-Restricted Data) document supports the FY 2012 SSMP by providing detailed information on the science, technology, and engineering capabilities that serve as the foundation for all stewardship and management efforts. It replaces, in total, the FY 2011 Annex C.

I. Policy Consensus, Future Posture to be Achieved

The Administration has conveyed the policy direction for the stockpile through Presidential and Vice Presidential speeches, the National Security Strategy, and the 2010 Nuclear Posture Review Report. Guided by this direction, a policy consensus has emerged and has been articulated in testimony before Congress by the Secretary of Energy, the Secretary of Defense, the Administrator of the NNSA and in various reports submitted to Congress. This national policy consensus has resulted in the following guidelines for NNSA planning:

- enhance the safety, security, and use control of the stockpile while extending the life of the weapons for the foreseeable future;
- strengthen and sustain the science and technology capabilities that are the foundation of NNSA's deterrent;
- refurbish and modernize the physical infrastructure that produces and enables the management and assessment of the stockpile;
- continue eliminating the need for underground nuclear testing;
- provide no new military capability; and
- require no production of new fissile material for use in nuclear weapons.

Thus, the NNSA has clear guidance to plan the future posture for the stockpile and the Nuclear Security Enterprise (NSE). This future posture will provide direction for the portion of the NSE supported by the President and the Congress through Weapons Activities. This chapter describes the intended future state of the nuclear stockpile. The envisioned future posture is fundamentally driven by the stockpile, rests upon a solid science, technology, and engineering (ST&E) foundation, requires access to essential capabilities provided through a unique physical infrastructure, completely relies on the critical human talent embodied in the enterprise's workforce, and demands cost-effective operations and business practices.

Stockpile

Over the next 20 years, the U.S. nuclear stockpile will be sustained and modernized through vigorous surveillance, assessment, life extension, and dismantlement efforts. The overall U.S. stockpile, which consists of active and inactive warheads, will not be larger than it is today (details discussed in classified Annex B). The exact composition of the stockpile will depend on ongoing and future life extension processes that formulate potential alternatives; and the subsequent national decisions made between available options informed by feasibility studies and well understood costs. Present indications are that the stockpile will continue to include a mix of warheads delivered by submarine-launched ballistic missiles and intercontinental ballistic missiles, and bombs and cruise-missile warheads delivered from aircraft platforms. NNSA will not develop new nuclear warheads, and the future stockpile will not support new military missions or provide for new military capabilities, beyond what the country already possesses today.

The stockpile will continue to be annually assessed to ensure that it remains safe, secure, and effective. Ongoing stockpile surveillance, with enhanced investments and using the best available approaches, will be conducted in accordance with sampling quantities and in-depth component evaluations required by the national laboratories for annual evaluation of the stockpile. Annual assessments will avail themselves of rigorous independent reviews and preeminent ST&E tools to understand fully and resolve any technical issues without conducting new underground nuclear tests.

Life Extension Programs (LEPs) will address known aging issues in weapon systems, and each LEP will study the options for increasing the safety, security, and reliability of nuclear warheads on a case-by-case basis. LEPs will only use nuclear components based on previously tested designs. The full range of LEP approaches will be considered: refurbishment of existing nuclear components, reuse of nuclear components from different warheads, and replacement of nuclear components. In any decision to proceed to engineering development, the United States will give strong preference to options for refurbishment and reuse. Replacement of nuclear components would be undertaken only if critical Stockpile Management Program goals could not otherwise be met, and if specifically authorized by the President and approved by Congress. Safety, security, and use control feature options will be pursued when feasible, and in coordination with DoD.

In addition to improved safety of the nuclear explosive package, LEPs will develop and introduce modern non-nuclear components and subsystems. The LEPs will replace the aging and obsolete non-nuclear parts in the stockpile. Throughout this period, production of limited life components will be fully supported. These limited life components are used for recurrent exchanges of neutron generators, gas transfer systems, or power sources.

Consistent with the Nuclear Posture Review Report, LEPs will attempt to reduce the number of warhead types by formulating options for common or adaptable warheads which may be flexibly deployed across different delivery platforms. The current planning scenario envisions that the useful lifetime of the W76-0, B61-3/4/7/10, W78-0, and the W88-0 will have been extended through major LEP efforts by 2031. These proposed activities could be potentially impacted by the following factors:

- an aging issue or defect in the existing stockpile that results in a change to the planned order of operations;
- the results of the analysis of alternatives being performed by the Air Force on long-range, stand-off capabilities;
- the results of the feasibility analyses for a common or adaptable warhead for the W78 and W88 ballistic missile warheads; and
- changes to DoD requirements for meeting future nuclear deterrence objectives.

All weapons retired prior to 2009 will be dismantled by the end of FY 2022. By 2031, the NNSA will have dismantled additional weapons if there are retirements beyond those planned in 2009. Based on current warhead numbers, the NNSA will have the capacity to complete any additional dismantlements in a timely manner.

There will be continued demand for strategic and special materials. For the foreseeable future, newly generated fissile material will not need to be produced. Fissile materials will be recovered, recycled, and reprocessed from retired components to meet current needs. Other critical material challenges will be addressed through the management of acquisition lead times. The stockpile will require the irradiation of source materials to support tritium production at steady-state rates. These steady-state rates may be greater than three times the present rates due to stockpile requirements and the decay of the stock of tritium.

Development of new technologies for implementation into future components will be performed throughout the next 20 years to provide safety, security, and reliability improvements; mitigate aging concerns in the existing stockpile; and address problems created by sunset materials and technologies. The Component Maturation Framework will identify options to be matured for insertion into the stockpile and will support the systematic, timely, and cost-efficient insertion of components into nuclear weapon systems.

Science, Technology, and Engineering

The many fields of ST&E that underpin the weapons program are well established, and the broad nature of issues facing the stockpile is understood. Therefore, the progress of ST&E can be highly targeted. This enables the resolution of significant stockpile issues, annual stockpile assessments and certification of life extended warheads without new underground nuclear testing.

Success in dealing with all stockpile issues is never a foregone conclusion. While many of these issues involve grand technical challenges that inspire excellence in the workforce, they also add schedule and technical risk. In the past, the stockpile has been affected by significant problems for which there were no ready solutions, and the resolution of these issues required significant amounts of time and intellectual and program investment. As the stockpile ages, new challenges and unforeseen issues will continue to arise. In order to ensure timely and effective responses to these issues, the ST&E base—both people and facilities—must be robust.

By 2031, a new generation of weapons designers, code developers, experimentalists, and engineers must be capable of demonstrating a fundamental understanding of nuclear weapons functionality using computer-aided design and assessment tools that are increasingly more predictive and more precisely calibrated. High-fidelity experimental capabilities will be fully operational and will produce quantitative data that will help preclude the technical need for a resumption of underground nuclear testing. Predictive capabilities, driven by stockpile and other national security needs, will continue to evolve in response to increased fundamental discovery promoted by higher fidelity computer simulations coupled with improved experiments and diagnostics.

A robust ST&E program will enable an accurate annual assessment process that drives a responsive production complex. Stockpile surveillance will produce the needed quantitative data to both feed an accurate annual assessment and drive corrective actions. Production specifications will be based on critical material properties and component characteristics that are directly linked to defined performance boundaries, and warhead certification and component qualification will be based on known properties and characteristics to minimize dependence on qualitative manufacturing process control and yield qualification-relevant data to be used within code simulations.

This dedication to ST&E will include direct interaction with related national defense initiatives that will highlight technical challenges, encourage scientific curiosity, and assist in avoiding technological surprise or combating proliferation threats.

Physical Infrastructure

In 20 years, the physical infrastructure will have evolved significantly from a post-World War II/Cold War era nuclear weapons complex into a more efficient 21st century NSE with less environmental impact. The post-2031 NSE will retain all of its required production and experimental capabilities. It will consist of eight major locations, each of which will have undergone significant changes. Vital mission functions will be sustained by a modernized physical infrastructure for plutonium, uranium, tritium, high-explosive, and non-nuclear component production, high-fidelity testing, and waste disposition.

As systems and facilities are updated, safety system reliability, personnel safety and security, greenhouse gas emissions, and operational costs will be improved. Limitations in the fundamental capabilities needed to produce nuclear weapon components will be eliminated as these systems and facilities are repaired and replaced.

Chapter IV provides the NNSA leadership with a 20-year plan for the revitalization and sustainment of the NNSA physical infrastructure. As a nuclear weapons state, the U.S. must maintain a basic set of production, scientific and engineering capabilities. This minimum capability-based physical infrastructure will have to be responsive to changing world demands and have the inherent capacity to produce up to 80[1] of the most work-intensive weapons per year while sustaining the remaining stockpile. The NNSA will also prioritize sustainment of existing infrastructure, and support efficient management and execution of construction projects. Other changes expected over the next 20 years include high-security fence reductions and excess facility disposition.

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1 This figure is based on the primary rate limiting capability to replace pits, which is agreed to in the *Memorandum of Agreement Between the Department of Defense and the Department of Energy Concerning Modernization of the U.S. Nuclear Infrastructure* signed on April 1, 2010 by the Secretary of Energy and May 3, 2010 by the Secretary of Defense.

As the NSE transforms, the NNSA will reduce the footprint at facilities such as the legacy Kansas City Bannister plant following implementation of the Kansas City Responsive Infrastructure Manufacturing and Sourcing lease. These reductions will support the ability to offset the larger footprint as an outcome of new construction over the next decade with a net reduction of over a half-million gross square feet. After this period, the NNSA should continue to see further footprint reductions to support right-sizing.

Beyond 2013, the Facilities and Infrastructure Recapitalization Program ends. The NNSA is preparing to use corporate facilities management principles to transition to a new capabilities-based infrastructure investment approach. This will foster modernization, recapitalization, and footprint reductions. The NNSA will thereby achieve efficiencies through a balanced portfolio.

Federal and Contractor Workforce

As is the case today, in 2031 the next generation of nuclear designers, scientists, technicians, and engineers will continue to be the NNSA's greatest asset. The 21st century NSE—with cutting edge science facilities and a continuing mission of national importance—will have provided the environment for the management and operating contractors to sustainably attract and retain the best and brightest scientists and engineers. In addition, defense initiatives beyond stockpile stewardship, such as nuclear forensics that support attribution and treaty verification activities, are expected to provide a broadened mission that will push the envelope of nuclear technology and further challenge and develop nuclear security professionals.

The federal workforce also is expected to be better optimized to respond and adjust to customer requirements, stockpile issues, and a changing world of fewer nuclear weapons. In 2031, the NNSA Future Leaders Program is expected to be paying tremendous dividends in the quality and the diverse backgrounds of the federal workforce.

The NSE will have implemented a comprehensive workforce strategy geared toward retention of existing staff through implementation of career development programs. Additionally, the NSE will have established a pipeline of opportunities and internships, shared teaching opportunities, and funded credible science and math programs to attract, mentor, and select potential candidates for employment. Thus, the hiring, retention, and retirement rates of the federal workforce and the management and operating contractors should be stable. Nevertheless, the success of these strategies will remain dependent upon continued support for the NSE.

Management Processes and Procedures

The NNSA continues to pursue performance-based contracting and to streamline business practices for all of its major management and operating contracts. With an enterprise-wide work breakdown structure, the NNSA will have more transparent reporting. This will result in fewer controls and more flexibility for the management and operating contractors. Key nuclear facilities in the NNSA complex will have been replaced or modernized to incorporate more engineered controls and less reliance on administrative controls. It is expected that the NNSA legacy waste issues will have been resolved, and the NNSA will be managing newly generated waste with emphasis on waste minimization at the sources of waste generation.

As a result, the NNSA's safety posture is expected to be greatly enhanced. Most high-hazard facilities will have been designed and constructed with modern and updated safety features, and most of the legacy risks will have abated. The NNSA and its contractor partners will have revised the requirements for safety regulation to rely primarily on national and international standards and regulations except in the unique situations where suitable consensus standards do not exist. As a result of reduced overall risks and improved safety control strategies, the NNSA will be able to conserve resources and place additional focus on the remaining high-hazard and unique operations.

II. Stockpile Stewardship and Management

The breadth of the Stockpile Stewardship and Management mission is significant and directly dependent upon continuously improving science, technology, and engineering (ST&E) capabilities. Stockpile stewardship is centrally identified with the certification and assessment of the stockpile. This provides documented assurance that the stockpile can meet its national mission. Stockpile management oversees the specific details by which the U.S. nuclear weapon stockpile is sustained and its safety and security features modernized. This includes extending the effective service life of weapon systems through planned Life Extension Programs (LEPs), pursuing opportunities for modernizing the stockpile to be more safe and secure, and performing exchanges of limited life components (LLCs). Many of the ST&E methods employed in stewardship are used to inform key stockpile management decisions and efforts. The table below provides a few examples of activities in each area:

Stockpile Stewardship	Stockpile Management
• Assessment: continuing evaluation of the ability of the stockpile to meet performance requirements	• LLC Exchange Activities
• Certification: The formal process to certify the readiness of systems to meet requirements	• LEPs and Technology Maturation
• Advanced Surveillance: incorporating new technology methods	• Continuing Surveillance of current stockpile
• Analysis of future stockpile changes: LEP Option Studies	• Dismantlement and Retirement

The Stockpile Stewardship and Management activity conducts continual surveillance and performance assessments of the present stockpile, providing a knowledge base from which to proceed in maintaining the stockpile. It investigates significant findings (discovered departures from design and/or manufacturing specifications) and resolves resulting issues. Such evaluation and surveillance efforts are essential for the stockpile to be assessed and certified and help determine if weapons are built to design specifications and whether material choices and production processes could change required performance.

Surveillance evaluations of non-nuclear components rely on a combination of direct tests in laboratory conditions and science-based extrapolations for the extreme environments posing survivability challenges. The Stockpile Stewardship and Management endeavor develops design and production alternatives for stockpile life extension options, and pursues increased knowledge and understanding of weapon components to avoid technological surprises. Stewardship and management not only address the ***current state*** of the stockpile but also its ***future state***—including aging processes, changes in manufacturing methods, and the projection of requirements and potential responses beyond the current life extension concepts. Finally, stewardship and management efforts deal with the eventual retirement and dismantlement of some nuclear weapon systems in accordance with national policy.

Stockpile Stewardship and Management also share common planning methodologies. The Predictive Capability Framework coordinates the complex array of requirements involving stockpile assessment, surveillance, and other related efforts and generates a plan of action for meeting these requirements. This plan includes schedules for a sophisticated array of experimental tests required to verify key stockpile modeling tools.

Following very similar methods, the Component Maturation Framework is being developed to coordinate the complex array of activities needed to ensure that the best technologies are available on timely schedules for the incorporation of improved safety and security features into the future stockpile. Significant effort is being devoted to increase the level of detail in the Predictive Capability Framework and Component Maturation Framework and for using these methodologies to better link stewardship, stockpile management and infrastructure aspects of the weapons program.

The Chapter II subsections that follow provide an overview for how the U.S. stockpile will be sustained over the next 20 years, including modernizing whenever feasible its safety and security features. These subsections and Annex B (a companion classified document that provides extensive details for comprehensive understanding and planning purposes) address the current status of the stockpile, including weapon types and quantities, age of the weapons, dismantlement projections, and current concerns associated with each weapon type. They describe the projected future state of the current stockpile, including weapon types and quantities out to 20 years and the strategic rationale for each type.

Present and Projected Stockpile Details: Size, Composition, Lifecycle Costs

The FY 2012 SSMP is consistent with the U.S. stockpile defined in the *FY 2011-2017 Nuclear Weapons Stockpile Memorandum*, which was signed by the Secretary of Energy and the Secretary of Defense in February 2011 and forwarded to the National Security Staff for submittal to the President. The Plan is also consistent with the *FY 2011-2024 Requirements and Planning Document (RPD)* authorized by the Nuclear Weapons Council. The total projected number of weapons in the nation's nuclear stockpile (active and inactive warheads and bombs) is contained in Annex B. This number may be reduced further if planned LEPs are completed successfully, the future infrastructure of the NNSA enterprise is achieved, and geopolitical stability permits. The composition of today's stockpile is summarized in Table 1. The detailed composition of the future stockpile will depend on future U.S. strategy decisions. Present indications are that the stockpile will continue to include a mix of warheads delivered by submarine-launched ballistic missiles and intercontinental ballistic missiles and bombs and cruise-missile warheads on aircraft platforms.

Total NNSA direct lifecycle costs (past and projected future dollars) for weapons in the stockpile are provided in Chapter VI–*Budget Requirements Estimates and Effective Business Practices*. The classified Annex B provides additional information, including actual stockpile numbers (by weapon type) projected through the next 20 years, differentiation between active and inactive warheads, estimated age of the stockpile, known issues associated with present weapons, and substantive discussions of the efforts associated with surveillance, life extension activities, and weapon dismantlement and disposition.

Table 1. Current Types of U.S. Nuclear Weapons and Associated Delivery Systems

Type	Description	Carrier	Laboratories	Mission	Military
WARHEADS—Ballistic Missile Platforms					
W78-0	Reentry Vehicle Warhead	MM III ICBM	LANL/SNL	Surface to Surface	Air Force
W87-0	Reentry Vehicle Warhead	MM III ICBM	LLNL/SNL	Surface to Surface	Air Force
W76-0/1	Reentry Body Warhead	D5 SLBM/Trident Sub	LANL/SNL	Underwater to Surface	Navy
W88-0	Reentry Body Warhead	D5 SLBM/Trident Sub	LANL/SNL	Underwater to Surface	Navy
BOMBS—Aircraft Platforms					
B61-3/4/10	Non-Strategic Bomb	F-15; F-16, certified NATO Aircraft	LANL/SNL	Air to Surface	Air Force
B61-7	Strategic Bomb	B-52 and B-2	LANL/SNL	Air to Surface	Air Force
B61-11	Strategic Bomb	B-2	LANL/SNL	Air to Surface	Air Force
B83-1	Strategic Bomb	B-52 and B-2	LLNL/SNL	Air to Surface	Air Force
WARHEADS—Cruise Missile Platforms					
W80-0	TLAM/N Missile	Attack Sub	LLNL/SNL	Underwater to Surface	Navy
W80-1	ALCM Missiles	B-52	LLNL/SNL	Air to Surface	Air Force

Legend: ALCM=Air-Launched Cruise Missile; ICBM=Intercontinental Ballistic Missile; LANL=Los Alamos National Laboratory; LLNL=Lawrence Livermore National Laboratory; MM=Minute Man; NATO=North Atlantic Treaty Organization; SLBM=Submarine-Launched Ballistic Missile; SNL=Sandia National Laboratories; TLAM=Tomahawk Land-Attack Missile
Note: TLAM/N is correctly included in this list as a weapon system in the current stockpile. The Nuclear Posture Review indicated this system will be retired. The specific schedule can be found in Annex B.

Continual Stockpile Surveillance and Assessments

Annual assessments of the nuclear stockpile will continue to employ rigorous independent reviews; preeminent ST&E tools and capabilities; and the best available stockpile surveillance approaches to detect, fully understand, and resolve technical issues (which continue to arise in today's stockpile). The Nuclear Security Enterprise investigates significant findings (discovered departures from design and/or manufacturing specifications) and resolves resulting issues. Such evaluation efforts are essential for the stockpile to be assessed and certified, to help determine if weapons are built to and continue to meet design specifications, and to determine if material choices and production processes could change required performance. Surveillance evaluations of non-nuclear components rely on a combination of direct tests in laboratory conditions and science-based extrapolations of the extreme environments posing survivability challenges.

The NNSA has received recommendations from the national laboratory directors, the DoD, the U.S. Strategic Command Strategic Advisory Group, and the JASON independent scientific panel that the Weapon System Surveillance Program should be strengthened. In response to this advice, the scope of the Stockpile Surveillance Program has been reviewed and revised as reflected in the near-term initiatives and long-term actions described below, and its funding substantially increased as outlined in Chapter VI–*Budget Requirements Estimates and Effective Business Practices*.

Near-term initiatives concerning assessments of the stockpile include:

- Continue to improve predictive capabilities that establish confidence in current stockpile assets and define appropriate actions to be taken in future LEP activities;
- Obtain initial results from Independent Nuclear Weapon Assessment Teams by 2012; and
- Continue to deploy a broad range of experimental capabilities to increase the knowledge base that underpins the evaluation of the stockpile and the ability to assess and certify weapon performance in present and future designs; and potentially expand subcritical scaled experimental efforts, starting in FY 2011, to improve confidence in predictive capabilities and help validate simulation codes.

In areas involving the surveillance of the stockpile, the NNSA will, in the near term:

- Invest additional resources, starting in FY 2011, to fully support enhanced surveillance efforts across all facets: in-depth evaluation of nuclear and non-nuclear components and materials; functional component, laboratory, and flight tests; and base capabilities for performing surveillance activities; and
- While still attempting to detect "birth defects," continue recent emphasis on enhancing quantitative measurements of materials aging effects and predictive aging trends.

Long-term and ongoing actions to be taken in areas of stockpile assessments and surveillance include:

- Publish annual U.S. stockpile assessment and weapons reliability reports. The reports will address any concerns that would affect the ability of the Secretary of Energy to certify the safety, security, or reliability of active or inactive warheads.
- Complete, by 2017, validation and margin and uncertainty quantification activities to fundamentally model a full suite of underground and above ground experiments conducted in the past.
- Provide the science and technology basis needed to assess surveillance findings. For primaries, this includes advancing understanding for how plutonium ages. Such knowledge relies on measurements obtained from gas gun experiments and at the Z pulsed power facility, as well as integrated hydrodynamic experiments at the Dual Axis Radiographic and Hydrodynamic Testing (DARHT) facility and the U1a underground physics laboratory complex. In addition to providing fundamental information, this work will help to resolve

significant findings associated with concerns surrounding primary implosion. Resolution of significant findings associated with secondaries will involve high energy density experiments at the National Ignition Facility (NIF) and Z pulsed power machine to validate models for complex hydrodynamic flows.

- If required, expand the use of Independent Nuclear Weapon Assessment Teams throughout the annual assessment process.
- Continue to use stockpile surveillance and assessment results to help inform future requirements for extending the lifetime of the nuclear and non-nuclear components in the stockpile.

Sustain the Stockpile and Modernize its Safety, Security, and Use Control Features through LEPs, LLC exchanges, and Technology Maturation

Weapon systems in today's nuclear stockpile are routinely sustained beyond their original design lifetime requirement. Issues that may ultimately degrade the performance of some nuclear weapons to unacceptable levels continue to be regularly detected in existing systems. These issues require active management. LEPs will modify Cold War era weapons to provide enhanced margins against failure, increased safety, and improved security and use control features. For example, safer insensitive high explosives may replace conventional main charges in nuclear explosive package primaries when feasible. Life extension designs can employ higher reliability components which may enable a smaller stockpile. Components and materials with known compatibility and aging issues or manufacturability problems may be replaced with better alternatives. Consistent with the Nuclear Posture Review (NPR) Report, LEPs can attempt to reduce the number of warhead types or support stockpile size reductions by formulating options for interoperable (common or adaptable) warheads that could be flexibly deployed across different delivery platforms.

All sustainment or modernization efforts will rely upon an extensive range of existing and contemplated experimental capabilities. In addition to already-formulated experimental efforts, the NNSA recognizes the value of subcritical experiments to further improve confidence in the ability to model nuclear processes. Such models are employed to support annual stockpile assessments and warhead life extension efforts. This integrated experimental approach will provide performance data for nuclear weapon system primaries and will augment confidence in the enterprise's predictive simulations by improving knowledge of how plutonium reacts when extremely compressed through the detonation of high explosives. To ensure successful execution and to maximize technical value, subcritical experiments will require the participation of significant portions of the enterprise. These experiments will exercise a variety of skills and toolsets, including manufacturing, assembly, diagnostics, and manipulation of special nuclear materials and high explosives.

Additionally, LLCs such as neutron generators, tritium gas transfer systems, or power sources deteriorate predictably with age and must be replaced before adversely affecting warhead function or personnel safety. The NNSA and DoD are jointly aligned on the needed deliveries for these components to ensure no weapon fails to meet requirements. Stimulated by changes in DoD requirements, NNSA now anticipates a greater LLC exchange workload than was assumed in the planning basis generated prior to completion of the Nuclear Posture Review for the FY 2011 Budget request.

Ongoing technology maturation and manufacturing readiness efforts are prerequisites to obtain successful outcomes to LEPs and to develop future exchange components. Maturation in anticipation of future needs allows the required safety, security, use control, and reliability technologies to be implemented in a timely and cost-effective fashion when demanded by LEP or LLC exchange efforts. The intent is to have a suite of options available for which, at a minimum, system or subsystem models or prototypes have already been demonstrated in relevant environments (Technology Readiness Level 6 or beyond). Full-scale engineering and production development for LEP or LLC exchange efforts will have a strong preference for options of such maturity or greater.

Figure 1 shows the planning schedule for stockpile life extensions and LLC exchange activities. The schedule is dependent on Nuclear Weapons Council approval of any new programs and funding authorizations and appropriations.

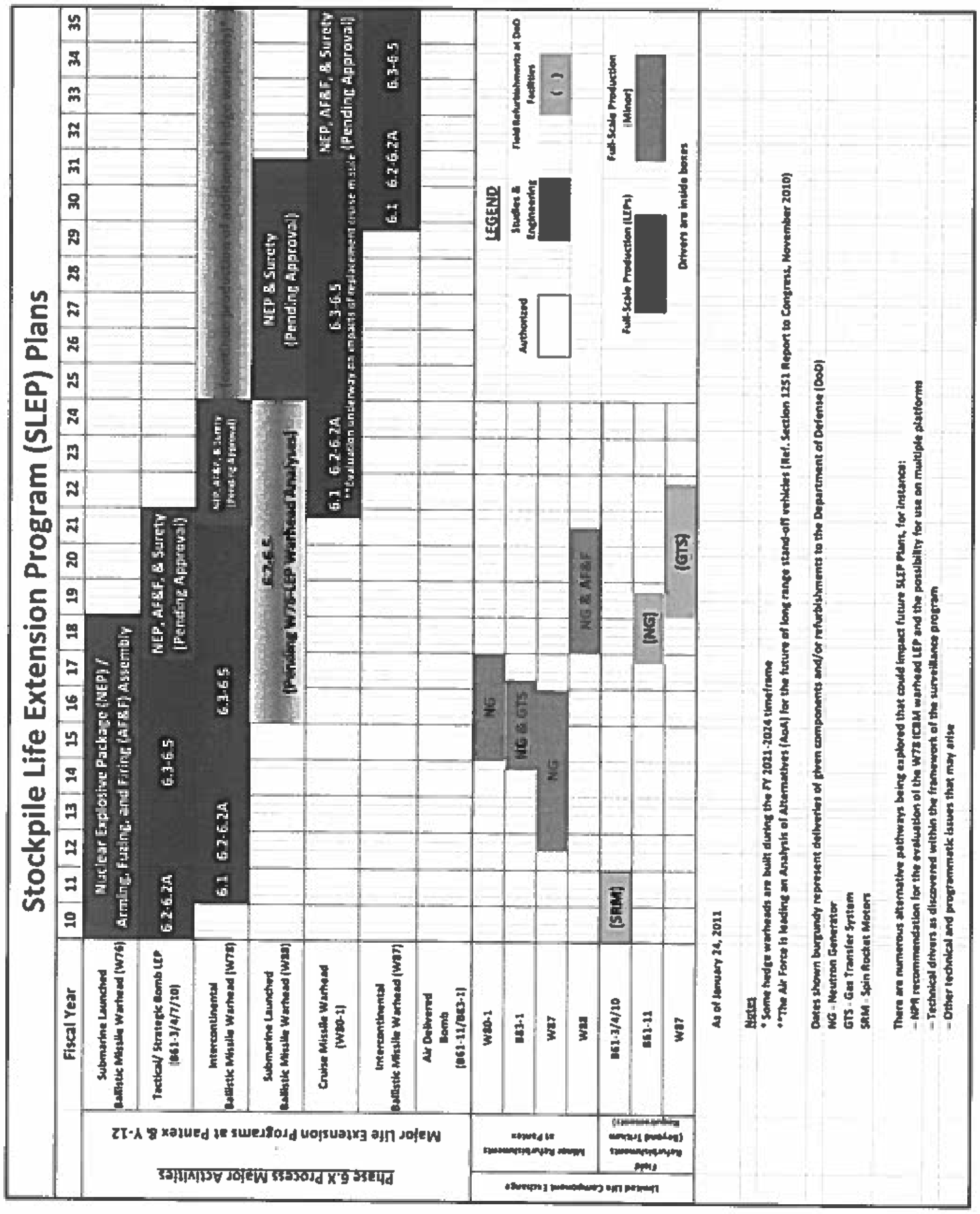
Near-term initiatives concerning LEPs include:

- Achieve full production quantities of W76-1 warheads and complete production by FY 2018, an adjustment of one year from the recommendation in the Nuclear Posture Review Report that is endorsed by the Nuclear Weapons Council.
- Complete B61 feasibility of alternatives and cost study (with accompanying technology maturation efforts) to support first production unit by FY 2017.
- Initiate in FY 2011 an Early Concepts Assessment (Phase 6.1) study for the W78 warhead in a manner that accounts for potential commonalities, adaptability, or interoperability with the W88 system.
- Conduct studies to consider, in response to a post-Nuclear Posture Review DoD request, a possible option to develop a common arming, fuzing, and firing (AF&F) component for the W88 and W78 warheads. Early development of a W88 AF&F makes the thorough evaluation of commonality options possible. Even if a high degree of commonality is ultimately not deemed appropriate, AF&F development plans would still allow for more efficient sustainment of the W88 by aligning the first production of a new W88 AF&F to begin in FY 2018 when limited-life neutron generator component exchanges are currently scheduled.

Near-term initiatives concerning LLC exchange efforts include:

- Full support of neutron generator production levels for the W76-0/1 and the W78-0 through 2012.

- Prepare to increase neutron generator production efforts beyond FY 2011, not only to continue meeting the needs of the W76-0/1 and W78-0, but also replace existing neutron generators in the W87, W80-1, B83-1, B61-11, B61-LEP, and W88.
- Replace the gas transfer system in the B83-1 bomb by 2017.



- **Note 1:** See FY 2011 Annex A, Chapter 1.G for definitions of the development process.
- **Note 2:** See classified FY 2012 Annex B for additional details.

Figure 1. Schedule for the Stockpile Life Extension Program and Limited Life Component Exchanges

Near-term initiatives concerning technology maturation efforts include:

- In FY 2011, formalize a Component Maturation Framework that will ensure rapid technology development and timely production deployment of weapons products that will be needed in the future for safety, security, use control, and/or reliability improvements.

Long-term and ongoing actions to be taken in the areas of LEPs, LLC exchanges, and technology maturation include:

- Support DoD study of options for the long range stand off missile that is under consideration; sustain the current W80 Air-Launched Cruise Missile warhead until the long range stand off missile is fielded.
- By FY 2031, extend through major LEP efforts, the current useful lifetime of the W76-0, W78-0, and W88-0 ballistic missile delivered warheads and the B61-3/4/7/10 aircraft delivered bombs.
- By 2015, provide a comprehensive science basis underpinning deployment of new safety technologies in the stockpile. This effort will rely on Dual Axis Radiographic and Hydrodynamic Testing for validation of the effects of new components on hydrodynamics, on the NNSA high energy density facilities (Z, Omega, and National Ignition Facility) for validating boost models, and on Advance Simulation and Computing peta-scale resources to simulate the effects of perturbations to the weapon.
- By FY 2031, eliminate known aging issues in several existing weapon systems through LEPs and, whenever feasible, resulting in a stockpile that incorporates modern safety, security, and use control features—such as insensitive high explosives, fire resistant pits, detonator safing, direct optical initiation or other advanced initiation approaches, multi-point safety designs, modern trajectory-sensing signal generators, and/or tamper-sensing systems. The FY 2012 classified Annex B, Chapter V–*Stockpile Life Extension* includes a table titled Summary of Safety, Security, and Reliability Features of Current Nuclear Weapons Systems and in an "Ideal" System. It is a summary of the improvements that might be achieved as a consequence of an overall LEP effort.
- Continue to support fully neutron generator production requirements to meet the needs of the nuclear weapon systems previously described. Expectations are that the total annual production quantities for neutron generators will range from 700 to 800 components between FY 2012 and FY 2017.
- Pursue continuous development of new technologies to enable excellence in future safety and security improvements to the stockpile as well as to address problems created by sunset materials and technologies in existing weapons.
- Address tritium demands (essential for the production of LLCs), by irradiation of source materials at steady-state rates to be achieved by FY 2019. These rates may be greater than three times present rates as a consequence of demands needed to support a new generation of gas transfer system designs. The detailed quantities that will be required are

contingent on decisions yet to be made by the Nuclear Weapons Council as part of the 6.X development and approval process.

- Manage development and production lead times to overcome challenges associated with the establishment of new suppliers or obtaining of alternate materials to replace those weapon-critical items that may no longer be available for purchase or involve single-source production vendors.
- If required by future LEPs, demonstrate pit reuse at the PF-4 facility by FY 2017.
- Apply the full spectrum of ST&E capabilities to certify the performance of the nuclear stockpile and to design, qualify, and manufacture all chosen life extension alternatives. ST&E experimental facilities will be used to 1) develop, improve, and validate physics-based models based on fundamental science, component, and system-scale tests; 2) assess weapon responses to the conditions outlined in the stockpile-to-target sequences; and 3) qualify and certify the safety, security, and reliability of all stockpile elements.

Retirement and Dismantlement

Weapons are retired from the stockpile as a result of changes in strategic requirements or because items are removed from the stockpile to be evaluated for surveillance purposes. The subsequent Weapons Dismantlement and Disposition process involves four major activities: disassembly, characterization, disposition, and weapon response analyses. Disassembly operations separate the warhead into its major components and materials. Components are then characterized to identify any potential hazards and ascertain classification issues that may be associated with individual parts. During disposition weapon components are earmarked for reuse, storage, recycling, surveillance, or disposal. Disposition may also include steps that demilitarize components so they cannot be used as originally intended, as well as the alteration of parts to declassify them for shipment to offsite salvage locations in accordance with federal regulations and Department of Energy (DOE) orders. Proper characterization and disposition ensure production sites do not become constrained by storage limitations. Weapon response analyses are performed to understand how dismantlement activities will be carried out in detail, and how subsystems and components will respond to the various operations. These analyses make certain that dismantlement and disposition operations will be conducted in a safe manner.

Many factors affect dismantlement rates, including the logistics required to conduct disassembly and inspection activities and the availability of technicians, equipment, and facilities. A dismantlement plan[2] for FY 2011 and future years was submitted to Congress in 2008. The information contained in that report is now updated in the classified FY 2012 SSMP

2 "National Nuclear Security Administration's Dismantlement Plan for FY 2011 and Future Years Associated with Reductions in the U.S. Nuclear Weapons Stockpile" (U); Classified Secret-Restricted Data Level; Submitted by: Administrator, NNSA on March 2008.

Annex B, Chapter II–*Weapon Dismantlement-General*. This plan accounts for additional retirements projected from the post-Nuclear Posture Review stockpile configuration. A primary goal is to take advantage of the momentum generated by the completion of safety reviews and documented safety analyses for the handling, disassembly, and inspection of all existing weapon systems under the Seamless Safety for the 21st century initiative to enable dismantlements across the entire spectrum of retired assets.

Near-term initiatives concerning dismantlements or retired warheads or bombs include:

- Continue dismantlement of retired B53 nuclear bombs in FY 2011.

Longer-term and ongoing actions to be taken in this area include:

- Dismantle all nuclear weapons retired prior to 2009 no later than the end of FY 2022.

III. Science, Technology, and Engineering—The Base of Stockpile Stewardship and Management

Science, technology, and engineering (ST&E) is the fundamental underpinning of the SSMP; it provides the basis for annual assessment and certification without the need to resume underground nuclear testing (UGT). Key decisions involving all aspects of weapon production, operation, and delivery are enabled through analysis and computational assessment of stockpile aging and evolution. This evolution includes changes in production, manufacturing, dismantlement methods and the insertion of modern technologies. This analysis is used to predict impending reliability concerns, evaluate life extension options, incorporate modern weapon safety, security, and use control, and evaluate production methods for the realization of stockpile modernization. Annex C provides a detailed description of the use of predictive capability to satisfy requirements for annual assessment, assess the effects of past stockpile maintenance actions, and enable future stockpile modernization.

The suite of planned ST&E activities throughout the next decade is closely aligned with identified stockpile needs and the 2010 Nuclear Posture Review (NPR) Report, and an outline of this planning is provided in this chapter. These activities are detailed in the implementation plans of the many sub-elements of ST&E (e.g., the Science Campaign sub-program on Dynamic Materials Properties). Extension into the longer term, out to 2031, focuses on emerging nuclear security challenges to ensure continued nuclear deterrence effectiveness; decrease the size of the nuclear weapons stockpile while incorporating advanced safety, security, and use control; and reduce the threat of technological surprise or nuclear proliferation.

ST&E is the Basis for Stockpile Stewardship and Management Analysis

The NNSA's ST&E capabilities are interwoven throughout the enterprise, providing the fundamental basis for SSMP. These capabilities are called upon to serve six principal roles:

- execute annual assessment of stockpile safety, security, and reliability;
- improve surveillance and monitoring of the stockpile condition including identification and resolution of Significant Finding Investigations;
- continue analysis of options for maintaining and modifying the future stockpile–the core of the Life Extension Program (LEP);
- develop and mature the technologies leading to components for future stockpile modernization;
- deliver certification that LEP products meet military requirements before entering the stockpile; and

- provide protection against a diverse set of emerging national security challenges, including nuclear deterrence, global threats of nuclear proliferation, and domestic energy independence.

Annual assessment of the stockpile is the process through which most stockpile decisions are made and provides the basis to assure the President of continued stockpile effectiveness without the need to resume UGT. Since the cessation of UGT, the annual assessment process has required greater fidelity in surveillance data, has emphasized understanding aging trends beyond original manufacturing defects, and has placed a greater reliance on numerical simulations. These simulations have incorporated progressively more detailed scientific understanding of critical physical phenomena at the extreme conditions spanning the stockpile-to-target sequences and nuclear explosions. These simulations use sophisticated models and numerical algorithms developed in the Advanced Simulation and Computing program and validated through extensive analysis of data from both the past UGT archive and sophisticated new experiments. The extraordinarily high reliability requirements (for example, a one in a million risk of inadvertent detonation in abnormal environments) and the need for assurance of a weapon's continued readiness over decades requires the use of the same rigorous ST&E methods for nuclear and non-nuclear weapon components, sub-systems, and systems.

The degree of confidence in nuclear weapons assessments is based upon the combined verification and validation of predictive simulation codes, physical models, and the quantification of uncertainties associated with the simulations used to support the assessments. Verification and validation is a scientific process to ascertain that a simulation is "right for the right reason." Verification provides evidence of the correctness of the computer coding in solving the pertinent equations, while validation assesses the adequacy of the physical models used in the code to represent the real situation. Since nuclear weapon simulations must extrapolate far beyond available data and must predict coupled, multi-scale physical phenomena that are difficult to isolate in experiments, verification and validation is a significant unifying challenge to Stockpile Stewardship.

Performance metrics for stockpile safety and reliability are expressed in the context of Quantification of Margins and Uncertainties. These performance metrics can be straightforward, such as measures of the integrated nuclear yield or the variability of a weapon's primary output versus the design specification. The metrics can be increasingly complex, such as the time-phased evolution of primary performance through high explosive detonation, fission burn, and fusion boost. Verification and validation combined with metric uncertainty quantification form the foundation of the formal Quantification of Margins and Uncertainties methodology, which has matured through peer review within the NNSA and by JASON independent scientific panel and the National Academy of Sciences.

Regular refinement and re-prioritization of ST&E activities are influenced by metric development and Quantification of Margins and Uncertainties assessment. For example, nuclear explosive package assessments today depend on empirical factors used to calibrate simulation codes through prudent consideration of UGT data. An aggressive ST&E program is replacing these empirical factors with scientifically validated fundamental data and physical models for predictive capability. As the stockpile continues to change due to aging and through the inclusion of modernization features for enhanced safety and security, the validity of calibrated simulations decreases, raising the uncertainty and need for predictive capability. Increased computational capability and confidence in the validity of comprehensive science-based theoretical and numerical models will allow assessments of weapons performance in situations that were not directly tested. These codes, combined with past UGT and non-nuclear test data and the expert judgment of weapons scientists, form a unique pillar of the stockpile assessment program. Ensuring that critical competence remains will require capturing judgment within calibrated simulation codes as well as making the necessary scientific advances needed to implement predictive capability. Despite the considerable advances made within the ST&E activities, it is certain that there is no simple set of technical criteria—absent expert interpretation and judgment—which will assure the safe and reliable performance of a nuclear weapon.

A comprehensive science and technology program provides the methods needed for advancing predictive capabilities used in simulations of weapons performance. This program includes utilizing the NNSA's unique facilities to provide measurement of fundamental materials properties for the extreme conditions found in nuclear weapons. These facilities include the Joint Actinide Shock Physics Experimental Research for measurements of plutonium properties, the Lujan Neutron Scattering Center for the data used to understand nuclear reactions occurring in weapons and a broad array of intermediate and small scale facilities. The science and technology program also requires complex integrated experiments that test significant portions of weapons performance. These integrated experiments help to validate annual assessments and exercise the broader enterprise responsible for stockpile stewardship. A regular series of hydrodynamic experiments at the Dual Axis Radiographic Hydrotest facility is providing detailed high resolution three-dimensional information needed to resolve significant finding investigations. Sub-critical nuclear experiments at the Nevada National Security Site are providing new insights into plutonium behavior, future stockpile safety options and the effects of aging.

Nuclear weapon surveillance, including laboratory and flight tests, is a critical element of reliability assessment. The original Stockpile Evaluation Program assessed whether a weapon was manufactured to design specifications and if the material choices and/or production processes used inadvertently introduced undesirable attributes. The Enhanced Surveillance program provides methods to assess materials aging effects and evaluation tools needed to predict when weapons will experience significant performance degradation. For example, this increased understanding of surveillance was demonstrated by the 2006 determination that stockpile pits were aging gracefully and the prediction that they would continue to perform for a number of decades into the future. Efforts are underway to improve further the effectiveness of the Stockpile Evaluation Program by developing metrics to describe the results of realized and non-realized surveillance activities, as well as by enhancing integration of the Surveillance Enterprise. New statistical analysis tools are being developed to evaluate actual surveillance data (realized) and account for missing data (non-realized), thus generating improved estimates of stockpile health.

While the importance of ST&E to the basic research, design, and certification of the stockpile is obvious, ST&E also plays a major role in the technology maturation, production, and quality assurance of stockpile components and systems. To mature and produce products for stockpile life extension, production sites require exceptional manufacturing capabilities and expertise. For example, the production agencies develop production strategies, design manufacturing processes, and execute material studies to assure contaminant free and compatible cleaning, packaging, handling, and assembly of weapon system components in an environment of high security. Production scientists and engineers develop product acceptance protocols and processes capable of detecting counterfeit and otherwise substandard purchased components. Often, design specifications and production processes push commercial equipment beyond its normal limits. Custom adaptations must often be integrated with commercial systems, and, in many cases, test equipment, tooling, and production gauging must be custom designed to enable first production and to support steady-state production commitments.

ST&E goes beyond design, production, testing, and product assurance. It also includes special knowledge and expertise for building and maintaining much of the necessary physical infrastructure for the enterprise. ST&E is critical in the design and construction of major research and production facilities. For example, the transformation of the Kansas City Plant requires considerable expertise and capabilities to ensure that special production environments can be maintained, cross contamination concerns are eliminated, and future flexibility is sustained to minimize the time and money necessary to reconfigure the non-nuclear manufacturing infrastructure for future stockpile needs. The Kansas City Plant has used facility-focused ST&E to realize the concept of a "responsive infrastructure" that can quickly and economically adapt to changing mission needs for decades to come.

The production of components to support limited life component exchange (LLCE) and LEP activities generates a large number of technical challenges and may involve production processes that have not been exercised in decades. During long suspensions in production, materials and equipment become obsolete, vendors go out of business or lose interest, and knowledge can be lost. A number of technical challenges related to production are identified and addressed in advance at production sites through mechanisms such as plant-directed research and development, campaigns, and Directed Stockpile Work. History has shown, however, that there are always unanticipated issues that arise during the maturation of production processes, just as there are during the maturation of the designs themselves. Under the ST&E umbrella, issues are addressed collaboratively between the plants and the laboratories. For example, ST&E has addressed problems encountered during neutron generator manufacturing, such as the issue of "choking" discussed in Annex C.

Recent ST&E Advances in Stockpile Stewardship and Management

The retention of nuclear weapons in the stockpile beyond original expectation has, in several situations, resulted in potential changes in performance inconsistent with the original weapon design intent and military specifications. See Annex C for illustration of how modern assessment techniques that provide detailed surveillance information have become sufficiently robust to uncover problems that were not anticipated during the UGT era.

At the inception of the NNSA Accelerated Strategic Computing Initiative in 1995, the goal of developing a practical computing platform with a peak speed of 100 teraflops (1 teraflop equals 10^{12} floating point operations per second [flops]) was established to conduct full-scale numerical weapon simulations with reasonable efficiency (turnaround time) and resolution. Realization of such efficient capabilities required synergistic development of hardware, algorithms, and computing techniques. A 100 teraflops capability was achieved in 2005 with the successful deployment of the Purple machine. Utilization of this capability quickly showed that this estimated capacity was not adequate to reduce simulation uncertainties and errors. The Roadrunner system demonstrated world-class petaflop (10^{15} flops) performance in 2008. Again, experience revealed that emerging challenges related to aging and stockpile modernization require increased computational capability beyond this goal for two basic reasons: 1) improved resolution and geometric fidelity is needed to address the inherently three dimensional nature of safety and security requirements, and 2) increased computations per zone are needed for "sub-grid" models to implement fundamental science advances in materials models. These and other key elements of an effective predictive capability require expanded data-intensive computing with continued development of new algorithms and techniques in conjunction with hardware advances to handle multi-physics, multi-scale simulations. These trends in anticipated computational needs now approach exa-scale (a million trillion calculations per second or 10^{18} flops) in the 2018 to 2024 timeframe. The need for a value of exa-scale capability is gaining recognition and support from multiple agencies and missions.

Advances in simulation capability are being matched by advances in experimental validation of the physics within the simulations and in the experimental verification of the predicated integral performance. On this front, the first weapon-relevant physics experiment of the National Ignition Campaign has been successfully completed and high-compression Pu experiments have resumed on the Z machine—both yielding increased understanding of relevant materials behavior at extremes. Dual-Axis Radiographic Hydrodynamic Test second axis is fully operational, providing two orthogonal views and five time-separated, high-resolution images. This capability has been used for several hydrotest experiments for both Los Alamos National Laboratory and Lawrence Livermore National Laboratory weapon systems supporting both life extension and physics understanding. Hydrotests are the tests performed to study the hydrodynamic performance of integrated primary components. The multiple late-time imaging Dual-Axis Radiographic Hydrodynamic Test feature is proving to be particularly valuable.

The successful 2010 resolution of the long standing differences in fission products analysis and in the long-sought resolution of the energy balance problem are remarkable demonstrations of the power of science and technology emphasis. Similarly, the development of predictive capabilities has driven considerable advances in the fundamental understanding of materials needed for nuclear weapons. This, in turn, has enabled the replacement of materials and technologies that are no longer available and the introduction of new manufacturing approaches, which was experienced in the W76-1 production. This has somewhat alleviated the need to attempt to reproduce weapons exactly as they were originally manufactured and tested.

The Qualification Alternatives to the Sandia Pulsed Reactor program for electronic subsystem survivability in fast neutron and gamma environments represents another recent success. While UGTs and the Sandia Pulse Reactor (SPR)-III provided a few representative threat environments, the complete range of stockpile-to-target sequence threats was never addressed by the historical experimental-proof-test approach. The science-based Qualification Alternatives to the SPR program has revealed several important limitations to the previous qualification methodology for silicon transistors and is helping guide the development of new compound semiconductor technology for improved hardness to neutron displacement damage. The Qualification Alternatives to the SPR approach incorporates Quantification of Margins and Uncertainties and is enabling a much more complete electronic component assessment over the entire range of potential threats; this program will enhance component maturation for future stockpile modernization.

The Inertial Confinement Fusion (ICF) program is currently focused on the grand challenge of achieving ignition at the National Ignition Facility. As stated previously, the National Ignition Campaign executed the first National Ignition Facility weapon physics experiment in FY 2010. This was not the credible fusion experiment that was expected in FY 2010 due to unexpected scientific and technical challenges. The current plan for the National Ignition Campaign is to demonstrate ignition (gain equal to or greater than by the end of the third quarter of FY 2012. Continued support for stockpile ST&E will progress through the development of a) robust ignition platforms to study burn physics, b) new platforms, including applications of ignition, to drive experiments to the highest energy densities representative of weapons extremes, and c) a suite of experimental capabilities required to obtain data in areas of radiation transport, equation of state, complex hydrodynamics, opacity, and integrated implosions.

Methods and Structure for ST&E Planning and Future Development

Today's level of physics-based understanding is adequate to predict performance at a level that supports many aspects of improved flexibility and responsiveness in future life extension activities. Further enhanced predictive capabilities are, however, essential to enable the continuing introduction of modern safety and security features. The options available to policy makers are bound by these ST&E capabilities; these capabilities determine what can be engineered and the spectrum of changes that can be confidently assessed without UGT.

Because today's weapons assessment limitations have financial and policy implications, continued progress toward detailed predictive capability is imperative.

The robust NNSA ST&E capability developed over the past two decades has successfully assessed the nuclear weapons stockpile without the need for UGT, and it is now poised to enhance responsiveness to future stockpile modernization through the provision of increased confidence in the deterrent. Implementation of the Nuclear Posture Review vision will demand increasingly sophisticated scientific and engineering methodologies that will be enabled through continued scientific discovery and technological innovation.

The forward-looking ST&E planning is composed of four main parts:

- **Documentation of fundamental requirements.** The key elements of weapons analysis are contained in the ST&E sub-element program plans.
- **Predictive Capability Framework (PCF).** A framework used to organize, coordinate, and schedule experimental and theoretical activities to meet the requirements from above.
- **Component Maturation Framework (CMF).** A framework that ensures that new technologies are available for insertion in time to meet LEP and LLC exchange goals.
- **Detailed Implementation.** ST&E results are obtained through specific campaigns and annual assessment.

Experience suggests that unexpected nuclear weapon issues will continue to emerge. These dynamic trends in aging, the increasing need for design modifications implemented through LEPs, and unexpected surveillance observations leading to challenging significant finding investigations combine to make the coupled PCF and the CMF living documents that must be made responsive to the learning process.

The PCF provides a long-term roadmap that integrates ST&E and Directed Stockpile Work activities in order to answer questions that are crucial to continuing assessment and certification of the evolving stockpile and the deterrent. The PCF process first organizes and assesses the fundamental requirements, then produces a schedule of interrelated activities that will satisfy the basic requirements. A high-level overview of the process is summarized in a sequenced series of "pegposts" as illustrated in Figure 2. The pegposts represent the culmination of a major body of work aimed at a better understanding of some key weapons issues such as "burn-boost." As shown in the figure, specific experimental and theoretical activities are scheduled that address the four key components of weapons assessment:

- Safety and security;
- Nuclear explosive package assessment;
- Engineering assessment;
- Hostile Environments, Outputs, and Effects.

A detailed flow of activities linked to specific milestones and performance goals underlies each of the pegposts. An example of this sub-pegpost detail is the national plan referred to as the National Boost Initiative.

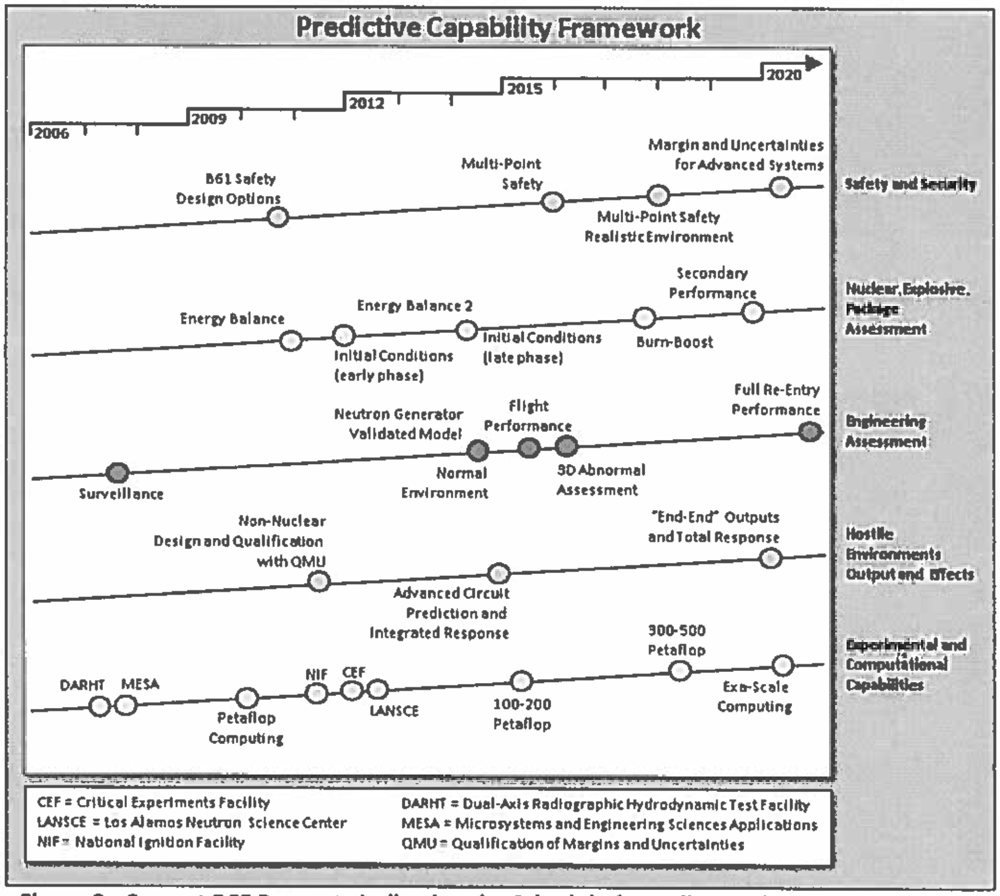


Figure 2. Current PCF Pegposts Indicating the Schedule for Delivery of Key Advancements in the Ability to Analyze and Predict Weapon Performance, Aging, and Evolution

The pegposts have been well defined to 2020. In the period from 2020 to 2031, the PCF methodology described above will be utilized to make projections of the key areas where technical advances will greatly enhance assessment, certification, and surveillance processes. For example, in using the PCF process to organize the response to Primary or Secondary requirements, the limits imposed by near-term computing power are carefully considered. In the case of certain important materials properties, it is clear that a strong push to exa-scale computing in the 2018 to 2021 timeframe will greatly enhance the ability to estimate long term system performance issues.

Using this methodology, some of the key areas of emphasis in the period from 2020 to 2031 will be:

- Much greater emphasis and reliance on high-fidelity (including three dimensional and high-resolution) simulations and their validation through increasingly complex experiments to address key uncertainties defined by the PCF advances through 2020. Advanced computational power will enable more complete assessments.
- More complete and sophisticated materials science and turbulence models. These models will provide a more complete picture of key materials phenomena that are essential to certification and assessment.
- High-precision nuclear cross-section theory and measurements, especially for fission reactions, to improve understanding of nuclear criticality.
- Detailed use of ignition-level experimental conditions as developed and included in the Inertial Confinement Fusion activities. This capability will provide a thorough and integrated test of predictive and analytical tools over a significant range of relevant weapons phenomena.
- Use of non-ignition High-Energy-Density Physics experiments. This capability will include the extension of conditions of pressure, temperature, and density previously unavailable anywhere in the laboratory environment.
- Greater use of "comprehensive" end-to-end simulations to better understand weapon performance where testing is not possible.
- More sophisticated engineering code evaluation of key technology questions.

Advancement of predictive capability also helps to mitigate technological surprise within the broader nuclear arena. Similar to the PCF, the CMF methodology is emerging to serve as a long-term planning tool that integrates the development and production of physical hardware (components). Working in concert these planning methodologies ensure that predictive tools and physical hardware are matured in a timely fashion for stockpile sustainment. These strategies are coupled because the CMF includes the maturation plans for development and production of stockpile sustainment components. PCF provides the tools and capabilities for establishing the environments that those components will witness and the qualification of those components in meeting performance specifications. In addition, PCF provides the capability to certify weapons when various component changes and/or additions are employed. Figure 3 depicts the aforementioned PCF and CMF complimentary goals and objectives.

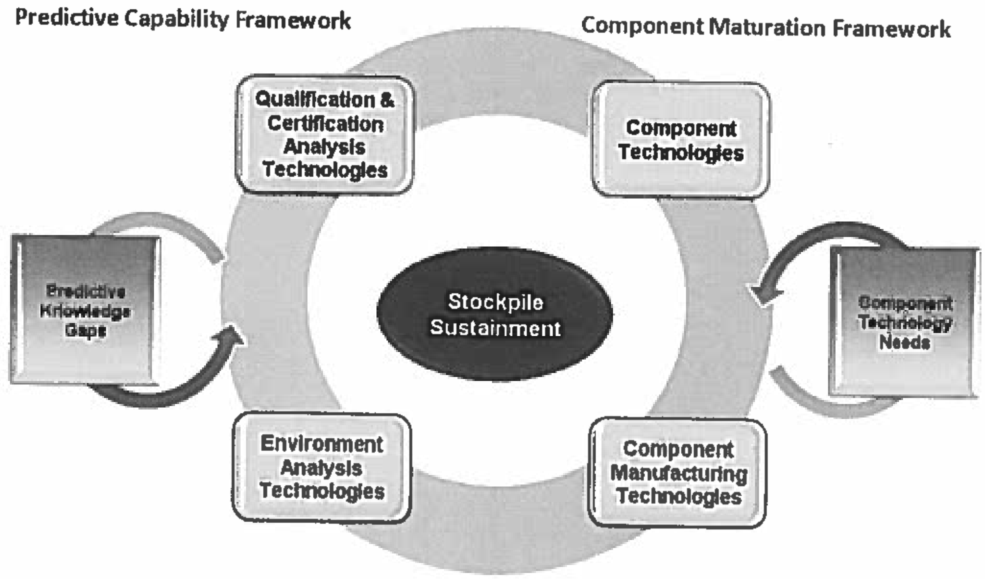


Figure 3. Direct Coupling Between Predictive Capability Framework and the Component Maturation Framework

Nuclear weapons are complex systems comprised of non-nuclear and nuclear systems, subsystems, and components. These subsystems and components are designed and incorporated in weapons to meet high level requirements such as Presidential Directives, Requirements Planning Document (outlines stockpile size and characteristics), military characteristics, and stockpile-to-target sequence. The Components of systems and subsystems periodically require replacements due to an abnormality discovered during surveillance (aging or birth defects), or design flaws. In addition, new components are required to meet enhanced safety and security requirements. Development of new or replacement components is directly affected by the evolution of the state-of-the-art for certain technologies. For example, the microelectronics industry continues rapid evolution to smaller feature size and lower operating voltages. The NNSA's radiation-hardened and specialized microelectronic device development capabilities must remain close to industry capabilities to maintain compatibility with industry tools and instruments supporting the development, production, and maintenance of devices, as well as to enable straightforward integration of specialized and commercial devices in circuit design. Such necessary linkages to industry capabilities often mean that simple component replacement is not feasible due to sunset technologies, discontinued supply chain capabilities, moratoriums on using certain materials, improved manufacturability of alternative technologies, better qualification capabilities that allow alternative technologies, and obsolete technologies, thus requiring new product development for stockpile insertion. The CMF is a strategy to mature component technologies such that they are ready for insertion during life extensions (both Modifications and Alterations) and Limited Life Component Exchanges.

The readiness levels of components for insertion include Technology Readiness Levels and Manufacturing Readiness Levels. The plan for component development flows through the high level requirements (e.g., Requirements and Planning Document) through the Technical Basis for

Stockpile Transformation process, which identifies the need to replace components due to defects or their end-of-life, or plans for enhanced safety, security and reliability. Thus, options for new or replaced components are first identified in the Technical Basis for Stockpile Transformation. Programmatically, options are matured with the development piece funded in the Engineering Campaign (surety and enhanced surveillance), and Directed Stockpile Work stockpile services for non-nuclear component development (e.g., radars). The manufacturing readiness is supported in the Readiness Campaign. Figure 4 outlines the flow of requirement and programmatic resources for the maturation of components.

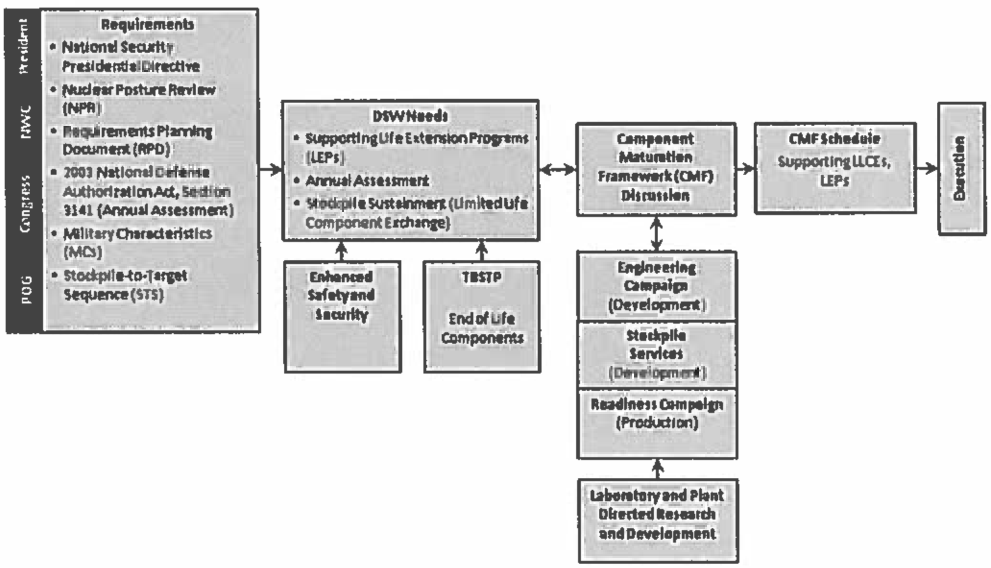


Figure 4. Vision of CMF's Role in the Management of the Technology Maturation Portfolio

The NNSA has developed the CMF by receiving inputs for component maturation and placing the information into a tabular spread sheet. Information gathered includes the systems, subsystems, and components; the LEP or LLCE that the component supports; the date of achieving Technology Readiness Level 7 (final development of the component demonstrated in operating environment) and Manufacturing Readiness Level 6 (manufacturing system integration); and the pacing elements on the critical path for reaching those technology readiness levels. Figure 5 depicts the subsystems being developed to sustain the stockpile.

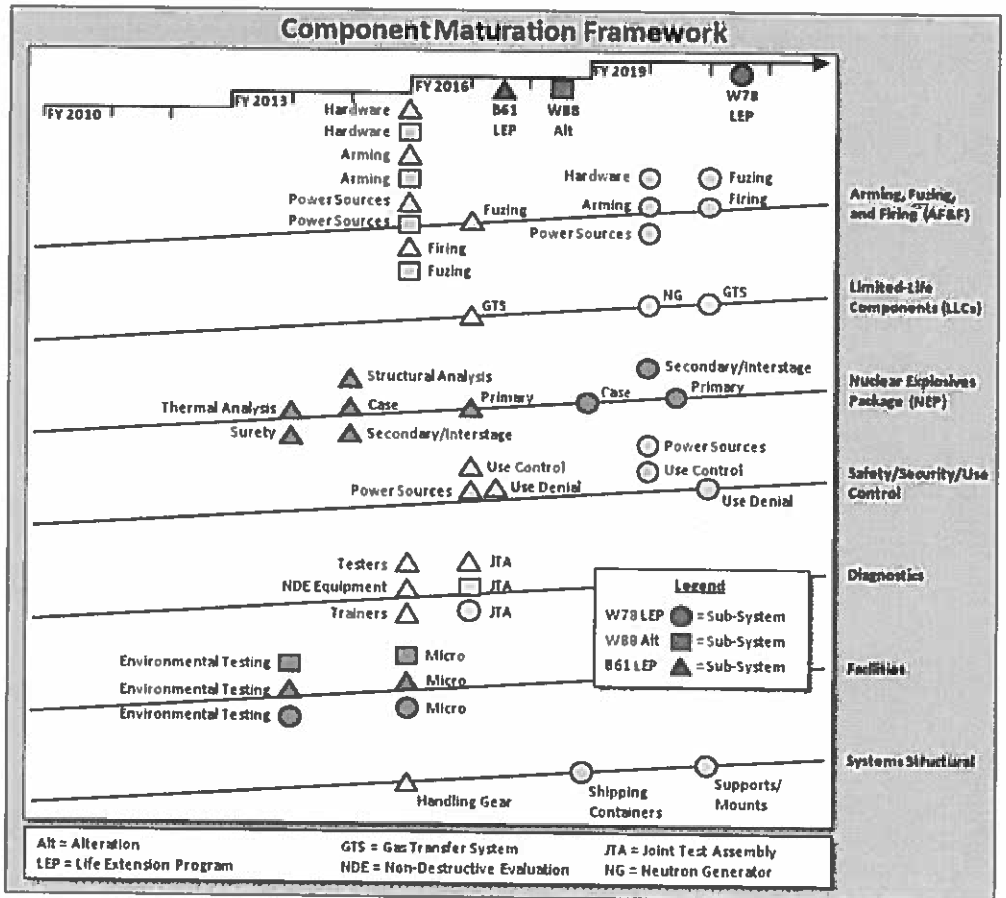


Figure 5. Component Maturation Framework, Revision 0

For each of these subsystems, a host of components is needed for stockpile sustainment.

The CMF will outline all of the development and production activities needed for component maturation. These activities will be resourced in the respective programs and then managed as a major technical effort with maturation levels tracked and managed. The CMF will be used to communicate component technology resource requirements and the status of those technologies being developed to meet stockpile sustainment timelines.

The down-select of systems, sub-systems, and components for LEPs will continue to follow the 6.X process with down-select of technologies ultimately decided by the Nuclear Weapons Council. The CMF contributes to this process by maturing alternative technologies so that maturation will not be an issue when down-selecting.

The next stage of the CMF will be to enhance non-LEP technology entries to include additional LLCEs and the tools and equipment required for infrastructure recapitalization, including the maturation of technologies required for the Uranium Processing Facility. In addition, a demonstration of PCF and CMF integration will be pursued using the components and predictive tools needed to mature and qualify multi-point safety.

The PCF and CMF have developed well-defined integrated plans to 2020; basic trends for plan extension to 2031 are relatively clear. In the period from 2020 to 2031, projections identify key areas where technological advances will greatly enhance the assessment, certification, surveillance, and modernization of the stockpile. For example, by using the PCF process to organize the response to Nuclear Explosive Package requirements, the limits imposed by near-term computing power are carefully considered. In the case of primary performance, complete three-dimensional simulations of boost cavity formation will provide enhanced confidence in performance. In the case of modeling of key materials such as the behavior of plutonium at very high pressure, exa-scale computing will enable predictive capability—founded in first-principles theoretical understanding—that is currently out of reach. The main issues and expected responses extended to the 2031 timeframe are:

- **Weapons materials aging and replacement material qualification:** As materials age and require replacement, there will be an increasing need for more sophistication in predicting their behavior under weapons conditions. In addition, as unavoidable changes in the stockpile occur, models for materials behavior will need to be more closely related to fundamental thermodynamic and physical properties; i.e., to "first principles."
  - **Response:** Exa-scale computing will enable prediction of the properties of the most important materials beginning from first principles. To fully realize this predictive capability, characterization of the dynamic and aged properties of weapons materials will inform and validate new higher fidelity models.
- **Accurate prediction of the boost phase of primary performance:** The National Boost Initiative will produce very valuable results by 2020 that will greatly enhance predictive capability for certification. The National Boost Initiative is unlikely, however, to settle all issues associated with the very complex phenomena of boost cavity formation, boundary turbulence, and mix.
  - **Response:** A thorough investigation of burning plasma conditions will be performed at the National Ignition Facility. This work will discover new coupled effects and future high-gain experiments needed to examine key weapons effects. After 2020, consideration of upgrades to igniting plasma systems using lasers or pulsed power drivers will be needed to meet the postulated weapons requirements.
- **The continuing value of large scale, integrated, hydrodynamic experiments:** Large scale, integrated, hydrodynamic experiments that test many aspects of the early phase of weapons operation can be performed at the Dual-Axis Radiographic Hydrodynamic Test Facility and Contained Firing Facility. These experiments are essential to simulation code validation, Significant Finding Investigation resolution, annual stockpile assessment and certification, component performance assessments; and to establish confidence in stockpile modernization options. Experiments that include special nuclear material will become more important as aging continues and modernization design options become more complex. A

commitment has been made to investigate the value of subcritical experiments to improve design confidence and code validation. Positive results in this work will likely result in the need for advancements in experimental diagnostics, including advanced radiographic tools.

- **Response:** A key element of the current effort involving subcritical experiments for scaling and surrogacy will be an assessment of the need for more sophisticated experiments.

- **Full use of exa-scale computing power through extensive model development and validation:** With the onset of exa-scale computation capability there will be much greater emphasis and reliance on three-dimensional simulations and their validation. Increasingly complex experiments will be needed to obtain this validation, but the payback will be a significantly improved predictive three-dimensional software package that will reduce current simulation uncertainties.
  - **Response:** In order to take advantage of this computational power, there will need to be commensurate progress in modeling and software development. The experimental validation of these new tools will require new experimental approaches related to measuring complex materials behavior and investigating extreme conditions such as igniting plasmas.
- **Transforming surveillance capabilities to better predict materials aging and coupled effects resulting from actual weapons environments:** As the stockpile continues to age and materials replacements must be made, there will be an even greater need to accurately monitor the physical state of the stockpile. Surveillance will move away from observing defects introduced by manufacturing to the production of quantitative data that can be used to identify aging changes.
  - **Response:** The development of new diagnostic tools for enhanced surveillance is leading to the maturation of new techniques and their subsequent migration to the Stockpile Evaluation Program. More emphasis on quantitative measurements and non-destructive techniques will be needed to ensure stockpile reliability in the future.
- **Maintaining weapons design, engineering, and key manufacturing capabilities in the 40 years beyond the last nuclear test:** By 2025 there will be no remaining personnel with actual underground nuclear test design and operation expertise.
  - **Response:** The future contractor workforce will be attracted to a nationally important program to ensure confidence in the nuclear weapon stockpile and challenges of the broader Nuclear Security Enterprise. The requisite computer simulation capabilities coupled with increasingly complex experimental science will establish needed training and competency for the future.

The broad influence of advanced ST&E can only be realized when viewed through the perspective of the broader national security mission. This mission applies to the breadth of research spanning from fundamental scientific discovery associated with the exploration of thermo-nuclear burn and other laws of physics, to applied challenges related to the development of new detectors to locate improvised explosive devices, to the model and simulation capabilities necessary to perform global climate modeling. Over the past 5 years, the NNSA has demonstrated great success in responding to challenges from the national security and deterrence landscape. Advances have been made in areas such as nuclear forensics that aid in attribution, the development of render-safe technologies, the assessment of foreign weapons, and the detection of clandestine weapons materials. Response to these emerging challenges has been rapid and efficient, in large part due to the existence of the workforce and nuclear materials infrastructure of the Nuclear Security Enterprise. Additional budgetary support from these activities directly adds to Nuclear Security Enterprise capabilities. Plans to further enhance the broader Nuclear Security Enterprise are being developed, and these plans are further enabled by increased collaboration among NNSA's nuclear weapons, and nonproliferation programs, and Intelligence Community elements.

IV. Physical Infrastructure

This chapter, along with Chapters V and VI, supersede the FY 2011 Annex D report titled "Biennial Plan and Budget Assessment on the Modernization and Refurbishment of the Nuclear Security Complex."

Chapter IV provides the plan for the NNSA physical infrastructure revitalization and sustainment over the next 20 years. The SSMP identifies baseline capacities for critical NNSA mission functions—such as plutonium and uranium—and identifies and prioritizes at-risk physical infrastructure assets. The focus is on NNSA-owned, leased, and permitted physical infrastructure that is required to support weapons activities. Physical infrastructure planning begins with the Future-Years Nuclear Security Program (FYNSP) near-term projects that are approved for the 5-year budget (FYNSP=5 years). These near-term projects have a minimum of a Critical Decision (CD)-0 justification for mission need, and frequently have matured to having an alternatives analysis with an approved CD-1 that supports design of the approved/preferred alternative. Additionally, CD-0 approval allows the Program to request project engineering and design funds for use in preliminary design, final design, and baseline development. Establishment of a performance baseline provides the foundation for the submission of a budget request for the total project cost. There is a very defined and measured process for requesting capital resources to support design and construction for the projects once they have received this level of maturity (CD-0 and CD-1) as they become part of the program for the acquisition of capital assets.

Budget assumptions support planning for proposed projects from FY 2017 through FY 2031. These assumptions are presented in Chapter VI. In order to plan for this period, the NNSA sites submit proposed projects that support the closure of mission gaps or known infrastructure risks for mission functions. All proposed mission gaps are evaluated annually by site physical infrastructure experts and the programs, and an enterprise-wide priority list of approved and proposed projects is developed. This enterprise-wide Integrated Priority List is constrained based on the FYNSP and post-FYNSP budget assumptions for the 20-year planning horizon. Given the 20-year, long-term schedule, there is flexibility in the planning process to adjust proposed projects based on changes in requirements, priorities, assumptions, and budget.

The NNSA recognizes that the proposed physical infrastructure information presented in this Plan does not represent activities or projects that are currently poised for decision. Rather, physical infrastructure proposed projects are designed for planning purposes and adhere to applicable DOE/NNSA National Environmental Policy Act implementing processes and procedures.

Capability and Capacity Objectives

Table 2 summarizes the current and future (pre-2031) capacities for each major NNSA mission function that directly supports weapons production and delivery. Color codes are used based on post-NPR stockpiles to highlight known mission functions at risk within the enterprise's physical infrastructure or programmatic equipment. The mission functions have been revised from the FY 2011 SSMP, Annex D, Table D-1, with specific changes addressed in the last column in the table. Physical infrastructure or programmatic equipment remedies to mitigate known risk are identified in Table 2 for the mission function, when appropriate.

The color coding on Table 2 is defined as follows:

- Existing and/or future capacity estimated to be sufficient for post-NPR stockpiles with a bounded number of hedge warheads to be maintained.
- Capacity is sufficient, but existing infrastructure is economically inefficient.
- Existing capacity is subjective and may or may not be sufficient today for future post-NPR stockpiles.
- Existing capacity estimated to be sufficient today for post-NPR stockpiles but age and condition of current infrastructure make it highly unreliable for being sustained longer-term.
- Existing capacity is not sufficient for post-NPR stockpiles.

Table 2. Rate Limiting Capability and Future Projected Capacities for Weapons Activities

Function	Rate-Limiting Capability	Baseline Capacity Today	Future Capacity	Risk Mitigation Needed to Ensure Future Capacity	Changes from 2011 SSMP
Design, Certification, Experiments, and Surveillance	Number of simultaneous LEPs supportable	1 LEP	2-3 LEPs[3]	Support laboratories, experiment site and plants ST&E capabilities and phasing of LEP activities	
	Warhead certifications and assessments	Up to 8 warheads	Up to 8 warhead types	Stable support for NNSS and lab ST&E capabilities and surveillance	
	Computational Science	Petaflops	Exaflops	Implement Exa-scale	New (added)– computing capability has short technological lifetime

3 The Stockpile Life Extension Program (SLEP) plans, presented in Chapter II, define requirements for the phased approach required to support the enduring stockpile.

Table 2. Rate Limiting Capability and Future Projected Capacities for Weapons Activities (*continued*)

Function	Rate-Limiting Capability	Baseline Capacity Today	Future Capacity	Risk Mitigation Needed to Ensure Future Capacity	Changes from 2011 SSMP
	Environmental Testing	Capacity is subjective due to aging equipment and infrastructure for LLCs and 2 phased LEPs	Sufficient for LLCs and 2 phased LEPs	Complete Test Capabilities Revitalization Phase II; continue refurbishment of Tonopah Test Range; and evaluate alternatives for hostile and major environmental test capabilities	New (added)—construction will support B61 LEP First Production Unit
	Hydrodynamic experiments with Pu	Radiography not sufficient for all experiments at NNSS	Sufficient to support all subcritical scenarios	Evaluate alternatives and upgrade radiography equipment for Pu hydrodynamic experiments	New (added)—current radiography has limitations for plutonium hydrodynamic experiments at NNSS
Plutonium	Pits requiring most manufacturing process steps	10-20 pits per year	Up to 80[4] pits per year	Implement PF-4 Manufacturing Process Equipment Upgrades (Program funding—non-capital)	TRP projects have been added with TRP Phase III under consideration
				Construct TRP Phase II and consider implementing TRP Phase III upgrades	
				Construct CMRR-NF	
	Radioactive Waste Disposition			Construct TRU Waste and RLWTF	New (added)–More clarity in regards to waste disposition planning and project priorities and the State of New Mexico consent order

4 This figure is based on the primary rate limiting capability to replace pits, which is agreed to in the *Memorandum of Agreement Between the Department of Defense and the Department of Energy Concerning Modernization of the U.S. Nuclear Infrastructure* signed on April 1, 2010 by the Secretary of Energy and May 3, 2010 by the Secretary of Defense.

Table 2. Rate Limiting Capability and Future Projected Capacities for Weapons Activities (*continued*)

Function	Rate-Limiting Capability	Baseline Capacity Today	Future Capacity	Risk Mitigation Needed to Ensure Future Capacity	Changes from 2011 SSMP
Uranium	Refurbished or new CSAs.	160 CSA per year	Up to 80[5] CSAs per year	Construct UPF	
	Non-HEU CSA Components			Evaluate Depleted Uranium, Lithium Production and General Manufacturing capabilities and construct required facility	New (added)–a proposed project to support CSAs, replace obsolete facilities, and reduce site footprint
Tritium	Unrestricted Low Enriched Uranium (LEU) for TVA reactors	May or may not be sufficient for all scenarios	Sufficient for all scenarios	Identify sourcing for 940 MT of unrestricted LEU (or 1,800 MT for two reactors) for life of TVA agreement	New (added)– there is a projected limitation of LEU fuel for TVA reactors
	Tritium Production	544 TPBARs per cycle sufficient through FY 2015	1,700 up to 2,500 TPBARs per reactor fuel cycle	Complete Supplemental EIS, if the finding is no impact, obtain NRC approval of TVA license amendment request to support FY 2015 fuel cycle change.	Changed from green to yellow based on tritium quantity requirements that are expected to be over three times the current requirement
	Reservoir loading and unloading	Relocate functions to newer facilities within H-area to improve efficiencies	Sufficient for all scenarios	Implement TRIM through the H-area Old Mfg facility project	Changed from green to blue based on opportunity to consolidate functions
High Explosives	HE manufacturing	1,000 pound s per year	Up to 2,500 pounds per year	Construct HE Pressing Facility Evaluate other HE Projects, e.g., HE Science Technology and Engineering, HE Packaging and Staging, HE Formulation, and HE Component Fab/Qualification Facility	Change– additional facilities identified over and above the HE Pressing facility that will be needed to support HE operations
		300 hemi-spheres per year	Up to 600 hemispheres per year		

5 This figure is consistent with the Final Complex Transformation Supplemental Programmatic Environmental Impact Statement, dated October 2008.

Table 2. Rate Limiting Capability and Future Projected Capacities for Weapons Activities (*continued*)

Function	Rate-Limiting Capability	Baseline Capacity Today	Future Capacity	Risk Mitigation Needed to Ensure Future Capacity	Changes from 2011 SSMP
Non-nuclear	Non-nuclear component production	Sufficient for LLCs and 2 phased LEPs	Sufficient for LLCs and 2 phased LEPs	KCRIMS under construction and the NNSA will lease facility	Change–KCRIMS has changed from implementing the plan to execution of the construction project
	Component production at laboratory	Insufficient for LLCs and 2 phased LEPs	Requires continual (due to technology) tooling and equipment updates Sufficient for LLCs and 2 phased LEPs	Require tooling and process system modifications for the silicon and compound semi-conductor fabrication facilities (Operating funding—non-capital)	
SNM Storage	Warhead and special nuclear material quantities	Insufficient without construction of CMRR-NF	Sufficient for all scenarios	Addressed on Enterprise Level Construct CMRR-NF for Pu storage Pantex Zone 12 Pu capacity adequate with modification to some bays Pantex Zone 4 will require equipment upgrades for sustainment. Ship surplus pits to SRS to alleviate potential Pantex storage issues. Y-12 HEU adequate with HEUMF Maintain NNSS/DAF for future reserve capacity (DAF also supports other ST&E mission activities)	Change–HEU storage capacity is adequate. An enterprise level Pu analysis is complete. The analysis indicates there is adequate plutonium weapon storage capacity at Pantex. A range of options are being considered prior to additional Pantex Zone 4 upgrades. The color remains yellow until CMRR-NF is constructed

Table 2. Rate Limiting Capability and Future Projected Capacities for Weapons Activities (*continued*)

Legend: CMRR-NF=Chemistry and Metallurgy Research Replacement-Nuclear Facility; CSA=Canned Subassembly; DAF=Device Assembly Facility; EIS=Environmental Impact Statement; Fab=Fabrication; HE=High Explosive; HEU=Highly Enriched Uranium; HEUMF=Highly Enriched Uranium Materials Facility; KCRIMS=Kansas City Responsive Infrastructure Manufacturing and Sourcing; LEU=Low Enriched Uranium; LLC=Limited Life Components; LEP=Life Extension Program; MT=Metric Tons; NNSA=National Nuclear Security Administration; NNSS=Nevada National Security Site; NRC=Nuclear Regulatory Commission; Pu=Plutonium; RLWTF=Radioactive Liquid Waste Treatment Facility; SNM=Special Nuclear Material; SRS=Savannah River Site; SSMP=Stockpile Stewardship and Management Plan; ST&E=Science, Technology, and Engineering; TPBARs=Tritium-Producing Burnable Absorption Rods; TRIM=Tritium Responsive Infrastructure Modifications; TRP=TA-55 Reinvestment Phase; TVA=Tennessee Valley Authority; UPF=Uranium Processing Facility

Sustainment of Existing Physical Infrastructure

New construction will play a key role in support of enterprise modernization. An equally important function that requires constant vigilance, however, is sustaining the existing physical infrastructure in order to maximize its design life. Modernization of the enterprise includes reducing deferred maintenance, constructing replacement facilities, and disposing of surplus facilities. The Administration is committed to fully funding the construction of the Uranium Processing Facility (UPF) and the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR-NF), and doing so in a manner that does not redirect funding from the core mission of managing the stockpile and sustaining the science, technology, and engineering foundation. The resources for CMRR and UPF in the FY 2012 budget will increase funding over the FY 2012 number in the 2011 FYNSP.

The average deferred maintenance growth across the complex in the future is projected to be approximately $70 million per year. The increase of $87 million in FY 2012 will be allocated to arrest near-term deferred maintenance growth, while supporting increased scope of work for stockpile activities. The NNSA expects deferred maintenance will be addressed in the out-years with planned increases in operations and maintenance dollars in addition to the $87 million in FY 2012; funding will grow by an additional $298 million by 2016.[6] The increased resources will be prioritized to fund selected disposition of excess infrastructure, which will take obsolete facilities and their associated deferred maintenance off the books. The NNSA will stabilize deferred maintenance in mission critical facilities to address priority maintenance, recapitalization, and disposition of excess capacity across the Nuclear Security Enterprise to sustain needed capabilities.

Approved and Proposed Line Item Construction Projects

A list of approved and proposed Integrated Priority List Readiness in Technical Base and Facilities capital construction projects for the FYNSP and post-FYNSP periods is presented in Figure 6. The proposed post-FYNSP projects address the period FY 2017 through FY 2031 and

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6 The additional increase does not include the increase in funding for the University of California legacy pension payments.

are constrained by the budget assumptions that are presented in Chapter VI. The projects will be considered in the NNSA future budget requests. General scope descriptions for the proposed projects are presented in Appendix D.

The CMRR-NF and UPF designs are currently more than 50 percent complete. The baseline for both projects will be established in FY 2013 after the design work reaches 90 percent maturity. CMRR-NF and UPF construction will be planned to be executed in a few critical phases that will enable the NNSA to set and track performance baselines for subprojects of clearly defined scope to enhance stakeholder transparency and project execution. Based on the current pace of design, the NNSA expects construction of the nuclear facility buildings to be completed by 2020 for both projects and anticipates operational functionality on or before 2023 for CMRR-NF and 2024 for UPF. Design options are being developed to optimize construction and transition to operations in phases so that functions and capabilities are maintained continuously and transferred into the new facilities as soon as practicable, in compliance with operational readiness expectations for new nuclear facilities.

The majority of the enterprise-wide priority list of proposed projects does not currently have an approved mission need justification (CD-0). Further, given that the proposed projects have not yet fully identified the means of meeting their applicable mission gap, and that baseline cost estimates are established at CD-2, the schedule milestones and cost ranges are considered a "rough order of magnitude." The Readiness in Technical Base and Facilities project start and completion dates are subject to change due to a variety of factors and are updated annually.

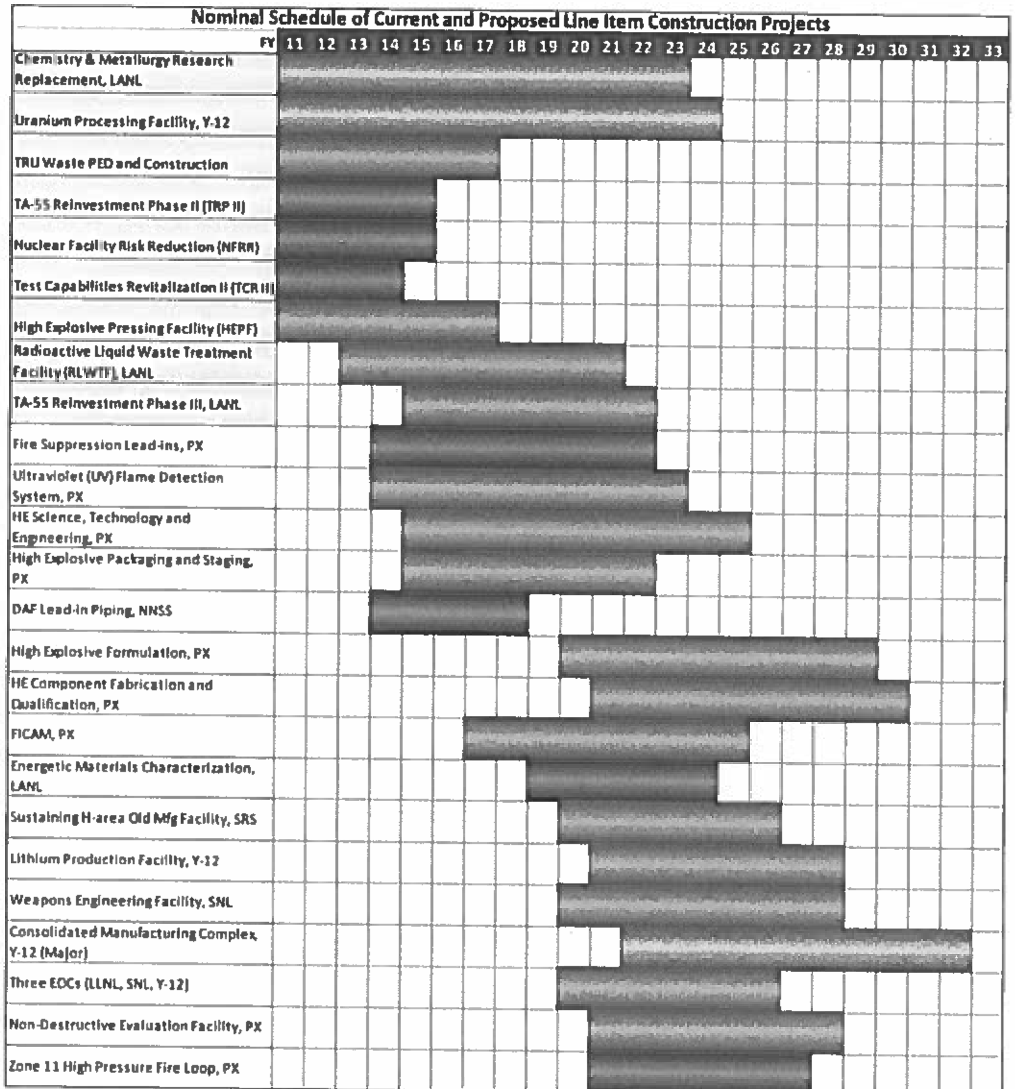

Figure 6. Defense Programs Integrated Priority List–Capital Projects

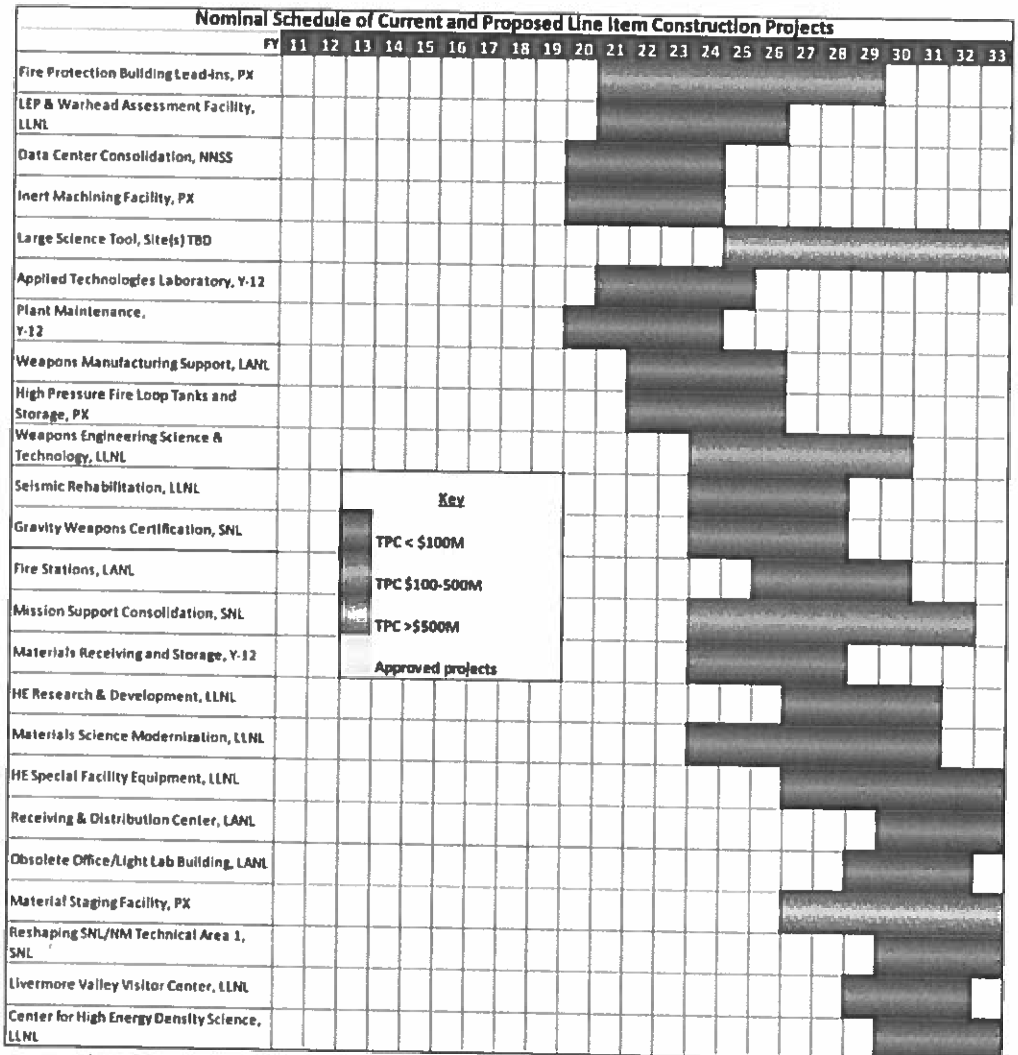

Figure 6. Defense Programs Integrated Priority List–Capital Projects (*continued*)

Approved and Proposed Non-Capital and Capital Equipment, and Non-Defense Program Projects

A list of approved and proposed non-capital and capital equipment and non-Defense Programs (DP) projects is presented in Table 3. The FYNSP approved projects include Kansas City Responsive Infrastructure Manufacturing and Sourcing and Exa-scale. The list also includes post-FYNSP proposed projects that will mitigate known mission risks. Project descriptions are presented in Appendix D.

Table 3. Nominal Schedule/Cost of Non-Capital or Capital Equipment or Non-Defense Program Projects

Function	Rate-Limiting Capability	Risk Mitigation Needed to Ensure Future Capability	Rough Order of Magnitude	
			Schedule	Cost
Design, Certification, Experiments and Surveillance	Computational science 100x improvement in system software scaling	Implement Exa-scale (programmatic equipment)	CD-4 Range: FY 2018 - FY 2021	Range: TBD Multi Program Operation Resources (NNSA and Office of Science)
	Radiography for Subcritical Experiments	Radiography at NNSS to support all hydrodynamic experiments (programmatic equipment)	CD-4 Range: FY 2013 - FY 2016	Range: TBD After Alternatives Analysis
Uranium	Supports production in a smaller PIDAS	PARP	CD-4 Range: 2020 - 2025 Staged implementation consistent with UPF schedule	Range: $191 - $384M NA-70 Program Capital Resources
Non-nuclear	KCP: non-nuclear component production	Construct KCRIMS	Operational FY 2014	GSA Construction
	Component production at laboratory	Replace tooling and modify process system in the silicon fabrication facility	FY 2013 - FY 2016	$25M Annual Operations Resources (Non-Capital)

Legend: CD=Critical Decision; GSA=General Services Administration; KCP=Kansas City Plant; KCRIMS=Kansas City Responsive Infrastructure Manufacturing and Sourcing; M=Million; NNSA=National Nuclear Security Administration; NNSS=Nevada National Security Site; PARP=Protected Area Reduction Project; PIDAS=Perimeter Intrusion Detection and Assessment System; TBD=To be Determined; UPF=Uranium Processing Facility

Other changes expected over the next 20 years include efforts to reduce security and excess facility maintenance costs for mission-direct work. As a result of high-security fenced area reductions and excess facility disposition, physical infrastructure modernization will contribute significantly to mission efficiency.

High-security fenced area reductions are directly attributable to facility modernization and special nuclear material consolidation. There will be a net reduction of 139 acres or approximately 25 percent of the high-security fenced area that will be made possible with the completion of UPF. This net reduction factors in the additional high-security fenced areas that will be required for the CMRR-NF and excludes areas that will be added with construction of the Mixed Oxide Fuel Fabrication Facility. The 139 acre net reduction includes a 90 percent reduction at Y-12 and an expected reduction at LLNL as the Superblock transitions to security Category III status. However, several unique special nuclear material facilities and capabilities at LLNL may be required to support ongoing and future Life Extension Programs. LLNL is currently exploring options to continue to use those facilities for limited durations in support of Life Extension Programs.

Measuring the NNSA footprint—its growth or reduction—is a valuable modernization measure as the enterprise transforms and aims to right-size. The NNSA footprint has grown modestly by approximately one percent over the last four years due to new construction and added lease space outpacing excess elimination. Beyond 2013, when the Facilities and Infrastructure Recapitalization Program ends, the NNSA will use corporate facilities management principles to transition to a new capabilities-based infrastructure investment approach that will foster modernization, recapitalization, and footprint reductions. The NNSA will reduce the enterprise's footprint with the disposition of Los Alamos National Laboratory's Technical Area-3 old Administration Building, TA-21 (old Pu processing facility), and the legacy Kansas City Bannister Plant. These reductions support offsetting the new construction over the next decade with a net reduction of over half-million gross square feet. In the next twenty years, right-sizing progress should continue to occur with the establishment of a funded excess facility disposition program.

Capability for Weapons Activities Post-2031 Based on Results from the Proposed Physical Infrastructure Modernization

Table 4 provides a post-2031 physical infrastructure posture that supports the Administration's vision of a modern, efficient 21st century NSE. Although the eight sites of today remain, significant change and modernization within most of the sites will have been accomplished. Table 4 shows a performance status of green (satisfactory) for most of the NSE's major mission functions in a post-2031 future posture. However, additional modernization work must be accomplished in the years after 2031. Known risks for physical infrastructure in the post-2031 future weapons programs posture are presented in Table 4.

Mission functions, once identified with capability issues, that can now be listed in the future posture setting with a satisfactory capacity status include: plutonium, uranium, tritium, and high explosives. The improvements in performance are the expected result of the realization of new FYNSP and post-FYNSP budget assumptions, efficiencies in the management and execution of construction projects, and operation efficiencies gained through improved governance. Efficient business reforms and governance implementation will have effectively reduced operational burden at some sites while maintaining high safety and environmental standards, catalyzing increased program execution, and reducing costs.

Table 4 highlights the known risks in the future posture, post-2031 enterprise, which include computational science, non-nuclear production, assembly and disassembly, and special nuclear material storage.

(shaded)	Existing and/or future capacity estimated to be sufficient for post-NPR stockpiles with a bounded number of hedge warheads to be maintained.
(white)	Existing capacity is subjective and may or may not be sufficient today for future post-NPR stockpiles.
(dark shaded)	Facility or infrastructure has exceeded the design life or lease period.
(light shaded)	Facility or infrastructure is approaching the end of design life or lease period.

Table 4. Post-2031 Rate Limiting Capability Status and Physical Infrastructure Modernization Accomplishments

Function	Rate-Limiting Capability	Post-2031 Status Physical Infrastructure Modernization Accomplishments		Post 2031 Changes
Design, Certification, Experiments, and Surveillance	Number of simultaneous Life Extension Programs (LEPs) supportable	Sustain existing capabilities		Facilities continue to be evaluated for vulnerabilities/risks
	Warhead certifications and assessments	Stable support for Laboratories and NNSS ST&E capabilities, and surveillance.	TCR Phase II (SNL) constructed and Tonopah Test Range refurbishment complete	
			Energetic Materials Characterization (LANL) constructed	
			Weapons Engineering Facility (SNL) constructed	
			LEP and Warhead Assessment Facility (LLNL) constructed	
			Large Science Tool[7] (under construction)	
			Weapons Manufacturing Support (LANL) constructed	
			Weapons Engineering Science and Technology (LLNL) constructed	
			Gravity Weapons Certification (SNL) constructed	
			HE R&D (LLNL) constructed	
			Material Science Modernization (LLNL) constructed	
			HE Special Facility Equipment (LLNL) under construction	
			Center for High-Energy-Density Science (LLNL) under design	

7 The large science tool project and location will be determined based on requirements to support science, technology, and engineering (ST&E) infrastructure development. The potential requirements for new ST&E based infrastructure development fall into four categories that are listed in Appendix D.

Table 4. Post-2031 Rate Limiting Capability Status and Physical Infrastructure Modernization Accomplishments (*continued*)

Function	Rate-Limiting Capability	Post-2031 Status Physical Infrastructure Modernization Accomplishments		Post 2031 Changes
	Infrastructure Support	Sustain existing facilities	DAF Lead-In Piping (NNSS) constructed	
			EOC (SNL) constructed	
			EOC (LLNL) constructed	
			Data Center Consolidation (NNSS) constructed	
			Seismic Rehabilitation (LLNL) constructed	
			Mission Support Consolidation (SNL) constructed	
			Receiving and Distribution Center (LANL) under construction	
	Computational science systems software scaling	Sustain Cutting Edge Technological Computation al Edge	Exa-scale constructed Pursuing Faster "Extreme" Speed (100 Exaflops)	Computational system hardware and software must push the cutting edge of technology[8] to support deterrent systems
	Radiography to support all hydrodynamic experiments	Sustain experiment capabilities and provide code validation data for weapons certification	Frequency of experiments satisfactory	No Changes Identified
			Preferred alternative implemented to support all hydrodynamic experiments at NNSS	
Plutonium	Pits requiring most manufacturing process steps	Sustain existing capabilities and facilities	CMRR-NF constructed and operational	No Changes Identified
			TRP Phase II and III (LANL) constructed	
			PF-4 Manufacturing Process Equipment Upgrade complete	
			TRU Waste (LANL) constructed	
			RLWTF (LANL) constructed	
	Infrastructure Support	Sustain infrastructure	SERF (LANL) constructed	
			Fire Station (LANL) constructed	
Uranium	Refurbished or new CSAs	Sustain existing capabilities	NFRR complete	No Changes Identified
			UPF constructed	
	Non-HEU CSA Components	Sustain existing capabilities	Lithium Production and CMC Facilities constructed	

8 Technology obsolescence for computational system hardware and software is rapid. The yellow color coding is designed to highlight this rapid change and need to continually update the system in order to maintain the cutting edge.

Table 4. Post-2031 Rate Limiting Capability Status and Physical Infrastructure Modernization Accomplishments (*continued*)

Function	Rate-Limiting Capability	Post-2031 Status	Physical Infrastructure Modernization Accomplishments	Post 2031 Changes
	Infrastructure Support	Sustain existing capabilities	PARP constructed EOC constructed	
			Applied Technologies Laboratories Constructed	
			Plant Maintenance constructed	
			Materials Receiving and Storage (Y-12) constructed	
Tritium	Unrestricted LEU for TVA reactors	Sustain existing capabilities	Identified source for 940 MT of unrestricted LEU (or 1800 MT for two reactors) for life (2048) of TVA agreement	
	Tritium Production		Complete Supplemental EIS with finding of no impact and obtain NRC approval of TVA license amendment request in FY 2015	No Changes Identified
	Reservoir loading/ unloading operations		Sustainment of the H-area Old Manufacturing Facility – TRIM is completed	
High Explosives (HE)	Specialty explosive manufacturing, HE component fabrication, and staging	Sustain existing capabilities	HE Pressing constructed	No Changes Identified
			HE Science Technology and Engineering constructed	
			HE Packaging and Staging constructed	
			HE Formulation Facility constructed	
			HE Component Fabrication/Qualification Facility constructed	
			Inert Machining Facility constructed	
	Infrastructure Support		Zone 11 HPFL (PTX) constructed	
Fusion	Laser beams focus energy on target chamber for ignition	Sustain existing NIF	Sustained capabilities for plasma physics research and high yield inertial fusion applications	No Changes Identified
Non-nuclear	Component production plant	Sustain existing Facilities	KCRIMS constructed – GSA lease to THE NNSA	
	Component production at laboratory	Limited Life Technology	Maintain silicon and semi-conductor tooling on the trailing edge of the semi-conductor industry (equipment supported by operating resources)	Technology updates are required in order to maintain capability slightly behind industry
Assembly/ Disassembly	Dismantlement, disassembly and inspection, and LEP operations	Sustain subsystems and infrastructure support	Fire Suppression Lead-ins constructed	No Changes Identified
			UV Flame Detection System constructed	
			Facility Installed CAMs constructed	
			Non-Destructive Evaluation Facility constructed	
			Fire Protection Building Lead-ins (PTX) constructed	
			HPFL Tanks and Storage (PTX) constructed	

Table 4. Post-2031 Rate Limiting Capability Status and Physical Infrastructure Modernization Accomplishments (*continued*)

Function	Rate-Limiting Capability	Post-2031 Status Physical Infrastructure Modernization Accomplishments		Post 2031 Changes
		Cells/bays end of design life	Preferred Alternative implemented for cells/bays	A number of manufacturing facilities that support this function that include the Zone 12 PIDAS and critical safety systems are approaching the end of design life
Transportation	Number of convoys	Sustain existing capabilities	Satisfactory	No Changes Identified
SNM Storage	Warhead and SNM quantities	Pantex design life for bays/cells and Zone 4 PIDAS	Preferred Alternative implemented for Zone 4 consistent with Material Staging Facility Project	Zone 12 storage alternatives must be considered as Pantex's Zone 4 PIDAS end of life approaches
		LANL	CMRR-NF constructed	No Changes Identified
		NNSS	DAF reserve support—satisfactory	
		SRS	Excess pit disposition support—satisfactory	
		Y-12	HEUMF satisfactory (Uranium)	

Legend: CAM=Continuous Air Monitor; CMC=Consolidated Manufacturing Complex; CMRR-NF=Chemistry and Metallurgy Research Replacement-Nuclear Facility; CSA=Canned Subassembly; DAF=Device Assembly Facility; EIS=Environmental Impact Statement; EOC=Emergency Operations Center; GSA=General Services Administration; HE=High Explosive; HEU=Highly Enriched Uranium; HEUMF=Highly Enriched Uranium Materials Facility HPFL=High Performance Fuel Laboratory; KCRIMS=Kansas City Responsive Infrastructure Manufacturing and Sourcing; LANL=Los Alamos National Laboratory; LEP=Life Extension Program; LEU=low enriched uranium; LLNL=Lawrence Livermore National Laboratory; MT=metric tons; NFRR=Nuclear Facility Risk Reduction; NIF=National Ignition Facility; NNSS=Nevada National Security Site; NRC=Nuclear Regulatory Commission; PARP=Protected Area Reduction Project; PF=Plutonium facility; PIDAS=Perimeter Intrusion Detection and Assessment System; PTX=Pantex Plant; R&D=Research and Development; RLWTF=Radioactive Liquid Waste Treatment Facility; SERF=Sanitary Effluent Reclamation Facility; SNL=Sandia National Laboratories; SNM=Special Nuclear Materials; SRS=Savannah River Site; ST&E=science, technology, and engineering; TCR=Test Capabilities Revitalization; TRIM=Tritium Responsive Infrastructure Modifications; TRP=TA-55 Reinvestment Phase; TRU=Transuranic Waste; TVA=Tennessee Valley Authority; UPF=Uranium Processing Facility

V. Workforce and Critical Skills Sustainment

A diverse and highly talented workforce is needed to accomplish the SSMP objectives. This workforce must be equipped with the specialized skills needed to sustain the nuclear deterrent and achieve related national security goals. Over the last decade, numerous critical skills studies have made note of the advancing age of the NNSA workforce and the growing concern over the ability of the Nuclear Security Enterprise (NSE) to attract and retain qualified and skilled replacements. The nuclear weapons that constitute the United States nuclear arsenal are highly specialized devices, and the suite of skills necessary to design, produce, maintain, assess, and dismantle these weapons is specialized, diverse, and demanding. Currently, there is an urgent need to refresh both the federal and management and operating (M&O) contractor workforce. It will be impossible for the NNSA to succeed as an enterprise and to accomplish the objectives of the SSMP, without explicit focus on identifying critical skill needs, and then recruiting, training, retaining, motivating, and exercising the federal and contractor workforce at the nuclear security laboratories, test site, production plants, and the NNSA Headquarters and Site Offices. The President's budget supports the NNSA enterprise on the path toward workforce revitalization through the execution of Life Extension Programs, investments in meaningful science, technology, and engineering (ST&E) national security challenges, and the modernization of the facilities and infrastructure.

Since the end of the Cold War, NNSA workforce issues have been dynamic. The stewardship program drove staff strength in computer science, nuclear physics, computational engineering, numerous engineering disciplines, experimental sciences, laser physics, and other similar high tech fields. The number of NNSA-funded M&O contractor personnel doing or supporting this technical activity today at the three major laboratories has increased by more than 20 percent since the end of the Cold War. This expanded talent pool developed the stewardship tools used to improve stockpile knowledge and to support life extensions.

However, personnel reductions occurring over the past 5 years in key areas, including stockpile stewardship, surveillance, and life extensions, have resulted in the loss of both newly recruited employees and the experienced staff needed for mentoring and coaching. In two separate reports[9] from the Government Accountability Office (GAO), it was noted that success in sustaining the deterrent requires that the NNSA stabilize and, in select areas, reverse this downward trend. Specifically, the NNSA must collect key workforce data on knowledge, skills, and competencies and remain vigilant and focused on its recruiting and retention efforts, as well as anticipate, and appropriately plan for, future critical skill needs and potential shortages.

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[9] GAO-04-545, Report to the Chairman, Subcommittee, on Strategic Forces, Committee on Armed Services, U.S. Senate, NATIONAL NUCLEAR SECURITY ADMINISTRATION Key Management Structure and Workforce Planning Issues Remain As NNSA Conducts Downsizing, June 2004.
GAO-05-164, Report to Congressional Committees, NATIONAL NUCLEAR SECURITY ADMINISTRATION Contractors' Strategies to Recruit and Retain a Critically Skilled Workforce Are Generally Effective, February 2005.

The President has clearly stated that, as long as nuclear weapons exist, the United States will maintain a safe, secure, and effective stockpile. Until verifiable global nuclear disarmament is reached, more attention is required to sustain the facilities, programs, and human talent supporting the NSE. In addition to providing stockpile support, NSE personnel are crucial to maintain U.S. ability to understand the technical problems associated with verifying arms control cuts and to support defense initiatives such as nuclear forensics. Additionally, subject matter expertise is essential to improving U.S. understanding of foreign nuclear weapon activities and minimizing the associated risks to the nation.

Identification of critical skills is essential for the NNSA to appropriately plan for the future. The major focus needs to be on critical skills that are determined to be essential to the execution of the nuclear weapons program, specialized, and not readily available in the general workforce, and also difficult to replace. The requisite level of expertise requires extensive training—often in addition to graduate and post-graduate education—and a minimum of 3 years of on-the-job experience to achieve proficiency. A loss of critical skills could impair or even preclude the ability of the NNSA to maintain the safety, security, and reliability of the nuclear weapons stockpile.

The Challenge for the Nuclear Security Enterprise

The NNSA produces some of the world's most complex, high-reliability, and high-consequence products in a high-security environment. Many technologies and materials (e.g., plutonium and tritium) are critically tied to the nuclear weapons mission.

2009 Strategic Posture Commission Report

"The Commission's second main concern about the nuclear weapons complex is that the intellectual infrastructure is in serious trouble due to a decline in weapons experienced resources—perhaps more so than the physical complex itself. It strongly recommends that significant steps be taken to remedy the situation. It is important to understand the weapons laboratories are more than a complex of facilities and instruments. The foundation of their work in support of the national deterrent is a unique scientific and engineering capability."

In the past, the NNSA attracted the best and brightest minds to its world-class laboratories and production plants because of its important mission, competitive pay and benefits, access to the most advanced laboratories with the finest equipment, and the opportunities it offered for daily interaction with peers who routinely rank among the world's most respected in their fields. During the past two decades, stockpile stewardship was sustaining scientific and technical talent. Today, many of the NNSA's personnel have retired or will retire soon. As an example, very few experienced designers remain from the underground nuclear testing era. Design competencies are fundamentally different from the skills that support stockpile assessment and analysis and can only be developed through programs that fully exercise each design step from conceptual design through product realization. Since the cessation of underground nuclear testing, the lack of hands-on field experiments—such as fully integrated subcritical experiments—has limited the development of weapon designers. The effects of the 2-year salary freeze will have to be monitored closely to determine the potential additional impacts on recruitment and retention of the workforce.

ST&E competencies are essential not only for confident stewardship and sustainment of the stockpile, but also for closely related activities such as foreign weapons assessments, monitoring and interpretation for nuclear testing and nuclear proliferation risks, intelligence analysis and determination of adversary countermeasures in order to ensure that the stockpile supports U.S. national requirements. Certain competencies and capabilities are beneficially applied to other national and international challenges such as global climate change modeling and energy research. In the past, opportunities to exercise the full suite of competencies through life extensions have been canceled or delayed. This is now changing. The path forward recognizes the importance of strengthening the intellectual infrastructure, leading to a program that balances sustaining needed scientific expertise while developing the next generation of talent necessary to execute Life Extension Programs.

Maintaining the right skills mix as the NNSA mission evolves is a significant human capital management challenge. An even greater reliance on intellectual excellence will be required to sustain the necessary ST&E base with the required critical skills to support the nuclear weapons complex and meet the needs of the enduring stockpile and infrastructure. Just as stockpile stewardship and the modernization of the physical infrastructure enable reductions in the number of deployed nuclear weapons, they also allow for the right-sizing of the physical size and staff of the enterprise. Effective collaboration across organizational units will be one of the keys to meeting the challenge, along with leadership and change management in affected organizational units and sites that make up the NSE.

The following are key elements necessary to ensure that the NNSA has the federal and contractor workforce needed to realize the President's vision for the NSE:

1. Stability in support for the core stewardship ST&E community;
2. National commitment in key program areas to permit staff to see the value of a career associated with nuclear security (deterrence, nonproliferation, nuclear counterterrorism, etc.);
3. Programs providing the opportunity to fully exercise design and production skills;
4. Modern, state-of-the-art facilities to maintain and to expand current capabilities; and
5. Assessment of the current workforce plans to ensure that critical skills are identified and corrective actions are in place to address near- and long-term gaps.

The future workforce will have talent that is a diverse and dynamic blend of experience and youth; it will be comprised of a mixture of top-performing program experts and rounded out by talented newcomers with great potential and eagerness who are dedicated to public service and the stewardship of the nation's most important security programs. Working together, the NNSA, educators, and industry can develop the new ideas, curricula, and approaches necessary to ensure an adequate number of trained and properly skilled national security workforce personnel. The NNSA leadership recognizes these issues and is proactively encouraging the development of the next generation workforce.

The Federal Workforce

Current State of Federal Workforce

The federal workforce at Headquarters, Site Offices, and the Service Center play a critical role in managing and overseeing not only the nuclear weapons program mission, but also the other national security missions of the NNSA.

This workforce performs for the NNSA and not just for the Office of Defense Programs, but also vital functions such as nonproliferation, security of nuclear materials and facilities, nuclear forensics, and emergency response. All these skills and specialties are interrelated, and integrated as the National Security Enterprise grows and cross-trains its technical, policy and business specialists in support of program planning and implementation as well as program management; project management; environment, safety, health, and security oversight; and acquisition and contract management. In part, the NNSA's programmatic success hinges on the acquisition and retention of a highly qualified and skilled federal workforce. Over the past several years, there has been significant attrition in the Headquarters and Site Office federal workforce. Maintaining the numbers and staffing levels needed for the future will be difficult without a dedicated and sustained planning effort in workforce development in order to obtain and then retain the skills needed to carry out NNSA responsibilities under the Nuclear Posture Review as well as implementation of the SSMP. The GAO in its 2004 report to the Chairman, Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, recognized this redirection toward the nuclear security mission of the future when it stated that:

> "NNSA should complete and implement data-driven workforce planning for the longer term that (1) determines the critical skills and competencies that will be needed ... (2) develops strategies tailored to address gaps in number, skills and competencies...and (3) monitors and evaluates the agency's progress..."[10]

The NNSA's current federal workforce planning capability has not been as broad-based as the Nuclear Posture Review now requires. DOE's Federal Technical Capability Panel coordinates activities to recruit, deploy, develop, and retain federal employees with the necessary technical capabilities to safely accomplish the Department's missions and responsibilities at defense nuclear facilities. However, the NNSA needs a corporate systematic capability to conduct current supply versus future demand requirements analysis and forecasting; this planning ability is essential to effective workforce planning not just for the nuclear weapons mission, but for our nonproliferation and other mission areas as well. The difficulties associated with acquiring and maintaining a high-performing staff that is able to carry out the critical functions of the NSE are compounded by the requirement for U.S. citizenship and a Q-level security

[10] GAO-04-545, Report to the Chairman, Subcommittee, on Strategic Forces, Committee on Armed Services, U.S. Senate, NATIONAL NUCLEAR SECURITY ADMINISTRATION Key Management Structure and Workforce Planning Issues Remain As NNSA Conducts Downsizing, June 2004.

clearance in NNSA facilities. At present, an interim NNSA-wide planning ceiling of 1,970 and 1,859 full-time equivalents for FY 2011 and FY 2012, respectively, has been established. A comprehensive re-examination of the personnel and other resource requirements needed to execute the DOE's new Strategic Plan and the NNSA's governance model is planned. Significant further adjustments of the federal workforce will not be advanced until these requirements are known.

Future State of Federal Workforce

The NNSA is also taking steps to retain the current skilled workforce and to develop the future workforce. These efforts include the development of "knowledge capture" programs, pipeline programs, beneficial temporary assignments, workplace flexibility initiatives, and mentoring programs. The NNSA has put into place numerous programs, such as the Nonproliferation Graduate Fellowships, the Computational Science and Stewardship Graduate Fellowship, and management internships to infuse the Stockpile Stewardship Program with young, technically competent individuals. These programs offer special recruitment and retention allowances, special pay categories, continuing educational opportunities, rotational opportunities, challenging assignments, and if warranted, rapid advancement.

Other key NNSA activities and programs to recruit and retain the current and next generation of nuclear enterprise talent are as follows:

- **Succession Management:** This process identifies key positions and associated profiles (Succession Management Position Profiles) for key positions within the organization that, if left unfulfilled, could seriously jeopardize or restrict the ability to accomplish NNSA missions. The profiles collected will provide structure and data to help assess and quantify issues associated with succession for the key positions.
- **Demonstration Project on Pay-for-Performance and Pay Banding:** The NNSA is piloting a 5-year demonstration project on Pay-for-Performance and Pay Banding (by the Office of Personnel Management) to test new Human Resource concepts to recruit and retain a high caliber staff by providing faster pay progression for high-performing employees and to build on the workforce planning system to better identify competency needs and gaps.
- **Future Leaders Program:** The Future Leaders Program is a 2-year internship program for recent college graduates and is designed to develop the critical skills required for future federal workforce. Each year the Future Leaders Program recruits approximately thirty individuals.[11]
- **Student Career Experience Program:** The Student Career Experience Program provides on-the-job training for college students directly related to the students' field of study, with

[11] NNSA's implementation of the Future Leaders Program could be impacted by recent Administration Guidance regarding Career Intern Programs.

the potential for being converted to permanent federal appointments upon completion of their education.

- **Student Temporary Employment Program:** The Student Temporary Employment Program is a summer internship program for college students; each year approximately 40 to 50 students participate.
- **Minority Serving Institutions Program:** The Minority Serving Institutions program supports a number of activities including internships, which are designed to create a pool of potential future employees who have had meaningful work experiences and consider the NNSA as a serious career choice. Each year over 5,000 students participate in various activities across the NNSA site offices, laboratories, and plants through agreements with 29 Minority Serving Institutions.

As the U.S. works to reduce the role and the number of nuclear weapons, the need for a world-class NNSA workforce becomes even more crucial. The present state of critical skills and capability understanding, modeling, and thoughtful preparation for the future is not adequate, and requires immediate and sustained attention. Leadership commitment and congressional action to fund and implement workforce planning and development solutions for the long term is essential to the nuclear security mission.

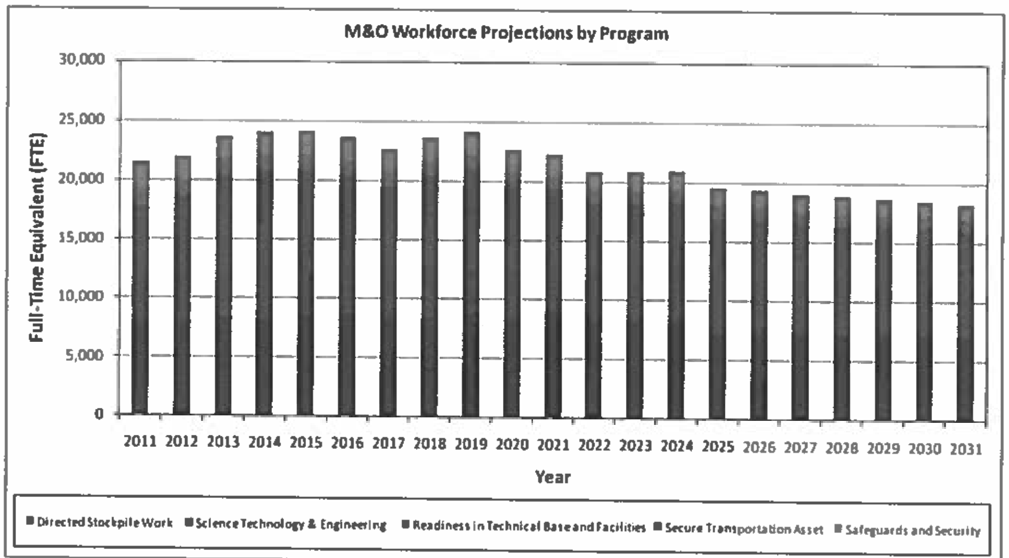
The M&O Contractor Workforce

Current State of M&O Contractor Workforce

The Defense Programs activities of the M&O contractor workforce today are less than a half of its 1990 size. There has been a significant increase in the associated NNSA workload in nonproliferation, nuclear security, nuclear forensics, and emergency response. The initial reduction was due to consolidation of sites (the closure of the Rocky Flats, Mound, and Pinellas production facilities) and the cessation of plutonium and highly-enriched uranium production. This period also reflects the transition from underground testing as a stockpile certification methodology to a stronger ST&E base, developing and leveraging advances in high-fidelity simulations, analyses, and non-nuclear tests.

The NNSA remains capable of executing the Stockpile Stewardship and Management Program, performing surveillance, and maintaining and assessing the U.S. stockpile as a safe, secure, reliable, and effective nuclear deterrent along with supporting the full range of other NNSA nuclear security missions. The concern about human capital revolves around a lack of robustness and depth of the contractor workforce; cross training opportunities have been limited due to the period of program contraction, leaving little or no redundancy in the contractor workforce.[12] In its 2005 report to Congress[13] the GAO found that the NNSA's M&O contractors' strategies to plan, recruit, and retain appropriately skilled staff were effective; the M&O contractors undertake annual reviews in which managers play a key role and they incorporate the basic principles essential to strategic workforce planning.

Estimates of workforce needs for the next 20 years for the M&O based on current program requirement projections are shown in Figure 7. These workforce projections are based on the assumptions that tasking and resources will be made available for major construction projects, such as Chemistry and Metallurgy Research Replacement-Nuclear Facility and Uranium Processing Facility, Life Extension Programs, and ST&E Programs. These projections are only based on weapons activities funding and do not include the funding that the laboratories and plants receive from other programs for other national security or other high-priority efforts that leverage the nuclear weapons program expertise and infrastructure.



Note: Data shown is based on input from the eight NNSA sites.

Figure 7. M&O Workforce Projections by Program

Additionally, the M&Os have established the Enterprise Modeling Consortium to develop actionable needed skills data and models. The Enterprise Modeling Consortium will provide an

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12 Today's NNSA-funded M&O workforce is only 40 percent the size of the Cold War. Then, NNSA funded M&O contractors doing materials production, weapons production, and laboratory and test work. Except at incidental levels, materials production has stopped, and the weapons production workforce has been halved. The effect of ceasing underground nuclear testing, adopting the Quantification of Margins and Uncertainties process and Stockpile Stewardship on the laboratory and test workforce has decreased it only by a few percent since the Cold War.

13 GAO-05-164, Report to Congressional Committees, NATIONAL NUCLEAR SECURITY ADMINISTRATION Contractors' Strategies to Recruit and Retain a Critically Skilled Workforce Are Generally Effective, February 2005.

integrated analysis of the potential impacts of policy requirements on the NNSA stockpile, infrastructure, and range of required skills.

Future State of M&O Contractor Workforce

Intellectual infrastructure assessment and management activities will continue and be expanded to transition the workforce from the Cold War-era capacity-based complex to the capability-based NSE of the future. Workforce transitions, based on the improved understanding from these assessments and evolving implementation approaches based on impact metrics are needed.

Each NNSA site is concerned with the loss of essential corporate and background/historical knowledge and has developed a site-specific strategy to recruit, train, and retain new employees. Knowledge preservation programs have been in place since the end of nuclear testing. These include archiving underground test data, countless documents, and hundreds of videotaped interviews. Additionally, some sites have developed mentoring and cross-training programs in high-profile areas. Working closely with a number of universities and industry, the national laboratories and production plants have developed specific curricula to help fill the needs in each discipline.

Managing talent requires a strategic approach to human resources management throughout the career cycle: attracting, retaining, developing, and transitioning the most important asset—people. The goal is to strategically align employee growth and development with the NNSA's current and future business needs. Sites aggressively recruit to maintain a good position relative to critical skills needed to meet upcoming mission requirements. Maintaining and enhancing this position requires strategic planning as well as aggressive programs for the recruitment and retention of personnel with these critical skills. The actions being implemented to position M&Os to recruit and retain adequate scientific and technical expertise to carry out the NNSA mission are as follows:

- Providing an attractive and competitive total compensation/benefits package that includes variable pay options such as signing and retention bonuses and increased base salaries in specialty areas.
- Ensuring through workforce planning that needed skills are available at the right time as workload and internal demographic changes occur. This planning integrates work scope, priority, skill mix, funding, facility/equipment availability, demographics, and historical analysis to develop projections of specific needs.
- Partnering with universities to promote student work programs, recruit graduates and alumni, and tailor degree programs and curriculum content.
- Providing in-house education and educational assistance programs to promote continuous personal development and improvement of the knowledge base.
- Providing challenging work and knowledge preservation tools to sustain manufacturing competency and archive weapons processes.

- Recruiting candidates within the NSE to retain skills that are still needed and have been affected by downsizing.

M&O contractors are also engaged in a variety of initiatives designed to promote employee growth and retention. These initiatives include:

- Employee Development: Sites employ mentoring series for recent college graduates, new hires, and Student Program employees. Additionally, the Educational Assistance Program encourages employee development.
- Leadership Development: First Line Supervisor Peer-Coach Development workshops and leadership assessments are completed for first line supervisors. The outcome of the assessments is an individual development plan for each front-line supervisor and section manager, providing a catalyst for ongoing succession planning and current and future leadership development.
- Apprenticeship Program: The Apprenticeship Program addresses recruitment and retention of skilled craft workers.
- Job Rotations: This is an intra-site employee development program designed specifically to increase and retain essential and critical job skills as well as to promote professional growth.
- Career Development: Career development allows for the use of an organized approach to match employee goals with the business needs in support of workforce development initiatives. The purpose of career development is to provide career coaching and career development resources to all employees, thereby empowering them to become self-directed and proactive in their own career progression.
- Succession Planning: Through succession planning efforts, sites develop succession rosters for critical positions.
- Variable Pay Program: Sites employ the use of variable pay to help in attracting and retaining those in critical skill positions.

These programs and activities are reviewed regularly and refined as necessary to ensure appropriate critical skills are available to execute and support the NSE missions.

The Non-M&O Contractor Workforce

The NNSA also relies upon the university communities, key private sector industrial enterprises, and other DOE and other-agency laboratories and specialized facilities. Through academic alliances or long-term vendor relationships, the NNSA seeks to maintain a sufficiently skilled, versatile, knowledgeable, and experienced workforce to supplement the federal and M&O contractor workforces in a few areas where it is neither necessary nor desirable to have capabilities and the associated personnel 'in house.' The firms involved in the fabrication of Tritium Producing Burnable Absorber Rods and the Laboratory for Laser Energetics are examples of external workforce providers for which the NNSA needs to maintain a cognizance regarding numbers, skill, experience level, and availability.

In summary, a highly and diversely skilled workforce in the integrated federal, M&O and external provider communities is essential to the success of the full scope of the NNSA national security missions. In the past, there has been a too narrow focus on what was needed just for the execution of the nuclear weapons program. With the publication of the Nuclear Posture Review, the enhanced scope of the Stockpile Stewardship and Management Program, and the importance given to the full spectrum of the NNSA's nuclear security mission areas, the development, deployment and retention of the workforce needs to proceed even more on an integrated corporate basis.

VI. Budget Requirements Estimates and Effective Business Practices

Background

From FY 2004 to FY 2010, a downward trend in the Weapons Activities budget resulted in a loss of purchasing power of 20 percent for Defense Programs. As part of the 2010 Nuclear Posture Review (NPR) Report, the Administration made a commitment to modernize America's nuclear arsenal, and the infrastructure that sustains it, in order to maintain the deterrent for as long as nuclear weapons exist. To begin this effort, the President requested a nearly 10 percent increase for Weapons Activities in the FY 2011 budget and $4.4 billion in additional funds for these activities for the FY 2011 Future Years Nuclear Security Program (FYNSP).[14] Further, the Administration now proposes an additional increase in FY 2012 through 2016 funding by over $4 billion compared to the FY 2011 FYNSP.[15] The Administration projects an investment of approximately $88 billion in the Nuclear Security Enterprise (NSE) over the next decade. These resources will help to invest in a modern, 21st century national security enterprise that can sustain the stockpile and support the full range of nuclear security missions. With these investments, NNSA will be able to continue to move toward an enterprise that is safer, smaller, more secure, more efficient, more sustainable, and more adaptable.

The program and resulting budget structure to support the weapons activities mission is shown in Figure 8. Weapons Activities comprise the largest portion of the NNSA budget. The current budget structure also serves as the cost reporting structure for Weapons Activities work.

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[14] After adjustment for the transfer of the Pit Disassembly and Conversion Facility from the Weapons Activities account to the Defense Nuclear Nonproliferation account, the increase over the FYNSP is actually $5.4 billion.

[15] The additional increase does not include the increase in funding for the University of California legacy pension payments.

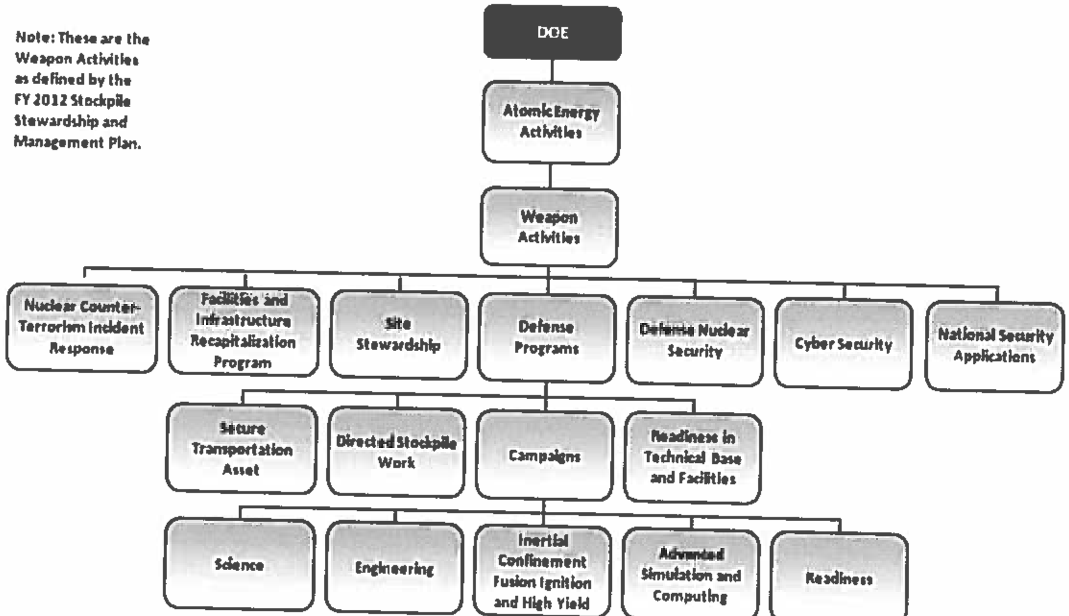


Figure 8. Weapons Activities Account

Budget Requirements Estimates

The projections beyond the FYNSP are appropriately called estimates. They are a snapshot in time of expected inflation and other factors, given a specific set of requirements (that are themselves not fixed) over a period of several years. Budget estimates are evaluated each year and adjusted as necessary.

Indeed, planning and design, as well as budget estimates, have matured since the President's budget for FY 2011 was developed. This is reflected in the FY 2012 President's Budget. Notably, stockpile requirements to fully implement the 2010 NPR Report and the New Strategic Arms Reduction Treaty have been refined, and the NNSA has begun executing its FY 2011 SSMP. The FY 2012 SSMP updates and discusses, in particular, evolving Life Extension Program (LEPs) and progress on the designs of key facilities such as the Uranium Processing Facility (UPF) and the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR-NF).

The President has requested $7.6 billion for FY 2012, an increase of $0.6 billion over the planned FY 2012 funding level included in the FY 2011 FYNSP. Thus, in two years, the level of funding requested for this program will have increased by $1.2 billion, in nominal terms, over the $6.4 billion level appropriated in FY 2010. As shown in Figure 9, if this funding is appropriated by Congress, it will reverse the 20 percent loss in purchasing power that occurred for Defense Programs from FY 2004 to 2010.

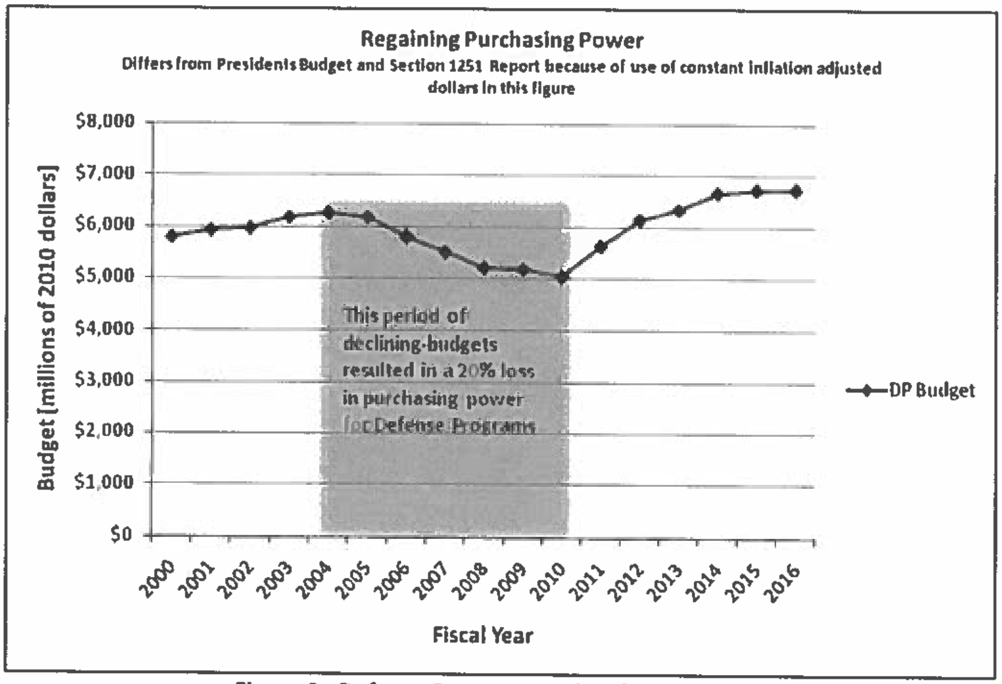


Figure 9. Defense Programs Budget by Fiscal Year

Directed Stockpile Work and Science, Technology, and Engineering Campaigns Budget

Surveillance–Surveillance activities are essential to enable continued assessments of the reliability of the stockpile without nuclear testing. Surveillance involves disassembly and inspection of a sample of weapons from the stockpile and the conduct of laboratory tests and joint flight tests with the DoD on certain systems, subsystems, and components to assess their performance. These activities allow detection of possible manufacturing and design defects, as well as detection of the effects of material degradation over time. The NNSA has received recommendations from the national laboratory directors, the DoD, the U.S. Strategic Command Strategic Advisory Group, and the JASON Independent Scientific Defense Group that the nuclear warhead/bomb surveillance program should be expanded.

In response to this broad-based advice, the NNSA has reviewed the stockpile surveillance program and its funding profile. As shown in Figure 10, from FY 2005 through FY 2009, funding for surveillance activities, when adjusted for inflation, fell by 27 percent. In response, the surveillance budget was increased by 50 percent, from $158 million to $239 million. In the FY 2012 budget, the President will sustain this increase throughout the FYNSP. If Congress appropriates at this level of funding, required surveillance activities can be performed.

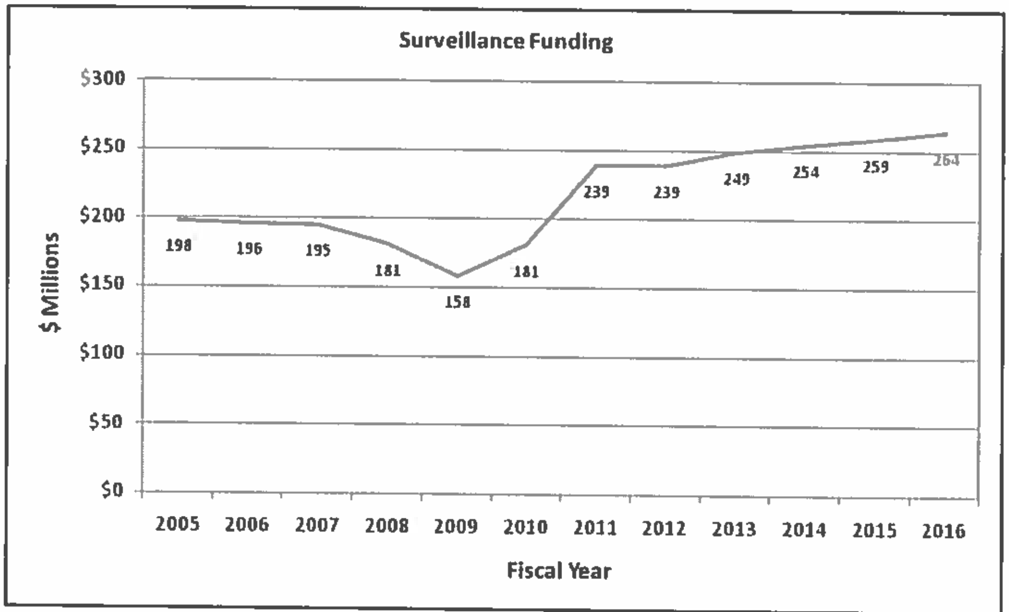


Figure 10. Surveillance Funding

Weapon System Life Extensions and Services—The Administration is committed to pursuing fully funded LEPs for the nuclear weapons stockpile. The FY 2011 budget submission and the NPR outlined initial plans. Since May 2010, additional work has further defined the requirements to extend the life of the following weapon systems:

- W76—The DoD has finalized its assessment for determining the number of W76 warheads to remain in the stockpile to support current guidance. The required number of W76-1 life-extended warheads is larger than the NNSA assumed in its FY 2011 budget plans. The NNSA has adjusted its plan accordingly to ensure the W76-1 LEP is completed in FY 2018, a one-year adjustment that has been endorsed by the Nuclear Weapons Council. This adjustment will not affect the timelines for B61 or W78 life extensions. If Congress appropriates funds at the level requested by the President, the LEP will be fully funded for the life of the program at about $255 million annually.
- B61—The NNSA began the study on the nuclear portion of the B61 life extension in August 2010, six months later than the original planning basis. To overcome this delay, the NNSA will accelerate the technology maturation, warhead development, and production engineering that is necessary to retain the schedule for the completion of the first production unit in FY 2017.

- W78[16]—The study on the W78 LEP should begin in 2011 with the intent to study, among other things, a common warhead for the W78 and the W88 as an option for W78 life extension.
- W88 arming, fuzing, and firing—Development of a W88 arming, fuzing, and firing is required for sustainment of the W88 and would also enhance the evaluation of commonality options for the W78/W88. Approximately $400 million has been added to the FY 2012 through 2016 FYNSP for this purpose.
- Stockpile Systems and Services–The NNSA is executing a larger program of stockpile maintenance than assumed in the FY 2011 budget. The additional work includes an increase in the development and production of the Limited Life Component to support the weapons systems. Consequently, the Administration has requested increased funding of $31 million in FY 2012 for the increased production of neutron generators and gas transfer systems.

Experiments—As LEPs continue, the NNSA is considering additional methods for evaluating the best technical options for LEPs. One consideration is expanded surrogate material experiments on the Dual-Axis Radiographic Hydrodynamic Testing Facility, the Contained Firing Facility, and the National Ignition Facility. Other options under consideration include integral hydrodynamic and subcritical experiments in support of improving warhead safety and security features without adding new military capabilities or pursuing underground explosive nuclear weapons testing. This program might include scaled experiments that could improve the predictive capability of numerical calculations by providing data on plutonium behavior under compression by high explosives. In order to thoroughly understand this issue, to assess its cost-effectiveness, and to ensure that there is a sound technical basis for any such effort, the Administration will conduct a review of these proposed activities and potential alternatives to determine which experiments would best provide the data needed to support improved predictive capabilities.

Readiness in Technical Base and Facilities Budget

Modernization of the enterprise includes sustaining existing facilities, reducing deferred maintenance, constructing replacement facilities, and disposing of surplus facilities. The Administration is committed to fully fund the construction of the UPF and the CMRR-NF in a manner that does not redirect funding from the core mission of managing the stockpile and sustaining the science, technology, and engineering (ST&E) foundation. To this end, in addition to increased funding for UPF and CMRR-NF, the FY 2012 budget will increase funding over the FY 2012 number in the 2011 FYNSP for operations and maintenance by approximately $207 million ($375 million, with pension funding in Institutional Site Support).

[16] The W78 study is pending congressional approval.

Readiness in Technical Base and Facilities (RTBF)—UPF and CMRR-NF Construction. These two nuclear capabilities are required to ensure the United States can maintain a safe, secure, and reliable arsenal over the long term. Both of these projects take decayed World War II infrastructure and consolidate multiple industrial nuclear facilities into two complexes that are significantly smaller, safer, adaptable, and more secure. The capability for processing uranium and plutonium research are critical functions required through the 21st century regardless of the size of the stockpile. The 2010 NPR Report concluded that the United States needed to build these facilities; the Administration remains committed to their construction.

Construction of large, one-of-a-kind facilities such as these presents significant challenges. Several reviews by the Government Accountability Office, as well as a "root-cause" analysis conducted by the DOE in 2008, have found that initiating construction before designs are largely complete contributes to increased costs and schedule delays. In response to these reviews, and in order to assure the best value for the taxpayers, the NNSA has concluded that reaching the 90 percent engineering design stage before establishing a project baseline for these facilities is fundamental to their successful pursuit.

The designs of these two facilities are about 50 percent complete as of March 2011; the estimated cost ranges of the facilities have increased. Responsible stewardship of taxpayer dollars required to fund these facilities demands close examination of requirements and an understanding of their associated costs so that the NNSA and DoD can make informed decisions about them. To this end, the NNSA, in cooperation with the DoD, is carrying out a comprehensive review of the safety, security, environmental, and programmatic requirements that drive the costs of these facilities. In parallel with, and in support of this effort, separate independent reviews are being conducted by the Corps of Engineers and the DOE Chief Financial Officer. In addition, the Secretary of Energy has convened his own review, with support from an independent group of senior experts, to evaluate facility requirements.

The overriding focus of this work is to ensure that UPF and CMRR-NF are built to achieve needed capabilities. The NNSA expects that construction project cost baselines for each project will only be established in FY 2013 after 90 percent of the design work is completed. At the 45 percent design phase, the estimated range for the CMRR-NF is $3.7 billion to $5.9 billion and the estimated range for UPF is $4.2 billion to $6.5 billion. Estimates include project engineering and design, construction, and other costs from inception through completion. Over the FYNSP period (FY 2012 through 2016), the Administration has requested an increase in funding of $620 million over the amount requested in the FY 2011 FYNSP for the two facilities.

At this stage in the process of estimating costs, it would not be prudent to assume NNSA knows all of the annual funding requirements over the lives of the projects. Funding requirements will be reconsidered on an ongoing basis as the designs mature and as more information is known. Innovative funding mechanisms, such as forward funding, may be useful in the future for providing funding stability to these projects. The NNSA has determined that it would not yet be appropriate and possibly counterproductive to pursue such a mechanism until the 90 percent design point is achieved. As planning for these projects proceeds, the NNSA and Office of

Management and Budget will continue to review all appropriate options to achieve savings and efficiencies in the construction of these facilities.

CMRR-NF and UPF will be planned in a few critical phases that will enable the NNSA to set and track performance baselines for subprojects of clearly defined scope to enhance transparency and project execution. Based on the current pace of design, the NNSA expects construction of the nuclear facility buildings to be completed by 2020 for both projects, and anticipates full operational functionality on or before 2023 for CMRR-NF and 2024 for UPF to meet program and customer expectations.

RTBF—Operations. In addition to supporting and sustaining existing facilities, the following will be supported in order to implement an increased scope of work for stockpile activities, especially surveillance and ongoing LEPs:

- Nevada National Security Site—Experimental facility availability to support ongoing subcritical and other hydrotest experiments necessary for certification of life extension technologies.
- Pantex—Investment in current infrastructure and construction to include FY 2012 funding for flood recovery and prevention.
- Sandia National Laboratories—Addresses minimum-operations capability at Tonopah Test Range, including limited recapitalization of equipment. Includes funds to begin recapitalization of testing equipment to support increased Directed Stockpile Work surveillance activities for the W76 and B61 and support the essential capabilities in micro-systems and radiation hardness and Test Capabilities Revitalization Phase II that are required to support the W76/B61/W78/W88 LEPs and the W88 Alteration (arming, fuzing, and firing replacement).
- Lawrence Livermore National Laboratory—Includes support for ongoing operations of Site 300 and the continued responsible stewardship of Superblock.
- Los Alamos National Laboratory (LANL)—Addresses operations at LANL's weapons components production facilities, waste facilities, and LANL science facilities. The latter include Dual Axis Radiographic Hydrodynamic Testing facility and the Los Alamos Neutron Science Center (including Linear Accelerator Risk Mitigation activities).
- Y-12—Investments in infrastructure and construction, including support for ongoing operations at 9212, Beta 9204-2E, and Nuclear Facilities Risk Reduction Project.
- Kansas City—Investment sufficient to meet the needs for the W76-1, B61, W78, and W88 while preparing and completing the move to the Kansas City Responsive Infrastructure Manufacturing and Sourcing site at Botts Road.
- Savannah River—Investment in infrastructure and construction, including funding for Tritium Responsive Infrastructure Modifications.

RTBF—Other Construction. The FY 2012 budget request includes $67 million for the High Explosive Pressing Facility project that is ongoing at Pantex, $35 million for the Nuclear Facilities

Risk Reduction Project at Y-12, $25 million for the Test Capabilities Revitalization Project Phase II at Sandia and $13.4 million for the Transuranic Waste Facility and $19.4 million for the TA-55 Reinvestment Project Phase II at LANL. As the UPF and CMRR-NF projects are completed, the NNSA will continue to modernize and refurbish its physical infrastructure over the next 10 years.

More broadly, across the entire FYNSP period, the following projects will be funded as detailed in Table 5. Where projects are not baselined, a preliminary cost range is presented.

Table 5. Near Term Projects

Function	Rate-Limiting Capability	Risk Mitigation Needed to Ensure Future Capability	TPC or Cost Range
Plutonium	Pits requiring most manufacturing process steps	Construct CMRR-NF	Range: $3.7B - $5.9B
	Pits requiring most manufacturing process steps	PF-4 Manufacturing Process Equipment Upgrades Project	FYNSP DSW Operating
	Extend useful life of PF-4	TRP Phase II	Range: $75M - $100M
	Radioactive Waste Disposition	TRU Waste	Range: $71M - $124M
Uranium	Extend useful life for 9212 and 9204-2E	Nuclear Facility Risk Reduction	TPC: $75.8M
	Refurbished or new CSA	Construct UPF	Range: $4.2B - $6.5B
HE	HE specialty manufacturing	Construct HE Pressing	TPC: $146.7M
Non-nuclear Production	KCP: non-nuclear component production	Construct KCRIMS	GSA Construction
	SNL: Revitalize normal/ abnormal mechanical environments	TCR Phase II	TPC: $57.8M

Legend: B=Billion; CMRR-NF=Chemistry and Metallurgy Research Replacement-Nuclear Facility; CSA=Canned Subassembly; DSW=Directed Stockpile Work; FYNSP=Future-Years Nuclear Security Program; GSA=General Services Administration; HE=High Explosive; KCP=Kansas City Plant; KCRIMS=Kansas City Responsive Infrastructure Manufacturing and Sourcing; M=Million; SNL=Sandia National Laboratories; TCR=Test Capabilities Revitalization; TPC=Total Project Cost; TRP=TA-55 Reinvestment Project; TRU=Transuranic Waste; UPF=Uranium Processing Facility

RTBF—Construction Management. Because of the unprecedented scale of construction that NNSA is initiating both in the NSE and in nonproliferation activities, the Administration recognizes that stronger management structures and oversight processes will be needed to prevent cost growth and schedule slippage. NNSA will work with DoD, Office of Management and Budget, and other affected parties to analyze current processes and to consider options for enhancements.

Other Fiscal Issues

Pension Cost Growth and Alternative Mitigation Strategies

NNSA has a large contractor workforce many of whom participate in employer sponsored defined-benefit pension plans. Pursuant to DOE/NNSA contracts with their contractors the

U.S. Government reimburses reasonable pension costs. Market downturns, interest rate decreases, and new statutory requirements have caused large increases in pension costs. The Administration is fully committed to continuing to reimburse contractors for these pension costs in accordance with their contracts. The Administration's FY 2012 budget request will therefore cover total pension reimbursement estimated to be $875 million for all of NNSA for FY 2012. This represents $300 million more than the amount provided in FY 2011. Over the five-year period, FY 2012 to FY 2016, the Administration's FY 2012 budget request will provide a total of $1.5 billion above the FY 2011 level. About three-quarters of this funding are associated with Weapons Activities and is included in the funding totals for those programs.

The Administration will conduct an independent study of these issues using the appropriate statutory and regulatory framework to inform longer-term decisions on pension reimbursements. The Administration is evaluating multiple approaches to determine the best path to cover pension plan contributions while minimizing the impact to mission. Contractors are evaluating mitigation strategies, such as analyzing plan changes, identifying alternative funding strategies, and seeking increased participant contributions. Also, contractors have been directed to look into other human resource areas where savings can be achieved in order to help fund pension plan contributions.

Updated 20-Year Projection

NNSA remains on course with the long-term strategy set by the President and reflected in the NPR that provides the direction for the size and composition for the stockpile, reaffirms the strategic intent to maintain the nuclear deterrent for the foreseeable future, and reaffirms the necessity that NNSA provide this deterrent without underground nuclear testing. The overall estimate of NNSA budgetary needs from FY 2012 through 2031 is reflected in Figures 11 and 12. These figures account for the low range and high range estimates for UPF and CMRR-NF presently available at the 45 percent design phase.

Table 6. Weapons Activities Post Future Years Nuclear Security Plan—*
10-Year Budget Requirements Estimate ($ millions)

	FY 2012 FYNSP					FYNSP + 5				
Fiscal Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Directed Stockpile Work	1,963.58	2,111.44	2,327.86	2,529.99	2,630.71	2,630	2,630	2,630	2,610	2,670
Science Campaign	405.94	418.22	416.28	394.32	404.10	430	450	470	490	510
Readiness and Engineering Campaigns	285.57	299.17	296.65	293.16	294.01	310	330	350	360	370
Advanced Simulation and Computing Campaign	628.95	616.10	628.10	643.12	659.21	690	730	760	800	830
Inertial Confinement Fusion Ignition and High Yield Campaign	476.27	476.38	471.67	485.24	495.03	520	550	570	600	620
Readiness in Technical Base and Facilities	1,705.62	1,907.13	1,922.03	1,935.83	1,957.15	1,540	1,770	1,960	2,070	2,120
RTBF: UPF/CMRR-NF**	460.19	490.00	700.00	700.00	700.00	960	880	780	580	-
RTBF: Other Construction	160.32	87.13	120.48	93.83	77.74	200	200	200	200	600
Secure Transportation Asset	251.27	249.46	252.87	261.52	267.77	270	280	280	270	270
Defense Nuclear Security	722.86	729.80	729.17	756.11	814.97	800	820	830	840	850
Facilities & Infrastructure Recapitalization Program	96.38	94.00	-	-	-	-	-	-	-	-
Other Weapons Activities ***	472.76	469.85	553.37	590.43	604.91	590	600	610	620	620
Total ****	7,629.72	7,948.67	8,418.48	8,683.54	8,905.60	8,900	9,200	9,400	9,400	9,500

Legend: CMRR-NF=Chemistry and Metallurgy Research Replacement-Nuclear Facility; UPF=Uranium Processing Facility

Notes:

* The totals attributed here to Weapons include DoD funding for programs endorsed by the Nuclear Weapons Council. The DoD levels in FY 2013-FY 2016 include $2.2 billion that will be allocated, in annual increments, to the NNSA due to the close link between DoD and NNSA in determining nuclear weapons-related requirements.

** UPF/CMRR-NF costs in this table represent the low end of the current cost range for these projects as presented in the February Section 1251 Report.

*** Other Weapons Activities include Nuclear Counterterrorism Incident Response, Site Stewardship, Cyber Security and National Security Applications.

****Totals for FY 2017 through FY 2021 may not add up due to rounding.

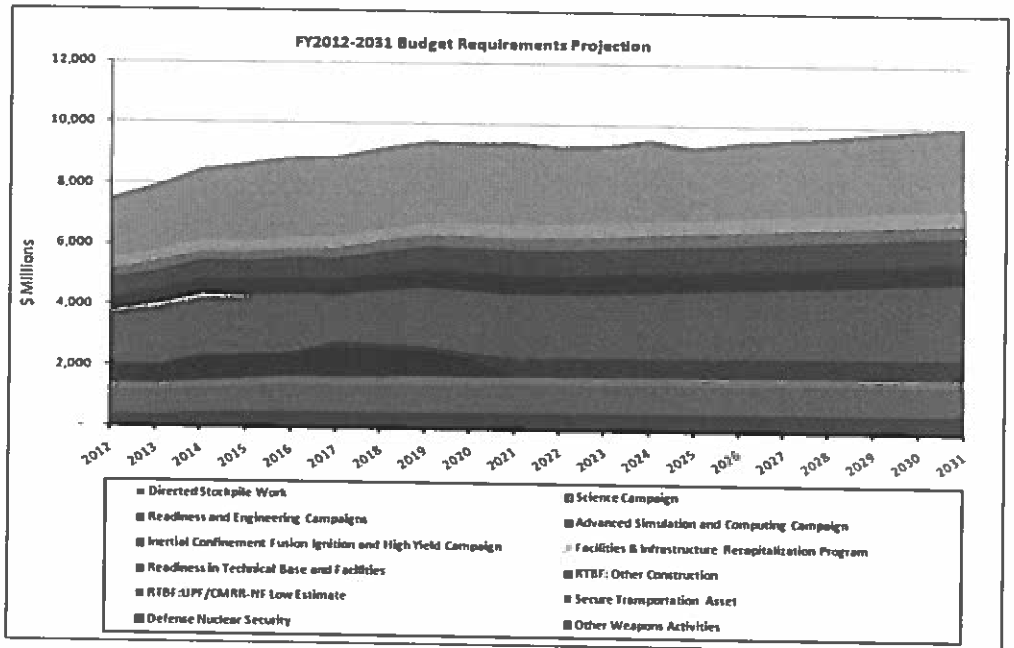


Figure 11. An Out-Years Budget Requirements Low End Estimate of the Weapons Activities of the NNSA in then-year dollars

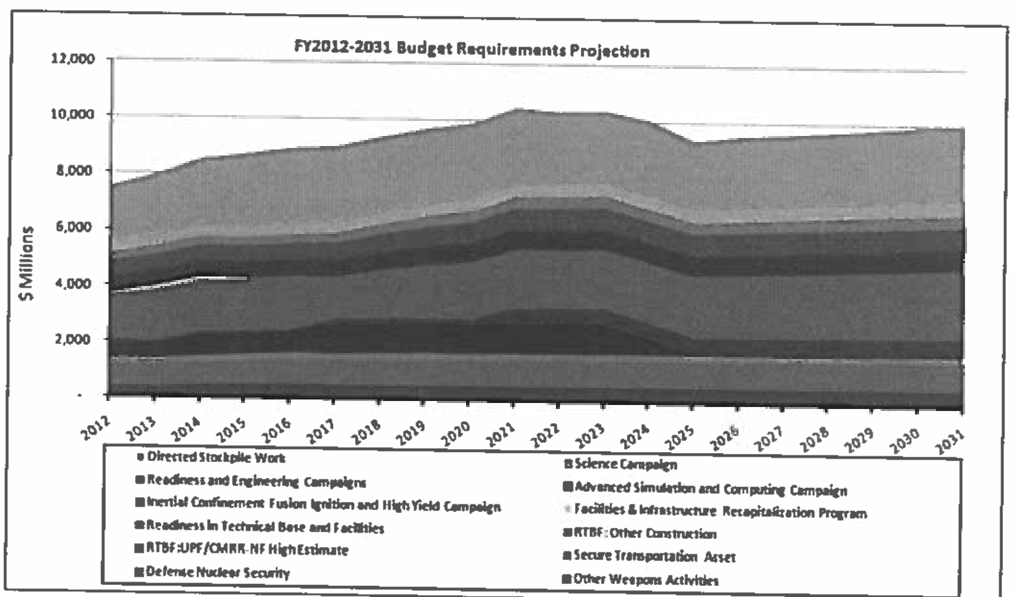


Figure 12. An Out-Years Budget Requirements High End Estimate of the Weapons Activities of the NNSA in then-year dollars

Past and Projected Weapon System Lifecycle Costs

Lifecycle costs encompass all the anticipated costs associated with a project or program throughout its life. This includes costs from pre-design through manufacturing to the end of life. For nuclear weapons, lifecycle cost analysis is useful in comparing similar weapon designs. For systems that have the same research and development costs, one weapon design may have a lower manufacturing cost, but higher maintenance and support costs.

The design, manufacturing and sustainment costs of the weapons in the stockpile were not reported by weapon type before FY 2003, and back-calculating these costs is not feasible. At the direction of Congress, starting with the FY 2005 DOE budget request, certain stockpile sustainment costs for each weapon type have been reported annually within the NNSA Directed Stockpile Work subprogram. Actual sustainment funding for weapon maintenance and life extension activities has been reported as prior year appropriations going back to FY 2003. Sustainment costs include: ongoing assessment activities; Limited Life Component Exchange; required and routine maintenance; safety studies; periodic repair; resolution and timely closure of significant finding investigations; military liaison work; and surveillance to assure continued safety, security, and reliability. These costs are incurred every year that a weapon is in the active stockpile. LEPs, which are not part of the stockpile sustainment, are undertaken as needed to extend the life of a warhead for an additional 20 to 30 years. LEP costs are incurred only for the duration of the life extension activities.

It is important to note that these weapon-specific sustainment appropriations do not reflect the breadth of stockpile supporting activities in the Weapons Activities account of the NNSA budget. In fact, weapon-specific costs are only a fraction of the Weapons Activities budget. Other costs trace to ST&E campaigns, physical infrastructure, and providing security and transportation. Further discussion of each Weapons Activities is found in Appendixes A and C.

Budget Trends and Assumptions

Directed Stockpile Work

Figures 13 through 19 show the annual stockpile sustainment and life extension costs for each weapon system in the active stockpile, not corrected for inflation. The intermittent nature of LEP costs is apparent in the figures. Figure 13 illustrates the cyclical nature of life extension costs as the B61 bomb progresses through the phases of weapon design, cost analysis, development, and finally, production. Figure 14 indicates the significantly earlier expenditures for life extension activities of the W76 with nine more years of life extension production activities planned. In contrast, the W78 (Figure 15) has incurred minimal cost for annual sustainment from 2003 to 2010, but an LEP study and future development is planned to begin in 2011. Six of the seven active weapon systems have had or will have LEPs undertaken in the 28 years shown in the charts. Total direct costs for each weapon in the 2003 through 2031 period are provided in Figure 20. Even though the figure does not capture all the costs incurred for a weapon, it illustrates the significance of life extensions to the lifecycle cost of a weapon system. Figure 21 is a one chart summary of the total U.S. projected nuclear weapons life extension costs over the period of 2010 through 2031 and Figure 22 illustrates total active projected stockpile costs for the same period.

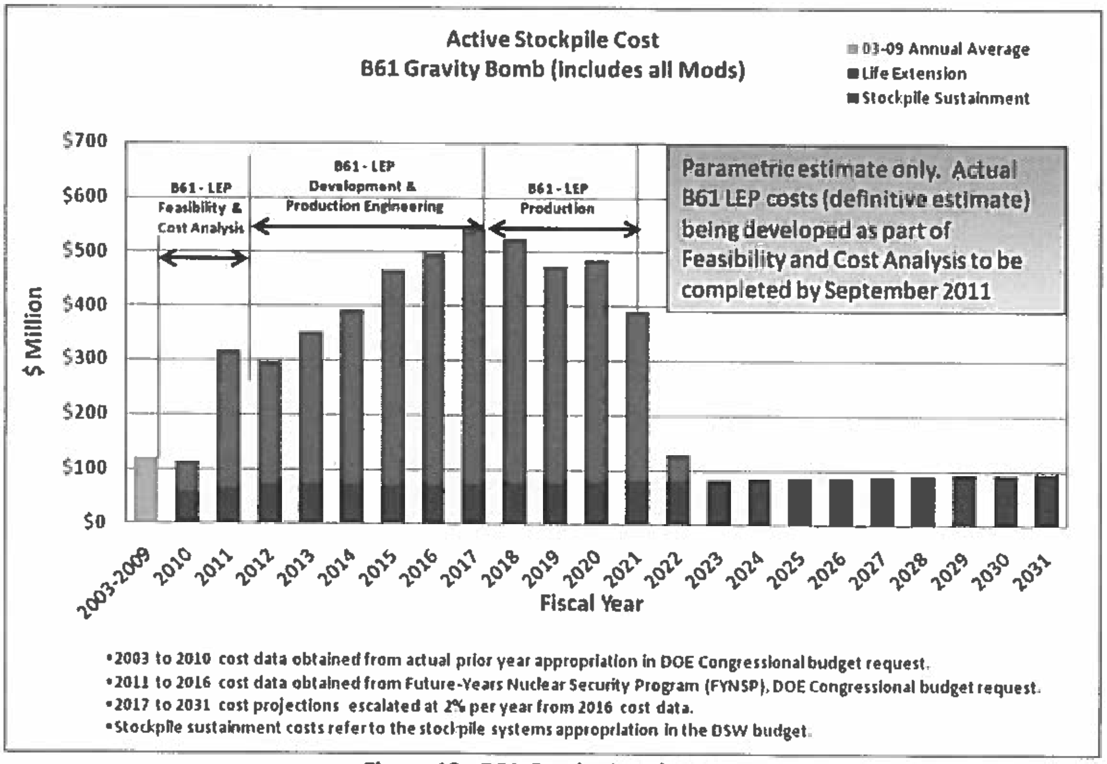
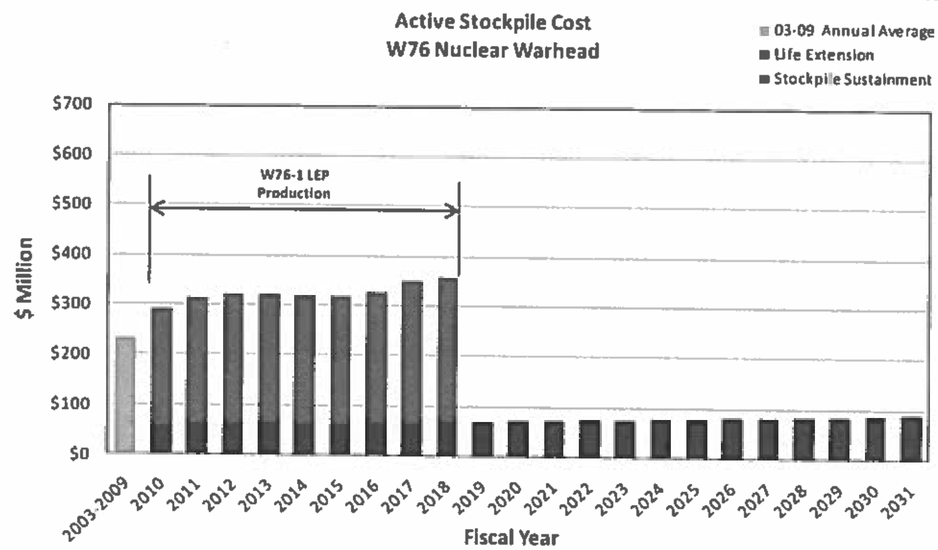
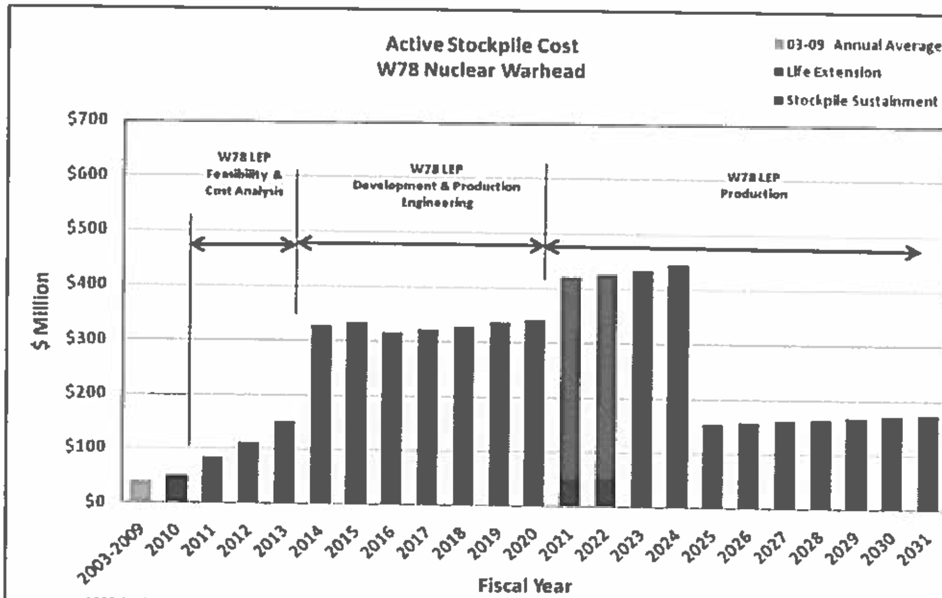


Figure 13. B61 Gravity Bomb Costs



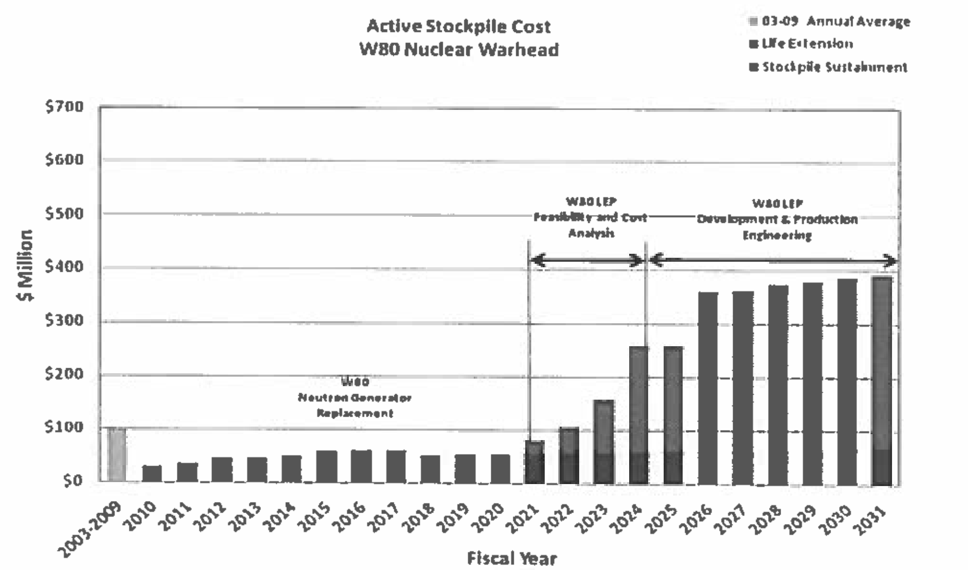
•2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
•2011 to 2016 cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
•2017 to 2031 cost projections escalated at 2% per year from 2016 cost data.
•Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.

Figure 14. W76 Nuclear Warhead Costs



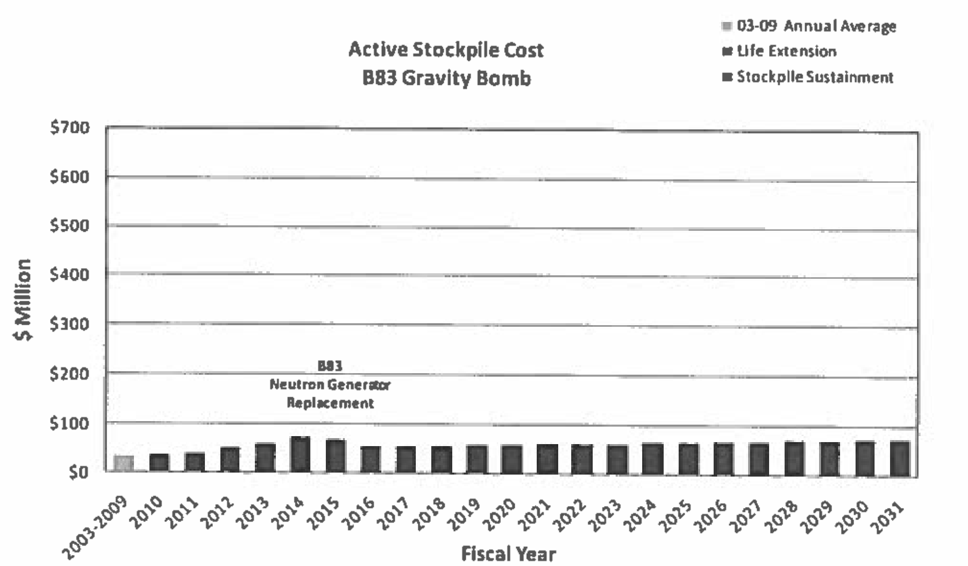
•2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
•2011 to 2016 cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
•2017 to 2031 LEP cost projections obtained from internal LEP/RRW Tradeoff Study methodology and cost data, subject to change.
•2017 to 2031 sustainment cost projections escalated by 2% per year from 2016 cost data.
•2025 to 2031 estimated production costs and period depend on DoD requirements to be determined.
•Better cost estimates for the W78 LEP are expected after the Feasibility and Cost Analysis.
•W78 LEP studies to evaluate the feasibility of using the resulting warhead on other platforms.
•Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.

Figure 15. W78 Nuclear Warhead Costs



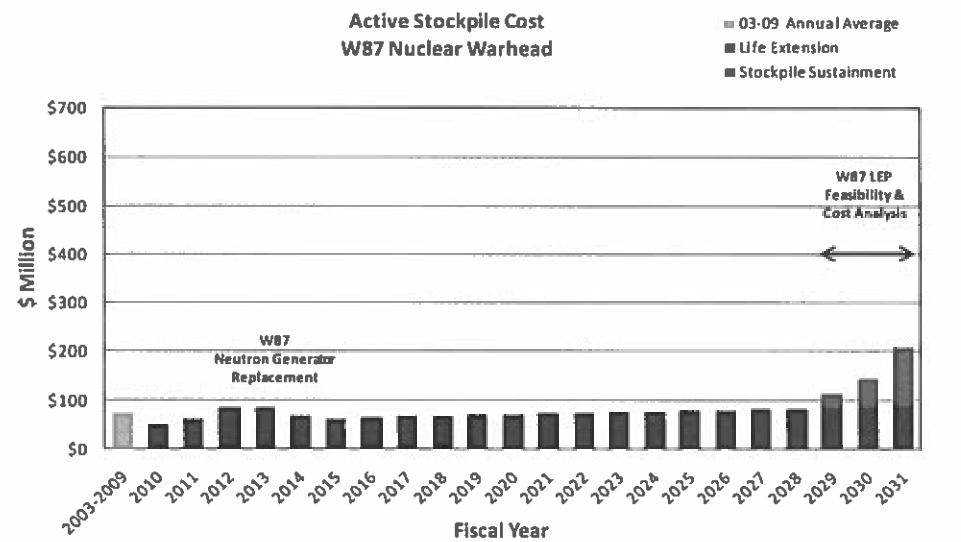
- 2003 to 2009 average cost includes four years of W80-3 LEP expenditures prior to the LEP being cancelled
- 2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
- 2011 to 2016 cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
- 2017 to 2031 cost projections escalated at 2% per year from 2016 cost data.
- Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.
- NNSA is supporting the U.S. Air Force in studying options for future long-range standoff capability. The outcomes of these studies may impact W80-1 LEP schedules.

Figure 16. W80 Nuclear Warhead Costs



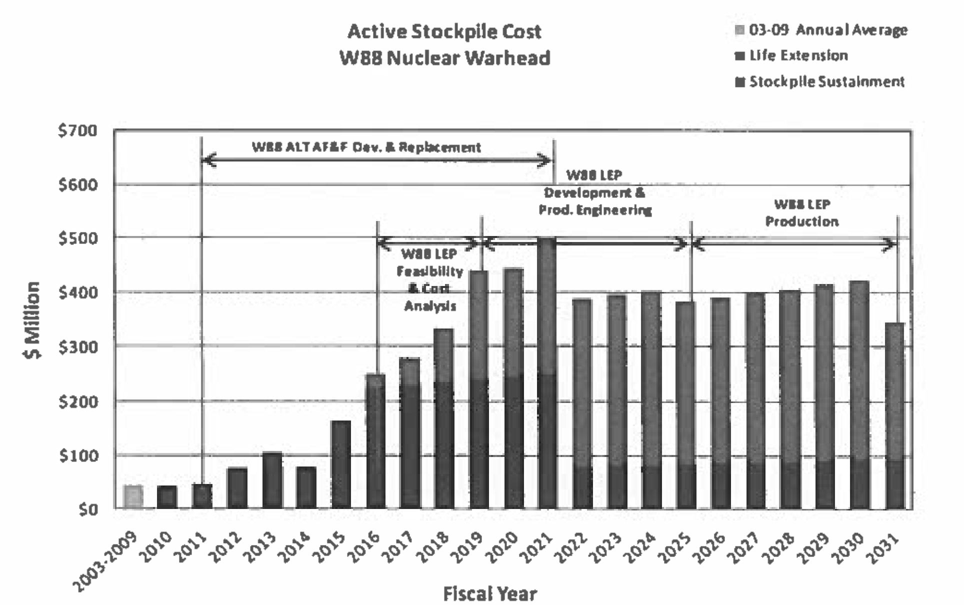
- 2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
- 2011 to 2016 cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
- 2017 to 2031 cost projections escalated at 2% per year from 2016 cost data.
- Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.

Figure 17. B83 Gravity Bomb Costs



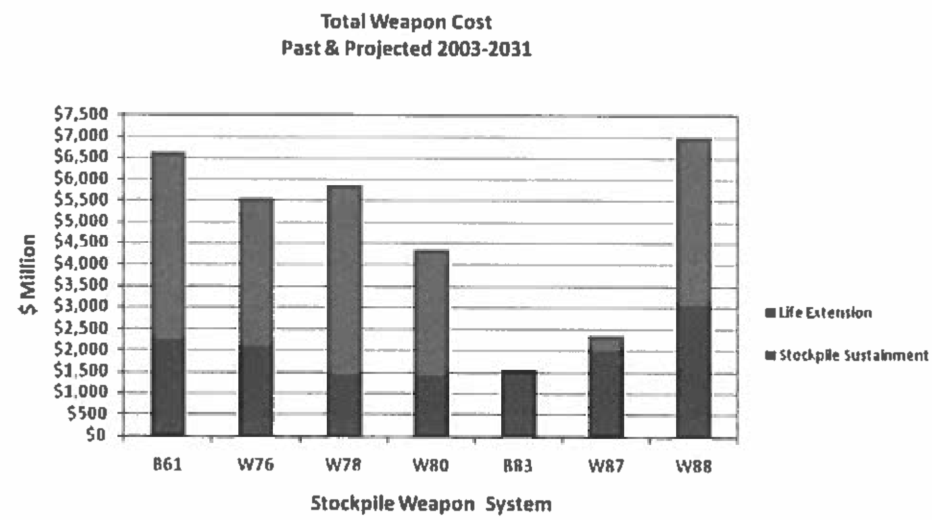
•2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
•2011 to 2016 cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
•2017 to 2031 cost projections escalated at 2% per year from 2016 cost data.
•Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.

Figure 18. W87 Nuclear Warhead Costs



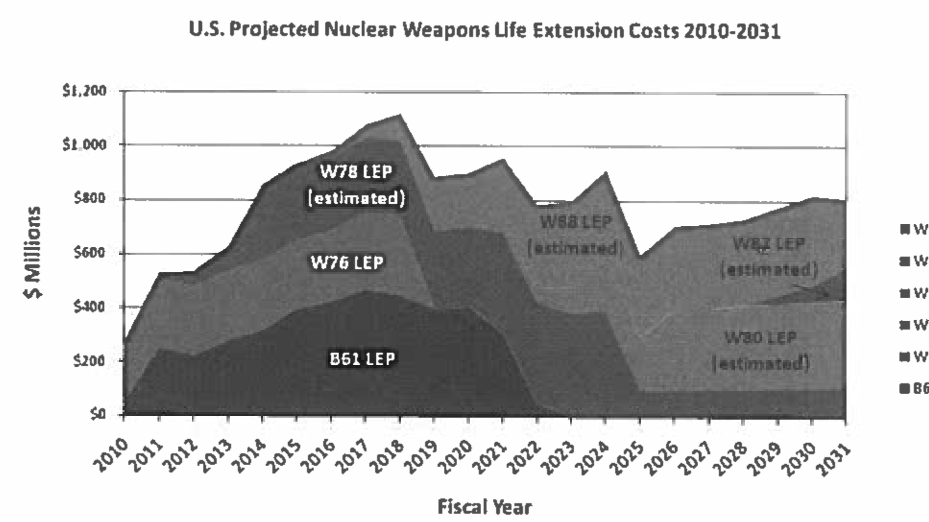
•2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
•2011 to 2016 cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
•2017 to 2031 cost projections escalated at 2% per year from 2016 cost data.
•Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.
•W88 AF&F Alt total costs are being developed.
•W78 LEP studies will include feasibility of common W78/W88 warhead. Outcomes of these studies may affect W88 LEP schedule.

Figure 19. W88 Nuclear Warhead Costs



•2003 to 2010 cost data obtained from actual prior year appropriation in DOE Congressional budget request.
•2011 to 2016 cost data obtained from Future Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
•2016 to 2021 B61 LEP cost projections obtained from early internal Phase 2 evaluations.
•2016 to 2031 W78 LEP cost projections obtained from internal LEP/RRW Tradeoff Study methodology and cost data.
•2016 to 2031 sustainment cost projections escalated at 2% per year from 2015 cost data.
•Stockpile sustainment costs refer to the stockpile systems appropriation in the DSW budget.

Figure 20. Total Lifecycle Costs: 2003 - 2031



•2010 to 2016 LEP cost data obtained from Future-Years Nuclear Security Program (FYNSP), DOE Congressional budget request.
•LEP costs projections escalated at 2% per year from 2016 cost data.

Figure 21. Total U.S. Projected Nuclear Weapons Life Extension Costs: 2010 - 2031

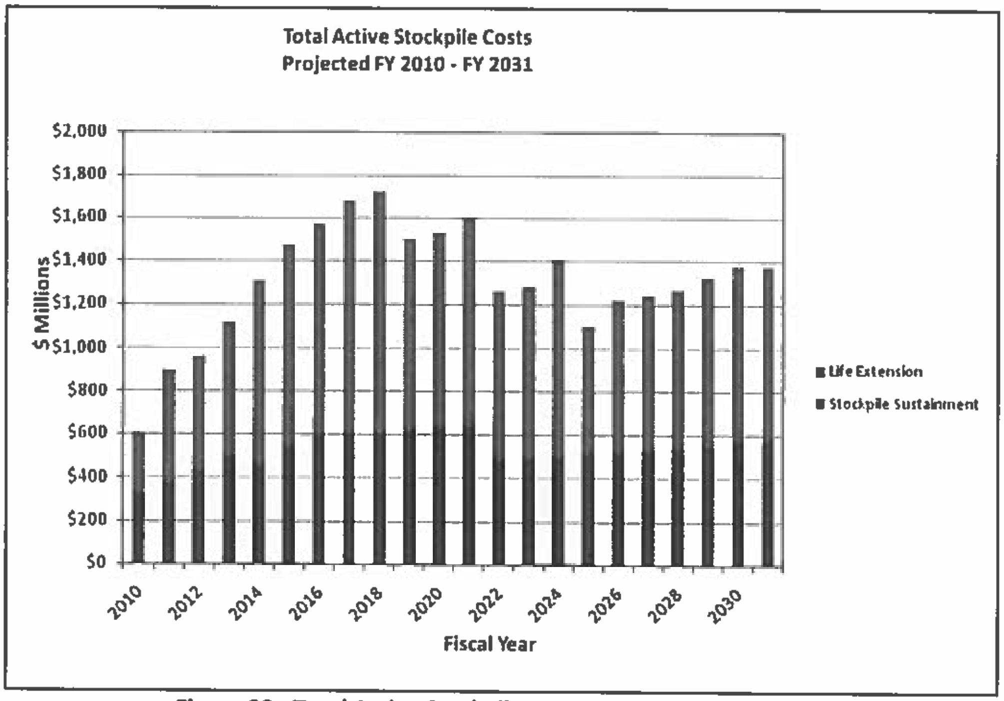


Figure 22. Total Active Stockpile Costs Projected 2010 - 2031

Science Technology and Engineering Campaigns

FY 2017 through2021: Beginning in FY 2017, the budget requirements estimate is based on an increase of approximately $100 million a year, for the ST&E campaigns. Areas of emphasis include:

- Increased experimental work to examine LEP options, including the ability to simultaneously perform multiple LEP studies;
- Improved computational capability and capacity to support the greater demands of three dimensional LEP modernization actions related to safety and security options;
- A strengthened ST&E base required to conduct LEPs, mature advanced technologies to increase weapons safety, security, and use control; qualify components and certify weapons without testing; and provide annual stockpile assessments through weapons surveillance; and
- FY 2022 through 2031: Projected costs reflect a 2 percent annual growth in the campaigns.

RTBF Capital Projects

- FY 2017 through FY 2020: Assumes construction for other project requirements (all but UPF and CMRR-NF) will continue after the FYNSP with a funding profile of approximately $200 million a year.

- FY 2020: Complete funding for UPF and CMRR-NF; since these projects are not yet baselined, a planning figure of approximately $8 billion is spread over the intervening years for these two major capital investments. Alternatively, if a higher range of UPF and CMRR-NF costs are baselined in FY 2013, the planning figure could be as high as $12 billion and the spread could extend to FY 2024.
- FY 2021 through FY 2031: An investment of approximately $600 million dollars per year is planned to be used for construction projects once construction is completed on the UPF and CMRR-NF.

Expected Efficiencies

- FY 2017: When compared to historical (FY 2005) levels, a total annual reduction of $100 million in costs will be achieved by the Kansas City Responsive Infrastructure Manufacturing and Sourcing initiative. An annual savings of $35 million will be achieved prior to FY 2017. The remaining $65 million of annual cost reduction at the Kansas City Plant will be achieved starting in FY 2017 after transition to the new leased facility is complete and the legacy facility has been dispositioned.
- FY 2021: Based on contracting efficiencies and improved business and governance practices, NNSA will reduce overhead rates to the 2004 level of approximately 40 percent. This will result in an annual savings of approximately $150 million per year.
- FY 2023: Project a fifty percent reduction in dismantlement costs due to completing work on the backlog of retired weapons.
- Upon completion of UPF: Reduction in Perimeter Intrusion Detection and Assessment System security fence and other operational efficiencies will result in significant annual savings at Y-12. Timeframe and amount will be determined by UPF program completion.

Operations and Effective Business Practices

NNSA and its Defense Programs element are embarked on one of the most demanding periods in the history of the United States' military and non-military application of nuclear technology. The policy framework for the nuclear deterrent, as addressed by the 2010 NPR Report approved by the President, has broad government-wide support. For the first time in many years, a consensus exists on the need to support the full array of missions performed by the NNSA, as reflected in both the appropriations marks for FY 2011 and the additional resources provided as part of the recent update to the 1251 Report. With this broad-based support come demanding new performance requirements and an unprecedented interest in monitoring NNSA's ability to execute effectively and efficiently.

NNSA is aggressively undertaking a number of initiatives to ensure responsible stewardship of the Defense Programs budget. The NSE delivers a broad range of products required by the nation's nuclear stockpile from weapon components and systems to security services to ST&E assessments and solutions. The enterprise's ability to perform the mission depends not only on overall funding to a sufficient level capable of supporting modernization of the stockpile and sustaining the necessary ST&E base and preparedness and resiliency of its infrastructure, but also on enabling business practices that are needed to be more efficient and cost effective. This section provides a summary of some of the key initiatives underway.

Governance Reform

Congress and a number of independent panels have recommended that the organization and governance model for NNSA be re-examined and/or revamped.

In its report, the Stimson Center Task Force on Leveraging the Scientific and Technological Capabilities of the NNSA National Laboratories for 21st Century National Security, stated as a key finding:

> "Governance is the key Issue."[17] "The Laboratories and Nevada National Security Site need an effective coordinating entity, one that provides strategic guidance and management direction." Based on this finding and subsequent analysis, the task force concluded "that creating a fully independent agency for national security science and technology will be the approach most likely to address all the findings and implement the recommendations [of the task force] ... Moreover, a new agency has the greatest probability of achieving the optimum long-term national security S&T research infrastructure for the nation."[18]

Similarly, in its final report, the Congressional Commission on the Strategic Posture of the United States also commented on the NNSA enterprise in the following terms:

> "On the nuclear weapons complex: ...Re-designating the weapons laboratories as national security laboratories and strengthening their cooperation with the Departments of Defense, State, and Homeland Security and also the intelligence community can help with both of these problems. NNSA has not achieved the original intent of the law that created it; it lacks the needed autonomy. This requires that the NNSA Act be amended to establish NNSA as a separate agency reporting to the President through the Secretary of Energy, along with other provisions aimed at ensuring the needed autonomy."[19]

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[17] Stimson Report "Leveraging Science for Security: A Strategy for the Nuclear Weapons Laboratories in the 21st Century" by the Task Force on Leveraging the Scientific and Technological Capabilities of the NNSA National Laboratories for 21st Century National Security, 2009, pg. 42.

[18] Ibid, pg. 44.

[19] "America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States, Executive Summary" William J. Perry, Chairman, James R. Schlesinger, Vice-Chairman, published by the United States Institute Peace, Washington, D.C., 2009 pg. xviii.

One major undertaking is the preparation of transformation by Assistant Deputy Administrator for Nuclear Safety, Nuclear Operations, and Governance Reform. The objective is improved mission performance through clear definitions of roles and responsibilities; improved transparency of Contractor Assurance Systems; established processes to ensure a balanced, risk-informed set of federal requirements; improved contract performance evaluation plans with balanced priorities focused on mission results; and improved, more efficient oversight processes.

This transformation streamlines how NNSA does business and allows resources to be focused and directed in a way that maximizes mission accomplishment while ensuring that safety and security are integral components of that mission. This will enable the NNSA of the future to transition into a less expensive enterprise that leverages scientific and technical capabilities to safely and securely meet the nuclear security mission. This goal will be achieved through a common understanding of how NNSA governs and performs according to NNSA's operating principles and by leveraging strong federal oversight and contractor assurance systems that improve performance and accountability, reduce costs, and use validated standards. On completion of the governance and oversight transformation effort, NNSA expects to have:

- Clear roles, responsibilities, and accountability—NNSA authorities will align to accountability and, in general, will be delegated to the lowest level decisionmaker whose access to information and span-of-control matches the decision to be made. All NNSA managers will be invested in the mission, whether they are scientific, technical, administrative, or logistical in nature. Detailed assignment of roles and responsibilities within specific line, program, and functional areas will be established during the development and promulgation of a comprehensive NNSA Functions, Responsibilities, and Authorities Document.
- Strong contractor assurance systems—NNSA will ensure its contractors have effective assurance systems that manage performance consistent with contract requirements. An effective assurance system provides transparency between contractors and NNSA to ensure alignment across the NNSA enterprise to accomplish mission needs and allows NNSA to determine the level of federal oversight necessary. An effective Contractor Assurance System enables continuous improvement of Contractor performance, integrates and aligns Contractor management systems, and supports corporate parent governance. It also allows more efficient and effective application of NNSA oversight resources.
- Balanced federal requirements—NNSA will work internally and with other DOE organizations to ensure that federal requirements rely primarily on national and international standards and regulations except in the unique situations where suitable consensus standards do not exist. Where specific requirements are necessary, these requirements will be revised to ensure the appropriate focus on contractor accountability while allowing maximum innovation and flexibility. Requirements will also be revised to align federal responsibilities in a manner that supports decisionmaking.
- Focused, integrated, effective, and efficient federal and contractor oversight systems—NNSA will improve upon performance-based oversight by using a graded approach

consistent with associated risks and the contractor's demonstrated performance. While doing that, NNSA will maintain its responsibility to exercise independence in oversight to sustain a strong self-regulatory posture where applicable and appropriate. Implementation of independent oversight for nuclear and high hazard activities will continue to be maintained and enhanced as NNSA balances requirements, risks, and resources.

- Improved contractual performance accountability—NNSA will improve its contracts and its contract evaluation processes to ensure that contracts are a governance framework that supports accomplishment of the mission and encourages innovation and efficiency of operations while maintaining the highest standards for safety, security, and environmental protection.

Recent assessments (some within DOE, including NNSA; others by external review panels) have looked at today's NNSA governance situation and suggested reforms for a more capable enterprise. Governance reform must continue in order to increase the efficiency of operations and enhance productivity. The status quo is not acceptable to the Secretary of Energy or the NNSA Administrator.

It is imperative for NNSA to improve two governance elements: how management and operating (M&O) contractor entities are managed and how oversight is implemented at NSE sites. Such improvements can evolve better business practices to enable increases in the percentage of resources to be applied directly to mission work. These reforms will also sustain national confidence concerning efficient use of appropriated resources and future budget requests.

Governance changes are already underway. Momentum from these initial reforms will be sustained and enhanced.

Contracting Reform

NNSA will implement a new, creative acquisition strategy. This strategy will move NNSA toward a single M&O contract for the management of select, key components of the NSE. The new strategy would also competitively award a new Integration, Management and Execution Construction Management Contract to enable project planning and execution efforts to be performed by design and construction experts, leading to improved construction management and reduced costs at all of NNSA's laboratories and production sites.

Business Management Process Improvement

The Business Management Advisory Council (BMAC) was established by the NNSA Administrator in 2009 to ensure improved efficiencies and economies in the NSE throughout all business functions. The long-term objective of the BMAC is to transform the federal and M&O community's business management processes from a tactical, reactive, single-site functionality to a strategically driven integrated enterprise functionality that ensures maximum value for every dollar spent, directly and indirectly. Attendant to, and flowing from, these changes will be related to federal policy, contract strategy, and administration changes and improvements. The BMAC is critical to achieving this broader transformation of the business functions.

Key objectives of BMAC include:

- Establish NSE-wide, cross-functional business strategies.
- Reduce the Total Cost of Ownership for internal assets, acquired goods and services, and all other business operational costs.
- Improve skills of NSE M&O Business Management Community.
- Align the Contracts and Contract Oversight Models to support Council initiatives and results.

The BMAC applies an integrated, cross-functional/business unit analytical approach to the entire NSE. In doing so, the NSE can begin to look for opportunities to create efficiencies and enhance cost effectiveness across the entire complex in areas such as: acquisition, contractor human resources including pension and healthcare initiatives, personal property, supply chain management, finance, and other areas.

The BMAC membership consists of the NNSA Chief Operating Officer, Chief Operating Officers or equivalent from each M&O contractor, NNSA Senior Procurement Executive, and NNSA Program and Site Office representatives. The Council functions in a collaborative advisory nature ensuring impartiality and championing process improvements. The BMAC will oversee the activities of each Functional Subgroup Team and collectively approve or disapprove its strategies. Advisory members routinely inform their respective site offices on initiatives being worked.

The BMAC identified, implemented, and validated approximately $180 million in cost savings in the various functional areas to the NNSA enterprise in FY 2010 and is working toward a goal of another $180 million for FY 2011.

Enterprise Portfolio Analysis Tool

The NNSA Enterprise Portfolio Analysis Tool is a tailored web-based application using off-the-shelf Oracle technology. Its purpose is to provide a consistent framework for planning, programming, budgeting, and evaluation of work required to execute the Defense Programs mission. That framework is grounded in the NNSA National Work Breakdown Structure, which sub-divides the work into well-defined, budget-significant activities. Deployment of the Enterprise Portfolio Analysis Tool introduces portfolio management within NNSA, which is an industry best practice.

Use of this tool can provide input to, and support transparency for high-level strategic decisions regarding portfolio investment including:

- Budget formulation and justification
- Impact analysis of different funding scenarios

- Measuring program performance against baseline

The Enterprise Portfolio Analysis Tool aligns well with other business-process-improvement efforts. The NNSA Acquisition Strategy Team and the Government Accounting Office have cited the need for a well-integrated, high-quality National Work Breakdown Structure. The NNSA Chief Financial Officer Cost Management Initiative emphasizes cost-structures and work breakdown structure definitions for an effective rollup of information and comparability across the enterprise; and the DOE Chief Financial Officer Cost Transparency Team was chartered to implement standard cost accounting and business systems to improve cost management and accountability. With access to these enhanced capabilities, the NNSA leadership will be able to base its decisions on validated priority-focused information as the relationships are illustrated in Figure 23.

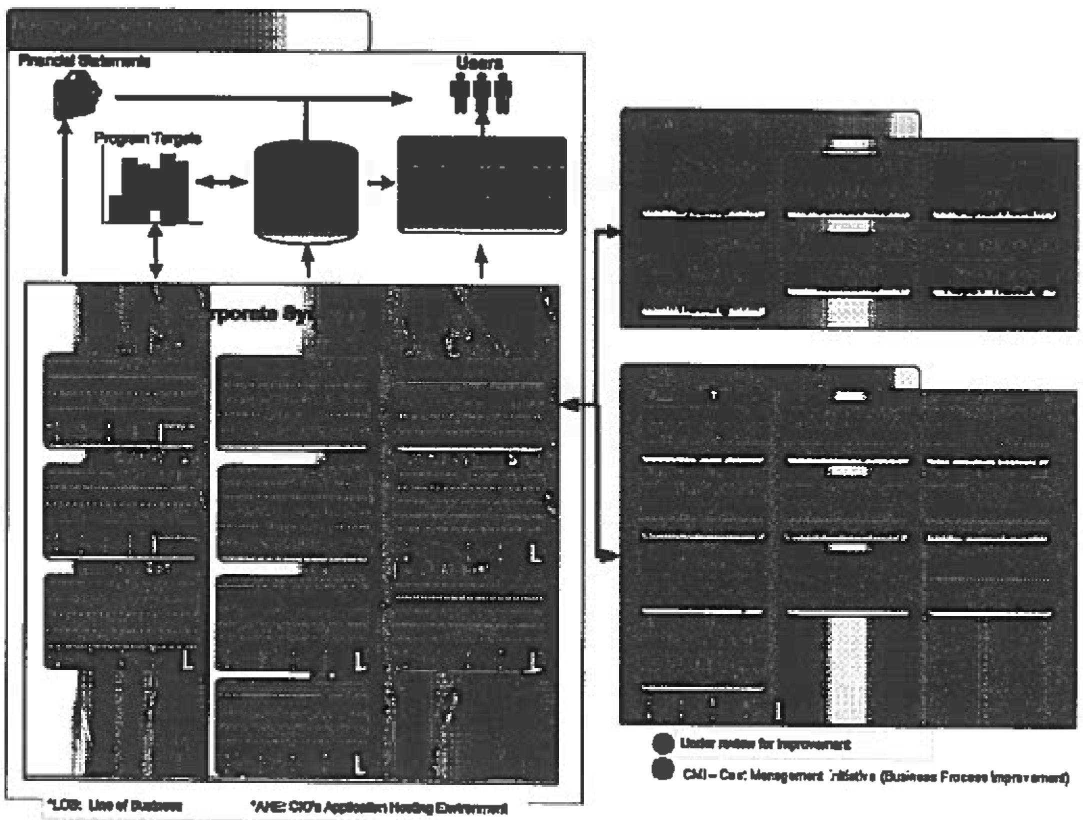


Figure 23. Enterprise Portfolio Analysis Tool is One Element of DOE's iManage Unified Systems

Enterprise Modeling

The Enterprise Modeling Consortium was established by NNSA as a resource to the NSE for integrated decision support using enterprise data, modeling tools, and associated analysis capability. The Enterprise Modeling Consortium is responsible for developing tools to integrate existing modeling capabilities, to address any modeling capability gaps that are identified, and to acquire and maintain enterprise modeling data.

The Enterprise Modeling Consortium program consists of three distinct elements, as illustrated in the Figure 24. As it develops its core technical capabilities, the Consortium provides NNSA with an analysis of the stockpile and the infrastructure and critical skills required to maintain the stockpile. Thus, these elements highlight the Enterprise Modeling Consortium's role as both a developer of enterprise models and a key provider of program analysis to management and staff.

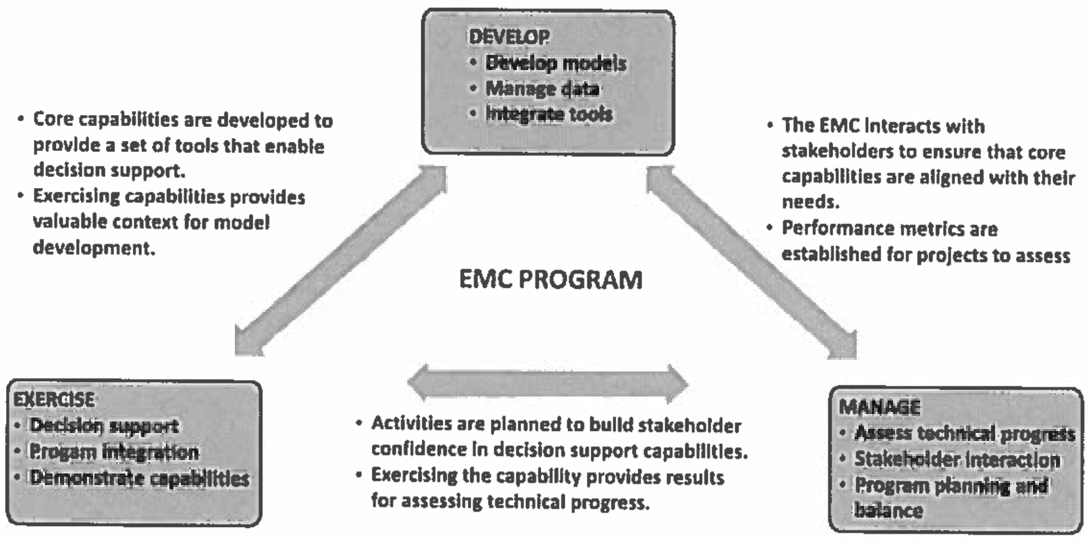


Figure 24. Enterprise Modeling Consortia (EMC) Program

Enterprise Wireless Project Initiative

The enterprise wireless program should provide the next generation wireless infrastructure across all NNSA sites with real-time data collection, user mobility, and automated solutions while ensuring effective protection of NNSA information.

This activity is directly supportive of the NSE Complex Transformation goals. Consolidation of site footprint in Complex Transformation makes it imperative that wireless infrastructure be in place prior to large project completions. The Nuclear Regulatory Commission estimates $2,000 per foot for installing fiber optic wire in a nuclear facility. A solution that provides an infrastructure that is unaffected by distance while providing availability and bandwidth is essential to achieving cost avoidances during footprint consolidation. Wireless technology allows for network connectivity to be rapidly provided in support of the mission with minimal incremental costs. The NNSA Chief Information Officer is investigating an opportunity to realize significant cost savings in the unclassified and classified environments by making meaningful investments in a robust, secure, wireless information technology infrastructure across the NSE.

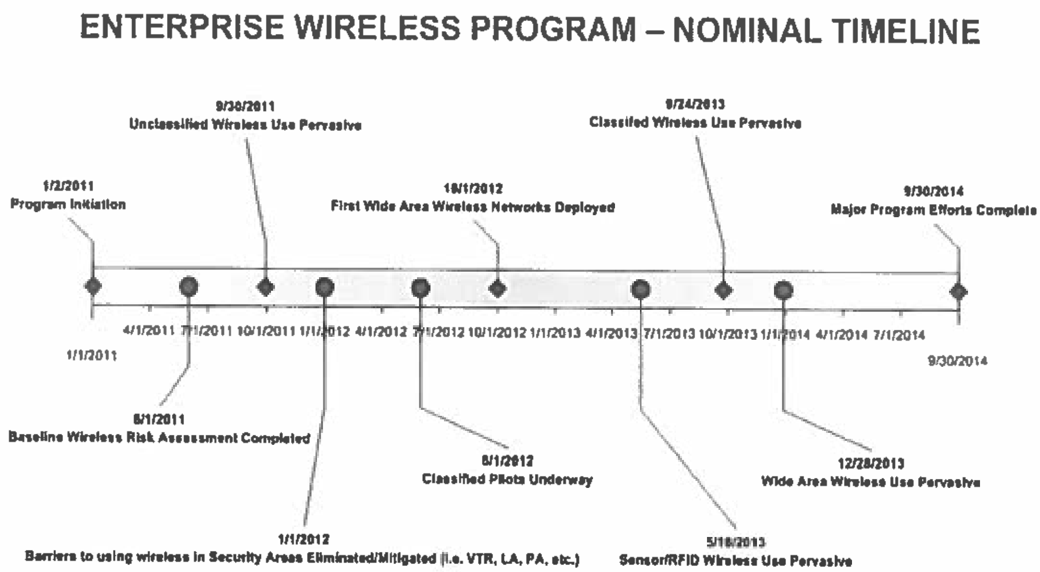


Figure 25. Enterprise Wireless Program—Nominal Timeline

VII. Conclusion

The SSMP provides a detailed plan of the scope, schedule, and necessary resources to maintain a safe, secure, and effective stockpile without new underground nuclear testing. It is aligned with the recently emerged national consensus on nuclear security, and it seeks to aggressively begin the work now to achieve the goals set out in that consensus. The most significant accomplishments since last year's plan are in extending the life of the stockpile. NNSA is at full production on the W76, and has begun a study of a full scope Life Extension Program (LEP) on the B61. The NNSA will also soon begin the study for the W78 that includes a study of commonality with some portion of the W88 pending congressional approval. This represents a significant increase in the scope of work for extending the life of the stockpile.

There have been changes to last year's plan based on continued work on the design activities for the Uranium Processing Facility (UPF) and the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR-NF). Although the design is not yet complete for these projects, the high end estimates for the UPF and CMRR-NF may require work to continue on these projects so that the facilities would reach completion in FY 2023 for CMRR-NF and FY 2024 for UPF. However, this Plan retains NNSA's commitment to attaining the functionality needed to meet DoD requirements by FY 2020.

The NNSA completed an external independent review of the High Explosive Pressing Facility design and expects to award the construction contract in spring 2011. The Highly Enriched Uranium Materials Facility, a state-of-the-art ultra-secure uranium storage facility, began its initial loading in April 2010. In September 2010, NNSA broke ground on a state-of-the-art campus to house the new manufacturing plant in Kansas City. These are all critical steps in NNSA's effort to transform a Cold War nuclear weapons complex into a 21st century Nuclear Security Enterprise.

In the past year, NNSA completed the W62 dismantlement a full year ahead of schedule. At the same time, it began dismantlement work on the B53 and the W80. This accomplishment means NNSA now has authorization to work on all of the weapon systems in the stockpile. These accomplishments also serve to increase confidence in the success of NNSA's Plan. In the area of science, NNSA's National Ignition Facility achieved several scientific milestones, including completion of its first integrated ignition experiment and an unprecedented one megajoule laser shot. Also, NNSA achieved the first successful use of the Dual-Axis Radiographic Hydrodynamic Test facility in multi-pulse/dual-axis mode. These are some of the examples of the diverse range of accomplishments occurring within the Nuclear Security Enterprise. While these accomplishments demonstrate the initial progress of NNSA's planning, they do not guarantee future success. There are many challenges ahead. While much of the effort remains in the design and study phase, the existence of a 20-year plan for the Nuclear Security Enterprise allows the NNSA to manage risk across the enterprise and make adjustments as necessary.

Finally, this Plan reflects a further commitment in resources above last year's Plan. This commitment by the Administration along with the support of the Congress will allow the NNSA to maintain the stockpile and modernize the Nuclear Security Enterprise that sustains it. With this commitment NNSA will be able to recruit and retain the best men and women to maintain a safe, secure, and effective deterrent for as long as nuclear weapons exist.

Appendix A—Enterprise and Programmatic Structure Updates

To a large extent, last year's *Annex A FY 2011 Stockpile Stewardship Plan (dated May 2010)* remains current. Annex A described the congressionally funded NNSA Weapons Activities effort, the individual programs and campaigns that constitute these activities, and the organization of the NNSA Nuclear Security Enterprise to perform the work. The interested reader can use this earlier annex to gain access to more extensive information than is provided in the present Appendix A.

The information in this year's Appendix A provides a short summary of accomplishments and changes for Weapons Activities programs or campaigns. For each program or campaign, the following is provided:

- Highlights of accomplishments since the FY 2011 SSMP
- Current issues or challenges
- Major milestones and changes in future plans

Budgetary details for each Weapons Activities are provided in Appendix C—*Financial Pie-charts and Tabular Budget Data.*

Directed Stockpile Work Program

Highlights of Accomplishments since FY 2011 SSMP

The Directed Stockpile Work (DSW) program completed a number of significant accomplishments recently in support of the Stockpile Stewardship and Management Program, including:

- Life Extension Programs (LEPs). Pantex exceeded the W76-1 production quotas by 20 percent. Additionally, DSW production investments helped reduce single point failures for the manufacturing of various components.
- Stockpile Systems. All FY 2010 Annual Assessment Reports and Laboratory Director letters to the President were successfully completed and a common neutron generator (NG) was selected for the B61 and B83.
- Weapons Dismantlement and Disposition. DSW completed scheduled Seamless Safety for the 21st Century activities to authorize processing for the B53 and W84.
- Stockpile Services. DSW completed the FY 2009 Annual Stockpile Assessment Memorandum to the President and submitted Weapons Reliability Reports to the DoD.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
LEPs	Completing B61 Phase 6.2/6.2A (Feasibility and Cost Analysis) LEP activities on a compressed schedule.
	Multiple LEPs will be concurrently worked for the first time.
Stockpile Systems	Recapitalizing aging equipment to sustain stockpile production/surveillance (e.g., laser cutting, transmitter test hardware).
	Reevaluating the surveillance program to ensure it is operating efficiently. This includes continuing to support the laboratory requirements for annual assessment while changing focus from discovering birth defects to assessing aging of some components of the weapons.
Weapons Dismantlement and Disposition	At the current dismantlement rates at Pantex, storage space is nearing capacity across the Nuclear Security Enterprise.
Stockpile Services	Meeting DoD required delivery numbers for Neutron Generators and developing components and subsystems for Limited Life Component exchange, and LEPs.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
LEPs	Produce sufficient quantities of W76-1 warheads to meet Navy requirements; complete delivery of all units to the Navy by FY 2018.
	Complete a nuclear and non-nuclear life extension study of the B61-12. Prepare for first production unit in 2017 that meets all safety, security, use control, and reliability objectives.
Stockpile Systems	Complete annual assessment process for each weapon system.
	Increase warhead surveillance and essential science, technology, and engineering investments to support stockpile assessment and certification in the absence of underground nuclear testing.
	Deliver limited life and other components according to schedules developed jointly by the NNSA and the DoD.
	Begin a life extension study in FY 2011 to explore options to extend the life of the W78 system.
Weapons Dismantlement and Disposition	Exceed schedule weapons dismantlement quantities at Pantex.
	Exceed scheduled canned subassembly dismantlement quantities at Y-12.
Stockpile Services	Complete and deliver Weapons Reliability Report for each weapon type.
	Complete requalification of component manufacturing processes in support of Kansas City Responsive Infrastructure Manufacturing and Sourcing effort.
	Fully enable surveillance, pit manufacturing, and NG manufacturing endeavors.

The major change in the DSW program compared to the FY 2011 SSMP is an increase in investments for weapon surveillance over the next several years. These plans are consistent with the needs of reliability reporting and the Annual Assessment process. Furthermore, there are future requirements to replace aging components for all stockpile weapons through the Limited Life Component exchange or LEP processes while continuing to sustain dismantlements consistent with current program goals. Additionally, DSW must ensure it maintains a knowledgeable workforce that can respond to stockpile requirements.

Science Campaign

Highlights of Accomplishments since FY 2011 SSMP

The Science Campaign, with its advanced technologies, has broadened the range of options available in the LEPs. It developed and applied physics-based models to assess quantitatively energy balance issues in the stockpile, representing a significant step in the campaign's focus to deliver predictive capabilities. In Advanced Radiography, additional diagnostic development explores transformational technologies that will replace or enhance optical and radiographic measurements for hydrotests. Recent accomplishments in several areas are summarized below.

Advanced Certification

- Executed two safety, security, and use control experiments at the Dual Axis Radiographic Hydrodynamic Testing facility.
- Made significant progress on the analysis of high priority historic underground test data, including Neutron Experiment data, Reaction History data, and 20 Pinhole Imaging Neutron Experiment Images.
- Completed first advanced surety assessment of a reuse concept and the path to certification required for this concept to be further developed.
- Continued to provide science-based technical capabilities and uncertainty quantification and assessment in support of future stockpile options.

Primary Assessment Technology

- Used proton radiography at the Los Alamos Neutron Science Center to study ejecta production mechanism and transport.
- Investigated fission yield basis interpretation differences between Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL); the majority of differences were resolved with implications for stockpile systems.
- Developed a tool to assess the uncertainty associated with radiochemical information in FY 2009; validated and initiated that tool in 2010, replacing a 40+ year-old method.
- Successfully executed the Ortega confirmatory shot on July 28, 2010, as part of the Bacchus/Barolo Subcritical Experiment Series on plutonium behavior under shocked conditions. The Bacchus Experiment was successfully executed on September 15, 2010, and the Barolo A Subcritical Experiment was successfully executed on December 1, 2010. All data were captured and of high quality, and the radiographs were exceptional in data content.

Dynamic Materials Properties

- Sandia National Laboratories (SNL) and LANL experiments on Z resulted in new, interesting data on the properties of plutonium from four material samples.
- Completed a series of thermal explosion experiments on PBX-9501 and PBXN-9, which demonstrate the differences in thermal sensitivity of the two high explosives.
- Bacchus and Barolo A, two subcritical experiments, were fired in U1a to understand damage mechanisms.
- Performed experiments probing electronic structure of actinide materials, providing key validation data for models.

Advanced Radiography

- Performed 31 proton radiography experiments at the Los Alamos Neutron Science Center during the 2010 run cycle.
- Development of the MOXIE high speed camera for radiographic applications garnered a research and development 100 Award.
- SNL and NNSS completed assembly of a 21-cell, 3 MeV linear transformer driver and began evaluation for advanced radiographic source applications.

Secondary Assessment Technologies

- SNL and LLNL conducted four Z experiments in FY 2010 to provide data on energy balance.
- Attained a K-shell yield of 85 kilojoules on Z with a stainless steel plasma radiation source in FY 2010, exceeding prior yields less than 60 kilojoules and meeting entry-level, early testing needs of the Engineering Campaign.
- Produced a 3-year plan for stockpile stewardship weapons science at NNSA's High-Energy-Density facilities (National Ignition Facility (NIF), Z and Omega).

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Campaign-wide	Assessment of risk and related cost has become more challenging when dealing with hazardous or unique materials such as plutonium.
Primary Assessment Technologies	No new issues since last year.
Dynamic Materials Properties	A new challenge and an accomplishment—use of Z-facility to obtain next generation of plutonium data.
Advanced Radiography	Define future radiographic capabilities required for subcritical experiments.
	Develop advanced compact radiographic sources (drivers and x-ray sources).
Secondary Assessment Technologies	No new issues since last year.

Subprogram	Description of Issue or Challenge
Advanced Certification	Focus more on this subprogram than in past years.
	Develop a product-based certification capability.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Campaign-wide	Strengthen nuclear weapons assessment and LEPs through scheduled development of the predictive capability framework.
	Support key national security issues by maintaining tools and capabilities to find solutions to current and emerging national scientific problems.
Primary Assessment Technologies	Complete ignition and burn Part I in FY 2015.
Dynamic Materials Properties	Complete data and improve multi-phase Equation-of-State and Strength models in FY 2013.
Advanced Radiography	No changes since last year.
Secondary Assessment Technologies	No changes since last year.
Advanced Certification	No changes since last year.

Engineering Campaign

Highlights of Accomplishments since FY 2011 SSMP

The Engineering Campaign has produced a number of significant accomplishments in FY 2010 that support the Stockpile Stewardship and Management Program. Key highlights include:

- The Enhanced Surety subprogram successfully completed number five on the Defense Programs Getting the Job Done in FY 2010 list to "demonstrate technologies required to field an integrated surety system by September 2010." This was accomplished by maturing command and control system technologies applicable to a NNSA transportation application to Technology Readiness Level 6.
- The Weapons Systems Engineering Assessment Technologies subprogram completed a mock high-explosive assembly and collected data for modeling and characterization of its stress state.
- The Nuclear Survivability subprogram demonstrated high precision techniques to assess the potential impact on radiation hardness during system lifetime.
- The Enhanced Surveillance subprogram completed the development of four diagnostics to Technology Readiness Level 6. This includes: (1) Schlieren imaging for detonators; (2) Acoustic Resonance Spectroscopy for pit application; (3) Computer Tomography reconstruction and image analysis tools for application to CoLOSSIS and other data; and (4) Non-Destructive Laser Gas Sampling system for canned subassembly application.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Enhanced Surety	Implement improved stockpile surety capabilities which require integrating, qualifying, and certifying deeply buried surety subsystems through the LEP process.
	Coordinate with military partners for implementation of Integrated Surety Solutions Technologies.
Weapons Systems Engineering Assessment Technology	Obtain full suite of qualification environmental test hardware to support upcoming LEPs (e.g., B61).
Nuclear Survivability	Qualify the Qualification Alternatives to the Sandia Pulse Reactor project in order to support the B61 LEP.
	Understand the relationships of warhead design features to lethality and other nuclear weapon effects (NWEs) for evaluating design and modification options. Current plans for this activity do not address the full spectrum of NWE capabilities needed to support the Nuclear Posture Review; planning to develop and steward improved NWE predictive capabilities is underway.
Enhanced Surveillance	Risk that insufficient component lifetime data will be available for making decisions concerning weapon alterations or modifications resulting in unnecessary or premature expenditures for exchanges of components.
	Resources have been allocated to work on the highest priority components; however, aging risks are not being assessed for numerous other important components and materials that are critical for safe and effective warheads.
	The time that existing components will endure in the stockpile goes beyond the experience for aged warhead materials.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Enhanced Surety	Continue to develop and optimize the highest priority surety technology for manufacturing, material compatibility, and subsystem integration focusing on the first insertion.
	Perform parametric studies on Multi-Point Safety options for engineering assessments in support of the LANL and LLNL efforts to bracket technologies consistent with the Engineering Campaign Technology Roadmap.
Weapons Systems Engineering Assessment Technology	Realize organic decomposition and breach of safety-related sealed exclusion regions in abnormal thermal environments.
	Assess the effects of hermetic gaskets on aperture penetration of electromagnetic radiation.
	Conduct experimental effort to characterize the as-built stress state of high-fidelity high explosive systems to support continuous improvement of assessment (modeling) capability.
Nuclear Survivability	Evaluate equivalency of ion irradiations to simulate relevant neutron damage in relevant III-V compound semiconductor electronics for Qualification Alternatives to the Sandia Pulse Reactor.
	Conduct a DSW stakeholder review of the research and development activities and priorities to assure alignment with DSW LEP, Limited Life Component, and surveillance schedules.
	Model and calculate appropriate scenarios for the NWM21 threats for the W87 Nuclear Explosive Package.
Enhanced Surveillance	Establish initial canned subassembly component lifetimes for the B61.
	Demonstrate utilization of state-of-the-art sensor technology into new testbeds (i.e., insensitive High-explosive Assembly sTress state Characterization [iHATCH]).
	Develop sensor technologies that could be applied to the Nuclear Explosive Package.
	Develop an approach for effectively transitioning Enhanced Surveillance Component Material Evaluation capabilities into ongoing Core Surveillance and complete the development of selected high-priority Component Material Evaluation activities.
	Modernize Weapon Evaluation Test Laboratory System Tester Capabilities.

Subprogram	Major Milestones Digest
	Complete an annual enhanced surveillance stockpile aging and lifetime assessment to support the annual assessment process and the Technical Basis for Stockpile Transformation Planning.
	Develop next suite of gas transfer systems diagnostics for surveillance transformation.
	Demonstrate methodology for system health assessment with targeted applications using available data and information.
	Characterize the aging behavior of legacy/new materials and components in coordination with decisionmaking on LEPs/Limited Life Components.
	Install and demonstrate surveillance diagnostics at the plants ready for process qualification.
	Develop improved predictive capabilities and assessments for nuclear and non-nuclear components and materials to support assessment and certification.

In addition to supporting the Weapons Systems Engineering Assessment Technologies and the Nuclear Survivability subprograms into the future, the Engineering Campaign will focus on surety and enhanced surveillance activities to support future LEPs, alterations, and modifications of stockpiled weapons. Upcoming LEPs will provide NNSA the opportunity to improve weapon surety (safety, security, use control), and improve weapon system effectiveness through the application of modern technologies and advanced materials. The Engineering Campaign will also help develop an understanding of material function and the impact of material aging through the application of advanced capabilities.

The Enhanced Surety subprogram will continue its focus on maturing technologies for viable insertion opportunities. In support of future LEPs, this subprogram will deliver a power management option and demonstrate and deliver a fully functional integrated surety solution. Development and certification of multi-point safety options for the next insertion opportunity will continue at LANL and LLNL. Enhanced collaborations with the United Kingdom will continue to incorporate system integration through SNL and develop technologies at the physics laboratories.

The Weapon Systems Engineering Assessment Technology subprogram will focus on producing data sets for model validation in support of current weapon alterations and modifications. Specifically, this subprogram will provide an extensive set of thermal, mechanical, and shock validation data to qualify the B61 and future LEPs.

The Nuclear Survivability subprogram will use models, simulations, experiments, testing, and analysis to focus on the continued development of nuclear survivability assessment capabilities. Under this subprogram, continuing development of Qualification Alternatives to the Sandia Pulse Reactor will provide the capability to qualify radiation hardened electronics to hostile environments without additional testing at the Sandia Pulse Reactor III. In addition, inclusion of modern electronics in arming, fuzing, and firing circuits will increase surety, improve reliability, and increase margin due to the intrinsic radiation hardness of the advanced materials.

The Enhanced Surveillance subprogram will provide updated results on weapon aging for the annual assessment reports and conduct planned experiments and modeling to support lifetime estimates. This subprogram will provide initial canned subassembly component lifetimes for the B61; deliver improved aging models, experimental methods, and predictive tools for selected materials and components; and continue work to understand aging mechanisms and effects.

Inertial Confinement Fusion Ignition and High Yield Campaign

Highlights of Accomplishments since FY 2011 SSMP

The first integrated ignition experiment, known as a THD experiment (tritium, hydrogen, and deuterium) was performed on the NIF. This demonstrated the complex integration of the subsystems required for an ignition campaign. Additional accomplishments include:

National Ignition Campaign

- The first multiple shock timing experiments on the NIF were complemented by timing four shock waves on OMEGA where the technique has been developed.
- Surrogate germanium-doped plastic (CH-Ge) fuel capsules in a hohlraum at point-design scale (up to radiation temperatures of 300 eV) with energies up to 1.2 MJ were symmetrically imploded on the NIF.
- A triple picket Polar Drive target design for the NIF, using a novel beam smoothing technique, showed target gains of ~30 in two dimensional hydrodynamic simulations.

National Ignition Campaign Diagnostics

- First suite of neutron Time-of-Flight detectors (15 in all) has been qualified on the NIF using Polar Drive exploding pusher implosions designed by Laboratory for Laser Energetics.
- SNL developed, calibrated, and delivered a total deuterium-tritium neutron yield diagnostic that is operational on the NIF.
- The Gamma Reaction History (GRH-6m) diagnostic, developed by LANL, was installed on the NIF.

National Ignition Campaign Target Development and Production

- A new polishing/ablation process for producing ultra-smooth plastic CH-Ge capsules provides nearly 10 times tighter specifications for surface finish.

Management, Planning, and Review

- Under Secretary for Science, Dr. Steven Koonin, chaired a panel in October 2010 that reviewed progress of the National Ignition Campaign (NIC).
- The newly formed High-Energy-Density Council, with representatives from Headquarters NNSA, LANL, LLNL, and SNL, provided guidance on the SSP shots carried out on NNSA's large high-energy-density facilities and developed a three-year plan for their use.

Inertial Confinement Fusion Ignition and High Yield Campaign Program High-Energy-Density Facilities

- In FY 2010, the NIF completed the infrastructure and safety review required for tritium and other hazardous material use.
- In FY 2010, more than 130 experiments were conducted on Z and the OMEGA Laser Facility performed 1,707 effective target shots.
- Significant resources were devoted to preparing the Z Facility for high-priority plutonium experiments. The first plutonium shot was successfully conducted on November 18, 2010.

Pulsed Power Inertial Confinement Fusion Ignition and High Yield Campaign

- The first fully kinetic, collisional, electromagnetic simulations of the time evolution of an imploding Z-pinch plasma were obtained.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Campaign-wide	Achieving ignition on NIF is a scientific challenge for stewardship that comes with intrinsic scientific uncertainties.

Major Milestones and Changes in Future Plans

Based upon a directed change from the Inertial Confinement Fusion Ignition and High Yield Campaign Office, the NIC was rebaselined and its milestones updated in October 2010. Some of the key milestones from the rebaselined NIC program and future plans are shown below:

Subprogram	Major Milestones Digest
Ignition	FY 2011: Begin first integrated ignition experiments on the NIF.
	Through FY 2012: Conduct DT implosion campaign to produce Gain = 1, then 5 MJ output.
	FY 2012: NIC.
	FY 2013: Begin development of advanced ignition concepts.
Support of Other Stockpile Programs	FY 2013: Begin Uses of Ignition Experiments in support of SSP.
	FY 2015: Demonstrate key extreme conditions of matter needed for predictive capability.
NIF Diagnostics, Cryogenics and Experimental Support	FY 2011: Complete operational qualification of the first set of NIC ignition diagnostics.
	FY 2012: Operationally Qualify first ARC beamline.
	FY 2012: Issue long-term NIF diagnostics plan.
	FY 2016: Complete initial set of hardened diagnostics and facility modifications for high radiation environments.
Pulsed Power Inertial Fusion	FY 2011: Obtain spatially and temporally resolved spectroscopic measurements of fusion plasmas to determine temporal evolution of the plasma conditions at stagnation.
Facility Operations and Target Production	FY 2011: Provide 1,300 or more effective target shots on the OMEGA Laser Facility.
	FY 2011: Develop new capabilities that advance Z's support for materials property measurements.
	FY 2011: Demonstrate routine operation of Z at 85 kV Marx charge.
	FY 2012: Demonstrate 1.8 MJ NIF operations.
	FY 2012: Provide classified operations capability for the NIF.
	FY 2012: Transition NIF to routine operations in support of the SSP and other missions.

Advanced Simulation and Computing Campaign

Highlights of Accomplishments since FY 2011 SSMP

The information regarding Advanced Simulation and Computing in last year's Annex A of the FY 2011 Stockpile Stewardship Plan is essentially current. Recent highlights include:

- Contributed to the completion of a level 1 milestone on energy balance involved in the physics of nuclear weapons. This culminated ten years of work to reduce a major uncertainty for predicting weapon performance.
- The previous Advanced Simulation and Computing capability machine at LLNL, Purple, was retired, and the new capability machine Cielo has been delivered and accepted at LANL. Cielo is now in the midst of the accreditation process for General Availability for classified computing.
- In a collaborative effort with DOE's Office of Science, established the six-lab Exa-scale Steering Committee, consisting of LANL, LLNL, SNL, Oak Ridge National Laboratory, Argonne and Lawrence Berkeley national laboratories, for the purpose of identifying exa-scale applications and technology for DOE missions and to scope out the tenets of an exa-scale initiative.
- Completed right-sizing study to determine the amount and types of computational and computing skills needed to sustain stockpile stewardship.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Integrated Codes	No major new issues or challenges.
Physics and Engineering Models	This subprogram is charged with the development, initial validation, and incorporation of new models into the Integrated Codes. Therefore, it is essential that there be a close interdependence between these two subprograms. There is also extensive integration with the experimental programs of the SSP, mostly funded and led by the Science Campaign.
Verification and Validation	As nuclear test data is becoming less relevant with an aging stockpile and as weapons designers with test experience leave the enterprise, it becomes increasingly important that enterprise codes are verified and validated so future generations of designers are comfortable relying on these foundational tools.
Computational Systems and Software Environments	To achieve its predictive capability goals, the Advanced Simulation and Computing Campaign must continue to invest in and consequently influence the evolution of computational environments. The Computational Systems and Software Environments provides the stability that ensures productive system use and protects the large investment in simulation codes.
	Over the next five to seven years, computational science at the laboratories will go through a growth spurt beginning with production access to a 20-petaflop system. To accommodate this transition, computer science investments are needed in system software and tools, input/output, storage and networking, post-processing and a common computing environment.
Facility Operations and User Support	No major new issues or challenges.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Integrated Codes	Same milestones as previously described in FY 2011 SSMP.
Physics and Engineering Models	Same milestones as previously described in FY 2011 SSMP.
Verification and Validation	Baseline demonstration of uncertainty quantification aggregation methodology for full-system weapon performance prediction.
Computational Systems and Software Environments	FY 2011: Additional deliveries expected to increase Cielo capability from 1.03 petaflops to 1.37 petaflops.
	FY 2011 through FY 2018: Over the next five to seven years, computational science at the laboratories will go through a growth spurt beginning with production access to a 20-petaflop system.
Facility Operations and User Support	Same milestones as previously described in FY 2011 SSMP.

Readiness Campaign

Highlights of Accomplishments since FY 2011 SSMP

The Readiness Campaign has produced a number of significant accomplishments in FY 2010 that support the Stockpile Stewardship and Management Program. Key highlights include:

- The Stockpile Readiness subprogram installed a microwave furnace to be used for the material recycle and recovery process at Y-12.
- The High Explosives and Weapon Operations subprogram deployed the Advanced High Explosive Gauging Technique, which addressed acceptance of small lots with minimum product loss and reduced overall manufacturing cycle time and waste.
- The Non-Nuclear Readiness subprogram deployed NG testers which assure NG test capability by modernizing testers as required supporting NG production and shelf-life programs.
- The Tritium Readiness subprogram consolidated 368 Tritium-Producing Burnable Absorber Rods from Cycle 9 of the Watts Bar Nuclear reactor Unit 1.
- The Advanced Design and Production Technologies subprogram advanced the technology for the delivery of a preliminary plan for a solventless process for polyimide slappers.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Stockpile Readiness	Transfer vital projects to other Defense Programs' accounts as applicable (DSW, Science Campaign, Engineering Campaign) to ensure that required capabilities continue to be addressed and supported.
High Explosives and Weapon Operations	Transfer vital projects to other Defense Programs' accounts as applicable (DSW, Science Campaign, Engineering Campaign) to ensure that required capabilities continue to be addressed and supported.
Non-Nuclear Readiness	Manage risk to meet the current schedules and potential down select decisions for future LEPs.
	Retain critical skills to meet Technology Maturation requirements and support LEP schedules.
Tritium Readiness	Work with Tennessee Valley Authority to meet production requirements and manage tritium releases.
	Advance TPBAR understanding of permeation mechanism to provide potential design solutions to reduce tritium releases.
Advanced Design and Production Technologies	Transfer vital projects to other Defense Programs' accounts as applicable (DSW, Science Campaign, Engineering Campaign) to ensure that required capabilities continue to be addressed and supported.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Campaign wide	Reinforce the Nuclear Security Enterprise's ability to mature nuclear weapon components through the Component Maturation Framework.
Non-Nuclear Readiness	Complete FY 2011 Electronic Neutron Generator project plan activities as required to support B83 Electronic Neutron Generator replacement by April 2014 and maintain capability with the B61 LEP design.
Tritium Readiness	By the end of FY 2016, complete irradiation of 2,352 Tritium-Producing Burnable Rods to provide tritium for nuclear weapons.

Future Plans

Beginning in FY 2012, the funding and focus of the Readiness Campaign will be realigned to solely support the Tritium Readiness subprogram and the Non-Nuclear Readiness subprogram. Vital projects of the Stockpile Readiness subprogram, the High Explosives and Weapons Operations subprogram, and the Advanced Design and Production Activities subprogram will be captured in other DP accounts. Future planning for Tritium Readiness and Non-Nuclear Readiness are described below.

The priority for the Tritium Readiness subprogram will be to maintain the tritium production infrastructure at a rate to ensure tritium production meets stockpile requirements. The Pacific Northwest National Laboratory will curtail development and test activities, but continue to support irradiation of Tritium-Producing Burnable Absorber Rods at the Tennessee Valley Authority to satisfy Nuclear Regulatory Commission requirements for technical oversight. The Tritium Extraction Facility will continue in a responsive operations mode through 2017 followed by continuous operations in the out years.

The Non-Nuclear Readiness subprogram will deploy manufacturing technologies required to meet scheduled first production units and sustained production for the near-term (FY 2014 through FY 2022). Actions to restore funding in the out-years for projects in the Stockpile Readiness, High Explosives and Weapons Operations, and Advanced Design and Production

Technologies subprograms are being assessed against overall stockpile requirements and the potential for supporting the work in other areas of the Weapons Activities budget.

Readiness in Technical Base and Facilities Program

Highlights of Accomplishments since FY 2011 SSMP

The Readiness in Technical Base and Facilities program ensures NNSA program facilities are operationally ready to execute NNSA missions in: Stockpile Stewardship (i.e., Science Campaigns), Stockpile Management (i.e., DSW), Nuclear Nonproliferation, Naval Reactors fuel, and Emergency Operations. Readiness in Technical Base and Facilities funds current operations of the complex and makes capital investments to sustain the complex into the future. In FY 2010, key highlights included:

- Exceeded corporate facility availability goal of 95 percent.
- Achieved the industry target of 5 percent Facility Condition Index for mission-critical facilities.
- Provided transportation container support for DSW and NNSA missions to support LEP and Stockpile Stewardship programs.
- Packaged 76 percent and shipped 73 percent of all Category I/II materials from Lawrence Livermore National Laboratory consistent with the profile to achieve de-inventory in FY 2012.
- Completed the loading of the Highly Enriched Uranium Materials Facility ahead of schedule.
- Signed and finalized a joint agreement between the U.S. and France to refurbish and jointly fund and operate criticality experiment facilities to meet two broad technical needs: fissionable solution and horizontal split table critical experiments.
- No adverse infrastructure impacts on DSW deliverables even with the Pantex flood.
- Successfully completed the Operational Readiness Review of the Critical Experiments Facility at the Device Assembly Facility on the Nevada National Security Site.
- Completed the Highly Enriched Uranium Materials Facility at Y-12 within budget.
- Completed construction of the Chemistry and Metallurgy Research Replacement Radiological Laboratory and Utility Office Building at the LANL on time and within budget.
- Completed construction of two fire stations at the Nevada National Security Site on time and within budget.
- Completed on time and within budget the Technical Area-55 Reinvestment Project Phase I at LANL.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Overall Program	Ability to address the possibility of considerably higher pension contributions than in previous years.
Operations	Support for the existing infrastructure continues to be a challenge due to its deteriorated condition and escalating requirements and costs associated with nuclear facility safety and compliance. The future will bring increasing challenges as the NNSA continues to become more responsive to current and future national security challenges, which require revitalization of the nuclear weapons infrastructure.
	Above issue could be compounded by a vision requiring the continued maintenance of the present infrastructure while developing the infrastructure of the future. Readiness in Technical Base and Facilities intends to manage available infrastructure support resources to prioritize and fund selected projects that will consolidate program activities, reduce program footprint, and refurbish scientific process equipment as needed to support priority program work.
	Readiness in Technical Base and Facilities budget is adequate in FY 2012 to sustain minimum operations capability. Goal of Readiness in Technical Base and Facilities is to increase infrastructure support through the Future-Years Nuclear Security Program period to surpass minimum operable and achieve a sustainable capability level by FY 2016.
Construction	In addition to the two current major projects—Chemistry and Metallurgy Research Replacement and Uranium Processing Facility—and six other current projects, there are over forty projects that have been proposed for construction in the next 20 years. All of these projects are needed to replace or refurbish existing, deteriorated facilities. A sustained funding stream will be necessary to address the growing need for infrastructure revitalization.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Overall Program	Ensure NNSA program facilities are operationally ready to execute NNSA missions.
	Through the foreseeable future maintain infrastructure (facilities, equipment and staffing) at or above the minimum operational capability in support of the Defense Programs and NNSA missions.
	Expand and transition critical skills to younger staff.
Operations	Ensure continued safe operations in all Nuclear Facilities.
	Complete transition to the new Kansas City facility.
	Initiate MESA Recapitalization of Silicon Fabrication Facility at SNL.
	Close Area G at LANL in compliance with New Mexico Environmental Department requirements.
	Support technology readiness for radiography and microelectronics supporting Stockpile Stewardship and LEPs respectively.
	Introduce Capability Based Facilities and Infrastructure investments, which will address facility recapitalization and Infrastructure Line Item requirements, continue disposition of excess facilities and provide energy sustainability.
Construction	Chemistry and Metallurgy Research Replacement becomes fully operational in FY 2023. Uranium Processing Facility becomes fully operational in FY 2024. High explosive Pressing Facility becomes fully operational in FY 2017.

Secure Transportation Asset Program

Highlights of Accomplishments since FY 2011 SSMP

Significant highlights include:

- Completed 100 percent of shipments safely and securely without compromise/loss of nuclear weapons/components or a release of radioactive material.
- Sustained highly qualified and professional federal agent force between 370 and 390.
- Continued the replacement of the aging DC-9 fleet.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Overall Program	Require funding to support the recapitalization of the infrastructure for a 21st century Nuclear Security Enterprise.
Operations and Equipment Funds	Replace end-of-life systems and maintain classified command and control, communication, computer, and cyber (C5) systems activities to support required oversight of nuclear convoys.
	Maintain life-cycle replacement for Secure Transportation Asset (STA) escort vehicles, Armored Tractor, and transporters.
	Expand, upgrade and maintain the STA facilities and equipment in support of federal agents and projected workload.
	Provide federal agents with training venues to maintain operational readiness qualifications and simulated over-the-road terrains.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Overall Program	Continue to conduct 100 percent of shipments safely and securely without compromise/loss of nuclear weapons/components or a release of radioactive material.
Operations and Equipment Funds	Continue vehicle production to support mission requirements: • Armored Tractor production begins in FY 2012 with production activities continuing throughout the Future-Years Nuclear Security Program; and • Next Generation Transporter begins in FY 2013 with production activities starting in FY 2016 and continuing throughout the Future-Years Nuclear Security Program;.
	Initiate the design, engineering and fielding of a new Command, Control, Communication, Computer and Cyber (C5) System to replace the current Transportation Command and Control System which is reaching its end of life.
	Maintain current facilities and develop recapitalization plans.
	Sustain agent manpower between 370 and 390.

Other

It should also be noted that the information in the Annex A FY 2011 Stockpile Stewardship Plan (dated May 2010), page 130, concerning STA needs should be updated as follows:

Training—The nature of safe and secure STA convoy operations requires specialized and remote facilities to train the federal agents. The facilities must be able to support full-scale emergency and tactical operations scenarios, tactical driving techniques, and ranges for a variety of weapons and explosives. A permanent facility is maintained at Fort Chaffee, Arkansas, to support special weapons, tactics, agent training, and the Agent Candidate Training Academy. Satellite facilities and venues throughout the United States are used for Operational Readiness Training scenarios requiring large road networks and secure locations. Large training areas and the complexity of STA training events require a large and dynamic logistical and control staff. A specialized training fleet is maintained to support training realism.

Facilities and Geographic Deployment—STA is the interconnecting link between DOE facilities, NNSA sites, and military installations supporting the President's and DOE's national nuclear agenda. To accomplish its missions, STA maintains over 80 distinct facilities across the United States to support communications, training, logistics, mission operations, and management oversight. Facilities are located in New Mexico, Texas, Tennessee, Maryland, Kansas, Idaho, South Carolina, and Arkansas. With its primary headquarters in Albuquerque, New Mexico, STA has three Federal Agent Commands, each with training and vehicle maintenance facilities: Western Command in Albuquerque, New Mexico; Central Command in Amarillo, Texas; and Eastern Command in Oak Ridge, Tennessee.

Nuclear Counterterrorism Incident Response Program

Highlights of Accomplishments since FY 2011 SSMP

In FY 2010:

- Deployed multiple field teams to 46 high-profile special events and 19 emergency response events around the world.
- Participated in over 100 national and international counterterrorism exercises.
- Continue to work closely with other government agencies.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Overall Program	Ensure that capabilities are in place to respond to any DOE/NNSA facility emergency, nuclear, or radiological incident within the United States or abroad.
	Continue to provide operational planning and training to counter both domestic and international nuclear terrorism and assure that DOE can carry out its mission-essential functions.
Emergency Management	No significant issues or challenges since last year.
Emergency Response	No significant issues or challenges since last year.
NNSA Emergency Management Implementation	No significant issues or challenges since last year.
Emergency Operations Support	No significant issues or challenges since last year.

Subprogram	Description of Issue or Challenge
National Technical Nuclear Forensics	No significant issues or challenges since last year.
International Emergency Management and Cooperation	No significant issues or challenges since last year.
Nuclear Counterterrorism	No significant issues or challenges since last year.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Overall Program	No significant changes since last year.

Facilities and Infrastructure Recapitalization Program

Highlights of Accomplishments since FY 2011 SSMP

Recent highlights for the Facilities and Infrastructure Recapitalization Program (FIRP) program include:

- The FIRP continues progress toward achieving its goal to fund $900 million of legacy deferred maintenance (DM) reductions. The FIRP's congressionally mandated end date is FY 2013.
- In FY 2010, FIRP exceeded its annual target and reached 89 percent of its Program goal by funding over $65 million of legacy DM for high priority projects in mission critical facilities.
- To date, FIRP's Roof Asset Management Program added more than $22 million in value to NNSA's roofing portfolio through life extending optimal repairs and installed almost 2 million square feet of cool roofs, including 486,000 square feet in FY 2010. Roof Asset Management Program has eliminated almost $80 million of legacy deferred maintenance with an average contribution of $11 million per year from FY 2004 through 2010.
- In FY 2010, FIRP resumed funding facility disposition projects after successfully completing a commitment to remove 3 million square feet of excess footprint in FY 2008. FIRP funded $9 million of facility disposition projects in FY 2010 and will continue to fund projects that yield legacy DM reduction.
- In FY 2010, with the completion of Pantex's Electrical Distribution System Upgrades and Gas Main and Distribution System Upgrade projects, Sandia's Technical Area-1 Heating Systems Modernization, and Y-12's Steam Plant Life Extension and Potable Water System Upgrades projects, FIRP has concluded its Utility Line Item subprogram. There were a total of nine projects valued at $284 million that retired $140 million of legacy deferred

maintenance and ensured the reliable delivery of vital utility services to mission critical facilities at five NNSA sites.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Overall Program	No significant issues or challenges since last year.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Overall Program	In FY 2012, FIRP will achieve 95 percent of its $900 million legacy DM reduction goal.

Site Stewardship Program

The description of this program provided in last year's Annex A FY 2011 Stockpile Stewardship Plan (dated May 2010) continues to be current without significant changes.

Defense Nuclear Security Program

Highlights of Accomplishments since FY 2011 SSMP

Significant recent highlights include:

- Completed the initial phase of a Security Reform Initiative in FY 2010 as part of a Zero-Based Security Review that will improve NNSA's ability to implement its national security mission while maintaining a robust security posture at all of its sites. These reforms will demonstrate to Congress and others that the NNSA effectively accomplishes its security mission in a manner that is reasonable, defensible, and consistent across the NSE.
- Defense Nuclear Security (DNS) collaborated extensively with the NNSA field sites and the DOE's Office of Health, Safety and Security to effectively and comprehensively examine and analyze the security posture of NNSA, as well as determine the appropriate policies for implementation at the NNSA sites. In partnership with the DOE Office of Health, Safety and Security, DNS piloted the Graded Security Protection (GSP) Implementation Assistance Visit. The GSP-Implementation Assistance Visit pilots have ensured all enduring NNSA Category I sites fully use the flexibility of the DOE's GSP and identified low- or no-cost modifications to the site protection posture, providing high confidence that the NNSA meets or exceeds the GSP protection requirements.
- The NNSA Administrator signed NNSA policy letter (NAP) 70.4 on *Information Security* establishing protection and control requirements for classified matter, including Restricted Data. He also signed NAP 70.2 on *Physical Protection*, which establishes physical protection requirements for classified matter, facilities, and special nuclear material. The new policies are based on national and DOE requirements and standards; support Deputy Secretary of Energy's broader Departmental Safety and Security Reform Initiatives; and created clear

guidance tailored to NNSA's unique and vital national security mission that establishes consistent corporate expectations for the protection of NNSA's assets.

- The DNS Security Commodity Team (SCT), a DNS-led consortium of site security and logistics professionals, established a partnership with the NNSA Supply Chain Management Center to lead and manage strategic sourcing and common procurement initiatives that support operational and economical efficiencies with regard to equipment standardization for the NNSA protective force. The SCT established an *Interagency Contractor Procurement Team* agreement with a protective mask manufacturer, which provides significant savings for all contractors under the DOE umbrella (the SCT strives to construct sourcing agreements, which may be used even by non-NNSA sites). Nearly $200 thousand was saved in the third quarter of FY 2010 alone as a result of this effort, and the SCT is continually working to construct similar Interagency Contractor Procurement Team agreements for other equipment items.
- The SCT committed to procuring ammunition through contracts established by the DoD Joint Munitions Command, which offers the use of its existing DoD ammunition contracts for future procurements. This will supply nearly 90 percent of DNS ammunition requirements at a much-reduced price and will offer the highest levels of quality assurance due to the military-specification standards required by DoD. The new process will also promote more granular reporting of the actual ammunition needs and use for each site.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Overall Program	Design the Zero-Based Security Review to address overall challenges in NNSA security program with a focus on three primary areas: Nuclear Security Management, Security Policy Reform, and Security Program Governance and Oversight Restructuring.
	Nuclear Security Management: Develop and implement a standardized risk management model that supports the implementation of the GSP while determining the optimal allocation of resources and deployment of security technologies. Collaborate with other government agencies with similar nuclear security missions. Identify best practices and new approaches to strengthen the NNSA physical security program.
	Security Policy Reform: Establish clear and consistent policy expectations for the NSE. Reduce misinterpretation errors and administrative burdens through the development and implementation of a set of NNSA physical security policy letters (NAP), as well as guiding the consistent interpretation and implementation of the NAP requirements.
	Security Program Governance and Oversight Restructuring: Identify and implement opportunities to improve federal security governance and oversight. Support NNSA governance efforts by realigning functional roles, responsibilities, and accountabilities of the program's federal and contractor organizations. Improve the DNS oversight model to better leverage Contractor Assurance System results and ensure federal oversight is appropriately tailored based on risk and performance status.
Protective Forces	DNS ammunitions requirements must be identified as a national security-related priority. Extensive delivery date projections (up to two years) of some types of ammunition ordered through DoD presents training and operational logistical challenges, which may degrade unit readiness.

Subprogram	Description of Issue or Challenge
	A DNS-led, NSE-wide comprehensive review of protective force annual sustainment training programs (planning, programming, and execution) identified significant opportunities for training program reform that will yield significant improvements in mission readiness and utilization of available resources. As this is an unprecedented approach toward collaboratively defining core protective force training requirements, existing Code of Federal Regulations and departmental policy language will need to be changed to support expected significant operational and budgetary efficiencies; as such, lawmaker acceptance of DNS input toward revision of 10 Code of Federal Regulations 1046 (Physical Protection of Security Interests) is vital toward maximizing the potential of a "corporate" training program.
Physical Security Systems and Information Security	Implement new *Physical Protection* NAP and *Information Security* NAP to reform and improve the NNSA physical security program with a corroborated effort of federal-contractor and NNSA Headquarters-Field partnerships. The net effect of these policies will be a substantially stronger security program that efficiently meets critical mission support needs. These NAPs are the first in a series of security reforms to be made in FY 2011 and 2012 to improve NNSA business practices and to increase the efficiency of operations consistent with sound risk management principles.

Major Milestones and Changes in Future Plans

Subprogram	Major Milestones Digest
Overall Program	FY 2012: Utilize Zero-Based Security Review effort to implement an effective and efficient safeguards and security program with an acceptable level of risk that is defensible and supports the NNSA National Security Mission.
	FY 2012: Institutionalize a formal approach to assess changes resulting from the Zero-Based Security Review initiative, including third party audits, peer reviews, and independent assessments to validate all or part of the NNSA security posture.
	FY 2012: A key element of the Zero-Based Security Review initiative is to refine policies and processes, and adapt lessons learned from the implementation effort.
Protective Forces	FY 2012: Create continuity and transparency in corporate training processes across NSE and ultimately improve the proficiency of the existing protective force through a more cost-effective, corporately sponsored and site-implemented approach to training.
	FY 2013: To the extent that is reasonable and appropriate, standardize the NNSA protective force equipment across NSE.
Physical Security Systems and Information Security	FY 2012: Full implementation of NAPs for Information Security and Physical Protection with NAP requirements being incorporated into respective site contractor's contracts by modification agreements.

Cyber Security Program

The description of this program provided in last year's *Annex A FY 2011 Stockpile Stewardship Plan (dated May 2010)* continues to be current without significant changes.

National Security Applications

Drivers for change include:

- Historically, Defense Programs has planned and executed all of the investments in science, technology, and engineering core capabilities. Over the period of 70 years, these core capabilities have also become critical to other national security missions.
- The National Security Applications budget represents a portion of NNSA's corporate-level participation in the Cabinet-level interagency planning of science, technology, and engineering investments.
- Strategic capability planning partners include the DoD, the Office of the Director of National Intelligence, and the Department of Homeland Security.

Highlights of Accomplishments since FY 2011 SSMP

Significant recent highlights include:

- Exercising and refining materials science and experimental capabilities in creating material equations-of-state used in simulating nuclear detonation. Weapons capabilities are stronger, and important intelligence questions have been answered.
- Develop and maintain new radiation sources, measurement and instrumentation expertise, extension of high performance code capabilities, and material science expertise.
- Enhancing weapon physics capabilities by examining technologies for active interrogation of shipping containers.
- Develop nuclear materials databases and rapid, high fidelity analytical techniques.
- Enhancing the understanding of radiation hardening physics for weapons applications by exploring hardening required for nuclear security, safety, and disposal.
- Develop modeling, simulation, theory and experimental capabilities that underpin problems in energy security.
- Improving and increasing confidence in the classified computer codes used for U.S. stockpile designs by broadening their application to non-US designs.
- Address multi-domain nuclear security threats including threat design, international safeguards, radiochemistry analysis, and material disablement.

Current Issues or Challenges

Subprogram	Description of Issue or Challenge
Weapons of Mass Destruction Analysis and Assessments	This subprogram addresses two significant challenges in the area of weapons of mass destruction analysis and assessments that are of particular relevance to NNSA capabilities. First is the challenge to deliver high specificity detection of nuclear materials that are often at a distance in complex scenarios (e.g., cargo, moving target). A second challenge is that of rapid, robust analysis and data evaluation of nuclear materials and debris to enable attribution. These two challenges provide opportunities to develop and maintain nuclear security capabilities including new radiation sources, measurement and instrumentation expertise, extension of high performance code capabilities, and material science expertise.
Actinide Chemistry, Diagnostics, and Remote Detection	Actinide Chemistry, Diagnostics and Remote Detection subprogram critical efforts are aimed at preventing the terrorist use of nuclear weapons. Actinide chemistry and diagnostics enable rapid and robust identification of the materials interdicted or collected. Key initiatives include the development of comprehensive nuclear materials databases, newly predicted signatures and rapid, high fidelity analytical techniques. Emphasis on debris forensics broadens radiochemistry research, nuclear cross section evaluation, and particle transport modeling.
Impacts of Energy and Environment on Global Security	This subprogram supports development and application of the nuclear security enterprise's resident expertise and methodologies needed to maintain the U.S. nuclear security mission that are adjacent to and strongly complement broader energy security problems. This includes modeling, simulation, theory and experimental capabilities that underpin problems in energy security from laser-based applications, fission/fusion systems, carbon treaty verification capabilities, special nuclear materials metallurgy skills associated with nuclear security, safety and disposal.
Advanced Analysis, Tools, and Technologies	This sub-program invests in a portfolio of tools and technologies that will address threats across multiple national security domains including threat design, international safeguards, radiochemistry analysis, and material disablement. Integrated software tools that incorporate uncertainty quantification methodologies and validation of simulation results will benefit the nuclear security enterprise and a number of the national security partners that prioritize these important and emerging analysis concepts. Interagency interest in weapons effects and NNSA expertise will seek tools in areas such as consequence management and electromagnetic pulse threatened environments. Although nuclear materials characterization is directly relevant to nuclear emergency response operations and for surveillance of the current U.S. stockpile, simulation, development, and engineering of new materials and algorithms will enable robust characterization of aging or less well-characterized nuclear materials. High performance computing is integral to enabling a robust predictive capability in the service of national defense. Special purpose hardware and software, advancement in algorithm design and performance, advanced distributed processing, and appropriately secured computing facilities are aspects of this foundational technology.

Appendix B—Requirements Mapping

Congressional requests for information on the NNSA SSMP are currently distributed throughout multiple pieces of legislation. Appendix A in the 2011 SSMP Summary provided a mapping of the requested information to the pertinent section(s) of the documents. Appendix B updates legislative requirements mapping for the current document.

50 U.S. Code Sec. 2521	NNSA Response
Sec. 2521. Stockpile stewardship program	
(a) Establishment	
The Secretary of Energy, acting through the Administrator for Nuclear Security, shall establish a stewardship program to ensure -	
(1) the preservation of the core intellectual and technical competencies of the United States in nuclear weapons, including weapons design, system integration, manufacturing, security, use control, reliability assessment, and certification; and	The Plan, Chapters I, II, V Annex C, Chapters I, II Annex B, Chapters III, VII
(2) that the nuclear weapons stockpile is safe, secure, and reliable without the use of underground nuclear weapons testing.	The Plan, Chapters I-VII Annex B, Chapters III-VII
(b) Program elements	
The program shall include the following:	The Plan, Chapters I-VII Annex B, Chapters III-VII
(1) An increased level of effort for advanced computational capabilities to enhance the simulation and modeling capabilities of the United States with respect to the performance over time of nuclear weapons.	
(2) An increased level of effort for above-ground experimental programs, such as hydrotesting, high-energy lasers, inertial confinement fusion, plasma physics, and materials research.	The Plan, Chapter III Annex C, Chapter I, Pg. 14
(3) Support for new facilities construction projects that contribute to the experimental capabilities of the United States, such as an advanced hydrodynamics facility, the National Ignition Facility, and other facilities for above-ground experiments to assess nuclear weapons effects.	The Plan, Chapters II, III Annex C, Chapters II-VI
(4) Support for the use of, and experiments facilitated by, the advanced experimental facilities of the United States, including -	
(A) the National Ignition Facility at Lawrence Livermore National Laboratory;	
(B) the Dual Axis Radiographic Hydrodynamic Testing facility at Los Alamos National Laboratory;	
(C) the Z Machine at Sandia National Laboratories; and	
(D) the experimental facilities at the Nevada test site.	
(5) Support for the sustainment and modernization of facilities with production and manufacturing capabilities that are necessary to ensure the safety, security, and reliability of the nuclear weapons stockpile, including -	The Plan, Chapters II-IV Annex C, Chapter II
(A) the Pantex Plant;	
(B) the Y-12 National Security Complex;	
(C) the Kansas City Plant;	
(D) the Savannah River Site; and	
(E) production and manufacturing capabilities resident in the national security laboratories (as defined in section 2471 of this title).	

50 U.S. Code Sec. 2522	NNSA Response
Sec. 2522. Report on stockpile stewardship criteria	
(a) Requirement for criteria The Secretary of Energy shall develop clear and specific criteria for judging whether the science-based tools being used by the Department of Energy for determining the safety and reliability of the nuclear weapons stockpile are performing in a manner that will provide an adequate degree of certainty that the stockpile is safe and reliable.	The Plan, Chapter III Annex C, Chapter I
(b) Coordination with Secretary of Defense The Secretary of Energy, in developing the criteria required by subsection (a), shall coordinate with the Secretary of Defense.	
(c) Report	
(1) In each odd-numbered year, beginning in 2011, the Secretary of Energy shall include in the stockpile stewardship plan required by section 2523 of this title a report containing the following elements:	The Plan, Chapter III
(A) A description of the information needed to determine that the nuclear weapons stockpile is safe and reliable and the relationship of the science-based tools to the collection of that information.	Annex C, Chapter I, II
(B) A description of any updates to the criteria established under subsection (a) during - (i) the previous two years; or (ii) with respect to the report in 2011, the period beginning on the date of the submission of the report under section 3133 of the National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136; 117 Stat. 1751; 50 U.S.C. 2523 note) and ending on the date of the submission of the 2011 stockpile stewardship plan required by section 2523 of this title.	Annex C, Chapter I
(C) For each science-based tool to collect information needed to determine that the nuclear weapons stockpile is safe, secure, and reliable that is developed or modified by the Department of Energy during the relevant period described in subparagraph (B) - (i) a description of the relationship of the science-based tool to the collection of such information; and (ii) a description of criteria for assessing the effectiveness of the science-based tool in collecting such information.	Annex C, Chapter II
(D) An assessment described in paragraph (2).	
(2) An assessment described in this paragraph is an assessment of the stockpile stewardship program conducted by the Administrator for Nuclear Security in consultation with the directors of the national security laboratories. Such assessment shall set forth the following:	Annex C , Chapter I, II
(A) An identification and description of -	
(i) any key technical challenges to the stockpile stewardship program; and	Annex C, Chapter IV, Pg. 87
(ii) the strategies to address such challenges without the use of nuclear testing.	Annex B, Chapter VII
(B) A strategy for using the science-based tools (including advanced simulation and computing capabilities) of each national security laboratory to ensure that the nuclear weapons stockpile is safe, secure, and reliable without the use of nuclear testing.	Annex C, Chapter II
(C) An assessment of the science-based tools (including advanced simulation and computing capabilities) of each national security laboratory that exist at the time of the assessment compared with the science-based tools expected to exist during the period covered by the future-years nuclear security program.	Annex C, Chapter II
(D) An assessment of the core scientific and technical competencies required to achieve the objectives of the stockpile stewardship program and other weapons activities and weapons-related activities of the Department of Energy, including – (i) the number of scientists, engineers, and technicians, by discipline, required to maintain such competencies; and	

(ii) a description of any shortage of such individuals that exists at the time of the assessment compared with any shortage expected to exist during the period covered by the future-years nuclear security program.	The Plan, Chapter V
(d) Definitions In this section: (1) The term "future-years nuclear security program" means the program required by section 2453 of this title. (2) The term "national security laboratory" has the meaning given such term in section 2471 of this title. (3) The term "weapons activities" means each activity within the budget category of weapons activities in the budget of the National Nuclear Security Administration. (4) The term "weapons-related activities" means each activity under the Department of Energy that involves nuclear weapons, nuclear weapons technology, or fissile or radioactive materials, including activities related to - (A) nuclear nonproliferation; (B) nuclear forensics; (C) nuclear intelligence; (D) nuclear safety; and (E) nuclear incident response.	

50 U.S. Code Sec. 2523	NNSA Response
Sec. 2523. Plan for stewardship, management, and certification of warheads in the nuclear weapons stockpile	
(a) Plan requirement	
The Secretary of Energy shall develop and annually update a plan for maintaining the nuclear weapons stockpile. The plan shall cover, at a minimum, stockpile stewardship, stockpile management, and program direction and shall be consistent with the programmatic and technical requirements of the most recent annual Nuclear Weapons Stockpile Memorandum.	The Plan, Chapters I-VII Annex B, Chapters I-VII
(b) Plan elements The plan and each update of the plan shall set forth the following:	
(1) The number of warheads (including active and inactive warheads) for each warhead type in the nuclear weapons stockpile.	Annex B, Chapter I
(2) The current age of each warhead type, and any plans for stockpile lifetime extensions and modifications or replacement of each warhead type.	Annex B, Chapter IV
(3) The process by which the Secretary of Energy is assessing the lifetime, and requirements for lifetime extension or replacement, of the nuclear and nonnuclear components of the warheads (including active and inactive warheads) in the nuclear weapons stockpile. (4) The process used in recertifying the safety, security, and reliability of each warhead type in the nuclear weapons stockpile. (5) Any concerns which would affect the ability of the Secretary of Energy to recertify the safety, security, or reliability of warheads in the nuclear weapons stockpile (including active and inactive warheads).	Annex B, Chapters III-VII
(c) Annual submission of plan to Congress	
The Secretary of Energy shall submit to Congress the plan developed under subsection (a) not later than March 15, 1998, and shall submit an updated version of the plan not later than May 1 of each year thereafter. The plan shall be submitted in both classified and unclassified form.	Annex B, Chapters III-VII

50 U.S. Code Sec. 2524	NNSA Response
Sec. 2524. Stockpile management program	
(a) Program required	
The Secretary of Energy, acting through the Administrator for Nuclear Security and in consultation with the Secretary of Defense, shall carry out a program, in support of the stockpile stewardship program, to provide for the effective management of the weapons in the nuclear weapons stockpile, including the extension of the	The Plan, Chapters I-VII Annex B, Chapters I-VII

effective life of such weapons. The program shall have the following objectives:

(1) To increase the reliability, safety, and security of the nuclear weapons stockpile of the United States.

(2) To further reduce the likelihood of the resumption of underground nuclear weapons testing.

(3) To achieve reductions in the future size of the nuclear weapons stockpile.

(4) To reduce the risk of an accidental detonation of an element of the stockpile.

(5) To reduce the risk of an element of the stockpile being used by a person or entity hostile to the United States, its vital interests, or its allies.

(b) Program limitations

In carrying out the stockpile management program under subsection (a), the Secretary of Energy shall ensure that -

The Plan, Chapters I-VII

(1) any changes made to the stockpile shall be made to achieve the objectives identified in subsection (a); and

(2) any such changes made to the stockpile shall -

(A) remain consistent with basic design parameters by including, to the maximum extent feasible, components that are well understood or are certifiable without the need to resume underground nuclear weapons testing; and

(B) use the design, certification, and production expertise resident in the nuclear complex to fulfill current mission requirements of the existing stockpile.

(c) Program plan

In carrying out the stockpile management program under subsection (a), the Secretary of Energy shall develop a long-term plan to extend the effective life of the weapons in the nuclear weapons stockpile without the use of nuclear weapons testing. The plan shall include the following:

The Plan, Chapters I-VII

(1) Mechanisms to provide for the manufacture, maintenance, and modernization of each weapon design in the nuclear stockpile, as needed.

Annex B, Chapters II-VII

(2) Mechanisms to expedite the collection of information necessary for carrying out the program, including information relating to the aging of materials and components, new manufacturing techniques, and the replacement or substitution of materials.

Annex C, Chapters I, II
Annex B, Chapters III-VII

(3) Mechanisms to ensure the appropriate assignment of roles and missions for each nuclear weapons laboratory and production plant of the Department of Energy, including mechanisms for allocation of workload, mechanisms to ensure the carrying out of appropriate modernization activities, and mechanisms to ensure the retention of skilled personnel.

Annex C. Chapter III,

(4) Mechanisms to ensure that each national laboratory of the National Nuclear Security Administration has full and complete access to all weapons data to enable a rigorous peer review process to support the annual assessment of the condition of the nuclear weapons stockpile required under section 2525 of this title.

The Plan, Chapter V, Pg. 47

(5) Mechanisms for allocating funds for activities under the program, including allocations of funds by weapon type and facility.

(6) An identification of the funds needed, in the fiscal year in which the plan is developed and in each of the following five fiscal years, to carry out the program.

Annex B, Chapters III-VII

(d) Annual updates

The Secretary of Energy shall annually update the plan required under subsection (c) and shall submit the updated plan to Congress as part of the stockpile stewardship plan required by section 2523(c) of this title.

The Plan Chapter VI,
Pg 67-72

(e) Program budget

In accordance with the requirements under section 2529 of this title, for each budget submitted by the President to Congress under section 1105 of title 31, the amounts requested for the program under this section shall be clearly identified in the budget justification materials submitted to Congress in support of that budget.

The Plan, Chapter VI

The Plan, Chapter VI,
Appendix C

The Plan, Chapters I-VIII

NNSA Response to Public Law, Legislation, and other Reporting Requirements

House Report 110-185 to Accompany H.R. 2641, FY08 Energy and Water Development Appropriations Act	NNSA Response
U.S. Strategic Nuclear Weapons Strategy for the 21st century and the Future Nuclear Weapons stockpile - The Department of Energy (DOE) and the Department of Defense (DoD) are proposing to develop a new nuclear warhead under the Reliable Replacement Warhead (RRW) program and begin a nuclear weapons complex modernization proposal called Complex 2030. These multi-billion dollar initiatives are being proposed in a policy vacuum without any Administration statement on the national security environment that the future nuclear deterrent is designed to address. The Committee's concern is supported by statements made by nuclear weapon experts in recent reports by the Defense Science Board and the American Association for the Advancement of Science, and in congressional testimony by such credible experts as a former Chairman of the Senate Armed Services Committee and a former Secretary of Defense. These review panel and national security experts all agreed that there has been no clear policy statements that articulate the role of nuclear weapons in a post-Cold War and post-9/11 world. The lack of any definitive analysis or strategic assessment defining the objectives of a future nuclear stockpile makes it impossible to weigh the relative merits of investing billions of taxpayer dollars in new nuclear weapon production activities when the United States is facing the problem of having too large a stockpile as a Cold War legacy. Currently, there exists no convincing rationale for maintaining the large number of existing Cold War nuclear weapons, much less producing additional warheads, or for the DoD requirements that drive the management of the DOE nuclear weapons complex. The Committee believes it is premature to proceed with further development of the RRW or a significant nuclear complex modernization plan, until a three-part planning sequence is completed, including: (1) a comprehensive nuclear defense strategy, based upon current and projected global threats; (2) clearly defined military requirements for the size and composition of the nuclear stockpile derived from the comprehensive nuclear defense strategy; and (3) alignment of these military requirements to the existing and estimated future needs and capabilities of NNSA's weapons complex. The Committee views completion of this three-part planning sequence as a necessary condition before considering additional funding for Complex 2030 and RRW activities. Therefore, the Committee directs the Secretary, in consultation with the Department of Defense and Intelligence Community, to submit to the House and Senate Committees on Appropriations, a comprehensive nuclear security plan that:	No longer applicable
(1) Includes a comprehensive nuclear defense and nonproliferation strategy, developed by all relevant stakeholders across the Administration, defining the future U.S. nuclear deterrent requirements and nuclear nonproliferation goals. To the extent this strategy involves the production and deployment of new warheads and acceleration of legacy warhead dismantlements, a statement of how such actions will impact the state of global security, with respect to the future U.S. nuclear deterrent and nonproliferation goals, should be included in the comprehensive strategy.	NPR, QDR
(2) Includes a detailed description, prepared by the Department of Defense (DoD) and the Department of Energy (DOE), that translates the strategy described in (1) above into a specific nuclear stockpile, that:	
a. Aligns estimated global threats to the required characteristics of the U.S. nuclear stockpile in terms of specific numbers and types of warheads, both active and inactive, and associated delivery systems.	NPR The Plan, Chapters I, II Annex B, Chapter I
b. Includes a complete, quantitative status of the current stockpile warhead inventory by type and delivery system and anticipated changes to reach the 2012 Moscow Treaty commitments, including an unclassified summary of the topline stockpile quantity.	NPR Annex B, Chapter I. Pg. 1-4

c. Defines, in year by year increments planned changes in the size and composition of the nuclear stockpile through fiscal year 2030 required to meet the strategy described in (1) above. Identify changes in the stockpile related to the nuclear force structure based on the strategy described in (1) above; the impact of accelerated warhead retirements and dismantlements based on out year stockpile requirements under the Moscow Treaty, as well as, potential reductions associated with the strategy described in (1) above; the impact of completing planned life extension milestones to extend the service life of the existing stockpile; the impact on the future stockpile employing both existing warheads and new warheads under the RRW proposal; required life extension program throughput rates; required production rates for an operationally deployed RRW replacing an existing system; and associated dismantlement rates. This should include an unclassified summary of the topline stockpile quantity, per year, up through 2030.	Annex B, Chapter II NPR Annex B, Chapters I-VII No longer applicable No longer applicable
d. Includes a detailed analysis comparing the risks, costs and benefits, stockpile size, and relationship to achieving the nuclear defense and nonproliferation strategic goals of maintaining the existing stockpile under the Life Extension Program (LEP) versus transitioning to the reliable replacement warhead strategy, by warhead type and delivery system.	The Plan, Chapters I, II No longer applicable
(3) Includes a comprehensive, long-term expenditure plan, from fiscal year 2008 through fiscal year 2030, that fully defines the needs and capabilities of the NNSA weapons complex to support the stated military requirements outlined in (2) above, including:	
a. A comprehensive, fiscal year 2008 complex operating cost inventory by site and activity as a baseline;	
b. A year-by-year resource plan from fiscal year 2008 through fiscal year 2030, subdivided into five-year milestones for dismantlements, stockpile reduction, cost savings (with respect to the established, fiscal year 2008 baseline), complex consolidation, life extension programs, warhead refurbishments, special nuclear material consolidation, physical and cyber security requirements, proposed RRW production and deployment, and how achievement of such milestones aligns with long-term complex transformation goals, specifically identifying the cost impacts of alternative strategies. This should include an unclassified summary of dismantlement progress, relative to the topline stockpile quantity for the given year.	The Plan, Chapter VI, Appendices A and C The Plan, Chapters IV, VI Annex B, Chapter V The Plan, Chapter VIII, Appendix C, No longer applicable
c. A detailed description of the potential impacts of significant reductions in the overall stockpile in terms of cost savings, physical security benefits, complex consolidation, and stockpile reliability, safety, and security.	The Plan, Chapter VI, Pg. 67-73
d. Estimates of staffing requirements corresponding to achievement of five-year milestones and long-term complex transformation plans.	
e. A detailed cost-benefit analysis comparing the resources required to maintain the existing facilities for the existing stockpile to new facilities required to support RRW production and deployment, and a description of how NNSA will mitigate the potential risks and costs associated with simultaneously managing both competing objectives in the near term.	The Plan, Chapters II, IV, VI No longer applicable

The Committee does not accept the same policy argument put forward by the nuclear weapons establishment after the Cold War ended that justified the Science-Based Stockpile Stewardship program. With the demise of the Soviet Union, the U.S. halted nuclear weapons production activities and implemented a moratorium of underground nuclear testing. In 1995, the Department of Energy proposed, and Congress supported, investing billions in new science facilities and super-computing capabilities to maintain the safety, security, and reliability of the existing stockpile without underground nuclear testing. Only a decade later, and after having spent billions of dollars, the NNSA is proposing to begin production of a new nuclear warhead before the country has received any significant return on the earlier investments, even though the major Stockpile Stewardship facilities are not yet completed and fully operational.

In order to make more informed policy and funding decisions, the revised nuclear strategy and stockpile plan must address the specific threats the nuclear stockpile of the future needs to address; the arms control treaties and agreements that bound the nuclear weapons activities; the nuclear policies and programs of other nations; and the impact on nonproliferation goals, policies and programs supported by the United States. Neither the Quadrennial Defense Reviews nor the Administration's 2001 Nuclear Posture Review provided a long term nuclear weapons strategy or the defined total nuclear stockpile requirements for the 21st century. The Administration's contention that the Moscow Treaty puts the U.S. on the path toward the lowest number of nuclear weapons necessary for national security would only be accurate if the Moscow Treaty addressed the actual status of all the warheads in the U.S. stockpile and all the above concerns. It does not.

National Defense Authorization Act for FY 2008 H. R. 1585 (110-477)	NNSA Response
SEC. 3122. REPORT ON RETIREMENT AND DISMANTLEMENT OF NUCLEAR WARHEADS. Not later than March 1, 2008, the Administrator for Nuclear Security, in consultation with the Nuclear Weapons Council, shall submit to the congressional defense committees a report on the retirement and dismantlement of the nuclear warheads that will not be part of the enduring stockpile as of December 31, 2012, but that have not yet been retired or dismantled. The report shall include—	
(1) the existing plan and schedule for retiring and dismantling those warheads;	Annex B, Chapter II
(2) an assessment of the capacity of the nuclear weapons complex to accommodate an accelerated schedule for retiring and dismantling those warheads, taking into account the full range of capabilities in the complex; and	Annex B, Chapter II
(3) an identification of the resources needed to accommodate such an accelerated schedule for retiring and dismantling those warheads.	Annex B, Chapter II

House Report 111-203 to Accompany H.R. 3183, FY 2010 Energy and Water Development Appropriations Act	NNSA Response
Report on Nuclear Stockpile. The Secretary of Energy shall, not later than December 1 of each year, submit a report to Congress specifying, for the due date of the report and projected for 5, 10, 15, and 20 years after that date, (1) the number of nuclear weapons of each type in the active and reserve stockpiles (2) the strategic rationale for each type, and (3) the past and projected future total direct lifecycle cost of each type.	The Plan, Chapters I, VI Annex B, Chapter I

Sect. 1251, Public Law 111-84, National Defense Authorization Act for FY 2010	NNSA Response
SEC. 1251. Report on the plan for the nuclear weapons stockpile, nuclear weapons complex, and delivery platforms and sense of Congress on follow-on negotiations to START Treaty. (a) Report on the Plan for the Nuclear Weapons Stockpile, Nuclear Weapons Complex, and Delivery Platforms - (1) REPORT REQUIRED - Not later than 30 days after the date of the enactment of this Act or at the time a follow-on treaty to the Strategic Arms Reduction Treaty (START Treaty) is submitted by the President to the Senate for its advice and consent, whichever is later, the President shall submit to the congressional defense committees, the Committee on Foreign Relations of the Senate, and the Committee on Foreign Affairs of the House of Representatives a report on the plan to - (A) enhance the safety, security, and reliability of the nuclear weapons stockpile of the United States; (B) modernize the nuclear weapons complex; and (C) maintain the delivery platforms for nuclear weapons. (2) ELEMENTS - The report required under paragraph (1) shall include the following:	
(A) A description of the plan to enhance the safety, security, and reliability of the nuclear weapons stockpile of the United States.	The Plan, Chapters I-VII
(B) A description of the plan to modernize the nuclear weapons complex, including improving the safety of facilities, modernizing the infrastructure, and maintaining the key capabilities and competencies of the nuclear weapons workforce, including designers and technicians.	The Plan, Chapters IV, V
(C) A description of the plan to maintain delivery platforms for nuclear	Not Applicable

weapons.	
(D) An estimate of budget requirements, including the costs associated with the plans outlined under subparagraphs (A) through (C), over a 10-year period.	The Plan, Chapter VI, Pg. 56
(b) Sense of Congress - It is the sense of Congress that - (1) the President should maintain the stated position of the United States that the follow-on treaty to the START Treaty not include any limitations on the ballistic missile defense systems, space capabilities, or advanced conventional weapons systems of the United States; (2) the enhanced safety, security, and reliability of the nuclear weapons stockpile, modernization of the nuclear weapons complex, and maintenance of the nuclear delivery systems are key to enabling further reductions in the nuclear forces of the United States; and (3) the President should submit budget requests for fiscal year 2011 and subsequent fiscal years for the programs of the National Nuclear Security Administration of the Department of Energy that are adequate to sustain the needed capabilities to support the long-term maintenance of the nuclear stockpile of the United States.	

Sect. 3112, Public Law 111-383, Biennial Plan on Modernization and Refurbishment of the Nuclear Security Complex	NNSA Response
(a) IN GENERAL.—Subtitle A of title XLII of the Atomic Energy Defense Act (50 U.S.C. 2521 et seq.) is amended by inserting after section 4203 the following new section: "SEC. 4203A. BIENNIAL PLAN ON MODERNIZATION AND REFURBISHMENT OF THE NUCLEAR SECURITY COMPLEX. (a) IN GENERAL—In each even-numbered year, beginning in 2012, the Administrator for Nuclear Security shall include in the plan for maintaining the nuclear weapons stockpile required by section 4203 a plan for the modernization and refurbishment of the nuclear security complex. (b) PLAN DESIGN— (1) IN GENERAL—The plan required by subsection (a) shall be designed to ensure that the nuclear security complex is capable of supporting the following: (A) Except as provided in paragraph (2), the national security strategy of the United States as set forth in the most recent national security strategy report of the President under section 108 of the National Security Act of 1947 (50 U.S.C. 404a). (B) The nuclear posture of the United States as set forth in the most recent Nuclear Posture Review. (2) EXCEPTION—If, at the time the plan is submitted under subsection (a), a national security strategy report has not been submitted to Congress under section 108 of the National Security Act of 1947 (50 U.S.C. 404a), the plan required by subsection (a) shall be designed to ensure that the nuclear security complex is capable of supporting the national defense strategy recommended in the report of the most recent Quadrennial Defense Review. (c) PLAN ELEMENTS—The plan required by subsection (a) shall include the following: (1) A description of the modernization and refurbishment measures the Administrator determines necessary to meet the requirements of—	
(A) the national security strategy of the United States as set forth in the most recent national security strategy report of the President under section 108 of the National Security Act of 1947 (50 U.S.C. 404a) or the national defense strategy recommended in the report of the most recent Quadrennial Defense Review, as applicable under subsection (b); and (B) the Nuclear Posture Review.	The Plan, Pg. I, III, Chapter VI The Plan, Chapters II, IV
(2) A schedule for implementing the measures described in paragraph (1) during the ten years following the date on which the plan for maintaining the nuclear weapons stockpile required by section 4203 and into which the plan required by subsection (a) is incorporated is submitted to Congress under	The Plan, Chapter I The Plan, Chapter IV

section 4203(c).

(3) Consistent with the budget justification materials submitted to Congress in support of the Department of Energy budget for the fiscal year (as submitted with the budget of the President under section 1105(a) of title 31, United States Code), an estimate of the annual funds the Administrator determines necessary to carry out the plan required by subsection (a), including a discussion of the criteria, evidence, and strategies on which the estimate is based.

The Plan, Chapter VI

(d) FORM—The plan required by subsection (a) shall be submitted in unclassified form, but may include a classified annex.

(e) NUCLEAR WEAPONS COUNCIL ASSESSMENT—

(1) ASSESSMENT REQUIRED.—For each plan required by subsection (a), the Nuclear Weapons Council established by section 179 of title 10, United States Code, shall conduct an assessment that includes the following:

(A) An analysis of the plan, including—

(i) whether the plan supports the requirements of the national security strategy of the United States or the most recent Quadrennial Defense Review, whichever is applicable under subsection (b), and the Nuclear Posture Review; and

(ii) whether the modernization and refurbishment measures described under paragraph (1) of subsection (c) and the schedule described under paragraph (2) of such subsection are adequate to support such requirements.

(B) An analysis of whether the plan adequately addresses the requirements for infrastructure recapitalization of the facilities of the nuclear security complex.

(C) If the Nuclear Weapons Council determines that the plan does not adequately support modernization and refurbishment requirements under subparagraph (A) or the nuclear security complex facilities infrastructure recapitalization requirements under subparagraph (B), a risk assessment with respect to—

(i) supporting the annual certification of the nuclear weapons stockpile under section 4203; and

(ii) maintaining the long-term safety, security, and reliability of the nuclear weapons stockpile.

(2) REPORT REQUIRED.—Not later than 180 days after the date on which the Administrator submits the plan required by subsection (a), the Nuclear Weapons Council shall submit to the congressional defense committees a report detailing the assessment required under paragraph (1).

(f) DEFINITIONS—In this section:

(1) The term 'nuclear security complex' means the physical facilities, technology, and human capital of the following:

(A) The national security laboratories (as defined in section 3281 of the National Nuclear Security Administration Act (50 U.S.C. 2471).

(B) The Kansas City Plant, Kansas City, Missouri.

(C) The Nevada Test Site, Nevada.

(D) The Savannah River Site, Aiken, South Carolina.

(E) The Y-12 National Security Complex, Oak Ridge, Tennessee.

(F) The Pantex Plant, Amarillo, Texas.

(2) The term 'Quadrennial Defense Review' means the review of the defense programs and policies of the United States that is carried out every four years under section 118 of title 10, United States Code.".

(b) CLERICAL AMENDMENT—The table of contents for the Atomic Energy Defense Act is amended by inserting after the item relating to section 4203 the following new item: "Sec. 4203A. Biennial plan on modernization and refurbishment of the nuclear security complex."

NDAA FY 2011 Report of the Committee On Armed Services House Of Representatives on House Report 5136 together with Additional Views	NNSA Response

Report 111-491
ITEMS OF SPECIAL INTEREST
NATIONAL NUCLEAR SECURITY ADMINISTRATION
Stockpile Surveillance

Overview

The budget request contained $11.3 billion for the programs of the National Nuclear Security Administration for fiscal year 2011. The committee recommends $11.3 billion, the amount of the budget request.

Weapons Activities

The budget request contained $7.0 billion for the Weapons Activities of the National Nuclear Security Administration (NNSA) for fiscal year 2011.

Over the past few years, increasing concern has been voiced regarding the NNSA's ability to maintain the safety, security, and reliability of the nuclear weapons stockpile into the indefinite future. For example, in testimony before the Subcommittee on Strategic forces during a July 17, 2008 hearing on the modernization of the nuclear weapons complex, each of the nation's three nuclear weapons laboratory directors expressed concerns about the reductions in highly skilled scientists and engineers at the labs required to make room for consolidation and improvements in the complex's infrastructure.

In May 2009, the Congressional Commission on the Strategic Posture of the United States reported that the "Stockpile Stewardship Program and the Life Extension Program (LEP) have been remarkably successful in refurbishing and modernizing the stockpile." But at the same time, the commission concluded that these strategies "cannot be counted on for the indefinite future." The commission noted that the NNSA's "physical infrastructure is in serious need of transformation" and that the "intellectual infrastructure is also in trouble."

The JASON independent scientific panel report from September 2009 on the Life Extension Program noted: "All options for extending the life of the nuclear weapons stockpile rely on the continuing maintenance and renewal of expertise and capabilities in science, technology, engineering, and production unique to the nuclear weapons program." The JASON independent scientific panel concluded that "this expertise is threatened by lack of program stability, perceived lack of mission importance, and degradation of the work environment."

The committee therefore welcomes the increased funds in the budget request for Weapons Activities, which should begin the process of resolving the physical and intellectual infrastructure challenges facing the NNSA. However, the committee notes that these challenges can only be overcome through long-term program and budget stability.
The committee recommends $7.0 billion for Weapons Activities, the amount of the budget request.

Stockpile Stewardship
The committee views execution of the science-based Stockpile Stewardship Program (SSP) as the core national security mission of the National Nuclear Security Administration (NNSA). The SSP utilizes data from previous nuclear tests, unique experimental tools, unmatched advanced simulation and computing capabilities, and the world's foremost nuclear weapons scientists, engineers, and technicians to maintain the safety, security, and reliability of weapons without nuclear tests.

In the committee report (H. Rept. 111–166) accompanying the National Defense Authorization Act for Fiscal Year 2010, the committee expressed concern about the ability of NNSA to exercise the new experimental capabilities that have been developed, and to ensure that the scientists, engineers, and technicians employed in the nuclear security enterprise are actively engaged in challenging, meaningful work. Such activity is critical to the long-term management of the stockpile because specific areas of remaining uncertainty about the performance of nuclear weapons can only be illuminated through scientific experiments using these capabilities.

In contrast to last year, the committee believes that the budget request should be sufficient to properly exercise those experimental capabilities and to continue improving the nation's ability to certify the nuclear weapons stockpile without additional nuclear weapons testing.

Stockpile Management

Section 3113 of the National Defense Authorization Act for Fiscal Year 2010 (Public Law 111-84) required the Secretary of Energy, in consultation with the Secretary of Defense, to provide for the effective management of the weapons in the nuclear weapons stockpile. The provision created objectives for, and limitations on, the management of the nuclear weapons stockpile.

The budget request included the following specific objectives as part of the National Nuclear Security Administration's (NNSA) proposed stockpile management program:
(1) Produce sufficient quantities of W76–1 warheads to meet Navy requirements;
(2) Complete a life extension of the B61 that meets all safety, security, use control, and reliability objectives;
(3) Initiate a life extension study to explore the path forward for the W78, consistent with the principles of the stockpile management program;
(4) Modernize plutonium capabilities including the design and construction of the Chemistry and Metallurgy Research Facility Replacement-Nuclear Facility;
(5) Modernize uranium capabilities with emphasis on the Uranium Processing Facility; and
(6) Sustain and strengthen the science, technology, and engineering, and surveillance base essential to supporting the stockpile.

The committee supports these proposed objectives and is pleased that the Administration has adopted the framework of the stockpile management program as a significant element of the recently-released Nuclear Posture Review.

However, the committee is concerned that artificial limitations might be applied to the options for managing the stockpile and observes that nothing within the statute would limit management of the nuclear weapons stockpile using the spectrum of options identified by the Congressional Commission on the Strategic Posture of the United States in May 2009.

The committee agrees with the JASON independent scientific panel that: "Assessment and certification challenges depend on design details and associated margins and uncertainties, not simply on whether the LEP is primarily based on refurbishment, reuse, or replacement."

The committee believes that the NNSA should task its design and production agencies to thoroughly evaluate the spectrum of options for managing any particular stockpile system before deciding on a case-by-case basis on the specific mix of actions required to ensure that a given stockpile system can continue to achieve its current military capabilities in a safe, secure, and reliable manner.

Directed Stockpile Work

The budget request contained $1.9 billion for Directed Stockpile Work (DSW), an increase of $392.5 million above the fiscal year 2010 appropriated level.

DSW includes activities to ensure the present and future operational readiness of nuclear weapons. While the committee welcomes the requested increase in DSW funding, it is concerned that the budget request does not contain sufficient resources to support production and dismantlement activities at the Pantex Plant in Amarillo, Texas.

The committee recommends $1.9 billion for Directed Stockpile Work, including an increase of $11.0 million for DSW at Pantex to ensure that the W76–1 and B–61 life extension programs, stockpile surveillance and critical weapons dismantlement programs remain on schedule.

Stockpile Surveillance
Surveillance of stockpile weapons is essential to stockpile stewardship.

Inadequate surveillance would place the stockpile at risk. In September 2009, the JASON independent scientific panel found: "The surveillance program is becoming inadequate. Continued success of stockpile stewardship requires implementation of a revised surveillance program." The committee directs the National Nuclear Security Administration Administrator for Nuclear Security to submit a report to the congressional defense committees on its plans for implementing a revised surveillance plan by October 1, 2010.

The Plan, Chapters II, VI
Annex B, Chapter III

B61 Phase 6.2/6.2A Life Extension Study
The budget request contained $251.6 million for Directed Stockpile Work for the B61 Phase 6.2/6.2A Life Extension Study.

The request would fund a study of the nuclear and non-nuclear components scope of the B61 life extension, including implementation of enhanced surety, extended service life, and modification consolidation. The National Nuclear Security Administration (NNSA) expects to complete the study by the end of fiscal year 2011 and is planning to deliver the first production unit (FPU) in 2017.

The committee understands the importance of meeting a 2017 delivery date and supports the full scope B–61 life extension study. However, the committee is concerned that the schedule for completion of the Life Extension Study has been delayed by a year, and is therefore concerned that the schedule for delivering the FPU by 2017 is at risk. While the committee recognizes that a thorough project baseline cannot be delivered until the Life Extension Study is complete, it expects the NNSA Administrator for Nuclear Security to keep the committee fully informed of the progress toward establishing that baseline and of any significant changes to the schedule during the course of the year.

Science Campaign
The budget request contained $365.2 million for the Science Campaign for fiscal year 2011.

The request included $85.7 million for Primary Assessment Technologies, which is the program responsible for development and implementation of the Quantification of Margins and Uncertainty methodology used to certify weapons without testing. The request also included $77.0 million for Advanced Certification, a substantial increase above the $19.4 million provided in fiscal year 2010, to support the development of advanced certification capabilities.

The committee recommends $365.2 million, the amount of the budget request.

Inertial Confinement Fusion Ignition and High Yield Campaign
The budget request contained $481.5 million for the Inertial Confinement Fusion Ignition and High Yield Campaign, an increase of $23.6 million from the fiscal year 2010 appropriated level.

This campaign, often referred to as the National Ignition Campaign, includes funding for performing experiments at the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory. The increase supports fabrication and installation of diagnostics necessary to utilize NIF for experiments under ignition conditions, a major requirement for applying NIF to weapons problems.

The committee recommends $481.5 million, the amount of the budget request.

Advanced Simulation and Computing Campaign
The budget request contained $615.7 million for the Advanced Simulation and Computing (ASC) Campaign.
The committee notes that the ASC Campaign funds the principal means of validating the performance of nuclear weapons absent nuclear explosive tests. As the major experimental tools of the Stockpile Stewardship Program are brought on line, more data will be available to inform these advanced simulations. Such simulations will be more robust than past efforts, and should yield greater confidence in the nation's enduring nuclear weapons stockpile. Therefore, the committee supports the $48.1 million increase in the ASC request from the fiscal year 2010 appropriated level.

The committee recommends $615.7 million, the amount of the budget request.

Readiness Campaign
The budget request contained $112.1 million for the Readiness Campaign, an increase of $12.1 million above the fiscal year 2010 appropriated level. Of that total, $50.2 million was requested for Tritium Readiness to operate the tritium production capability required to sustain the nuclear weapons stockpile.

The committee is aware that uncosted balances have accumulated in this account as a result of delays in tritium production and extraction due to significant technical issues related to the irradiation of tritium producing burnable absorber rods.

The committee understands that the National Nuclear Security Administration (NNSA) is currently able to meet its stockpile requirements despite the lower than planned production rate by supplementing tritium production with recycled tritium from dismantled warheads. However, the committee is concerned that NNSA has identified neither effective technical solutions for increased tritium production nor viable alternative supplies. The committee does not support the additional funds in the budget request for Tritium Readiness and directs the Administrator for Nuclear Security to submit to the congressional defense committees by March 1, 2011, a plan for ensuring a sufficient supply of tritium into the future.

The committee recommends $61.9 million, a decrease of $50.2 million for the Readiness Campaign.

Readiness in Technical Base and Facilities
The budget request contained $1.8 billion for Readiness in Technical Base and Facilities (RTBF).

RTBF supports the physical infrastructure and operational readiness of the nuclear security laboratories and plants. RTBF funds are divided between Operations and Maintenance, and Construction sub-programs.

The committee is concerned that the request for Operations of Facilities, within the Operations and Maintenance account, is insufficient to support the facilities at the Pantex Plant in Amarillo, Texas, and the Y–12 Plant in Oak Ridge, Tennessee. The committee recommends an additional $70.0 million to support the critical weapons program activities at these facilities. For the Y–12 facility, the committee recommends an additional $15.0 million for Material Recycle and Recovery activities within the Operations and Maintenance account to sustain enriched uranium recycle and recovery operations.

The budget request also included funds for two of the most significant National Nuclear Security Administration infrastructure projects: $225.0 million for final design and initial construction of the Chemistry and Metallurgy Research Replacement-Nuclear Facility at Los Alamos National Laboratory in New Mexico, and $115.0 million in Project Engineering and

Design work for the proposed Uranium Processing Facility at the Y–12 Plant. The committee supports both of these infrastructure modernization projects.

The committee recommends $1.9 billion, an increase of $85.0 million, for RTBF.

Use of prior year balances
The committee is aware of significant prior year balances within the National Nuclear Security Administration's (NNSA) accounts which are beyond recommended levels, and directs the NNSA Administrator for Nuclear Security to use these funds to finance fiscal year 2011 budget requirements and offset the recommended funding increases for Directed Stockpile Work and Readiness in Technical Base and Facilities mentioned above.

Appendix C—Financial Pie Charts and Tabular Budget Data

The budgetary information in this appendix to the Plan, supplements the FY 2012–FY 2016 budget request submitted by the President to Congress for NNSA Weapons Activities, and supports the budget requirement estimates discussed in Chapter VI of this Plan.

Table 7. Weapons Activities Overview

(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Directed Stockpile Work	1,564,290	1,898,379	1,963,583	2,111,439	2,327,859	2,529,992	2,630,707
Science Campaign	294,548	365,222	405,939	418,216	416,284	394,315	404,097
Engineering Campaign	149,679	141,920	143,078	168,418	165,898	159,449	158,693
Inertial Confinement Fusion and High Yield Campaign	457,486	481,548	476,274	476,381	471,668	485,237	495,026
Advanced Simulation and Computing Campaign	566,069	615,748	628,945	616,104	628,100	643,120	659,210
Readiness Campaign	106,744	112,092	142,491	130,753	130,754	133,706	135,320
Readiness in Technical Base and Facilities	1,810,279	1,848,970	2,326,134	2,484,259	2,742,504	2,729,657	2,734,890
Secure Transportation Asset	240,683	248,045	251,272	249,456	252,869	261,521	267,773
Nuclear Counterterrorism Incident Response	223,379	233,134	222,147	219,737	232,680	236,045	242,205
Facilities and Infrastructure Recapitalization Program	95,575	94,000	96,380	94,000	0	0	0
Site Stewardship	63,308	105,478	104,002	104,699	175,370	207,488	212,706
Defense Nuclear Security	769,823	719,954	722,857	729,795	729,173	756,110	814,967
Cyber Security	123,338	124,345	126,614	125,416	125,321	126,898	130,003
National Security Applications	0	20,000	20,000	20,000	20,000	20,000	20,000
Congressionally Directed Projects	3,000	0	0	0	0	0	0
Use of Prior Year Balances/Rescission of Prior Year Balances	-81,830	0	0	0	0	0	0
Total	**6,386,371**	**7,008,835**	**7,629,716**	**7,948,673**	**8,418,480**	**8,683,538**	**8,905,597**

Directed Stockpile Work

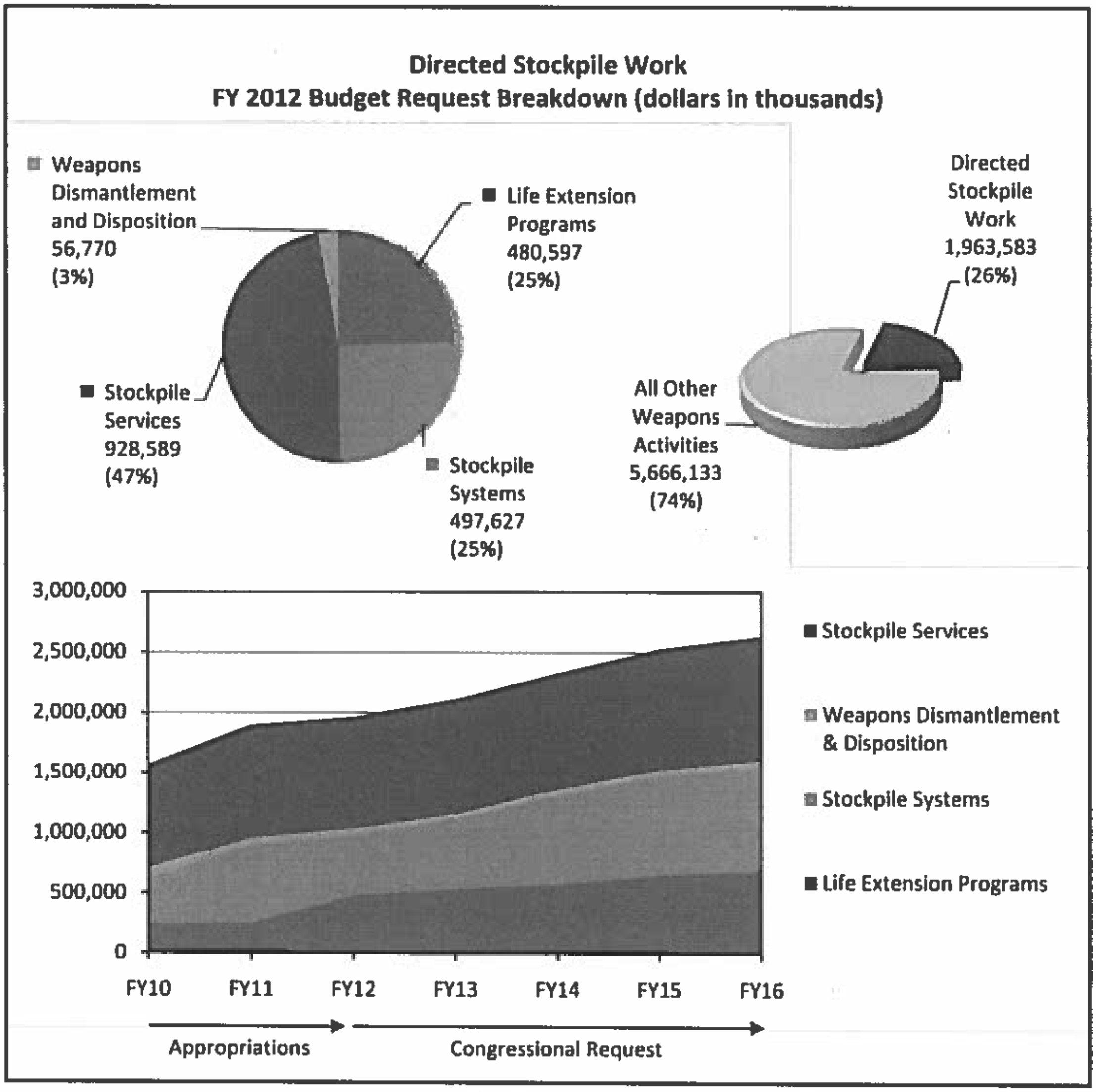
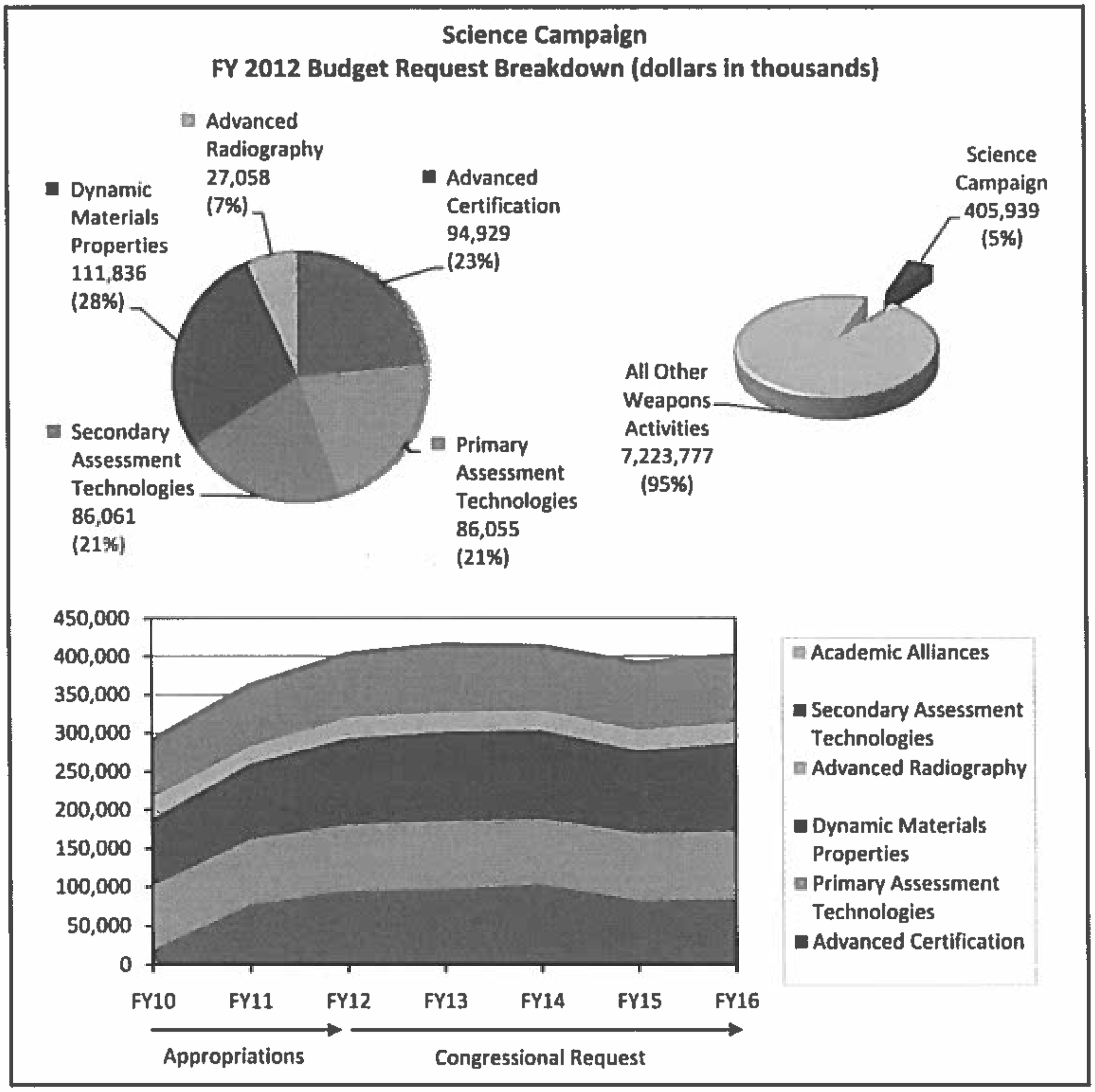


Figure 26. FY 2012 Budget Request for Directed Stockpile Work

	(dollars in thousands)						
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Life Extension Programs							
B61 Life Extension Program	0	0	223,562	279,206	320,894	396,869	426,415
W76 Life Extension Program	231,888	249,463	257,035	255,000	255,000	255,000	260,099
Subtotal, Life Extension Programs	231,888	249,463	480,597	534,206	575,894	651,869	686,514
Stockpile Systems							
B61 Stockpile Systems	114,195	317,136	72,396	72,364	72,483	70,488	71,534
W62 Stockpile Systems	2	0	0	0	0	0	0
W76 Stockpile Systems	65,451	64,521	63,383	65,445	63,580	63,537	65,727
W78 Stockpile Systems	52,167	85,898	109,518	151,207	329,354	333,978	316,507
W80 Stockpile Systems	20,107	34,193	44,444	46,540	50,457	58,898	59,775
B83 Stockpile Systems	36,689	39,349	48,215	57,947	72,516	65,941	54,663
W87 Stockpile Systems	53,848	62,603	83,943	85,689	68,774	63,638	65,492
W88 Stockpile Systems	42,743	45,666	75,728	105,582	78,602	163,626	226,060
Subtotal, Stockpile Systems	385,202	649,366	497,627	584,775	735,766	820,106	859,758
Weapons Dismantlement and Disposition	95,786	58,025	56,770	43,404	52,090	54,205	55,495
Stockpile Services							
Production Support	300,037	309,761	354,502	319,805	320,614	332,371	341,203
Research and Development Support	37,071	38,582	30,264	31,059	31,824	33,116	33,904
Research and Development Certification and Safety	189,174	209,053	190,892	241,658	242,424	250,963	255,747
Management, Technology, and Production	183,223	193,811	198,700	199,080	207,290	215,468	222,137
Plutonium Sustainment	141,909	190,318	154,231	157,453	161,957	171,894	175,949
Subtotal, Stockpile Services	851,414	941,525	928,589	949,055	964,109	1,003,812	1,028,940
Total, Directed Stockpile Work	1,564,290	1,898,379	1,963,583	2,111,439	2,327,859	2,529,992	2,630,707

Figure 26. FY 2012 Budget Request for Directed Stockpile Work (*continued*)

Science Campaign

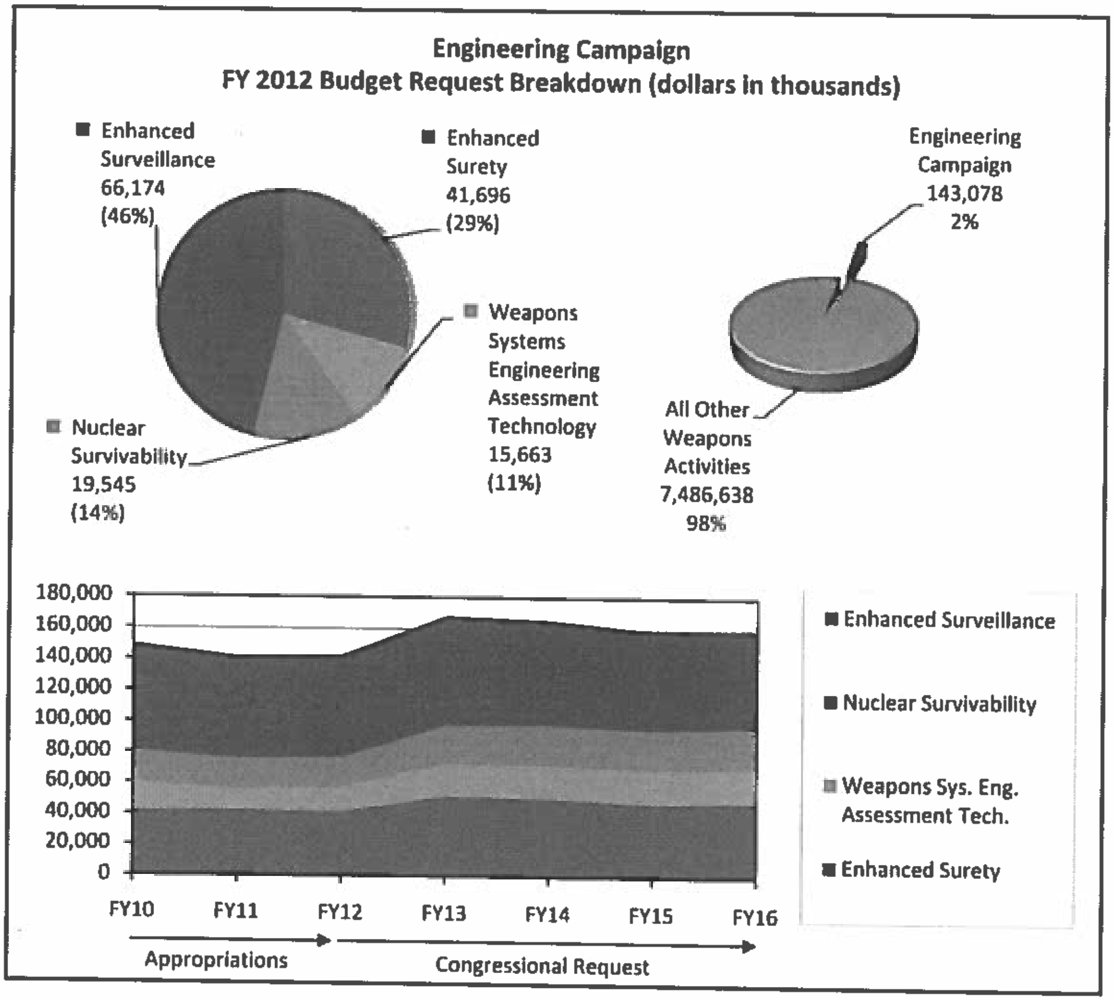


(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Advanced Certification	19,269	76,972	94,929	97,229	103,271	82,000	84,174
Primary Assessment Technologies	82,838	85,723	86,055	88,893	85,894	88,368	88,831
Dynamic Materials Properties	86,371	96,984	111,836	114,980	114,170	106,398	114,620
Academic Alliances	0	0	0	0	0	0	0
Advanced Radiography	28,489	23,594	27,058	26,816	26,528	27,421	26,473
Secondary Assessment Technologies	77,581	81,949	86,061	90,298	86,421	90,128	89,999
Total, Science Campaign	294,548	365,222	405,939	418,216	416,284	394,315	404,097

Figure 27. FY 2012 Budget Request for Science Campaign

Engineering Campaign



(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Enhanced Surety	41,928	42,429	41,696	51,922	50,810	47,649	48,773
Weapons Systems Engineering Assessment Technology	17,977	13,530	15,663	21,233	21,502	21,244	21,699
Nuclear Survivability	20,980	19,786	19,545	24,371	25,691	26,079	26,318
Enhanced Surveillance	68,794	66,175	66,174	70,892	67,895	64,477	61,903
Total, Engineering Campaign	149,679	141,920	143,078	168,418	165,898	159,449	158,693

Figure 28. FY 2012 Budget Request for Engineering Campaign

Inertial Confinement Fusion Ignition and High Yield Campaign

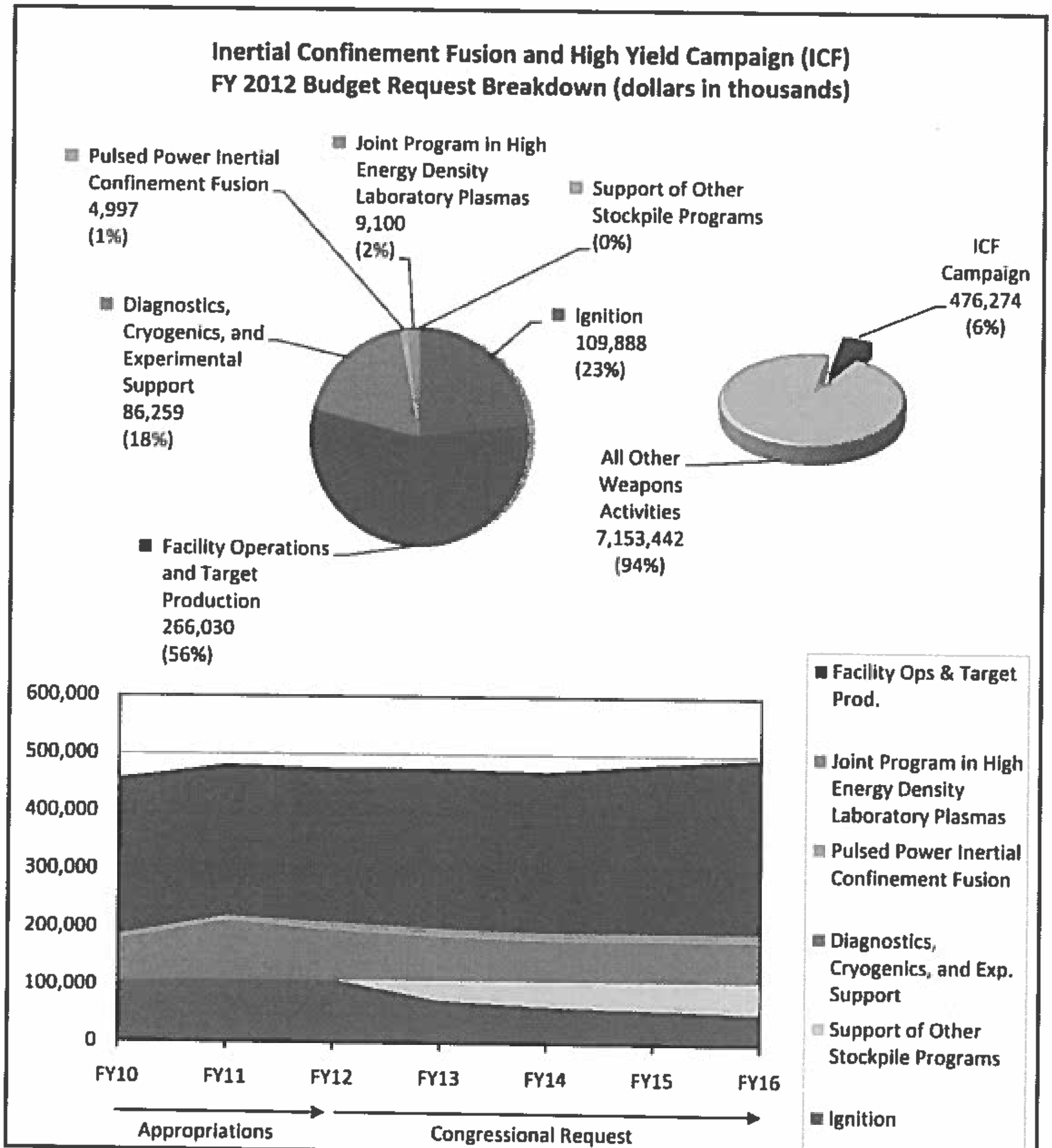
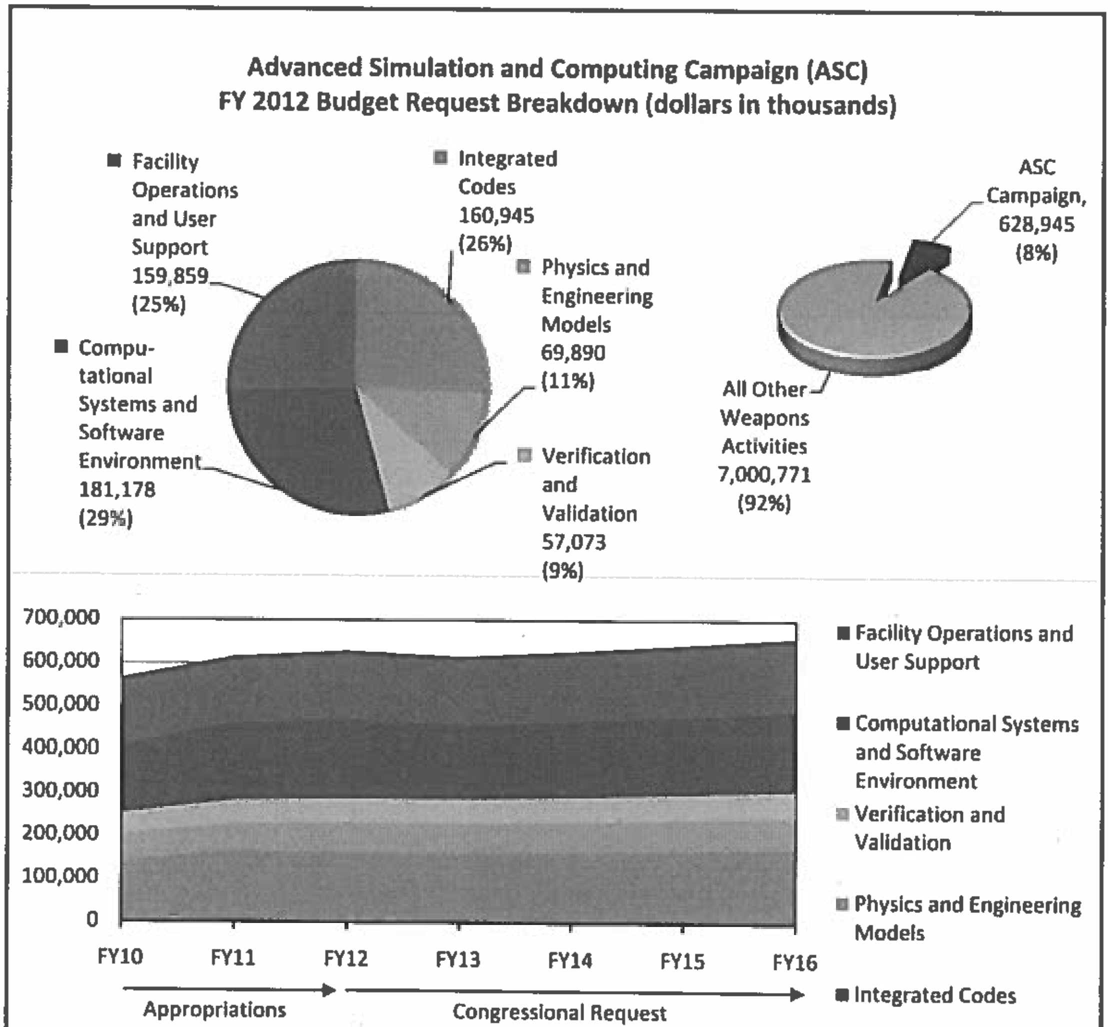


Figure 29. FY 2012 Budget Request for Inertial Confinement Fusion and High Yield Campaign

	(dollars in thousands)						
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Ignition	106,575	109,506	109,888	74,410	65,000	60,000	55,000
Support of Other Stockpile Programs	0	0	0	35,590	45,000	50,000	55,000
NIF Diagnostics, Cryogenics, and Experimental Support	72,144	102,649	86,259	76,267	70,159	70,517	69,617
Pulsed Power Inertial Confinement Fusion	4,992	5,000	4,997	5,000	5,000	5,000	5,000
Joint Program in High-Energy-Density Laboratory Plasmas	4,000	4,000	9,100	9,500	9,500	9,500	9,500
Facility Operations and Target Production	269,775	260,393	266,030	275,614	277,009	290,220	300,909
Total, Inertial Confinement Fusion Ignition and High Yield Campaign	457,486	481,548	476,274	476,381	471,668	485,237	495,026

Figure 29. FY 2012 Budget Request for Inertial Confinement Fusion and High Yield Campaign (*continued*)

Advanced Simulation and Computing Campaign

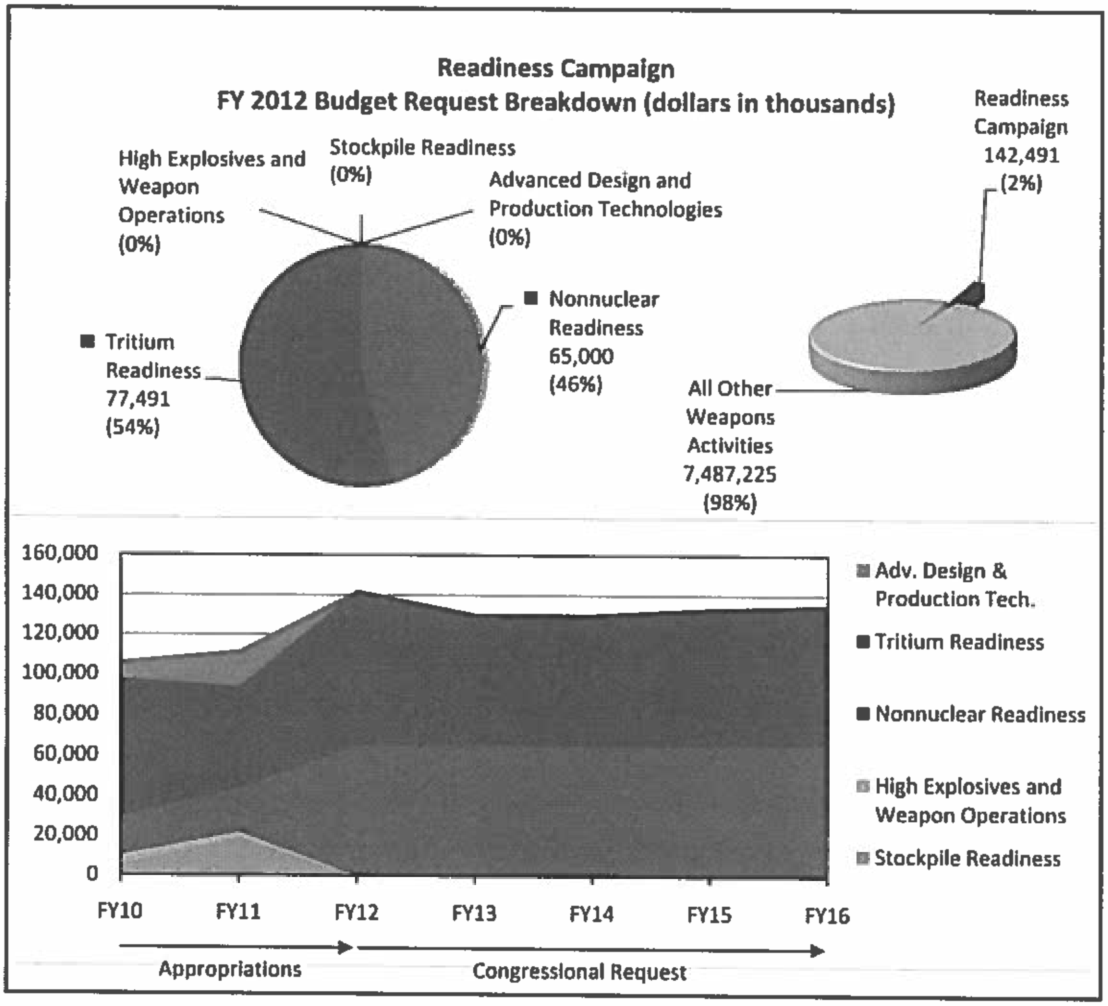


(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Integrated Codes	140,882	165,947	160,945	160,170	163,287	167,194	171,377
Physics and Engineering Models	61,189	62,798	69,890	69,567	70,922	72,617	74,434
Verification and Validation	50,882	54,781	57,073	56,794	57,899	59,284	60,767
Computational Systems and Software Environment	157,466	175,833	181,178	170,462	173,782	177,937	182,389
Facility Operations and User Support	155,650	156,389	159,859	159,111	162,210	166,088	170,243
Total, Advanced Simulation and Computing Campaign	**566,069**	**615,748**	**628,945**	**616,104**	**628,100**	**643,120**	**659,210**

Figure 30. FY 2012 Budget Request for Advanced Simulation and Computing Campaign

Readiness Campaign

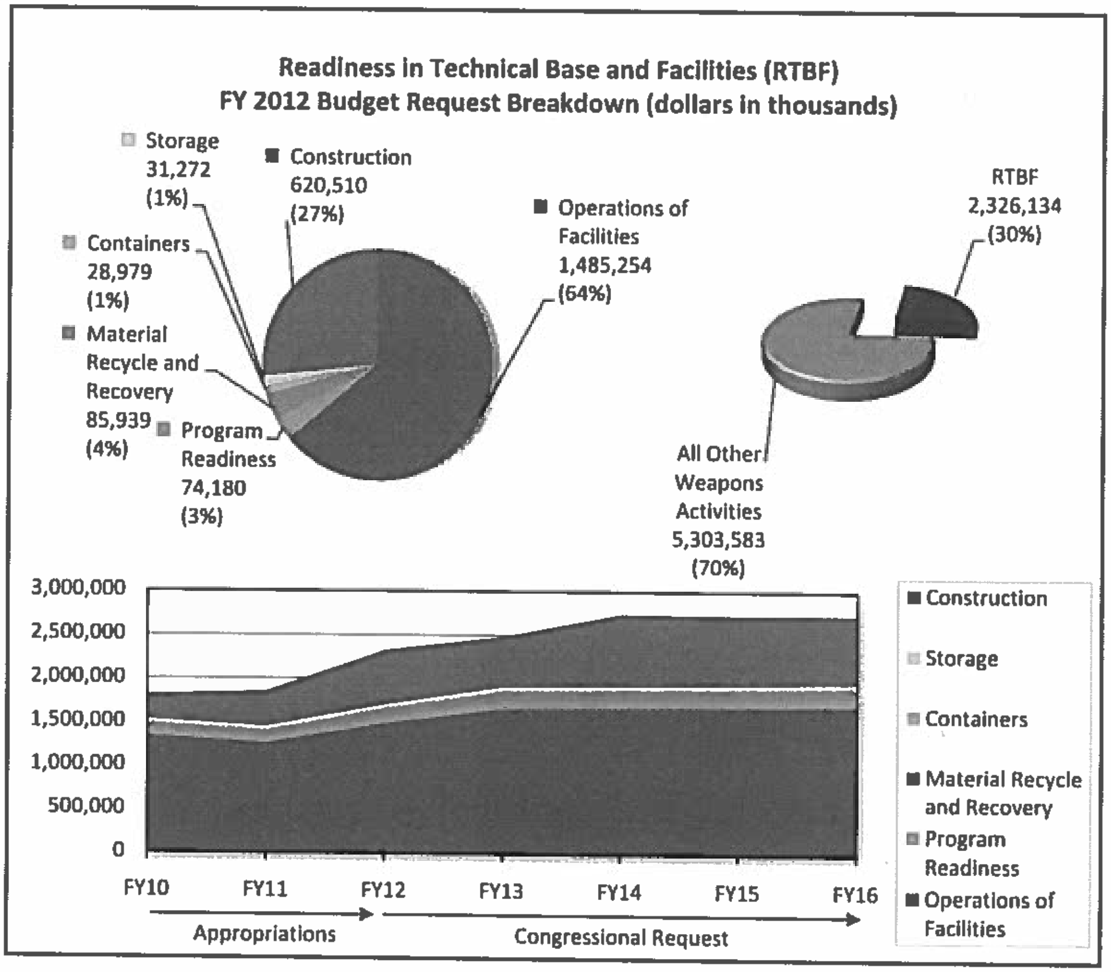


(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Stockpile Readiness	5,670	18,941	0	0	0	0	0
High Explosives and Weapon Operations	4,583	3,000	0	0	0	0	0
Nonnuclear Readiness	19,625	21,864	65,000	65,000	65,000	65,000	65,000
Tritium Readiness	68,245	50,187	77,491	65,753	65,754	68,706	70,320
Advanced Design and Production Technologies	8,621	18,100	0	0	0	0	0
Total, Readiness Campaign	106,744	112,092	142,491	130,753	130,754	133,706	135,320

Figure 31. FY 2012 Budget Request for Readiness Campaign

Readiness in Technical Base and Facilities

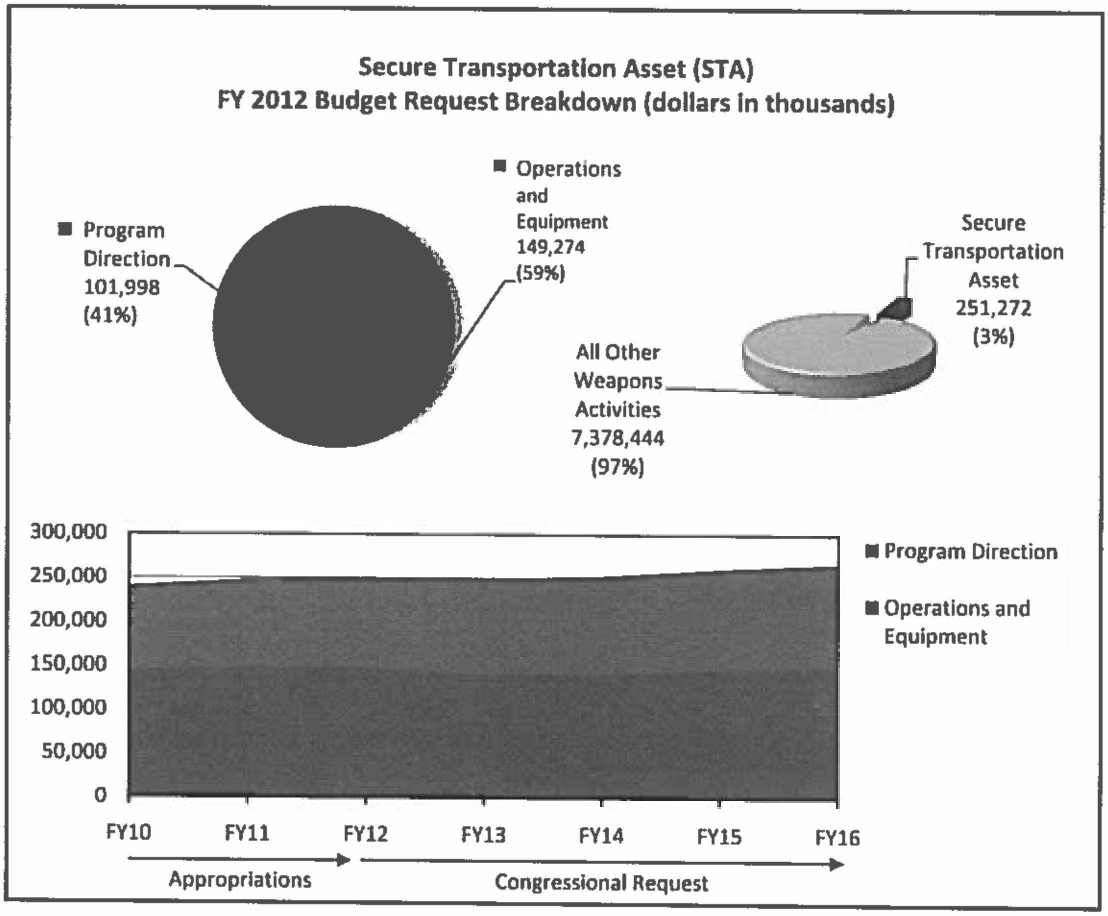


(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Operations of Facilities	1,336,399	1,257,991	1,485,254	1,655,922	1,673,863	1,681,568	1,699,396
Program Readiness	72,873	69,309	74,180	88,900	89,511	90,780	91,504
Material Recycle and Recovery	69,224	70,429	85,939	104,940	102,782	105,021	106,642
Containers	23,321	27,992	28,979	25,016	23,997	24,809	25,396
Storage	24,558	24,233	31,272	32,347	31,872	33,647	34,208
Construction	283,904	399,016	620,510	577,134	820,479	793,832	777,744
Total, Readiness in Technical Base and Facilities	1,810,279	1,848,970	2,326,134	2,484,259	2,742,504	2,729,657	2,734,890

Figure 32. FY 2012 Budget Request for Readiness in Technical Base and Facilities

Secure Transportation Asset



(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Operations and Equipment	144,542	149,018	149,274	141,560	142,270	146,865	150,561
Program Direction	96,141	99,027	101,998	107,896	110,599	114,656	117,212
Total, Secure Transportation Asset	240,683	248,045	251,272	249,456	252,869	261,521	267,773

Figure 33. FY 2012 Budget Request for Secure Transportation Asset

Nuclear Counterterrorism Incident Response

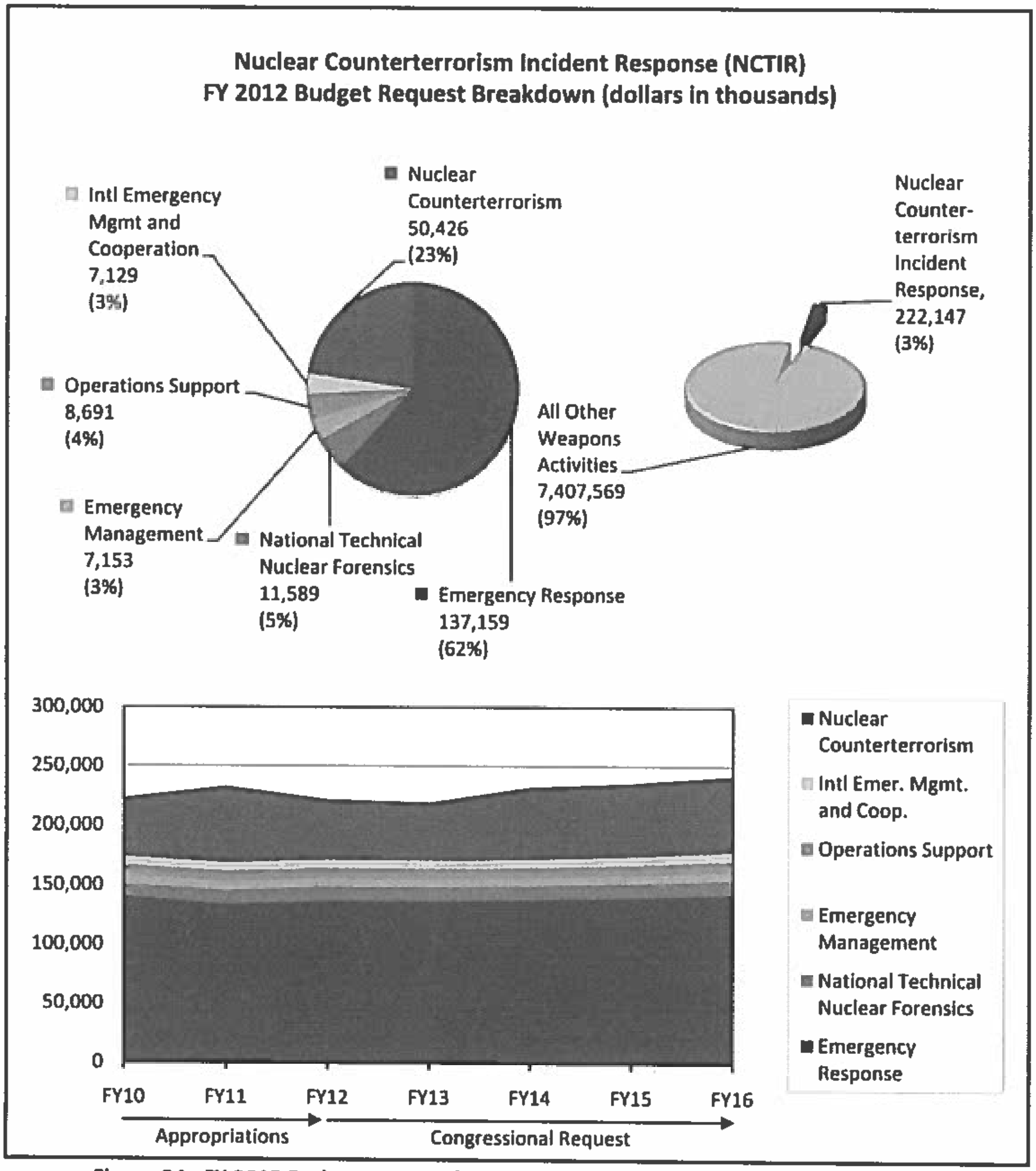
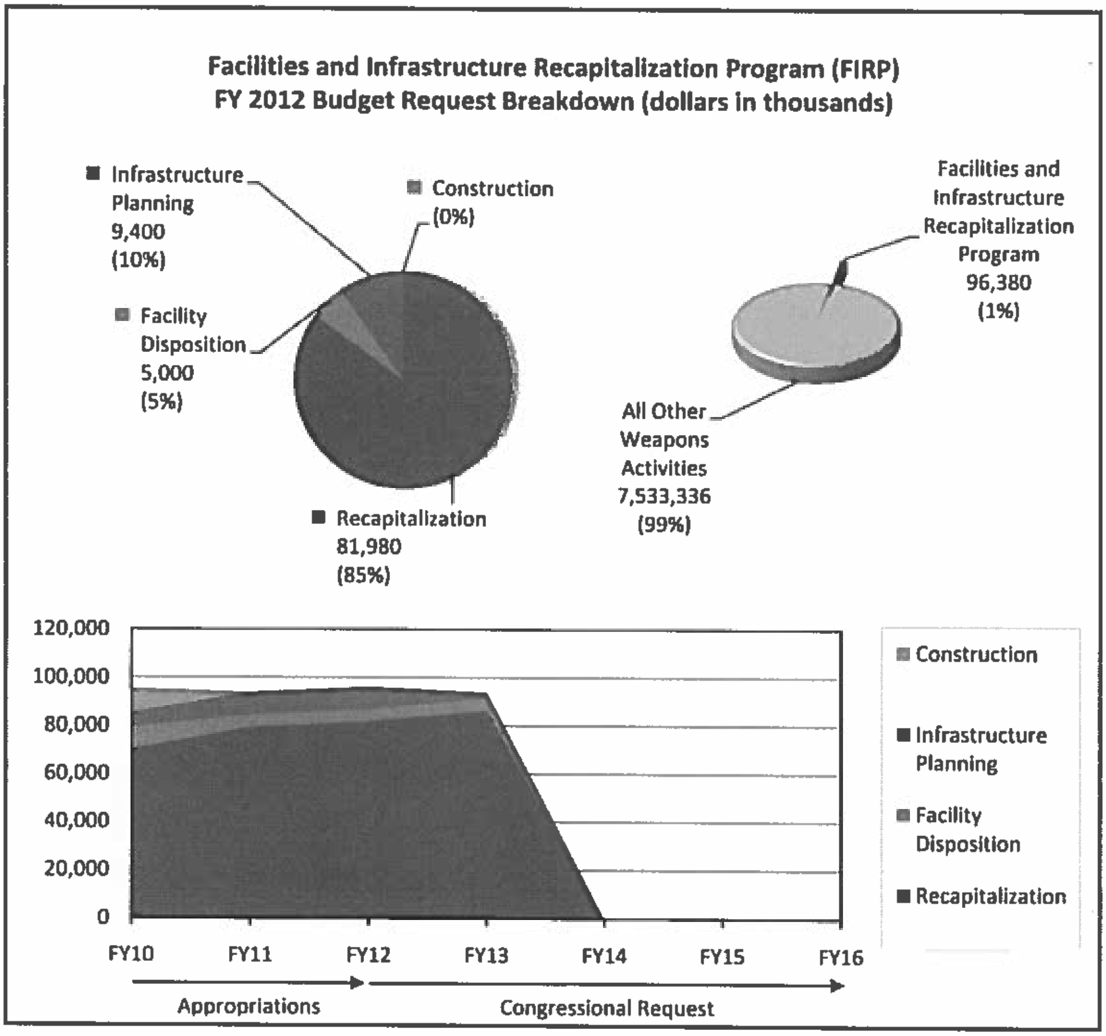


Figure 34. FY 2012 Budget Request for Nuclear Counterterrorism Incident Response

	(dollars in thousands)						
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Emergency Response	140,481	134,092	137,159	136,918	138,440	140,098	142,816
National Technical Nuclear Forensics	10,227	11,698	11,589	11,694	11,577	11,828	12,274
Emergency Management	7,726	7,494	7,153	6,629	6,506	6,694	6,776
Operations Support	8,536	8,675	8,691	8,799	8,749	9,000	9,110
International Emergency Management and Cooperation	7,181	7,139	7,129	7,139	7,032	7,276	7,664
Nuclear Counterterrorism	49,228	64,036	50,426	48,558	60,376	61,149	63,565
Total, Nuclear Counterterrorism Incident Response	**223,379**	**233,134**	**222,147**	**219,737**	**232,680**	**236,045**	**242,205**

Figure 34. FY 2012 Budget Request for Nuclear Counterterrorism Incident Response (*continued*)

Facilities and Infrastructure Recapitalization Program

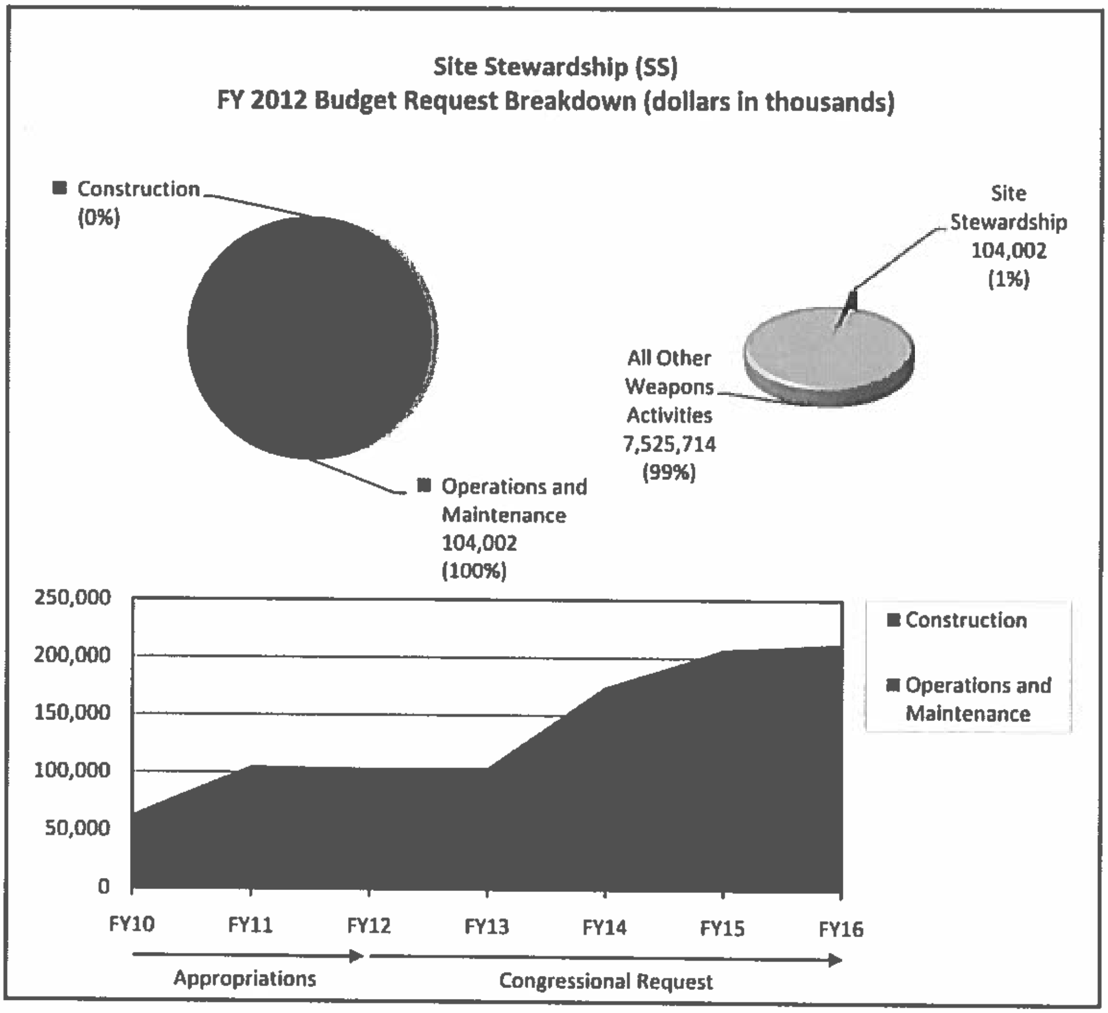


(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Recapitalization	70,483	79,600	81,980	86,600	0	0	0
Facility Disposition	8,976	5,000	5,000	5,000	0	0	0
Infrastructure Planning	6,153	9,400	9,400	2,400	0	0	0
Construction	9,963	0	0	0	0	0	0
Total, Facilities and Infrastructure Recapitalization Program	95,575	94,000	96,380	94,000	0	0	0

Figure 35. FY 2012 Budget Request for Facilities and Infrastructure Recapitalization Program

Site Stewardship



(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Operations and Maintenance	63,308	90,478	104,002	102,458	175,370	192,488	197,706
Construction	0	15,000	0	2,241	0	15,000	15,000
Total, Site Stewardship	63,308	105,478	104,002	104,699	175,370	207,488	212,706

Figure 36. FY 2012 Budget Request for Site Stewardship

Defense Nuclear Security

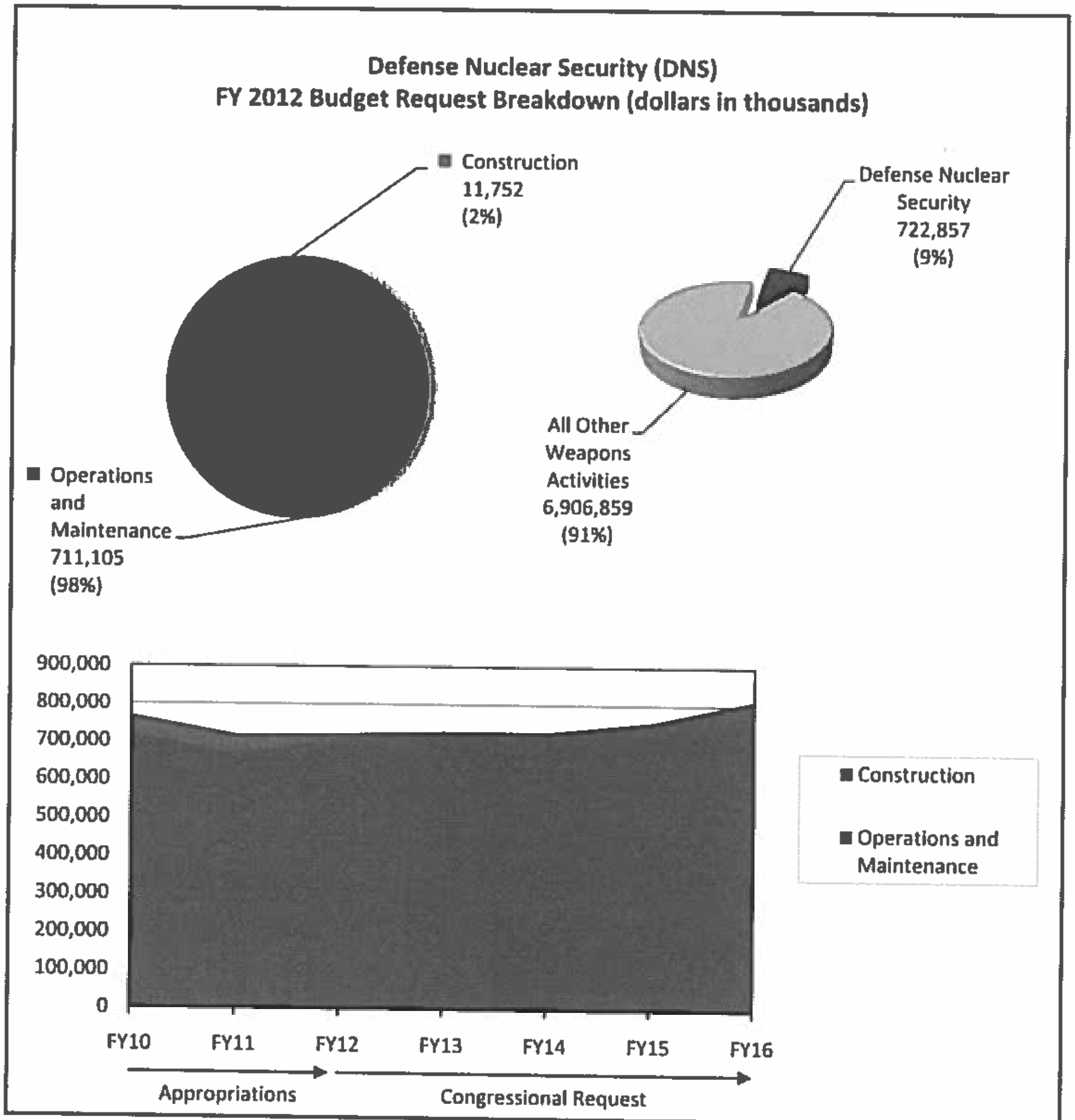
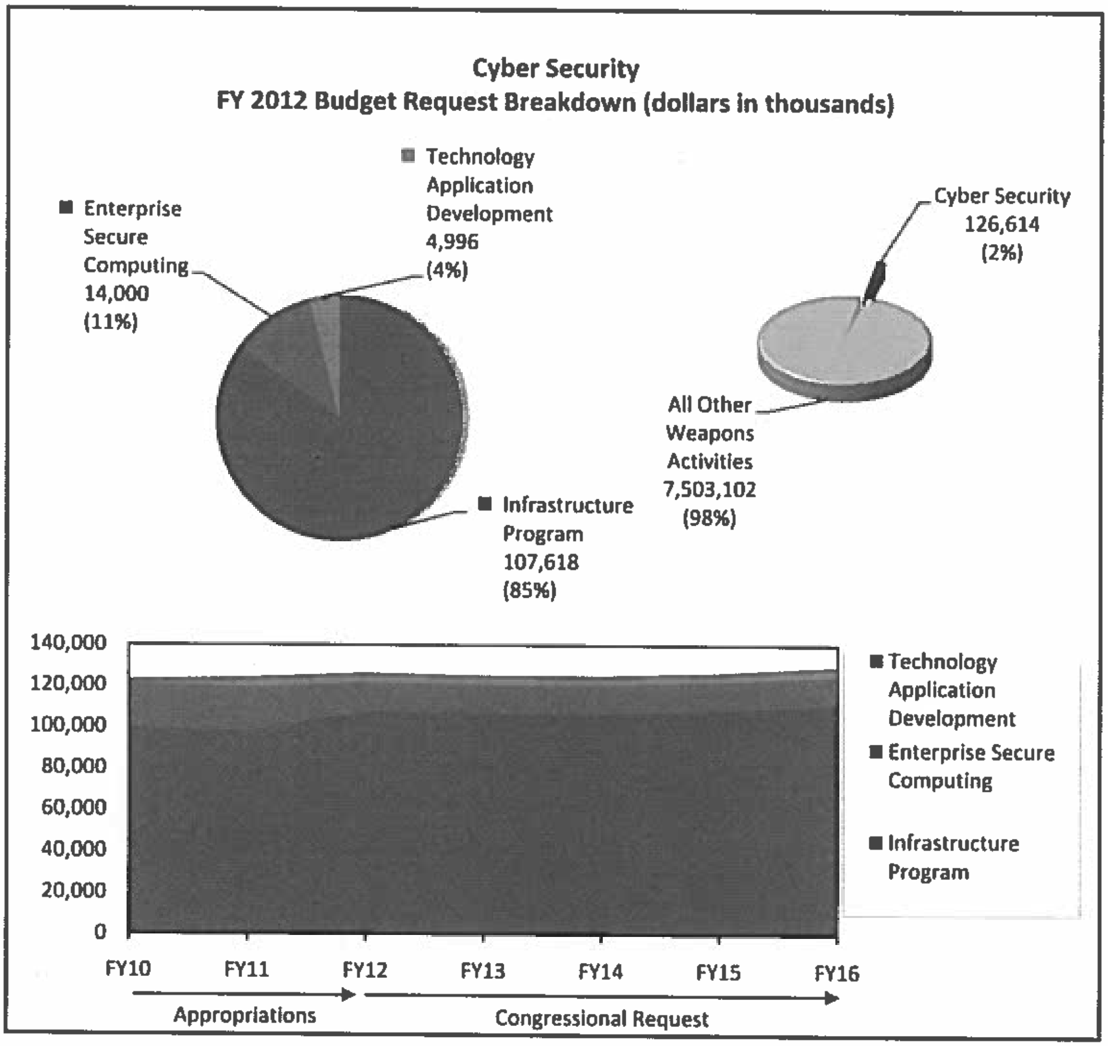


Figure 37. FY 2012 Budget Request for Defense Nuclear Security

	(dollars in thousands)						
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Protective Forces	453,779	414,166	418,758	405,145	402,755	417,474	451,148
Physical Security Systems	74,000	73,794	107,636	129,491	130,266	132,872	140,537
Information Security	25,300	25,943	30,117	29,540	30,148	31,406	33,806
Personnel Security	30,600	30,913	37,285	39,063	39,375	39,862	41,205
Materials Control and Accountability	35,200	35,602	34,592	33,206	33,502	34,831	37,412
Program Management	83,944	80,311	77,920	86,706	86,363	92,631	103,527
Technology Deployment, Physical Security	8,000	7,225	4,797	6,644	6,764	7,034	7,332
Graded Security Policy	10,000	0	0	0	0	0	0
Construction	49,000	52,000	11,752	0	0	0	0
Total, Defense Nuclear Security	769,823	719,954	722,857	729,795	729,173	756,110	814,967

Figure 37. FY 2012 Budget Request for Defense Nuclear Security (*continued*)

Cyber Security



(dollars in thousands)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Infrastructure Program	99,838	97,849	107,618	106,826	106,711	108,193	111,233
Enterprise Secure Computing	21,500	21,500	14,000	14,000	14,000	14,000	14,000
Technology Application Development	2,000	4,996	4,996	4,590	4,610	4,705	4,770
Total, Cyber Security	123,338	124,345	126,614	125,416	125,321	126,898	130,003

Figure 38. FY 2012 Budget Request for Cyber Security

National Security Applications

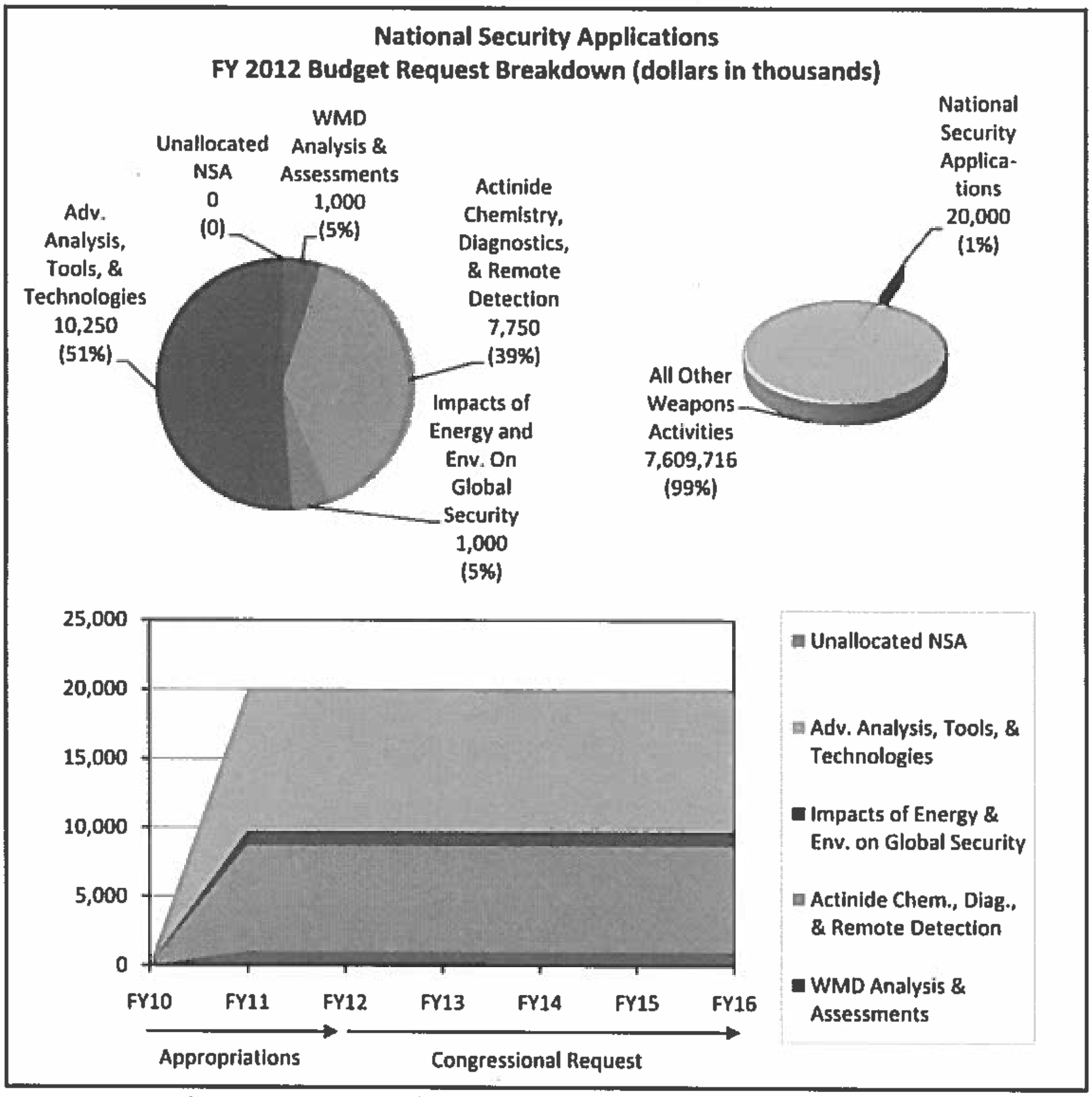


Figure 39. FY 2012 Budget Request for National Security Applications

	(dollars in thousands)						
	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
WMD Analysis and Assessments	0	1,000	1,000	1,000	1,000	1,000	1,000
Actinide Chemistry, Diagnostics, and Remote Detection	0	7,750	7,750	7,750	7,750	7,750	7,750
Impacts of Energy and Environment on Global Security	0	1,000	1,000	1,000	1,000	1,000	1,000
Advanced Analysis, Tools, and Technologies	0	10,250	10,250	10,250	10,250	10,250	10,250
Unallocated NSA	0	0	0	0	0	0	0
Total, National Security Applications	**0**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**

Figure 39. FY 2012 Budget Request for National Security Applications (*continued*)

Appendix D—Physical Infrastructure Updates

Chapter IV explained the necessary activities to modernize post-World War II and Cold War era nuclear weapons facilities and infrastructure, and transition it to an NNSA NSE capable of meeting future demands. The FY 2012 SSMP Appendix D provides the project descriptions that support a 20-year planning document. Figure 6 shows the integrated priority list of approved and proposed enterprise capital construction projects, and associated schedules and Rough Order of Magnitude costs. Project descriptions and schedules and Rough Order of Magnitude costs are provided in Table 3 for Nominal Schedule of Non-Capital, Capital Equipment, and Non-Defense Program Projects.

Design, Certification, Experiments and Surveillance Facilities

Potential Infrastructure Modernization

The following proposals for Design, Certification, Experiments, and Surveillance based infrastructure modernization fall into two categories. The majority of the proposals are site-specific and are intended for initiation within the next decade. The other category ("Large Science and Technology Tools") is a projection of stockpile-based requirements in the post-2020 period and represents an expenditure of significantly more than $1 billion. All of these items are part of the integrated priority list shown in Figure 6.

- **Test Capabilities Revitalization Phase II** (Sandia National Laboratories [SNL]). This project was approved for Start of Construction in FY 2009 but received only partial funding. The project is fully funded in the FY 2012 Future-Years Nuclear Security Program (FYNSP). The Test Capabilities Revitalization (TCR) construction supports B61 Life Extension Program (LEP) First Production Unit and provides the environmental test infrastructure required for testing of the nuclear explosives package and non-nuclear and systems engineering for the W78 and W88 LEP.
- **Energetic Materials Characterization** (Los Alamos National Laboratory [LANL]). Proposes to provide modernized, reliable, and efficient infrastructure to conduct energetic material operations and provide capabilities critical to the surveillance and safety of energetic materials related to the nation's enduring nuclear stockpile and to homeland security needs. The proposal would replace several 50+ year old facilities that are obsolete, require excessive maintenance, and cannot be configured to accommodate requirements.
- **Weapons Engineering Facility** (SNL). Replaces five buildings and 300,000 square feet of poor facilities with 200,000 square feet of centralized, high security, and current supporting computing technology to house all SNL weapons engineers. The Project reduces the SNL NNSA limited area from 11 acres to 2 acres with associated savings in security costs.
- **LEP and Warhead Assessment Facility** (Lawrence Livermore National Laboratory [LLNL]). Proposes to refurbish the nuclear device design and evaluation facilities required to support the upcoming B61 LEP and W78 LEP warhead development programs, as well as major

portions of the design agency annual assessment activities. These facilities are approaching 40 to 50 years of age with poor operational reliability and now are in need of refurbishment and replacement. Special facility equipment unique to these assets will require revitalization through a 4- to 5-year recapitalization program. The proposal would refurbish the existing facilities.

- **Large Science and Technology Tools Project.** The potential requirements for new science, technology, and engineering-based infrastructure development fall into the four principal categories described below. NNSA will continue to evolve to meet an increasingly challenging mission that is characterized by aging of the stockpile, obsolescence of key technologies, and the possibility of considerable new threats. In addition, the current strong interest in many of NNSA's capabilities by outside entities is likely to grow significantly. This interest spans the range from other aspects of national security to the broader needs of the general U.S. scientific community. A list of potential large science tools projects follows. The required science tools project and location will be determined in the future:
  - **Enhancement of large-scale, sub-critical, integrated experiments at Nevada National Security Site.** Current initiatives involving large-scale hydrodynamic experiments related to scaling and surrogacy may help to define the value of such experimentation for 1-2 decades. Such work would also enhance the test readiness of the weapons program and supply vital hydrodynamic data for Stewardship requirements.
  - **Expanded capability for measurement of materials properties under extreme conditions.** Replacement and assessment of aging materials will become a critical, continuing task in the period beyond 2020. In addition, advancement of sophisticated materials science predictive capability will be a key component of U.S. scientific viability. Testing of materials under extreme conditions will be important to the weapons program and other vital national needs. Advanced schemes utilizing multiple high photon energy probes (using advanced accelerators), advanced laser systems, and pulse power have been proposed to address this need. One integrated proposal for satisfying this need is the Matter-Radiation Interactions in Extremes concept proposed by Los Alamos.
  - **Advanced fusion and large scale High-Energy-Density (HED) Physics Capability.** Current work in HED Physics involving both igniting and non-igniting conditions hold great promise in weapons applications and many other areas of science. Results of on-going experiments could point the way to applications requiring larger Fusion/HED drivers utilizing lasers or pulsed power. Expenditures in the "next step fusion/HED would be in the $1.5 billion category."
  - **Enhancement of exa-scale computing.** Although establishment of the core capability for exa-scale computing is likely to be in place between 2018 and 2021, full use of this significant advance will require considerable additional infrastructure. This additional infrastructure would transform this new level of computing power into a national capability.

- **Weapons Manufacturing Support Facility** (LANL). Proposes to consolidate facilities to provide reliable, safe, and effective non-nuclear component machining and fabrication for weapons. The smaller facility will reduce financial burden and provide necessary support to LANL missions that are not currently available.
- **Weapons Engineering Science and Technology** (LLNL). Proposes to consolidate and modernize parts of the core weapons engineering and science buildings that were built shortly after LLNL was founded in 1952. These existing facilities, which support Directed Stockpile Work and Science Campaigns, are past their useful life and require replacement or refurbishment to continue mission critical weapons engineering and science operations. In addition to seismic deficiencies and a large maintenance backlog, the existing facilities have legacy beryllium contamination. The proposal would provide a consolidated and modern facility of laboratory and office space. The proposal will include the cost to deactivate and decommission the vacated space.
- **Gravity Weapons Certification** (SNL). This project is required to maintain the capability to validate performance of gravity nuclear weapons from development through surveillance in support of both NNSA and U.S. Air Force requirements. The existing equipment and infrastructure used to capture data and support flight test operations at Tonopah Test Range is aged, obsolete, and requires constant and proactive maintenance in order to support the mission. The proposal provides several options to address program requirements. The proposal would perform repair, refurbishment, and/or upgrades to roads, power grid, facilities, and equipment associated with execution of this capability.
- **High Explosive Research and Development (R&D)** (LLNL). Proposes to relocate capabilities that are currently in Site 300 and continue to be needed. Closure of Site 300 will result in the loss of two mission critical high explosive R&D capabilities that provide significant support to the High Explosive Applications Facility. The proposal would construct an annex onto the existing High Explosive Applications Facility which consolidates high explosive R&D capabilities and enables the elimination of Weapons Account funding at Site 300, without loss of ongoing functions.
- **Materials Science Modernization** (LLNL). Proposes a materials research complex to address the evolving missions of the Laboratory and provide LLNL programs with a modern infrastructure for materials fabrication, characterization, and testing in support of LLNL's national security mission. The proposal would establish a modern facility to advance capabilities in precision experiments and precision fabrication of designer materials and other related materials research in support of LLNL's enduring national security missions.
- **High Explosive Special Facility Equipment** (LLNL). Proposes to refurbish or replace facilities and equipment that are currently used in the synthesis, formulation, processing, and testing of high explosives. The condition of existing facilities and equipment is deteriorating and warrants major investment to maintain reliability to meet mission deliverables and to bring maintenance costs to an affordable level.
- **Center for HED Science** (LLNL). Proposes to create laboratory and office space for collaboration in an open environment between various governments and private industry.

The proposed center specifically would promote partnerships to advance research in HED science and would be positioned to enhance the use of National Ignition Facility capabilities in support the NNSA Office of Fusion Science Joint Program in HED Laboratory Plasmas.

- Project descriptions for the modernization proposals that are listed in Table 3, Nominal Schedule/Cost of Non-Capital or Capital Equipment or Non-Defense Program Proposed Projects:
  - **Exa-scale** provides the United States with the next generation of extreme scale computing capability to solve problems of national importance in energy, the environment, national security, and science. The two NNSA sites being considered for locating this advanced computing capability are LANL and LLNL. This programmatic equipment will be considered in the post-FYSNP budget using operating resources.
  - **Radiography for subcritical experiments** (Nevada National Security Site). This project is being considered for addition, but currently no decisions have been made. The existing Cygnus dual beam radiography power is not sufficient for the plutonium experiments as currently conceived. Radiography alternatives for the plutonium hydrodynamic subcritical experiments will be evaluated to support these experiments in the post-FYNSP.
- **Laboratory and Experiment Site.** This project supports Infrastructure project proposals (projects are listed in Figure 6):
  - **Device Assembly Facilities Lead-in Piping** (Nevada National Security Site). Proposes to remediate 20 years of galvanic and microbial corrosion that has resulted in a decrease of the fire suppression lead-in pipe's thickness by up to 80 percent. The sloughing of interior coal tar pipe lining contributed to 76 percent of the Device Assembly Facilities' fire suppression system being unavailable by inhibiting water flow and further exposing the piping interior surfaces to corrosive agents. Some of the current lead-in piping is 40-50 feet below the surface and is inaccessible for inspection or repair. The proposed project would replace the piping and upgrade the fire suppression system.
  - **Emergency Operations Center (EOC)** (SNL). Consolidates personnel and equipment to improve both response capability and response time. This project also relocates the Emergency Response outside the "Zone of Exposure" in Technical Area (TA)-1. The current EOC is within the TA-1 primary exposure zone meaning that in some events EOC personnel would have to "shelter in place" rather than respond. There are also numerous operational difficulties with the current Center including no radio communications with the City of Albuquerque Fire Department, one line of communications with City of Albuquerque Police, a need to support central alarm stations and secure communication lines, no place to hang Level A personal protected equipment suits, no garaging for emergency response vehicles, and related inability to store self-contained breathing apparatus in vehicles.
  - **Emergency Operations Center** (LLNL). Proposes to replace the current temporary Emergency Operations Center in B490, which does not meet State of California or national standards or DOE requirements for an EOC. The current EOC is co-located

within a large unsecure building that creates operational, safety, and security risks. The proposal would construct a facility with office space, a media center, communications, and alarm monitoring/dispatch center.

- **Data Center Consolidation** (Nevada National Security Site). Proposes to consolidate the existing data centers into one state of the art facility that will support control of energy consumption and operating costs. The existing Nevada National Security Site data center is infrastructure is energy inefficient and not optimized. The proposed data center will address advancing technology, reduce operational costs, increase energy efficiency, and serve as backup for the NNSA enterprise. This center will protect data and computing functions vital to mission needs, reduce risk of power outages, increase electrical reliability, and support replication of energy efficient practices across the enterprise.
- **Seismic Rehabilitation of laboratory buildings** (LLNL). Proposes to rehabilitate 10–15 of the most seriously seismically deficient buildings at LLNL, providing seismic upgrades that are essential to continuing programmatic operations in many of the enduring mission-essential facilities. The laboratory conducted a comprehensive seismic evaluation of its entire facility inventory and determined that seismic rehabilitation is needed for approximately 60 buildings as they do not meet the "life safety" standards. LLNL is located in a seismically active region and there is a 62 percent probability of one or more earthquakes of magnitude 6.7 or greater in the next 30 years.
- **Mission Support Consolidation.** Proposes to replace and consolidate 40+ year-old existing facilities and temporary structures that are used to house executive management and support services personnel. These facilities do not comply with current building codes, contribute to an increasing deferred maintenance liability, and are increasingly more costly to operate and maintain. The proposal would consolidate operations which would result in a more efficient, safe, secure, and mission responsive work environment, as well as addressing footprint reduction, cost reduction, energy use reduction, and workplace efficiency improvements.
- **Receiving and Distribution Center** (LANL). Proposes to replace an obsolete 60-year-old facility that requires excessive maintenance and repair, is in an inappropriate location, and has inadequate seismic strength. The new facility would be smaller, more efficient, and located in a place that reduces security vulnerabilities to TA-3.
- **Reshaping SNL/New Mexico TA-1** . This project significantly reduces the secured area and security fencing and the NNSA footprint of SNL TA-1 and related costs by reshaping the boundary and the entries to the site and relocating the gate to Kirtland Air Force Base. This reshaping allows 358 acres of TA-1 (30 percent of the area) to be located outside of Kirtland Air Force Base boundary. The project also reshapes and redirects roads, service roads and service areas, creates specific service access for deliveries and inspections, and relocates Fleet Services and other operations. The project improves logistics and parking and provides a bus plaza, bike stations and opportunities for renewable energy installations.

- **Livermore Valley Visitor Center** (LLNL). Proposes construction of a visitor center as a transformational element in the Livermore Valley Open Campus (LVOC). It would provide a central facility to greet and screen visitors and project common areas that will be shared by all the LVOC facilities. This project is proposed as a major component of the LVOC effort to provide the opportunity for collaboration between the Laboratory, government, and industry partnerships to advance national science issues. This potential project will be in design and that is why it is not reflected in Table 4 as being complete.

Plutonium Facilities

Potential Infrastructure Modernization

- **Chemistry and Metallurgy Research Replacement Facility-Nuclear Facility (CMRR-NF) Status.** The project is on schedule and the design is currently at approximately 50 percent completion. The project performance baseline will be set (baselined) in FY 2013 when the design achieves 90 percent maturity. Construction is scheduled to complete by 2020; the facility is scheduled to be fully operational by 2023. The updated cost range is estimated (based on 45 percent design maturity) at $3.7 billion to $5.86 billion.
- **TA-55 Reinvestment Phase I, II, and III.** The project will extend the life of the Plutonium Facility (PF)-4, the multi-purpose plutonium facility, by approximately 25 years with replacement and upgrades of major physical infrastructure systems. Changes are summarized below:
  - TA-55 Reinvestment Phase I construction is complete as of 2010;
  - TA-55 Reinvestment Phase II has established a baseline (Critical Decision-2) and is fully funded in the FY 2011 FYNSP as a new start project. The project start is delayed by the continuing resolution in FY 2011;
  - TA-55 Reinvestment Phase III project will focus on facility infrastructure systems (e.g., mechanical, electrical, structural). The project scope is under consideration for post-FYNSP resources;
  - **PF-4 Manufacturing Process Equipment Upgrades Project** (project name changed from PF-4 Recapitalization). This project is one of several investments planned to support the increased pit capacity and capability production requirements by 2018 through 2020. One main goal of the plutonium Sustainment Program is to ramp up to a production capability of up to 80 pits per year in 2022. The Upgrades project supports process equipment and other production enhancements inside of PF-4. One strategy for increasing this production capability is to add equipment to augment the existing manufacturing processes co-located inside a dedicated room in PF-4. In the near term, however, the program must replace pieces of process equipment that have exceeded "end-of-life" just to maintain the 10-20 pit-per-year capacity that currently exists. With existing FY 2011 funding, the removal of old process equipment from the dedicated room has begun. Progress will depend on the ability to obtain and maintain adequate

funding in the next decade over and above what is required to complete directed work scope in the 2 to 5 years.

- **Radioactive Waste Disposition.** The waste facilities are an integral part of conducting plutonium programs in the system of nuclear facilities. Waste treatment facilities must have an appropriate priority so as not to impact operations at TA-55 and the Chemistry and Metallurgy Research Replacement Facility-Nuclear Facility. This is a potential choke point particularly if manufacturing operations increase.
- **Consolidated Waste Capability** (LANL). This project has been deleted. Change from 2011 SSMP Annex D.
- **Transuranic Waste Facility.** This project is fully funded starting in FY 2012 FYNSP. The project scope provides for staging, characterization, and shipping/receiving of transuranic waste bound for the Waste Isolation Pilot Plant in Carlsbad. This project will replace current solid waste operations that are performed in Area "G" that will be closed in 2015 to comply with the consent order between DOE and New Mexico Environmental Department.
- **Radioactive Liquid Waste Treatment Facility (RLTWF)** Construction is expected to begin in FY 2013 on this facility. Radioactive Liquid Waste Treatment Facility replaces a system that is more than 40 years old with diminishing reliability. It processes radioactive liquid waste for the entire site. This project provides radioactive waste treatment and supports zero liquid discharge for 15 technical areas, 63 buildings, and 1,800 sources of radioactive liquid waste. Upgrades are required in order to comply with current codes and standards including seismic and electrical. The project is conducting a value engineering study to evaluate scope and cost savings opportunities prior to requesting NNSA approval to set the project's performance baseline.

- **Plutonium Support Infrastructure Proposals:**
  - **LANL Sanitary Effluent Reclamation Facility (SERF).** SERF was originally constructed in 2003 to supply reclaimed sanitary effluent for use at the Strategic Computing Complex. The expansion of SERF will provide treatment capacity (500,000 gallons per day) and reuse capability, thereby greatly reducing the amount of discharge and meeting National Pollutant Discharge Elimination System compliance requirements.
  - **Fire Stations (LANL).** This project proposes to replace two existing fire stations. The two existing fire stations were constructed in the early 1950s and continue to be operated beyond their useful life. The current facilities are inadequate to house assigned fire apparatus and personnel and do not meet current standards. Facility locations do not support meeting the required response times.

Uranium Facilities

Potential Infrastructure Modernization

There are no changes to the three primary projects planned to modernize the Y-12 National Security Complex. The gaps remain: 1) replacement of the aging enriched uranium production infrastructure; 2) consolidation and reduction of the high security footprint; and 3) revitalization of non-highly enriched uranium production facilities. The project elements are summarized below.

- **Nuclear Facility Risk Reduction.** Nuclear Facility Risk Reduction will extend the useful life for Buildings 9212 and 9204-2E until the Uranium Processing Facility (UPF) replacement facility is constructed. Process support systems are showing significant age-related deficiencies that have impacted reliability. The project has been baselined and will begin construction in FY 2012.
- **UPF Facility.** This project is at approximately 50 percent design maturity. The new 380,000 square foot facility will replace all high enriched uranium production capability now performed in four existing facilities with a total square footage of approximately 800,000 square feet. The UPF facility is designed to improve security, safety, efficiency in operations, and will reduce annual operating costs substantially. The project performance baseline will be set in FY 2013 when the design achieves 90 percent maturity. The updated cost range estimate (based on 45 percent design maturity) is $4.2 billion to $6.5 billion. NNSA intends to execute the UPF project in a few critical phases or stages with priority given to replacing aging processing capability in Building 9212. Completion of the UPF project and the Y-12 Protected Area Reduction Project will support the reduction of the high-security fence from 150 acres to 15 acres.
- **Replacement of non-highly enriched uranium Production Facilities.** Y-12's mission to produce nuclear weapons secondaries is encumbered by a number of aged, oversized, and inefficient facilities charged with non-highly enriched uranium material and component production. Modernization plans call for the replacement of these facilities with two new facilities, Lithium Production Facility (LPF) and Consolidated Manufacturing Complex. Specifics on each proposed project follow:
  - **Lithium Production Facility.** Proposes replacement of building 9204-02 (built in 1944) where lithium production and related non-nuclear special materials operations are currently performed. The lithium facility has exceeded its useful life, is exhibiting mechanical and structural problems, and has ever increasing deferred maintenance. The proposal would construct a smaller replacement facility outside the Perimeter Intrusion Detection and Assessment System, using industrial standards. This was previously part of the Consolidated Manufacturing Complex but has greater urgency and is now proposed separately.

    Consolidated Manufacturing Complex. Supports CSA production at Y-12. The Consolidated Manufacturing Complex will replace facilities constructed in the 1940s and

1950s that perform production work for depleted uranium, special materials, and general manufacturing vital in support of canned subassembly production. The existing facilities are oversized for today's mission and do not meet current codes and standards. They are costly to operate, have many operating issues, and have exceeded their expected life. The proposal would construct a combined facility that will consolidate these non-highly enriched uranium production functions into one smaller, modern facility with greatly reduced annual operating costs.

- **Uranium Support Infrastructure Proposals:**
  - **Protected Area Reduction Project.** This project includes reconfiguration of the Perimeter Intrusion Detection and Assessment System, vehicle and pedestrian portals, and final ARGUS implementation to support reduction of the Y-12 Perimeter Intrusion Detection and Assessment System from 150 acres to 15 acres. The Protected Area Reduction Project completion schedule range is 2020–2025 and will be correlated with UPF project completion. Alternate approaches to accomplishing this project scope are continuing to be evaluated in light of the UPF staged approach. This is a NA-70 funded project.
  - **EOC.** The proposed Y-12 EOC consolidates emergency operations, the fire protection department, and emergency operations facilities along with plant shift operations (911-like call-in and monitoring center) has received Critical Decision-0 and Critical Decision-1 approval.
  - **Applied Technology Laboratory.** This project will address deficiencies in Buildings 9202, 9203, and 9731. These facilities (each approximately 60 years of age) house R&D services including technology solutions and advancements for the plant and for other nationally important R&D missions. Continued occupancy of these non-code compliant, aging facilities will require increasingly escalating operating and maintenance expenditures.
  - **Plant Maintenance Facility.** This project proposes to replace an existing oversized facility constructed in 1944. The proposed facility would consolidate satellite maintenance facilities into one modern and efficient location.
  - **Materials Receiving and Storage Facility.** Supports consolidation of non-enriched uranium materials staged in multiple deteriorating buildings and disposition of an offsite lease facility where the bulk of Y-12 procurements and supplies are received. The proposed new facility would consolidate receipt and storage functions to increase the efficiency of operations and reduce the annual cost of the combined functions.

Tritium Facilities

Potential Infrastructure Modernization

There is no change regarding the plan for the Tritium Programs, known as Tritium Responsive Infrastructure Modifications (TRIM). It remains well-aligned with NNSA's current modernization objectives and any other foreseeable strategic direction in which tritium missions endure. TRIM will be considered in post-FY 2012 FYNSP budgets. The proposed project that supports the TRIM scope is described as follows:

- **Sustainment of the H-area Old Manufacturing Facility.** Proposes to relocate and replace support systems and equipment in a 50+ year old facility that has exceeded design life. The 1958 era H-area Old Manufacturing Facility's (HAOMF) infrastructure and utility systems are at or are near end-of-life condition. The facility is oversized and requires a large staff and high operating costs, and cannot be maintained with the current budget. The proposal would relocate HAOMF functions to other, existing facilities within the H-Area. After transfers, HAOMF would be closed.
- **Other Tritium Support Activities:**
  - **Low Enriched Uranium (LEU).** There is a potential strategic shortage in LEU. Therefore, the DOE/NNSA is pursuing identification of a source of 940 metric tons of unrestricted LEU or 1,800 metric tons for two reactors, for the life of the Tennessee Valley Authority (2048) agreement.
  - **Tritium production.** To ensure an adequate supply of tritium gas for the nuclear weapons stockpile, DOE plans to increase the current number of Tritium-Producing Burnable Absorber Rods irradiated at 544 per cycle through FY 2015 and increasing up to 1,700 Tritium-Producing Burnable Absorber Rods per cycle. The fuel assemblies used contain Tritium-Producing Burnable Absorber Rods. A supplemental environmental impact statement is being developed in order to support any proposed programmatic changes. In addition, the DOE/NNSA will obtain Nuclear Regulatory Commission approval of Tennessee Valley Authority license amendment in FY 2015.
  - Savannah River National Laboratory provides R&D underpinning HAOMF sustainment and process development for Tritium and Gas Transfer System production. In order to efficiently carry out this mission, especially in view of pending production contract consolidation challenges, Savannah River National Laboratory must improve its current tritium handling capabilities so that tritium R&D can be conducted efficiently in a laboratory environment.

Assembly, Disassembly, and High Explosives Facilities

Potential Infrastructure Modernization

The highest priority actions continue to be those associated with high explosives and the need to upgrade subsystem equipment within these manufacturing facilities; e.g., ultraviolet (UV) Flame Detection System and Fire Suppression Lead-Ins. Specifics regarding proposed projects are discussed below:

- **High Explosives Facilities:**
  - **High Explosive Pressing Facility Update (Pantex [PTX]),** The High Explosive Pressing Facility is fully funded in the FY 2012 FYNSP and will replace facilities that are aged and

in poor condition, requiring increased levels of maintenance and decreasing facility availability. The project construction is scheduled to be completed in 2017.

- **High Explosive Science Technology and Engineering Facility** (PTX). Proposes to accommodate operations that are currently located in three aging (40-to-65 years old) buildings, one semi-permanent trailer, and one laboratory area that are past their useful life. These operations support the production-related mission by developing technologies for production. Further, support is provided for the manufacturing and testing of high explosive and waste operations management that are necessary to accomplish mission deliverables. The proposal will replace old facilities with modern structures that will significantly reduce energy costs, create operational efficiencies, and advance transformation goals for a smaller, more adaptable plant.
- **High Explosive Packaging and Staging Facility** (PTX). Proposes the replacement of one administrative and three storage magazines for explosives movements built between 1942 and 1966. These buildings were constructed with the less rigorous design standards of the time and deteriorate with age, thus resulting in reduced explosive limits. The proposal will construct new magazines to support long-term explosives operations in Zone 11. The new facility will provide operational efficiencies as the current magazines do not have the capacity to support high explosive synthesis, high explosive pressing, or high explosive formulation.
- **High Explosive Formulation Facility** (PTX). Proposes to replace 65 year-old buildings (includes 12-19) in order to provide operational efficiencies for plastic bonded explosive production. The existing Cold War-era buildings lack safety elements needed for the explosive operating structures. Today's current explosive limits greatly reduce the productivity of formulation activities and the ability to support mission deliverables. The proposal is to build a facility in Zone 11 compliant with current safety codes that will allow upgraded operations capacity to support large-scale, high-explosive formulation. This is required to support future LEPs and lower operating costs as required by current energy directives.
- **High Explosive Component Fabrication and Qualification Facility** (PTX). Replaces two facilities almost 60 years old (12-31 and 12-32) that are limiting operations. The existing facilities are inefficient and unreliable, and jeopardize the ability to meet scheduled weapons assembly and dismantlement rates. The proposal will construct a consolidated facility which would implement improved environment, safety, and health control, enhanced efficiency, and maintenance reduction.
- **Inert Machining Facility** (PTX). Proposes to house various inert parts and fixtures fabrication operations required to perform testing and analysis for the NNSA weapon surveillance program. Additionally, parts generated from the dismantlement process will be sanitized in this facility. These operations support Directed Stockpile Work production work, specifically, component disposition and stockpile surveillance in accordance with the NNSA program requirements. This facility will be constructed with a versatile design to facilitate technology transfer of advanced machining methods.

Almost as important, a state-of-the-art facility will be instrumental in developing and maintaining critical skills required to support future stockpile surveillance.

- **High Explosives Support Infrastructure Proposal:**
  - **Zone 11 High Pressure Fire Loop (HPFL)** (PTX). This project will restore reliable fire suppression water distribution for the high explosive area at Zone 11. The upgraded HPFL for Zone 11 will be designed to provide water at a pressure, flow rate, and quantity to meet the demands of the fire suppression system in each facility. Failures in the existing system have increased over the past several years. The continued cast iron pipe deterioration and lack of cathodic protection will continue to increase the rate of failures. The project proposes to replace the Zone 11 HPFL piping to increase worker safety, avoid operational shutdowns, and preserve capital investments.
- **Assembly/Disassembly Facilities.** Subsystem upgrades are required to support safety, security, and maintenance refurbishment projects in order to maintain the overall plant functionality. The proposed projects are defined below:
  - **Fire Suppression Lead-Ins** (PTX). This project addresses replacement and modernization of the aged, unreliable, and deteriorating infrastructure in weapons assembly and disassembly production facilities in Zone 12. Due to aging and corrosive existing soil conditions, the lead-in piping to the nuclear facilities has experienced multiple failures. Installation of the new lead-in piping will significantly decrease the potential for additional piping failures in the system. This will, in turn, reduce production facility down time, permit more effective maintenance, and eliminate the current deferred maintenance of the system.
  - **UV Flame Detection System (bays and cells support equipment)** (PTX). Replaces existing UV flame detection systems with infrared detectors in weapons assembly and disassembly facilities. The current flame detection system depends on UV detectors which are 1980s vintage technology. Due to its obsolescence, system parts will be available only through 2012. The manufacturer of the current UV system will be phasing out production and will not comply with the new product approval standard. The proposal consists of replacing the flame detection systems and deluge releasing controllers in nine production buildings. This project allows for increased worker protection and meets modern safety standards.
  - **Facility Installed Continuous Air Monitoring Equipment Replacement (FICAM) (bays and cells support equipment)** (PTX). Supports replacement of existing tritium and alpha sensors that are no longer supported or fabricated by the manufacturers. When a component fails, continuous air monitoring (CAM) fails, and nuclear operating areas must stop work and evacuate personnel. Historical data reflects approximately 50 failures per year. The proposal will replace the system and its components, which is necessary for continued nuclear operations.
  - **Non-Destructive Evaluation Facility** (PTX). Proposes to replace a Cold War-era building where current explosive limits reduce productivity and the capability of building, maintaining, and retiring nuclear weapons. The current explosive limits also restrict

analytical and scientific capabilities. The proposed new facility will incorporate safety and security enhancements into the design, eliminate administrative controls, and provide mission agility for future requirements. This will boost operating efficiencies and greatly reduce energy costs.

- **Fire Protection Building Lead-ins Replacement** (PTX). Replaces existing ductile and cast iron pipe (installed between 1979 and 1985) to ameliorate pipe degradation and soil corrosion issues. The proposed project will replace the piping into non-nuclear Zone 12 buildings and ramps from the HPFL up to and including the riser flange and would radically decrease the possibility of future failures.
- **HPFL Tanks and Storage Project** (PTX). Proposes the replacement of existing facilities that were constructed in 1973 and are in poor condition. The existing liner continues to slump over the siphon inlet, which limits the ability of the pumps to deliver the required water. Replacing the tanks and pumps is needed in order to avoid shutdown of explosive and production buildings, maintain the high-pressure fire protection system, and provide a reliable water supply for the fire protection system.

- **Storage of Special Nuclear Material** at PTX may be consolidated in the future with the following project dependent on alternatives analyzed and projected cost savings:
  - **Material Staging Facility** (PTX). Proposes a modern safe and secure staging area that is in close proximity to the weapons productions area. The existing staging and storage area is remote from the production area which makes material transferred between the staging and operations areas exposed and vulnerable. Also, although the current staging area was constructed to the standards of that time, it now requires significant and costly administration and oversight to meet modern safety and security needs. By collocating storage and staging with the production area, mission production efficiency, security, and safety will increase while costs to operate decrease.

Non-Nuclear Components Production Facilities

Non-Nuclear Approved Infrastructure Modernization

- **Kansas City Responsive Infrastructure Manufacturing and Sourcing.** Replaces the 67 year-old, 3.1 million square foot production plant with a new General Service Administration (GSA) leased facility with approximately 1.2 million square feet of net useable space. The GSA executed the lease agreement with the developer on June 14, 2010 and a groundbreaking ceremony was conducted on September 8 for the new Kansas City Responsive Infrastructure Manufacturing and Sourcing campus construction. The new manufacturing facility is located at 14500 Botts Road, approximately 8 miles south of the current Kansas City Bannister Federal Complex. The project is on schedule with major milestones as follows:
  - July 2010: Construction start of new campus
  - November 2012: Construction complete; relocation activities begin

- August 2014: Complete relocation and begin disposition of old facility

During the relocation transition period, only a relatively small amount of non-nuclear production capabilities will be out of service at any given time, and deliveries will continue from inventory stock being built ahead of the relocation. Development activities will largely be unaffected since both plants will be operating simultaneously for 18 months.

Readiness in Technical Base and Facilities operating funds will relocate equipment, material, and personnel and provide final hookups to the building utility and security systems. The overall project, excluding legacy facility disposition, maintains positive cash flow for the duration of the project through savings realized from reduced facility maintenance at the legacy site and reduced indirect support costs from the business process transformation.

SNL

Non-Nuclear Approved Infrastructure Modernization

- Silicon fabrication facility project replaces tooling and modifies process systems. The silicon fabrication requires periodic retooling on the trailing edge of the semi-conductor industry (equipment supported by operating resources). This maintains the capability to utilize recent technology advances developed and proved by others as an option for use in nuclear weapons applications. It further allows NNSA to benefit from tooling donations from the private sector in lieu of procurements as a way to keep the tooling on the lagging edge of the technology. All tooling, whether procured or donated, requires packing, transport, complex installation, and modification of the process system and plumbing of gases and materials that serve the tools.

Appendix E—List of Acronyms

AF&F	Arming, Firing, and Fuzing
ASC	Advanced Simulation and Computing
BMAC	Business Management Advisory Council
CD	Critical Decision
CMF	Component Maturation Framework
CMRR-NF	Chemistry and Metallurgy Research Replacement Facility-Nuclear Facility
DM	Deferred Maintenance
DNS	Defense Nuclear Security
DoD	Department of Defense
DOE	Department of Energy
DP	Defense Programs
DSW	Directed Stockpile Work
EOC	Emergency Operations Center
FIRP	Facilities and Infrastructure Recapitalization Program
FY	Fiscal Year
FYNSP	Future Years Nuclear Security Program
GAO	Government Accountability Office
GSP	Graded Security Protection
HAOMF	H-area Old Manufacturing Facility
HED	High-Energy-Density
HPFL	High Performance Fuel Laboratory
ICF	Inertial Confinement Fusion
KCRIMS	Kansas City Responsive Infrastructure Manufacturing and Sourcing
LANL	Los Alamos National Laboratory
LEP	Life Extension Program
LEU	Low Enriched Uranium
LLC	Limited Life Component
LLNL	Lawrence Livermore National Laboratory
LVOC	Livermore Valley Open Campus
M&O	Management and Operating

NAP	Policy Letters
NIC	National Ignition Campaign
NG	Neutron Generator
NNSA	National Nuclear Security Administration
NPR	Nuclear Posture Review
NNSS	Nevada National Security Site
NSE	Nuclear Security Enterprise
NWE	Nuclear Weapon Effects
PCF	Predictive Capability Framework
PF	Plutonium Facility
PTX	Pantex Plant
R&D	Research and Development
RTBF	Readiness in Technical Base and Facilities
SCT	Security Commodity Team
SERF	Sanitary Effluent Reclamation Facility
SNL	Sandia National Laboratories
SPR	Strategic Petroleum Reserve
SSMP	Stockpile Stewardship and Management Plan
SSP	Stockpile Stewardship Program
ST&E	Science, Technology, and Engineering
STA	Secure Transportation Asset
TA	Technical Area
THD	Tritium Hydrogen Deuterium
TRIM	Tritium Responsive Infrastructure Modifications
UGT	Underground Nuclear Testing
UPF	Uranium Processing Facility
U.S.	United States
UV	Ultraviolet